Does corporate social responsibility mediate the relationship between board diversity and financial distress: evidence from an emerging economy?

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Abstract

Purpose – *The study hypothesized that the impact of board diversity on financial distress (FD) is not direct but rather mediated by the firm's corporate social responsibility (CSR) activities. Consequently, the purpose of this study is to examine the impact of CSR as a mediator in the board diversity–FD relationship.*

Design/methodology/approach – *The study examined six board diversity dimensions – age, gender, nationality, education and tenure in 81 nonfinancial Pakistan Stock Exchange (PSX)-listed firms from 2010 to 2021. The CSR engagement of the sample firms is evaluated using a multidimensional financial approach and the likelihood of FD is computed using Altman's Z-score. The system-generalized method of moments estimator is used to meet the study objectives. In addition, several tests are run to determine the robustness of the study's findings.*

Findings – *Based on the procedure for mediation analysis outlined by Baron and Kenny (1986), the authors found that CSR is significantly inversely associated with the likelihood of FD. Second, board diversity variables age, gender and national diversity were positively associated with CSR. Third, board age, gender and national diversity are significantly inversely related to FD. Finally, it was found that there is partial mediation between board age diversity and FD, whereas full mediation is shown between board age diversity and FD and between board nationality diversity and FD.*

Practical implications – *This study provides practical insights into PSX's board diversity for companies, regulators and policymakers.*

Originality/value – *This research studies the connection between board diversity and FD. In addition, the current study extended the analysis by testing for the first time the mediating role of CSR in the diversity–distress relationship, particularly in the context of an emerging economy.*

Keywords *Board diversity, CSR, Financial distress, Emerging market*

Paper type *Research paper*

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1. Introduction

Following the global financial crisis of 2008 and the financial scandals of reputed companies around the world, i.e. Enron, World COM, Lehman Brothers and American Investment Group, predicting the financial distress (FD) of businesses continues to be a significant area of concern for all company stakeholders, including business owners, managers, creditors and investors. FD occurs when a company fails to honor its debt obligations when they become due. When a company's performance declines to the point where its financial commitments to preferred stockholders and other stakeholders can no longer be met, it is said to be in FD (Habib *et al.*, 2020). FD has both direct and indirect consequences for firms. The direct costs of FD, according to Lubben (2000), are negligible

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and range from 1% to 5% of the firm value; however, indirect costs are substantial. According to Altman (1984), the indirect FD costs range from 11% to 17% of firm value. Given the disastrous effects of FD, businesses must give top priority to creating strategies to lower the likelihood of FD. Creating strategies to lessen the possibility of being victimized as a distressed firm is crucial for the company.

According to the earlier literature, governance features such as the structure and characteristics of the board of directors contain some crucial information that could explain FD (Chen *et al.*, 2020; Younas *et al.*, 2021). Xu *et al.* (2022) argued that a corporate governance (CG) mechanism aligns managers' interests with those of stakeholders, reducing the agency problem (Jensen and Meckling, 1976) and thus saving the firm from FD. Similarly, Aksoy and Yilmaz (2023) stated that corporate governance and board characteristics have a significant influence on a company's financial stability by assisting in decision-making processes and enacting appropriate policies. Diversity has been shown to boost board member effectiveness (Ali *et al.*, 2021) and, thus, firm success (Molla *et al.*, 2021; Foster *et al.*, 2023). Several studies have shown that board features like board size, independence and ownership level have an impact on the FD (Farooq *et al.*, 2020; Ali and Nasir, 2018; Manzaneque *et al.*, 2016; Ali *et al.*, 2021; Farooq and Noor, 2021). Recently, board members' diversity has received considerable attention in corporate governance (Ali *et al.*, 2021; Khan *et al.*, 2023). Board diversity refers to board members' differences in age, gender, nationality, experience, knowledge, skills, preferences, etc. (Van Knippenberg *et al.*, 2004). A more diverse board, according to Katmon *et al.* (2019), would contribute a greater range of resources, skills and viewpoints that would improve business performance and indirectly save the firm from FD. Firms with a more diverse board of directors have greater access to resources, which helps to reduce external dependency, reduce uncertainty and improve reputation, all of which leads to increased firm value and saves the firm from FD. In recent governance literature, researchers and practitioners have paid close attention to boardroom diversity (Hoang *et al.*, 2018). According to the literature, increasing board diversity may improve board performance and, consequently, overall corporate performance (Carter *et al.*, 2003). However, a homogeneous board is more likely to have members who share similar viewpoints and who have strong bonds with one another (Li and He, 2023). According to Miller and Triana (2009), this increased conformity pressure ultimately reduces the quality and variety of crucial decisions.

For more than three decades, corporate social responsibility (CSR) has captivated the attention of both academia and business (Zaman *et al.*, 2022). CSR is a key corporate activity that incorporates environmental and social concerns into business strategies (Harjoto and Jo, 2011). Despite widespread recognition that CSR is important for business performance, the fundamental rationale for how CSR operates remains a mystery (Ye *et al.*, 2021). According to Xu *et al.* (2022), CSR is an addition of corporate governance that works as an external mechanism that takes into account the concerns of broader stakeholders, thereby meeting the firm's fundamental goal, i.e. maximum firm performance (Harjoto and Jo, 2011). Okafor *et al.* (2021), on the other hand, argue that corporate governance is the mechanism that effectively executes CSR. In the same way, Harjoto and Jo (2011) argues that an effective corporate governance mechanism signals a firm's CSR engagement to a broad range of stakeholders, enhancing the firm's reputation and maximizing firm performance. Based on the above arguments, we argue that board diversity, an important corporate governance mechanism, cannot directly save a company from FD if it is not related to organizational-level activities like CSR. The accounting literature also suggests that board diversity is likely to reduce the possibility of FD through participation in other community-related activities (Galbreath, 2016). As a result, this study proposes that CSR could be a missing link between board diversity at the individual level and FD at the organizational level. Furthermore, in the context of both developing and developed economies, testing the mediating impact of CSR in this diversity–distress relationship is an unexplored area in the existing literature. Only a few studies in the literature have examined the impact of board gender diversity (one aspect of board diversity) on firm performance, with CSR acting as a moderator (Galbreath, 2018; Boukattaya *et al*., 2022; E-Vahdati *et al*., 2018). To the best of our knowledge, no study has examined CSR as a mediating role in the diversity–distress relationship. To fill this void, this study conducts a preliminary investigation into the association between board diversity and FD, as well as the mediating effect of CSR between the two.

The general objective of this study is to examine the possible linkage between board diversity and FD and to illustrate the role of CSR as a mediator in this diversity–FD relationship. For this purpose, we analyzed the data of 81 nonfinancial Pakistan Stock Exchange (PSX)-listed firms for the period of 12 years from 2010 to 2021 (972 firm-year observations) using the dynamic panel data technique of generalized method of moments (GMM). Following the research of Farooq *et al.* (2020), we calculate the level of FD of sample firms using the Altman's *Z*-score. The greater the value of the *Z*-score, the lower will be the chances of FD of the respective firm. Board diversity characteristics include board gender diversity, age diversity, nationality diversity, educational level diversity and experience diversity, whereas a multidimensional financial approach is used to measure the extent to which sample firms engage in socially related activities. To determine whether CSR acts as a mediator between board diversity and FD, we followed the process described by Baron and Kenny (1986). According to the GMM regression results, CSR and FD have a significant inverse relationship. Second, it was found that board age, gender and national diversity have a significant positive impact on a firm's level of CSR investment. At the third stage of the analysis, we looked into the impact of board diversity variables on FD and discovered that board age, gender and nationality diversity have a significant inverse association with FD. Finally, at the fourth step of the analysis, it was found that there is a partial mediation between board age diversity and FD, whereas full mediation is shown between board gender diversity and FD and between board nationality diversity and FD.

This paper contains numerous contributions. First, few studies have been conducted to examine the association between board diversity and FD, as existing studies focused on board diversity and its relationship with firm competencies, CSR reporting, financial information reporting and financial performance (Lone *et al*., 2016; Khan *et al*., 2019; Khan *et al,* 2023). Limited attention has been given to the study of the impact of board diversity and FD and no study has been conducted on how board diversity affects FD. Furthermore, the failure of Taj Company, Sarah Textile, Engro Group and the National Bank of Pakistan demonstrates Pakistani enterprises' poor governance. To increase financial performance and save from FD, an effective governance framework is essential. Second, the majority of the studies that have been conducted focus only on gender or age diversity (. Lee and Thong, 2023; Guizani and Abdalkrim, 2023; Muien *et al*., 2023; Kristanti *et al*., 2016; Manzaneque *et al*., 2016; Mittal and Lavina, 2018; Zhou, 2019), leaving out other aspects of board diversity. Khatib *et al.* (2021), in a comprehensive literature review, emphasized the need to investigate board diversity traits rather than focusing on one component of board diversity, namely, board gender diversity. It is challenging to generalize the findings of these studies without taking into account additional board diversity factors (Rhode and Packel, 2014). Ararat *et al.* (2015) discovered that individual board diversity attributes had no conclusive effect on the results of the company, in contrast to the diversity index of the board, which has a positive association with firm value. This study attempts to close this gap by taking into account various facets of board diversity. This study focuses on six different aspects of board diversity most relevant to FD, namely, gender, age, nationality, experience, education and tenure, and investigate how they affect FD. Third, most studies have used FD measures (. Altman, 1968; Berger *et al*., 1996) designed for developed markets. However, such studies are inconclusive and cannot be applied to an emerging economy like Pakistan due to large differences in financial, accounting and economic systems (as cited in Altman *et al*., 2007; Zhang *et al*., 2013). Third, empirical research has found a link between board diversity and the risk of FD (Ali *et al*., 2022; Yousaf *et al*., 2021;

Kristanti *et al.*, 2016; Manzaneque *et al.*, 2016). Although researchers suggested that mediating variables be investigated to determine how board diversity improves firm performance (Harjoto *et al.*, 2019; Miller and Triana, 2009). This study bridges that gap by using CSR as a mediator to explain how board diversity affects the likelihood of FD in Pakistan.

The findings will be useful to policymakers in Pakistan and other developing Asian countries in developing regulatory frameworks for board diversity. When establishing a board diversity framework in Pakistan, policymakers should prioritize age, gender and nationality diversity. This study emphasizes the importance of applying board diversity to engage the firm in CSR to save the firm from FD in the long run. The study provides valuable insights for investors on how to increase investment efficiency and avoid over- or underinvestment by demonstrating that CSR has a mediating effect on the diversity–distress relationship.

The remainder of the paper is organized as follows: Section 2 discusses the literature review and hypothesis development. The research methodology is discussed in Section 3 and the results and discussion are presented in Section 4. Finally, Section 5 presents the study's conclusion.

2. Literature review and hypothesis development

The influence of board diversity on FD is explained by two authoritative views, namely, the agency-based view and the resource-based view (Yousaf *et al.*, 2021). According to the agency hypothesis (Jensen and Meckling, 1976), agency problems caused by the separation of owners and managers may result in enterprises being handled inefficiently, increasing the likelihood of FD. The board, on the other hand, is an important governance tool that can help owners and managers align their goals, resolve problems with creditors and provide management with counsel on various business decisions (Platt and Platt, 2012). According to the agency, a diverse board includes directors with diverse backgrounds and distinct viewpoints (Benkraiem *et al.*, 2017), which improves managerial supervision (Carter *et al.*, 2003; UlAin *et al.*, 2020). UlAin *et al.* (2020) contend that board gender diversity, one facet of board diversity, can be used to control agency problems. According to Loukil *et al.* (2019), board diversity provides more significant monitoring benefits to shareholders, minimizes information asymmetry (Usman *et al.*, 2019), ensures regulatory compliance (Aksoy and Yilmaz, 2023) and results in lower agency costs.

According to the resource-based view (Pfeffer and Salancik, 1978), diverse boards are better suited to conduct advisory functions because diverse members provide high-quality resources in the form of skills, expertise, information and outside connections (Loukil *et al.*, 2019). A more diverse board can aid with the selection of financial resources (Pfeffer and Salancik, 1978), improve financial information reliability (Aksoy and Yilmaz, 2023), manage external dependencies and boost financial institution credibility (Hillman *et al.*, 2007). Accordingly, based on the agency-based view and resource-based view, it is claimed that a more diverse board has stronger monitoring and advisory capacities, which in turn increases financial performance and lessens FD (Yousaf *et al.*, 2021).

2.1 Age diversity

The age diversity of the board of directors is a representation of the age distribution of the board members. Age is a reliable indicator of a person's level of experience as well as their capacity for taking risks (Herrmann and Datta, 2005). It exemplifies a generation gap that differs in terms of personal values held. The different ages are expected to embrace and value every different experience, cultural norm, habit and personal trait that can affect decision-making (Agustia *et al.*, 2022). According to Talavera *et al.* (2018), increasing board experience, resources, knowledge and network could increase profitability or financial performance. Age comprises two critical characteristics: productivity and experience. Young directors are more productive, adaptable and open to new technologies and ideas. They are also more likely than older directors to take on high risks and focus on environmental and ethical issues. Older directors, on the other hand, have a wealth of experience (Handajani *et al.*, 2014), extensive networks for resource acquisition (Mishra and Jhunjhunwala, 2013) and are more likely to prioritize social welfare (Hafsi and Turgut, 2013). Age diversity among directors means that they are productive and have a lot of experience. This reduces agency problems by effectively monitoring and aligning the short- and long-term interests of shareholders and other stakeholders, which saves the company from FD. According to Platt and Platt (2012), the likelihood of bankruptcy decreases as board members' ages rise. As shown by Fernández-Temprano and Tejerina-Gaite (2020), Ali *et al.* (2014) and Goergen *et al.* (2015), greater age diversity among board members improves financial performance, whereas Khan *et al.* (2023) revealed a negative impact of age diversity on financial performance in Pakistan. Based on the above discussion, we argued that:

H1. Board age diversity is negatively associated with the risk of financial distress.

2.2 Gender diversity

Gender diversity is critical to increasing the effectiveness of a board by involving managers' commitments to social and environmental concerns, overall monitoring and bringing diverse views, ideas, skills and perspectives to the boardroom (McGuinness *et al.*, 2017; Loukil *et al.*, 2019; Guizani and Abdalkrim, 2023). Female directors can deepen and broaden conversations to improve the quality of decisions (Hsu *et al.*, 2019; Garcia and Herrero, 2021). This is so that women's perspectives, experiences and working methods can be distinct from those of male directors (Giannarakis, 2014). Women are less likely than men to be supportive of cheating, according to Whitley *et al.* (1999). Doty *et al.* (2005) also note that men consistently report being more willing to act unethically than women. Kennedy and Kray (2014) also noted that, in contrast to men, women are not prepared to compromise moral principles (such as honesty and loyalty) at the workplace in exchange for financial gain and societal status. Because they do not use the same unethical tactics as men, women negotiate with less success than men, claim Kennedy *et al.* (2017). In several contexts, including civic, military, education, sports and the workplace, women behave in a significantly more morally engaged manner than men (Moore *et al.*, 2012).

A board with female directors is more likely to have an impact on how much a company engages in CSR, according to Jain and Jamali (2016). There are many psychological traits that women on boards may have that make them more attentive to stakeholder interests (Wood and Eagly, 2009). Women tend to arrive on boards of directors with different backgrounds and experiences than men do, which may result in a different orientation toward the various stakeholders in the organization. In addition, having women on boards of directors has been shown to improve financial performance (Khan and Subhan, 2019; Dedunu and Anuradha, 2020; Abbas and Frihatni, 2023; Loukil *et al.*, 2019; Brahma *et al.*, 2021; Gyapong *et al.*, 2021; Dettori and Floris, 2022). In addition, female board members contribute to better governance through higher attendance and monitoring rates than their male counterparts (Terjesen *et al.*, 2009). The enhanced governance will result in improved financial performance for the company, thereby preventing the firm from FD (Zhou, 2019; Kristanti *et al.*, 2016; Mittal and Lavina, 2018). However, Saima and Arefin (2022) fail to find any impact of board gender diversity on FD in Bangladeshi firms. Based on the discussion, we argued that:

H2. Board gender diversity is negatively associated with the risk of financial distress.

2.3 National diversity

The board of directors' national diversity demonstrates the presence of foreign directors on the board. To have a competitive advantage in international markets, organizations must have a board of directors with a diversified nationality (Katmon *et al.*, 2019). The resource-view perspective recognizes foreign directors as the organization's most significant resource (Kaczmarek, 2009). Directors from various nations provide the company with a competitive advantage that can be used to expand its global network. Foreign board members contribute unique ideas and perspectives to the decision-making process due to their diverse cultural backgrounds, languages, life experiences and involvement (Ferrero-Ferrero *et al.*, 2015). Foreign board membership has several advantages, according to Fidanoski *et al.* (2014). The first aspect is the accessibility of directors with significant business expertise. Second, owing to their varied backgrounds, foreign members can contribute valuable and diverse skills that domestic members lack. Third, having foreign board members can help persuade foreign minority investors that the business is being run competently and with their interests in mind. According to Ruigrok *et al.* (2007), foreign directors are more likely to be independent, which, according to the agency theory, translates to better monitoring and, presumably, a lower risk of FD. Fuente *et al.* (2017) claim that having a foreign director on the board of directors can broaden viewpoints and ideas. This is because decision-making can be enhanced by factors such as global markets, diverse professional backgrounds, religions, languages, life experiences, knowledge and cultures. As a result, boards with international directors may experience improved financial performance as a result of their international experience (Sarhan *et al.*, 2019; Ararat *et al,* 2015; Estelyi and Nisar, 2016; Khan *et al.*, 2023). Conversely, Masulis *et al.* (2012) discovered an inverse association between board national diversity and financial performance and contend that this is because foreign directors are expensive and ineffective monitors. After all, they lack familiarity with local laws, roles and regulations as well as the organization's documentation process. Hence, based on the above discussion, we argued that:

H3. Board national diversity is negatively associated with the risk of financial distress.

2.4 Educational diversity

The term "educational diversity" describes the range of educational backgrounds among the board of directors. According to the resource-view perspective, educational diversity is critical for boosting competitive advantage and business performance (Barney, 1991). Using agency theory as a foundation, educational diversity improves directors' capacity to restrain managerial entrenchment behavior by examining strategic choices, coordinating executive compensation with performance and managing earnings management. Making decisions with diverse knowledge can be approximated by educational diversity. Financial, human resource, environmental, societal, ethical, legal, taxation and media-related occupational and educational diversity characteristics are necessary for active decision-making (Khan and Baker, 2022). According to Mahadeo *et al.* (2012), one of the primary reasons for Rolls Royce's demise in the 1970s was an educationally homogeneous board comprised primarily of engineers. Directors' diverse educational backgrounds aid in overcoming information asymmetry and agency issues. According to stakeholder theory, a board with a varied range of educational backgrounds can give creative suggestions to encourage long-term sustainable performance for all stakeholders. Higher levels of education are linked to open-mindedness, information processing capacity and tolerance for change, as claimed by Hambrick and Mason (1984). Diverse educational backgrounds provide the knowledge, abilities and experiences necessary to contribute in a variety of ways and generate novel ideas for strategic decision-making (Tarus and Aime, 2014). According to Hsu *et al.* (2013), the board members' diverse educational backgrounds are important for the success of the company because it enhances their capacity for information processing and their ability to spot novel insights and abstractions. Adnan *et al.* (2016), Kagzi and Guha (2018) and Fernández-Temprano and Tejerina-Gaite (2020), on the other hand, discovered an inverse relationship between educational-level diversity and financial performance. Similarly, in terms of innovation, Subramanian *et al.* (2016) discovered that educational-level diversity has a significant negative influence on innovation, whereas Mir-Babayev (2015) finds no significant impact. According to Harjoto *et al.* (2015), educational diversity is likewise positively connected to CSR performance; however, Khan *et al.* (2019) discover that educational diversity in Pakistan is inversely related to CSR. Based on these mixed findings, we developed the hypotheses as follows:

H4. Board educational diversity is negatively associated with the risk of financial distress.

2.5 Tenure diversity

Diversity in terms of tenure refers to how long a director has been on the board of an organization (Khan and Subhan, 2019; Khan *et al.*, 2023). Directors with longer tenures are more knowledgeable about the business, its operations and its rules and regulations than directors with shorter tenures (Katmon *et al.*, 2019; Ali *et al.*, 2022). Senior or boards with a longer tenure tend to have more experience, expertise and competition than younger boards. A diverse board of directors with accountants, attorneys, bankers and external chief executive officers (CEOs) is necessary due to the complexity of business management (Anderson *et al.*, 2011). Experience diversity can improve monitoring, reduce agency conflicts and boost financial performance (Post and Byron, 2015). According to the resource-based view, directors' experience diversity improves access to resources due to various external connections for long-term financial and social performance, saving the firm from FD. However, the junior board of directors possesses open-minded, dynamic characteristics, as well as technological development dynamics (Harjoto *et al.*, 2015). Having senior and junior directors can result in a balance of knowledge and independence. Long-serving directors may become indifferent to shareholder interests if they collude with management, jeopardizing their independence (Hafsi and Turgut, 2013). Young directors with short tenure, on the other hand, may be less efficient in advising and monitoring duties due to a lack of understanding of a firm's operations and history (Pozen and Hamacher, 2015). Long-term directors help the board make more mature and effective decisions (Khan and Baker, 2022). Long-tenured directors with extensive experience can have a significant impact on a company (Liew *et al.*, 2017). As a result, combining long- and short-tenured directors may improve top management monitoring (Liu and Sun, 2005), resulting in improved financial performance (Khan *et al.*, 2023; Huang and Hilary, 2018). Due to effective monitoring, a board's tender diversity may lessen agency problems and save the firm from FD. In contrast, Bernile *et al.* (2018) discovered that a large proportion of long-tenured board members hindered board efficacy to decrease business risk because extended tenure results in the establishment of groupthink or bondage to the CEO hampered the board's monitoring duty. Based on the above discussion, we argued that:

H5. Board tenure diversity is negatively associated with the risk of financial distress.

2.6 Mediating role of corporate social responsibility

A more diverse board of directors should result in a positive financial outcome, this argument has been based on the idea that having a diverse board will make it easier to understand the market, be more creative and make better decisions, help solve problems better, broaden people's views and increase monitoring (Carter *et al.*, 2010). Campbell and Mínguez-Vera (2008) argued that diversity in boards is vital for a better understanding of different stakeholder groups, greater innovation and improved thought processes to reach optimal solutions. However, the findings for the direct association between board diversity and FD are decidedly mixed. Mixed results have led some to conclude that having a gender-diverse board – or any other board characteristics – is unlikely to have a direct effect on FD and that alternative explanations are required.

One alternative explanation is that a more diverse board raised ethical and social standards, resulting in improved relationships with stakeholders and their continued support. A more diverse board improves the corporation's ability to recognize the demands and interests of multiple stakeholders (Ferrero-Ferrero *et al.*, 2015) and engage in more CSR practices (Chang *et al.*, 2017). In their meta-analysis, Lagasio and Cucari (2019) also say that the number of women on a board is a factor that affects environmental, social and governance issues. In the same way, Velte (2022) argued that board characteristics had a positive effect on CSR performance, which in turn improved financial performance. Consequently, the mechanism by which a more diverse board affects financial performance and saves the firm from FD may be their influence over CSR as a means of responding to stakeholders' needs and interests. According to Attig *et al.* (2013), Sun and Cui (2014) and Cheng *et al.* (2014), a company's participation in CSR activities increases its creditworthiness and provides easy access to finance. CSR activities help firms obtain better terms for equity financing (El Ghoul *et al.*, 2011), reduce credit risk (Hsu and Chen, 2015) and obtain a bank loan at a lower interest rate (Goss and Roberts, 2011), all of which help the firm save from FD. The influence of board diversity in encouraging firms' adoption of CSR, as well as the repercussions of improved firm performance and savings from FD, can be described using an agency-based perspective. First, according to agency theory, a diverse board clarifies the roles, rights and responsibilities of shareholders and other stakeholders, as well as ensures that business decisions are aligned with firm objectives, which include both financial (i.e. financial performance) and nonfinancial (i.e. CSR performance). By minimizing agency conflicts, a diverse board balances the interests of both shareholders and management, maximizing corporate success. It also effectively monitors the decision and level of participation in CSR activities, balancing short-term value creation with long-term value protection (Liu and Zhang, 2017).

In summary, a diverse board enables the firm to engage in CSR (Harjoto *et al.*, 2015), shows stakeholders their commitment to CSR, supports their claims of legitimacy and creates an atmosphere favorable to business development, hence promoting financial success (Wang and Sarkis, 2017). Based on the preceding discussion, we contend that CSR plays a moderating role in the association between board diversity and FD, increasing the firm's legitimacy in the eyes of stakeholders. The following hypothesis is therefore proposed:

H6. The firm's engagement in CSR activities mediates the relationship between board diversity and financial distress.

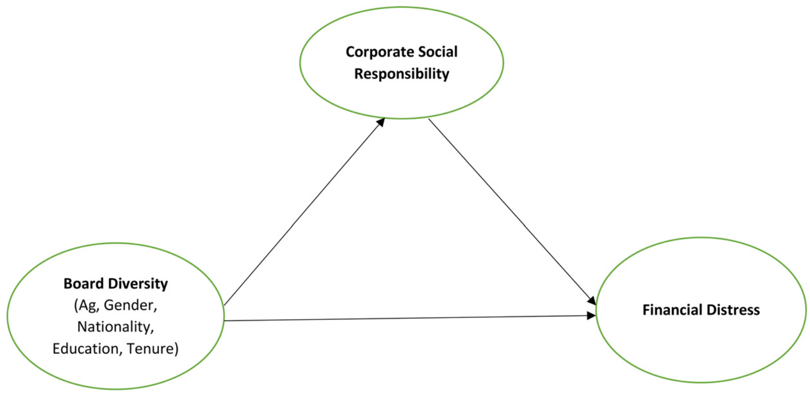
2.7 Conceptual framework of the study

Figure 1 depicts the proposed conceptual model of the study based on the literature review. According to the model, FD is our dependent variable, whereas board diversity variables serve as explanatory variables. CSR was used as a moderating variable in the study.

3. Data and methodology

This research focused on nonfinancial firms listed on the PSX. We excluded financial sectors from our sample because they are heavily regulated (Said *et al.*, 2009) and pollute less than other sectors (Matute-Vallejo *et al.*, 2011). Financial institutions follow different accounting rules and standards than other businesses (Farooq and Noor, 2021). Furthermore, financial firms differ from other types of firms in terms of CSR because they do not manufacture any products. As a result, they place less emphasis on activities that benefit the environment and save energy. Furthermore, to be a part of the study's sample, we apply several firm selection criteria, such as firms remaining listed throughout the entire sample period, no mergers and acquisitions during the study period and complete data

Figure 1 Conceptual framework of the study



Source: Author's own work

available throughout the study period. Based on these criteria, the final sample includes 16 sectors and 81 firms, with a total of 972 firm-year observations from 2010 to 2021. The data was collected from a vast array of secondary sources, including company websites, CSR reporting centers, regulatory publications, media press releases, annual reports and sustainability reports. As part of a pilot study, the CSR expenditures of all PSX-listed companies were analyzed, and it was determined that the majority of companies only began reporting their efforts in 2010. Since at least 2007, a small number of businesses have produced CSR disclosure reports. In this investigation, we sampled information from 2010 to 2021.

3.1 Measurement of variables

3.1.1 Board diversity measures Following the study of Khan *et al.* (2019), our board diversity variables comprise age diversity, gender diversity, national diversity, educational diversity and tenure diversity. In line with Harjoto *et al.* (2015) and Khan *et al.* (2019), we measured diversity variables using Blau's (1977) index of heterogeneity.

$$\mathrm{BI} = 1 - \sum_{i=1}^{n} Pi^2,$$

where BI is Blau's index, P is the proportion of board members in each category, i is the category and n is the total number of board members in each category. AGE is an age heterogeneity index with two categories: less than 50 years old and more than 50 years old. GENDER is a gender diversity index divided into two categories: male and female. NATION is divided into two categories: Pakistani nationality and foreign nationality. EDULEVEL is a heterogeneity index for educational level, with four categories PhD, MS/MPhil, master degree holder, diploma and others. TENURE is divided into five categories: less than three years, six years, nine years and 15 years or more (i.e. 1, 2, 3, 4 and 5 or more).

3.1.2 Financial distress measures Following Boubaker *et al.* (2020), Bugeja (2015), Richardson *et al.* (2015) and Farooq *et al.* (2023), we evaluated the financial distress measure (FD) of sample firms using Altman's (1968) *Z*-score. A higher *Z*-score indicates a lower risk of FD.

$$Z\text{-score} = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5,$$

where

$X1$ = net working capital/total assets; $X2$ = retained earnings/total assets; $X3$ = Earnings before interest and tax/total assets; $X4$ = market value of equity/book value of debt; and $X5$ = sales revue/total assets (Altman, 1968).

3.1.3 Corporate social responsibility measures. There have been several different methods proposed in the literature for measuring CSR. In this study, we followed the research conducted by Ehsan (2019), Farooq and Noor (2021) and Khan *et al.* (2021), and we used a multidimensional financial approach.

$$\text{CSR\_ratio}_{it} = \frac{\text{Firms spending in charitable donations, employees welfare and research and development}}{\text{EAT (earnings after tax)}}$$

3.1.4 Control variables. The following variables serve as controls in this study. Audit committee size (AC size) is the first control variable measured by the number of audit committee directors. Audit committee independence (AC ind) is the proportion of independent directors to the total number of directors. Big4 (Big4) is a dummy variable whose value is 1 if the auditing firm is one of the top four firms in the country and 0 otherwise. The definition of firm size (Fsize) is the log of total assets. Leverage is the ratio of total debt to total assets (Lev). Sales growth (Sgth) is the proportional change in revenue compared to the same period the previous year.

3.2 Model of the study

To determine whether or not CSR serves as a mediator between board diversity and FD, we followed the process outlined by Baron and Kenny (1986). In mediation, there are four steps, which are mentioned below:

Step 1: Model 1 shows how the mediating variable (CSR) affects the dependent variable (Z-score):

$$\text{FD}_{it} = \sum \Upsilon_0 + \alpha_1 \text{CSR}_{it-1} + \sum \Upsilon_i * \text{Control variables}_{it} + \varepsilon_{it} \tag{1}$$

Step 2: Model 2 shows how the independent variable (board diversity) affects the mediating variable (CSR):

$$\text{CSR}_{it} = \sum \Upsilon_0 + \alpha_1 \text{CSR}_{it-1} + \alpha_2 \text{Age}_{it} + \alpha_3 \text{Gen}_{it} + \alpha_4 \text{Nat}_{it} + \alpha_5 \text{Edu}_{it} + \alpha_6 \text{Ten}_{it} + \sum \Upsilon_i * \text{Control variables}_{it} + \varepsilon_{it} \tag{2}$$

Step 3: We use the following model (Model 3) to check whether there is a statistically significant connection between the independent variable (board gender diversity) and the dependent variable (FD):

$$\text{FD}_{it} = \sum \Upsilon_0 + \alpha_1 \text{FD}_{it-1} + \alpha_2 \text{Age}_{it} + \alpha_3 \text{Gen}_{it} + \alpha_4 \text{Nat}_{it} + \alpha_5 \text{Edu}_{it} + \alpha_6 \text{Ten}_{it} + \sum \Upsilon_i * \text{Control variables}_{it} + \varepsilon_{it} \tag{3}$$

Step 4: We demonstrate how the independent and mediator variables affect the dependent variable. Mediation is complete when the relationship between dependent and independent variables becomes insignificant after including the mediating variable in the regression equation (Baron and Kenny, 1986). If the coefficient significance of the independent variable is reduced but still significant, mediation is only partially effective (Sobel, 1986). The following regression equation is used in Step 4 of the analysis.

$$\mathrm{FD}_{it} = \sum \Upsilon_0 + \alpha_1 \mathrm{FD}_{it-1} + \alpha_2 \mathrm{Age}_{it} + \alpha_3 \mathrm{Gen}_{it} + \alpha_4 \mathrm{Nat}_{it} + \alpha_5 \mathrm{Edu}_{it} + \alpha_6 \mathrm{Ten}_{it} + \alpha_7 \mathrm{CSR}_{it} + \sum \Upsilon_i * \mathrm{Control\ variables}_{it} + \varepsilon_{it} \tag{4}$$

3.3 Methodology

We used dynamic models to assess the board diversity–FD link as static models provide biased estimates due to autocorrelation, heteroscedasticity and endogeneity of explanatory factors (Hasan *et al.*, 2021). Furthermore, many corporate finance academics recognize the endogeneity problem in panel data. Endogeneity difficulties in regression models can be caused by a variety of variables, including measurement inaccuracy, simultaneity and reverse causality. Endogeneity can have a major impact on inference and can be removed by using the GMM technique (Lin *et al.*, 2019; Aksoy and Yilmaz, 2023; Ali *et al.*, 2022; Guizani and Abdalkrim, 2023). As a result, the dynamic GMM estimator model was used to study the effect of board diversity on FD. GMM allows for residual autocorrelation, a correlation between independent variables and error terms, heteroscedasticity and contemporaneous residual correlation (Lin and Fu, 2017). Dynamic GMM includes a one-year lag of the dependent variable as an independent variable to capture adjustment dynamics and correct for endogeneity. We used the system GMM as it implies that the difference GMM proposed by Arellano and Bond (1991), as suggested by Blundell and Bond (1998), has poor predictive capacity in a small sample. When using the GMM approach, the lagged values of the explanatory variables are used as instruments. We also used the Hansen and Sargent test of overidentifying constraints (Roodman, 2009) to examine the validity of these instruments. We use the Arellano-Bond AR(1) and AR(2) tests to perform the serial correlation test in error terms. The Wald test is used to determine the joint significance of the calculated coefficients for all variables.

4. Results and discussions

4.1 Descriptive analysis

Table 1 presents the descriptive results of the studied variables. Results show that the mean value of the *Z*-score is 4.087 with a standard deviation of 2.727. The range of *Z*-score is 0.615–9.941. According to the average value, the majority of the sample companies are financially stable. In terms of explanatory variables, the mean value for age diversity is 0.423, with a range of 0–0.6, which is greater than the 0.421 found by Khan *et al.* (2019) for Pakistan, 0.159 found by Katmon *et al.* (2019) for Malaysia and 0.110 found by Ibrahim and Hanefah (2016) for Jordan. However, it is lower than for firms in developed countries, such as the 0.781 found by Harjoto *et al.* (2015) for firms in the USA. For Pakistan, the mean gender diversity is 0.104 from 2010 to 2021, indicating a gradual increase in recent years. This is higher than the 0.051 and 0.040 found by Majeed *et al.* (2015) and Lone *et al.* (2016), respectively. This gradual progressive movement demonstrates the firm's compliance with Pakistan's new CG codes 2017, which require at least one female director. The average national diversity value is 0.214, which is higher than the average national diversity values found by Muttakin *et al.* (2015), Ibrahim and Hanefah (2016) and Katmon *et al.* (2019) for Bangladesh, 0.110 for Jordan and 0.070 for Malaysia, respectively. Furthermore, it is higher than the 0.199 found by Khan *et al.* (2019) for the period 2010–2017, indicating a gradual increase in national diversity. The mean educational level ranges from 0.2 to 0.8, implying

Table 1 Descriptive statistics					
Variable	*Obs*	*Mean*	*SD*	*Min*	*Max*
Z-score	972	4.087	2.727	0.615	9.941
Age_diversity	972	0.423	0.096	0	0.6
Gen_diversity	972	0.104	0.153	0	0.5
Nat_diversity	972	0.214	0.223	0	0.6
Edu_diversity	972	0.501	0.138	0.2	0.8
Ten_diversity	972	0.614	0.122	0	0.9
CSR_ratio	972	0.254	0.364	−0.302	1.733
AC_size	972	4.049	1.114	3	8
AC_ind	972	0.298	0.196	0	0.8
Big4	972	0.765	0.425	0	1
Fsize	972	7.425	0.505	6.658	8.511
Lev	972	0.494	0.204	0.161	0.835
Sgth	972	0.095	0.182	−0.281	0.43

Note: Table derived through STATA "asdoc" command
Source: Authors' own work

that all firms are somewhat diverse, ranging from 20% to 80%. The average value for tenure diversity is 0.614, with values ranging from 0 to 0.9, indicating that some firms are completely homogeneous, whereas others are 90% heterogeneous. This mean value is lower than the 0.831 and 0.741 found by Harjoto *et al.* (2015) and Hafsi and Turgut (2013), respectively. The mean value of the mediating variable, CSR ratio, is 0.254, with a standard deviation of 0.364, which shows that on average, sample firms spend 25% of their earnings after tax.

As for the control variables reported in Table 1, the audit committee size of sample firms is 4 with a minimum and maximum number of members in the audit committee is 3 and 8, respectively. The mean value of audit committee independence is 0.30, which shows that on average, 30% of audit committee members comprises of independent directors. The range of audit committee independence is from 0% to 80%, respectively. The average value of the big four is 0.76, which shows that on average, 76% of the sample firms have big four auditors firms. The average firm size, which is measured by taking the natural log of total assets, is 7.42 with a range from 6.072 to 8.885. The mean value of leverage is 0.496, which shows that almost half of the firm's financing was arranged from borrowing that leads to greater FD for the sample firms. The average sales growth is 0.215, which shows on average, there is a 21% increase in sales among sample firms about the previous year.

Table 2 presents the correlation results for the variables. Results show that entire board diversity variables, except for educational-level diversity and tenure diversity, show a positive relationship with *Z*-score, which shows that there is a negative relationship between board diversity variables and FD, except for educational-level and tenure diversity. In connection with the firm's engagement in CSR, the result shows that ethnic diversity, educational-level diversity and tenure diversity are negatively linked with CSR spending, whereas reminder board diversity-related variables are directly linked with CSR. We find that the correlations between the explanatory variables of the same model are not high. Their results indicate that there is no problem with multicollinearity. Table 2 shows the correlation results for the remaining variables, which show that there is no evidence of multicollinearity in the data because the correlation coefficients between model variables are less than 0.70. As a result, there is no multicollinearity in the data.

Furthermore, we investigate multicollinearity using the variance inflation factor (VIF). A VIF larger than 10 implies excessive multicollinearity but a VIF less than 10 is acceptable. However, according to Henseler *et al.* (2015) and Ullah *et al.* (2023), the highest level for the VIF is 5. VIF results in Table 3 demonstrate that no value is larger than 5. As a result, there is no multicollinearity between the research variables.

Table 2 Matrix of correlations

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*
Z-score	1.000												
Age_diversity	0.115	1.000											
Gen_diversity	0.056	−0.051	1.000										
Nat_diversity	0.200	0.135	−0.028	1.000									
Edu_diversity	−0.021	−0.104	−0.132	0.127	1.000								
Ten_diversity	−0.052	−0.194	0.037	−0.145	0.002	1.000							
CSR_ratio	0.240	0.122	0.191	0.022	−0.107	−0.035	1.000						
AC_size	−0.075	−0.071	−0.166	−0.060	−0.032	−0.092	−0.081	1.000					
AC_ind	0.238	0.074	0.073	0.051	0.022	−0.083	0.068	−0.075	1.000				
Big4	0.137	0.026	−0.123	0.331	0.091	−0.111	−0.067	0.262	0.225	1.000			
Fsize	−0.148	−0.056	−0.065	−0.106	0.253	−0.014	−0.174	0.207	0.215	0.227	1.000		
Lev	−0.439	−0.099	0.026	0.069	0.140	0.073	0.012	0.006	−0.091	−0.052	0.108	1.000	
Sgth	0.141	−0.071	−0.021	−0.036	0.031	−0.004	0.053	−0.098	−0.121	−0.136	0.009	−0.040	1.000

Note: Table derived through STATA "asdoc" command
Source: Authors' own work

Table 3 Variance inflation factor

Variables	*VIF*	*1/VIF*
Big4	1.404	0.712
Fsize	1.32	0.758
Nat_diversity	1.272	0.786
AC_size	1.217	0.822
AC_ind	1.182	0.846
Edu_diversity	1.157	0.864
Age_diversity	1.114	0.897
Gen_diversity	1.106	0.904
CSR_ratio	1.105	0.905
Ten_diversity	1.082	0.924
Lev	1.078	0.927
Sgth	1.062	0.942
Mean VIF	1.175	

Source: Authors' own work

4.2 Regression analysis

Following the mediation rules of Baron and Kenny (1986), we test the mediation effect of CSR in the association between board diversity and FD using hierarchical regression analysis. In Model 1 of Table 4, the impact of CSR on FD is presented. In the second model, we examined the effect of board diversity on CSR. The impact of board diversity on FD is reversed in Model 4. After satisfying the aforementioned three mediation conditions, the cumulative impact of board diversity and CSR on FD is then investigated in Model 4.

The regression results of Model 1 show that a firm's participation in CSR-related engagements has a significant positive relationship with *Z*-score, indicating that CSR has a significant inverse impact on the level of FD. The greater a firm's investment in CSR activities, the lower the likelihood of FD. This validates the stakeholder's perspective on CSR. This supports the concept that a firm's participation in CSR activities fosters relationships with stakeholders, fosters goodwill and gives easy access to cash in times of need, so protecting the firm from FD. The findings support the findings of Khan *et al.* (2021) and Farooq *et al.* (2023), who conducted a study on PSX-listed firms and discovered the same inverse association between CSR and FD across sample firms. This significant

Table4 System GMM regression results

Variables	*Z-score (Model 1)*	*CSR_ratio (Model 2)*	*Z-score (Model 3)*	*Z-score (Model 4)*
Z-score (−1)	0.362*** (0.044)		0.349*** (0.042)	0.358*** (0.043)
CSR_ratio (−1)		0.266*** (0.054)		
Age_diversity		1.189* (0.438)	1.019*** (1.340)	1.512** (1.370)
Gen_diversity		0.662** (0.338)	2.465** (1.048)	2.490 (1.055)
Nat_diversity		0.849** (0.360)	1.413*** (1.129)	1.231 (1.142)
Edu_diversity		−0.268 (0.375)	−0.897 (1.130)	−0.952 (1.140)
Ten_diversity		−0.0266 (0.189)	0.551 (0.584)	0.54 (0.588)
CSR_ratio	0.308*** (0.174)			0.336* (0.179)
AC_size	−0.0109 (0.089)	0.00381 (0.029)	−0.0181 (0.089)	−0.00769 (0.089)
AC_ind	2.200*** (0.373)	0.0169 (0.135)	2.070*** (0.378)	2.129*** (0.382)
Big4	0.3 (0.233)	0.0304 (0.075)	0.336 (0.235)	0.344 (0.236)
Fsize	−2.934*** (0.410)	−0.26 (0.160)	−3.269*** (0.447)	−3.479*** (0.461)
Lev	−7.424*** (0.645)	0.359* (0.214)	−7.448*** (0.642)	−7.377*** (0.648)
Sgth	2.001*** (0.248)	0.0644 (0.084)	1.959*** (0.249)	2.008*** (0.252)
Constant	27.19*** (2.942)	2.662** (1.168)	29.67*** (3.260)	31.45*** (3.374)
Year dummy	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes
Observation	972	972	972	972
Wald Chi^2	2,462.11	56.44	668.24	617.87
Hansen's test	0.617	0.517	0.873	0.867
AR(1)	0.021	0.017	0.003	0.002
AR(2)	0.591	0.475	0.652	−0.673

Notes: Standard errors in parentheses. $^{***}p < 0.01$; $^{**}\ p < 0.05$; $^{*}\ p < 0.1$
Source: Authors' own work

inverse association supports Yang *et al.*'s (2019) theory that a corporation's participation in CSR activities draws investment and builds favorable stakeholder relationships, hence saving the firm from FD. Furthermore, our results are compatible with those of Zheng *et al.* (2019), Al-Hadi *et al.* (2017), Shahab *et al.* (2018), Boubaker *et al.* (2020), Do (2022) and Khan *et al.* (2021).

The effect of board diversity on CSR is shown in Model 2 of Table 4. The findings indicate a significant positive association between board age diversity and CSR. The level of a company's participation in CSR-related activities will increase as the age diversity of the board increases. This positive relationship backs up the findings of Beji *et al.* (2021) and Ferrero-Ferrero *et al.* (2015). They contended that increased age diversity could improve environmental performance. A well-balanced board includes a good mix of young and experienced directors. According to Hafsi and Turgut (2013), age reflects a director's wisdom in business management and sensitivity to society. Khan and Baker (2022) and Post *et al.* (2011) argued that young directors are typically more productive, flexible and receptive to new technologies and ideas. They are also more likely to assume high risk and focus on more environmental and ethical issues than older directors. Age diversity on the board, according to Beji *et al.* (2021), could improve the board's environmental performance. Hence, greater age-diverse boards are positively linked with CSR.

The second variable of board diversity, board gender diversity, exhibits a significant positive impact on CSR, indicating that Pakistani companies with a higher number of women directors have more participation in CSR-related activities. This positive relationship supports the findings of earlier studies like Lone *et al.* (2016), Gul *et al.* (2017), Majeed *et al.* (2015), Velte (2022), Uyar *et al.* (2021), Galletta *et al.* (2022) and Ibrahim and Hanefah (2016). The result is also consistent with the resource-based concept that female directors are considered a significant resource for the firm as they bring unique perspectives and ideas to the boardroom (Siciliano, 1996).

Board national diversity has a significant positive effect on CSR. The amount of CSR activity by the company will increase as the number of foreign directors increases in the boardroom. This finding is consistent with the resource-based view that foreign directors, as outside directors, provide more input and resources, such as diverse opinions, language, religion, life experiences, culture, behavior and norms, which in turn improve decision-making (Ruigrok *et al.*, 2007) and support CSR reporting strategies (Ayuso and Argandona, 2009). This positive association supports the findings of Lau *et al.* (2016), Harjoto *et al.* (2019), Beji *et al.* (2021), Tihanyi *et al.* (2005) and Khan (2010).

The remaining board diversity indicators, such as board tenure and education-level diversity, do not appear to have any effect on CSR, indicating that PSX-listed firms do not place a premium on onboard members' relevant education before being appointed to the board of directors. This is in line with the argument of Jizi *et al.* (2014), who too find a statistically insignificant influence of experience on CSR. This insignificant influence of board educational diversity on CSR does not support the assumption that more educated directors are more knowledgeable about environmental issues and hence have a higher commitment to CSR. The findings contradict those of Beji *et al.* (2021), Vives (2022) and Gadenne *et al.* (2009), who discovered that board educational diversity is positively related to CSR. Among control variables, only leverage has shown a significant positive impact on CSR, meaning the higher the level of leverage by the firm, the lower will be the engagement in CSR-related activities.

After investigating the impact of board diversity on CSR, the direct impact of board diversity on FD is presented in Model 3 of Table 4 in the third step of mediation analysis. The result indicates that board age diversity has a direct effect on *Z*-score, showing that board age diversity is significantly negatively correlated with FD. This supports the resource-based view, which holds that age diversity promotes proficiency and innovation, thereby increasing the company's competitive advantage. The result supports the argument that a board with greater age diversity will be more productive and experienced, thereby reducing agency issues by effectively monitoring and aligning shareholders' and stakeholders' short- and long-term interests to save the company from FD (Platt and Platt, 2012). The result demonstrates that in PSX firms, the older directors sit on the board due to their greater experience or affiliation with the company. They are performing their role with greater diligence and objectivity; as a result, they help to minimize agency issues in the firm and the misalignment of short- and long-term goals, leading the firms to prevent the firm from FD. Findings support the results of Fernández-Temprano and Tejerina-Gaite's (2020), Ali *et al.* (2014) and Goergen *et al.* (2015) that age diversity has a positive effect on firm performance, thereby saving the firm from FD.

Board gender diversity shows a significant positive impact on *Z*-score, which shows that greater gender-diverse boards save firms from FD. This significant negative impact on FD supports the agency's opinion that having women on board plays an active monitoring role in managerial actions, keeping the firm away from FD (Guizani and Abdalkrim, 2023). Furthermore, this is congruent with the resource-based perspective, which suggests that the presence of women on the board may be a resource that can be exploited to improve management monitoring and control (UlAin *et al.*, 2020). This supports the argument that greater female board participation increases a board's effectiveness by involving managers' commitments to social and environmental concerns, overall monitoring and bringing diverse views, ideas, skills and perspectives to the boardroom (McGuinness *et al.*, 2017; Loukil *et al.*, 2019; Guizani and Abdalkrim, 2023), thus, increasing financial performance of the firm and saving it from FD (Darrat *et al.*, 2016; Katmon *et al.*, 2019; Zhou, 2019; Kristanti *et al.*, 2016; Mittal and Lavina, 2018).

The significant positive correlation between board national diversity and *Z*-score shows that there is a significant inverse association between board national diversity and FD. The findings support the resource-based view that foreign directors provide the company with access to a broader social network, diverse and international expertise and communication skills (Beji *et al.*, 2021) and bring new ideas and perspectives into the business (Hafsi and Turgut, 2013), all of which improve financial performance and save the firm from FD. Furthermore, the findings corroborate the idea that boards with international directors may have superior financial performance as a result of their worldwide experience (Sarhan *et al.*, 2019; Ararat *et al.*, 2015; Estelyi and Nisar, 2016; Khan *et al.*, 2023).

The remaining board diversity variables, i.e. board education diversity and tenure diversity demonstrate no correlation with FD. This insignificant impact of educational diversity on FD does not support the agency-based view that educational-level diversity increases directors' ability to control managerial entrenchment behavior by assessing strategic decisions and aligning executive pay with performance (Ali *et al.*, 2022), thus improving firm performance and saving the firm from FD. Among the control variables, audit committee independence has a significant positive relationship with *Z*-score, indicating that greater audit committee independence protects the firm from FD. In contrast, leverage and firm size have a significant positive correlation with FD. Increased leverage increases the likelihood of a firm being FD.

In the final step, we examine the mediating effect of CSR on the association between diversity and FD by adding CSR to the regression equation and the results are presented in Model 4 of Table 4. As previously noted, we used the approach outlined by Baron and Kenny (1986) to assess the mediating role of CSR in the diversity–FD link. These authors show that three conditions must be met to meet the mediation criterion. First, the independent variable (board diversity) must be found to be significantly related to the mediating variable (i.e. CSR). The second condition is that the independent variable (board diversity) is significantly related to the dependent variable (FD). The third condition is that the mediating variable (i.e. CSR) is significantly related to the dependent variable (i.e. FD). Based on these three conditions, only three board diversity variables, namely, board age diversity, board gender diversity and board national diversity, met these criteria. According to the findings, board education diversity and board tenure diversity fall short of the aforementioned criterion. As a result, we want to see whether CSR can act as a mediator between the three remaining diversity variables (i.e. age, gender and nationality) and FD. Table 4 shows that board age diversity is considerably positively associated with FD but the degree of significance remains less. Galbreath (2018) noted that when both independent and mediating variables are included in the equation and the association between independent and dependent variables becomes significantly less, it shows partial mediation. Hence, we conclude that CSR partially mediates the relationship between board age diversity and FD.

Board gender diversity shows an insignificant impact on FD in Model 4 of Table 4. This insignificant impact shows the full mediation effect of CSR in the board gender diversity–FD relationship. This shows that the relation between gender diversity and FD is indirect. This supports the argument of Rao and Tilt (2016) that the presence of women on board results in "soft" improvements, such as higher ethical and social standards, which in turn foster positive relationships with stakeholders. This enhanced relationship with stakeholders increased the firm's financial performance (Freeman *et al.*, 2004), which saved the company from FD. Furthermore, this result supports the findings of Boukattaya *et al.* (2022), Galbreath (2018) and Agustia *et al.* (2022), who argued that the effect of women's board participation on firm performance is not direct but rather mediated by CSR. After incorporating the mediating variable into the equation of Model 4, board national diversity shows an insignificant impact on FD. According to Baron and Kenny (1986), there is a complete mediation between the board's national diversity and FD. As a result, this study establishes an indirect relationship between board nationality diversity and FD. Galbreath (2018) also claimed that when the link between the independent variable and the dependent variable becomes insignificant after adding the mediating variable, it demonstrates full mediation. Hence, we argued that CSR fully mediates the relationship between board nationality diversity and FD. Board members from various countries are unique and valuable. Diverse board members have a broader understanding of customers, markets and business opportunities, which can help the company generate new product ideas and marketing strategies that can encourage innovation, generate competitive advantage, improve financial performance and save the firm from FD. We cannot test the mediation effect of CSR between these two diversity variables and FD because two of the board diversity variables, board educational diversity and board tenure diversity, fail to meet the criterion required to test the mediation effect.

4.3 Robustness test

Following the study of Agustia *et al.* (2022), we conducted the Sobel test to check the robustness of the results. Table 5 displays the result of the Sobel test to determine whether board age diversity indirectly affects FD. According to the Sobel calculator (https://quantpsy.org/sobel/sobel.html), the *p*-value is 0.0109 $<$ 0.100; therefore, according to Baron and Kenny (1986), there is a partial mediation because the *p*-value is less significant after adding the mediating variable. Galbreath (2018) also suggested in his study that partial mediation occurs when both independent and mediating variables are included in the equation and the correlation between independent and dependent variables becomes significantly smaller. Table 6 presents the Sobel test result for determining whether board gender diversity indirectly affects FD. According to the results, since the *p*-value is insignificant (0.188 $>$ 0.100) after the addition of the mediating variable, there is complete mediation. Consistent with the preceding findings, Galbreath (2018) asserted that full mediation occurs when the link between the independent variable and the dependent variable becomes insignificant with the addition of the mediating variable into the equation. Finally, Table 7 presents the result of whether board nationality diversity directly affects FD. The result of the Sobel test shows *p*-value is 0.8501 $>$ 0.100. It shows the complete mediation of CSR between board nationality diversity and FD. These results and in line with our baseline results that are presented in Table 3.

Table 5 Sobel test result board age diversity effect on financial distress through corporate social responsibility as a mediating variables

Input variables	*Input*	t-*statistics*	*Std. error*	p-*value*
a	0.428714	2.5464047	0.25880816	0.01088389
b	1.53782			
Sa	0.1509427			
Sb	0.2675077			

Note: Use interactive calculator for mediation test @ https://quantpsy.org/sobel/sobel.htm
Source: Authors' own work.

Table 6 Sobel test result board gender diversity effect on financial distress through corporate social responsibility as a mediating variables

Input variables	*Input*	t-*statistics*	*Std. error*	p-*value*
a	0.0956358	0.3448029	0.18088659	0.1882341
b	1.52926			
Sa	0.0953865			
Sb	0.2703643			

Note: Use interactive calculator for mediation test @ https://quantpsy.org/sobel/sobel.htm
Source: Authors' own work.

Table 7 Sobel test result board age diversity effect on financial distress through corporate social responsibility as a mediating variables

Input variables	*Input*	*t-statistics*	*Std. error*	p-*value*
a	0.0135321	0.18897335	0.11190047	0.8501137
b	1.56267			
Sa	0.0715727			
Sb	0.2614864			

Note: Use interactive calculator for mediation test @ https://quantpsy.org/sobel/sobel.htm
Source: Authors' own work

In addition, to test the robustness of the results, we used the ZM score (Zmijewski, 1984) to quantify the likelihood of FD among sample firms. In their respective research, Boubaker *et al.* (2020) and Farooq *et al.* (2023) also use the ZM score to assess the level of FD. The higher the ZM score, the higher the likelihood of FD. The ZM score is calculated using the following formula:

$$ZM = -4.336 - 4.515\,(NI/TA) + 5.679\,(TL/TA) + 0.004\,(CA/CL) \tag{2}$$

Results are presented in Table 8 that is consistent with our main findings, which are shown in Table 3.

5. Conclusions

Companies with a diverse board can solve problems more amicably and swiftly, generate more diverse ideas and have a broader base of knowledge. The composition of the board is crucial for all businesses because it determines strategic decisions. The present study aims to explore the mediating effect of CSR on the relationship between board diversity and FD.

Table 8 Robustness test result

Variables	*ZM-score (Model 1)*	*CSR_ratio (Model 2)*	*ZM-score (Model 3)*	*ZM-score (Model 4)*
ZM_Score (−1)	0.0878*** (0.024)		0.0903*** (0.024)	0.0901*** (0.024)
CSR_ratio (−1)		0.266*** (0.054)		
Age_diversity		1.189* (0.438)	−0.258** (0.308)	−0.214* (0.311)
Gen_diversity		0.662** (0.338)	−0.172*** (0.250)	−0.171* (0.251)
Nat_diversity		0.849** (0.360)	−0.0855** (0.208)	0.122* (0.208)
Edu_diversity		−0.268 (0.375)	0.312 (0.245)	−0.304 (0.247)
Ten_diversity		−0.0266 (0.189)	−0.204 (0.148)	0.209 (0.148)
CSR_ratio	−0.0621** (0.045)			0.056 (0.046)
AC_size	0.0166 (0.022)	0.0038 (0.029)	0.0193 (0.023)	0.0201 (0.023)
AC_ind	−0.137** (0.097)	0.0169 (0.135)	−0.122*** (0.100)	−0.11** (0.101)
Big4	−0.137** (0.056)	0.0304 (0.075)	−0.135** (0.059)	−0.140** (0.059)
Fsize	0.211** (0.087)	−0.26 (0.160)	0.283*** (0.097)	0.277*** (0.099)
Lev	6.666*** (0.154)	0.359* (0.214)	6.681*** (0.156)	6.661*** (0.158)
Sgth	−0.328*** (0.065)	0.0644 (0.084)	−0.315*** (0.066)	−0.310*** (0.066)
Constant	−6.563*** (0.629)	2.662** (1.168)	−6.960*** (0.695)	−6.960*** (0.711)
Year dummy	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes
Observations	972	972	972	972
Wald Chi^2	3,542.27	102.64	3,660.02	3,451.31
Hansen's test	0.723	0.694	0.891	0.876
AR(1)	0.001	0.019	0.01	0.003
AR(2)	0.672	0.537	0.736	0.782

Notes: Standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$
Source: Authors' own work

This study covers 81 nonfinancial PSX-listed firms for the period from 2010 to 2021. The study's result can be summarized as follows: first, CSR is significantly inversely associated with FD. The greater the firm's involvement in CSR-related activities, the lower will be the chances of FD being faced by the firm. Second, among board diversity variables, age, gender and nationality diversity of the board shows a significant positive relationship with the CSR, leaving education and tenure-level diversity insignificant. Third, we found that in connection with FD, only age, gender and national diversity shows a significant negative relationship with FD. We follow the procedure of Baron and Kenny (1986) to test the mediation impact of CSR between diversity–FD relationships. As a result, we finally incorporate both board diversity and CSR variables in the equation to examine the influence on FD. The results demonstrate that there is a partial mediation between board age diversity and FD but full mediation between board gender diversity and FD and board national diversity and FD. Furthermore, to check the robustness of the result, we follow the stud of Galbreath (2016) using the Sobel test. The Sobel test result confirms an indirect relationship between board diversity (gender and nationality) and FD based on the mediating role of CSR. Hence, there is a complete mediation between board diversity (gender and nationality) and FD and there is a partial mediation between board diversity (age) and FD and the results are consistent with our baseline findings. Furthermore, we calculated FD using the ZM score and investigated the impact of board diversity and CSR on FD. The findings back up our primary findings. The research findings are congruent with our theoretical framework, which is based on ideas from resource- and agency-based perspectives.

The importance of diversity attributed to enhancing a firm's CSR engagement and reducing the probability of FD has important policy implications. First, this study extends the existing literature on the relationships between board diversity and FD, CSR and FD and board diversity and CSR by examining the three-way relationship between all three and identifying the mediating role of CSR between board diversity and FD. In contrast to other research findings in the case of Pakistan, our study fills a gap in the existing literature by offering a preliminary argument regarding the mediating effect of CSR in the diversity–stress relationship. Thus, we have contributed to the theoretical literature by refining the diversity–distress relationship with the mediating effect of CSR in one of the developing economies and by providing first-hand insight into the relationship between diversity and FD in Pakistan from the perspective of resource-based view theory and agency-based view theory.

The findings will be of use to policymakers in Pakistan and other developing countries in Asia as they set regulations regarding the board diversity framework. When building a board diversity framework in Pakistan, we urge that legislators make it mandatory to diversify their board structure in terms of age, gender and nationality diversity to boost competitive advantages and prevent the firm from FD. Furthermore, in line with the resource-based view, these internal resources should be prioritized because it will reduce the firm's FD through the emphasis on CSR. Second, policymakers and regulators should encourage PSX-listed enterprises to appoint board members with suitable educational resources to improve firm performance and keep it out of FD, as irrelevant educational background reduces firm performance (Khan *et al.*, 2023). It is further suggested that PSX-listed companies link the board of directors' tenure to the company's performance in terms of profitability, investment effectiveness and CSR. This will encourage directors to play their roles more objectively and will benefit the company in terms of higher profitability, reduced FD risk, etc. This study highlights for business owners how crucial it is to implement board diversity to involve the company in CSR and prevent long-term FD. Because the study demonstrates that the diversity–distress relationship is the mediating effect of CSR, investors can learn valuable lessons from it about how to improve investment efficiency and prevent over- or underinvestment. For business owners, this study emphasizes the importance of board diversity in engaging the firm in CSR and preventing FD in the long run.

This study is not without limitations. First, because this is a single-country study, generalizability is limited. Future research could strive to strengthen the findings by investigating the mediated relationship depicted in this article in other nations. Second, we used widely acknowledged board diversity attributes; nevertheless, other aspects, such as government policies, TMT gender diversity, religion and expertise, may have a substantial impact on FD and should be explored in future studies. Third, this study is limited to investigating CSR as a moderating variable. Other characteristics, such as board processes, board activities or group cohesiveness, may have a mediated impact on board diversity and FD and hence should be examined more in future research. Fourth, the study's inherent weakness is that culture, religion, knowledge, experience and leadership quality are difficult to quantify properly. Finally, there is an argument that complementary managerial resources are required for boards to be effective (Galbreath, 2016). The complementary aspects of board–management interaction were not examined. Future research could look into how board diversity fosters complementary relationships with management and how this complementary relationship affects FD. The findings of such studies may shed light on additional ways in which board diversity influences FD. Indeed, future research should look into mediated models to confirm the link between board diversity and FD.

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