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Business Resilience and Business Innovation for Sustainability

The Double-Edged Role of Artificial Intelligence and Other Disruptive Technologies

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Preface

Scholars, practitioners, and professionals consider business innovation as a necessity to minimize business risk. Through technological innovation, businesses can adapt to societal changes and reduce the impact of both internal and external threats and risks. Business resilience is the ability to deal with challenging conditions by ensuring the existence and prosperity of the organization. In today's rapidly evolving global landscape, businesses face unprecedented challenges and opportunities. The twin imperatives of building resilience against disruptions and driving innovation for sustainable growth have become paramount for long-term success. This book delves into the complex and often paradoxical role of artificial intelligence (AI) and other disruptive technologies in navigating this intricate terrain.

While AI and related technologies offer transformative potential for enhancing business resilience—from predictive analytics for risk mitigation to automated systems for operational continuity—they also present significant challenges. Ethical considerations, potential biases in algorithms, job displacement concerns, and the environmental impact of technology development all demand careful consideration. This double-edged sword requires a nuanced understanding to harness the benefits while mitigating the risks.

This book aims to provide a comprehensive exploration of this dynamic interplay between technology, resilience, and sustainability. It is targeted towards a diverse audience, including academics, students, researchers, business practitioners, policymakers, and anyone interested in the intersection of technology, business strategy, and sustainable development.

We explore a range of critical topics, including but not limited to technological innovation and inclusivity, sustainable educational planning and integrating technology into educational development strategies, the impact of data analytics on business intelligence, financial technology and inventory management efficiency, augmented reality and digital marketing, and many more.

This work is intended to inspire critical thinking, foster collaboration, and contribute to a more informed and responsible approach to harnessing the power of technology for the benefit of both businesses and society.

Our hope is that this book will serve as a valuable resource for navigating the complex challenges and opportunities presented by AI and other disruptive technologies in the pursuit of sustainable business excellence.

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Board of Directors' Attributes and Quality of Sustainability Reports Among Industrial Companies and Banks Listed on a Stock Exchange

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Abstract The study's objective was to investigate the effects of board attributes on sustainability reporting in 18 banks and industrial enterprises listed on the Palestine Stock Exchange between 2013 and 2022. The study employed Linear Regression Analysis to select between the fixed regression model and the random regression model based on the *p*-value, as well as Descriptive Statistics for each variable and the Correlation Coefficient for the strength of the associations between the variables. We employed randomization if the percentage is more than five percent. R corn 4.1.1. The study found that the size of the board of directors and gender diversity are significant factors in the caliber of sustainability reports, and that the CEO's independence and dual personality have a detrimental impact on the caliber of sustainability reports. The study made the following recommendations for the Board of Directors: it should be larger, more diversified, and comprise non-executives. It is also advised that banks and businesses in the industrial sector reveal the level of their CSR and show more concern for the environment and human resources.

Keywords Board of directors characteristics · Quality of sustainability reports · Corporate social responsibility · Agency theory · Resource dependence theory

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1 Introduction

Sustainability disclosures are becoming increasingly important in developing countries as governments recognize social and environmental issues and investors' interest in transparency increases [1, 2]. Establishing internal control systems and maintaining efficient stakeholder communication are critical tasks for the board of directors, and a diverse board improves the caliber of decision-making [3–5]. Gender diversity on corporate boards significantly influences firms' sustainability engagement, as evidenced by recent literature [6, 7]. Even one female board member can improve a company's social responsibility, particularly in settings where men predominate [8]. In addition to bringing more diversified skills and experience to the board, the size of the board of directors has a significant impact on the company's operations, management, and ability to fulfill strategic goals related to sustainable development [5, 9], which is one of the main drivers of its effectiveness [10], Furthermore, independent directors possess unique incentives and values in contrast to executive directors, who typically prioritize short-term objectives. While independent directors do not take part in the company's production or operations and instead seek to enhance the decision-making process, executive directors are directly involved in these activities and their choices are frequently impacted by their administrative roles within the organization. Regarding the Board of Directors, considering their autonomy [11–13]. Being the CEO and chairman at the same time creates a conflict in leadership and governance [14].

The industrial sector contributes significantly to economic development by providing employment opportunities, increasing productivity and exports [15]. Financial institutions, especially banks, also play a key role in influencing corporate social responsibility across all industries by improving corporate governance, transparency, and disclosure [16]

The board of directors plays a crucial role in leading businesses [17, 18], yet it is frequently blamed for oversight shortcomings and corporate missteps that reduce shareholder value [19]. Businesses aim to strike a balance between sustainability and financial performance, putting long-term expansion ahead of immediate profits [20]. Public enterprises are essential to sustainable development and resource utilisation in Palestine; nevertheless, despite their ability to alleviate poverty and economic issues, there is a dearth of study on corporate social responsibility (CSR) in contested locations such as Palestine [21].

Sustainability reports are essential resources for promoting communication between businesses and a wide range of stakeholders, such as government agencies, communities, suppliers, employees, shareholders, and investors. These reports emphasize responsibility and transparency by providing insightful information about how businesses handle sustainability issues, contribute value, and reduce risks. Sustainability reports are essential for the Board of Directors because they keep an eye on management procedures, assess business performance, and direct strategic decision-making. Boards can assure long-term sustainability, improve company

governance, and increase competitiveness in the market by utilizing the information found in sustainability reports.

Our study, which is unique in that it focuses on revealing the quality of corporate social responsibility in addition to levels, by including pictures, numbers, and graphics, aims to analyse the impact of board characteristics on the quality of sustainability reports in industrial companies and banks listed on the Palestine Stock Exchange from 2013 to 2022. It also concentrated on assessing how board composition affects CSR issues (environment, human resources, employees, and products).

2 Theoretical Background, Literature Review and Hypotheses Development

Sustainability reports foster communication between companies and stakeholders, promoting transparency and accountability. They help stakeholders understand a company's sustainability efforts and value creation while managing risks. For the board of directors, sustainability reporting is crucial for overseeing management behavior and evaluating performance, ensuring effective guidance. Sustainability reporting involves measuring, disclosing, and evaluating organizational efforts to achieve sustainable development goals [2]. Agency theory states that by regulating managers' behaviour, independent board members can improve board oversight and lower agency costs [22, 23] In order to attain competitive excellence and continual development, boards must balance economic, social, and environmental objectives. Resource dependence theory highlights the significance of management boards' competencies in promoting sustainability [24].

2.1 Gender Diversity

Gender diversity on corporate boards is crucial for addressing sustainability issues and enhancing management effectiveness, according to recent studies. Theoretical frameworks including as resource dependence theory and stakeholder theory encourage the participation of women on boards, and research suggests that the diversity of their perspectives improves decision-making [25]. Research indicates that organisations with a higher proportion of female board members typically exhibit superior stakeholder management, community involvement, and philanthropic endeavors [26]. Furthermore, there is a correlation between higher female representation and a higher probability of generating integrated sustainability reports [27]. Although this topic has received more attention from developed nations, research shows that sustainable practices and board gender diversity are positively correlated in both developed and emerging markets [28]. Research from Asia, Africa,

and Europe in particular has shown that corporations with larger percentages of female board members typically have more robust environmental, social, and governance (ESG) disclosures [29, 30]. To completely comprehend the mechanisms underlying these links and their consequences for corporate governance and sustainability, more research is necessary, even in light of the increased focus and data supporting these relationships. Based on the above theoretical and empirical arguments, we hypothesize that:

H1: There is a positive correlation between Board Gender Diversity and the Quality of Sustainability Reports.

2.2 Board Size

The total number of board members who are employed by a specific corporation is known as the board size. In terms of financial knowledge and problem-solving abilities, boards typically contain a wider range of backgrounds, which benefits the company's reputation and image [31]. The quality of sustainability reporting is positively correlated with board size, as repeatedly shown by recent study. Research by [32–36] all demonstrate that stronger sustainability reporting and larger boards are positively correlated. According to agency theory, corporations in Malaysia that have a larger board have better sustainability disclosure [37]. In a similar vein, [38] found that bigger boards improve disclosures about sustainability in Pakistani businesses. Additionally, [39] discovered a statistically significant and favorable correlation between board size and sustainability reporting. Additionally, [40] emphasized how important board size is to enhancing sustainability reporting for Nigerian listed non-financial companies. Based on the above theoretical and empirical arguments, we hypothesize that:

H2: There is a positive correlation between Board Size and the Quality of Sustainability Reports.

2.3 Board Independence

For the Board of Directors to effectively oversee the agent and internal operations, independence is essential. By making sure there are an adequate number of independent directors, this is accomplished [41]. Board independence and sustainability reporting are positively correlated, according to recent studies. Research [27] found that, among 134 multinational corporations, board independence was positively correlated with integrated reporting quality. After examining 88 South Asian listed businesses, Abdelhaq et al. [42] came to the conclusion that board independence has a big impact on environmental sustainability reporting. In a similar vein, Amer

et al. [43] highlighted how important board independence is to encouraging sustainability reporting among 176 Latin American publicly traded companies. Furthermore, Githaiga and Kosgei [31] demonstrated that independence, financial know-how, and gender diversity on boards have a favorable effect on sustainability reporting in East African listed businesses. These results were corroborated by study [40], which showed that board independence improves sustainability reporting for Nigerian listed non-financial enterprises. Based on the above theoretical and empirical arguments, we hypothesize that:

H3: There is a positive correlation between Board Independence and the Quality of Sustainability Reports.

2.4 CEO Duality

CEO duality, in which a single individual serves as both the chairman and the CEO at the same time, facilitates executive authority coherence and expeditious decision-making, which benefits businesses in critical business situations [44]. This arrangement makes it easier for management and the board to communicate effectively since the CEO can use their power to improve performance and reveal pertinent information [39]. When considering CEO duality from the perspective of agency theory, profit maximization may take precedence over CSR activities [35]. Research by [43, 45] discovered inverse relationships between CEO duality and ESG disclosure in publicly traded firms, indicating that centralized authority may obstruct efficient governance and decision-making, resulting in disputes and eroding the legitimacy of corporate governance frameworks. Based on the above theoretical and empirical arguments, we hypothesize that:

H4: There is a negative correlation between Board CEO Duality and the Quality of Sustainability Reports.

3 Methodology

3.1 Population and Sample

From 2013 to 2022, banks and industrial enterprises registered on the Palestine Stock Exchange made up the study population. The sample comprises companies that satisfy multiple requirements, of which:

First, being listed on the Palestine Stock Exchange.

Second, being listed within the specified timeframe.

These requirements led to the inclusion of 18 banks and industrial enterprises in the sample. Comprising seven of the eight banks and eleven industrial enterprises; Al Safa Bank was left out in because it was listed in 2022.The study focused on the industrial sector and banks because they represent an important sector in Palestine, as they are considered among the emerging Palestinian sectors that affect the state's economy.

3.2 Variable Measurement

The Dependent Variable: Quality of Sustainability Reporting

Measuring, revealing, and holding organizations responsible for their efforts toward attaining sustainable development goals are all part of sustainability reporting [2].

The study [46] provided the baseline for the corporate social responsibility levels used to judge the quality of sustainability reports, which were then adjusted to fit the study's sample. The measurement of corporate social responsibility involves examining the information contained in the financial reports of banks and industrial enterprises. A score of 1 indicates the presence of CSR, while a score of 0 indicates its absence.

$$\text{CSR-Level} = \sum \text{Employee, Product, Environment, and Community Points}/30.$$

Independent Variables

Four independent variables were employed in the study: Gender Diversity, Board Size, Independence, and CEO Duality. Moreover, four control variables were employed: Leverage, Profitability, Firm Size, and Firm Age.

The operational definitions of dependent, independent, and control variables are given in Table 1.

3.3 The Regression Model

The following multiple regression model was created in order to investigate the effects of board of directors characteristics on the quality of sustainability reports in banks and industrial enterprises listed on the Palestine Stock Exchange between 2013 and 2022:

$$CSR - L = \alpha i + \beta 1BGD + \beta 2BSIZE + \beta 3BIND + \beta 4CEO + \beta 5LEV + \beta 6PROF + \beta 7SIZE\,F + \beta 8AGE + \varepsilon it$$

Table 1 Measurement of variables

Variable	Label	The definition	Operational definition	References
Corporate social responsibility-level	CSR-L	Ability to manage operations efficiently and achieve profitability, leading to business sustainability and effective achievement of financial goals [46]	$\sum$ Points of (community, environment, employee, and product)/30	[46]
Gender diversity	BGD	A certain proportion of women must be on the board of directors [47]	The proportion of female directors	[31]
Board size	BSIZE	The board size represents the total number of individuals serving as board members within a specific company [31]	The number of board members	[31, 48]
Independence	BIND	The board is composed of several independent directors [31]	The ratio of independent directors to the total number of directors on the board	[49]
CEO duality	CEO	Means that the CEO also serves as the chairman of the board [48]	Converted the variable to a binary representation, where "0" means that the CEO is not the chairman and "1" indicates that they are	[39, 48]
Leverage	LEV	The debt-to-assets ratio measures how much of a company's assets are financed by debt. It is computed by dividing total liabilities by total assets. This metric assesses a company's reliance on borrowed capital or leverage [50]	Total liabilities to total assets	[51, 52]
Profitability	PROF	The profits a company achieves from revenues after deducting all costs and expenses observed during a certain period	Net income divided by total assets is the return on asset equation	[51]

(continued)

Table 1 (continued)

Variable	Label	The definition	Operational definition	References
Firm Size	SIZE	Typically, a company's capitalization, total assets owned, and total sales generated all indicate its size	The asset total log at the conclusion of the period	[39]
Firm Age	AGE	The period during which the company exists and is active in the market	Number of years passed since listing	[53]

Source Developed by authors

3.4 Additional Analysis

Two further metrics were included in the study: In the first research, the quality of corporate social responsibility was ranked from 0 to 6 based on the board of directors' qualities, as determined by looking at numbers and photos [8].

0: No information disclosed, 1: An item's general disclosure; 2: Items referenced in general disclosures that have accompanying photos; 3: are descriptive and qualitative disclosures that provide clear and precise details; 4: are mostly qualitative and descriptive disclosures that include supporting images or diagrams; 5: are digital disclosures or disclosures that include numerical data; and 6: are full digital disclosures that include pictures or graphs.

The impact of the board of directors' attributes on the CSR items of environment, human resources, society, and product is the subject of the second examination.

4 Result and Discussion

4.1 Descriptive Statistics

Table 2 presents the findings of the descriptive statistical analysis of the study variables, which comprise the dependent, independent, and control variables Together with the other analytical variables that were examined in the study:

Table 2 shows the descriptive statistical analysis that industrial companies and banks listed on the Palestine Stock Exchange generally disclose their CSR levels, with an average CSR-L of 0.55 ($p = 0.90$d). However, there is a need to improve the detection of CSR-Q, which is indicated by the lower average CSR-Q of 0.18 ($p = 0.99$d), which is equivalent to 3%. Regarding items of CSR, (ENV) is lower (mean = 0.28), while disclosures related to (HR), (CI), and (PRO) are relatively higher. (BGD) is low (0.08), with the average percentage of female board members being around 9%, which is below corporate governance requirements. Most board

Table 2 Descriptive statistical analysis

Variable	Mean	Std. Dev	Min	Max
CSR-L	0.55	0.18	0.2	0.93
CSR-Q	0.18	0.12	0.03	0.71
ENV	0.28	0.28	0	0.89
HR	0.57	0.2	0.1	1
CI	0.78	0.27	0	1
PRO	0.71	0.27	0	1
BGD	0.08	0.11	0	0.45
BSIZE	8.92	2.16	4	14
BIND	0.39	0.11	0.6	1
CEO	0.14	0.35	0	1
LEV	0.44	0.27	0.06	0.93
PRO	0.04	0.08	− 0.62	0.27
SIZE	555,442,870.18	1,156,879,385.1	760,584	6,508,221,806
AGE	14.4	6.24	0	25

members are independent (mean = 0.93) and non-executive (mean = 0.14). Firms tend to rely on equity (mean leverage = 0.44) and show low profitability (mean = 0.04). In addition, the average size and age of firms are 555, 442, 870.15 and 14.4, respectively.

4.2 Correlation Coefficient

The associations between independent and control factors and the dependent variables (CSR-L and CSR-Q) and CSR-L items in banks and industrial enterprises listed on the Palestine Stock Exchange were examined using the Pearson correlation coefficients in Table 3. There appears to be no problem with multicollinearity among the research variables, as indicated by the maximum correlation coefficient value of 0.47, which indicates that correlations between independent variables usually fall below 0.7.This makes it possible to assess the importance of each variable and how it affects the dependent variable's prediction.

The variables BGD, BSIZE, BIND, LEV, PROF, and SIZE have a positive correlation with CSR-L, while the variables CEO and AGE have a negative correlation with CSR-L.

BGD, BSIZE, BIND, and SIZE have a positive correlation with CSR-Q. Additionally, there is a negative correlation between CSR-Q and (CEO, LEV, PROF, AGE).

Table 3 Correlation Coefficient Analysis for industrial companies and banks

	CSR.L	CSR.Q	ENV	HR	CI	PRO	BGD	BSIZE	BIND	CEO	LEV	PROF	SIZE	AGE
CSR.L	1	0.78 (< 0.001)	0.78 (< 0.001)	0.79 (< 0.001)	0.61 (< 0.001)	0.66 (< 0.001)	0.29 (< 0.001)	0.38 (< 0.001)	0.16 (0.03)	− 0.05 (0.526)	0.13 (0.09)	0.07 (0.33)	0.47 (< 0.001)	− 0.26 (< 0.001)
CSR.Q		1	0.65 (< 0.001)	0.62 (< 0.001)	0.47 (< 0.001)	0.46 (< 0.001)	0.01 (0.874)	0.43 (< 0.001)	0.16 (0.032)	− 0.1 (0.169)	− 0.03 (0.727)	− 0.01 (0.898)	0.29 (< 0.001)	− 0.09 (0.227)
ENV			1	0.46 (< 0.001)	0.25 (0.001)	0.31 (< 0.001)	0.16 (0.031)	0.15 (0.048)	0.2 (0.008)	− 0.13 (0.08)	− 0.02 (0.824)	0.05 (0.51)	0.35 (< 0.001)	− 0.34 (< 0.001)
HR				1	0.31 (< 0.001)	0.45 (< 0.001)	0.12 (0.108)	0.33 (< 0.001)	0.08 (0.26)	− 0.03 (0.68)	0.19 (0.013)	− 0.17 (0.024)	0.38 (< 0.001)	− 0.35 (< 0.001)
CI					1	0.37 (< 0.001)	0.16 (0.03)	0.41 (< 0.001)	− 0.15 (0.046)	0.29 (< 0.001)	0.02 (0.838)	0.19 (0.01)	0.28 (< 0.001)	0.13 (0.08)
PRO						1	0.47 (< 0.001)	0.31 (< 0.001)	0.39 (< 0.001)	− 0.25 (0.001)	0.25 (0.001)	0.19 (0.011)	0.36 (< 0.001)	0.05 (0.501)
BGD							1	− 0.02 (0.74)	0.11 (0.142)	− 0.18 (0.013)	0.25 (0.001)	0.19 (0.011)	0.42 (< 0.001)	0.06 (0.432)
BSIZE								1	0.16 (0.038)	0.05 (0.544)	0.47 (< 0.001)	− 0.28 (< 0.001)	0.4 (< 0.001)	0.2 (0.006)
BIND									1	− 0.65 (< 0.001)	0.21 (0.004)	− 0.12 (0.113)	0.23 (0.002)	− 0.03 (0.661)
CEO										1	0.02 (0.74)	0.02 (0.773)	0.05 (0.467)	0.08 (0.301)
LEV											1	− 0.37 (< 0.001)	0.59 (< 0.001)	0.17 (0.025)
PROF												1	− 0.16 (0.029)	0.08 (0.261)

(continued)

Table 3 (continued)

	CSR.L	CSR.Q	ENV	HR	CI	PRO	BGD	BSIZE	BIND	CEO	LEV	PROF	SIZE	AGE
SIZE													1	0.05 (0.529)
AGE														1

Notes *Significant at the 0.01 level (two-tailed); ** Significant at the 0.05 level (two-tailed); *** Significant at the 0.10 level (two-tailed)

The correlation between ENV (CSR-L) and (BGD, BSIZE, BIND, PROF, and SIZE) is positive. Additionally, there is a negative correlation between ENV (CSR-L) and (CEO, LEV, and AGE).

The correlation between HR (CSR-L) and (BGD, BSIZE, BIND, LEV, and SIZE) is positive. Additionally, there is a bad correlation between HR (CSR-L) and (CEO, PROF, and AGE).

(BGD, BSIZE, CEO, LEV, PROF, SIZE, and AGE) and CI (CSR-L) have a positive correlation. Moreover, BIND and CI have a negative association (CSR-L).

4.3 Regression Analysis

The effect of independent variables (BGD, BSIZE, BIND, CEO) and control factors (LEV, PROF, SIZE, AGE) on the dependent variable (CSR-L) was determined in this section using a panel linear regression model (fixed effects model and random effects model). The best model was then chosen using the Hausman test. Thus, we employ a fixed effects model otherwise, and a random effects model if the Hausman test value is $p > 0.05$. However, when employing VIF, no collinearity issues were discovered [54–56].

We chose to interpret the Random effects model based on the p-value of the Hausman test ($p = 0.159$).

The results of a linear regression study performed on banks and industrial enterprises listed on the Palestine Stock Exchange are presented in Table 4. First, the first hypothesis is supported by a substantial positive effect (0.483, $p < 0.001$) between the percentage of females on boards of directors (BG) and (CSR-L). Second, prior research has shown that (BSIZE) positively affects CSR-L (0.008, $p = 0.221$), as reported in papers like [36, 42]. The adverse impact of BIND on CSR-L (-0.112, $p = 0.388$) defies agency theory and certain research [27]. The CEO's detrimental effect on CSR-L (-0.039, $p = 0.322$) is consistent with earlier studies [36], stating that when the CEO is also the chairman, profit maximization should take precedence above social considerations. Furthermore, CSR-L is significantly impacted negatively by (LEV) (-0.229, $p < 0.001$), but positively by (PROF) and (SIZE) (0.027, $p = 0.841$ and 0.058, $p < 0.001$, respectively). Lastly, (AGE) has a negative relationship with CSR-L (-0.011, $p < 0.001$), suggesting that recently listed businesses put profits before social responsibility.

We chose to interpret the Random effects model based on the p-value of the Hausman test ($p = 0.279$).

Table 5 displays the results of a linear regression analysis carried out on Palestine Stock Exchange-listed companies, which indicated multiple noteworthy correlations with (CSR-Q). Between BGD and CSR-Q, there is a positive effect of 0.042 ($p = 0.553$). Greater transparency is typically associated with larger boards, which is

Table 4 LR analysis between CSR.L and other variables

Fixed effect model					Random effect model					
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	Hausman test	VIF
BGD	0.474	0.094	< 0.001	0.606/ 0.564	0.483	0.095	< 0.001*	0.606/ 0.564	0.159	1.27
BSIZE	0.01	0.007	0.152		0.008	0.007	0.221***			2.59
BIND	− 0.067	0.13	0.605		− 0.112	0.13	0.388***			2.42
CEO	− 0.021	0.04	0.604		− 0.039	0.04	0.322***			2.35
LEV	− 0.223	0.048	< 0.001		− 0.229	0.048	< 0.001*			2.13
PROF	0.037	0.132	0.781		0.027	0.133	0.841***			1.51
SIZE	0.056	0.008	< 0.001		0.058	0.008	< 0.001*			3.53
AGE	− 0.013	0.002	< 0.001		− 0.011	0.002	< 0.001*			1.11

Notes * Significant at the 0.01 level (two-tailed); ** Significant at the 0.05 level (two-tailed); *** Significant at the 0.10 level (two-tailed)
Mode 1 >> formula = CSR.L ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

consistent with agency theory's emphasis on increased monitoring capability translating into increasing responsibility. BIND, however, revealed a negative effect that might have been influenced by variables outside the purview of the study, including social interactions or control relationships. The claim that agency expenses can be reduced by keeping the functions of CEO and board chairman distinct is supported by the substantial negative impact of the CEO. Furthermore, leverage showed a strong negative correlation, suggesting that when debt levels rise, businesses become less likely to take responsibility because of the increased dangers. Although not statistically significant, PROF revealed a negative effect that could have an impact on CSR-Q. On the other hand, AGE significantly lowered CSR-Q, whereas SIZE significantly increased it.

We chose to interpret the Fixed effects model based on the p-value of the Hausman test ($p = 0.001$).

The environment (CSR-L item) and other variables in industrial enterprises and banks listed on the Palestine Stock Exchange are analyzed using linear regression, as presented in Table 6.

The CSR-L items show a positive correlation of 0.447 ($p = 0.009$) between BGD and ENV. BSIZE has a positive impact on ENV (CSR-L items) of 0.004 ($p = 0.72$). BIND positively affects ENV (CSR-L items) by 0.228 ($p = 0.223$). BIND has a 0.027 favorable impact on ENV (CSR-L items).

Between LEV and ENV (CSR-L items), there is a significant negative effect of − 0.297 ($p = 0.001$).PROF and ENV (CSR-L items) have a negative relationship of − 0.041 ($p = 0.955$). SIZE and ENV (CSR-L items) had a significant positive influence of 0.053 ($p < 0.001$). Showing a statistically significant negative correlation between AGE and ENV (CSR-L items) of − 0.023 ($p < 0.001$).

Table 5 LR analysis between CSR.Q and other variables

Fixed Effects					Random Effect				Hausman test	
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	phtest	VIF
BGD	0.035	0.071	0.622	0.481/ 0.426	0.042	0.071	0.553***	0.481/ 0.426	0.279	1.27
BSIZE	0.01	0.005	0.043		0.009	0.005	0.072**			2.59
BIND	− 0.077	0.098	0.433		− 0.121	0.098	0.217***			2.41
CEO	− 0.061	0.03	0.044		− 0.079	0.03	0.008**			2.35
LEV	− 0.237	0.036	< 0.001		− 0.242	0.036	< 0.001*			2.12
PROF	− 0.135	0.1	0.181		− 0.141	0.1	0.161***			1.51
SIZE	0.038	0.006	< 0.001		0.04	0.006	< 0.001*			3.53
AGE	− 0.004	0.001	0.001		− 0.003	0.001	0.021**			1.11

Notes * Significant at the 0.01 level (two-tailed); ** Significant at the 0.05 level (two-tailed); *** Significant at the 0.10 level (two-tailed)
Mode 2 >> formula = CSR.Q ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

Table 6 LR analysis between ENV (CSR-L items) and other variables

Fixed effects					Random effect				Hausman test	
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	Phtest	VIF
BGD	0.435	0.169	0.011	0.443/ 0.384	0.447	0.172	0.009*	0.443/ 0.384	0.001	1.27
BSIZE	0.006	0.012	0.601		0.004	0.012	0.72***			2.59
BIND	0.354	0.233	0.132		0.288	0.236	0.223***			2.41
CEO	0.027	0.072	0.711		0	0.073	0.998***			2.35
LEV	− 0.288	0.086	0.001		− 0.297	0.087	0.001*			2.12
PROF	− 0.006	0.239	0.979		− 0.014	0.242	0.955**			1.51
SIZE	0.05	0.014	< 0.001		0.053	0.014	< 0.001*			3.53
AGE	− 0.025	0.003	< 0.001		− 0.023	0.003	< 0.001*			1.11

Notes * Significant at the 0.01 level (two-tailed); ** significant at the 0.05 level (two-tailed); *** significant at the 0.10 level (two-tailed)
Mode 3 >> formula = ENV ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

We chose to interpret the Random effects model based on the p-value of the Hausman test ($p = 0.209$).

The linear regression analysis of human resources (CSR-L item) and other variables in banks and industrial enterprises listed on the Palestine Stock Exchange is presented in Table 7.

Table 7 LR analysis between HR (CSR-L items) and others varibles

Fixed effects					Random effect				Hausman test	
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	Phtest	VIF
BGD	0.23	0.113	0.044	0.509/ 0.456	0.241	0.114	0.035**	0.509/ 0.456	0.209	1.27
BSIZE	0	0.008	0.999		− 0.001	0.008	0.889***	0.509/ 0.456		2.59
BIND	− 0.35	0.156	0.027		− 0.395	0.157	0.012*	0.509/ 0.456		2.41
CEO	− 0.078	0.048	0.109		− 0.096	0.048	0.045***	0.509/ 0.456		2.35
LEV	− 0.14	0.057	0.016		− 0.146	0.058	0.012*	0.509/ 0.456		2.12
PROF	− 0.454	0.16	0.005		− 0.46	0.161	0.004*	0.509/ 0.456		1.51
SIZE	0.058	0.009	< 0.001		0.06	0.009	< 0.001*	0.509/ 0.456		3.53
AGE	− 0.016	0.002	< 0.001		− 0.014	0.002	< 0.001*	0.509/ 0.456		1.11

Notes * Significant at the 0.01 level (two-tailed); ** Significant at the 0.05 level (two-tailed); *** Significant at the 0.10 level (two-tailed)
Mode 4 >> formula = HR ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

Between BGD and HR, there is a statistically significant positive effect of 0.241 ($p = 0.035$) (CSR-L items). HR (CSR-L items) is negatively impacted by BSIZE by − 0.001 ($p = 0.889$). BIND significantly reduces HR (CSR-L items) by − 0.395 ($p = 0.012$). Between the CEO and HR (CSR-L items), there is a substantial positive effect of − 0.096($p = 0.045$).

Between LEV and HR (CSR-L items), there is a significant negative effect of − 0.146($p = 0.012$).

PROF and HR (CSR-L items) have a significant negative influence of − 0.046 ($p = 0.004$). SIZE and HR (CSR-L items) had a significant positive influence of 0.053 ($p < 0.001$). Showing a statistically significant negative correlation between AGE and HR (CSR-L items) of − 0.014 ($p < 0.001$).

We chose to interpret the Random effects model based on the *p*-value of the Hausman test ($p = 0.941$).

The linear regression study between the society (CSR-L item) and other variables in the banks and industrial enterprises listed on the Palestine Stock Exchange is displayed in Table 8.

Table 8 LR analysis between CI (CSR-L items) and other variables

Fixed effects					Random effect				Hausman test	
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	Phtest	VIF
BGD	0.52	0.153	0.001	0.547/ 0.499	0.51	0.153	0.001*	0.547/ 0.499	0.941	1.27
BSIZE	0.029	0.011	0.01		0.031	0.011	0.006*			2.59
BIND	− 0.49	0.211	0.021		− 0.406	0.21	0.053**			2.41
CEO	0.084	0.065	0.199		0.114	0.064	0.076***			2.35
LEV	− 0.454	0.077	< 0.001		− 0.449	0.078	< 0.001*			2.12
PROF	0.312	0.215	0.15		0.298	0.216	0.167***			1.51
SIZE	0.076	0.012	< 0.001		0.073	0.012	< 0.001*			3.53
AGE	0.005	0.003	0.061		0.002	0.003	0.337***			1.11

Notes * Significant at the 0.01 level (two-tailed); ** significant at the 0.05 level (two-tailed); *** significant at the 0.10 level (two-tailed)
Mode 5 >> formula = CI ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

Between BGD and CI, there is a statistically significant positive effect of 0.51 ($p = 0.001$) (CSR-L item). There is a positive relationship between CEO and CI (CSR-L item), a negative effect between BIND and CI (CSR-L item), and a substantial positive effect of 0.031($p = 0.006$) on CI (CSR-L item) according to BSIZE.

Between LEV and CI (CSR-L item), there is a significant negative effect of − 0.449($p < 0.001$), a positive effect of 0.298 ($p = 0.167$) from PROF on CI (CSR-L item), a substantial positive effect of 0.073 ($p < 0.001$) from SIZE on CI (CSR-L item), and a positive effect of 0.002 ($p = 0.337$) from AGE on CI (CSR-L item).

We chose to interpret the Random effects model based on the p-value of the Hausman test ($p = 0.209$).

The linear regression analysis of Product (CSR-L item) and other variables in banks and industrial enterprises listed on the Palestine Stock Exchange is presented in Table 9.

BGD and PRO (CSR-L item) have a substantial positive effect of 0.927 ($p < 0.001$), while BSIZE and PRO (CSR-L item) have a positive effect of 0.016 ($p = 0.154$). BIND has a positive effect of 0.465 ($p = 0.026$) on PRO (CSR-L item), while CEO has a negative effect of − 0.076 ($p = 0.235$) on PRO (CSR-L item).

LEV has a significant positive effect of 0.617 ($p = 0.004$) between PROF and PRO (CSR-L item), and a negative effect of –0.067 ($p = 0.388$) on PRO(CSR-L item). On PRO (CSR-L item), SIZE has a substantial positive impact of 0.04 ($p = 0.001$), while AGE has a negative impact of − 0.002 ($p = 0.494$) on PRO.

Table 9 LR analysis between PRO (CSR-L items) and other variables

Fixed effects					Random effect				Hausman test	
Variable	Beta	SD	P	R2/ AR2	Beta	SD	P	R2/ AR2	Phtest	VIF
BGD	0.935	0.157	< 0.001	0.494/ 0.44	0.927	0.153	< 0.001*	0.494/ 0.44	1	1.27
BSIZE	0.015	0.011	0.18		0.016	0.011	0.154***	0.494/ 0.44		2.59
BIND	0.447	0.217	0.041		0.465	0.209	0.026*	0.494/ 0.44		2.41
CEO	− 0.083	0.067	0.213		− 0.076	0.064	0.235***	0.494/ 0.44		2.35
LEV	− 0.07	0.08	0.381		− 0.067	0.078	0.388***	0.494/ 0.44		2.12
PROF	0.618	0.222	0.006		0.617	0.215	0.004*	0.494/ 0.44		1.51
SIZE	0.041	0.013	0.002		0.04	0.012	0.001*	0.494/ 0.44		3.53

Notes * Significant at the 0.01 level (two-tailed); ** Significant at the 0.05 level (two-tailed); *** Significant at the 0.10 level (two-tailed)
Mode 6 >> formula = PRO ~ BGD + BSIZE + BIND + CEO + LEV + PROF + SIZE + AGE

5 Conclusion

The purpose of the study was to look into how the qualities of the board of directors affected the caliber of sustainability reports from 2013 to 2022, as determined by the levels of corporate social responsibility. It was discovered that banks and industrial enterprises in Palestine prefer revealing CSR levels over quality, with averages of 0.18, or 3%, for quality and 55% for CSR levels. Among the most significant findings are that gender diversity positively influences the quality of sustainability reports, which is consistent with many studies, including the study [28]. Increasing the representation of women on boards of directors can improve sustainability practices and effectively meet stakeholder needs. The study also focuses on societal aspects, productivity, human resources, and the environment. The Study's [30] findings corroborate the idea that gender diversity improves boards of directors' oversight capabilities. Second, it showed that since larger boards of directors include a wider range of backgrounds and expertise, the size of the board positively affects the caliber of sustainability reports. Third: We disregarded the third hypothesis since the evidence showed that independence had a detrimental effect on sustainability reports' quality. This was explained by the existence of unaccounted-for determinants of independence, such as accounting expertise. Furthermore, the credibility and impartiality of a report may suffer when it lacks independence, and the data it contains may be skewed by prejudices, special interests, or other forms of manipulation. As a result, reports lose some of their credibility and usefulness as instruments

Table 10 Results

Hypothesis number	Hypotheses	Result
1	There is a positive correlation between Board Gender Diversity and the Quality of Sustainability Reports	Supported
2	There is a positive correlation between The size of the Board and the Quality of Sustainability Reports	Supported
3	There is a positive correlation between Independence and the Quality of Sustainability Reports	Rejected
4	There is a negative correlation between CEO Duality and the Quality of Sustainability Reports	Supported

Source Developed by authors

for gauging sustainability. As a result, independence is seen as a crucial component in guaranteeing the caliber of sustainability reports and upholding their legitimacy and openness. Agency theory, which states that independent board members improve board monitoring and lower agency expenses, is in conflict with this. Numerous investigations, including studies [43], refute this. In conclusion, the study revealed that the CEO's duality has a negative impact on sustainability report quality when there is a conflict between the CEO and the Chairman of the Board of Directors. This could potentially impact the level of objectivity in reporting, which is in line with other research, such as study [45], which found that it was detrimental to use one person's strength to undermine both positions. The Board of Directors makes decision-making difficult and raises the possibility of executive remuneration conflicts and improper use of corporate governance procedures. Increasing the number of women appointed to the board, increasing its size, and designating non-executive directors were among the proposals. The report also recommended broadening the definition of corporate social responsibility disclosure to include figures, photographs, and graphics as well as paying more attention to environmental and human resource concerns by following environmental regulations and raising funds. The study was constrained in that it only examined a small number of dependent and variable variables, as well as concentrating on two sectors of the Palestinian society: banks and industrial enterprises. Future studies could look into other attributes of the board and different metrics for evaluating the quality of sustainability reports, like the Global Reporting Initiative. They could also use data from other industries, including services or enterprises operating in comparable settings (Table 10).

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