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When a crisis hits: An examination of the impact of the global financial crisis and the COVID-19 pandemic on financing for women entrepreneurs



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ABSTRACT

Crises have significant implications for entrepreneurs' businesses. Female entrepreneurs are often found to suffer from crises due to their marginalized positions. Despite the increasing research at the nexus of crisis, entrepreneurship, and gender, how a crisis may influence investors' funding decisions concerning female entrepreneurs and whether different macro crises bring with them different implications remain under-explored questions. Drawing on role congruity theory and the crisis and strategic decision-making literature, this paper proposes that macro crises can shake the perceived incongruity between traditional stereotypes of the female gender role and masculine stereotypes related to the entrepreneur's role, thereby affecting financing for female entrepreneurs. We further compare two specific crises having different associated implications: the global financial crisis (GFC) and the COVID-19 pandemic. We conducted two studies, one emphasizing experimental manipulation and the second based on observational data. We found consistent evidence that investors were more likely to invest in female-founded ventures after the GFC; however, the opposite phenomenon occurred after COVID-19. Our experiment demonstrates that changed perceptions of gender role incongruity are a critical underlying mechanism driving our results. Our research has implications for both the entrepreneurship literature and role congruity theory.

Executive summary: Amidst the expanding body of research on crisis, entrepreneurship, and gender, there is a predominant focus on the entrepreneur, leaving a discernible gap in our understanding of how macro-level crises specifically influence investors' funding decisions related to female entrepreneurs, and whether different types of crises lead to varying outcomes. This paper aims to bridge this gap, drawing insights from role congruity theory and integrating perspectives from crisis and strategic decision-making literature. We suggest that macro crises have the potential to shift investors' perceived incongruities between female gender roles and the masculine stereotypes commonly associated with entrepreneur roles, consequently affecting funding decisions for female-founded ventures.

To test our hypothesis, we conducted two comprehensive studies within the contexts of two different crises, each with unique implications: the Global Financial Crisis (GFC) and the COVID-19 pandemic. Our first study employed experimental manipulation, while the second relied on

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observational data. Across both studies, the results were consistent: post-GFC, investors demonstrated an increased propensity to invest in female-founded ventures; conversely, after the onset of COVID-19, this trend reversed. Crucially, our findings underscore the pivotal role of perceptions of gender role incongruity in shaping the observed outcomes.

Our framework enriches the existing body of literature, offering nuanced insights into how various crises may impact investors' funding decisions based on gender. Moreover, our results underscore the importance of aligning actions with macro-level shifts as we strive to cultivate more inclusive entrepreneurial ecosystems.

1. Introduction

Macro crises often represent an inescapable reality for human societies. Natural disasters, wars, global health crises, and financial crises often impose extreme unexpected circumstances on societies at large, significantly changing their economic, technological, and/or social landscapes. Increasing research has started to look at the implications of macro crises for entrepreneurship, such as entrepreneurs' decisions (e.g., Davidsson and Gordon, 2016), organizing (e.g., Shepherd and Williams, 2014; Williams and Shepherd, 2016), and performance (e.g., Bartz and Winkler, 2016). Scholars have often viewed female entrepreneurs as particularly vulnerable to crisis due to the social and economic barriers they face (Pines et al., 2010), leading to poor performance and negative impacts on mental health when a crisis strikes (Birhanu et al., 2022; Caliendo et al., 2023).

Despite the important advances made by previous research, most prior studies have adopted an *entrepreneur-focused* approach. There is limited theorization and detailed understanding of how a macro crisis may also shape the funding decisions of *external resource providers*, such as venture capitalists and angels, toward female entrepreneurs (Doern et al., 2019; Leitch et al., 2018). Indeed, while public discourse and financial news reporting have reinforced the idea that female entrepreneurs who attempt to secure financing are at a universal disadvantage when a crisis hits (e.g., Boorstin, 2021), there is likely more to the story as different macro crises are situated within unique historical contexts that create different operational circumstances for investors. In short, there is a lack of deeper investigation into *how* a macro crisis may influence investors' gender-related funding decisions and whether *different* macro crises bring different implications.

In this paper, we attempt to provide an answer to these questions. Building on role congruity theory (Eagly and Karau, 2002) and the literature on macro crises and strategic decision-making (e.g., Davidsson and Gordon, 2016; Luo and Zhang, 2022), we connect macro-level crises with micro-level investor decision-making regarding female entrepreneurs. Entrepreneurial financing has been found to exhibit significant gender bias (Brooks et al., 2014; Ewens and Townsend, 2020; Gupta et al., 2009; Malmström et al., 2017; Thébaud, 2015; Tonoyan et al., 2020), and a major source of such bias is investors' perceived incongruity between traditional gender role stereotypes for women and masculine stereotypes regarding an entrepreneur's role. We theorize that a macro crisis could influence the perceived role congruity of female entrepreneurs and, in turn, funding decisions concerning these women by changing three first-order mechanisms: risk preference, salience of female entrepreneurship, and commitment to weakening masculine norms. We situate our theoretical model among two distinct major crises: the global financial crisis (GFC) of 2008–2009 and the COVID-19 pandemic (COVID-19) that began in 2019. We formulate hypotheses and, in testing them, find that new venture investors were more likely to invest in female entrepreneurs after the GFC; conversely, they were less likely to invest in female entrepreneurs after the onset of COVID-19.

We conduct two studies to balance the internal and external validity of our research. The first study comprises an online experiment based on experimental manipulations of the type of macro crisis. The results suggest that compared to the no-crisis condition, the GFC increased the perceived role congruity of female entrepreneurs and, in turn, their funding probabilities. Contrariwise, compared to the no-crisis condition, COVID-19 reduced the perceived role congruity of female entrepreneurs, leading investors to be less likely to invest in female entrepreneurs after the crisis began. In further tests of our theorized mechanisms, we find that risk preferences and commitment to weakening masculine norms were likely the primary mechanisms driving the differences. The second study leverages Crunchbase, a database that provides real-time information on startup investments, investors, and entrepreneurs, to investigate the impact of the two macro crises on investors' funding decision toward female-founded ventures. To identify and approximate a causal relationship, we adopt a quasi-experimental generalized difference-in-differences design that uses the severity of the crisis shock as the treatment intensity. The results suggest that investors were more likely to fund female-founded ventures after the GFC; however, the opposite was true for investors after COVID-19.

Our paper makes several contributions. First, we join the conversation on crises and entrepreneurship (e.g., see Doern et al., 2019; Newman et al., 2022; Shepherd et al., 2022; Williams et al., 2017, for reviews) by offering a new investor-focused angle. While previous studies have highlighted that entrepreneurs hit by a crisis change their perceptions of risk and opportunity (Davidsson and Gordon, 2016) as well as their attitudes (Liu et al., 2023), our model suggests that investors' perceptions and decisions are also shaped by crises. Our theoretical model provides detailed theorization of the links between a macro crisis, perceived role congruity, and funding decisions.

As our second contribution, our findings advance the entrepreneurial financing and gender literature. Much of the literature in this stream has not touched upon the impacts of a macro crisis on investors' investment patterns related to female entrepreneurs, instead mostly assuming that women are likely to be universally disadvantaged in a crisis. This propensity led Leitch et al. (2018, p. 109) to lament the existing literature's "pronounced tendency to set aside macroeconomic and policy-related topics" and, hence, the lack of

studies examining the diversified impacts of crises on financing for female entrepreneurship. In heeding their call, we find that female entrepreneurs are not universally disadvantaged; instead, the impact depends on the particular crisis they encounter.

Third, we contribute to role congruity theory in general and its application in entrepreneurship in particular. *Micro-level contextual* variations in role congruity perceptions have frequently been investigated in both management and entrepreneurship studies (see Eagly and Karau, 2002; Anglin et al., 2022, for reviews). Specifically, in entrepreneurship, previous research has examined the venture context (social-related ventures; e.g., Anglin et al., 2022; Yang et al., 2020), the financing context (crowdfunding; e.g., Johnson et al., 2018), and the individual behavioral context (female entrepreneurs' masculine behaviors and expressions; e.g., Kanze et al., 2018; Seigner et al., 2022). Our investigation extrapolates the situation from micro to macro and highlights a theoretical framework for how macro crises lead to changes in perceptions of female entrepreneurs' gender role congruity. Thus, our study also expands the application of role congruity theory at the macro level.

2. Theoretical background

2.1. Macro crises, entrepreneurship, and gender

A crisis can be defined as “an extreme, unexpected or unpredictable event that requires an urgent response from organizations and creates challenges for them” (Doern et al., 2019).¹ A macro crisis is thus a crisis that happens at the macro societal level, potentially affecting the globe and creating a significant threat to the public (Woodall, 2021). For example, wars, macro economic crises, global health crises, and natural disasters are oft-cited macro crises whose impacts extend widely, affecting a large population of people and creating societal-level repercussions.

Macro crises are particularly relevant to entrepreneurship. On the one hand, entrepreneurial activities are often a potent source of economic and social change that alleviate crises (e.g., Shepherd and Williams, 2014; Williams and Shepherd, 2016). On the other hand, entrepreneurial firms frequently suffer from the liabilities of newness and smallness (Stinchcombe, 1965), which may make them particularly vulnerable in times of crisis (Fairlie, 2020; Graeber et al., 2021). The nexus of crisis and entrepreneurship has received substantial attention in both the economics literature and the entrepreneurship literature. Research has suggested that a crisis can impact entrepreneurs' decisions (e.g., Davidsson and Gordon, 2016; Klapper and Love, 2011), attitudes (Liu et al., 2023), opportunity identification (Linnenluecke and McKnight, 2017; Salvato et al., 2020), organizing (Shepherd and Williams, 2014; Williams and Shepherd, 2016), resilience responses (e.g., Doern, 2016; Kuckertz et al., 2020; also see Doern et al., 2019, for a review), and performance (e.g., Birhanu et al., 2022). While crises generally lead to negative consequences for entrepreneurs and their businesses, entrepreneurs have also shown the ability to cope with a crisis positively (Bullough et al., 2014). In addition, pre-crisis conditions, such as resource endowment, may help buffer entrepreneurs from the negative impacts of a crisis (e.g., De Carolis et al., 2009).

The issue of gender has begun to receive increasing attention in this stream of literature. Indeed, female entrepreneurs often face social and economic barriers, such as family and care responsibilities, limited financial and business-oriented backgrounds and training, narrow networks, and social prejudice (Kogut and Mejri, 2022; Pines et al., 2010). As a result, they often operate in an informal sector, run smaller businesses, and have fewer resources at their disposal compared to men (Pines et al., 2010). Given these barriers, the extant literature suggests that female entrepreneurs tend to be disproportionately impacted by crises, manifesting in a variety of ways. For instance, they often experience lower sales growth (Birhanu et al., 2022), their ventures may be of lower quality (Giotopoulos et al., 2017), they typically report lower weekly hours worked (Kalenkoski and Pabilonia, 2022), and their mental health may suffer (Caliendo et al., 2023). In addition, female entrepreneurs have been found to prefer more conservative strategies in response to a crisis (Buratti et al., 2017).

While previous studies have advanced scholarly understanding of how female entrepreneurs may face some particularities of crises, whether due to constraints or preference (Birhanu et al., 2022), understanding of the other side of the story remains limited—that is, how external resource providers may also change their perceptions and, consequently, their funding decisions related to female entrepreneurs in response to a crisis. In fact, most prior studies on entrepreneurial financing have focused on investors' overall investment amounts and the number of deals made in crises. These studies have generally argued and found that macro crises could lead to a credit crunch and a weak initial public offering (IPO) market, inducing investors to take a conservative stance, at least in the immediate aftermath of the onset of a crisis (Bellavitis et al., 2022; Block and Sandner, 2009; Gompers et al., 2008; Gompers and Lerner, 2004; Howell et al., 2020). Except for Cowling et al. (2020), and Thébaud and Sharkey (2015), who reported conflicting results concerning the impact of the GFC on funding for female entrepreneurs, much of the literature has neglected the impacts of a crisis on investors' gendered investment patterns. Instead, scholars seem to have rested on the assumption that women are likely to be universally disadvantaged due to the consistent gender funding gap found in most circumstances (Brooks et al., 2014; Ewens and Townsend, 2020; Gupta et al., 2009; Guzman and Kacperczyk, 2019).

However, macro crises, such as mega-disasters and events, spark organizational and institutional change as individuals review and revise the dominant way of thinking and acting (Birkmann et al., 2010; Pearson and Clair, 1998; Tilcsik and Marquis, 2013). Studies focused on macro crises and decision-making have suggested that such change could involve gendered norms and even benefit women. For example, after the social crisis of sexual harassment and the subsequent #MeToo movement, the hiring of women increased in venture capital firms (Calder-Wang et al., 2021) and in Hollywood (Luo and Zhang, 2022). Thus, unpacking the relationship between

¹ Crisis is a narrower concept than adversity, which is defined as “an unfortunate event or circumstance or the state of serious and continued difficulty” (Tian and Fan, 2014, p. 252).

macro crises and funding decisions regarding female entrepreneurs is urgently needed, as echoed by Leitch et al. (2018).

In addition, existing studies have situated their examinations within particular crises. For example, Bellavitis et al. (2022) examined venture capital investments during the COVID-19 crisis, while Block and Sandner (2009) investigated the topic in light of the GFC. While crises may often create demand and/or supply shocks that dampen investors' market confidence, different macro crises are also situated within *unique historical contexts* that create different operating circumstances for investors. For example, discrete natural disasters, such as earthquakes and hurricanes, are often hostile in terms of their destruction of local resources; nevertheless, their effects are typically temporary, and their patterns may be predictable with reasonable accuracy. Unlike natural disasters, some crises, such as Brexit, do not immediately impact resource supplies but impose lingering uncertainty and unpredictability that cloud the future status of business relations (Bloom et al., 2019). Thus, as crises differ, such as by severity and cause (Doern et al., 2019), they likely lead to different implications for investors' decisions regarding female entrepreneurs.

In what follows, we introduce and explain role congruity theory to provide a lens for understanding the gendered nature of entrepreneurial financing. We suggest that a macro crisis could influence funding decisions for female entrepreneurs by shaping perceptions of their gender role congruity.

2.2. Role congruity theory and women's disadvantages in entrepreneurial financing

Uncertainty is the cornerstone of entrepreneurship (Knight, 1921). Naturally, this uncertainty is transferred to new venture investors when they need to make decisions without sufficient market and financial information or even a prototype product to demonstrate the potential value of an emerging venture. Accordingly, social factors, such as gender (Brooks et al., 2014), social ties (Wang, 2016), high-status affiliation (Wuebker et al., 2015), and homophily (Franke et al., 2006), frequently play an important role in investors' decision-making process. These social factors are often associated with descriptive norms or stereotypes that embody investors' knowledge of, beliefs about, and expectations of specific social groups, thereby providing a cognitive shortcut for investors. Among these social factors, gender is among the most visible and stable (Rudman and Phelan, 2008) and is typically associated with the widely accepted social norms concerning what women are and do (Eagly and Karau, 2002).

Role congruity theory (Eagly and Karau, 2002) explains how women are often perceived as unfit for professional roles that are viewed as masculine, such as leaders and entrepreneurs, thus resulting in prejudice. The female gender role is more strongly associated with communal and relationship-oriented attributes. In contrast, entrepreneurship has traditionally been depicted and viewed as a male-dominated activity, and the characteristics considered essential for entrepreneurial success are usually masculine in nature (Gupta et al., 2009). The scarcity of female leadership in the corporate world and the male tendency to own large, highly profitable, growth-oriented businesses further strengthen this masculine perception (Brush, 2006). This state of affairs results in an incongruity between the female gender role and the entrepreneur role.

As a result of this incongruity, investors tend to scrutinize female entrepreneurs more intensely than their male counterparts. For example, investors may take female entrepreneurs less seriously, question their commitment, and believe their businesses have poor prospects for growth or profits (Cliff, 1998; Gupta et al., 2009; Malmström et al., 2017; Morris et al., 2006). Even worse, investors are likely to hold a higher evaluation standard for women or attribute women's business success to factors other than ability (Brush et al., 2004; Jennings and Brush, 2013; Murphy et al., 2007). Thus, it is not surprising that previous studies have consistently identified a gender funding gap (Brooks et al., 2014; Ewens and Townsend, 2020; Gupta et al., 2009; Guzman and Kacperczyk, 2019; Malmström et al., 2017).

Despite investors' average tendency toward bias against women, scholars have found perceived gender role incongruity is subject to contextual influences. As Eagly and Karau (2002, p. 590) concisely summarized, "A lessening of the prejudice that is directed toward female leaders and potential leaders would require change in gender roles or leader roles or both." Contextual characteristics may change such role norms. In particular, the entrepreneurship literature highlights several contextual factors that may have this effect. First, there is the social venture context. Social ventures embody more communal and other-oriented features than commercial ventures, making female entrepreneurs more congruent with the entrepreneur role (Anglin et al., 2022). Accordingly, female entrepreneurs can reduce or even revert gender bias by sending social signals (Yang et al., 2020), framing social impact (Lee and Huang, 2018), or starting social ventures (Anglin et al., 2022). Second, there is the financing context. A financing context with heightened uncertainty may invite a more welcoming attitude toward female entrepreneurs. Indeed, Greenberg and Mollick (2017) found that female entrepreneurs can outperform male entrepreneurs in the crowdfunding context due to activist choice homophily. Within the same context, Johnson et al. (2018) provided a different explanation for why female entrepreneurs outperform male entrepreneurs in such a context, asserting that the more uncertain environment of online crowdfunding underscores trustworthiness as a communal characteristic traditionally linked with women. Third, there is the individual behavioral context. While leadership research has theorized and found that female leaders may encounter backlash when behaving masculinely, the entrepreneurship literature reveals that women may benefit from more using promotion-focused language (Kanze et al., 2018) and making innovation claims (Seigner et al., 2022), both of which are traditionally associated with masculinity.

Overall, despite the ongoing debate regarding the impact of a specific context (see Anglin et al., 2022, for a review), scholars commonly accept that situational variations can strengthen, weaken, and even revert gender role incongruity (Eagly and Karau, 2002). The existing entrepreneurship studies, however, have focused mostly on micro-level contexts, as illustrated in the previous discussion. Whereas micro contexts provide a proximal understanding, macro contexts matter because they can shape societal/group norms regarding gender and entrepreneur roles. For example, regarding gender roles, Zhao and Yang (2021) found that gender inequality beliefs vary across different Chinese provinces, which has effects on the disadvantages female entrepreneurs face. As for the entrepreneur role, Thébaud (2015) found that gender bias might be less significant in societies where female entrepreneurs are more

prevalent, such as in the United States versus the United Kingdom.

2.3. Macro crises and funding decisions regarding female entrepreneurs

How do macro crises link to gender role congruity perceptions and thereby funding decisions for female entrepreneurs? We build on the literature on macro crises and strategic decision making (e.g., [Davidsson and Gordon, 2016](#); [Luo and Zhang, 2022](#)) and suggest three first-order mechanisms underlying these relationships: (1) a crisis changes investors' risk preference, (2) a crisis changes investors' perceptions of the salience of female entrepreneurship, and (3) a crisis changes investors' commitment to weakening masculine norms. We situate our theorizing among two different macro crises—the GFC and COVID-19—as we expect the two crises to exert different influences on the three mechanisms for investors. This approach moves beyond the current crisis and entrepreneurship literature, in which researchers have typically situated their investigative efforts within the context of one particular crisis.

2.3.1. The GFC

A financial crisis happens when the price of financial obligations collapses, which may lead to the collapse of the economy. As the worst financial crisis since the Great Depression, the GFC contracted global gross domestic product (GDP) by 2.9 % and slowed international trade growth to 4.1 % ([World Bank, 2019](#)). Low standards in the lending market, abuse of collateralized debt obligations, and the dearth of regulation of the financial sector jointly caused the GFC ([Foster and Magdoff, 2009](#)), sharing some similarities with the run-ups to other historical financial crises. For example, [Reinhart and Rogoff \(2008\)](#) observed that a sharp and unsustainable asset price increase and credit boom resulting from accommodative monetary policies were evident before every major financial crisis, from the GFC to the so-called Big Five banking crises in advanced economies (Finland in 1991, Japan in 1992, Norway in 1987, Sweden in 1991, and Spain in 1997). As a result, investors engaged in aggressive and irrational investments, often incurring over-indebtedness ([Bordo, 2008](#)), and exhibited herd behavior as unregulated financial innovations persisted, further accumulating systemic risk.

2.3.2. Risk preference

Risk is a core concept in both entrepreneurship and crisis research. While entrepreneurs bear risk in creating a venture, a high level of perceived environmental risk from a crisis can deter their entrepreneurial activities ([Davidsson and Gordon, 2016](#)). Similarly, [Luo and Zhang \(2022\)](#) suggested that risk mitigation is a crucial mechanism underlying a macro crisis and changed decision-making. For example, after the social crisis of sexual harassment and the subsequent #MeToo movement, Hollywood producers hired more women to mitigate potential legal, market, and reputational risks.

The trade-off between risk and return is an essential decision criterion for new venture investors ([Tyebjee and Bruno, 1984](#)). A critical repercussion of crises that affect investors' decisions manifests in their risk preference, or their attitudes toward risk, which varies across a continuum from risk averse to risk-seeking. The psychology and economics literature has argued that individuals' risk preferences are not always stable and that experience has a great influence in shaping it ([Hertwig et al., 2004](#); [Nisbett and Ross, 1980](#)). For instance, [Malmendier and Nagel \(2011\)](#) demonstrated that individuals who experience macro economic shocks are less willing to take financial risks and are more pessimistic about future investment returns.

A crisis, as a significant shock to individuals, may influence investors' preferences through several possible channels, including (1) changes in the macro economic environment ([Guiso and Piaella, 2008](#)), meaning that when economic activities and market expectations are low, individuals are more risk averse; (2) changes in an individual's wealth level, such as an individual who experiences great loss becoming more risk averse ([Campbell and Cochrane, 1999](#); [Barberis et al., 2001](#); [Andersen et al., 2019](#)); and (3) changes in emotions ([Loewenstein, 2000](#); [Wang and Young, 2020](#); [Kuhnen and Knutson, 2011](#)) such that positive emotions like excitement could induce people to take risks, while negative emotions, such as fear or anxiety, create the opposite effect.

Following this line of argument, we contend that the GFC likely decreased investors' risk preference. First, the GFC resulted in slowed economic activities and poor market prospects. Based on World Bank data,² the US GDP growth rate, a widely used indicator of economic expansion and contraction, decreased by 0.82 % in 2008 and further deteriorated by 3.45 % in 2009—more than in any previous global recession since the end of World War II. Moreover, it took until 2013 for the United States to recover to its pre-GFC level of GDP. This contraction in the economy meant less customer spending and demand for entrepreneurial products and services and fewer attractive opportunities for business development, which further fed into investors' risk aversion.

Second, venture investors experienced greatly shrinking values as the GFC affected both the capital input and market exit values. As a result, investors encountered immense difficulty in fundraising. Capital commitments to US venture funds fell by almost half from 2008 to 2009 ([Block et al., 2018](#)). In addition, the collapse of financial systems led to a weakened IPO market. In particular, the number of IPOs in the United States dropped from 296 in 2007 to 57 in 2008 (an 81 % drop) and to 69 in 2009 ([Statista, 2022](#)). The value of venture capital-backed IPOs dropped from 7.2 billion dollars in 2007 to 0.7 billion in 2008 (a 90 % drop) and to 1.2 billion in 2009 ([Statista, 2022](#)). The average year-end gains after an IPO were – 42 % for businesses that had an IPO in 2008 ([Statista, 2022](#)). The weak exit market thus severely curtailed investors' opportunities to exit successfully, fueling their risk aversion.

Lastly, the GFC evoked significant negative emotions among investors, such as anxiety and fear about the future ([Deaton, 2012](#)). After the collapse of major financial institutions and massive sell-offs in financial markets, panic and anxiety prevailed, as reflected in the slump in the stock market. Furthermore, extensive media coverage employing phrases like “economic meltdown” and drawing

² <https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?end=2021&locations=US&start=2005&view=chart>

comparisons to the Great Depression exacerbated negative emotions. Indeed, the investor confidence index published by Yale University³ showed that the one-year confidence level dropped 9 % in 2008 from the previous year. This confidence has still not fully recovered to the pre-GFC level of 2007. Overall, the negative emotions induced by the GFC likely also led to higher risk aversion on the part of investors.

2.3.3. Salience of female entrepreneurship

Alongside risk consideration, macro crises could also affect the decision-making of new venture investors by shaping their perceived salience of female entrepreneurship. The term “salience” refers to the priority investors assign to particular stakeholder groups and is indicative of their perceived importance (Mitchell et al., 1997). Such perceived salience, in turn, could act as a catalyst, prompting individuals to adjust their behavior (Luo and Zhang, 2022).

First, the salience of female entrepreneurship should increase with the perceived value of investing in female entrepreneurs. As suggested by the stakeholder salience literature (Freeman and Reed, 1983; Frooman, 1999; Mitchell et al., 1997), the salience stems from the investors' dependence on female entrepreneurship to obtain resources needed for survival. The GFC severely impacted traditionally male-dominated sectors like construction and manufacturing, as indicated by an average negative growth rate of -6.24 % in 2008 and 2009 (Bureau of Economic Analysis⁴). Such a marked effect led to the term “manceession” in the media (Thompson, 2009). Conversely, sectors with substantial female representation, including education, healthcare, social services, accommodation, and hospitality, weathered the storm more effectively, as evidenced by an average negative growth rate of only -1.19 % during the same period. Moreover, the most female-intensive sectors recorded an average growth of 3.4 % in 2008 and 2009 compared to 2007. Consequently, the GFC had a more detrimental effect on male-dominated sectors while enhancing the appeal of female-associated ones. This transformation in the market dynamics likely led investors to reconsider their pre-conceptions, driving them to recognize the escalating value of investments in female-led enterprises. This situation likely arose due to the halo effect, a cognitive bias whereby the performance of one aspect (in this instance, the out-performance of female-dominated sectors) is extrapolated to inform judgments about related elements (here, the potential success of female-led businesses and the overall realm of female entrepreneurship).

Second, the salience of female entrepreneurship can be seen to rise in parallel with the prevalence of female entrepreneurs, a trend that was observed after the GFC. As indicated by Global Entrepreneurship Monitor (GEM) data,⁵ the total early-stage entrepreneurial activity (TEA) gender ratio, a metric representing the ratio of female to male entrepreneurs between the ages of 18 and 64, exhibited an average rise of 6.67 % in 2008 and 2009 as compared to 2007. This increase in the number of female entrepreneurs may have boosted their legitimacy among new venture investors by normalizing women's participation in entrepreneurial roles. Legitimacy is a key influencer of stakeholder salience, as pointed out by Agle et al. (1999). As a result, after the GFC, female entrepreneurs are less likely to be regarded as minorities and are instead likely to be perceived with increased salience or prominence.

In conclusion, by increasing the perceived value of female-related investments and the prevalence of female entrepreneurs, the GFC amplified the salience of female entrepreneurship in the eyes of new venture investors.

2.3.4. Commitment to weakening masculine norms

Entrepreneurial activities have historically been defined by masculine norms, with success in entrepreneurship being associated with traits and behaviors traditionally viewed as masculine. However, crisis situations often lay bare the deficiencies of such entrenched institutional logics and challenge the validity of long-standing assumptions, values, and beliefs (Sine and David, 2003). Such moments of uncertainty can spur investors to reconsider their paradigms and commit to a change in approach (Luo and Zhang, 2022; Herscovitch and Meyer, 2002).

We posit that crises can drive what we term investors' commitment to weakening masculine norms, characterized as an inherent desire to scrutinize and contest the dominant masculine norms in entrepreneurship when assessing entrepreneurial ventures. The nature of a crisis can either stimulate or dampen investors' intrinsic commitment to challenge or uphold the masculine stereotypes of entrepreneurship, thereby influencing their preferences for ventures led by female entrepreneurs. Such commitment to instigate change is an essential first step toward reshaping beliefs and decision-making criteria (Luo and Zhang, 2022).

The GFC serves as a case in point. Many scholars have tied the GFC to controllable factors closely associated with traditionally masculine traits and behaviors, including risk-taking and aggressiveness. Policymakers and media outlets have argued that some of the structural deficiencies leading to the crisis, such as inadequate supervision of financial innovation, rapid financial liberalization, and an over-emphasis on risk-taking, could have been mitigated or even prevented (Claessens et al., 2010; Reinhart and Rogoff, 2008; Romer and Romer, 2017; World Bank, 2013).

The fallout from the GFC led to an introspective discourse critiquing the over-emphasis on masculinity in the business world. A poignant question encapsulating this sentiment asked, “If Lehman Brothers had been Lehman Sisters, run by women instead of men, would the credit crunch have happened?” (Sunderland, 2009). Prügl (2012) argued that this discourse birthed a narrative myth of women as more financially responsible, positioning this narrative as a corrective mechanism, championing prudent woman, and advocating for more gender diversity in the business world to restore a sense of social and economic harmony.

The perceived role of dominant masculine norms in precipitating the GFC likely prompted many investors to reassess the traditional

³ <https://som.yale.edu/centers/international-center-for-finance/data/stock-market-confidence-indices/united-states>

⁴ Data accessed at: <https://www.bea.gov/itable/gdp-by-industry>.

⁵ Global Entrepreneurship Monitor data accessed at <https://www.gemconsortium.org/data/key-aps>.

image they had of a successful entrepreneur as inherently masculine. In turn, this shift likely strengthened their resolve to question and challenge such norms, altering their investment criteria in the process.

2.3.5. The GFC, gender role congruity, and investment decisions concerning female entrepreneurs

When new venture investors become more risk averse, their perceptions of the ideal entrepreneur role may change. While risk-taking and aggressiveness are often associated with entrepreneurial success in non-crisis conditions, crisis-induced risk aversion may prompt investors to seek a “safer” bet. Women are often stereotypically viewed as being risk averse and are often assumed to make safer strategic decisions and take safer actions (Carr and Steele, 2010). The entrepreneurship literature also indicates that female entrepreneurs are less willing to take risks (e.g., Davis and Shaver, 2012; Malmström et al., 2017). Consequently, when the GFC triggered investors’ risk aversion, the incongruity between female gender stereotypes and the prototypical entrepreneurial role decreased, leading to a higher likelihood that investors would fund female entrepreneurs after the GFC. Along these lines, Cowling et al. (2020) noted that in the bank lending context, women were more likely to receive bank loans after the GFC and were considered “ideal borrowers” because they were more risk averse.

Similarly, when female entrepreneurship becomes more salient, investors’ perceptions of a suitable entrepreneur are likely to change. In this case, investors who perceive the potential profitability and resilience of female-led enterprises will likely adapt to the new realities of the market and be more likely to consider women as suitable entrepreneurs. Moreover, investors who are aware of the increasing prevalence of female entrepreneurs are likely to take their potential more seriously. Instead of viewing female entrepreneurship as a minority phenomenon or an outlier, they may begin to recognize it as a significant rising trend. This heightened awareness could lead to a re-evaluation of investment strategies and a broader acceptance of the intrinsic value that diverse leadership, particularly female leadership, can bring to entrepreneurship.

Additionally, a commitment to weakening prevailing masculine norms can significantly influence gender-based strategic decision-making. For instance, Luo and Zhang (2022) suggested that Hollywood producers might have been intrinsically motivated to employ more women following the #MeToo movement, spurred by feelings of empathy and remorse. Similarly, the GFC could have provoked investors to contemplate the adverse effects of entrenched masculine norms on their perceptions of the entrepreneur role. This realization could have weakened their adherence to the traditionally masculine image of entrepreneurship. As a result, the entrepreneur role likely became more congruent with women’s gender role after the GFC, making female entrepreneurs more appealing prospects for investment. This shift in perception and alignment signifies a crucial change in the investment landscape and the potential for increased support for female entrepreneurs.

Based on the arguments discussed up to this point, we propose the following hypotheses for the GFC:

H1a. Compared to the pre-crisis period, new venture investors were more likely to invest in female entrepreneurs after the GFC.

H1b. The effect of the GFC on investments in female entrepreneurs is mediated by perceptions of female entrepreneurs’ role congruity. More specifically, the GFC increased female role congruity in entrepreneurship, thereby increasing investments in female entrepreneurs.

2.3.6. COVID-19

COVID-19 is a global health crisis that initially emerged in Wuhan, China, in December 2019. The virus then quickly spread globally, creating a huge shock to many economic, political, and social facets of human life. Unlike the circumstances surrounding the GFC, COVID-19 originated as a pandemic with uncontrollable causes external to investors. Although the debate about the precise origin and transmission path of SARS-CoV-2 is ongoing, most scientists have supported a natural origin hypothesis, positing that the virus was originally transmitted from animals to humans (e.g., Calisher et al., 2021; Wacharaplaesadee et al., 2021).

2.3.7. Risk preference

COVID-19 has many distinct features compared to traditional macro economic and financial crises, which have influenced investors’ preference through the same channels we argued before but in the opposite direction. First, although COVID-19 caused a sudden negative shock to the economy,⁶ private markets have remained relatively healthy, and the shock to the economy was initially rooted in the quarantine restrictions imposed in an attempt to control the spread of infection. In response to worries about the drying out of liquidity in the market, the US government implemented *large-scale* and *speedy* monetary and fiscal policies to ease the negative shock of COVID-19. For example, the Federal Reserve Board took the historic step of offering assistance programs and lending to firms, particularly small and medium-sized enterprises, to alleviate the impact. In contrast, during the GFC, the Federal Reserve mainly aimed its assistance at Wall Street (see Fischer, 2021, for a review). The scale and speed of government support after COVID-19 helped the economy bounce back quickly. In 2020, US GDP contracted by -4.33% , but it quickly recovered, reaching a growth rate of 5.55% , which surpassed previous years since 2005.⁷ These facts, combined with the rollout of vaccines, indicate that economic activities and market prospects may not deteriorate severely from COVID-19.

Second, COVID-19 has posed an exogenous shock to investors, meaning that investors’ wealth has not been at great risk and has even gained in value. From the fundraising side, venture capital investors experienced prosperity in 2020 and 2021, specifically enjoying 20% growth in 2020 and 55% growth in 2021 (Statista, 2022). From the IPO side, the number of IPOs in the United States increased from 195 in 2019 to 431 in 2020 (a 121% increase) and to 951 in 2021 (Statista, 2022). The value of venture capital-backed

⁶ World Bank, <https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?end=2021&locations=US&start=2005&view=chart>

⁷ World Bank, <https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?end=2021&locations=US&start=2005&view=chart>

IPOs increased from 25 billion dollars in 2019 to 30.4 billion in 2020 (a 22 % increase) and to 60.1 billion in 2021 ([Statista, 2022](#)). The average year-end gains after IPO were 54 % for businesses that had an IPO in 2020 ([Statista, 2022](#)). Such strong market exit performance is therefore likely to feed into investors' risk-seeking behavior.

Third, COVID-19 elicited a generally optimistic outlook in the investment community. Despite the challenges posed by the pandemic, investors remained sanguine about future market prospects. In a survey of >1000 venture capitalists, [Gompers et al. \(2021\)](#) found that venture capitalists expected the economic decline caused by COVID-19 to be more modest and to rebound more quickly than was the case during the GFC. They also expected the effect of the pandemic on their performance to be small or non-existent, and 91 % of the venture capitalists surveyed believed they would outperform public markets. A follow-up survey confirmed the venture capitalists' expectations in that they reported investing at just 6 % off their normal pace in the first half of 2021, and 70 % of portfolio companies were positively affected or unaffected by the pandemic. In 2020, the overall amount of venture industry activity reached a new high with \$156.2 billion invested ([Pitchbook, 2021](#)). The following year, the number soon reached \$330 billion, double the previous historical high ([Pitchbook, 2022](#)). Influenced by such positive emotions, investors are more likely to take risks in choosing their investments.

Overall, the relatively robust macro economic climate, enhanced investor wealth, and broadly positive investor sentiment fostered by COVID-19 might have prompted investors to be more open to taking risks. We also draw attention to the findings of [Bellavitis et al. \(2022\)](#), who identified that venture capital investors were initially sensitive to the ongoing pandemic and were likely becoming more risk averse. However, their findings centered on the immediate aftermath of COVID-19 (from January 1, 2019, to July 11, 2020), when the unexpectedness of the situation created a temporary negative shock to the economy and market.

2.3.8. Salience of female entrepreneurship

Unlike the GFC, the COVID-19 pandemic appears to have diminished the salience of female entrepreneurship by decreasing both the perceived value of investments tied to female entrepreneurship and the representation of female entrepreneurs. The negative impact of the COVID-19 pandemic has been more severe in sectors with high female engagement, such as tourism, leisure, and hospitality ([Alon et al., 2020](#)). Simultaneously, the lockdown policies and social distance measures, along with a healthy financial market, have created lucrative investment opportunities in male-dominated industries, such as artificial intelligence, automation, and biotech. For example, many technology firms and e-commerce platforms, including Zoom, Cloudflare, Esty, and Shopify, benefited from the accelerating digitization wave during the COVID-19 outbreak, with market capitalizations increasing by 160 % in 2020 ([Costa, 2020](#)). Venture capitalist Jon Soberg of MS&AD Ventures captured the market sentiment post-COVID-19, stating, "This is the hottest market I've seen, and it isn't slowing down. There is a river of money flowing into VC, and it is growing stronger as LPs (Limited Partners) are recognizing how important technology investing is to strong portfolio performance" ([Cannice, 2021](#), pp. 2–3).

Statistical data corroborates this trend. Based on sector output data provided by the Bureau of Economic Analysis, female-dominated industries, including educational services, healthcare and social services, accommodation and hospitality, and other such services, experienced a significant drop in output—a – 13.63 % drop in 2020 compared to 2019. While they recovered in 2021 with a 12.74 % growth rate, the average growth rate remained negative (i.e., –0.45 %). By comparison, the male-dominated sectors of construction, manufacturing, and information experienced an average growth of 2.11 % in 2019 and 2022. This trend was especially true for the information sector, which includes software publishers, telecommunications, and data-processing businesses. This sector experienced 1.63 % growth in 2020 and 13.41 % growth in 2021. Overall, COVID-19 has had a disproportionately damaging effect on the economic activities and prospects of female-dominated sectors, potentially resulting in a perceived decrease in the attractiveness of female-led businesses due to the halo effect. Furthermore, COVID-19 influenced the representation of female entrepreneurs. According to GEM data, the TEA gender ratio saw an average decrease of –9.34 % in 2020 and 2021 compared to 2007.

To summarize, COVID-19 has effectively diminished the salience of female entrepreneurship for new venture investors. This decreased salience can be attributed to two primary factors: the perceived devaluation of investments associated with female entrepreneurs and the decreased prevalence of female entrepreneurs in the marketplace. As a consequence, the pandemic has led to a shift in investor perceptions, reducing the focus on female-led initiatives in the entrepreneurial sphere.

2.3.9. Commitment to weakening masculine norms

In contrast to the GFC, COVID-19 was triggered by external uncontrollable causes originating outside of the finance sector and human society at large. In such a case, investors are unlikely to change the dominant perception of successful entrepreneurs. Instead, the existing stereotypes favoring masculine entrepreneurs may even be strengthened by the need for strong leadership and innovation to navigate uncertainty and external threats ([James and Wooten, 2005](#); [Mulder and Stemmerding, 1963](#)). Indeed, the relationship between external threats and bias against female leaders has been found in ad hoc groups ([Van Vugt and Spisak, 2008](#)), with people preferring a male leader in inter-group competitions, and in the political arena, in which external threats to a country have led to individual bias against female political leaders ([Kim and Kang, 2021](#)).

Under such circumstances, investors are not likely to prioritize female-related characteristics as remedies to a crisis but are instead likely to seek more masculine traits, such as innovativeness, competitiveness, and aggressiveness, to accelerate effective preparation for the future. This reinforcement of traditional expectations for the entrepreneurial role is echoed in media articles and reports published in the wake of COVID-19, as exemplified by the following:

2020 has been a challenging year, with hardship and loss. There is much to lament, but millions of American entrepreneurs are showing us how to get through this difficult time with creativity, initiative, and grit. They are spotting opportunities and unmet needs, pivoting and adapting, and breaking down old ways of doing things to pioneer new models that will lead to more progress and prosperity for us all. It's a great time to be an entrepreneur. ([McDonald, 2020](#)).

Similarly, De Win (2022), senior managing director and head of global sales and origination at Singapore Exchange Limited, maintained a similar sentiment, emphasizing the need for fearlessness and persistence: "In this new era of entrepreneurship, building an 'unstoppable' business or product requires an ambition unfettered by doubt or fear, along with the resilience to persevere." This narrative reflects the ongoing demand for traditionally masculine traits within entrepreneurial spaces during and following the pandemic.

2.3.10. COVID-19, gender role congruity, and investment decisions concerning female entrepreneurs

We suggest that after the onset of COVID-19, new venture investors are likely to be more risk-seeking (or less risk averse), perceive female entrepreneurship as less salient, and exhibit minimal or no commitment to weakening masculine norms. In this type of situation, female traits are usually not considered to be consistent with the characteristics of the typical successful entrepreneur. In other words, female entrepreneurs are likely to be less attractive in a funding event. Based on these arguments, we propose the following hypotheses:

H2a. *Compared to the pre-crisis period, new venture investors are less likely to invest in female entrepreneurs after the onset of COVID-19.*

H2b. *The effect of COVID-19 on investments in female entrepreneurs is mediated by perceptions of female entrepreneurs' role congruity. More specifically, COVID-19 has reduced female role congruity in entrepreneurship, thereby reducing investments in female entrepreneurs.*

Notably, although we propose three first-order mechanisms linking a macro crisis to perceptions of female entrepreneurs' role congruity and, in turn, funding decisions concerning these women, we also recognize that each particular mechanism might not be strong enough independently to drive the impact of a macro crisis. The three mechanisms likely work in conjunction to drive the change. Accordingly, we do not hypothesize for each of the micro mechanisms but instead hypothesize the overall effect. Moreover, considering the magnitude and gravity of these crises, behavioral changes are likely to occur swiftly and may persist over an extended period.

Fig. 1 illustrates our theoretical model.

3. Method

We conducted two studies to ensure internal and external validity. Study 1 is a randomized between-participants online experiment that tests our main hypotheses (i.e., H1a, H1b, H2a, and H2b) and the expanded three mechanisms (see Fig. 1). An experiment is well suited to isolate the variables of interest and rule out alternative explanations of cause and effect (Spencer et al., 2005). Study 2 is a study based on the archival data from Crunchbase. We used that to test our two main effects (i.e., H1a and H2a). Whereas an archival study limits the possibility to test detailed mechanisms, it increases confidence in the external and ecological validity of a theoretical model. Such a combined mixed-methods approach has been fruitfully and increasingly used in entrepreneurship research (e.g., Johnson et al., 2018; Stevenson et al., 2022) to maximize the overall validity of studies.

3.1. Study 1: Design

3.1.1. Participants

We recruited 195⁸ participants from the Prolific platform⁹ who reported being employed in the finance industry and having investment experience either through having personally purchased shares or having purchased shares as part of their employment. These two criteria ensured that participants possessed some degree of interest and knowledge related to evaluating an investment opportunity. We did not specifically target new venture investors (e.g., business angels or venture capitalists) because of the known difficulty of finding a large enough pool of these investors to support our design (Da Rin et al., 2013). Our recruitment criteria were similar to those of previous experimental studies on new venture investment (Brooks et al., 2014; Mahmood et al., 2019; Van Balen et al., 2019). We further restricted our participants to residents of the United States or the United Kingdom to ensure English would be their native language and because both countries have had similar experiences with the GFC and COVID-19. Each participant was offered a financial incentive of 3.00 GBP (equivalent to 4.20 USD) for completing a 15-min online experiment. After checking the quality of participants' responses,¹⁰ 191 valid, complete responses remained.

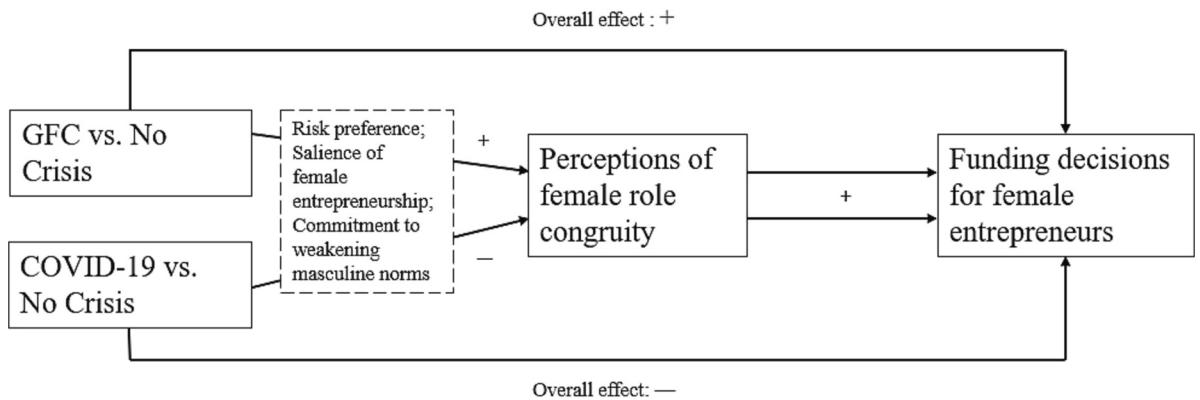
3.1.2. Design and procedures

Participants were randomly assigned to one of three experimental conditions: COVID-19 versus GFC versus no crisis (in 2016). Participants were told to imagine themselves as new venture investors in a specific context. First, participants were introduced to the background of the context (i.e., the COVID-19, GFC, or no-crisis condition) and were asked about their impressions regarding the condition. Next, participants read a business summary and listened to a 2.5-min audio pitch presented by the female founder of a

⁸ We originally intended to recruit 50 individuals per experimental group; however, faced with the potential for incomplete and inattentive responses online, we added an additional 30 % margin to the 50 for each group (i.e., 65 individuals) for a total of 195 individuals.

⁹ Prolific Academic is a UK-based online platform featuring registered participant pools that has been increasingly used in academic research (see Palan and Schitter, 2018, for an overview).

¹⁰ Four respondents were excluded due to failing the attention check question.



Note: Dashed box represents mechanisms theoretically argued but not explicitly hypothesized.

Fig. 1. Theoretical model.

hypothetical new venture. Participants were then asked about their overall perception of the congruity between the founder and a successful entrepreneur in the experimental condition. Subsequently, participants evaluated the new venture and made an investment decision.¹¹

We hired a professional voice actor through the Fiverr platform to ensure the quality of the audio. We manipulated the crisis type when introducing the background. As noted in our theory development, crises have different characteristics. For the GFC, the background introduction stated that the crisis was caused by risk-taking and a lack of regulations governing financial institutions. Meanwhile, for COVID-19, the background introduction described disruptions to current business models and investment trends. This practice ensured that participants who had memory decay or limited knowledge of these crises could have a reasonable understanding of the focal crisis condition. To minimize the effects of the new venture industry, we set the new venture in an industry (specifically, the freelance platform) that participants were likely to perceive as gender-neutral, based on the gender distribution of the freelancers (Statista, 2023).

3.2. Study 1: Variables

3.2.1. Crisis

The crisis variable was derived from our manipulated experimental conditions and was set to 1 for the no-crisis condition, 2 for the GFC, and 3 for COVID-19.

3.2.2. Perceived congruity

In most of the literature we surveyed on gender role congruity theory, scholars did not directly measure role congruity perceptions (e.g., Lee and Huang, 2018; Yang et al., 2020; Anglin et al., 2022; Gupta et al., 2018) but examined the theory based on assumed gender differences. The essence of a gender congruity perception is a congruity/fit/suitability perception between the gender of the person under evaluation and the stereotypical view of the environment (e.g., job, organization, tasks), as suggested by the lack of fit model (Heilman, 1983, 2001). Thus, we followed the previous literature (Bosak and Sczesny, 2008) and measured the direct perceived congruity between the founder and a successful entrepreneur using a seven-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*) with the following four items: (1) "I think that the founder is very well qualified for the entrepreneur position," (2) "It would be difficult for the founder to fulfill the entrepreneurial requirements," (reverse coded) (3) "The founder fits the profile of the desired entrepreneur," and (4) "The founder will likely meet the skills and abilities required for entrepreneurship." We adapted the items (Bosak and Sczesny, 2008) to fit with the entrepreneurial evaluation task in the experiment. We aggregated these items to create an average perceived congruity score. The Cronbach's alpha for this measure was 0.84.

3.2.3. Investment decisions

Following the previous literature (e.g., Chen et al., 2009), we used the following item to evaluate respondents' investment

¹¹ Readers can download the crisis manipulation and pitch script material here: <https://www.dropbox.com/scl/fi/59ix1ir1hhkr6ruivjy79/Crisis-manipulation-and-pitch-script.docx?rlkey=givj4hdniuwcd9vs7gdj2xji&dl=0>

decisions. Specifically, our participants were asked to answer yes or no to the question, “Overall, if you had to make a decision right now, would you invest in this business?” In the robustness check, we also used an alternative construct measure¹² to capture participants’ investor preferences on a seven-point Likert scale. The results were robust.

3.2.4. Risk preference

The preference for risk has been quantified through various methodologies in the extant literature, encompassing both direct survey measures and incentivized games. Comparative research has suggested that a single question measure of risk preference whereby respondents directly appraise their inclination toward risk demonstrates the most robust predictive validity (Tasoff and Zhang, 2022; Dohmen et al., 2011). Therefore, we assessed participants’ risk preferences utilizing a single-item question that asks subjects to rate, on a scale from 0 to 10, their preference for avoiding risk (0) versus embracing risk (10) in financial investments. For a robustness check, we additionally employed an alternative construct—specifically, the Domain-Specific Risk-Taking scale (Blais and Weber, 2006; Weber et al., 2002)—to capture participants’ investment risk preferences on a seven-point Likert scale. The results were robust.

3.2.5. Salience of female entrepreneurship

To capture this construct, we followed and adapted the items used in previous research (Goldsby et al., 2018; Agle et al., 1999). Participants were asked to indicate the extent to which they agreed with three statements using a seven-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*): (1) “Female entrepreneurs are highly salient in the context of new venture investments,” (2) “Female entrepreneurs should receive high priority from new venture investors,” and (3) “New venture investors need to pay more attention to female entrepreneurs.”¹³ The Cronbach’s alpha was 0.78. We aggregated these items to create an average score for the salience of female entrepreneurship.

3.2.6. Commitment to weakening masculine norms

We also adapted the established measure of commitment to organizational change (Herscovitch and Meyer, 2002) to our study setting. Participants were asked to indicate the extent to which they agreed with the following statements using a seven-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*):

New venture investors often regard entrepreneurship as a masculine activity and implicitly associate successful entrepreneurs with masculine traits. What is your attitude toward weakening such masculine norms under the current condition? (1) I believe in the value of this change, (2) This change is a good strategy for new venture investment, (3) I think that new venture investors are making a mistake by introducing this change (reverse coded), (4) This change serves an important purpose, (5) Things would be better without this change (reverse coded), and (6) This change is not necessary (reverse coded).

The Cronbach’s alpha was 0.92. We aggregated these items to create an average score.

3.3. Study 1: Analytical method

Considering the multiple paths in our model, we followed previous studies (e.g., Yu et al., 2021) and used maximum likelihood structural equation modeling (SEM). SEM has benefits over sequential ordinary least squares regressions as it estimates multiple paths simultaneously while allowing for testing indirect effects. Indirect effects are estimated using bootstrapping (1000 times), a preferred method for mediation in which the multiplication of individual paths is not likely to be normally distributed (Hayes and Preacher, 2010).

3.4. Study 1: Results

3.4.1. Balance checks

We conducted several checks, including a Pearson’s chi-squared test and one-way analysis of variance, to check the validity of our randomized experimental process. We found no significant difference across the different experimental groups in terms of the composition of participants’ gender ($\chi^2(2) = 0.070; p = 0.966$), age ($F = 0.27; p = 0.765$), experience with new venture investment ($\chi^2(2) = 0.259; p = 0.878$), or entrepreneurial experience ($\chi^2(2) = 0.734; p = 0.693$). We also examined differences in investors’ risk preferences, salience of female entrepreneurship, and commitment to weakening masculine norms under different experimental situations. According to our findings, compared to the no-crisis situation, the GFC condition led to a risk preference level for investors that was significantly lower (GFC: 4.698; no-crisis: 5.781; $t = 3.237; p = 0.002$), while COVID-19 moderately increased investors’ risk preferences (COVID-19: 6.484; no-crisis: 5.781; $t = -2.454; p = 0.016$). In terms of the salience of female entrepreneurship, we observed a slight, though not statistically significant, increase in the score during the GFC compared to the non-crisis condition (GFC:

¹² We asked, “Do you think this venture will grow to have 100+ employees at some point in the future”; “Do you think this venture will be successful in getting the financial investment it needs to grow”; “If you had the opportunity, would you invest in this business?”; “How likely is it that you would invest in this business?”; and “How likely is it that you would recommend this business to other investors?” The Cronbach’s alpha value was 0.88.

¹³ It’s worth noting that items 2 and 3 might more closely reflect individual preferences rather than perceptions of reality. As such, we performed a robustness test focusing on item 1 alone, and the findings remained unchanged.

4.698; no-crisis: 4.583; $t = -0.650$; $p = 0.517$). In contrast, the period of COVID-19 showcased a significant decline in the score (COVID-19: 4.172; no-crisis: 4.583; $t = -2.190$; $p = 0.027$). For investors' commitment to weakening masculine norms, we found a significantly higher score in the GFC condition compared to the non-crisis condition (GFC: 5.471; no-crisis: 5.036; $t = -2.363$; $p = 0.020$). Conversely, the score was significantly lower in the COVID-19 condition than in the non-crisis condition (COVID-19: 4.549; no-crisis: 5.036; $t = 1.948$; $p = 0.054$). These findings are consistent with and also support our previous argument about the three-mechanism differences in different macro crises.

3.4.2. Main results

Table 1 provides the summary statistics and correlations for our variables. **Table 2** lists the path estimates for the SEM models, presenting first the SEM model without adding mediators. We found that compared to the no-crisis condition, the GFC increased the likelihood of investing in the female entrepreneur (coefficient: 1.281; $p = 0.006$). In contrast, compared to the no-crisis condition, COVID-19 reduced the likelihood of investing in the female entrepreneur (coefficient: -1.091; $p = 0.003$). These results support H1a and H2a.

Table 2 also displays the path estimates for the SEM model with mediators added. In particular, we found that the GFC increased the perceived congruity of the female entrepreneur (coefficient: 0.269; $p = 0.022$), whereas COVID-19 reduced perceived congruity (coefficient: -0.418; $p = 0.006$). In turn, perceived congruity increased the likelihood of investment (coefficient: 1.744; $p = 0.000$). A summary of the SEM results is also shown in **Fig. 2**.

We also tested the mediating effect using bootstrapping, as presented in **Table 3**. The indirect effect of the GFC on investment decisions through perceived congruity was positive and statistically significant (coefficient: 0.469; 95 % bias-corrected confidence interval [0.074, 1.092]). In comparison, the indirect effect of COVID-19 on investment decisions through perceived congruity was negative and statistically significant (coefficient: -0.729; 95 % bias-corrected confidence interval [-1.422, -0.226]). Overall, these results support H1b and H2b.

3.4.3. Additional tests

To increase the robustness of our conclusions, we evaluated whether the impact of a crisis on investment decisions via gender role congruity perceptions was subject to respondents' age, experience, and gender. We found no statistically significant impact of these variables.

We also conducted an additional SEM test to provide insight into the three mechanisms we identified theoretically: risk preferences, salience of female entrepreneurship, and commitment to weakening masculine norms. **Fig. 3** graphically summarizes the results,¹⁴ reflecting the expected direction that the GFC would reduce risk preferences (coefficient: -1.083; $p = 0.001$) and increase commitment to weakening masculine norms (coefficient: 0.435; $p = 0.017$). It increases the salience of female entrepreneurship, though not significantly (coefficient: 0.115; $p = 0.514$). COVID-19 increased risk preferences (coefficient: 0.703; $p = 0.014$) while reducing the salience of female entrepreneurship (coefficient: -0.411; $p = 0.024$) and commitment to weakening masculine norms (coefficient: -0.486; $p = 0.050$). Risk preferences reduced role congruity perceptions of the female entrepreneur (coefficient: -0.071; $p = 0.055$), while the salience of entrepreneurship (coefficient: 0.120; $p = 0.044$) and commitment to weakening masculine norms (coefficient: 0.126; $p = 0.016$) increased it. Overall, based on the statistical significance of the results, risk preferences and commitment to weakening masculine norms appeared to be the strongest drivers of the underlying results for the GFC, and all three mechanisms appeared to be strong drivers of the underlying results for COVID-19.

To further strengthen our theoretical predictions, we conducted an additional experiment in which we tested how investors' evaluations of a male entrepreneur change in different crisis conditions. All other experimental manipulations were the same as in the main experiment. We found that the GFC reduced the likelihood of investing in the male entrepreneur (coefficient: -0.131; $p = 0.718$) but was not statistically significant. In contrast, compared to the no-crisis condition, COVID-19 significantly increased the likelihood of investing in the male entrepreneur (coefficient: 1.091; $p = 0.006$). The extended path estimates for the SEM model with mediators added showed that the GFC does not significantly reduce the perceived congruity of the male entrepreneur (coefficient: -0.041; $p = 0.777$), whereas COVID-19 increased perceived congruity (coefficient: 0.268; $p = 0.045$). Overall, these results provide additional support for our theoretical model. The results for the male entrepreneur are shown in [Appendix A](#).

3.5. Study 2: Data and sample

For our primary data source in the second study, we used Crunchbase, which was launched in 2007 and specializes in providing information on startup investments, investors, entrepreneurs, and various startup activities. The majority of the data in this crowd-curated online database comes from its venture partners and an active community of contributors. Crunchbase ensures the accuracy and coverage of the database by implementing robust supplementary strategies with a data team that manually verifies the daily updates. Using artificial intelligence and machine learning, the database is triangulated by following various online sources, such as press releases, SEC filings, and other third-party databases. We chose Crunchbase due to the several distinct advantages it offers over other venture investment databases, such as timeliness and its provision of cross-linked information on firms, founders, key employees, funding series, and entrepreneur profiles (e.g., gender, age, and education). Furthermore, the database covers the length of both events

¹⁴ SEM results are shown in [Appendix A](#).

Table 1
Descriptive statistics (Study 1).

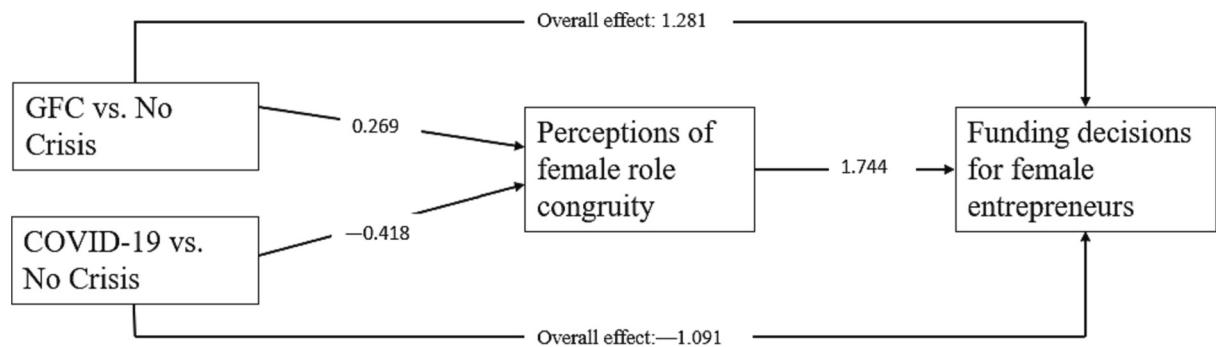
Variables	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Investment dummy	0.639	0.482	1.000							
(2) Role congruity perceptions	5.648	0.832	0.509***	1.000						
(3) No crisis	0.335	0.473	0.026	0.044	1.000					
(4) GFC	0.33	0.471	0.342***	0.271***	-0.498***	1.000				
(5) COVID-19	0.335	0.473	-0.367***	-0.314***	-0.504***	-0.498***	1.000			
(6) Respondent age	38.759	10.587	-0.154**	-0.092	-0.042	-0.008	0.050	1.000		
(7) Respondent gender	1.45	0.499	0.089	0.248***	0.004	0.014	-0.018	-0.030	1.000	
(8) New venture investment experience	0.141	0.349	0.024	-0.068	0.030	0.003	-0.033	0.019	-0.156**	1.000
(9) Ever entrepreneur	0.267	0.444	-0.063	-0.175**	-0.002	0.055	-0.052	0.007	-0.237***	0.231***

*** $p < 0.01$.

** $p < 0.05$.

Table 2
SEM results (Study 1).

	Path estimates	SE	p
<u>Model without mediators</u>			
GFC → Investment decisions	1.281	0.462	0.006
COVID-19 → Investment decisions	-1.091	0.368	0.003
<u>Model with mediators</u>			
GFC → Role congruity perceptions	0.269	0.117	0.022
COVID-19 → Role congruity perceptions	-0.418	0.152	0.006
Role congruity perceptions → Investment decisions	1.744	0.442	0.000
GFC → Investment decisions	1.085	0.517	0.036
COVID-19 → Investment decisions	-0.841	0.404	0.037



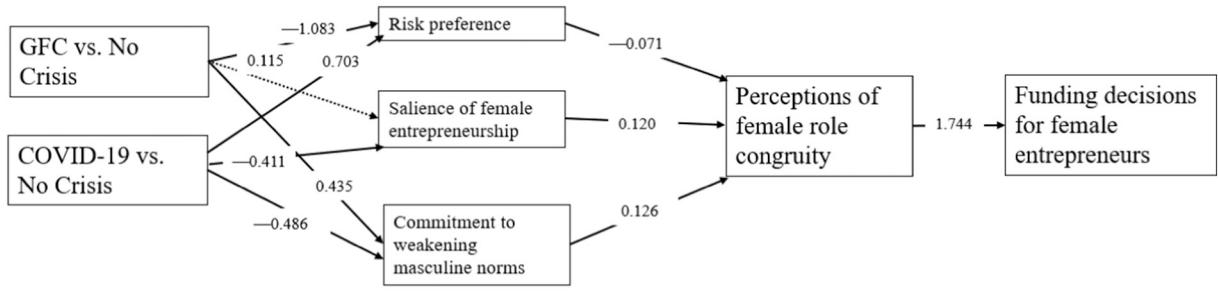
Note: Solid lines represent effects that are statistically significant at $p < 0.1$. Dashed lines are insignificant

Fig. 2. Results (Study 1).

Table 3
Indirect effect estimation (Study 1).

	Indirect effects	[95 % bias corrected confidence interval]
GFC → Role congruity perceptions → Investment decisions	0.469	[0.074, 1.092]
COVID-19 → Role congruity perceptions → Investment decisions	-0.729	[-1.422, -0.226]

(i.e., the GFC and COVID-19) targeted in our study. Our choice also reflected Breschi et al. (2018)'s comparison of several similar databases, which revealed that Crunchbase offers more exhaustive coverage of venture capital deals and startups. Several academic studies published in reputable journals have also recently endorsed the use of this database (e.g., Block et al., 2015; Ter Wal et al., 2016; Wang et al., 2022). Because the data we needed for analysis was nested in several levels, including investors, investments, new ventures, and entrepreneurs, we retrieved and downloaded them through multiple application programming interface endpoints. We



Note: Solid lines represent effects that are statistically significant at $p < 0.1$. Dashed lines are insignificant

Fig. 3. Results including the three mechanisms (Study 1).

then merged the different levels of data.

Our sample was an unbalanced longitudinal dataset in which each unit of observation represented an investor's investment activity for a particular funding stage in a particular year (i.e., each line of observation was at the investor–funding stage–year level). The investors in our sample were angel investors and venture capitalists. Funding stage data was provided by Crunchbase in 28 funding categories.¹⁵ To reduce the heterogeneity in funding stages, we focused on early equity-based funding stages, such as pre-seed, seed, series A to series D, and private equity. Similar to Bellavitis et al. (2022), we excluded some funding stages, such as corporate round, convertible note, debt financing, grant, crowdfunding, initial coin offering, non-equity assistance, secondary market, unknown, and undisclosed. We chose to exclude these funding stages because the motivation driving these investments may differ significantly from the motivation driving equity-based investments, and investors like corporate and government agencies may have goals that diverge from those of angel investors and traditional venture capitalists (Cholakova and Clarysse, 2015; Dushnitsky and Shapira, 2010; Grilli and Murtinu, 2014). Additionally, to mitigate concerns related to cultural and geographic differences, we included only investments made by US-based investors in US-based ventures.

To target the effect of two distinct crisis events, the GFC and COVID-19, on investors' financing decisions concerning female entrepreneurs, we selected two non-overlapping sample periods for our study. For the GFC event, the sample period covered 2003 to 2010. During this period, we had 2667 observations involving 327 investors. The average number of new ventures they had invested in was 3.29, of which 14 % were female-founded ventures. For the COVID-19 period, the sample consisted of 21,802 observations associated with 2701 investors from 2015 to 2022. On average, these investors had invested in 3.76 new ventures, 26 % of which were founded by women. The imbalance between the sample sizes of the targeted events was mainly due to the significant increase in the database's coverage over the past few years (Dalle et al., 2017) but was also caused by the fast development of the startup investment market in recent years (National Venture Capital Association, 2020).

In addition to Crunchbase, we also collected unemployment data grouped by industry and year from the US Bureau of Labor Statistics. The industry classification followed the North American Industry Classification System (NAICS) at the two-digit level, with unemployment data adjusted for seasonal fluctuations.

3.6. Study 2: Variables

3.6.1. Female-founded ventures

To capture investors' funding decisions related to female entrepreneurs at the investor–funding stage–year level, we measured the number of new ventures with at least one female founder (female-founded new ventures). This approach was appropriate as Crunchbase does not provide data on funding applications but only on funded ventures. In the robustness check, we used the alternative measure of the number of new ventures with only female founders (female-only new ventures).

3.6.2. Post-crisis and shock (*treatment*) intensity

As we elaborate in the next section, we used generalized difference-in-differences (DiD) estimation. This setting featured two key variables: the *post-crisis* indicator and the *shock (*treatment*) intensity* variable. We constructed the *post-crisis* variable based on the year of investment, which equaled 1 for investments made after 2007 (> 2007) and 2019 (> 2019) for the GFC and COVID-19, respectively, but 0 otherwise.

To construct the *shock (*treatment*) intensity* variable, which captured the severity of the shock to investors caused by the respective crisis, we examined investors' investment portfolios before the onset of the crisis. An investor's investment portfolio was determined by the industries of the new ventures in which the focal investor had invested. During each crisis, some industries were affected more than

¹⁵ Angel, convertible note, corporate round, debt financing, equity crowdfunding, grant, initial coin offering, non-equity assistance, post-IPO equity, post-IPO secondary, post-IPO debt, pre-seed, private equity, product crowdfunding, secondary market, seed, series A, series B, series C, series D, series E, series F, series G, series H, series I, series J, series unknown, undisclosed (<https://support.crunchbase.com/hc/en-us/articles/115010458467-Glossary-of-Funding-Types>).

others, so investors whose investment portfolios centered on these industries were likewise affected more severely. To alleviate concerns about reverse causality, we tracked the investment portfolios of investors within the five years *before* the crisis (Bellemare et al., 2017). Because an investor's investment trajectory was unlikely to change suddenly, such an approach was a reasonable approximation (Dimov and De Clercq, 2006; Norton and Tenenbaum, 1993). The severity of the shock to an industry was measured as the standardized change in the unemployment rate after the crisis event, a figure that has long been used to evaluate crises' effects on the macro environment, labor market, and social welfare (e.g., Forsythe et al., 2020; Margo, 1993), as well as on investment uncertainty (Leduc and Liu, 2016).

Hence, for a focal investor, overall shock intensity was the weighted average of the shock severity to industries that the investor had invested in within the five years before the crisis, whereas weight was based on the investor's investment portfolio. For instance, if an investor's investments during the past five years before the crisis were distributed as 40 % in the platform industry, 30 % in the education industry, and 30 % in the sports industry, we would assume the investor's exposure to industry shocks were proportional to this distribution.¹⁶ Therefore, the shock experienced by this investor would be calculated as a weighted average of the shocks to these respective industries—that is, shock to investor = $0.4 \times$ shock to platform industry + $0.3 \times$ shock to education industry + $0.3 \times$ shock to sports industry.

Since we focus on US-based investments, we chose to use unemployment rate data at the two-digit NAICS code level released by the US Bureau of Labor Statistics as our data source. Doing so ensured that we would have complete unemployment data at the industry level for the years affected by both the GFC and COVID-19. Crunchbase does not provide a standard industry code, such as NAICS, but rather an industry category description, which consists of 47 unique categories for new ventures. We manually coded these to match them with NAICS codes.

3.7. Control variables

To alleviate concerns about unobserved heterogeneities, we controlled for an *investor–funding stage fixed effect* and *year fixed effect*. In addition, we controlled for the *average deal size* (in thousands USD) that an investor made per funding stage¹⁷ and year as previous research has uncovered differences in demand for and supply of external financing between female- and male-founded ventures (Fairlie and Robb, 2009; Kanze et al., 2018). We also controlled for the *number of new ventures* that the focal investor funded per funding stage and year. Finally, we controlled for the number of male/female founders who graduated with a science, technology, engineering, or mathematics (STEM) major, with a master's/PhD degree, and from an elite university, per funding stage and year, to control for the impact of entrepreneurs' human capital.

3.8. Study 2: Estimation methods

A crisis is a time when an exogenous shock has occurred. This condition provides a quasi-experimental setting to identify the causal relationship between the macro environment and entrepreneurial funding. A classical approach to examining such a shock entails adopting a traditional DiD design that compares a single treatment group (the group affected by the shock) and a single control group (a comparable group not affected by the shock) before and after the crisis. However, in our empirical setting, no strictly controlled group was arguably unaffected by the crises because of their universal nature. In such cases, a generalized design, which extends the dichotomous treatment status to a continuous treatment intensity denoting how strongly a given entity is affected by the shock, is appropriate (Angrist and Pischke, 2008; Callaway et al., 2021; D'Haultfoeuille et al., 2023). Instead of estimating the average treatment effect of the treated, as in traditional DiD design, a generalized design allowed us to estimate the average causal response, which is the overall average causal response in outcome from a small change in treatment intensity.

Following the established research practice of employing generalized DiD (e.g., Chown, 2020; Enikolopov et al., 2011), we estimated a two-way fixed-effect model (e.g., including an *investor–funding stage fixed effect* and *year fixed effect*).¹⁸ This approach helped remove unmeasured heterogeneities between investors and different funding stage and resulted in the examined effect as the within-change in investment. Specifically, we used the following econometric model to test H1a and H2a:

$$\text{Female founded ventures}_{ijt} = \alpha_1 \text{post_crisis}_i + \alpha_2 \text{shock_intensity}_i + \alpha_3 \text{post_crisis}_i \times \text{shock_intensity}_i + X_{ijt} + \eta_i + \theta_{ij} \quad (1)$$

where the i , j , and t indexes corresponded to the investor, funding stage, and investment year, respectively; *post-crisis* was a dummy indicator for before and after the crisis period; *shock intensity* was a time-invariant continuous measure for the severity of the impact to the focal investor; X was a vector of time-variant covariates; and θ_{ij} and η_i represented the *investor–funding stage fixed effect* and *year fixed effect*, respectively. The coefficient of interest α_3 captured the weighted average causal response effect of the crisis on the outcome variable *female-founded ventures*.

¹⁶ When a startup was associated with multiple industries in Crunchbase, we recognized each industry association of the startup and considered the investor to have made an investment in each of those industries.

¹⁷ For each investment event, Crunchbase provided information on the overall deal size but not the exact amount a particular investor invested, the same practice featured in other commercial data sources, such as CB Insights.

¹⁸ De Chaisemartin and D'Haultfoeuille (2020) reviewed all papers published by the *American Economics Review* between 2010 and 2012 and found that 20 % used a two-way fixed-effect regression to estimate the effect of a treatment on an outcome.

Table 4.1
Descriptive statistics and pairwise correlation matrix (Study 2: COVID-19 sample).

Variable	Obs	Mean	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Female-founded ventures	21,802	0.988	1										
Shock intensity	21,802	4.009	0.047***	1									
Post-crisis	21,802	0.370	0.053***	-0.034***	1								
Average funding amount	21,802	2.54 × 10 ⁷	-0.056***	-0.103***	0.149***	1							
# of new ventures invested in	21,802	3.766	0.853***	0.020***	0.049***	-0.035***	1						
# of female founders with master's/PhD degrees	21,802	0.319	0.654***	0.023***	-0.041***	-0.035***	0.527***	1					
# of male founders with master's/PhD degrees	21,802	1.400	0.554***	-0.044***	-0.064***	0.041***	0.772***	0.447***	1				
# of female founders graduated from elite schools	21,802	0.309	0.627***	0.039***	-0.044***	-0.027***	0.505***	0.774***	0.434***	1			
# of male founders graduated from elite schools	21,802	1.288	0.479***	-0.030***	-0.072***	0.045***	0.705***	0.396***	0.864***	0.426***	1		
# of female founders with STEM majors	21,802	0.264	0.607***	-0.007	-0.029***	-0.023***	0.503***	0.712***	0.437***	0.687***	0.403***	1	
# of male founders with STEM majors	21,802	1.633	0.569***	-0.034***	-0.062***	0.024***	0.805***	0.440***	0.890***	0.441***	0.860***	0.440***	1

*** $p < 0.01$.

Table 4.2

Descriptive statistics and pairwise correlation matrix (Study 2: GFC sample).

Variable	Obs	Mean	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Female-founded ventures	2667	0.448	1										
Shock intensity	2667	0.528	-0.013	1									
Post-crisis	2667	0.435	0.178***	0.015	1								
Average funding amount	2667	1.39×10^7	-0.070***	-0.198***	-0.082***	1							
# of new ventures invested in	2667	3.292	0.366***	0.159***	0.075***	-0.007	1						
# of female founders with master's/PhD degrees	2667	0.210	0.644***	-0.080***	0.123***	-0.025	0.143***	1					
# of male founders with master's/PhD degrees	2667	1.560	0.256***	0.125***	0.104***	-0.007	0.787***	0.105***	1				
# of female founders graduated from elite schools	2667	0.183	0.623***	-0.023	0.131***	-0.043**	0.186***	0.723***	0.159***	1			
# of male founders graduated from elite schools	2667	1.321	0.265***	0.145***	0.119***	-0.040**	0.762***	0.089***	0.820***	0.166***	1		
# of female founders with STEM majors	2667	0.197	0.605***	-0.086***	0.076***	-0.008	0.154***	0.697***	0.114***	0.566***	0.125***	1	
# of male founders with STEM majors	2667	1.739	0.249***	0.144***	0.103***	-0.03	0.834***	0.094***	0.849***	0.145***	0.816***	0.099***	1

*** $p < 0.01$.** $p < 0.05$.

Because our dependent variables were count variables, we applied a fixed-effect Poisson regression model. We also incorporated robust clustered standard errors in the model to account for possible heteroskedasticity and lack of normality in the error terms (Greene, 2003). Notably, in the actual analyses, the main effect of *shock intensity_i* was automatically omitted from the fixed-effect regressions because it was absorbed by the investor-funding stage fixed effect. The effects of *post-crisis* were also automatically omitted, being absorbed by the year fixed effect. These omissions did not impact the estimates of the coefficient of interest a_3 .

3.9. Study 2: Results

Tables 4.1 and 4.2 present descriptions of the final samples used in the analyses. Table 5 displays the main results of our DiD estimates for the GFC and COVID-19 samples. In Model 1, we found a positive and statistically significant coefficient on *shock intensity* \times *post-crisis* (coefficient: 2.046, $p = 0.029$) for the GFC sample, indicating that after the GFC, one additional unit of shock intensity increased investors' investments in female-founded ventures by 205 %, which supports H1a. Model 2 examined the effects year by year through interactions between the year dummies and the shock (treatment) intensity variable. The coefficients of these interactions demonstrated how the impact of a crisis evolved over time. Consistent with the previous analysis, in Model 2, the coefficients of these interactions were statistically significant, indicating a steady trend of investment in female-founded ventures.

Model 3 presents the main results of our DiD estimates for the COVID-19 sample. The results support H2a—namely, after COVID-19, one additional unit of shock intensity decreased investors' investments in female-founded ventures by 10.9 % (Model 2 *shock intensity* \times *post-crisis* coefficient: -0.109; $p = 0.001$). In Model 4, most of the yearly effects after COVID-19 were statistically significant. However, based on the coefficients, the negative impact gradually turned weaker with the year (*shock intensity* \times *year 2020* coefficient: -0.175; $p = 0.09$, *shock intensity* \times *year 2021* coefficient: -0.128; $p = 0.056$; *shock intensity* \times *year 2022* coefficient: -0.101; $p = 0.131$).

We conducted four additional analyses to check the robustness of our results against different measurement and model specifications (results in Appendix B). In the first analysis, we used the alternative dependent variable of female-only ventures to capture a purer effect of investors' attitudes toward female entrepreneurs. The results appear in Appendix B, Table B.1. In the second analysis, we

Table 5
Generalized DiD results (Study 2).

	GFC		COVID-19	
	(1)	(2)	(3)	(4)
Post-crisis \times Shock intensity	2.046** (0.939)		-0.109*** (0.034)	
Year 2008 \times Shock intensity		10.111*** (2.404)		
Year 2009 \times Shock intensity		6.422** (2.640)		
Year 2010 \times Shock intensity		9.469*** (2.631)		
Year 2020 \times Shock intensity			-0.175*** (0.067)	
Year 2021 \times Shock intensity			-0.128* (0.067)	
Year 2022 \times Shock intensity			-0.101 (0.067)	
Average funding amount	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Number of new ventures invested in	0.164*** (0.033)	0.165*** (0.032)	0.031** (0.014)	0.031** (0.014)
# of female founders with master's/PhD degrees	0.690*** (0.141)	0.692*** (0.141)	0.116*** (0.028)	0.116*** (0.028)
# of male founders with master's/PhD degrees	-0.026 (0.046)	-0.023 (0.045)	-0.058* (0.034)	-0.058* (0.033)
# of female founders graduated from elite schools	0.555*** (0.157)	0.561*** (0.154)	0.144*** (0.052)	0.144*** (0.052)
# of male founders graduated from elite schools	0.006 (0.040)	0.004 (0.039)	0.071** (0.035)	0.071** (0.035)
# of female founder with STEM majors	0.592*** (0.111)	0.592*** (0.111)	0.154*** (0.027)	0.154*** (0.027)
# of male founder with STEM majors	-0.150*** (0.055)	-0.155*** (0.055)	-0.053*** (0.016)	-0.054*** (0.016)
Year fixed effect	YES	YES	YES	YES
Investor-funding stage fixed effect	YES	YES	YES	YES
Observations	2667	2667	21,802	21,802
Log pseudolikelihood	-938	-930	-14,586	-14,584

Note: Robust clustered standard errors in parentheses..

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

restricted our sample to the first-time investment between an investor and a new venture as gender role incongruity might have been more salient during a first-time investment. The results of this analysis can be found in [Appendix B, Table B.2](#). Third, we used the data from [Dingel and Neiman \(2020\)](#), which captured the impact of work-from-home and social-distance measures on business across different industries, as our alternative shock measure for the COVID-19 pandemic. The related results are displayed in [Appendix B, Table B.3](#). Lastly, we aggregated the data into investor-year level and showed results in [Appendix B, Table B.4](#). Overall, the results remained largely consistent with our main analysis of the COVID-19 crisis. In the first two tests, during the GFC crisis, the coefficients were in the same direction but became statistically insignificant. We discuss the possible reasons in the “Discussion” section that follows.

4. Discussion

Across two studies, we found largely consistent results—namely, that the GFC increased individuals' likelihood of investing in female entrepreneurs, while COVID-19 decreased the likelihood of such investments, and the effects were mediated by changed gender role congruity perceptions after the crises hit. Our findings thus highlight the vital role macro crises play in shaping investors' gendered decision-making processes and thus speak to the following streams of literature and theory.

4.1. Implications for theory

With these two studies, we contribute to the growing conversation around crises and entrepreneurship. The research in this stream of literature has examined different types and severity levels of adversity, ranging from macro-level economic and financial crises (e.g., [Davidsson and Gordon, 2016](#); [Girotopoulos et al., 2017](#)) to natural disasters (e.g., [Shepherd and Williams, 2014](#); [Williams and Shepherd, 2016](#)). However, the existing research has mostly taken an entrepreneur-focused perspective, finding that a crisis can pose both a threat and an opportunity for entrepreneurs. For example, though crises may often heighten perceptions of uncertainty and dampen market confidence ([Davidsson and Gordon, 2016](#)), they can also create opportunities for entrepreneurial action, as seen in the efforts to rebuild after disaster strikes ([Shepherd and Williams, 2014](#); [Williams and Shepherd, 2016](#)). We expand on these studies and develop a framework to scrutinize the impacts of crises through an investor lens.

Our framework and corresponding results revealed that for new venture investors, a crisis can also be viewed as both a threat and an opportunity. For example, while the GFC had devastating economic effects on investors, it also motivated investors to look more closely at female entrepreneurs in an effort to avoid the behaviors responsible for the crisis. However, these results did not hold for COVID-19, which had very different antecedents. Our study accordingly joins the limited number of studies examining crises from investors' decision-making perspective (e.g., [Bellavitis et al., 2022](#); [Howell et al., 2020](#)) and expands the research horizon of broader studies on crises and entrepreneurship.

We also speak to the studies focusing specifically on gender issues in crises and entrepreneurship. As suggested, this collection of studies has generally argued, as well as found, that women are at a disadvantage when a crisis hit. For example, [Girotopoulos et al. \(2017\)](#) observed that during an economic crisis, women are under-represented in high-quality entrepreneurship. [Kalenkoski and Pabilionia \(2022, p. 744\)](#) reported that after COVID-19, self-employed women have been “forced out of the labor force to care for children presumably due to prescribed gender norms and the division and specialization of labor within households.” On another note, [Buratti et al. \(2017\)](#) suggested that female entrepreneurs hit by a crisis are more likely to adopt a defensive strategy. However, female entrepreneurs' conditions after the crisis comprise an aggregation of several stakeholder influences, including both the entrepreneurs' own perceptions and situations and potential resource providers' perceptions and decisions. Unpacking such multi-sourced influences is essential, and situating the issue under different types of crises is equally critical. Our findings suggest that female entrepreneurs are not necessarily devastated when a crisis hits, at least from the investors' perspective. The onset of the GFC seemed to give female entrepreneurs an advantage as they were viewed as a safer bet.

We also contribute to the entrepreneurial financing and gender literature. Research in this stream of literature has taken various theoretical perspectives, such as role congruity and activist choice homophily, in examining women's (dis)advantages in new venture financing. However, an understanding of how a macro crisis shapes gendered investment decisions remains lacking. To the best of our knowledge, only two studies have thus far investigated how a crisis changes funding decisions related to female entrepreneurs, with mixed results. [Cowling et al. \(2020\)](#) assessed the issue in the context of loans, finding that female entrepreneurs were more likely to be granted loans after the GFC. However, [Thébaud and Sharkey \(2015\)](#) reported the opposite effect after the same crisis. Situating our empirical work in the equity funding context, we observed that a crisis truly shapes funding decisions affecting female entrepreneurs. Moreover, different crises have different impacts. Our study thus greatly enriches the understanding of whether and how a crisis influences financing for women in the entrepreneurial context ([Leitch et al., 2018](#)).

Finally, our findings contribute to role congruity theory and its application in entrepreneurship. The theory postulates that an individual's perception of gender role congruity is influenced by both the perceived gender role and the perceived leader or entrepreneur role. Consequently, any perceptual shift in either the gender role or the leader/entrepreneur role should transform the overall congruity perception. Prior studies have provided in-depth analyses of the micro-level contextual variations of such perceptions ([Anglin et al., 2022](#)). For instance, in entrepreneurship, earlier research has discussed the changed perceptions of the entrepreneur role in social ventures ([Anglin et al., 2022](#); [Yang et al., 2020](#)) and crowdfunding ([Johnson et al., 2018](#)) and the altered gender role perceptions stemming from female entrepreneurs' individual behaviors ([Kanze et al., 2018](#); [Seigner et al., 2022](#)). Indeed, female entrepreneurs are not universally disadvantaged in financing as they appear to outperform their male counterparts in contexts that underscore feminine attributes. However, these investigations have predominantly focused on micro-level contexts in shaping role

congruity perceptions.

While [Eagly and Karau \(2002\)](#) suggested that the macro environment matters (e.g., the leader role may have incrementally evolved to be more androgynous), there has been a limited investigation into how *sudden shifts in the macro environment* can disrupt deeply rooted perceptions of gender role congruity. Our study aligns with the predictions of role congruity theory that when a macro crisis alters the perceived masculinity of the entrepreneur role, the ensuing congruity perceptions for women change. However, this study stretches the bounds of the theory by integrating the macro crisis and strategic decision-making literature with role congruity theory, providing a theoretical elucidation of the mechanisms through which such change occurs among investors. At the same time, it enriches the application of role congruity theory by highlighting its significance at the macro level.

Based on our findings, this perceptual change after a crisis is speedy and sticky. In the case of the GFC, we observed a significant increase in funding for female entrepreneurs starting in 2008, the year the GFC formally set in, and the effect persisted until 2010. For COVID-19, the reduction in funding for female entrepreneurs was already apparent in 2020 and persisted until the end of 2022, which is the time period we have full data for. Additionally, further results from Study 1 indicate that among the three first-order mechanisms we explored, risk preferences and commitment to weakening masculine norms were likely the most potent mechanisms throughout both the GFC and the COVID-19 crisis. While we do not aim to over-generalize each specific crisis, our findings propose that risk preferences and commitment to weakening masculine norms are probably universal mechanisms that connect to gender role congruity perceptions in the crisis context.

It's noteworthy that our additional analyses have uncovered some fascinating observations. Firstly, the shifts in perceptions of gender role congruity appear to be asymmetrical by gender. Our main experiment based on female entrepreneurs demonstrated a significant increase in perceived gender congruity after the GFC. Conversely, the supplementary experiments we conducted on male entrepreneurs revealed that their perceived gender congruity was relatively resistant to reduction. While it did decrease following the GFC, the effect was not statistically significant (path estimate = $-0.041, p = 0.777$) and therefore did not considerably impact their investor attractiveness (path estimate = $-0.140, p = 0.730$).

Secondly, the shifts in perceptions of gender role congruity also appear to be asymmetrical across different crises. For instance, the effect sizes for role congruity perception generally appear larger during the COVID-19 crisis than during the GFC (e.g., Female entrepreneur COVID-19 vs. GFC: -0.418 vs. 0.269 ; Male entrepreneur COVID-19 vs. GFC: 0.268 vs. -0.041). These results suggest that an enhancement of the entrepreneur role's masculine image seems more pronounced and probable during a crisis than a reduction. Therefore, when the stereotypical masculine image of the entrepreneur diminishes, the perceived congruity between the female (or male) gender and the entrepreneurial role may increase (or decrease). However, the effect size and influence are generally less pronounced than when the change moves in the opposite direction.

Lastly, our robustness checks, which differentiated between female-founded and female-only ventures, showed that the results for female-only ventures were weaker during the GFC (female-founded coefficient: 2.046 ; female-only coefficient: 0.179). In contrast, the outcomes for female-only ventures during COVID-19 were comparable, if not stronger, than those for female-founded ventures (female-founded coefficient: -0.109 ; female-only coefficient: -0.206). This highlights that despite the fluctuations in investors' preference for women entrepreneurs in response to different crises, gender-balanced teams consistently performed better under both conditions. Rather than completely sidelining masculinity - which may be perceived as a contributing factor to a crisis - investors appear to mitigate its effects by bringing more women founders on board. Overall, these additional findings provide critical insights to extend role congruity theory, particularly in terms of the asymmetrical impacts of shifts in role congruity perceptions.

4.2. Implications for practice and diversity

Research into gender effects in entrepreneurship continues to garner attention from industry professionals and scholars alike (e.g., [Brush et al., 2020](#)). As we work toward building inclusive entrepreneurial ecosystems—that include investors, accelerators, and business schools—understanding these effects becomes vital. This study provides actionable insights and brings further clarity to the complex issue of gender bias.

First, our research indicates that macro-level societal shifts can either mitigate or amplify gender bias. This finding highlights the need for proactive strategies in gender-diversity initiatives that are attuned to the larger socio-economic landscape. For example, periods of significant societal change, such as the GFC, may present a favorable environment for advocates of gender diversity to promote their initiatives (e.g., by integrating more female investors), particularly as masculinity starts to be viewed as problematic. Conversely, crisis times like COVID-19 could pose specific challenges as the macro environment seemingly becomes more conducive to masculinity. In such scenarios, stakeholders need to double their efforts to emphasize the importance of female entrepreneurship, thereby negating the stronghold of masculine norms. A clear understanding of macro-level changes could be instrumental in crafting effective strategies to bridge the gender gap in entrepreneurship.

Second, our findings indicate that micro-level interventions aimed at reducing the gender gap should be implemented in alignment with macro changes. Previous studies have suggested tactics, such as women adopting more promotion-focused language, to increase their chances of entrepreneurial success ([Kanze et al., 2018](#)). However, in crisis times, traits associated with femininity might be viewed as a welcome change, providing a refreshing perspective when masculinity becomes a source of concern. Recent research has also pointed out potential unforeseen repercussions of otherwise straightforward interventions. For example, increasing the presence of female investors in the venture capital landscape might paradoxically decrease female entrepreneurs' chances of obtaining additional funding ([Snellman and Solal, 2023](#)), and the benefits of diversity among investors and investees often seems to be limited to scenarios involving male investors and female entrepreneurs ([Butticè et al., 2022](#)). These outcomes might alter as the macro environment changes. For example, when the investment community is actively working to dismantle masculine stereotypes, the adverse

financing results encountered by female entrepreneurs supported by female venture capitalists might be mitigated.

In a nutshell, for industry professionals looking to foster a more equitable entrepreneurial ecosystem, these findings underscore the importance of being alert to both macro- and micro-level changes and tailoring strategies accordingly.

4.3. Limitations and future research

Our study has several limitations that may leave opportunities for future research. First, we acknowledge that beyond gender role incongruity, there are many reasons for the gender gap in entrepreneurship (Jennings and Brush, 2013), and our findings should be viewed alongside these. For example, although our research was developed based on investors' perspectives, another explanation involves the labor supply of female entrepreneurs during crises. Future research can investigate the possibility of women's changed propensity to become entrepreneurs during crises and how different crises may shape any such effect. Second, owing to the known difficulty of recruiting actual investors (e.g., angel investors and venture capitalists) in relatively large sample sizes, our experiment entailed recruiting financial professionals who had investment experience, which might have biased our results. Thus, we encourage future researchers to validate our experimental findings among actual new venture investors when the opportunity presents itself. Third, our theory does not explicitly theorize the temporal aspects of different crises (e.g., speed of effect and stickiness of effect) on role congruity perceptions. The impacts of the GFC and COVID-19 appear to have been sustained over an extended period, but a crucial question remains: just how enduring will these effects prove to be? Future researchers are encouraged to investigate the evolution and long-term impacts of the COVID-19 crisis as more comprehensive datasets spanning longer periods become available for analysis. Fourth, even though much of the past research suggests that entrepreneurship is predominantly seen as a masculine endeavor (e.g., Gupta et al., 2008; Gupta et al., 2009; Marlow and Martinez, 2018), we didn't directly address this implicit stereotype in our survey. Finally, our study did not specifically focus on social ventures. Based on the findings of previous studies regarding women's advantages in social ventures, it would be fruitful to examine how different crises may enlarge or weaken women's advantages in such a context.

Author statement

Wei Yu: Conceptualization, Methodology, Data Curation, Formal analysis, Writing-Original draft, Writing-Review & Editing, Project administration, Supervision, Funding acquisition.

Jipeng Fei: Methodology, Formal analysis, Data Curation, Writing-Original draft, Writing-Review & Editing.

Grace Peng: Formal analysis, Experiment design, Writing-Original draft, Writing-Review & Editing.

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Data availability

The authors do not have permission to share data.

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Appendix A

Table A.1

SEM results (Study 1—female entrepreneur with the three additional mediators).

	Path estimates	SE	p
<u>Model with three mediators</u>			
GFC → Risk preferences	-1.083	0.333	0.001
COVID-19 → Risk preferences	0.703	0.285	0.014
GFC → Salience of female entrepreneurship	0.115	0.176	0.514
COVID-19 → Salience of female entrepreneurship	-0.411	0.183	0.024
GFC → Commitment to weakening masculine norms	0.435	0.183	0.017
COVID-19 → Commitment to weakening masculine norms	-0.486	0.248	0.050
Risk preferences → Role congruity perceptions	-0.071	0.037	0.055
Salience of female entrepreneurship → Role congruity perceptions	0.120	0.060	0.044
Commitment to weakening masculine norms → Role congruity perceptions	0.126	0.052	0.016
Role congruity perceptions → Investment decisions	1.744	0.442	0.000
GFC → Investment decisions	1.085	0.517	0.036
COVID-19 → Investment decisions	-0.841	0.404	0.037

Table A.2
SEM results (Study 1—male entrepreneur).

	Path estimates	SE	p
<u>Model without mediators</u>			
GFC → Investment decisions	-0.131	0.363	0.718
COVID-19 → Investment decisions	1.091	0.400	0.006
<u>Model with mediators</u>			
GFC → Role congruity perceptions	-0.041	0.145	0.777
COVID-19 → Role congruity perceptions	0.268	0.134	0.045
Role congruity perceptions → Investment decisions	1.359	0.284	0.000
GFC → Investment decisions	-0.140	0.406	0.730
COVID-19 → Investment decisions	0.897	0.466	0.054

Table A.3
Indirect effect estimation (Study 1—male entrepreneur).

	Indirect effects	[95 % bias corrected confidence interval]
GFC → Role congruity perceptions → Investment decisions	-0.056	[-0.527, 0.381]
COVID-19 → Role congruity perceptions → Investment decisions	0.364	[-0.014, 0.893]

Appendix B

Table B.1
Generalized DiD results for female-only ventures (Study 2).

	GFC	COVID-19
	(1)	(2)
Post-crisis × Shock intensity	0.179 (2.353)	-0.206*** (0.059)
Average funding amount	-0.000 (0.000)	-0.000* (0.000)
Number of new ventures invested in	0.424*** (0.050)	0.036** (0.017)
# of female founders with master's/PhD degrees	1.220*** (0.270)	0.138*** (0.044)
# of male founders with master's/PhD degrees	-0.236** (0.093)	-0.086* (0.035)
# of female founders graduated from elite schools	0.374 (0.281)	0.174*** (0.062)
# of male founders graduated from elite schools	-0.041 (0.092)	0.037 (0.039)
# of female founders with STEM majors	0.445** (0.196)	0.191*** (0.037)
# of male founder with STEM majors	-0.440*** (0.090)	-0.061*** (0.024)
Year fixed effect	YES	YES
Investor–funding stage fixed effect	YES	YES
Observations	1346	11,318
Log pseudolikelihood	-307	-5358

Note: Robust clustered standard errors in parentheses..

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

Table B.2
Generalized DiD results for first-time investments (Study 2).

	GFC	COVID-19
	(1)	(2)
Post-crisis × Shock intensity	0.720 (1.226)	-0.070* (0.037)
Average funding amount	-0.000 (0.000)	0.000 (0.000)
Number of new ventures invested in	0.188*** (0.033)	0.031** (0.015)

(continued on next page)

Table B.2 (continued)

	GFC	COVID-19
	(1)	(2)
# of female founders with master's/PhD degrees	0.635*** (0.185)	0.087*** (0.025)
# of male founders with master's/PhD degrees	-0.042 (0.054)	-0.059* (0.033)
# of female founders graduated from elite schools	0.509** (0.205)	0.118** (0.051)
# of male founders graduated from elite schools	-0.028 (0.051)	0.075** (0.033)
# of female founders with STEM majors	0.650*** (0.134)	0.158*** (0.024)
# of male founder with STEM majors	-0.134** (0.062)	-0.047*** (0.017)
Year fixed effect	YES	YES
Investor-funding stage fixed effect	YES	YES
Observations	1751	16,349
Log pseudolikelihood	-603	-10,744

Note: Robust clustered standard errors in parentheses..

*** $p < 0.01$.** $p < 0.05$.* $p < 0.1$.**Table B.3**

Generalized DiD results—COVID-19.

Alternative measurement of shock intensity from Dingel and Neiman (2020) (Study 2).

	Dingel and Neiman (2020)
Post-crisis \times Shock intensity	-0.690*** (0.207)
Average funding amount	0.000 (0.000)
Number of new ventures invested in	0.022*** (0.008)
# of female founders with master's/PhD degrees	0.106*** (0.030)
# of male founders with master's/PhD degrees	-0.009 (0.020)
# of female founders graduated from elite schools	0.077** (0.034)
# of male founders graduated from elite schools	0.020 (0.031)
# of female founders with STEM majors	0.071*** (0.021)
# of male founders with STEM majors	-0.039* (0.020)
Year fixed effect	YES
Investor-funding stage fixed effect	YES
Observations	27,089
Log pseudolikelihood	-18,380

Note: Robust clustered standard errors in parentheses..

*** $p < 0.01$.** $p < 0.05$.* $p < 0.1$.**Table B.4**

Generalized DiD results —.

Observations aggregate at investor-year level (Study 2).

	GFC	COVID-19		
	(1)	(2)	(3)	(4)
Post-crisis \times Shock intensity	1.456** (0.722)		-0.096*** (0.027)	
Year 2008 \times Shock intensity		4.271** (1.790)		
Year 2009 \times Shock intensity		4.315** (1.711)		
Year 2010 \times Shock intensity		4.765**		

(continued on next page)

Table B.4 (continued)

	GFC	COVID-19			
	(1)	(2)	(3)	(4)	
		(1.980)			
Year 2020 × Shock intensity					-0.165*** (0.052)
Year 2021 × Shock intensity					-0.143** (0.051)
Year 2022 × Shock intensity					-0.110** (0.056)
Average funding amount	-0.000* (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000
Number of new ventures invested in	0.069*** (0.014)	0.068*** (0.013)	0.010*** (0.003)	0.010*** (0.003)	0.010*** (0.003)
# of female founders with master's/PhD degrees	0.287*** (0.094)	0.284*** (0.093)	0.067*** (0.026)	0.067*** (0.026)	0.067*** (0.026)
# of male founders with master's/PhD degrees	-0.027 (0.030)	-0.026 (0.030)	-0.032*** (0.011)	-0.032*** (0.011)	-0.031*** (0.011)
# of female founders graduated from elite schools	0.171 (0.132)	0.163 (0.130)	0.098*** (0.017)	0.098*** (0.017)	0.098*** (0.017)
# of male founders graduated from elite schools	-0.033 (0.025)	-0.033 (0.024)	0.035 (0.024)	0.035 (0.024)	0.035 (0.024)
# of female founder with STEM majors	0.322*** (0.102)	0.327*** (0.101)	0.050** (0.025)	0.050** (0.025)	0.049* (0.025)
# of male founder with STEM majors	-0.028 (0.028)	-0.029 (0.028)	-0.011* (0.007)	-0.011* (0.007)	-0.011* (0.007)
Year fixed effect	YES	YES	YES	YES	YES
Investor–funding stage fixed effect	YES	YES	YES	YES	YES
Observations	2096	2096	15,507	15,507	15,507
Log pseudolikelihood	-1134	-1128	-13,843	-13,839	-13,839

Note: Robust clustered standard errors in parentheses..

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

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