Nexus among SDG 5 and sustainability performance

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Abstract

Incorporation of SDG 5 (Representation of women) on the board of directors is beneficial for corporation`s long-term value creation and sustainable expansion. This study examines how the inclusion of SDG 5 on the board affects sustainability (financial, social, and environmental). This study tries to define SDG 5's role and its implications for sustainability performance. This study is based on three theories: the Triple Bottom Line, which says that businesses should prioritize profit, the planet, and people; the agency theory, which says that directors should align stakeholders' interests with sustainability practices; and the gender socialization theory, which supports a gender difference perspective. The research sample consists of 8 years data span from 87 Industrial firms with Pakistan Stock Exchange listings. The study used dynamic GMM analysis for estimations. The results demonstrate that the presence of more women on boards of directors improves the sustainability of the social and environmental spheres, whereas having more women on the board of directors makes the company's finances less sustainable. According to this study, SDG 5 should encourage diversity and inclusion on the board of manufacturing organizations. These companies should also focus on sustainable growth and merit-based board member hiring. Additionally, this research has positive implications for regulators and policymakers who support sustainable organizations.

Keywords: SDG-5: Financial sustainability: social sustainability: environmental sustainability: manufacturing companies.

Introduction

Sustainability means "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Jhunjhunwala, 2023; Sakalasooriya, 2021). The 2030 Agenda for Sustainable Development was approved and ratified by each and every UN member state in 2015, with the goal of eradicating poverty, protecting the environment, and ensuring prosperity by 2030. (Tsalis, Terzaki, Koulouriotis, Tsagarakis, & Nikolaou, 2023). Its 17 Sustainable Development Goals (SDGs) are a comprehensive plan that balances economic, social, and environmental elements of sustainable development (Oliveira, 2024; Sekarlangit & Wardhani, 2021). The SDG encourages social inclusion, sustainable economic growth, decent workplaces, and gender parity. The Agenda 2030 for Sustainable Development emphasizes equity and inclusivity while promising to "transform our world" and "leave no one behind," ensuring that everyone, especially the most vulnerable, benefits from development (Schroeder et al., 2024).

Therefore, SDG 5 is closely and specifically related to this objective, i.e., gender equality or gender diversity. This goal aims to empower all females and to ensure the full participation of women in management, leadership, and decision-making (Beloskar, Haldar, & Gupta, 2024). The phrase "gender equality" describes the process of guaranteeing equal rights and liberties to all individuals, irrespective of gender, in all social contexts, like gender opportunities in businesses, the proportion of salary, abuses both physical and psychological, the right to vote and the right to get an education, economic participation, strategy development, and decision-making (Beloskar et al., 2024; Khatri, 2023; Martínez-García & Ansón, 2021). A number of issues must be addressed in order to guarantee that men and women are treated equally and have equal opportunities in the workplace. These issues include organizational culture, career advancement, hiring practices, pay equity, and work-life balance (Baghdadi, Safiullah, & Heyden, 2023; Kunze & Scharfenkamp, 2022). The empowerment of women is a crucial first step toward guaranteeing gender equality. The idea of empowering women emphasizes how important it is for women to be able to make more independent decisions in their lives (Lisowska, 2021). Empowerment of women is defined as "a woman's sense of self-worth, her decision-making power, her access to opportunities and resources, her power and control over her own life inside and outside the home, and her ability to effect change" (Slomka-Golebiowska, De Masi, & Paci, 2023). Four Aspects make up empowerment: status (do groups of men and women interact as equals or as superiors and subordinates), decision-making (do one or both groups make decisions), settlement of conflicts (do dispute resolution processes work, and can one group be forced to do something against its will), and resource distribution (do one or both groups control resources) (Dandona, 2015; Salazar & Moline, 2023). In terms of rights and opportunities, treatment and valuation, and empowerment (i.e., promoting women's agency and voice), gender parity is the focus of Sustainable Development Goal (SDG) 5 in the workplace (Mazumder, 2024).

As companies growing realize they need to balance their social and environmental obligations and their financial objectives, corporate governance has emerged as a key area of focus in the quest for sustainability (Awais, Zulfiqar, Saghir, Sohail, & Rana, 2022; Malik, Awais, Sulehri, Mohsin, & Ali, 2021; Saghir & Awais, 2024). The composition of corporate boards, which is central to this governance, is important in determining the strategic goals of companies. Lestari and Soewarno (2024) emphasized the value of diversity in boardrooms, especially the presence of female directors, as a way to improve business performance and decision-making. Women bring different perspectives, experiences, and values to the workplace, especially the boardroom, which can lead to more comprehensive discussions, increased innovation and creativity, improved financial and non-financial performance, better decision-making, employee satisfaction, and retention (Salazar & Moline, 2023; Zampone, Nicolò, Sannino, & De Iorio, 2024). It also enhances reputation and brand image, attracting top talent and customers. When it comes to corporate matters, women are a bit more careful and risk-averse, more confident, ethical, and concerned about their reputation (Dobija, Hryckiewicz, Zaman, & Puławska, 2021; Galletta, Mazzù, Naciti, & Vermiglio, 2022; Rixom, Jackson, & Rixom, 2023; Zampone et al., 2024). These attributes have the potential to enhance the efficacy of female directors in terms of overseeing and evaluating the financial, social, and environmental sustainability performance. Many factors are thought to contribute to gender inequality in boardrooms, such as work-life balance concerns, gender-based labor market segmentation, Stereotyping and prejudice against women, and the undervaluing of women's contributions (Baghdadi et al., 2023; Reddy & Jadhav, 2019).

Acknowledgment of women's presence around the world as a field of study is a reflection of growing academic interest in understanding the diverse and significant roles women play in different corporations and economies globally (Zampone et al., 2024). Therefore, it is crucial to understand female presence within the framework of a developing country such as Pakistan. In 1934, Lettie Pate Whitehead became the first female director of Coca-Cola, a large, renowned company (Wiley, Pavelka, & Stinnette, 2016). Regulators around the world took official action, though, since the trend did not significantly improve. Gender quotas are primarily intended to capitalize on the talents and skills of highly qualified women in order to maximize economic growth potential (Shaheen, 2022; Zampone et al., 2024). Another reason for the rise in the quantity of female board members is the Securities and Exchange Commission of Pakistan (SECP) guidelines, which mandate that the 2017 Code of Corporate Governance mandates that publicly listed companies have at least one female director on their boards. As a result, businesses have been able to adhere to the legal requirement for a female presence on the boards (Reddy & Jadhav, 2019; Wu, Richard, Triana, & Zhang, 2022). This initiative aims to promote more gender diversity, promote inclusive decision-making processes, and capitalize on the distinct viewpoints that women offer to corporate governance (Amin, Ur Rehman, Ali, & Ntim, 2022). These rules follow global developments, which show that more and more people are realizing the importance of having a diverse range of genders in boardrooms for more effective corporate governance and performance. Through the implementation of these regulations, Pakistan wants to increase the number of women in senior roles in the business world, thereby supporting wider endeavors aimed at achieving workplace gender equality(Athar, Chughtai, & Rashid, 2023; Zeeshan et al., 2022).

Indeed, an explosive and growing field of research is the analysis of the implications of SDG 5, which attempts to empower all women on boards of directors and attain gender equality, as well as the effect that this has on the performance of financial, social, and environmental sustainability. A key component of accomplishing this goal is having more women on BODs. The different perspectives, creativity, innovation, and problem-solving skills of women improve market awareness, consumer satisfaction, and company strategy, and ultimately increase revenue and profitability (Nadeem, Gyapong, & Ahmed, 2020). Businesses with female board members are more inclined to adopt environmentally friendly practices, reduce emissions, and invest in green technologies and renewable energy sources (Bazel-Shoham, Lee, Munjal, & Shoham, 2023; Meinzen-Dick, Kovarik, & Quisumbing, 2014). Gender diversity in the boardroom welcomes individuals with different backgrounds, aptitudes, viewpoints, and specialties (Baselga-Pascual & Vähämaa, 2021). The BOD's understanding of the rights and interests of diverse stakeholder groups is thus enhanced by diversity (Zampone et al., 2024). Additionally, gender diversity helps provide better problem-solving approaches and new creative ideas (Bosone, Bogliardi, & Giudici, 2022). Support for community-beneficial and social welfare-improving initiatives is more common among female directors (Prabowo, Jamin, Saputro, Mufraini, & Agustia, 2017). Businesses with a higher proportion of female board members outperformed their peers in terms of CSR (CSR) (Awwad, Binsaddig, Kanan, & Al Shirawi, 2023; Boiral & Yuriev, 2024; Gurol & Lagasio, 2022).

In a nutshell, this study's primary objective is to comprehend how females behave towards sustainability plans when they are members of BOD. This study contributed to offering in-depth insights into the theoretical as well as the practical aspects of the literature on the manufacturing sector's performance in terms of sustainability in Pakistan. Thus, the following are significant contributions made by this study to the literature on sustainability: Firstly, this research adds to the knowledge of the theoretical and practical significance of SDG-5, i.e., female presence in the BOD. Lack of gender diversity led to those enterprises' poor financial and non-financial sustainable performance (Ziolo, Szaruga, & Spoz, 2023). Secondly, this study expands our understanding of how to gauge sustainable development by evaluating its three key dimensions, i.e., financial, social, and environmental. Thirdly, this study uses an integrated approach based on the Triple Bottom Line, agency theory, and gender socialization theory to fill the gap in existing literature. Lastly, the research specifically focuses on the manufacturing sector of Pakistan because the manufacturing sector requires more practice of environmental practices due to its drainage and waste system, which damages the environment. Another reason is that Pakistan's main revenue source is the manufacturing sector; therefore, effective board members must be needed to focus on sustainability performance (Tanveer, Song, Faheem, Daud, & Naseer, 2021; Zampone et al., 2024).

The remaining components of this investigation are as follows: The theoretical backdrop, hypothesis development, and literature review form the basis of the following section. Methodology is a key component of the third section. This report then presents our findings from empirical research and a results discussion. The conclusions and implications form the base of the last section.

Literature Review and Theoretical Background

The issue of female presence in BOD has received substantial academic attention, and studies have framed the issue using multiple theories. Among various theories, the most highlighted are the triple bottom theory, gender socialization theory, and agency theory (Assenga, Aly, & Hussainey, 2018; Gurol & Lagasio, 2022; Peng, Fu, & Zou, 2024; Wu, Furuoka, & Lau, 2022).

The "triple bottom line" theory is concerned with a company's sustainability (Mendes, Braga, Correia, & Silva, 2023; Zampone et al., 2024). This theory states that businesses should prioritize profit, the planet, and people. and promotes companies to balance their societal and environmental responsibilities with their profits (Munjal & Sharma, 2023). It pushes companies to pay attention to their effects on people and the environment as well as profit—the conventional bottom line. The goal of this strategy is to develop a more just and sustainable kind of capitalism. The People (Social) dimension takes into account how businesses operations affect all parties involved, such as suppliers, consumers, employees, and society as a whole. Planet (Environmental) Aspects track an organization's ecological footprint while emphasizing environmentally sound practices. Profit (Financial) measures a company's financial performance, but it also takes into account how economic activity contributes to sustainability (Henry, Buyl, & Jansen, 2019).

Another theory relating to this study is agency theory, which states that a manager or director has an opportunistic mindset and may have goals different from those of stockholders (Hindasah & Harsono, 2021). The BOD acts as a representation and protects the corporate property's interests to prevent what is known as agency costs (Galletta et al., 2022). Considering this, numerous studies have addressed how having more female directors or management influences the company's strategic decisions, whether they are related to financial as well as non-financial (social and environmental) issues too (McElhaney & Mobasseri, 2012; Mungai, Ndiritu, & Rajwani, 2020). The interests of shareholders are better protected when there are women on the BOD. This is because individuals with diverse backgrounds provide unique insights into the decision-making process (Furlotti, Mazza, Tibiletti, & Triani, 2019). According to Jolevska and Cvetkoska (2023), female presence improves. Increasing oversight will increase board effectiveness and independence of management's opportunistic conduct and minimize agency difficulties, resulting in improved corporate sustainability. A diversified board is more inclined to consider the viewpoints of many stakeholders when making decisions, better representing the needs and interests of the community, customers, and staff (Torres, 2024).

Gender socialization theory, which says that socialization encourages individualistic and competitive behavior in males over cooperative and altruistic behavior in women (Marchini, Tibiletti, Mazza, & Gabrielli, 2022; Peng et al., 2024), can be used to support a gender difference perspective. In light of these different social commitments and expectations, multiple professions and leadership ideologies have emerged based on the gender of the leaders. Females are more focused on stakeholder-commitment outcomes and strategies based on long-term goals. These outcomes and goals are necessary for successful social and environmental practices and performance (Eliwa, Aboud, & Saleh, 2023). In leadership positions, women are also actively involved and creating connections (Nguyen, Ntim, & Malagila, 2020; Prabowo et al., 2017).

Hypothesis Development

SDG-5 in Board and financial Sustainability

A company's ability to make revenue while reducing risks and making adjustments for changing market dynamics is referred to as financial sustainability (Wu, Gao, Luo, Xu, & Shi, 2024). SDG 5 addresses corporate governance and enhancing the financial sustainability of organizations by promoting gender equality and female empowerment (Echeverri-Pimienta, Valencia-Herrera, & Correa-Mejía, 2022). Recent decades have seen a notable rise in the conversation around female presence in the workforce within organizations. An in-depth study conducted by Campbell and Mínguez-Vera (2007), revealed that businesses with females in decision-making positions (board) generate higher profitability and earn higher market returns. A significant number of women at top echelon positions, such as board member, boost both The company's worth and financial performance (Bannò, Filippi, & Trento, 2023; Orozco Collazos & Botero, 2024). According to Bosone et al. (2022), Less than 10% of board positions are held by women in Pakistani manufacturing companies, a gender disparity that has serious consequences for sustainability and financial performance (Bazel-Shoham et al., 2023; Zampone et al., 2024).

Issa, Yousef, Bakry, Hanaysha, and Sahyouni (2021) revealed that Companies having diverse BOD were seen as being more in compliance with the requirements and were subject to fewer financial penalties. In fact, females bring various talents, capabilities, and skills to BOD, including a propensity to be less risk-taking than men (Torres, 2024). Brahmbhatt, Patel, and Patel (2012) found female board members frequently emphasize financial sustainability and long-term strategic planning by improving firm`s return. Study of Buallay, Hamdan, Barone, and Hamdan (2022) have indicated that businesses with gender-diverse boards frequently see increases in profitability and return on investment (ROI) that result in enhancing financial sustainability. Dang, Ho, and Nguyen (2023) found that businesses with a minimum of one female board member experienced better average growth, lower leverage, and higher average returns on equity.

Gulamhussen and Santa (2015) observed a connection between the number of female members of the board and sustainability, asserting that the moderating influence of masculinity on a national level harms board diversity and affects females' behavior toward sustainability, which later on negatively affects the company`s performance.

Females do not perform better on the board in terms of corporate financial performance. It is because of their professional and familial obligations (Bazel-Shoham, Lee, Munjal, & Shoham, 2024; Jolevska & Cvetkoska, 2023). Due to family obligations, females are sometimes not given adequate time to pursue their professional goals. As an outcome, their involvement had no favorable and noteworthy effect on the financial performance of businesses (Dang et al., 2023; Dobija et al., 2021; Mohammad, Abdullatif, & Zakzouk, 2018). The study examines the role of female board members in a company's financial sustainability in addition to focusing on the strategic benefits of gender diversity in board effectiveness and corporate financial outcomes. We hypothesize the following in light of the foregoing argument and by the ideas outlined above:

H1: Having females in the BOD enhances financial Sustainability.

SDG-5 in Board and social Sustainability.

Researchers have studied how board diversity influences business social performance with the financial and economic elements (Boiral & Yuriev, 2024). Bătae, Dragomir, and Feleagă (2021) define social sustainability as "the achievement of performance and social impacts resulting from business programs and policies." Social sustainability is the capacity of a society or organization to uphold positive relationships among its members, equitable access to resources, and social well-being. According to Bazel-Shoham et al. (2024), the presence of female directors in the boardroom enhances the company's social sustainability because they offer distinct perspectives and leadership styles. Gurol and Lagasio (2022) emphasize the CSR principles and female board members. Females serving on BODs are more socially conscious than men, and this positively affects company success (Bazel-Shoham et al., 2024). According to them the concern for social, economic, or environmental issues is one of the traits that set women apart from other stereotypes, suggesting that the firm's dedication to these issues is mirrored in its success on the social front. Female directors often support and initiate CSR programs that benefit society, such as education, health, and community development, advocating for higher ethical standards and CSR, leading to more ethical business practices (Bussoli, Assal, Fattobene, & Graziano, 2024; Fehre & Weber, 2019).

The number of women serving as board directors contributes to a diversity of viewpoints and promotes workplace policies that are more equitable and inclusive (Zampone et al., 2024). They support work-life policies that can improve employee satisfaction and retention, such as flexible scheduling and parental leave. More females on boards increase disclosure of CSR (Moon, 2023; Zampone et al., 2024). According to Amin, Ali, ur Rehman, and Elamer (2023), there is a significant effect of females' presence in BOD on CSR reporting. Females have traits of social commitments and network contacts, which help businesses communicate with various stakeholder groups (Baghdadi et al., 2023; Kunze & Scharfenkamp, 2022). Stronger interactions with different groups of stakeholders will result in improved business social sustainability performance, as stakeholder relationships are the main causes of this performance (Bazel-Shoham et al., 2024; Furlotti et al., 2019; Gangi, Daniele, D'Angelo, Varrone, & Coscia, 2023). We hypothesize that, based on the above discussion related to female board members and social sustainability:

H2. Having females in the BOD enhances Social Sustainability.

SDG-5 in Board and Environmental Sustainability.

Environmental concerns are gaining greater attention from manufacturing companies, which concentrate on manufacturing products using economical techniques that lessen their adverse environmental consequences while conserving energy and natural resource (Torres, 2024; Wahyuningrum et al., 2023). Studies have highlighted manufacturing companies' participation in environmental responsibility due to their emissions, such as the generating of used and acquired energy, the extraction and manufacturing of acquired and consumed volatile compounds, and waste generation (Xu, Tong, Wang, & Yin, 2024). Female directors often prioritize long-term planning and sustainability, exhibiting a more holistic approach to environmental challenges by balancing financial goals with long-term ecological effects (Albitar, Borgi, Khan, & Zahra, 2023; Bazel-Shoham et al., 2024; Shakil, Tasnia, & Mostafiz, 2021).

Increasing resource efficiency and lowering carbon footprints are two examples of CSR initiatives that female directors usually support. A 2016 study that appeared in the Harvard Business Review found that Businesses that have more female board members are more likely to support pollution-reduction programs, boost energy efficiency, and generate energy from sustainable sources (Biswas, Chapple, Roberts, & Stainback, 2023; Boiral & Yuriev, 2024).

According to Issa and Hanaysha (2023) research, there exists a connection between the BOD's organizational structure and attributes and the adoption of environmental measures. Henderson and Loreau (2023) found that People who have more females in their group are more conscious of environmental issues. A research by Gangi, Daniele, Varrone, Coscia, and D'Angelo (2024) found that having more female directors on a board had a considerable influence on a company's environmental performance, particularly in terms of eco-innovation and emission management. In a similar vein, Yuriev and Boiral (2024) highlight the value of having a diverse range of genders on boards when creating environmental policies that work, especially for companies that have an impact on the community and the environment.

To our knowledge, only some studies analyzed the link between female presence in BOD and the environmental sustainability of manufacturing companies in Pakistan. We expect that female presence in the BOD will enhance environmental sustainability performance based on the theories mentioned earlier (Boiral & Yuriev, 2024; Singh, 2024). As a result, we develop the following hypotheses:

H3. Having females in the BOD enhances the Environmental Sustainability.

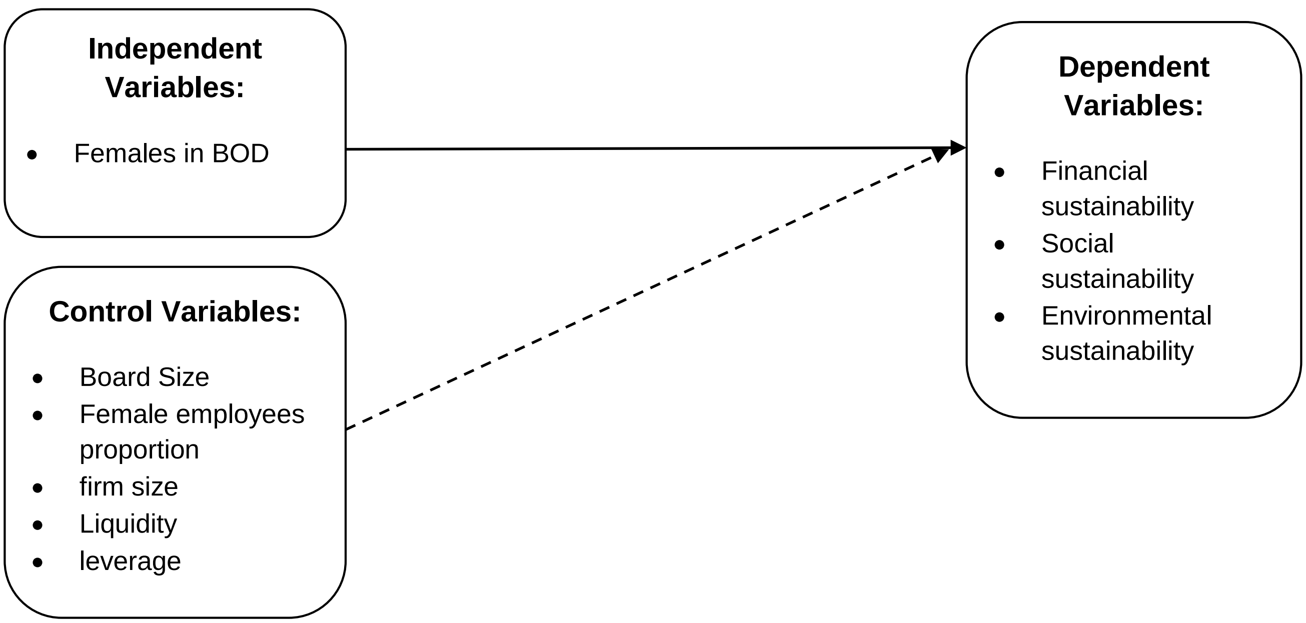

Figure 1: Conceptual Framework

Methodology

Sample and Procedure for data collection

The study sample comprises 87 manufacturing companies listed on the Pakistan Stock Exchange spanning eight years, from 2016 to 2023. Due to the lack of data from multiple companies and the fact that Pakistani companies are not required to disclose sustainability data, the sample size has been reduced from 268 to 87.

The reason for the selected period is that it provides an extensive and up-to-date analysis of sustainability performance and female board directors. Significant developments and trends in the manufacturing industry, as well as sustainable practices, characterize this time. The United Nations established 17 global sustainable development goals in 2015; as a result, starting in 2016, many countries and organizations increased their efforts to meet the goals, especially SDG-5 (Beloskar et al., 2024).

The rationale behind the selection of Pakistani manufacturing companies is their noteworthy economic contributions, encompassing GDP, employment, and export earnings. Water usage reduction, chemical management, energy efficiency, sourcing of raw materials, ethical sourcing, supply chain transparency, and fair labor practices, waste reduction, effective production planning, innovative technologies, and consumer education are some of these companies' sustainable practices (Eslami, Dassisti, Lezoche, & Panetto, 2019). The main sources of data are the websites of the State Bank of Pakistan, the PSX, the company's annual reports, company profiles, and official websites.

Econometric Model

We compute the following panel data models to examine the impact of the SDG-5 in the BOD on the three performance components of sustainability, namely financial, social, and environmental).

$$FINL_{it} = \beta_0 + \beta_1 FBOD_{it} + \beta_2 BSZ_{it} + \beta_3 FEMPL_{it} + \beta_4 FS_{it} + \beta_5 LIQ_{it} + \beta_6 LEV_{it} + \varepsilon_{it} \quad (eq\text{-}1)$$
$$SOCL_{it} = \beta_0 + \beta_1 FBOD_{it} + \beta_2 BSZ_{it} + \beta_3 FEMPL_{it} + \beta_4 FS_{it} + \beta_5 LIQ_{it} + \beta_6 LEV_{it} + \varepsilon_{it} \quad (eq\text{-}2)$$
$$ENTL_{it} = \beta_0 + \beta_1 FBOD_{it} + \beta_2 BSZ_{it} + \beta_3 FEMPL_{it} + \beta_4 FS_{it} + \beta_5 LIQ_{it} + \beta_6 LEV_{it} + \varepsilon_{it} \quad (eq\text{-}3)$$

Where; FINL stands for financial Sustainability performance, SOCL stands for social Sustainability performance, and ENTL stands for environmental Sustainability performance. The dependent variable is FBOD, which represents females on the board of directors. In this study, the control variables are BSZ (board size), FEMPL (Female employees), FS (Firm size), LIQ (Liquidity) and LEV (Leverage). Our statistical analysis was carried out using STATA software.

Table 1

Description of variables

Variable	Abbreviation	Description
Dependent variable		
Financial Sustainability performance	FINL	Financial index technique that employs a dichotomous approach to measure a company's financial sustainability. According to Hongming et al. (2020), it has eight indicators, thus consistent with Haniffa and Cooke (2005) and (Malik & Kanwal, 2018), the scoring method is additive and equally weighted. Where, if an item is disclosed, the value is "1"; otherwise, it is "0" .
Social Sustainability performance	SOCL	Social index technique that employs a dichotomous approach to measure a company's social sustainability. According to Hongming et al. (2020), it has nine indicators, thus consistent with Haniffa and Cooke (2005) and (Malik & Kanwal, 2018), the scoring method is additive and equally weighted. Where, if an item is disclosed, the value is "1"; otherwise, it is "0"
Environmental Sustainability performance	ENTL	Environmental index technique that employs a dichotomous approach to measure a company's environmental sustainability. According to Hongming et al. (2020), it has 20 indicators, thus consistent with Haniffa and Cooke (2005) and (Malik & Kanwal, 2018), the scoring method is additive and equally weighted. Where, if an item is disclosed, the value is "1"; otherwise, it is "0".
Independent variable		
Females in Board	FBOD	The ratio of female directors to all directors of members in BOD.
Control variables		
Board size	BSZ	The total members in the board of directors at the end of period
Females employees proportion	FEMPL	The percentage of female workers compared to all employees.
Firm size	FS	Natural logarithm of total assets
Liquidity	LIQ	Total current assets divided by Total current liabilities
Leverage	LEV	The ratio of total liabilities to total assets.

Estimation Techniques

Using the OLS estimation methodology on pooled data and ignoring the heterogeneity issue is the most straightforward easy estimating strategy. An upwardly biased estimate of the dynamic term's coefficient is typically produced by this method. A fixed effect estimating technique is typically applied to this problem, changing that variable. However, there is still a relationship between the transformed mistake and the transformed variable. Due to this modification, the estimate has a downward skew. To address these bias concerns, the instrumental variables technique is employed (Nadeem, Zaman, & Saleem, 2017).

All regressors are converted through differences using the different GMM (generalized method of moments), which also removes fixed effects, which addresses Endogeneity issues. System GMM addresses Endogeneity issues by (a) increasing efficiency through the addition of new instruments and (b) modifying the instruments so that they are exogenous with the fixed effects, or uncorrelated The result is a system of two equations: the original equation and the modified equation (Khatri, 2023). The results were obtained using the xtabond2 tool in Stata. One way to evaluate an instrument's accuracy is to use the Hansen statistic. The validity of the instruments is supported by the failure to reject the null hypothesis at the 0.05 confidence interval; However, with greater confidence intervals—especially over 0.25—failure to reject the null hypothesis increases the likelihood of an issue (Okoyeuzu, Ujunwa, Ujunwa, & Onah, 2021).

The serial correlation and autocorrelation of the error term are also examined. Upon failure of the second-order level rejection of the null hypothesis, In addition to the moment conditions being fulfilled, the error term is serially uncorrelated.

Results and findings

Descriptive Statistics and Correlation

In Table 2, descriptive statistics are displayed. As per the independent variable result, FINL, SOCL, and ENTL have mean values of 0.62, 0.53, and 0.59, respectively, when compared to the sustainability index. It shows how companies strive for sound financial sustainability practices to achieve financial sustainability; social sustainability values represent the businesses' involvement in social sustainability; and environmental sustainability values demonstrate the businesses' dedication to environmental sustainability (Boiral & Yuriev, 2024). According to the dependent variable result, Pakistani manufacturing companies have an average of 12 percent of female board members. Considering that the minimum value is zero, it indicates that some board rooms still lack a female member. The highest proportion of women on the board is 50%. Our results are similar to Fayaz, Abbas, and Zahid (2021).

Table 2

Descriptive statistics

Variable	Mean	SD	Min	Max
FINL	0.62	0.73	-0.26	1.15
SOCL	0.53	0.56	0.02	0.78
ENTL	0.59	0.38	0.11	0.85
FBOD	15.83	11.54	0	50
BSZ	12.25	11.25	4	27
FEMPL	45.21	16.25	10.25	54.26
FS	16.25	15.69	8.25	21.65
LIQ	1.36	1.25	0.15	2.43
LEV	0.48	0.92	0.16	0.88

Note: Three Dependent Variables are: FINL is Financial Sustainability, SOCL is Social Sustainability, and ENTL is Environmental Sustainability. Independent Variable is FBOD (Females in BODs). Five Control Variables are: BSZ (Board Size), FEMPL (Females employees' proportion), FS (Firm Size), LIQ (Liquidity) and LEV (Leverage).

Table 3 displays the pairwise coefficient of correlation for each variable. At the five percentile, the correlation coefficient values are significant. Moreover, the correlation coefficients show that the social and environmental sustainability performance of Pakistani manufacturing enterprises is improved when female employees are involved. This shows that having a gender-diverse leadership team in corporations benefits these companies' overall sustainability initiatives while also advancing equality (Khatri, 2023; Zampone et al., 2024). Moreover, the result shows that there is a negative correlation between having women in the boardroom and financial sustainability. This negative correlation suggests that women in the boardroom might not take an active role in financially sustainable matters because they lack the knowledge or experience in financial reporting (Dang et al., 2023; Galletta et al., 2022). In addition, from the values of variance inflation factor (VIF), i.e. not more than 5, indicate no issue of multicollinearity.

Table 3

Correlation

Variable	VIF	FINL	SOCL	ENTL	FBOD	BSZ	FEMPL	FS	LIQ	LEV
FINL		1								
SOCL		0.125	1							
ENTL		0.281	0.323	1						
FBOD	1.561	-0.215	0.039	0.064	1					
BSZ	1.327	0.131	0.107	-0.042	0.019	1				
FEMPL	1.956	-0.152	0.041	0.133	0.062	0.044	1			
FS	2.037	0.492	0.055	0.071	0.002	0.107	0.263	1		
LIQ	1.194	0.721	-0.119	0.066	0.033	0.124	0.786	0.493	1	
LEV	2.355	0.234	-0.362	-0.479	0.722	0.256	0.199	0.412	0.436	1

Note: Three Dependent Variables are: FINL is Financial Sustainability, SOCL is Social Sustainability, and ENTL is Environmental Sustainability. Independent Variable is FBOD (Females in BODs). Five Control Variables are: BSZ (Board Size), FEMPL (Females employees' proportion), FS (Firm Size), LIQ (Liquidity) and LEV (Leverage).

Regression Results and Discussion

Heteroscedasticity and autocorrelation issues cannot be solved by the pooled OLS model. The generalized method of moments- approach (GMM) (Arellano & Bond, 1991) is typically used to resolve this issue. Distinction By changing all of the independent and control variables and typically first differencing the data, GMM removes the fixed effects (Roodman, 2009).

Another problem is the existence of Endogeneity within the model signifies a breach of one of the assumptions of OLS, namely the absence of correlation between error terms and independent variables (Ullah, Fang, & Jebran, 2020). For confirming the presence of Endogeneity in the data, the J stat value is used. To validate the instruments' homogeneity, this study expects a J test statistic with a p-value of more than 5%. The results of GMM regression shown in Table 5 confirm the non-existence of Endogeneity, as the values of the J stat have more than 5% probability in all models. Furthermore, Autoregressive tests, specifically AR(1) and AR(2), are used to assess autocorrelation in regression model residuals, particularly when using the Generalized Method of Moments (GMM) estimation technique. The AR(1) test (i.e., first-order autocorrelation) ensures the validity of GMM estimation instruments and model specification, while the AR(2) test (i.e., second-order autocorrelation) verifies the instruments in GMM-based dynamic panel data models, ensuring accurate and reliable results. For accurate GMM estimation results, both tests aid in identifying problems with the model specification and the validity of the instruments. The GMM estimator was used to estimate the elastic impacts of the regression coefficients on the regression. In this study, three proxies for sustainability are used in the computations: financial, social, and environmental.

Table 5:

Dynamic GMM Regression results

	Equation 1 FINL	Equation 2 SOCL	Equation 3 ENTL
FBOD	-0.0028***	0.0754*	0.0245***
BSZ	0.0123**	0.5748	0.4578**
FEMPL	0.0010*	0.0541**	0.0125**
FS	0.0070	0.0333*	0.0145*
LIQ	0.0184**	-0.0229	0.0142**
LEV	-0.5780	0.8887	0.5134
Obs.	696	696	696
AR(1)	0.0034*	0.0022**	0.004*
AR(2)	0.4125	0.275	0.005
Adj. R-Sq	0.221	0.187	0.234
DW stat	1.8212	1.9254	1.6251
J-stat	284.35	303.3	275.36

Note: Three Dependent Variables are: FINL is Financial Sustainability, SOCL is Social Sustainability, and ENTL is Environmental Sustainability. Independent Variable is FBOD (Females in BODs). Five Control Variables are: BSZ (Board Size), FEMPL (Females employees' proportion), FS (Firm Size), LIQ (Liquidity) and LEV (Leverage).
***; ** and * denote significance at 1%, 5% and 10% significance, respectively.

Financial Sustainability

The first hypothesis's result indicates that the financial sustainability of Pakistani manufacturing companies is much adversely affected by the presence of women on the BODs. This shows a lack of active participation by women in boardrooms in financial sustainability performance. One factor contributing to this detrimental effect is the lack of financial knowledge and experience among the female board members, which makes them less concerned with their financial sustainability (Zalata, Ntim, Alsohagy, & Malagila, 2022). The second reason is that women in Pakistani society are not allowed to speak up in financial matters; this could affect boardroom discussions also. The last explanation is that women are only appointed to boards to comply with legal requirements regarding gender quotas. This result is based on an analysis of Dang et al. (2023); Dobija et al. (2021); Mohammad et al. (2018).

Social Sustainability

For the second hypothesis, females on BODs positively and significantly impact social sustainability. This shows that females in the boardroom actively participate in social sustainability performances. Female board members positively engage with stakeholders in their corporate social responsibilities, community engagement, ethical practices, and social networking (Awwad et al., 2023; Boiral & Yuriev, 2024). The results support Hypothesis 2. Female board members consistently strive to advance CSR (CSR) endeavors and community involvement using various initiatives that support local communities, including but not limited to education, healthcare, fair labor practices, and community development (Awwad et al., 2023; Bussoli et al., 2024; Cruz, Justo, Larraza-Kintana, & Garces-Galdeano, 2019; Gurol & Lagasio, 2022). Companies in Pakistan that have made gender diversity a priority at the board level have seen gains in social outcomes like CSR and employee satisfaction (Jizi, Salama, Dixon, & Stratling, 2014; Prabowo et al., 2017; Shakil et al., 2021).

Environmental Sustainability

According to environmental sustainability performance, the results indicate that the likelihood of pursuing policy emissions is higher when there are female directors present, supporting Hypothesis 3. According to Furlotti et al. (2019), female board members are constantly working to control environmental risk and create emission policies. Environmental concerns are more likely to be prioritized by female directors than by male directors (Glass, Cook, & Ingersoll, 2016). They are more likely to be in favor of rules and procedures that protect the environment. Female board members usually advocate for CSR programs that have strong environmental components, such as reducing carbon footprints, conserving resources, and supporting renewable energy projects (Alsayegh, Abdul Rahman, & Homayoun, 2020; Bătae et al., 2021; Beloskar et al., 2024; Elmagrhi, Ntim, Elamer, & Zhang, 2019; Galletta et al., 2022; Glass et al., 2016).

Conclusion

Gender equality, the UN's fifth sustainable development target, is a fundamental human right and a need for creating a comfortable, wealthy, and sustainable society (Weiland, Hickmann, Lederer, Marquardt, & Schwindenhammer, 2021). One of the pillars of this path will be SDG-5, gender equality, in the process of accomplishing the goals for a sustainable future (Beloskar et al., 2024). This objective acknowledges that gender equality is a basic human right as well as a prerequisite for a sustainable, safe, and secure society (Boiral & Yuriev, 2024; Zampone et al., 2024). Thus, all economic stakeholders, including the government, regulatory agencies, communities, families, workplaces, NGOs, and businesses, cooperate to take action to achieve the goals of SDG-5. Manufacturing businesses in Pakistan are vital to the nation's development, so they must adopt SDG objectives within their organizations. The integration of SDG-5 into a company's governance framework enhances governance efficacy and promotes sustainability, encompassing financial, social, and environmental aspects (Mazumder, 2024; Sekarlangit & Wardhani, 2021; Zampone et al., 2024). It also contributes to the long-term value creation and sustainable growth of the corporation. The goal of this study is to clarify the function of SDG 5 and how it affects sustainability performance.

In this study, the financial, social, and environmental sustainability performance of manufacturing companies was examined about SDG-5 (the presence of women in BODs). The study sample comprises 87 manufacturing companies listed on the Pakistan Stock Exchange, with data spanning eight years, from 2016 to 2023. In this study, all three equations were estimated using the GMM test. The findings of its analysis show that having more women on the BODs promotes environmental and social sustainability. However, having more women on the BODs makes the company less financially sustainable(Alsayegh et al., 2020; Bătae et al., 2021; Glass et al., 2016; Meinzen-Dick et al., 2014; Rajesh, 2020). Our results indicate that having more females on board in manufacturing companies in Pakistan has a significant effect on the company's sustainability (Eliwa et al., 2023; Galletta et al., 2022). The findings propose that having the representation of female directors in companies enhanced value creation, social commitments, and environmental strategies (Eliwa et al., 2023; Galletta et al., 2022; Mohammad et al., 2018). Atif, Alam, and Hossain (2020) state that female directors prefer to fund, choose, and support projects that promote CSR and environmental sustainability (Peng et al., 2024). Gender equality on boards ensures diverse viewpoints and sound governance practices, which improve SDG reporting and add to the overall sustainability of the company.

The results indicate that having women in leadership roles has a substantial impact on sustainability performance, which validates the three theories outlined in the study: the triple bottom theory, gender socialization theory, and agency theory. Agency theory posits that the BOD's role in actively supervising and delegating authority plays a pivotal role in surmounting agency challenges(Nguyen et al., 2020). According to Adams, de Haan, Terjesen, and van Ees (2015), agency theory assists women in lowering agency conflicts and improving the sustainability performance in organizations through their skills, knowledge, and emotional intelligence. According to the triple bottom theory, companies should put profit, the environment, and people first. and pushes businesses to strike a balance between their profits and their social and environmental responsibilities (Bazel-Shoham et al., 2024; Munjal & Sharma, 2023). Gender socialization theory is an additional theory that lends support to the perspective of gender differences. This theory states that women are more concerned with long-term goals and stakeholder commitments, outcomes, and strategies. For social and environmental practices and performance to be successful, these two outcomes and goals are required (Eliwa et al., 2023).

Limitations and Future Recommendations

There are certain limitations to this study that should serve as the foundation for theoretical and practical implications that will be beneficial to academics, strategic bodies of companies, and policymakers. First, the sample consists solely of Pakistani manufacturing companies; it is recommended to test this model across other industries and nations as well. Second, the scope of this research was limited to the presence of SDG-5 in the BODs. It is suggested that researchers look at how SDG-5 is implemented in the CEO, upper management body, and governance committees (such as the audit, Research & Development, and HR committees, among others). Thirdly, the scope of this study is restricted to SDG 5, and it is advised to examine the implications of other SDGs as well. It is suggested that the policy board of the company appoint females to their BODs and provide them with training in financial, social, and environmental sustainability to improve performance. It is also recommended that companies can achieve better financial, social, and environmental results by updating corporate governance codes to reflect best practices in diversity and inclusion.

The study highlights the significance of gender diversity policies for corporate executives and policymakers. It recommends that in order to enable women to participate effectively on boards, policymakers should establish supportive frameworks for them. This covers initiatives for developing leadership skills, providing mentorship, and addressing cultural biases. Policies in this area should promote accountability and openness in board nominations. Business executives ought to place a high priority on including women in board dynamics and using their special insights to improve governance and decision-making. Comprehensive on boarding procedures, ongoing professional development, and mentorship programs can help achieve this. As part of their sustainability strategy, business executives should support gender diversity because it can help with financial, social, and environmental issues.

Researchers should look into additional diversity criteria that were not considered in this study, such as experience, qualifications, racism, nationality, age, culture, and others that may affect sustainability performance.

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