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## When the going gets tough: Board gender diversity in the wake of a major crisis

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## ABSTRACT

Gender diversity on corporate boards continues to present a significant challenge, exacerbated by significant external disruptions such as financial crises or the recent COVID-19 pandemic. These exogenous shocks pressure organizations to reconcile diversity imperatives with more immediate concerns arising from the crises at hand. Employing elements from gender role and institutional theories, we argue that major exogenous shocks will negatively affect (i.e., reduce) gender diversity in corporate boards. Moreover, we propose that female CEOs and the strength of institutional mechanisms (i.e., quotas and corporate governance codes) will moderate (i.e., weaken) the negative effect of these shocks on board gender diversity. We examine these hypotheses in the context of the last global financial crisis (GFC), employing a panel of 10,181 unique firms across 21 countries between 2000 and 2015. We apply a two-way fixed effect difference-in-difference research design, complemented by an extensive battery of additional analyses to ensure robustness. Our results confirm a substantial decline in board gender diversity following the GFC. However, we do not find empirical support for female CEOs or institutional mechanisms in mitigating these diversity reductions. Following these findings, we propose several implications for research and policy.

## Introduction

Research links gender diversity to several desirable organizational outcomes, such as stronger ethics (Cumming, Leung, & Rui, 2015), better corporate oversight (Adams & Ferreira, 2009), sustained firm performance (Post & Byron, 2015), and more entrepreneurial endeavors (Lyngsie & Foss, 2017). Despite these benefits, the number of women on corporate boards remains relatively low (Harrigan, 1981; Daily, Certo, & Dalton, 1999; Terjesen, Sealy, & Singh, 2009), prompting outcries from various stakeholders (Torchia et al., 2011; Catalyst, 2017; The Economist, 2019; PwC, 2020; Guldiken et al., 2019). At the same time, recent disruptive events—such as the global financial crisis of 2008–2010, the terrorist attacks of 9/11, the war in Ukraine, and the COVID-19 pandemic, etc.—sustain a VUCA (volatile, uncertain, complex, and ambiguous) environment (Bennett & Lemoine, 2014) that forces organizations to develop new adaptation strategies in response to these challenges (Li & Tallman, 2011; Oh & Oetzel, 2017; Krammer, 2022) which in turn provide quasi-experimental settings for management scholars to test and advance new theories (Stoker, Garretsen, & Soudis, 2019; Sieweke & Santoni, 2020; Gómez, Krammer, Pérez-Arados, &

Salazar, 2024). Nevertheless, our knowledge of how organizational practices are affected by such exogenous shocks remains rather limited. To address this dearth, we investigate the effects of a major crisis on gender diversity in boards.

Combining elements from gender role theory (Bilimoria, 2006; Eagly & Karau, 2002) with institutional legitimacy (Suchman, 1995) and saliency (Bundy, Shropshire, & Buchholtz, 2013), we argue that a major crisis will negatively affect (i.e., reduce) gender diversity on boards worldwide. Subsequently, we posit that female leadership and the strength of formal and informal institutional provisions regarding gender—i.e., the provision of board gender quota or corporate governance codes that “recommends” higher board gender diversity—will moderate (i.e., weaken) the negative effect of these shocks on the board gender diversity. To test our theoretical predictions, we examine the impact of the global financial crisis (GFC) of 2008–2010 using a longitudinal dataset of firms across multiple countries. The GFC exhibits all characteristics of a major exogenous shock—i.e., market volatility and increased uncertainty (Kalemli-Özcan, Reinhart, & Rogoff, 2016), eroded trust in institutions (Sapienza & Zingales, 2012), and reduced labor demand (Popov & Rocholl, 2018)—making it a compelling choice

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for our research.

To test our theoretical conjectures, we use a sample of 67,594 firm-year from 547,322 director-firm-year observations in 10,181 unique firms across 21 countries between 2000 and 2015. We employ a two-way fixed-effect difference-in-differences test (TWFE DID) (Goodman-Bacon, 2021) for our main analysis, supplemented with an array of robustness and additional analyses. Our results provide strong causal evidence that female directors from the corporate boards experienced substantial negative pressure when faced with the GFC, thereby lowering gender diversity. In turn, we do not find sufficient support for the idea that female leaders and gender-related institutional mechanisms were able to mitigate this post-crisis reduction in gender diversity meaningfully.

We propose several contributions. First, we contribute to the gender diversity literature, specifically in the context of top management teams and corporate boards. Extant research has primarily been concerned with explaining board appointments as the result of micro- and mezzo-level explanations focusing on individual characteristics and organizational strategies (Hillman, Shropshire, & Cannella Jr., 2007; Westphal & Stern, 2007; McDonald & Westphal, 2013; Kogut, Colomer, & Belinky, 2014). We shift this attention to a major exogenous macroeconomic shock and its negative effects on diversity on corporate boards worldwide. Given the increasing pressures due to market volatility and competition following a crisis, our arguments highlight both the organizational trade-offs and the importance of the macro-context in determining gender balance *ex-post*, which are ever more crucial in the post-COVID-19 world (Alon et al., 2020; Milliken, Kneeland, & Flynn, 2020).

Second, we add to the “glass ceiling” literature, which focuses on the difficulties faced by women when attempting to advance in a managerial hierarchy (Powell & Butterfield, 2015) by explicating the role played by major shocks in exacerbating these gender-specific difficulties. Our explanations highlight the transitory saliency of the trade-offs organizations face following such crises (Bundy et al., 2013). Specifically, while legitimacy concerns such as equality and diversity have become very important in normal (non-crisis) periods (Suchman, 1995), these objectives take a back seat during adversity (Mittra, Post, & Sauerwald, 2021), overtaken by economic rationales prioritizing organizational survival (Smart & Vertinsky, 1977).

Third, we propose several factors that could mitigate the negative impact of a crisis on boards’ gender diversity. We focus on the important role that female leaders, notably female CEOs, can play in this regard, as advocated by the trickle-down effect, homophily, and similarity-attraction theories (Byrne, 1971; McPherson, Smith-Lovin, & Cook, 2001; Cook & Glass, 2015). Our arguments propose various mechanisms (i.e., greater legitimacy and reputational slack, special power status, and lower in-group bias) through which female leaders can act to maintain or promote gender diversity *ex-post* the crisis. However, our results indicate that, while they clearly improve gender diversity in their organizations in ‘normal’ (non-crisis) periods, having female CEOs does not overcome the negative effect of the crisis on board gender diversity. Subsequently, our findings suggest a complex relationship between female leadership and board gender diversity, one that can oscillate between “savior” (Cook & Glass, 2014) and “queen bee” behaviors (Derks, van Laar, & Ellemers, 2016; Arvate, Galilea, & Todescat, 2018), requiring further investigation in future research.

Finally, our study sheds light on organizational responses to external pressures. Specifically, we investigate whether better (i.e., more developed) institutional prescriptions for both formal (i.e., gender quotas) and informal (i.e., corporate governance—CG—codes) institutional elements can mitigate the negative effects of a crisis on gender diversity. Our findings suggest that while external pressures have a tangible positive effect on board gender diversity in general, they could not attenuate its decrease following the GFC. This insight contributes to the literature on institutions by documenting boundary conditions for organizations to revert to their adoption of socially desirable practices (Keig, Brouthers, & Marshall, 2015; Shea & Hawn, 2019) and liaising

with recent findings on the effectiveness of public versus private initiatives to increase diversity (Gormley, Gupta, Matsa, Mortal, & Yang, 2021).

## Hypotheses development

### *Major crises and gender diversity in boards*

A major crisis presents an opportunity to both improve and reduce gender diversity on boards. On the one hand, such unprecedented shocks exacerbate the need for qualified, competent personnel to carry out daily operations and provide effective leadership to steer firms through during turbulent times (Smart & Vertinsky, 1977). Such exogenous shocks (of economic, financial, and other nature) could provide incentives to firms to hire more women, in both management and operational positions, based solely on merit (Uhlmann & Cohen, 2005), i.e., their expertise and performance, and to hire women to board positions for the robust monitoring of executive actions (Hermalin & Weisbach, 1998; Adams & Ferreira, 2009). On the other hand, however, these events emphasize the need for the most efficient operational solutions (Stevenson, Pearce, & Porter, 1985) and directive leadership styles (Stoker et al., 2019) to navigate the choppy waters. Firms tend to concentrate on more immediate, short-term goals that will ensure their survival rather than focusing on “softer” issues, such as gender diversity, that are still predominantly undertaken to build legitimacy across different stakeholders (Zimmerman & Zeitz, 2002). Subsequently, we propose that the emergence of a major exogenous shock will exacerbate existing internal pressures to perform or survive the crisis, resulting in lower gender diversity than before the crisis. We base this conjecture on several rationales.

First, any major crisis will reduce the perceived need for an organization to act regarding gender diversity. In normal, non-crisis times, mimetic and normative pressures have a significant effect on how organizations behave and develop in response to market idiosyncrasies (DiMaggio & Powell, 1983), including tackling gender balance. However, a major systemic shock can alter a firm’s priorities, or at least “the degree to which a stakeholder issue resonates with and is prioritized by management” (Bundy et al., 2013, p. 353). Thus, diversity concerns will likely take a back seat during challenging economic and financial periods when the focus shifts to more pressing issues, such as access to capital (Kahle & Stulz, 2013) or cost management (Popov & Rocholl, 2018). In these circumstances, firms will likely focus on creating a “small, tightly knit” decision-making body that can respond to the crisis quickly and effectively (Smart & Vertinsky, 1977). Since many female director appointments are tokenistic (Kanter, 1997; Bilimoria, 2006; Eagly & Karau, 2002) to appease outside stakeholders (Terjesen et al., 2015), firms focused on surviving the crisis are unlikely to find female directors as legitimate board members who could be included in the tight-knit group to make fast, effective decisions.

Second, a major crisis will exacerbate some of the difficulties that female directors face during ‘normal’ times. Despite making significant progress in recent decades, women in high-status leadership positions experience high visibility, greater scrutiny, and greater pressure to perform than dominant in-group men (Knippen, Shen, & Zhu, 2019). When they are appointed, women remain relatively powerless and stereotyped within the organizational hierarchy (Ely, 1995), receive substantially less pay for similar top corporate jobs (Homroy & Mukherjee, 2021), and get disproportionately blamed for corporate failures (Park & Westphal, 2013). In turn, these issues negatively impact their performance at work (Sekaquaptewa & Thompson, 2002; Inzlicht & Ben-Zeev, 2003), downgrade their effective power status within the organization (Weck et al., 2022), jeopardize their informal and structural positions within their work group (Ridgeway, 1997), and increase the risk of being sacked, especially when coupled with poor performance (Gupta et al., 2020). These pressures are likely to be significantly amplified during periods of economic and financial distress, during which personal

**Table 1**  
Sample description.

Countries	Firm Obs.	Dir Obs.	AES	CKO	AES2	LV	Female CEO	Female CEO Board Chair	Female Dir. in Nomin Comm.	Quota	CG Code
Australia	2551	16959	2010		2010		0.040	0.000	0.315		2010
Austria	256	3636			2010	2008	0.008	0.000	0.148		2009
Belgium	531	5185	2009		2009	2008	0.012	0.000	0.209	2011	2009
Canada	3180	27550					0.022	0.006	0.219		
China	899	6450	2011		2011		0.043	0.024	0.171		
Denmark	168	1979				2008	0.075	0.000	0.101		2008
Finland	82	726					0.000	0.000	0.354		2008
France	2326	24593				2008	0.023	0.010	0.205	2011	2010
Germany	1453	18473				2008	0.008	0.001	0.107	2015	2009
Greece	205	2102		2010		2008	0.114	0.104	0.054		2013
Italy	786	9532		2010		2008	0.017	0.000	0.160	2011	2011
Luxembourg	121	952				2008	0.000	0.000	0.025		2009
Netherlands	742	6566	2010		2010	2008	0.018	0.004	0.199	2013	2008
Norway	85	571					0.000	0.000	0.035	2003	2004
Portugal	193	2420	2008	2010	2008	2008	0.048	0.000	0.036		2014
Singapore	713	5655	2008		2008		0.067	0.007	0.177		2012
Spain	644	8380		2010	2008	2008	0.014	0.000	0.262	2007	2006
Sweden	790	7346				2008	0.004	0.000	0.019		2004
Switzerland	445	3845				2008	0.029	0.000	0.137		2014
United Kingdom	11905	83236				2007	0.028	0.001	0.201		2011
United States	39519	343201	2010	2009	2010	2008	0.030	0.012	0.286		2013

performance, power status, and peer support are paramount for effective operation. As a result, women in the upper echelons of management face significant pressure to adopt traditionally male attitudes and strategies (Sealy, 2010), and are much less likely to improve or preserve gender diversity unless the in-group (male) majority sanctions this.

Finally, a major systemic shock will further exacerbate existing gender biases against appointing female directors (Bilimoria & Piderit, 1994; Kirsch, 2018). Following Lippert-Rasmussen (2006, p. 168), we define bias as prejudice “against a socially salient group or particular individuals qua members of a socially salient group.” This prejudice harms their economic well-being, including organizational representation (Becker, 1971). We posit that bias during a crisis will be more prevalent via two mechanisms: exclusions and acceptance requirements. Exclusionary bias ensures that women would not have the same ability to access goods (Ayres & Siegelman, 1995), services (Turner & Skidmore, 1999), and career opportunities (Firth, 1982; Bertrand & Mullainathan, 2004) as the dominant in-group members, simply because of their out-group characteristics. In an extreme scenario, dominant in-groups (i.e., men in this scenario) may also use financial means to avoid interactions with out-group members (Guryan & Charles, 2013). Gender bias also reduces diversity through an increased threshold of acceptance requirements, including requiring women to have higher qualifications, experience, and expertise to secure a top position (Hillman, Cannella, & Harris, 2002). Mentoring and support are two vital prerequisites for managerial appointments, but these are disproportionately assigned between men and women to the detriment of the latter (NOE, 1988; McDonald & Westphal, 2013; Arvate et al., 2018). A major crisis will further reduce the generic availability of these practices, disproportionately disadvantaging women’s chances of maintaining or improving their position in the organization.

Summing up, we propose that:

**Hypothesis 1.** *A major crisis will have a negative effect on (i.e., reduce) board gender diversity.*

#### *The role of female CEOs*

Women face many hurdles when it comes to rising toward the peak of corporate hierarchies (Oakley, 2000; Cook & Glass, 2014). The few who break through the “glass ceiling” (Daily et al., 1999) serve to legitimize their role in organizations in light of diverse institutional pressures

(Terjesen et al., 2015) and as an internal development function by mentoring other junior female staff to advance in their careers (NOE, 1988; McDonald & Westphal, 2013; Afzali, Silvola, & Terjesen, 2021). Our focus on female CEOs has two primary motivations. First, it allows us to examine the interplay between a significant and consequential major shock and actions taken by female CEOs in the context of gender diversity on boards, i.e., their diversity focus. Second, it reveals how female leaders’ corporate impact differs from that of men, who are responsible in most other firms. Essentially, we are asking the question: can female CEOs promote, or at least protect, other women on the boards when a crisis hits?

While the question of whether women promote more women than men has risen to the forefront of the “glass ceiling” debate (Corwin, Loncarich, & Ridge, 2022), the theoretical views are divided. On the one hand, women CEOs are depicted as gender “heroes,” who tend to promote more women into positions of power following theoretical tenets from homophily (McPherson et al., 2001) and similarity attraction (Byrne, 1971) theories, resulting in an overall improvement of gender diversity within boards (Guldiken et al., 2019). On the other hand, female CEOs are often dubbed “queen bees,” seeking to distance themselves from other women and adhering to the status quo regarding diversity to integrate themselves better and succeed in organizations where men still hold most top positions (Derks et al., 2016). While this debate is ongoing, we seek to add another nuance to it by focusing on the role of female CEOs in preserving or improving gender diversity in the wake of a major crisis. Given the disproportionate impact of the recent COVID-19 pandemic on women, this question is particularly relevant to policy interest in the current economic milieu (Milliken et al., 2020; Birhanu, Getachew, & Lashitew, 2022; Krammer, 2022).

We posit that female CEOs can mitigate some of the negative effects of a major crisis on the gender diversity of boards for at least three reasons. First, concerning gender diversity, female CEOs will likely enjoy greater legitimacy and reputational slack than their male counterparts. Gender diversity on boards is a closely monitored socio-political issue that cuts across organizations, industries, and even national borders (Terjesen et al., 2015). Subsequently, the focus on diversity from outside stakeholders often results in women reaching top executive positions, including board chairs and CEOs (Wang & Kelan, 2013). Since female CEOs are vital for maintaining and improving the external legitimacy concerns of various stakeholders, they are in a perfect position to impose their will on male-dominated organizations and

deliver on what are normative expectations of increasing female representation on boards (Carmeli & Schaubroeck, 2007).<sup>1</sup> Therefore, female CEOs are invested in maintaining the saliency and legitimacy of issues that have partially powered their rise to top executive positions (Gormley et al., 2023).

Second, given their unique combination of scarcity and skills, female CEOs often enjoy special status in their organizations, which they can utilize to improve gender diversity both within and outside their organizations (Guldiken et al., 2019). Given the scrutiny and attention they enjoy or endure, their position becomes powerful due to so few women employed at this level. Female CEOs are more likely to oppose and reduce inequality faced by female subordinates (Hultin & Szulkin, 1999; Cohen & Huffman, 2007), a process known as “homosocial reproduction” (Kanter, 1997). Moreover, they are more likely to be sympathetic to other women, appreciate other women’s performances at work, and allow for greater flexibility regarding maternity choices and career options than male leaders (Halpert, Wilson, & Hickman, 1993). Consistent with the trickle-down effect (Cook & Glass, 2015), female managers tend to promote more female junior appointments (Cohen, Broschak, & Haveman, 1998; Gorman, 2005) and seek more female clients (Beckman & Phillips, 2005). All these issues and the special status enjoyed by female CEOs suggest that they have the power and scope to at least preserve, if not improve, gender representation, even during a major tumultuous event.

Third, female CEOs are more likely to recognize and oppose gender bias in their organizations. Overall, women display weaker in-group bias than men since the latter have historically been the leading player in intergroup conflicts (Fehr, Bernhard, & Rockenbach, 2008). Following any such conflict, men receive the biggest gains but also bear the costs; in terms of physical and psychological consequences (Chagnon, 1988). Therefore, women are less likely to react strongly to risks and threats stemming from a major shock (van Vugt, de Cremer, & Janssen, 2007). Nonetheless, because of the personal exclusion and other related difficulties women face during their quest to climb the organizational hierarchy, they are uniquely placed to recognize in-group bias and could act to reduce or eliminate it (Oakley, 2000).

In conclusion, we propose that:

**Hypothesis 2.** *Female CEOs will moderate (i.e., weaken) the negative effect of a major crisis on board gender diversity.*

### *The role of the institutional environment*

Institutional theory firmly posits that firm behaviors and strategic responses will depend on the institutional environment in which the firm operates (Peng et al., 2009; Vasudeva, Zaheer, & Hernandez, 2013; Krammer, 2018). Therefore, examining the effects of the institutional context on the relationship between exogenous shocks and gender diversity may provide valuable insights for our research (Zhang, 2020). Subsequently, we follow the neo-institutional economic tradition of North (1990) and conceptualize institutions as having a formal and an informal component (Stiglitz, 2000; Williamson, 2009) which combine cognitive, normative, and regulatory aspects that govern societal and business interactions (Scott, 1995; Krammer, 2018). A key element of differentiation between formal and informal institutions is their enforcement or coercive power, with the former having clear, legally binding implications while the latter being softer and more prescriptive.

In our context, *formal institutional* elements focusing specifically on gender, most notably quotas, have been employed by governments worldwide to regulate diversity on boards (Terjesen et al., 2015). While

their effects on organizational performance, particularly in the long term, are still debated in the literature (Ahern & Dittmar, 2012). Nonetheless, more and more countries are implementing this type of regulation to promote equality, inclusivity, and sustainable development (Wang & Kelan, 2013).<sup>2</sup> Conversely, corporate governance (CG) structures are modeled on existing *informal institutional* norms and in line with societal expectations in each country (Meyer & Rowan, 1977). One of the core components of these CG codes is the gender composition of the board of directors. Since 2008, 55 countries, including Australia, Greece, the U.K., and the U.S., have implemented such arrangements to incentivize corporations to implement good CG (Humphries & Whelan, 2017). Adhering to institutional theory, we propose several reasons why formal (i.e., gender quotas) and informal (i.e., CG codes) institutions can mitigate the negative effects of a major shock on gender diversity in boards by changing organizational legitimacy, i.e., the ability of the firm to devise and adopt practices that are desirable and expected within the firm’s operating environment.

First, the quality of informal institutions relating to gender diversity in a country will support the maintenance (if not the improvement) of gender diversity norms on boards. Improving the gender balance across various business domains has become a practice that has gained significant momentum and has changed societal norms and values (Archibald, 2004). In turn, such practices in the public and private domains have become appropriate and desirable signals for organizations to send to their investors and stakeholders (Westphal & Zajac, 2013; Dobbin & Jung, 2011). Thus, firms in countries with more established norms and values around gender equality and supporting diversity will feel more pressure to maintain this course despite the economic rows caused by a major crisis. It will encourage further mimetic pressures on other firms in the same environment to adhere to and match the cognitive and normative acceptance levels regarding gender diversity. These pressures are further reinforced by investors’ perceptions, which are more favorable toward firms that closely follow the normatively accepted practices in a country (Zajac & Westphal, 2004; Fauver et al., 2017).

Second, and complementarily, the quality of formal institutions relating to gender diversity in a country will also provide significant support for maintaining (if not improving) gender diversity on boards. Firms that do not comply with regulations regarding anti-discrimination, equal opportunities, and affirmative action are likely to receive fines and experience reputational damage that can have a long-lasting effect (Hirsh & Cha, 2015), particularly from an investor’s point of view (Zajac & Westphal, 2004). Therefore, in institutional contexts, where there is greater regulatory scrutiny and emphasis on gender diversity, a firm’s compliance with these regulations will be more closely linked to its economic performance (Zhang, 2020). It will provide additional reassurance that, even in the case of a major crisis, organizations operating in highly regulated environments where the emphasis is on gender parity will be less likely to revert to tokenism or “business as usual” scenarios (Torchia et al., 2011; Guldiken et al., 2019). Thus, such scrutiny will disable the firm’s ability to reduce the number of out-group members (i.e., female directors).

Finally, there is the potential for legitimacy spillovers from strong institutional prescriptions regarding gender diversity. When formal regulations endorse gender balance and diversity, employees generally think more favorably of and are less biased toward women in leadership and power positions, seeing them as credible, competent leaders (Lucas, 2003; van Knippenberg & Schippers, 2007). It, in turn, changes the informal norms and behaviors of individuals in society, influencing the overall expectations and legitimacy thresholds of public and private investors (Ahern & Dittmar, 2012).

<sup>1</sup> For instance, Indra Nooyi, the former long-tenured CEO of PepsiCo and present corporate director of multinational firms such as Amazon.com, Inc. in the U.S. and Philips N.V. in the Netherlands, said, “Boards should welcome women, should want to listen to them” (Osukoya, 2019).

<sup>2</sup> The most recent example is the EU landmark agreement on a 40 percent quota for women on boards and a 33 percent share of senior corporate roles, including non-executive directors and directors, such as CEOs and CFOs.

**Table 2**  
Summary statistics.

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1 BGD (p)	0.086	0.101	1.00																					
2 Dummy BGD	0.518	0.499	0.82	1.00																				
3 BGD (c)	0.825	1.021	0.92	0.79	1.00																			
4 ExBGD (p)	0.017	0.052	0.40	0.30	0.35	1.00																		
5 Dummy ExBGD	0.142	0.349	0.33	0.31	0.34	0.79	1.00																	
6 ExBGD (c)	0.157	0.465	0.38	0.31	0.42	0.91	0.90	1.00																
7 NEBGD (p)	0.071	0.091	0.84	0.73	0.80	-0.09	-0.08	-0.08	1.00															
8 Dummy NEBGD	0.451	0.498	0.72	0.84	0.72	-0.09	-0.07	-0.06	0.86	1.00														
9 NEBGD (c)	0.664	0.860	0.80	0.71	0.86	-0.08	-0.05	-0.04	0.94	0.85	1.00													
10 Female CEO	0.028	0.166	0.26	0.16	0.20	0.02	0.01	0.01	0.05	0.04	0.04	1.00												
11 Post AES Treatment	0.320	0.467	0.10	0.09	0.07	-0.10	-0.11	-0.11	0.16	0.14	0.14	0.03	1.00											
12 Post CKO Treatment	0.323	0.468	0.09	0.11	0.10	-0.11	-0.11	-0.11	0.16	0.16	0.16	0.02	0.73	1.00										
13 Post AES2 Treatment	0.347	0.476	0.13	0.12	0.12	-0.02	-0.04	-0.03	0.16	0.15	0.15	0.02	0.93	0.68	1.00									
14 Post LV Treatment	0.565	0.496	0.09	0.07	0.09	0.03	0.02	0.03	0.09	0.07	0.09	0.01	0.40	0.61	0.44	1.00								
15 AES Treatment	0.668	0.471	0.03	0.08	0.02	-0.20	-0.21	-0.22	0.15	0.17	0.14	0.02	0.49	0.43	0.40	-0.04	1.00							
16 CKO Treatment	0.612	0.487	0.03	0.09	0.06	-0.17	-0.18	-0.17	0.14	0.17	0.15	0.01	0.30	0.55	0.22	0.11	0.78	1.00						
17 Post-2006 AES Treatment	0.528	0.499	0.05	0.07	0.03	-0.16	-0.17	-0.18	0.15	0.15	0.13	0.03	0.65	0.60	0.57	0.28	0.75	0.54	1.00					
18 Post-2007 AES Treatment	0.475	0.499	0.07	0.07	0.04	-0.15	-0.15	-0.16	0.15	0.14	0.13	0.03	0.72	0.67	0.65	0.40	0.67	0.47	0.90	1.00				
19 Post-2006 CKO Treatment	0.473	0.499	0.06	0.09	0.07	-0.14	-0.15	-0.14	0.15	0.16	0.15	0.02	0.48	0.73	0.42	0.42	0.58	0.76	0.81	0.72	1.00			
20 Post-2007 CKO Treatment	0.423	0.494	0.07	0.09	0.08	-0.13	-0.13	-0.13	0.15	0.16	0.15	0.02	0.56	0.81	0.50	0.54	0.52	0.68	0.73	0.82	0.90	1.00		
21 CEO Duality	0.379	0.485	0.05	0.06	0.07	0.06	0.00	0.06	0.03	0.04	0.05	-0.03	0.02	0.07	0.05	-0.04	0.23	0.26	0.10	0.07	0.13	0.11	1.00	
22 Board Size	8.552	3.065	0.25	0.40	0.50	0.09	0.18	0.27	0.24	0.36	0.42	-0.01	-0.03	0.05	0.01	-0.02	0.00	0.11	-0.05	-0.04	0.06	0.05	0.09	
23 Board Independence	0.648	0.220	0.13	0.16	0.14	-0.37	-0.34	-0.39	0.36	0.36	0.36	0.02	0.32	0.34	0.25	0.01	0.55	0.48	0.46	0.42	0.42	0.39	0.06	
24 Board Tenure	0.929	0.652	-0.11	-0.17	-0.20	0.00	-0.06	-0.07	-0.13	-0.17	-0.19	-0.01	0.07	0.09	0.07	0.03	0.14	0.14	0.11	0.09	0.12	0.10	0.12	
25 Board Outside Affiliations	0.220	0.112	-0.12	-0.21	-0.23	-0.08	-0.10	-0.15	-0.10	-0.16	-0.18	0.00	-0.08	-0.18	-0.09	-0.13	-0.13	-0.24	-0.12	-0.12	-0.23	-0.22	-0.08	
26 Board Supervisory	0.072	0.222	0.05	0.06	0.12	0.25	0.28	0.35	-0.08	-0.07	-0.05	-0.01	-0.18	-0.15	0.00	0.09	-0.37	-0.29	-0.28	-0.25	-0.21	-0.18	0.12	
27 Certified Directors	0.066	0.116	-0.04	-0.03	0.00	0.16	0.23	0.23	-0.14	-0.13	-0.12	-0.01	-0.17	-0.18	-0.12	-0.04	-0.30	-0.24	-0.27	-0.24	-0.23	-0.20	-0.07	
28 Board Financial Expertise	0.084	0.102	0.06	0.05	0.03	-0.13	-0.14	-0.15	0.14	0.12	0.11	0.01	0.17	0.20	0.14	0.12	0.16	0.17	0.20	0.20	0.21	0.21	-0.01	
29 Tobin's Q	1.769	1.339	0.00	-0.03	-0.04	-0.02	-0.03	-0.03	0.00	-0.02	-0.03	0.01	0.00	0.00	-0.01	-0.07	0.05	0.05	0.00	-0.03	0.00	-0.02	-0.01	
30 Total Assets	7.646	25.945	0.17	0.19	0.30	0.01	0.05	0.08	0.19	0.20	0.29	-0.01	-0.01	0.00	0.01	0.01	-0.05	-0.02	-0.04	-0.03	-0.02	-0.01	0.06	
31 Business Segments	2.738	1.944	0.16	0.19	0.24	0.07	0.09	0.12	0.15	0.17	0.21	-0.01	0.01	-0.02	0.04	0.02	-0.07	-0.07	-0.06	-0.05	-0.06	-0.05	0.06	
32 Geographic Segments	2.036	1.692	0.06	0.08	0.09	0.02	0.05	0.05	0.06	0.07	0.09	-0.02	-0.03	-0.06	-0.01	0.02	-0.13	-0.15	-0.09	-0.08	-0.11	-0.09	-0.01	
33 Operating ROA	0.028	0.164	0.11	0.13	0.13	0.03	0.02	0.04	0.11	0.13	0.13	-0.01	0.01	0.00	0.01	-0.04	0.04	0.03	0.00	0.00	0.00	-0.01	0.09	
34 Loss	0.229	0.420	-0.12	-0.16	-0.17	-0.05	-0.03	-0.07	-0.12	-0.15	-0.16	0.01	-0.02	0.00	-0.04	0.05	-0.05	-0.06	0.00	0.01	-0.01	0.00	-0.10	
35 Leverage	0.522	0.246	0.14	0.21	0.23	0.01	0.04	0.06	0.16	0.21	0.24	-0.01	0.01	0.07	0.03	0.04	0.05	0.11	0.03	0.03	0.09	0.08	0.06	
36 CapX	0.046	0.059	-0.06	-0.07	-0.07	-0.02	-0.02	-0.02	-0.05	-0.06	-0.06	-0.01	-0.01	-0.06	-0.02	-0.09	-0.01	-0.05	-0.01	-0.01	-0.04	-0.04	0.01	
37 R&D	0.031	0.084	-0.06	-0.07	-0.09	-0.05	-0.05	-0.06	-0.05	-0.06	-0.08	0.02	0.02	0.05	0.02	0.03	0.06	0.08	0.05	0.05	0.07	0.06	-0.05	
38 Cash Holdings	0.166	0.203	-0.09	-0.13	-0.14	-0.03	-0.04	-0.05	-0.09	-0.12	-0.14	0.02	0.02	0.02	0.01	0.01	0.04	0.01	0.04	0.03	0.02	0.01	-0.05	
39 Ownership	0.261	0.242	-0.11	-0.15	-0.15	0.22	0.21	0.21	-0.25	-0.27	-0.28	0.02	-0.19	-0.22	-0.13	-0.04	-0.22	-0.25	-0.17	-0.16	-0.20	-0.20	-0.02	
40 Gender Quota	0.036	0.187	0.17	0.12	0.20	0.24	0.22	0.27	0.06	0.05	0.09	0.00	-0.07	-0.01	0.09	0.15	-0.21	-0.10	-0.15	-0.12	-0.05	-0.03	0.04	
41 CG Code	0.303	0.460	0.17	0.12	0.15	0.10	0.10	0.11	0.13	0.09	0.11	0.02	0.35	0.19	0.41	0.40	-0.13	-0.19	0.06	0.13	-0.01	0.06	-0.10	
42 Guillen-Capron Reg. of CG	6.925	0.603	0.03	0.03	0.01	-0.14	-0.18	-0.18	0.11	0.12	0.11	0.01	0.25	0.30	0.24	0.05	0.45	0.48	0.39	0.35	0.41	0.37	0.13	
43 GD Parliaments	0.201	0.060	0.10	0.05	0.11	0.19	0.22	0.24	0.01	-0.03	0.00	-0.01	-0.05	-0.20	0.00	0.12	-0.45	-0.59	-0.21	-0.15	-0.33	-0.28	-0.17	
44 GD Labor Force	0.458	0.009	0.09	0.06	0.08	0.02	0.00	0.00	0.09	0.09	0.09	0.00	-0.05	0.01	0.04	0.16	-0.14	-0.17	-0.07	-0.05	-0.07	-0.04	-0.02	
45 GDP Per Capita (ln)	10.708	0.300	0.05	0.05	0.05	-0.12	-0.11	-0.12	0.12	0.11	0.12	0.00	0.23	0.26	0.25	0.26	0.15	0.20	0.23	0.22	0.29	0.28	-0.06	
Variable	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
23 Board Independence	0.03	1.00																						

(continued on next page)

Table 2 (continued)

Variable	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	
24 Board Tenure	-0.38	0.01	1.00																						
25 Board Outside Affiliations	-0.49	-0.02	0.18	1.00																					
26 Board Supervisory	0.28	-0.41	-0.14	-0.11	1.00																				
27 Certified Directors	0.17	-0.55	-0.17	0.10	0.32	1.00																			
28 Board Financial Expertise	-0.07	0.33	-0.06	0.08	-0.15	-0.19	1.00																		
29 Tobin's Q	-0.12	0.02	0.01	0.09	-0.07	-0.04	0.04	1.00																	
30 Total Assets	0.42	0.06	-0.17	-0.10	0.12	0.11	-0.01	-0.10	1.00																
31 Business Segments	0.32	-0.03	-0.07	-0.06	0.21	0.11	0.00	0.14	0.28	1.00															
32 Geographic Segments	0.15	-0.02	-0.05	0.04	0.16	0.06	0.05	-0.01	0.10	0.24	1.00														
33 Operating ROA	-0.16	0.04	0.07	-0.13	0.04	-0.01	0.03	0.09	0.04	0.17	0.14	1.00													
34 Loss	-0.24	-0.02	-0.04	0.19	-0.07	0.00	0.02	0.08	-0.12	-0.19	-0.10	-0.62	1.00												
35 Leverage	0.38	0.06	-0.16	-0.28	0.10	0.02	-0.05	-0.26	0.26	0.20	0.01	0.08	-0.19	1.00											
36 CapX	-0.07	0.01	-0.01	0.09	-0.03	0.01	0.03	0.05	-0.07	-0.03	0.00	0.08	0.00	-0.11	1.00										
37 R&D	-0.13	0.06	0.01	0.09	-0.04	-0.06	0.08	0.37	-0.08	-0.16	-0.02	-0.53	0.33	-0.23	-0.09	1.00									
38 Cash Holdings	-0.24	0.00	0.02	0.18	-0.05	-0.04	0.06	0.43	0.14	0.22	-0.05	-0.35	0.30	-0.47	-0.11	0.51	1.00								
39 Ownership	-0.13	-0.44	0.06	0.04	0.23	0.21	-0.22	-0.04	-0.12	-0.05	-0.06	-0.05	0.07	-0.07	-0.01	-0.05	0.03	1.00							
40 Gender Quota	0.13	-0.20	-0.05	-0.07	0.39	0.18	-0.09	-0.05	0.09	0.13	0.08	0.01	-0.03	0.06	-0.03	-0.03	0.15	1.00							
41 CG Code	-0.01	-0.08	-0.03	0.00	0.17	0.05	0.02	0.00	0.04	0.13	0.09	-0.02	0.00	0.00	-0.02	-0.02	-0.02	0.03	0.29	1.00					
42 Guillen-Capron Reg. of CG	-0.09	0.41	0.14	-0.06	-0.36	-0.29	0.16	0.02	-0.07	-0.15	-0.17	-0.02	0.01	-0.01	-0.02	0.05	0.05	-0.18	-0.19	-0.14	1.00				
43 GD Parliaments	0.06	-0.36	-0.13	0.06	0.34	0.23	-0.11	-0.05	0.07	0.18	0.21	0.00	0.00	-0.01	0.02	-0.06	-0.05	0.18	0.35	0.47	-0.68	1.00			
44 GD Labor Force	-0.09	0.08	0.08	0.05	-0.11	-0.09	0.09	0.01	-0.05	-0.07	0.02	-0.03	0.05	-0.06	0.01	0.02	0.00	-0.11	-0.02	0.05	0.15	0.09	1.00		
45 GDP Per Capita (ln)	-0.05	0.25	0.11	-0.01	-0.09	-0.13	0.11	0.04	-0.01	-0.03	0.04	-0.02	0.03	0.01	0.00	0.04	-0.03	-0.19	-0.09	0.23	0.20	-0.02	0.31	1.00	

Given these rationales, we propose our last joint hypothesis, namely:

**Hypothesis 3.** *Formal (a) and informal (b) institutional provisions will moderate (i.e., weaken) the negative effect of a major crisis on board gender diversity.*

**Methods**

*Data and sample selection*

We collected data for this study from several sources: BoardEx database for corporate board characteristics,<sup>3</sup> Thomson Reuters' Worldscope (Refinitiv) for financial characteristics, various public sources for gender quotas and CG code timings, minority shareholders' rights protection data from Guillén & Capron's (2016) study, and county-level indicators on parliamentary gender diversity, labor force, and GDP from the Inter-Parliamentary Union, the International Labour Organization, and the World Bank, respectively. We have provided a detailed account of the data sources in Appendix Table A1 and distribution by country for gender quotas and CG code timings in Appendix Table A2. While we report our core findings in the paper (Tables 1–6, Figs. 1 and 2), we report the numerous robustness tests, *ex-post* analyses, and additional information in Appendix A due to space constraints. We also provide in Appendix B a detailed account of the methodologies used in the paper for the robustness and sensitivity tests.

To construct our sample, we use the BoardEx database and follow prior studies (Yang et al., 2019; Homroy & Mukherjee, 2021): specifically, we remove all missing values<sup>4</sup> for our main variables of interest and those with a negative book value (as these firms are prone to high default risks<sup>5</sup>). We also removed firms from countries whose data got initiated in the BoardEx after 2004. This choice allows for sufficient pre- and post-GFC coverage for our analysis<sup>6</sup> (Goodman-Bacon, 2021). Finally, we excluded smaller countries that BoardEx sparsely covered by constituting a minimum benchmark of 75 firm-year observations. With this choice, we try to ensure a robust treatment effect since a small number of jurisdictions without sufficient observations will likely induce more noise in the estimates. Our final sample, which we employ for our empirical analyses, is 67,594 firm-year (or 547,322 director-firm-year) observations across 21 countries between 2000 and 2015.

*Study design*

We use the staggered timings of the GFC-affected countries as a quasi-natural experiment setting (Antonakis et al., 2010; Sieweke & Santoni, 2020). Prior studies across disciplines have taken advantage of various exogenous events (e.g., Ahern & Dittmar, 2012; Matsa & Miller,

<sup>3</sup> Similar to prior studies in this literature on the availability of board composition data, U.S. observations dominate our dataset (Ye, Deng, Liu, Szweczyk, & Chen, 2019; Homroy & Mukherjee, 2021; Mukherjee & Bonestroo, 2021).

<sup>4</sup> We have a missing data rate of 29.5 percent from the opening sample of 95,998. In the interest of full transparency, we have provided a full account of the missing variables in the supplementary material (see Appendix Table A17). Since the missing data is mostly clustered in firm-level control variables, each missing between 4 and 10 percent, we have no reason to believe they are systematically missing. Therefore, we do not expect our results to be systematically biased (Newman, 2014).

<sup>5</sup> Removing firm-year observations with high default risk is vital for our study since we are interested in studying how going-concern firms behave when faced with an exogenous crisis such as the GFC. We have eliminated 3099 observations owing to high default risk, constituting about 4 percent of the integrated sample.

<sup>6</sup> With this decision, we have removed mainly Latin American and Middle Eastern countries whose coverage in BoardEx was, at best, patchy. The only significant large economy this selection method eliminated was India, whose data quality was poor until the onset of the GFC in 2008.

**Table 3**  
Board Gender Diversity After a Crisis.

	(1)	(2)	(3)	(4)	(5)	(6)
Estimator	OLS	OLS	Probit	Probit	Poisson	Poisson
Dependent	BGD (p)	BGD (p)	Dummy BGD	Dummy BGD	BGD (c) (ln)	BGD (c) (ln)
SE	Country	Country	Country	Country	Country	Country
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	No	No	Yes	Yes
Industry Fixed Effect	No	No	Yes	Yes	No	No
Panel A						
Post AES Treatment	-0.022* (0.011)	-0.012*** (0.003)	-0.191*** (0.021)	-0.177*** (0.027)	-0.222*** (0.025)	-0.129*** (0.029)
Female CEO		-0.013*** (0.004)		0.271*** (0.034)		0.245*** (0.031)
CEO Duality		0.000 (0.001)		0.055*** (0.012)		0.035*** (0.013)
Board Size (ln)		-0.010* (0.005)		1.410*** (0.032)		1.116*** (0.034)
Board Independence		0.023*** (0.005)		0.384*** (0.045)		0.359*** (0.049)
Board Tenure		-0.016*** (0.003)		-0.033*** (0.010)		-0.053*** (0.013)
Board Outside Affiliations		-0.009 (0.009)		0.339*** (0.077)		-0.079 (0.095)
Board Supervisory		0.029* (0.016)		-1.578*** (0.116)		-1.100*** (0.115)
Certified Directors		-0.007 (0.007)		-0.560*** (0.068)		-0.360*** (0.075)
Board Financial Expertise		-0.012** (0.005)		0.033 (0.061)		0.166** (0.066)
Tobin's Q		0.001*** (0.000)		0.061*** (0.005)		0.054*** (0.005)
Total Assets (ln)		0.005*** (0.001)		0.127*** (0.005)		0.080*** (0.004)
Business Segments (ln)		-0.001 (0.001)		0.053*** (0.009)		0.033*** (0.009)
Geographic Segments (ln)		-0.001 (0.001)		0.013 (0.010)		-0.006 (0.009)
Operating ROA		0.006** (0.003)		0.302*** (0.052)		0.518*** (0.065)
Dummy: Loss		0.001 (0.001)		0.029* (0.017)		-0.028 (0.020)
Leverage		-0.006 (0.004)		0.105*** (0.031)		0.107*** (0.032)
CapX		0.012 (0.010)		-0.421*** (0.105)		-0.620*** (0.112)
R&D		0.005 (0.004)		-0.084 (0.095)		0.161 (0.118)
Cash Holdings		-0.001 (0.002)		-0.014 (0.037)		-0.040 (0.045)
Ownership		-0.012*** (0.003)		-0.164*** (0.027)		-0.087*** (0.030)
Gender Quota		0.066*** (0.007)		0.636*** (0.057)		0.313*** (0.050)
CG Code		0.004 (0.004)		0.145*** (0.026)		0.097*** (0.026)
Guillen-Capron Reg. of CG (ln)		0.000 (0.009)		-0.252** (0.101)		-0.092 (0.120)
GD Parliaments		0.183* (0.099)		2.957*** (0.529)		1.760*** (0.506)
GD Labor Force		0.233 (0.481)		12.702*** (2.289)		13.955*** (2.366)
GDP Per Capita		0.010 (0.014)		0.348*** (0.072)		0.186** (0.084)
constant	0.026** (0.010)	-0.198 (0.224)	-0.551*** (0.148)	-14.287*** (1.105)		
Obs. Firms	67594 10181	67594 10181	67594 10181	67594 10181	67594 10181	67594 10181
Adj. R-square	0.137	0.170				
Overall p-value	0.00	0.00	0.00	0.00	0.00	0.00
Panel B						
Post CKO Treatment	-0.019** (0.008)	-0.012*** (0.002)	-0.145*** (0.021)	-0.183*** (0.025)	-0.162*** (0.025)	-0.141*** (0.028)

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Table 3 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	
constant	0.025** (0.010)	-0.147 (0.215)	-0.572*** (0.150)	-13.482*** (1.121)			
All Controls	No	Yes	No	Yes	No	Yes	
Obs.	67594	67594	67594	67594	67594	67594	
Firms	10181	10181	10181	10181	10181	10181	
Adj. R-square	0.135	0.170					
Overall p-value	0.00	0.00	0.00	0.00	0.00	0.00	
Panel C: Parallel Trend and Placebo Tests							
	(1)	(2)	(3)	(4)	(5)	(6)	
Estimator	OLS	OLS	OLS	OLS	OLS	OLS	
Dependent	BGD (p)	BGD (p)	BGD (p)	BGD (p)	BGD (p)	BGD (p)	
SE	Country	Country	Country	Country	Country	Country	
Treatment Sample	AES	CKO	AES	CKO	AES	CKO	
Post Sample	NA	NA	Post-2006	Post-2006	Post-2007	Post-2007	
Treatment	0.009 (0.005)	0.009 (0.007)					
Post-Placebo Treatment			-0.000 (0.002)	-0.001 (0.002)	-0.000 (0.002)	-0.000 (0.002)	0.016** (0.006)
constant	-0.553*** (0.111)	-0.568*** (0.115)	0.329*** (0.107)	0.350*** (0.114)	0.331*** (0.109)	0.332*** (0.112)	-0.026 (0.222)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	No	No	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	No	No	No	No	No
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	23806	23806	23806	23806	23806	23806	67594
Firms	6061	6061	6061	6061	6061	6061	10181
Adj. R-square	0.172	0.172	0.047	0.047	0.047	0.047	0.170
Overall p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: We report the standard errors in parenthesis underneath the coefficients. Statistical significance is reported as follows: (Two-tailed) \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ ; (One-tailed) §  $p < 0.1$ , §§  $p < 0.05$ , §§§  $p < 0.01$ .

2013; De Paola & Scoppa, 2015; Stoker et al., 2019) or regulatory changes to examine various research questions.

The years between 2008 and 2010 are the seminal periods for the GFC (Acharya & Richardson, 2009). GFC's origin lay in the credit squeeze in global financial markets due to underappreciated risks in the U.S. subprime mortgage market (Carey et al., 2012). We identify the GFC-affected treatment sample following two principles. First, we identify a country in our *treatment* sample when a broad cross-section of firms and industries faces significant financial distress during a concentrated period. The second guiding principle is to determine the *treatment* sample using a conservative approach. Following these principles, we identify four sets of treatment samples to ensure robustness and mitigate the risk that one set of treatment countries could drive our results. According to our treatment sample identification criteria, the countries that have not experienced the GFC severely form our control sample in the quasi-natural experiment.

First, we follow Mukherjee & Bonestroo's study (2021) and employ the Zivot & Andrews (1992)<sup>7</sup> test on the country-level aggregate earnings series to determine treatment countries. This identification strategy is based on the notion that aggregate earnings have information value (Konchitchki & Patatoukas, 2013; Konchitchki & Patatoukas, 2014; Shivakumar & Urcan, 2017). Furthermore, since executives exercise significant discretion on reported corporate earnings (Dechow, Sloan, & Sweeney, 1995), aggregate earnings series are likely more stable than stock-market-based data. The first treatment sample (i.e., AES) uses only manufacturing and industrial firms to detect the structural break dates.

<sup>7</sup> We discuss the statistical features of the Zivot & Andrews test (1992) in the expanded methods section of the supplementary material document (Appendix B1).

Here, we exclude the financial sector as that is the origin of the GFC, and any significant break in the aggregate earnings series using nonfinancial firms would imply a considerable spillover effect of the GFC to other sectors. This choice aligns with our first principle, as described earlier.

Also, following Mukherjee & Bonestroo's study (2021), we develop a second identification set that uses the entire cross-section of firms, including those in the financial services sector (i.e., AES2). In Table 1, we report the countries that experienced an AES, and its timing, distinguishing between them based on the inclusion of the financial services sector (AES and AES2). AES *Treatment* identifies countries that experienced a significant AES, which we code as one; otherwise, zero. The post-crisis timing found for the treatment sample is *Post AES Treatment*. This variable is coded one in the treatment sample, starting with the year mentioned in Table 1. While most structural break timings are concentrated during 2008–2010, some variations exist across countries. This is to be expected in a data-driven identification of the countries that faced a significant GFC. Thus, these staggered GFC treatment timings are unlike a regulatory change year known with great precision. This form of the DID test is akin to the staggered adoption of a treatment (Cohen & Wang, 2013; Goodman-Bacon, 2021).

Our third set of treatment samples comes from Carey et al. (2012) and Kalemli-Özcan et al. (2016). Carey et al. (2012) identify the United States as one of the countries that faced the GFC using the “dramatic ... failure of Lehman [Brothers] in September 2008” (p. 422). Similarly, Kalemli-Özcan et al. (2016) identified Greece, Ireland, Spain, Portugal, and Italy as the ones facing the Sovereign Debt Crisis, which is a downstream crisis from the GFC. By 2010, the negative impact of the Sovereign Debt Crisis was plain to global markets and investors. In Carey-Kalemli-Özcan (CKO) *Treatment*, we include all these countries using the timings given by their respective studies. Table 1 provides details of the CKO *Treatment* countries and the timings of their crises.

**Table 4**  
The Role of Female Leaders.

	(1)	(2)	(3)
Estimator	OLS	Probit	Poisson
Dependent	BGD (p)	Dummy BGD	BGD (c) (ln)
SE	Country	Country	Country
Year Fixed Effect	Yes	Yes	Yes
Firm Fixed Effect	Yes	No	Yes
Industry Fixed Effect	No	Yes	No
All Controls	Yes	Yes	Yes
Panel A			
Post AES Treatment	−0.012*** (0.003)	−0.176*** (0.027)	−0.124*** (0.029)
Post AES Treatment x Female CEO	−0.008** (0.003)	−0.030 (0.069)	−0.124** (0.062)
Female CEO	−0.010 (0.006)	0.283*** (0.043)	0.301*** (0.041)
constant	−0.198 (0.224)	−14.288*** (1.105)	
Obs.	67594	67594	67594
Firms	10181	10181	10181
Adj. R-square	0.170		
Overall p-value	0.00	0.00	0.00
Panel B			
Post CKO Treatment	−0.012*** (0.002)	−0.186*** (0.025)	−0.138*** (0.028)
Post CKO Treatment x Female CEO	−0.002 (0.003)	0.078 (0.070)	−0.078 (0.062)
Female CEO	−0.013** (0.005)	0.244*** (0.042)	0.280*** (0.042)
constant	−0.147 (0.215)	−13.480*** (1.121)	
Obs.	67594	67594	67594
Firms	10181	10181	10181
Adj. R-square	0.170		
Overall p-value	0.00	0.00	0.00

Note: We report the standard errors in parenthesis underneath the coefficients. Statistical significance is reported as follows: (Two-tailed) \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ ; (One-tailed) §  $p < 0.1$ , §§  $p < 0.05$ , §§§  $p < 0.01$ .

The *CKO Treatment* and *Post CKO Treatment* coding methods are similar to the *AES* sample.

Our final treatment countries come from Laeven & Valencia (LV) (2020). They identified the countries that faced a banking crisis, including the timings of the start of the crisis.<sup>8</sup> In Table 1, we tabulate countries that faced a banking crisis, according to Laeven & Valencia, and their timings. The construction of the *Post LV Treatment* is similar to the method described earlier.

Based on our second guiding principle, only *AES* and *CKO* are the most conservative of the four treatment samples since they identify a limited set of countries. They constitute our primary set of treatment samples. We use *AES2* and *LV* treatment samples for robustness and sensitivity tests since they partially or fully rely on the financial services sector to identify crisis-affected countries, which narrows down the identification of the GFC to a single sector: the financial services sector, which is not congruent with our first principle.

<sup>8</sup> LV defined two main criteria to identify banking crisis-affected countries. According to the first criterion, a country is crisis-affected when the banking sector “faces significant bank runs, losses in the banking system, and/or bank liquidations.” According to the second criterion, a country is crisis-affected if the “banking policy intervention measures are in response to significant losses in the banking system” (p. 309).

### Dependent variables

We capture board gender diversity in several ways: (1). *BGD (p)* is the proportion of female directors on the board without counting any female CEOs<sup>9</sup>; (2) *Dummy BGD* equals one if there is a female director on the board without acknowledging the female CEOs, and zero otherwise; (3) *BGD (c)* is the number of female directors on the board, again without counting the female CEOs. In addition, we perform several additional analyses where we provide a finer-grained identification of female directors by their role on the board (non-executive versus executive) to test potential alternative explanations, which we will discuss later. *ExBGD* and *NEBGD* represent executive and non-executive directors, respectively. We use the suffixes (*p*) and (*c*) to represent the proportions versus count figures. When calculating the *ExBGD*, we continue to exclude counting female CEOs.

### Moderating variables

*Female CEOs*: Our main measure to capture female leadership in an organization is the gender of the CEO (one for female, and zero otherwise). To examine the robustness, we employ two additional proxies that measure different channels of female leadership that focus on power and access. Specifically, for *power*, we use female CEOs with a dual role as the board chair (Krause, Semadeni, & Cannella Jr, 2014), while for *access*, we use female directors’ appointments to the nomination committees (Ruigrok et al., 2006). We discuss these tests in the [supplementary material](#) since the results are not different from those we report for female CEOs (see Appendix B).

*Board Gender Regulations*: We code two types of categorical board gender regulations variables based on their level of formality (Williamson, 2009): *Gender Quota* and *CG Code*. A *Gender Quota* is a formal institution requiring a legislative instrument passed by the national Parliament or equivalent national body. Thus, *CG Code* is an informal institution where an industry body “recommends” higher gender diversity on boards without coercive compliance requirements. We code these variables one starting the year a country adopted or passed laws relating to female representation on the board of non-state-owned companies, irrespective of its compliance dates, and zero otherwise.

### Control variables

We include a wide range of firm- and country-specific controls to capture potential idiosyncrasies that might affect the dependent variables. Specifically, at the level of the firm, we include several governance controls such as *CEO Duality* (Krause et al., 2014),<sup>10</sup> i.e., whether the CEO is also the chair of the board; *Board Size* and *Board Independence*

<sup>9</sup> There are three main reasons for this decision. First, prior research increasingly shows that boards are reluctant to appoint more corporate insiders in addition to the CEO (Zorn et al., 2017), even though that trend has reversed in some countries, especially after the GFC (Mukherjee & Bonestroo, 2021). Since most CEOs automatically have a seat on the board, having a female CEO serves a dual purpose: that is, having a woman on the board and having a female CEO. Second, if firms apply informal quotas for how many female directors they have on their board (Dezsó, Ross, & Uribe, 2016; Chang et al., 2019), having a female CEO means they do not need to appoint another female executive to the board purely on gender considerations. Finally, we want to test how the boards behaved toward female directors post-GFC and not toward the senior-most executive in the firm, which is, while a valid research question, outside this study’s considerations. The inclusion of female CEO in the count of the board of directors is likely to overstate our results. Moreover, we use the female CEO as a moderator. Therefore, including female CEOs in the dependent and independent variables will likely create certain endogeneities that are difficult to mitigate.

<sup>10</sup> The director-level analysis includes separate controls for *CEOs* and *board Chairs*.

**Table 5**  
The Effect of the Institutional Environment.

	(1)	(2)	(3)	(4)	(5)	(6)
Estimator	OLS	OLS	Probit	Probit	Poisson	Poisson
Dependent	BGD (p)	BGD (p)	Dummy BGD	Dummy BGD	BGD (c) (ln)	BGD (c) (ln)
SE	Country	Country	Country	Country	Country	Country
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Panel A						
Post AES Treatment	-0.002 (0.005)	0.004 (0.004)	-0.176*** (0.027)	-0.114*** (0.031)	-0.028 (0.045)	0.051 (0.038)
<b>Post AES Treatment x Gender Quota</b>	<b>-0.056*</b> (0.029)		<b>-0.176</b> (0.119)		<b>-0.199</b> (0.127)	
<b>Post AES Treatment x CG Code</b>		<b>-0.018*</b> (0.009)		<b>-0.164***</b> (0.041)		<b>-0.196***</b> (0.057)
Gender Quota	0.081*** (0.027)	0.069*** (0.024)	0.689*** (0.067)	0.629*** (0.057)	0.375*** (0.100)	0.315*** (0.081)
CG Code	0.013** (0.005)	0.023*** (0.007)	0.141*** (0.026)	0.236*** (0.034)	0.134*** (0.040)	0.240*** (0.036)
constant	-0.629*** (0.135)	-0.612*** (0.135)	-14.142*** (1.106)	-13.854*** (1.105)	-9.689*** (1.165)	-9.583*** (1.177)
Obs.	67594	67594	67594	67594	67594	67594
Firms	10181	10181	10181	10181	10181	10181
Adj. R-square	0.208	0.207				
Overall p-value	0.00	0.00	0.00	0.00	0.00	0.00
Panel B						
Post CKO Treatment	-0.004 (0.005)	0.002 (0.004)	-0.178*** (0.026)	-0.117*** (0.029)	-0.030 (0.043)	0.060* (0.035)
<b>Post CKO Treatment x Gender Quota</b>	<b>-0.030</b> (0.032)		<b>-0.081</b> (0.102)		<b>-0.010</b> (0.187)	
<b>Post CKO Treatment x CG Code</b>		<b>-0.023***</b> (0.007)		<b>-0.177***</b> (0.038)		<b>-0.212***</b> (0.053)
Gender Quota	0.084*** (0.022)	0.074*** (0.022)	0.653*** (0.061)	0.650*** (0.057)	0.361*** (0.072)	0.355*** (0.085)
CG Code	0.014** (0.005)	0.022*** (0.007)	0.136*** (0.026)	0.212*** (0.031)	0.139*** (0.038)	0.230*** (0.042)
constant	-0.585*** (0.118)	-0.574*** (0.131)	-13.769*** (1.181)	-12.523*** (1.134)	-9.600*** (1.006)	-9.046*** (1.101)
Obs.	67594	67594	67594	67594	67594	67594
Firms	10181	10181	10181	10181	10181	10181
Adj. R-square	0.207	0.208				
Overall p-value	0.00	0.00	0.00	0.00	0.00	0.00

Note: We report the standard errors in parenthesis underneath the coefficients. Statistical significance is reported as follows: (Two-tailed) \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01; (One-tailed) § p < 0.1, §§ p < 0.05, §§§ p < 0.01.

(Ye et al., 2019); Board Tenure and Outside Affiliations of directors'; Board Supervisory<sup>11</sup> structure, i.e., whether firms have both a supervisory and an executive board (Denis & McConnell, 2003; Ferreira & Kirchmaier, 2013); Certified Directors -whether directors with outside affiliations have their abilities "certified" by the board labor market (Masulis & Mobbs, 2011) and Board Financial Expertise to control for boards' fungible expertise.

Furthermore, we include several salient indicators of firm performance and corporate structure. Thus, we control for the firm's long-term prospects using Tobin's Q, firm size using Total Assets, firms' diversification profiles using the number of Business Segments and Geographic Segments in which they are active, profitability levels using Operating ROA, whether they have sustained a Loss, capital structure and its associated risks (Leverage), any capital investments and R&D expenses (CapX and R&D), organization's liquidity (Cash Holdings) and Ownership features (i.e., insiders' ability to shape board structure).

Finally, we employ several country-level controls that are relevant to our study. Specifically, the Guillén & Capron scores (Guillen-Capron Reg.

<sup>11</sup> For robustness, like Mukherjee & Bonestroo (2021), we include a country-level control that identifies countries that mandate or allow dual board structures with qualitatively similar results.

of CG) to control for country-level variations in legal mechanisms that improve gender-non-specific corporate governance (log-transformed) complemented by the La Porta et al. (1998)'s less refined (binary) distinction of common-law/civil-law measure for investor protection (in our robustness checks). We use country-level gender diversity proportions within national parliaments (GD Parliaments) and the labor force (GD Labor Force) to control for general variations in terms of gender appointments within a national jurisdiction.<sup>12</sup> We also include GDP per Capita to control for other unobserved country-level variations. More details on the construction of all these variables are provided in Appendix Table A1.

#### Empirical model

To test the effect of GFC on gender diversity on boards, we employ the TWFE DID model (Goodman-Bacon, 2021), as shown below.

$$y = \alpha + \beta \text{PostTreatment} + \sum \theta \text{Controls} + \delta_{\text{unit}} + \nu_{\text{year}} + \epsilon \quad (1)$$

<sup>12</sup> Alternative country-level gender controls, such as Hofstede's masculinity index (Hofstede, 1984), do not change our results. We do not tabulate these results.

**Table 6**  
The Role of Female Directors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Estimator	OLS	Probit	Poisson	OLS	Probit	Poisson	OLS	Probit	Poisson	OLS	Probit	Poisson
Dependent	ExBGD (p)	Dummy	ExBGD (c)	ExBGD (p)	Dummy	ExBGD (c)	NEBGD (p)	Dummy	NEBGD (c)	NEBGD (p)	Dummy	NEBGD (c)
		ExBGD	(ln)		ExBGD	(ln)		NEBGD	(ln)		NEBGD	(ln)
SE	Country	Country	Country	Country	Country	Country	Country	Country	Country	Country	Country	Country
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Industry Fixed Effect	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No
Panel A												
<b>Post AES Treatment</b>	<b>-0.004*</b>	<b>-0.139***</b>	<b>-0.244***</b>	<b>-0.004*</b>	<b>-0.142***</b>	<b>-0.248***</b>	<b>-0.010**</b>	<b>-0.125***</b>	<b>-0.225***</b>	<b>-0.010**</b>	<b>-0.124***</b>	<b>-0.221***</b>
	(0.002)	(0.029)	(0.071)	(0.002)	(0.029)	(0.072)	(0.004)	(0.027)	(0.038)	(0.004)	(0.027)	(0.038)
<b>Post AES Treatment x Female CEO</b>				<b>0.005*</b>	<b>0.079</b>	<b>0.096</b>				<b>-0.009***</b>	<b>-0.050</b>	<b>-0.131§</b>
				(0.003)	(0.125)	(0.227)				(0.002)	(0.079)	(0.090)
Female CEO	-0.012***	-0.118	-0.409***	-0.015***	-0.145	-0.434***	-0.003*	0.108**	-0.073	0.001	0.128**	0.001
	(0.004)	(0.083)	(0.132)	(0.004)	(0.099)	(0.144)	(0.002)	(0.053)	(0.061)	(0.002)	(0.064)	(0.079)
CEO Duality	0.002***	0.100***	0.086	0.002***	0.100***	0.087	-0.001	-0.032*	-0.036	-0.001	-0.032*	-0.036
	(0.001)	(0.020)	(0.055)	(0.001)	(0.020)	(0.055)	(0.001)	(0.018)	(0.024)	(0.001)	(0.018)	(0.024)
Board Size (ln)	0.002	0.495***	0.556***	0.002	0.495***	0.556***	-0.009**	0.724***	0.429***	-0.009**	0.724***	0.431***
	(0.002)	(0.055)	(0.161)	(0.002)	(0.055)	(0.161)	(0.004)	(0.050)	(0.078)	(0.004)	(0.050)	(0.078)
Board Tenure	-0.000	0.069***	-0.005	-0.000	0.069***	-0.005	-0.016***	-0.100***	-0.095***	-0.016***	-0.100***	-0.095***
	(0.001)	(0.018)	(0.063)	(0.001)	(0.018)	(0.063)	(0.003)	(0.018)	(0.032)	(0.003)	(0.018)	(0.032)
Board Outside Affiliations	-0.013**	-0.488***	-1.294***	-0.013**	-0.488***	-1.295***	0.010**	0.345***	0.156	0.010**	0.345***	0.155
	(0.006)	(0.135)	(0.424)	(0.006)	(0.135)	(0.424)	(0.005)	(0.115)	(0.191)	(0.005)	(0.115)	(0.191)
Board Supervisory	0.027	0.698***	0.219	0.027	0.698***	0.221	0.010	-1.081***	0.421	0.010	-1.081***	0.416
	(0.020)	(0.059)	(0.349)	(0.020)	(0.059)	(0.349)	(0.021)	(0.075)	(0.485)	(0.021)	(0.075)	(0.485)
Certified Directors	0.018***	0.793***	0.922***	0.018***	0.793***	0.922***	-0.043***	-0.801***	-0.314***	-0.043***	-0.801***	-0.313***
	(0.003)	(0.091)	(0.193)	(0.003)	(0.091)	(0.193)	(0.009)	(0.086)	(0.121)	(0.009)	(0.086)	(0.121)
Board Financial Expertise	-0.013***	-0.817***	-1.381***	-0.013***	-0.817***	-1.380***	0.005	0.215**	-0.117	0.005	0.215**	-0.117
	(0.003)	(0.122)	(0.351)	(0.003)	(0.123)	(0.351)	(0.007)	(0.099)	(0.134)	(0.007)	(0.099)	(0.134)
Tobin's Q	-0.000	-0.014**	-0.009	-0.000	-0.014**	-0.009	0.001**	0.034***	0.014	0.001**	0.034***	0.013
	(0.000)	(0.007)	(0.020)	(0.000)	(0.007)	(0.020)	(0.000)	(0.006)	(0.010)	(0.000)	(0.006)	(0.010)
Total Assets (ln)	-0.000	-0.051***	0.025	-0.000	-0.051***	0.025	0.005***	0.211***	0.128***	0.005***	0.210***	0.128***
	(0.000)	(0.009)	(0.043)	(0.000)	(0.009)	(0.043)	(0.001)	(0.009)	(0.021)	(0.001)	(0.009)	(0.021)
Business Segments (ln)	-0.000	0.010	-0.001	-0.000	0.010	-0.001	-0.000	0.009	-0.009	-0.000	0.009	-0.009
	(0.000)	(0.015)	(0.038)	(0.000)	(0.015)	(0.038)	(0.000)	(0.014)	(0.020)	(0.000)	(0.014)	(0.020)
Geographic Segments (ln)	-0.000	0.041**	0.031	-0.000	0.041**	0.031	-0.001	-0.008	0.020	-0.001	-0.008	0.020
	(0.001)	(0.017)	(0.035)	(0.001)	(0.017)	(0.035)	(0.001)	(0.016)	(0.022)	(0.001)	(0.016)	(0.022)
Operating ROA	0.003**	-0.036	0.234	0.003**	-0.035	0.235	0.003	0.189***	0.177	0.003	0.189***	0.176
	(0.001)	(0.070)	(0.233)	(0.001)	(0.070)	(0.233)	(0.003)	(0.063)	(0.121)	(0.003)	(0.063)	(0.121)
Dummy: Loss	-0.000	0.028	0.011	-0.000	0.028	0.011	0.002**	0.039***	0.026	0.002**	0.039***	0.026
	(0.001)	(0.018)	(0.056)	(0.001)	(0.018)	(0.056)	(0.001)	(0.015)	(0.027)	(0.001)	(0.015)	(0.027)
Leverage	-0.000	0.007	0.008	-0.000	0.007	0.008	-0.006*	-0.053	-0.110	-0.006*	-0.053	-0.108
	(0.002)	(0.054)	(0.166)	(0.002)	(0.053)	(0.166)	(0.003)	(0.047)	(0.078)	(0.003)	(0.047)	(0.078)
CapX	0.003	0.019	0.298	0.003	0.020	0.298	0.010	-0.071	0.035	0.010	-0.071	0.030
	(0.002)	(0.141)	(0.426)	(0.002)	(0.141)	(0.426)	(0.009)	(0.116)	(0.238)	(0.009)	(0.116)	(0.238)
R&D	-0.000	-0.331**	-0.146	-0.000	-0.332**	-0.149	0.010	0.514***	0.488**	0.010	0.514***	0.489**
	(0.003)	(0.152)	(0.596)	(0.003)	(0.152)	(0.596)	(0.008)	(0.127)	(0.233)	(0.008)	(0.127)	(0.233)
Cash Holdings	0.001	-0.083	-0.002	0.001	-0.082	-0.000	-0.002*	-0.052	-0.151	-0.002*	-0.052	-0.152
	(0.002)	(0.057)	(0.185)	(0.002)	(0.057)	(0.185)	(0.001)	(0.052)	(0.094)	(0.001)	(0.052)	(0.094)
Ownership	0.000	0.268***	-0.043	0.000	0.267***	-0.043	-0.014***	-0.341***	-0.210***	-0.014***	-0.341***	-0.210***
	(0.001)	(0.040)	(0.106)	(0.001)	(0.040)	(0.106)	(0.003)	(0.036)	(0.060)	(0.003)	(0.036)	(0.060)
Gender Quota	0.012**	0.239***	0.118	0.012**	0.239***	0.118	0.057***	0.752***	0.497***	0.057***	0.752***	0.498***

(continued on next page)

Table 6 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	(0.005)	(0.049)	(0.081)	(0.005)	(0.049)	(0.081)	(0.007)	(0.066)	(0.071)	(0.007)	(0.066)	(0.071)
CG Code	-0.001	0.061***	0.032	-0.001	0.062***	0.032	0.005	0.154***	0.163***	0.005	0.154***	0.163***
	(0.002)	(0.022)	(0.057)	(0.002)	(0.022)	(0.057)	(0.004)	(0.021)	(0.032)	(0.004)	(0.021)	(0.032)
Guillen-Capron Reg. of CG (ln)	-0.004	0.067	-0.114	-0.004	0.068	-0.113	0.010	0.226	-0.031	0.010	0.226	-0.031
	(0.005)	(0.102)	(0.221)	(0.005)	(0.102)	(0.221)	(0.011)	(0.170)	(0.170)	(0.011)	(0.170)	(0.170)
GD Parliaments	0.054	2.266***	1.079	0.054	2.265***	1.083	0.126	0.221	2.617***	0.126	0.223	2.613***
	(0.035)	(0.244)	(0.804)	(0.035)	(0.244)	(0.804)	(0.083)	(0.329)	(0.714)	(0.083)	(0.330)	(0.714)
GD Labor Force	0.604**	5.065***	20.661***	0.604**	5.069***	20.655***	-0.515	8.355***	24.603***	-0.515	8.344***	24.587***
	(0.278)	(1.461)	(4.019)	(0.278)	(1.461)	(4.020)	(0.464)	(2.273)	(3.765)	(0.464)	(2.273)	(3.765)
GDP Per Capita	0.007	-0.171***	0.850***	0.007	-0.171***	0.852***	0.009	0.071*	0.126	0.009	0.071*	0.126
	(0.006)	(0.039)	(0.196)	(0.006)	(0.039)	(0.196)	(0.017)	(0.043)	(0.120)	(0.017)	(0.043)	(0.120)
constant	-0.331**	-3.310***		-0.331**	-3.313***		0.122	-9.188***		0.122	-9.185***	
	(0.126)	(0.699)		(0.126)	(0.699)		(0.224)	(1.013)		(0.224)	(1.013)	
Obs.	67594	67594	15917	67594	67594	15917	67594	67594	42489	67594	67594	42489
Firms	10181	10181	1902	10181	10181	1902	10181	10181	4948	10181	10181	4948
Adj. R-square	0.025			0.025			0.209			0.209		
Overall p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panel B												
Post CKO Treatment	-0.004***	-0.216***	-0.270***	-0.004***	-0.219***	-0.279***	-0.009***	-0.102***	-0.202***	-0.009***	-0.103***	-0.200***
	(0.001)	(0.030)	(0.066)	(0.001)	(0.029)	(0.067)	(0.002)	(0.026)	(0.037)	(0.002)	(0.026)	(0.037)
Post CKO Treatment x Female CEO				0.007**	0.082	0.221				-0.006***	0.018	-0.077
				(0.003)	(0.133)	(0.226)				(0.001)	(0.080)	(0.090)
Female CEO	-0.012***	-0.121	-0.414***	-0.016***	-0.147	-0.467***	-0.003*	0.107**	-0.075	-0.001	0.100	-0.033
	(0.004)	(0.084)	(0.131)	(0.004)	(0.102)	(0.143)	(0.002)	(0.053)	(0.061)	(0.003)	(0.064)	(0.078)
constant	-0.313**	-3.447***		-0.314**	-3.449***		0.159	-9.794***		0.160	-9.793***	
	(0.124)	(0.687)		(0.124)	(0.687)		(0.211)	(0.944)		(0.211)	(0.944)	
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	67594	67594	15917	67594	67594	15917	67594	67594	42489	67594	67594	42489
Firms	10181	10181	1902	10181	10181	1902	10181	10181	4948	10181	10181	4948
Adj. R-square	0.025			0.025			0.209			0.209		
Overall p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: We report the standard errors in parenthesis underneath the coefficients. Statistical significance is reported as follows: (Two-tailed) \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01; (One-tailed) § p < 0.1, §§ p < 0.05, §§§ p < 0.01.

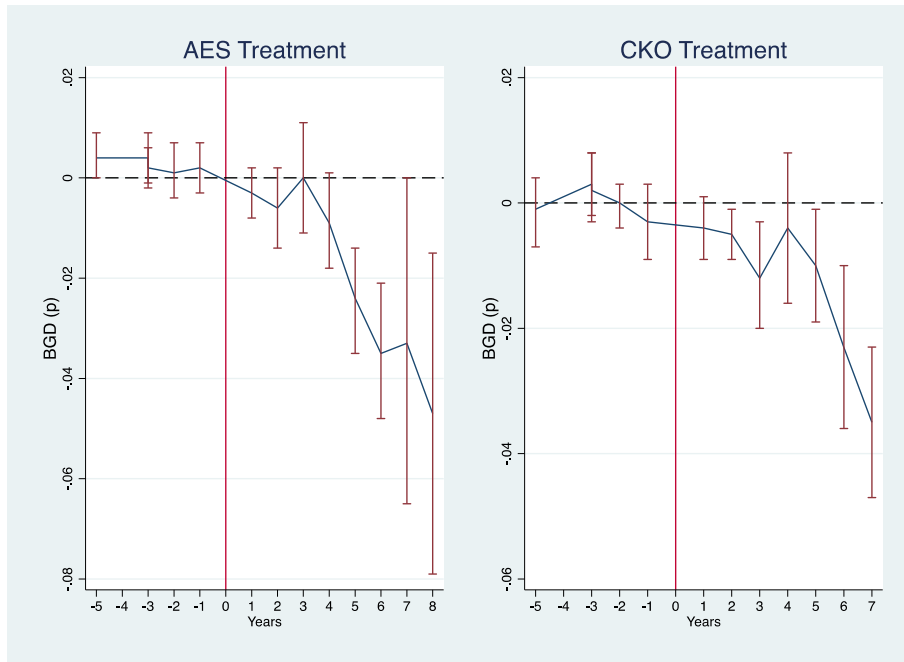


Fig. 1. Treatment effect on the proportion of board gender diversity.

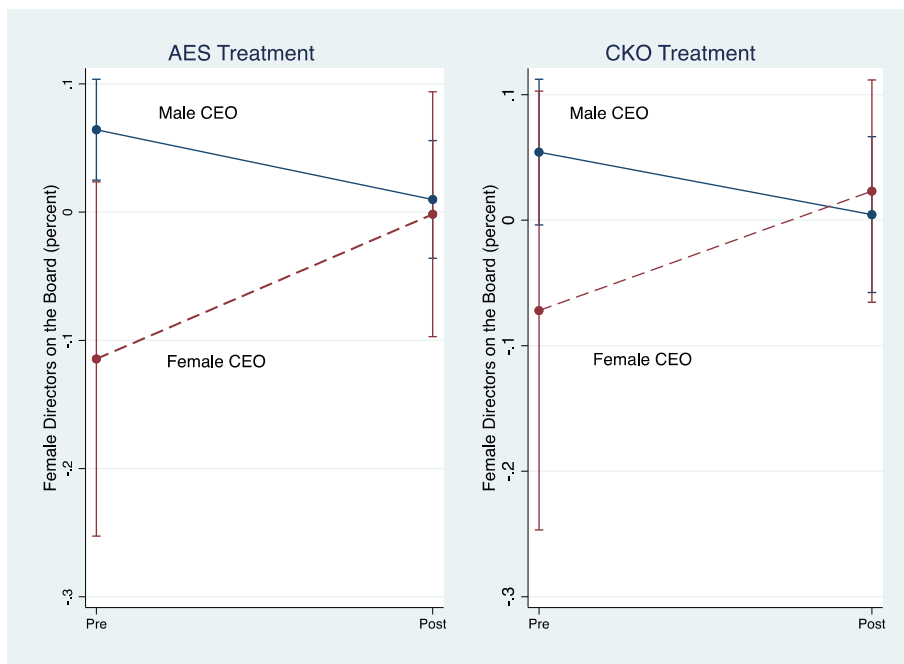


Fig. 2. Female CEO's moderating effect on the board gender diversity in the treatment sample pre- and post-treatment.

Our dependent variable,  $y$ , is one of the three proxies of board gender diversity described in the previous sub-section. We estimate the models at the firm level ( $i, t$ ) and director level ( $d, i, t$ ; only for robustness tests).

Here,  $i$  represents the firm,  $t$  represents the year, and  $d$  represents the director. *Post (AES or CKO) Treatment* is the staggered DID variable. It measures the average effect of the *treatment*, i.e., GFC, on the *treatment*

sample, i.e., crisis-affected countries, in the post-crisis period, compared to the control sample, i.e., unaffected countries, assuming the parallel trend assumption holds (Kahn-Lang & Lang, 2020; Borusyak, Jaravel, & Spiess, 2023). As discussed earlier, we include a vector of the firm- and country-level controls, which we lag by one year,<sup>13</sup> to ensure that other confounding effects do not drive our results.

When estimating the model, we use ordinary least square (OLS), Probit, or Poisson<sup>14</sup> estimators, depending on the nature of our chosen dependent variable (i.e., proportions, categorical, or count). We are interested in estimating the within-firm changes in the board gender diversity when the dependent variable is the proportion [*BGD* (*p*)] and the count [*BGD* (*c*)], respectively, after the treatment affects the firm. Therefore, we estimate a firm fixed-effect model (Shi, Connelly, & Cirik, 2018). We are interested in cross-firm differences when the dependent variable is categorical (*Dummy BGD*) before and after the treatment. Therefore, using Probit,<sup>15</sup> we estimate an industry fixed-effect model as a firm fixed-effect model will be too restrictive for this test. Since we observe the treatment (*AES* or *CKO*) at the country level, based on prior research (Bertrand, Duflo, & Mullainathan, 2004; Cameron & Miller, 2015; Abadie et al., 2023), we cluster the standard errors by country.<sup>16</sup>

To test Hypotheses 2 and 3, we modify model (1) by introducing an interaction of the *Post (AES or CKO) Treatment* with the female leadership (*Female CEO*) and institutional variables (*Gender Quota* and *CG Codes*). We lag both sets of moderators by one year. We retain the same set of lagged controls and estimators. In *Hypothesis 3*, we are interested in across-group effects. Therefore, we estimate an industry fixed-effect model. We continue to cluster the standard errors by country in all these models.

## Results

### Summary statistics

Table 2 reports the summary statistics for the complete sample. Approximately 9 percent of the board of directors are women, with non-executive female directors (7.1 percent) cornering about three-fourths of the female directorships. Only 52 percent of the firm-year observations in our sample have at least one female director. We found that female CEOs were the corporate leaders in 2.8 percent of firm-year observations.

<sup>13</sup> We find qualitatively similar results when we include higher-order lags (e.g., second or third lags) or multiple lags (e.g., first lag as well as third lag) of the explanatory variables.

<sup>14</sup> We estimated a negative binomial regression for the count model to decide on selecting the Poisson estimator for the count model. In this model, we do not find a significant mean-dispersion parameter alpha. Because of this, the model reduces to a Poisson distribution (Gardner, Mulvey, & Shaw, 1995). Therefore, we estimate a Poisson model. However, we found qualitatively similar results with firm fixed-effect negative binomial regression. We did not tabulate these results, but they are available on request.

<sup>15</sup> We have qualitatively similar results using a Logit estimator.

<sup>16</sup> Double-clustering of the standard errors is necessary when the residuals are correlated not only across the cross-sectional panel but also across the time (Thompson, 2011). In our case, it is a real possibility since we theorize that an exogenous event (i.e., GFC) has affected how firms structurally reconfigure the board in the affected countries. Double-clustering the standard errors by country-year and firm-year gives us qualitatively similar results (available on request).

### Main results

We report our main results in Table 3. In Panel A, we report the results using the *AES* treatment sample. While in Panel B, we report the results using the *CKO* treatment sample. In columns (1), (3), and (5), we report the main results without including any control variables. In both panels, *Post AES Treatment* and *Post CKO Treatment* are negative and statistically significant at a 1 percent confidence level, barring some exceptions which are significant with lower statistical confidence. We introduce all controls in columns (2), (4), and (6), respectively. In column (2), coefficients for *Post AES Treatment* and *Post CKO Treatment* are negative and statistically significant at a 1 percent confidence level (Panel A:  $\beta = -0.012$ ;  $p = 0.00$ ; Panel B:  $\beta = -0.012$ ;  $p = 0.00$ ). It suggests that, in the post-*AES* (*CKO*) period, the treatment firms reduced their proportion of female directors by about 14 percent<sup>17</sup> compared to the control sample.<sup>18</sup>

In column (4), the dependent variable is the categorical variable, *Dummy BGD*. The two-way industry<sup>19</sup> and year fixed-effect Probit coefficient estimates suggest that a statistically significant proportion of *AES* and *CKO* treatment firms completely removed female board representation during the post-period (Panel A:  $\beta = -0.177$ ;  $p = 0.00$ ; Panel B:  $\beta = -0.183$ ;  $p = 0.00$ ). A conservative estimate of the marginal effect suggests that over 5.1 percent of the *AES* and 4.7 percent of the *CKO* treatment firms removed female directors from their boards post-treatment. These results are qualitatively similar if we use the OLS estimator.

In column (6), we report the Poisson regression estimates (Hausman, Hall, & Griliches, 1984). In this nonlinear model, we use the count variable *BGD* (*c*), transformed into a natural logarithm, as the dependent variable.<sup>20</sup> Consistent with prior results, we find that *Post AES Treatment* and *Post CKO Treatment* load significantly negatively (Panel A:  $\beta = -0.129$ ;  $p = 0.00$ ; Panel B:  $\beta = -0.141$ ;  $p = 0.00$ ). The coefficient

<sup>17</sup> Following Fauver et al. (2017), we calculate that the magnitude of the decline in *BGD* (*p*) in Panel A and B is 13.9 percent. This results from the following calculation:  $0.012/0.086$ . Here 0.012 is the coefficient loading on *Post AES* and *CKO Treatment*, respectively, in column 2 of Panel A and Panel B in Table 3, and 0.086 is the sample mean of *BGD* (*p*) in Table 1.

<sup>18</sup> While estimating column (2) in Table 3, we cluster the standard errors at the country level as we believe the errors are most strongly correlated within that cluster (Cameron & Miller, 2015; Abadie et al., 2023). However, since there are only a limited number of countries (i.e., 21) with a large number of observations within those clusters, clustering the standard errors by country might not meet some of the conditions of the cluster-robust variance matrix. To safeguard against such a possibility, we estimate a “wild bootstrapped” model with 9,999 replications using the “bootest” command in Stata (Roodman, Nielsen, MacKinnon, & Webb, 2019). We document that wild bootstrapped t-values for the column (2) model from Table 3 is  $-4.12$  with a p-value of 0.035, and a 95 percent confidence range of the coefficient is  $[-0.021, -0.002]$ . Similar results for the *CKO* treatment in Panel B yield a t-value of  $-6.04$ , a p-value of 0.025, and a 95 percent confidence range of the coefficient:  $[-0.024, -0.005]$ . We also cluster the models at the firm level with qualitatively similar results. We do not tabulate these results separately. Finally, we estimate an out-of-sample model with an extended number of observations, as they were excluded because of missing control variables. In this test, we retain the full group effects but not the firm- and country-level control variables. We find that our main results hold even with this test. We report these tests in Appendix Table A17.

<sup>19</sup> When we estimated the categorical dependent variable model following a linear probability model (LPM) using the OLS estimator, wherein we employed firm and year fixed effects to ensure that our fixed effect selection did not drive our results, we found qualitatively similar results (*Post AES Treatment*  $\beta = -0.029$ ;  $p = 0.047$ ; *Post CKO Treatment*  $\beta = -0.033$ ;  $p = 0.001$ ). We do not tabulate these results.

<sup>20</sup> We transform the count data into the natural log to aid in interpreting and calculating the economic magnitude. We have qualitatively similar results using raw count data, which we have not tabulated but are available on request.

magnitudes suggest approximately a 12 percent decline in the count of female directors post-*AES Treatment* and a 13.2 percent decline post-*CKO Treatment*.<sup>21</sup> Again, these results are qualitatively similar using an OLS estimator.

**Parallel Trend Assumption.** Before concluding that the results support our *Hypothesis 1*, we must ensure that the parallel trend assumption (PTA) holds (Kahn-Lang & Lang, 2020; Borusyak, Jaravel, & Spiess, 2023). There are three ways in which the PTA can be violated. First, the treatment sample, i.e., the GFC-affected treatment countries (*AES* and *CKO*), might start with fewer female directors. Second, unobserved factors might drive the treatment firms to *preempt* the treatment's negative effect, also known as the *anticipation* effect (Wing, Simon, & Bello-Gomez, 2018). Third, omitted factors might drive the treatment effect and not our identification of the treatment as the GFC.

To examine and report on the PTA, we use the proportion of female directors on the board, i.e., *BGD (p)* (Fig. 1 and Panel C in Table 3). All PTA results hold when we use *Dummy BGD* and *BGD (c)* variables, which we do not tabulate in the interest of brevity. We begin our PTA tests by constructing Fig. 1. In this figure, we estimated a model with timing dummies across the staggered treatment switch year as the year zero, with five years before the treatment, and up to seven to eight years after the treatment, depending on the samples (i.e., *AES* or *CKO*). The treatment switch year is the omitted year. Fig. 1 shows an insignificant pre-treatment trend in *BGD (p)*. However, post-treatment, we document a significant decline in *BGD (p)*.<sup>22</sup> Therefore, we find visual support for the PTA.

In Panel C of Table 3, we report several formal tests supporting the PTA. We report the industry and year fixed-effect OLS estimates in columns (1) and (2) to address the first concern, as discussed earlier. The main explanatory variable in column (1) is *AES Treatment*, and in column (2) is *CKO Treatment*. The timeline for the test is 2000 to 2007, i.e., we stopped the tests before 2008, the year in which the adverse effects of the GFC became apparent to the global markets (Carey et al., 2012). Suppose the treatment samples have a strong negative perception of female directors during the pre-crisis period. The coefficient for *AES Treatment* and *CKO Treatment* will be significantly negative in their respective columns. Our results, however, show positive and insignificant results [column (1):  $\beta = 0.009$ ;  $p = 0.10$ ; column (2):  $\beta = 0.009$ ;  $p = 0.19$ ].

To assuage the second concern, we falsely assume that the GFC began in 2006 or 2007 for both sets of treatment samples. Using 2006 or 2007 is a decisive test of the anticipation effect. That is because prior research suggests that, while corporate insiders were found to be completely unaware of the impending GFC between 2006 and 2007, some market participants, such as financial analysts and, more importantly, institutional investors, did anticipate the crisis, with varying degrees of accuracy (Adebambo, Brockman, & Yan, 2015). Prior research has also documented that institutional investors keenly observe board configuration decisions, including board gender diversity (Dobbin & Jung, 2011). If the anticipation effect drove our main results, there was a stronger likelihood of declining gender diversity on board in 2007. We estimate a canonical  $2 \times 2$  DID model and report the results in columns (3)–(6). The timeline of these estimates remains 2000–07. In canonical

<sup>21</sup> We calculate the magnitude of the coefficient as follows:  $e^{-0.129} = 0.879 - 1 = -12.1$  percent. Similarly,  $e^{-0.141} = 0.868 - 1 = -13.2$  percent.

<sup>22</sup> We find similar results in support of the PTA using Borusyak et al.'s (2023) imputation estimator. Please see the Full Sample results in Appendix Figure B1.

treatment models, the treatment switch years are no longer staggered. The DID coefficient remains statistically insignificant throughout.<sup>23</sup>

The third concern is that our treatment sample is not identified using the treatment factor, i.e., the GFC. In other words, the treatment effect we document could be *falsely* predetermined based on omitted factors, not the GFC, as we theorize. We adopt a placebo test to ensure that our selection of the treatment factor is not a result of chance. In this test, we randomly assign country clusters to the treatment sample and select a post-crisis year at random. We report the result of this placebo test in column (7) of Panel C. The TWFE DID coefficient for the random treatment and post-period is positive and significant ( $\beta = 0.016$ ;  $p = 0.01$ ). Several random resampling into treatment and control groups generated qualitatively similar results, not the negative and significant results we documented in the rest of our study.

In conclusion, we document robust negative and economically significant evidence of a decline in board gender diversity post-GFC, which supports *Hypothesis 1*.

Next, we examine the two moderating contingencies. In Table 4, we examine the first contingency, i.e., the effect of female CEOs when faced with the GFC treatment. Similar to Table 3, we report the results using *AES* in Panel A and *CKO* in Panel B. We do not document that *Post AES Treatment x Female CEO* and *Post CKO Treatment x Female CEO* loads consistently statistically insignificantly to accept *Hypothesis 2*'s prediction that female CEOs will moderate the negative effect of the GFC on board gender diversity. However, *AES Treatment* and *CKO Treatment*'s direct effects remain significantly negative.<sup>24</sup>

We construct a margins graph using the *Dummy BGD* to investigate the mechanisms behind these moderating coefficients. Fig. 2 shows the female CEOs' marginal effect on board gender diversity post-GFC using *AES* and *CKO* as treatment. The figure suggests that the firms with female CEOs in the *AES Treatment* countries (*CKO Treatment*) during the pre-treatment period had 11.4 percent (7.2 percent) lower other female directors than the control sample. Post-treatment, female CEOs overcame that gap by increasing female directors' appointments. In other words, the firms with female CEOs in *AES Treatment* countries (*CKO Treatment*) increased other female directors' representation by 11.2 percent (9.5 percent) post-treatment. However, the moderating coefficient *Post AES* (and *CKO Treatment x Female CEO*) measures the gap between the proportion of firms with male CEO that removed female directors and the increase in female directorships by female CEOs post-treatment; the moderating coefficient is still small and statistically insignificant (in other specifications, the difference is large and negative; see Appendix Figure B4). It means that female CEOs' efforts in increasing other female directors' board appointment, while largely positive, it is not enough to overcome the negative effect of the GFC in a statistically meaningful way. These results remain qualitatively similar when we use other dependent variables, such as *BGD (p)* and *BGD (c)*.

<sup>23</sup> We find qualitatively similar results in tests with 2007 as the post-period if we increase the timeline to include 2008 and 2009. Besides, we continue to find support for the parallel trend assumption if we falsely assume that the GFC began in 2004 and 2005, respectively. We do not tabulate these results, but they are available on request.

<sup>24</sup> In this model, we treat the female CEO tenure within the firm as static since we operationalize the variable using a categorical variable. Nonetheless, we recognize that CEO tenure is time-varying. To ensure our modeling choice does not drive our results, we use the *Female CEO Tenure* variable, which takes the values of time in the role from BoardEx data, or zero, to find qualitatively similar results. We report these results in the Appendix Table A18.



Overall, we do not find enough support for Hypothesis 2.<sup>25</sup>

Finally, in Table 5, we formally test our third hypothesis: the effect of formal (*Gender Quota*) and informal (*CG Code*) institutions on gender diversity in boards following the GFC. In Panel A, we report the *AES* results, while in Panel B, we report the results using the *CKO* treatment. The moderating coefficients from both panels for both sets of moderators, i.e., gender quota (*Post AES Treatment x Gender Quota*) and CG code (*Post AES Treatment x CG Code*), are predominantly negative and statistically significant at conventional statistical confidence levels (1 percent to 10 percent statistical confidence levels). However, the failure to moderate the GFC's negative effects in both panels is statistically more robust for the CG code. In other words, we document that the countries with CG codes had statistically significantly fewer female directors post-GFC than those without such codes. For instance, using the *Dummy BGD*, we find that *Post AES Treatment (Post CKO Treatment)*, the firms without CG codes had 6.9 percent (7.6 percent) more female directors than those in a jurisdiction that recommended more gender diversity using a CG code.

In contrast, the results with gender quotas differ slightly in Panel A versus Panel B. In Panel A, similar to the results with CG codes, we document that countries with gender quotas have significantly fewer female directors' proportions (*BGD* ( $p$ );  $\beta = -0.056$ ;  $p = 0.09$ ) than those without such provisions. However, in Panel B, we see that in the post-GFC period, the *CKO Treatment* sample with gender quota had no different levels of female directors than the countries that did not have this regulatory provision. In other words, a coercive regulatory provision, instituted mostly through legislation, did not result in greater female directors' board representation in the post-treatment period in the treatment sample than the countries that lacked any such provision, facing the same crisis. Therefore, when taken together, these results suggest a complete rejection of Hypothesis 3.

#### Robustness tests

To ensure the robustness and validity of our main findings, we have performed an extensive battery of robustness and sensitivity tests, most of which are reported in the supplementary material attached to this paper (see Appendix A and Appendix B).

To ensure our results related to Hypothesis 1 are robust, in addition to standard robustness tests that we will discuss later, we have adopted a three-pronged approach that draws on several new advancements in econometric theory concerning TWFE DID, such as continuous DID (Acemoglu, Autor, & Lyle, 2004; Callaway, Goodman-Bacon, & Sant'Anna, 2021; Batalha et al., 2022), synthetic DID (Abadie & Gardeazabal, 2003; Arkhangelsky, Athey, Hirshberg, Imbens, & Wager, 2021) and Bacon decomposition (Goodman-Bacon, 2021). We report the summary statistics of the additional variables needed to conduct all our robustness tests in Appendix Table A3.

We model the continuous DID (Callaway et al., 2021) using the *GDP per Capita* (ln). We report the continuous DID results in Appendix Table A4. Synthetic DID models help to ensure that a lack of adequate control variables does not spuriously drive the main results (Abadie & Gardeazabal, 2003; Arkhangelsky et al., 2021). We report the synthetic DID results in Appendix Table A5, calculating the bootstrapped standard errors using 1000 replications.

Recent advances in econometric theory have suggested that the *staggered* adoption of treatment introduces bias in the DID coefficient (De Chaisemartin & d'Haultfoeuille, 2020; Callaway & Sant'Anna, 2021; Goodman-Bacon, 2021). We take several steps to ensure our results are robust: (1) we investigate the magnitude of this bias using two

<sup>25</sup> To assuage the risk that omitted variables spuriously drive our results, we match the firms with female CEOs to the ones without female CEOs on observed factors using the PSM technique. Our results remain unchanged, which we have reported in Appendix Table A16.

different specifications (Paternoster et al., 1998). Our treatment timings were staggered close to each other, i.e., between 2008 and 2010, with sufficiently long pre- (2000–07) and post-periods (2011–15). Thus, our estimate of the bias coefficient was insignificant (Goodman-Bacon, 2021). (2) Nonetheless, we estimate a Bacon decomposition of our staggered DID coefficients to substantiate these results further, which required a strongly balanced panel<sup>26</sup> (see Appendix Tables A6 and A7; Appendix Figure B2 and B3 for non-U.S. results). We continue to find robust support for Hypothesis 1 in all these tests. We summarize the results in Appendix Figure B1. We have provided a more in-depth discussion of these tests and findings in Appendix B.

We have performed several other robustness tests. We have re-estimated our TWFE DID results by interacting the industry dummies with the year dummies; used the change in the proportion of board gender diversity ( $\Delta BGD$ ) (Lev, Petrovits, & Radhakrishnan, 2010); bifurcated estimates of the financial<sup>27</sup> and non-financial sectors (Adams & Kirchmaier, 2016); employed the propensity score matching technique (Guo & Fraser, 2015); bootstrapped standard errors with 9,999 replications for the matched samples (Sant'Anna & Zhao, 2020; Callaway & Sant'Anna, 2021); and used hierarchical linear modeling (Hofmann, 1997; Stoker et al., 2019). We report all these results in Appendix Tables A8 and A9.

To ensure we control for director-level covariates, we have re-estimated our models using director-level data (547,322 observations). We control for the directors' experience, expertise, and demographics in these models using OLS (Appendix Table A10) and HLM estimators (untabulated). In addition to confirming our prior results using firm-level data, this test also reveals that junior non-CEO female executives with fungible expertise through their position as chief financial officer (CFO) roles were also removed from their positions post-GFC (Appendix Table A11). We have also used different treatments proposed by prior literature to identify the GFC (i.e., the treatment group), such as the *AES2* (Mukherjee & Bonestroo, 2021) or the *LV* (Laeven & Valencia, 2020). These results are presented in Appendix Table A12.

#### Additional analyses

We have performed additional *ex-post* analysis to provide context to our main results, which we discuss in this section.

*Executive Role.* The number of executive directors has been in a secular decline across many countries, including the U.S. (Zorn et al., 2017). The appointment of executive directors to boards is traditionally higher in countries that allow or mandate a dual board system (Denis & McConnell, 2003; Ferreira & Kirchmaier, 2013). Firms employ non-CEO junior executive directors as top executives to manage day-to-day operations and reduce agency risks (Acharya, Myers, & Rajan, 2011). Therefore, non-CEO junior executives are in greater demand post-GFC as they possess difficult-to-replicate non-fungible expertise in the firm and its operations (Mukherjee & Bonestroo, 2021).

Furthermore, research into the 'glass cliff' phenomenon suggests that some firms deliberately appoint a woman to a *precarious* top executive position in order for her to "take the fall" (Ryan & Haslam, 2005).

<sup>26</sup> We apply the Bacon decomposition method using Stata's "bacondecomp" command (Goodman-Bacon, Goldring, & Nichols, 2019). Results from the balanced panel are over 65 to 70 percent stronger than the base results we report in Table 3. Survivor firms are better performing (*Operating ROA* diff= 6 percent;  $p=0.00$ ), larger (*Total Assets* (ln) diff= 2.088;  $p=0.00$ ), and with greater oversight by independent directors (diff=1.7 percent;  $p=0.00$ ). Therefore, these survivor firms have far fewer economic reasons to reduce gender diversity on boards as they are better placed to absorb additional economic costs, if at all there.

<sup>27</sup> We document that the female directors in the financial services sector experienced negative representational pressure 12 to 30 percent stronger than the base results, depending on the treatment sample (i.e., *AES* or *CKO*; Appendix Table A4).

Therefore, it is likely that non-CEO junior female executive directors' roles in a firm could insulate them from the negative effects of the GFC. If anything, the glass cliff prediction would result in more female executives on the board. It would also imply that female directors' negative representational pressure is a function of their board role as non-executives and not primarily driven by gender.

To examine these possibilities, in Table 6, we disaggregate the dependent variable into female executive directors [columns (1)–(6)] or *ExBGD*. We also report on non-executive directors for comparability [columns (7)–(12)]. In columns (1)–(3) and (7)–(9), we document that executive and non-executive female directors' board representation faced significant setbacks post-GFC. In other words, having a non-CEO junior executive role on the board did not guarantee job security post-GFC for female executives.

The main interaction results from columns (4)–(6) and (10)–(12) (i.e., *Post AES Treatment x Female CEO* and *Post CKO Treatment x Female CEO*) suggest that female CEOs fully moderated the negative representational pressure experienced by female executive directors post-GFC (*ExBGD*), but not for the female non-executive directors (*NEBGD*). It suggests that post-GFC, non-CEO junior female executive directors' board positions were less at risk, and they received more representational support in a firm with female CEOs.

**Power and Access:** Here, we investigate why female CEOs have not been able to mitigate the reduction in board gender diversity and support greater representation following the GFC. We examine whether female CEOs were insufficiently effective *ex-post* the crisis due to a lack of power or perhaps access to the levers of board appointments. To capture the *power* aspect, we have focused on female CEOs with board chair positions (see Appendix Table A13). To measure *access*, we have examined female directors' appointments to the nomination committees (see Appendix Table A14). Regardless of the channel, we continue to find that female leaders with power and access could not or did not fully moderate the decline in gender diversity on board post-GFC.

**Financial Performance Concerns:** Financial performance concern (*Post & Byron, 2015*) is relevant in our context as research has documented that diversity benefits are disputed when hard decisions need to be made (*Triana, Miller, & Trzebiatowski, 2014*). Despite using various specifications described in the supplemental material, we do not find evidence that the decline in gender diversity on boards is related to financial performance concerns (see Appendix Table A15).

## Discussion and conclusions

The GFC was one of the major macroeconomic shocks of the twenty-first century. In this study, we have argued that the GFC-type crisis will reduce gender diversity on boards for various reasons. Specifically, when facing GFC, firms would be forced to prioritize their saliency and legitimacy needs differently than in 'normal' (non-crisis) times (*Bundy et al., 2013; DiMaggio & Powell, 1983*). In turn, this will shift corporate focus from softer issues such as gender diversity on boards to navigating the crisis as robustly as possible (*Smart & Vertinsky, 1977*). Since many board appointments remain tokenistic, with a lower status for women (*Bilimoria, 2006; Weck et al., 2022*), a GFC-type crisis will have the potential to exacerbate in-group biases within boards (*Bertrand & Mullainathan, 2004*), further delegitimizing and adversely affecting women's positions (*Suchman, 1995*). Female directors who are appointed, mostly as 'solo' actors on boards (*Inzlicht & Ben-Zeev, 2003*) will face greater performance pressure (*Gupta et al., 2020*) and a disproportionate share of any 'blame' (*Park & Westphal, 2013*). Finally, given ongoing academic and policy debates around gender in top management teams, we also investigate the role female CEOs, and institutional provisions (of formal and informal nature) can play in protecting gender diversity, especially during such turbulent times.

Using a TWFE DID research design on a large, international, and longitudinal sample (67,594 firm-year using 547,322 director-firm-year observations from 10,181 unique firms in 21 countries between 2000

and 2015) we document a robust decline in gender diversity on boards post-GFC, irrespective of their board positions, expertise, industry, and firm performance concerns. Non-executive and junior female executive directors have also faced removal from boards, including executives with specialized appointments, such as female CFOs.

Our core finding links a major crisis (i.e., the GFC) to reductions in board gender diversity and advances several streams of literature. Specifically, the body of work examining gender issues in the context of top management teams and boards has proposed various individual and organizational explanations for female appointments. They include access to vital resources (*Hillman, Nicholson, & Shropshire, 2008*), skills (*Kim & Starks, 2016*), experience (*Hillman et al., 2002*), and superior corporate values that benefit the stakeholders (*Cumming et al., 2015*). In 'normal' (non-crisis) times, such a plethora of reasons provides sufficient legitimacy to meet the expectations of both internal and external stakeholders (*Terjesen & Sealy, 2016*). We bring two nuanced contributions to this area: first, by explicating how a major crisis such as the GFC could alter the saliency of such institutional pressures (*Bundy et al., 2013*) by being overtaken by economic and efficiency rationales (*Smart & Vertinsky, 1977*) needed to survive and thrive in a VUCA environment that follows such major exogenous shocks (*Bennett & Lemoine, 2014*). Second, by bringing macro- (country-level or global-level) determinants of organizational diversity to the forefront, and thus complementing existing micro- and mezzo-explanations (*McDonald & Westphal, 2013; Westphal & Stern, 2007*) and contributing to the recent conversations on the efficiency of private versus public policies in spurring diversity (*Gormley et al., 2023*).

In addition to documenting GFC's direct and negative *causal* effect on board gender diversity, we proposed two potential moderators. The first is female CEOs under the assumption in the prior literature that "diversity begets diversity" (*Cook & Glass, 2015*). In other words, female CEOs will be more likely, willing, and able to sustain a gender agenda even in times of crisis. The second proposed moderator is institutional quality in terms of gender diversity through its formal (i.e., gender quotas) and informal (i.e., CG codes) elements as potential mitigators for the detrimental effects of the GFC on the board gender balance. Since boards are one of the most prominent organizational features (*Harris & Raviv, 2008*), firms are more likely to comply with institutional expectations across countries, both in formal and informal terms (*Terjesen et al., 2015*), particularly when there is a complex cost structure in place for non-compliance that extends well beyond simple fines (*Ahern & Dittmar, 2012*).

Interestingly, our empirical results fail to support any meaningful mitigation of the dwindling gender diversity in boards post-GFC, both when it comes to female CEOs and gender-related institutional mechanisms. To ensure the robustness of these conclusions, we performed some additional tests with similar results.<sup>28</sup> These results provide interesting insights for several research streams. First, female leadership suggests some movement toward equality for women, who face considerable challenges climbing the corporate ladder (*Oakley, 2000*). The expectation that this would automatically foster further diversity had theoretical limitations (*Duguid, 2011; Derks et al., 2016*). Our study documents the benefits of female leadership in fostering more diversity in 'normal' times while uncovering some boundary conditions for their impact in VUCA contexts. This aligns well with prior findings on the

<sup>28</sup> The first was female CEOs with a dual role as board chair as a measure of powerful female leaders (*Krause et al., 2014*). The second was female directors' presence on the nomination committee to measure how much access female leaders have to corporate mechanisms that manage leadership appointments (*Ruigrok et al., 2006*). In the second part of the moderating analysis, we used the informal CG codes and the formal gender quotas to measure institutional mechanisms. Regardless of how regulations are measured, the results remained the same: i.e., firms exposed to regulations continued to remove female directors post-GFC.

usefulness of female leaders in mentoring (Arvate et al., 2018), a decisive prerequisite of career progression in leadership positions (McDonald & Westphal, 2013). We document that non-CEO junior female executive directors' positions on a board, including female CFOs, were less at risk in a firm with female CEOs at the helm post-GFC. These results substantiate the value of female CEOs' focus on diversity within a firm and expose some limitations when the organization faces unprecedented shocks or crises.

Regarding the institutional landscape concerning gender diversity: many legislators worldwide have paid substantial attention to the cause of board gender diversity (Ahern & Dittmar, 2012; Terjesen et al., 2015; Gormley et al., 2023). While this has signaled changed norms (Terjesen & Sealy, 2016) and improved gender diversity on boards in some countries (de Cabo et al., 2022), it has inconsistent enforcement, and national idiosyncrasies may yield weak results, as found by our study. This underperformance becomes particularly blunt when organizations face a major crisis that shifts their priorities and legitimacy pressures. As such, gender quotas are far from being the 'silver bullet' designed to tackle the underrepresentation of women on the boards of firms despite their theoretical appeal (Terjesen & Sealy, 2016). Consensus and legitimacy building about the merits of female directors on boards remains arduous for individuals and firms alike.

### Practical implications

Besides theoretical and academic implications, our study is particularly relevant for managers and policymakers worldwide. Specifically, our results show that women face considerable representational downside in the period that follows a major crisis. These findings have immediate implications now, as societies around the world return to a 'new normal' following the COVID-19 pandemic (Krammer, 2022), with firms developing resilience (Gomez et al., 2024) and adapting their production, operation, work practices, and business models to these new realities (Bennett & Lemoine, 2014; Alon et al., 2020). Our results are, therefore, illustrative of the severity of organizational and economic pressures that female workers are likely to face globally, irrespective of their positions in the firm (Karamessini & Rubery, 2014).

In addition, while highlighting the limitations of female CEOs in promoting gender parity within firms post-GFC (Cook & Glass, 2015), our study also highlights their positive contributions to it as mentors. While both men and women in a position of power are responsible for facilitating an equitable work environment and mentoring subordinate executives (McDonald & Westphal, 2013), the role female CEOs play will likely become more scrutinized in the future (Corwin et al., 2022). Active female leadership will foster the next generation of female workers, who might have a better chance of equal organizational representation while contributing toward corporate social justice in the long run.

Lastly, our results reveal some limitations of institutional prescriptions (i.e., gender quotas or CG codes) in the wake of major exogenous shock, like the GFC. Legislators and regulators in some countries have dealt with biases that minorities, especially women, face in the workplace through anti-discrimination laws protecting their positions and status within firms. A key example is the Equality Act 2010 in the U.K. Similar initiatives in the U.S. have faced resistance, such as the Equal Rights Amendment (MacKinnon, 2014). Yet, recent evidence suggests that even formal institutional regulations can be ineffective (Gormley et al., 2023) and are further diminished when a crisis/shock occurs. As such, more research is needed on how to best tackle gender representations via robust and uniform measures that will withstand the uncertainty and pressures of future major shocks.

### Limitations and future research

This study is not without its limitations. We have utilized the exogenous shock of the GFC to examine its adverse effect on gender diversity

on boards. Unlike regulatory change, where the identification of the treatment sample is clear and unambiguous (Ahern & Dittmar, 2012; Fauver et al., 2017), identifying treatment countries that experienced the GFC contains some variations, which fosters ambiguity. We have used several identification strategies to overcome this limiting ambiguity and ensure robust results. Nonetheless, as revealed by the Bacon decomposition results (Goodman-Bacon, 2021), which we reported in the supporting material, some treatment countries might not have the same negative effect on board gender diversity as a group (i.e., countries) or to the extent we have documented in the main effects. Indeed, sub-sample analysis using the Bacon decomposition has revealed through the exclusion of the U.S. as part of the treatment sample that while we continue to find a negative effect, they were not statistically significant. It implies that a large weight of the GFC's negative effects we have documented on the board gender diversity has emerged from the U.S. firms (these results are available in the appendices). This is understandable as the U.S. is where the GFC originated, and alongside, it lacked safeguards for females in the top echelons, such as a gender quota or even a CG code that recommends higher board gender diversity until 2013, which were themselves not very helpful in mitigating the negative effect of the GFC, as revealed by this study.

Furthermore, there are other types of exogenous shocks such as environmental disasters (i.e., Gulf of Mexico oil spill), terrorism (i.e., 9/11 New York, 26/11 Mumbai; Paris attacks, etc.), political upheaval (i.e., Brexit), war (i.e., Ukraine), or pandemics (i.e., COVID-19). How these idiosyncratic shocks affect softer organizational issues, such as board gender diversity, could reveal important and interesting insights, which might vary from the predictions and evidence from this study because of how market participants interpret such major crises. Additionally, while our research design incorporated a good selection of countries, some were left out owing to data availability, particularly for the board composition variables. Thus, future studies benefiting from an even broader international coverage can both validate our findings and expand our theoretical conjectures. Penultimately, we have attempted to control for organizational and macro factors. Nevertheless, like all empirical studies, we cannot factor in all social, emotional, and cognitive factors salient to our research. Finally, we have employed the TWFE DID model, whose interpretations could be clouded by pre-existing and sometimes latent parallel trends or based on our selection of clustering of standard errors when estimating the model. While we have addressed these practical issues to the extent possible with conventional empirical tools, all our results should be interpreted cautiously.

### Concluding remarks

This study addresses a vital issue for organizational and leadership scholars: the evolution of gender diversity in boards following a major crisis, i.e., the GFC. We do this by building on gender role and institutional theories to propose that GFC will diminish both the saliency and legitimacy of diversity in boards. In addition to documenting the reduction in gender diversity on boards post-GFC, we theoretically and empirically examine the role of female CEOs and informal and formal institutional regulations in moderating the effect of the crisis on board gender diversity. Our results provide new insights into the limitations of female CEOs and institutional mechanisms in safeguarding gender diversity post-GFC but open new avenues for research on the potential of mentorship roles played by female leaders, the contingencies of female CEOs vis-à-vis promoting diversity, as well as the efficiency of our institutional levers in tackling these issues.

### CRedit authorship contribution statement

**Shibashish Mukherjee:** Writing – original draft, Conceptualization, Data curation, Formal analysis, Methodology, Resources. **Sorin M.S. Krammer:** Writing – review & editing, Conceptualization, Methodology, Supervision.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.leaqua.2024.101784>.

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