



# **Analyzing the Impact of Board Diversity on Financial Distress Risk: Empirical study on the Egyptian Listed Firms**

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**Abstract:**

**Purpose:** This study aims to investigate the impact of board diversity on financial distress of the non-financial Egyptian Listed firms.

**Design/ methodology/approach:** The study uses a data of 23 non-financial companies listed in the EGX30 from 2014 to 2023. The study uses a Panel data analysis, including Pooled Regression, Fixed Effect, and Random Effect models.

**Finding:** The result reveals that gender diversity and independent directors have a negative significant effect and mitigate financial distress, underscoring their role in enhancing financial stability and resilience. Conversely, board size and tenure show no significant impact on the financial distress risk.

**Originality/value:** These findings highlight the strategic advantage of structural and demographic board diversity in navigating economic uncertainties and regulatory challenges within Egyptian listed firms, suggesting avenues for further research in broader economic contexts.

**Keyword:** board diversity, structural board diversity, demographic board diversity, cognitive board diversity, Altman Z score, financial distress, corporate governance, sustainability.

**1- Introduction:**

Financial distress in a firm imposes significant costs on investors and creditors, including lost sales and profits, low dividends, legal fees, higher credit costs, tax avoidance, failure to issue new securities, and the opportunity cost of foregoing positive net present value project (Bhattacharjee & Han, 2014; Zhou, 2019). A company is considered financially distressed if it exhibits negative operating profit, or negative book value of equity, or if it undergoes a merger. Financial distress often involves liquidity problems and a failure to meet creditor obligations due to inadequate funds. The financial distress cycle encompasses a period of declining performance, reaching a low point, and subsequently entering a recovery phase.

Financial distress, a serious issue in corporate finance, emphasizes the crucial role of effective corporate governance. Numerous studies have showed the correlation between corporate governance and the financial distress (Darrat, Gray, Park, & Wu, 2016; EmadEldeen, 2024; Fich & Slezak, 2008; Lajili & Zéghal, 2010; Shahwan, 2015; Udin, Khan, & Javid, 2017; Yousaf, Jebran, & Wang, 2021). Ensuring the sustainability of a company is vital for policy and management decisions (Asyik, Muchlis, Riharjo, & Rusdiyanto, 2022; Kalbuana et al., 2021). Sustainability is a key concept in financial reporting (Sudaryanto, Courvisanos, Dewi, Rusdiyanto, & Yuaris, 2022), reflecting a company's ability to continue operating in its field (Prasetio, Sabihaini, Rusdiyanto, Rochman, & Kalbuana, 2021). However, maintaining business sustainability is challenging due to the constant risk of financial distress (Setiorini, Fidayanti, Kalbuana, & Cakranegara, 2022), which often precedes liquidation or bankruptcy (Utari, Sudaryanto, Jannah, & Sobakh, 2021). Although economic conditions fluctuate naturally, financial distress periods can cause significant concern for investors and creditors (Aliyyah et al., 2021). The economic downturn from 2020 to 2021, exacerbated by the COVID-19 pandemic, severely impacted the capital market (Hastomo, Karno, Kalbuana, & Meiriki, 2021)

The board of directors is essential in corporate governance and ensuring accurate financial reporting (Soliman & Abdel Salam, 2013). Some studies specify that there is a positive correlation between board diversity and the firm performance (Al-Shaer & Zaman, 2016; Alodat, Salleh, Nobanee, & Hashim, 2023; EmadEldeen, Elbayoumi, Basuony, & Mohamed, 2021; Rahman, Zahid, & Al-Faryan, 2023). Additionally, some research has focused on developed countries (Darrat et al., 2016; García & Herrero, 2021). However, the influence of board diversity is still a developing area of research in developing countries. Some studies have examined board diversity in China (Yousaf et al., 2021), in emerging markets (Young, Peng, Ahlstrom, Bruton, & Jiang, 2008), and in Egypt (Samaha & Dahawy, 2010).

The board diversity can be measured using Structured Diversity, Demographic Diversity, and Cognitive Diversity (Behlau, Wobst, & Lueg, 2024). The structural diversity Refers to attributes related to the organization and structure of a board, like independence, leadership duality, and board size. These factors influence governance and management incentives to protect shareholder value (Adams, De Haan, Terjesen, & Van Ees, 2015; Ben Selma, Yan, & Hafsi, 2022). Moreover, Demographic Diversity Encompasses observable attributes such as gender, age, nationality, and ethnicity. These attributes bring varied

perspectives and cultural insights to the board (Cucari, Esposito De Falco, & Orlando, 2018; Lee, Rhee, & Yoon, 2018). The majority of the research used the demographic diversity and have often measured financial distress in relation to gender (Kristanti, Rahayu, & Huda, 2016; Mittal & Lavina, 2018), Age, gender, education, nationality, tenure (Farooq, Ahmed, Khan, & Munir, 2024). Furthermore, Cognitive Diversity Involves varied experiences, qualifications, education, and tenure of board members. This diversity enhances cognitive performance, decision-making, and understanding of the business (Ben-Amar, Francoeur, Hafsi, & Labelle, 2013; Forbes & Milliken, 1999; Zona, 2016). However, more recent studies have found that cognitive diversity factors (such as experience, education, and tenure) are more closely related to the firm outcomes (Bernile et al., 2018; Harjoto et al., 2018) and are more highly valued by the investors (De-La-Hoz et al., 2018).

This study aims to highlight the influence of structural (board independence and board size), demographic (gender diversity), and cognitive board diversity attributes (board tenure) on the probability of financial distress. The study adds to the literature in several ways. It integrates board diversity with the financial distress risk. Therefore, the study considers four key diversity features and classifies them as structured (board size and independent board), demographic (gender diversity), and cognitive (board tenure). This is the first study to incorporate these diversity attributes collectively into financial distress prediction models, applying it to Egyptian listed firms. This study aims to investigate if board diversity impacts financial distress.

The rest of the paper is organized as follows: Section 2 covers the theoretical background and hypothesis development, Section 3 outlines the research methodology, Section 4 presents the data analysis, and Section 5 provides the conclusion.

## **2- Theoretical background and hypotheses development:**

### **2-1 Theoretical background:**

Board diversity act a pivotal part in corporate governance and organizational resilience against financial distress, drawing from theories such as upper echelons theory (Hambrick & Mason, 1984), resource dependence theory (Pfeffer & Salancik, 1978), signal theory (Spence, 1973), agency theory (Meckling & Jensen, 1976), and social categorization theory (Tajfel & Turner, 1985). We contend that diversity is a crucial factor for an organization's success. Integrating board diversity characteristics into our prediction models markedly improves the accuracy of predicting financial distress.

**Upper echelons theory** suggests that an organization reflects its top managers, whose choices significantly impact organizational performance (Kaur & Singh, 2019). The board, as the main decision-maker in the organizations (Simpson & Gleason, 1999), is liable for any financial and strategic decisions, as employment and assessment of top executives (e.g., CEOs), dividend policy, mergers or acquisitions, and the changes in the capital arrangement (Adams & Ferreira, 2009). Therefore, Having a diverse board upsurges the informational resources available to the board, enhances its capacity to recognize the strategic opportunities, progress successful plans, challenge disputes, reduce risk and improve the firm performance (Hsu, Lai, & Yen, 2019).

Furthermore, **resource dependence theory** posits that an organization's efficacy is affected by its aptitude to acquire and manage the serious resources from outer (Ruigrok, Peck, & Tacheva, 2007). The board diversity are better equipped to perform advisory roles because their diverse members bring high-quality resources such as knowledge, skills, information, and external connections (Hillman & Dalziel, 2003; Loukil, Yousfi, & Yerbanga, 2019). Beyond their monitoring and control functions, A diverse board of directors can strengthen monitoring and advisory functions, resulting in better performance. (EmadEldeen et al., 2021) and low financial distress (Guizani & Abdalkrim, 2023; Yousaf et al., 2021).

Moreover, **signal theory** posits that management conveys information that reflects the company's condition, benefiting stakeholders (de Haan, Offerman, & Sloof, 2011) . Additionally, signal theory is used to understand management's awareness of the company's future growth, that influences investor decisions (Brigham & Houston, 2013). This information signals management's act in meeting stakeholder expectations. Signal theory outlines the connections between internal variables, external variables, corporate governance mechanisms, internal controls, earnings management, and financial distress (Nurcahyono, Hanum, & Sinarasri, 2023).

Furthermore, **Agency Theory** posits that agents will perform in their self-interest, that is likely to conflict with the interests of the principal. The desired outcome in this theory is for the company to minimize costs and increase efficiency. Agency problems rise when the interests of the principal and the agent diverge, and the principal lacks the information to precisely evaluate the agent's behavior (Nuswantara & Maulidi, 2017). Insightful methods for addressing research problems can be derived from the purpose of agency theory. Financial distress typically results from poor financial decision (Bhaskar, Krishnan, & Yu, 2017) poor internal control schemes, ineffective managerial

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rules, inadequate information disclosure, and a failure to identify stakeholder privileges (Maina & Sakwa, 2017). These adverse situations are often due to agency problems. Thus, expanding our thoughtful of the board's role is crucial (Adams & Ferreira, 2009). Board diversity can mitigate management's entrenchment behavior by linking CEO turnover and reward to firm performance (Usman, Zhang, Farooq, Makki, & Dong, 2018), enhancing monitoring intensity (Ararat, Aksu, & Tansel Cetin, 2015; Hemdan, Hasnan, & Ur Rehman, 2021), overseeing investments (Harjoto, Laksmana, & Yang, 2019), and reducing free cash flow available to managers by sinking the capital structure and paying more dividends (Bernile, Bhagwat, & Yonker, 2018). Consequently, this helps decrease the probability of financial distress (Ali, Ali, Jiang, Hedvicakova, & Murtaza, 2022; Yousaf et al., 2021). Furthermore, the agency view suggests that a diverse board improves the monitoring role of management, as it includes directors from various backgrounds with distinct perspectives (Benkraiem, Hamrouni, Lakhali, & Toumi, 2017).

However, **Social categorization theory** suggests that board diversity can reduce teamwork steadiness, thereby impairing decision-making efficiency (Harjoto et al., 2019). This theory asserts individuals with alike characteristics form in-groups, while those with different traits are relegated to out-groups (Veltrop, Hermes, Postma, & de Haan, 2015). As a result, board members may categorize themselves into social categories based on education, nationality, gender, or age. Therefore, this theory expects that negative outlooks toward diverse individuals and limited interactions among diverse board members may negatively impact the performance of the board (Harjoto et al., 2019).

To sum up, Integrating upper echelons theory, resource dependence theory, agency theory, signal theory, and social categorization theory highlights the complex role of board diversity in both preventing and managing financial distress. Upper echelons and resource dependence theories emphasize that diverse boards enhance decision-making and access to critical resources, improving organizational performance and resilience against financial challenges. Agency and signal theories underscore that diverse boards improve monitoring, control, and communication, thereby mitigating risks that lead to financial distress. However, social categorization theory cautions that diversity can create in-group and out-group dynamics, potentially reducing teamwork consistency and decision efficiency, which can exacerbate financial problems. Therefore, while board diversity is crucial for leveraging varied perspectives and resources to prevent financial distress, it must be managed carefully to avoid these potential drawbacks and fully realize its benefits.

## **2-2 Hypotheses development:**

Corporate governance plays a pivotal role in maintaining the financial health of an organization. Among the various dimensions of corporate governance, board composition is a critical factor influencing a firm's strategic direction and risk management capabilities. The board size, gender diversity, tenure, and independence of board members collectively impact the board's effectiveness in overseeing management, shaping policies, and safeguarding shareholder interests. This section delves into the relationship between the structured, demographic, cognitive board diversity and financial distress, proposing hypotheses that explore how these attributes may mitigate or exacerbate financial challenges within firms.

### **2-2-1 Board Size and financial distress:**

Board size, referring to the total number of directors on a board in a given year (Maeri, 2014), shows a critical part in corporate governance. It is argued that greater board diversity, achieved through an adequate number of members, fosters interactions and shared ideas, which improve understanding of the firm's environment (EmadEldeen et al., 2021; Nielsen & Huse, 2010), and significantly impacts corporate governance effectiveness (Jackling & Johl, 2009). According to resource dependency theory, board size reflects the diversity of knowledge and resources available to the board. Large board is expected to possess a broader range of knowledge, skills, and expertise, thereby enhancing its monitoring and advisory capabilities (Corbetta & Salvato, 2004). Additionally, a large board can mitigate CEO influence (De Maere, Jorissen, & Uhlaner, 2014). Agency theory argues that a larger board increases disciplinary control over the CEO (Brédart, 2014), fosters external connections, and diversifies expertise.

Conversely, others showed that larger board may be ineffective at monitoring top management (Meckling & Jensen, 1976), potentially contributing to financial distress, and negatively impact financial health (Kalbuana, Taqi, Uzliawati, & Ramdhani, 2022), as larger boards may exacerbate financial challenges, hinder coordination and strategic decision-making (Salloum & Azoury, 2012), thus diminishing their monitoring and service roles. Coordination issues within larger boards may reduce effectiveness, further increasing the risk of financial distress (Harris & Raviv, 2008; Raheja, 2005). Other studies show that the board size has no significant effect on the financial distress (Ombaba & Kosgei, 2017). Therefore, based on these perspectives, we propose:

**H1: Board size has a negative effect on the financial distress risk.**

### **2-2-2 Gender diversity and financial distress:**

Board gender diversity, which is the presence of female directors on corporate boards, is considered a crucial aspect of corporate governance with implications for financial distress. Gender diversity on boards brings diverse perspectives, skills, and ideas, enriching decision-making and enhancing social and environmental commitments (EmadEldeen et al., 2021; Guizani & Abdalkrim, 2023; Loukil et al., 2019; McGuinness, Vieito, & Wang, 2017). It is argued that gender diversity can serve as a tool to mitigate agency problems (Ulain & Hussain, 2020), lower agency cost (Guizani & Abdalkrim, 2023), enhance board composition as a good corporate governance device (Carter, Simkins, & Simpson, 2003), and improve monitoring effectiveness by encouraging more thorough deliberations (Adams & Ferreira, 2009; Loukil et al., 2019). Furthermore, female directors are noted for improving governance through increased attendance and monitoring rates, exhibit more conservative risk behaviors (Bernile et al., 2018; Faccio, Marchica, & Mura, 2016), potentially leading to better financial performance and reduced financial distress (Darrat et al., 2016; García & Herrero, 2021; Hsu et al., 2019; Kristanti et al., 2016).

However, others show that the more female on board will weaken the board, and thus increase probability of financial distress (Saima & Arefin, 2022). On the other hand, others find no significant relationship between the gender diversity and the financial distress, suggesting that other factors may play a more critical role (Salloum & Azoury, 2012; Santen & Donker, 2009). Based on the discussion and the mixed findings in the literature, we propose:

**H2: Board gender diversity has a negative effect on the financial distress risk.**

### **2-2-3 Board Tenure and financial distress:**

Board tenure is the average number of years the directors have served on a board (Finkelstein & Hambrick, 1990; Hambrick & D'Aveni, 1992). It reflects the increasing control board members have over executive monitoring as their tenure lengthens, allowing them to accumulate firm-specific knowledge essential for effective strategic decision-making (Hillman & Dalziel, 2003). This knowledge enhances their ability to perform advising, creativity, and expertise in monitoring (Khan, Khan, & Saeed, 2019). Directors with long tenures are more willing to join board and committee conferences, accept committee tasks, have a better understanding of the firm's strategic policies, enhance access to



resources, and improve long-term financial and social performance (Post & Byron, 2015). Moreover, long-tenured board members are argued to control agency problems by dropping CEO rent extraction, leading to improved investment and acquisition policies and higher firm performance (Kim, Mauldin, & Patro, 2014), and reducing the chances of insolvency (Wilson, Wright, & Altanlar, 2014). thereby reducing the risk of financial distress (Ali et al., 2022).

Conversely, others found a negative association between the board tenure and the financial distress (De Maere et al., 2014), including increased management allegiance and reduced independence in monitoring (Byrd, Cooperman, & Wolfe, 2010). Extended tenure may lead to groupthink and limit diverse viewpoints within the board potentially hindering effective governance. A large portion of long-tenured board members reduces the board's effectiveness in reducing firm risk. This reduction in effectiveness is attributed to the emergence of groupthink or allegiance to the CEO, which hampers the board's monitoring role (Bernile et al., 2018)

Conversely, some studies found that board diversity has no impact on risk and investment oversight. Although there is an increasing body of research on the economic effects of tenure diversity, literature on board tenure diversity and financial distress remains limited (Salloum & Azoury, 2012).

In conclusion, while longer board tenure is generally associated with enhanced governance capabilities and reduced financial distress, potential drawbacks such as reduced independence and increased groupthink should be carefully considered and managed within board dynamics. Despite these contrasting views, we propose:

**H3: Board tenure has a negative effect on the financial distress risk.**

#### **2-2-4 Independent Directors and financial distress:**

An independent director is a board member who lacks significant affiliations with the company beyond their role on the board, has not been employed by the company in the past five years, has no familial ties to senior management, and holds no contracts with the company (Beasley, 1996). This independence ensures these directors can exercise unbiased judgment in their oversight role (Meckling & Jensen, 1976). Independent directors play a crucial monitoring role, potentially curbing practices that could compromise financial statement quality or breach securities laws (Byrd et al., 2010). Empirical studies suggest that firms with a higher proportion of independent directors exhibit

better performance and are less likely to experience financial distress (Darrat et al., 2016) , as these directors enhance governance effectiveness and mitigate risky practices (Appiah & Chizema, 2016; Manzaneque, Merino, & Priego, 2016; Salloum & Azoury, 2012). They are also more effective at avoiding bankruptcy once distress is specified (Fich & Slezak, 2008; Fizabaniyah, Nurcahyono, Argojuwono, & Hernawati, 2023).

However, some argue that insider-dominated boards may be preferred due to their access to critical internal information (Harris & Raviv, 2008). Stewardship theory supports this view, suggesting that firms with a majority of insider directors may demonstrate superior financial outcomes (Donaldson & Davis, 1991).

On the other hand, others find that independent director are inadequate for aligning shareholders' interests and ineffective at avoiding or reducing financial distress in firms when other factors are overlooked (Freitas Cardoso, Peixoto, & Barboza, 2019). Based on the existing literature, board diversity, particularly in terms of independent directors, is pivotal in predicting financial distress risk. Hence, we propose the following hypothesis:

**H4: Independent directors has a negative effect on the financial distress risk.**

These hypotheses provide a foundation for understanding the nuanced effects of board characteristics on financial health and underscore the importance of a balanced and well-structured board in corporate governance.

### **3- Research methodology:**

#### **3-1 Target Sample and Data collection**

The population of this study consists of EGX30, with a sample of the non- financial companies for the period from 2014 to 2023. This data was collected from the data stream. The final sample is 23 non-financial firms from EGX30 for the period from 2014 to 2023 with a total 230 observations.

#### **3-2 Variables Measurement:**

The measurement of variables is detailed in Table 1. Panel A presents the dependent variable, the Altman Z score, which measures financial distress. Panel B lists the independent variables related to board diversity, including structural (board size and independent board), demographic (gender diversity), and cognitive (board tenure) aspects. Panel C includes the control variables.

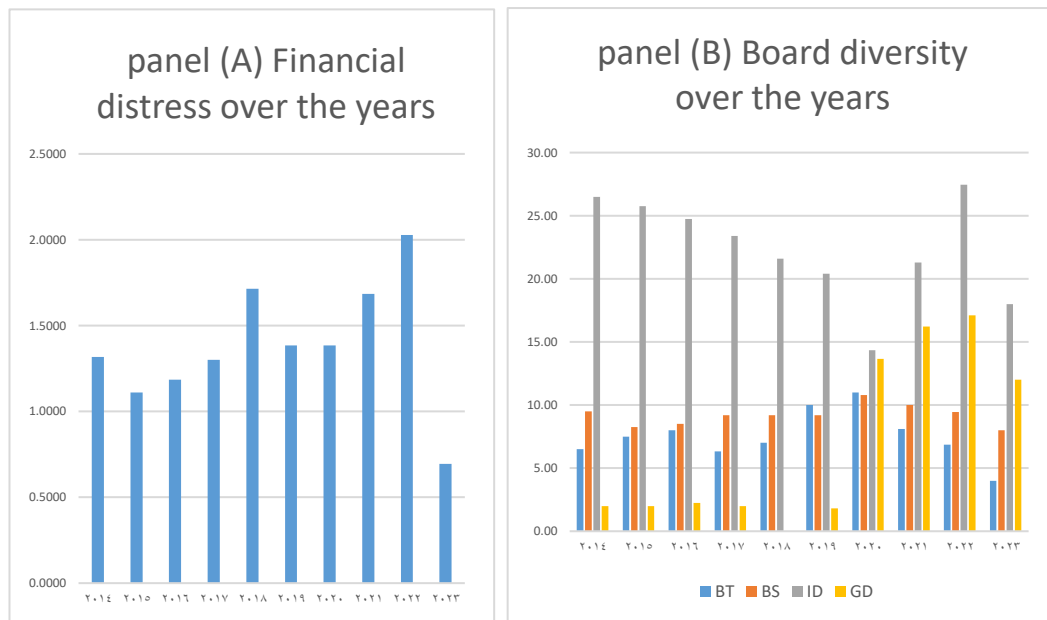
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**Table (1) variables measurement:**

Variables	Code	Measurement
Panel (A) dependent variable		
Altman Z score model	FD	$Z=1.2A+1.4B+3.3C+0.6D+1E$ <p>A is the Working Capital divided by Total Assets                      B is the Retained Earnings divided by Total Assets                      C is the Earnings Before Interest and Taxes divided by Total Assets                      D is the Market Value of Equity divided by Book Value of Total Liabilities                      E is the Sales divided by Total Assets</p>
Panel (B) independent variables		
Board size	BS	The total number of board members at the end of the fiscal year.
Gender diversity	GD	Percentage of female on the board
Board tenues	BT	Average number of years each board member has been on the board.
Independent board	IB	Percentage of independent board members as reported by the company.
Panel (C): control variables		
leverage	LEV	Total debt divided by total asset
Liquidity	LIQ	Current asset divided by current liability
Tangibility	TAN	Fixed asset dividend by total asset
Firm size	SIZE	Log Total asset

**4- Data analysis:**

**4-1 Descriptive statistics:**



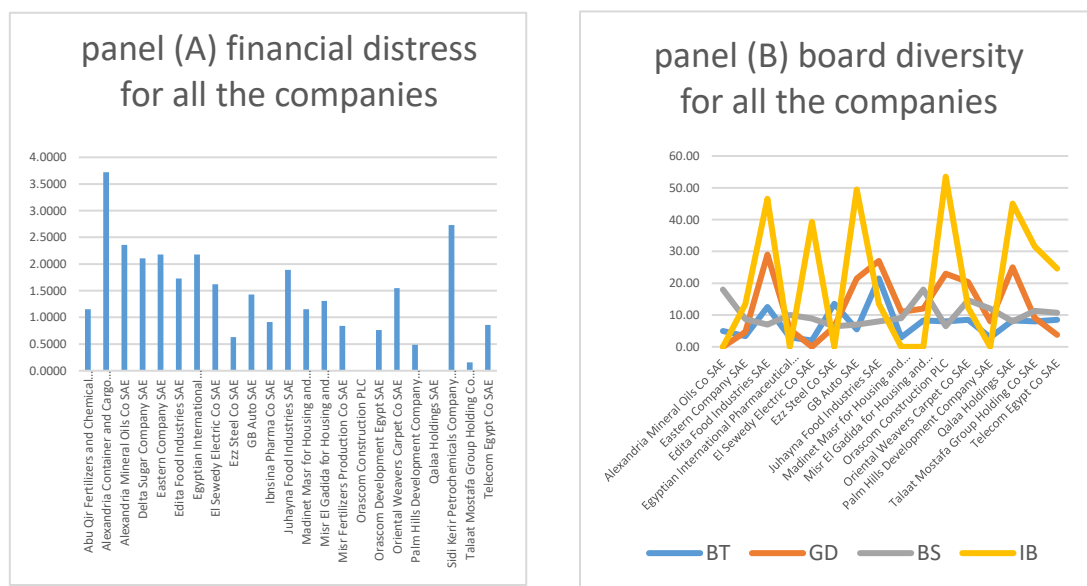
**Figure (1): Descriptive Statistics over the years**

Figure (1) displays trends in financial distress and board diversity from 2014 to 2023. In Panel (A), the Altman Z-score, a measure of financial distress, initially shows low distress with a high score in 2014, followed by a decrease in 2015, and subsequent fluctuations until 2018. It then declines notably in 2019 and 2020, reflecting increased financial distress due to the COVID-19 pandemic, before rising again by 2022. Panel (B) reveals relatively stable trends in board size and tenure over the period. However, gender diversity exhibits a significant increase from 2020 to 2023 after a period of low representation from 2014 to 2019. Conversely, the proportion of independent directors remains high until 2019 but decreases notably in 2020 due to a reduction in independent appointments during the pandemic, before rebounding thereafter.

The fluctuations in financial distress and board diversity observed in Figure (1) can be attributed to various economic and governance factors influencing Egyptian companies. For instance, the sharp increase in financial distress during 2019 and 2020 coincides with the severe economic impact of COVID-19 on global markets, including Egypt, affecting revenue streams, supply chains, and overall business stability. The subsequent recovery in

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financial health from 2021 onwards may reflect adaptive strategies and economic rebound efforts in the post-pandemic era, potentially supported by improved governance practices such as enhanced board diversity and strategic oversight. These trends underscore the dynamic interplay between corporate governance practices and financial performance in navigating external shocks and driving sustainable growth in Egypt's business landscape.



**Figure (2): Descriptive Statistics for all the companies:**

Figure (2) shows financial distress represented by the average Altman Z score for each company in panel (A), and board diversity in panel (B). Panel (A) indicates that companies such as Alexandria Container and Cargo Handling Company, Sidi Kerir Petrochemicals Company, Alexandria Mineral Oils, Delta Sugar Company, Eastern Company SAE, and Egyptian International Pharmaceutical Industries Company exhibit the highest Altman Z scores, suggesting low financial distress.

In panel (B), Ezz Steel Co SAE and Edita Food Industries SAE have board tenures exceeding 10. While Juhayna Food Industries SAE shows a board tenure of 21, Notably, Edita Food Industries SAE and Juhayna Food Industries SAE also demonstrate significant gender diversity with more than 27 directors, whereas Orascom Construction PLC and GB Auto SAE have gender diversity with more than 20 directors. Conversely, Alexandria Mineral Oils Co SAE, Misr El Gadida for Housing and Development SA, and Oriental Weavers Carpet Co

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SAE exhibit the largest board sizes. Additionally, Edita Food Industries SAE, GB Auto SAE, and Orascom Construction PLC have the highest independent directors, with up to 49 directors. In Egypt, recent economic reforms and sector-specific challenges, such as fluctuations in global commodity prices or regulatory changes, could impact companies' financial positions. For instance, industries like food processing (represented by Juhayna Food Industries SAE and Edita Food Industries SAE) and construction (Orascom Construction PLC) are sensitive to market demand and government policies, influencing their financial stability and strategic board decisions. Moreover, gender diversity, independent directors, board size and board tenure play crucial roles in governance and decision-making processes, affecting companies' resilience to financial distress.

Table (2): Descriptive Statistics:

Variables	Sample Size	Mean	Std. Dev.
BS	230	10.102	4.089
GD	230	12.798	11.723
BT	230	8.272	6.328
IB	230	21.792	17.714
LEV	230	0.302	0.205
LIQ	230	1.200	0.390
TAN	230	0.488	0.177
SIZE	230	7.258	0.445
FD	230	1.675	0.654

Table (2) shows the descriptive statistics for all the variables, it shows that the average board size is 10.102, the average gender diversity is 12.798, the average board tenure is 8.272, and the average independent board is 21.792 members. Moreover, the average Altman Z score is 1.675, which is considered to be low.

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**4-2 Correlation Analysis:**

**Table (3): Correlation analysis:**

Variables	Corr.	BS	GD	BT	IB	LEV	LIQ	TAN	SIZE	FD
BS	Corr.	1								
	p-value									
GD	Corr.	-0.273	1							
	p-value	0.009								
BT	Corr.	-0.325	0.639	1						
	p-value	0.002	0.000							
IB	Corr.	-0.375	0.233	-0.246	1					
	p-value	0.000	0.027	0.020						
LEV	Corr.	-0.372	0.218	0.335	0.054	1				
	p-value	0.000	0.039	0.001	0.611					
LIQ	Corr.	0.510	0.047	-0.237	-0.047	-0.500	1			
	p-value	0.000	0.660	0.024	0.663	0.000				
TAN	Corr.	0.109	-0.279	-0.455	0.105	-0.039	0.456	1		
	p-value	0.307	0.008	0.000	0.325	0.713	0.000			
SIZE	Corr.	0.179	-0.689	-0.552	-0.184	0.114	-0.259	0.226	1	
	p-value	0.091	0.000	0.000	0.082	0.285	0.014	0.032		
FD	Corr.	-0.136	0.447	0.144	0.331	-0.455	0.455	0.228	-0.542	1
	p-value	0.200	0.000	0.176	0.001	0.000	0.000	0.031	0.000	

Table 3 presents the correlation analysis examining how the financial distress, relates to various independent variables such as board diversity, structural factors (board independence and board size), demographic attributes (gender diversity), and cognitive board diversity (board tenure). The table also shows correlations among the independent variables. Multicollinearity, which becomes a concern if correlations between independent variables surpass 0.80, is not an issue according to the matrix. The highest correlation observed is 0.689 between firm size and gender diversity, while the lowest is 0.039 between tangibility and leverage.

**4-3 Panel Data Analysis:**

This study utilizes panel data from 23 firms over the period from 2014 to 2023 and applies three regression models: Pooled Regression, Fixed Effect, and Random Effect. To determine the most appropriate model, three statistical tests are conducted: the Wald test, the Breusch-Pagan LM test, and the Hausman test. These tests are performed at a significance level of  $\alpha=0.05$  using E-views 13 for data analysis. A statistical model was developed to test the hypotheses using the following equation.

$$FD_{it} = \beta_0 + \beta_1(BS)_{it} + \beta_2(GD)_{it} + \beta_3(BT)_{it} + \beta_4(IB)_{it} + \beta_5(LEV)_{it} + \beta_6(LIQ)_{it} + \beta_7(TAN)_{it} + \beta_7(SIZE)_{it}\epsilon_{it}.$$

where:

**FDit**: is Financial Distress for Company i during time t.

**BSit**: is Board Size for Company i during time t.

**GDit**: is Gender Diversity for Company i during time t.

**BTit**: is Board Tenure for Company i during time t.

**IBit**: is Independent Board Members for Company i during time t.

**LEVit**: is Leverage for Company i during time t.

**LIQit**: is Liquidity for Company i during time t.

**TAN**: is Tangibility for Company i during time t.

**SIZEit**: is Firm Size for Company i during time t.

**eit**: is the random error that is resulted from regression model.

Table (4) shows the results of Panel Data Models (Pooled Model, Fixed Effects Model, and Random Effects Model) for Egyptian listed firm (EGX30).

**Table (4): Regression models:**

Variables	Pooled Model				Fixed Effect Model				Random Effect Model			
	Coefficients		t-test		Coefficients		t-test		Coefficients		t-test	
	Value	S.E.	t	p-value	Value	S.E.	t	p-value	Value	S.E.	t	p-value
Constant	1.055	1.143	0.923	0.359	-1.812	1.296	-1.398	0.166	1.055	0.883	1.195	0.236
BS	-0.025	0.013	-1.986	0.050	0.013	0.036	0.375	0.709	-0.025	0.010	-2.57	0.012
GD	0.020	0.005	3.827	0.000	0.038	0.007	5.282	0.000	0.020	0.004	4.956	0.000
BT	0.036	0.012	3.088	0.003	0.013	0.024	0.521	0.604	0.036	0.009	3.999	0.000
IB	0.010	0.003	3.300	0.001	0.017	0.006	2.928	0.005	0.010	0.002	4.274	0.000
LEV	-2.103	0.237	-8.861	0.000	-2.721	0.394	-6.914	0.000	-2.103	0.183	-11.5	0.000
LIQ	0.151	0.166	0.906	0.367	0.150	0.156	0.965	0.338	0.151	0.128	1.174	0.244
TAN	1.526	0.288	5.293	0.000	1.694	0.558	3.036	0.003	1.526	0.223	6.855	0.000
SIZE	-0.025	0.140	-0.181	0.857	0.304	0.211	1.443	0.153	-0.025	0.108	-0.23	0.815
<b>R<sup>2</sup></b>	0.766				0.874				0.766			
<b>F-test(p-value)</b>	33.166 (0.000)				31.750 (0.000)				33.166 (0.000)			
<b>LM-test(p-value) = 26.301 (0.000), Wald-test(p-value) = 7.861 (0.000),</b> <b>Hausman-test(p-value) = 62.888 (0.000)</b>												

From the LM-test, Wald-test and the Hausman-test results. The study will use the Fixed Effects Model. The fixed effect model demonstrates that gender diversity (GD), independence (IB), and tangibility (TAN) have a positive significant impact on the Altman Z score, indicating a potential reduction in



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financial distress (FD), with regression coefficients of 0.038, 0.017, and 1.694 respectively, and all associated t-test p-values less than 0.05 (p-value = 0.000, 0.005, 0.003 <  $\alpha = 0.05$ ). Therefore, **hypotheses 2 and 4 are supported**. Conversely, leverage (LEV) shows a negative and statistically significant effect on the Altman Z score, suggesting an increase in the probability of financial distress, with a regression coefficient of -2.721 and a t-test p-value of 0.000, which is less than  $\alpha = 0.05$ . On the other hand, there is no statistically significant effect of board size (BS), earnings before tax (EB), and liquidity (LIQ) on FD, as evidenced by t-test p-values greater than the significance level at 5% (p-value = 0.709, 0.604, 0.338 >  $\alpha = 0.05$ ), **leading to the rejection of hypotheses 1 and 3**. Moreover, the independent variables included in the model explain 87.4% of the variance in the financial distress, with the remaining variance attributable to random errors or unaccounted factors affecting the financial distress.

### **Summary and conclusion:**

This study aimed to examine the influence of structural (board independence and board size), demographic (gender diversity), and cognitive (board tenure) diversity attributes on the likelihood of financial distress among non-financial companies listed on the EGX30 from 2014 to 2023. The sample consisted of 23 firms, totaling 230 observations, with data sourced from Data stream. The dependent variable, the Altman Z score, was utilized to measure financial distress. Structural board diversity was measured by board size and independence, demographic diversity by gender representation, and cognitive diversity by board tenure.

Panel data analysis was employed, utilizing three models: Pooled Regression, Fixed Effect, and Random Effect models. The findings indicate that gender diversity and independent directors have a significant negative impact on financial distress, suggesting that greater representation of women and independent directors on boards is associated with lower financial distress likelihood. In contrast, board size and board tenure showed no significant impact on financial distress among Egyptian listed firms. Therefore, this study underscores the importance of structural and demographic board diversity in enhancing financial stability and resilience, highlighting the strategic advantage such diversity can provide in navigating economic uncertainties and regulatory challenges.

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In conclusion, promoting greater diversity in board composition, particularly in terms of gender and independence, appears beneficial for mitigating financial distress risks in Egyptian listed firms. Future research could explore additional dimensions of board diversity and incorporate broader economic and market contexts to further enrich our understanding of these dynamics.

Based on the findings of this study, policymakers should consider implementing regulations that promote greater gender diversity and independence on corporate boards. Specifically, policies could mandate a minimum number of independent directors and female board members to enhance governance practices and reduce financial distress risks. Encouraging or even requiring diversity training for boards may further optimize their decision-making capabilities. Additionally, incentives for companies that exceed diversity benchmarks could be introduced to foster a more inclusive and effective board culture. Collaborative efforts between academics and industry practitioners could yield actionable insights and practical recommendations to enhance board effectiveness and corporate resilience.

### **Analysis and discussion:**

In this study, Gender diversity in corporate boards and leadership positions has been shown to reduce the probability of the financial distress. It suggests that diverse boards bring a broader range of perspectives and decision-making styles, leading to more comprehensive risk management and strategic planning. According to the previous research, gender diversity can serve as a tool to mitigate agency problems (Ulain & Hussain, 2020), lower agency cost (Guizani & Abdalkrim, 2023), enhance board composition as a good corporate governance device (Carter et al., 2003), and improve monitoring effectiveness by encouraging more thorough deliberations (Adams & Ferreira, 2009; Loukil et al., 2019). Furthermore, female directors are noted for improving governance through increased attendance and monitoring rates, exhibit more conservative risk behaviors (Bernile et al., 2018; Faccio et al., 2016) potentially leading to better financial performance. The result is consistent with (Darrat et al., 2016; García & Herrero, 2021; Hsu et al., 2019; Kristanti et al., 2016). However, the result is inconsistent with (Saima & Arefin, 2022; Salloum & Azoury, 2012; Santen & Donker, 2009).

In the context of Egypt, recent developments have highlighted efforts towards greater gender equality in corporate governance, making such diversity crucial. Companies in Egypt, like Edita Food Industries, Juhayna Food Industries, Orascom Construction, and GB Auto, which have the highest gender diversity in the non-financial firms in EGX30, are likely to benefit from improved decision-making processes and reduced risk of financial distress. This positive impact underscores the importance of inclusive leadership practices in fostering stability and resilience within corporate structures, ultimately contributing to sustainable business growth in the Egyptian market.

On the same vein, the independent directors can positively impact a company's Altman Z score and subsequently reduce the likelihood of financial distress through several mechanisms. First, independent directors bring a broader range of perspectives and experiences to boardroom discussions, leading to more comprehensive decision-making processes. This diversity can help identify risks earlier and implement more effective risk management strategies, thereby bolstering the company's financial health. As according to previous studies, this independence ensures these directors can exercise unbiased judgment in their oversight role (Meckling & Jensen, 1976), and play a crucial monitoring role (Byrd et al., 2010). The result is consistent with (Darrat et al., 2016), as these directors enhance governance effectiveness and mitigate risky practices (Appiah & Chizema, 2016; Darrat et al., 2016; Fich & Slezak, 2008; Fizabaniyah et al., 2023; Manzaneque et al., 2016; Salloum & Azoury, 2012). However, the result is inconsistent with Stewardship theory and (Freitas Cardoso et al., 2019). Companies in Egypt, such as Edita Food Industries SAE, GB Auto SAE, and Orascom Construction PLC, which have the highest number of independent directors, are increasingly recognizing the value of independent boards in navigating economic uncertainties and regulatory challenges. This positions them more robustly against financial distress. This trend underscores a growing acknowledgment of the strategic advantage that board diversity can confer in maintaining financial health and resilience amidst dynamic market conditions.

The study also showed that the board size has no effect on the financial distress. The result is consistent with (Ombaba & Kosgei, 2017), and inconsistent with the resource dependency theory and (Kalbuana et al., 2022). Moreover, the board tenure has no effect on the financial distress, the result is consistent with (Salloum & Azoury, 2012), and inconsistent with (Ali et al., 2022).

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## تحليل أثر تنوع مجالس الإدارة على مخاطر التعثر المالي

### دراسة تطبيقية على الشركات المصرية المقيدة بالبورصة

#### الملخص:

**الهدف:** تهدف هذه الدراسة في قياس أثر تنوع مجالس الإدارة على التعثر المالي للشركات المصرية غير المالية المقيدة بالبورصة.

**التصميم والمنهجية:** قامت الدراسة باستخدام عينة مكونة من ٢٣ شركة غير مالية مدرجة في EGX30 من عام ٢٠١٤ وحتى عام ٢٠٢٣. وتم القيام بتحليل البيانات الجماعية، بما في ذلك نماذج الانحدار المجمع والتأثير الثابت والتأثير العشوائي.

**النتائج:** أظهرت نتائج الدراسة الي أن التنوع بين الجنسين والمديرين المستقلين لهما تأثير سلبي ذات دلالة معنوية على التعثر المالي للشركات المصرية، مما يؤكد دورهما في تعزيز الاستقرار المالي والمرونة. وعلى العكس، كشفت النتائج ايضا الي ان حجم مجلس الإدارة ومدة ولايته لا يظهران أي تأثير معنوي على التعثر المالي للشركات المصرية.

**الأصالة والإضافة:** تسلط هذه النتائج الضوء على الميزة الإستراتيجية للتنوع الهيكلي والديموغرافي في التغلب على حالات عدم اليقين الاقتصادي والتحديات التنظيمية داخل الشركات المصرية المقيدة بالبورصة، مما يفتح مجال لإجراء مزيد من الأبحاث في سياق اقتصادي أوسع.

**الكلمات المفتاحية:** تنوع مجلس الادارة، التنوع الهيكلي، التنوع الديموغرافي، التنوع المعرفي، Altman Z score، التعثر المالي، حوكمة الشركات، التنمية المستدامة.