

Board gender diversity in innovative SMEs: an investigation across industrial sectors

Valeria Schifilliti and Elvira Tiziana La Rocca
Department of Economics, University of Messina, Messina, Italy

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Abstract

Purpose – Investigating the drivers that contribute to the success of small and medium-sized enterprises (SMEs) is crucial for ensuring the overall growth and sustainability of a country. The purpose of this research is to investigate the role of gender diversity on the Board of Directors of innovative SMEs to understand whether the presence of women on boards can improve the performance of such organizations devoted to introducing technological advancements in the product market.

Design/methodology/approach – The study adopts a quantitative approach, using a sample of 2,264 Italian innovative SMEs. These companies were selected from non-financial sectors and collected from *Analisi informatizzata delle Aziende Italiane (AIDA)*, a database provided by Bureau van Dijk. An unbalanced panel data involving a period from 2016 to 2021 was used with a total of 12,173 observations.

Findings – Our findings suggest that female representation has a negative effect on a company's financial performance. Moreover, the moderation effect of sector growth opportunities confirms this negative influence since in sectors characterized by high growth opportunities, the presence of women on boards was found to have a negative outcome.

Originality/value – The main contribution of the work lies in offering a comprehensive and thorough examination of the business category of innovative SMEs. Specifically, it extends previous research through a focus on board gender diversity of innovative SMEs by examining the impact of the presence of women in their boardrooms on firm performance outcomes. Furthermore, it provides an analysis of this effect, considering both high-growth and low-growth sectors.

Keywords Board gender diversity, Innovative SMEs, Firm performance

Paper type Research paper

1. Introduction

Gender diversity has emerged as an essential component of business governance, sustainability and growth. Ensuring equal and balanced representation and influence for minority groups inside organizational settings continues to be a significant challenge (Farag and Mallin, 2016). Over the past 10 years, organizations have come under increasing attention to encourage more diverse boards due to governmental regulations, media pressure and stakeholder influence. As a result, several actions have been taken to encourage gender diversity on the Board of Directors (BoD), such as the European Commission's adoption of a

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Directive in 2016 to increase female representation on corporate boards ([European Institute for Gender Equality, 2024](#)). Numerous European nations are promoting and perhaps even demanding publicly listed companies to expand the number of female directors on their boards, underlining the importance of gender balance in boardrooms ([European Women on Boards Gender Diversity Index Report, 2019](#)). For example, Germany, France, Belgium and Italy have adopted compulsory measures stating that between 30% and 40% of board positions must consist of women, while Denmark, Ireland, Greece, Spain, Luxembourg, the Netherlands, Austria, Poland, Portugal, Slovenia, Finland, Sweden and the UK have adopted soft measures, such as quotas without penalties or solely relevant to public firms ([European Women on Boards Gender Diversity Index Report, 2019](#)).

According to the [European Women on Boards Gender Diversity Index Report \(2019\)](#), based on information from 598 publicly listed companies in Europe, female representation on BoD lies at 33%, indicating an improvement over the past decade. Twenty-nine percent of the companies have boards that include at least 40% women, while 83 organizations have fewer than 20% of women on board. With a score of 0.53 on the Gender Diversity Index (GDI), in line with the European average, but 0.15 points lower than the highest-scoring nation, Italy ranks seventh among the countries analysed. The results showed that, in Italy, there is a substantial disparity between the representation of women on BoD and at the executive level. Italian companies have a 35% presence of women serving on BoD and supervisory boards, 21% holding chair positions and 41% employed in board and control committees. The representation of women in executive roles is 12%, while 17% of women hold the position of Chief Financial Officer. However, there is no female CEO among the STOXX Europe 600 companies in Italy where the GDI for Italy was considered by including all sectors ([European Women on Boards Gender Diversity Index Report, 2019](#)).

The concept of “board diversity” can be described as the variety within the composition of a board. This variety encompasses various dimensions, including, but not limited to, “gender, age, ethnicity, nationality, educational background, industrial experience, and organizational membership” ([Campbell and Mínguez-Vera, 2008](#); [Carter et al., 2003](#)). Specifically, the present study considers the presence of women on BoD as “board gender diversity” in line with previous studies such as [Adams and Ferreira \(2009\)](#), [Cook and Glass \(2018\)](#), [Gordini and Rancati \(2017\)](#).

Prior literature on the relationship between female board representation and firm performance reflects diverse findings, contributing to a mixed understanding of this association. Numerous studies, including those by [Cox and Blake \(1991\)](#), [Elsbach \(2003\)](#), [Smith et al. \(2006\)](#) and [Campbell and Mínguez-Vera \(2008\)](#), found that gender diversity positively influences a firm’s efficacy and competitive advantage. Additionally, several studies indicate that greater gender diversity on boards positively affects a firm’s performance with improved asset returns, market value and overall financial performance ([Singh et al., 2001](#); [Campbell and Mínguez-Vera, 2008](#); [Terjesen et al., 2016](#)). However, the impact of female board representation seems to vary depending on the context. On the one hand, prior research shows potential negative effects, particularly, beyond a critical threshold of around 20% female presence on boards ([Nguyen et al., 2015](#); [Darmadi, 2011](#); [Mínguez-Vera and Martin, 2011](#)). On the other hand, empirical evidence supports the notion that women on boards bring varied perspectives and expertise, enhancing board actions and organizational processes ([Adams and Ferreira, 2009](#); [Hillman et al., 2007](#)). In general, the literature landscape emphasizes the complexity of this connection. Although the presence of women on corporate boards can provide beneficial outcomes, it does not necessarily ensure enhanced performance since the outcome is likely determined by contextual circumstances, sectors, board composition or individual qualities of female directors ([Cox and Blake, 1991](#); [Elsbach, 2003](#); [Smith et al., 2006](#); [Campbell and Mínguez-Vera, 2008](#); [Adams and Ferreira, 2009](#); [Westphal and Zajac, 2013](#); [Singh et al., 2001](#); [Terjesen et al., 2016](#); [Gordini and Rancati, 2017](#);

Rubino *et al.*, 2021; Mari and Poggesi, 2020; Darmadi, 2011; Mínguez-Vera and Martin, 2011; Nguyen *et al.*, 2015; Mohsni *et al.*, 2021; Bennouri *et al.*, 2018; Adams and Ferreira, 2009).

The purpose of this research is to investigate the effect of BoD gender diversity on the performance outcomes of innovative small and medium-sized enterprises (SMEs). Furthermore, by conducting an analysis focused on interactions, it aims to investigate the moderating effect of sector growth opportunities. Innovative SMEs are an important reality today and few studies have provided a suitable breakdown on this specific topic. To the best of our knowledge, this kind of analysis in innovative SMEs remains fairly limited, therefore, the aim of the study is to fill this gap in literature offering an empirical contribution to an academically and managerially crucial issue regarding the board gender diversity of innovative SMEs.

The analysis employed a comprehensive database of Italian innovative SMEs, which is a noteworthy context due to its recent advancements in terms of the regulatory framework for innovation. The establishment of the Innovative SME company classification in 2015 by the Italian government was aimed at fostering technological development and promoting the growth of the country. These companies are more likely to compete within the national or worldwide market, thereby contributing to the enhancement of the country's export activities. Since their presence covers all geographical areas of the nation, this facilitates the dissemination of the advantages of innovation throughout the economy (ISTAT, 2021).

According to the findings of the present study, the presence of women in BoD has a negative effect on the financial success of innovative SMEs. Furthermore, the presence of women on boards was found to have a negative impact in industries that were characterized by significant growth potential as confirmed by the moderator effect of growth opportunities in different sectors. This highlights the paper's significant contribution to revealing the articulated impact of gender representation in corporate leadership on financial performance, especially when considering different sectoral growth dynamics.

The paper is structured as follows. Section 2 provides the theoretical and empirical context as well as hypotheses specification. Section 3 describes the sample, data and econometric methodology. The empirical findings of the study are presented in Section 4, and Section 5 concludes the article.

2. Literature review and research hypotheses

2.1 Theoretical background

Literature in the field of balanced representation and influence of minority groups in companies is constantly evolving, with ongoing discussions regarding the optimal levels of diversity for organizational effectiveness. This topic has been discussed using several theories including, but not limited to, *stakeholder theory*, stating that a board characterized by greater diversity becomes more familiar with the complexities of the heterogeneous market in which the company operates (Freeman, 1984); *signalling theory*, indicating that the presence of a certain number of women on the BoD may serve as a signal to individuals outside the company showing that it recognizes the importance of women and members of underrepresented groups and is therefore responsible regarding society (Bear *et al.*, 2010); *agency theory* suggesting that the adoption of board gender diversity is only allowed in situations where it contributes to the improvement of business performance by matching the objectives of the company's owners and managers (Dalton *et al.*, 2007; Jensen and Meckling, 2019); *resource dependence theory* that conceptualizes the company as a system that is not independent but rather reliant on other factors and circumstances, considering board composition and size as indicators of the board's capacity to supply essential resources to the organization (Hillman *et al.*, 2009); *human capital theory* stating that directors' human capital can contribute to the development of a company competitive advantage (Khanna *et al.*, 2014); and *social identity theory* examining the role of group membership in groups, such as gender, race, class

and occupation on an individual's identity (Turner and Tajfel, 1986). These identities create group boundaries and may provide higher evaluations of ingroup members, further reinforcing higher entry barriers for out-group members.

However, the present study considers two other opposed yet complimentary theories, namely, *token theory* and *critical mass theory* since they provide a valuable framework for understanding the impact of gender diversity on the BoD. Token theory suggests that tokens due to their numerical minority status in groups, such as women in predominantly male environments, might experience performance pressures, social isolation and stereotyping, but also have the potential to question established norms due to their unique perspectives (Kanter, 1977). Hence, token theory posits that when only one or a few women serve on a board, they are likely to be treated as symbolic representations rather than substantive contributors to board effectiveness. Lafuente and Vaillant (2019) showed that a balanced gender configuration (40–60% women) is more conducive to improving economic performance in financial firms instead of a single-woman representation. This aligns with the broader critique of tokenism that suggests minimal female representation does not significantly impact company performance or decision-making processes. However, further research analysing the presence of women in a minority status on the BoD showed that it is associated with positive outcomes and achieving a critical mass of women directors (at least three) can significantly enhance the level of firm innovation (Torchia *et al.*, 2011). Furthermore, the effectiveness of the board chairperson's leadership and the level of openness within the board are essential in facilitating the participation of women who are in the minority on the board in the decision-making process (Kanadli *et al.*, 2018). The concept of achieving a critical mass of women on boards is intended to mitigate the disadvantages of tokenism by facilitating a shift from perceiving women as purely symbolic representatives to recognizing them as influential contributors to the board.

Therefore, the theory of critical mass, specifically in relation to gender diversity on corporate boards, suggests that there is a minimum number of diverse individuals required in order to have a beneficial impact on organizational outcomes. Joecks *et al.* (2012) and Torchia *et al.* (2011) contend that having a critical mass, which is commonly defined as a minimum of three women on a board, is crucial for exerting influence on decision-making processes and cultivating a work atmosphere that is more inclusive. Rahman *et al.* (2023) investigating the impact of the Malaysian Code on Corporate Governance on boardroom gender diversity, found that even a slight increase in gender diversity can significantly enhance a firm financial performance. This supports the idea that beyond a critical threshold, women can exert considerable influence, challenging prevailing norms and contributing to more effective governance.

Gordini and Rancati (2017) and Guldiken *et al.* (2019) found that gender diversity, especially when reaching a critical mass, leads to improved financial performance and innovation, while Erhardt *et al.* (2003) further support this result by demonstrating a positive link between board diversity and firm financial metrics. These findings underline the potential for gender-diverse boards to contribute to superior strategic decision-making, risk management and financial outcomes. Recent literature indicates the importance of considering contextual factors, such as industry norms, national culture and regulatory frameworks, when assessing the impact of gender diversity on boards, such as Torchia *et al.* (2011) and Rahman *et al.* (2023) that emphasize the significance of considering the wider corporate governance landscape in which gender diversity initiatives are situated. However, according to the findings of Cook and Glass (2018) even when women are in small numbers (token women), they still have a substantial impact on their organizations by increasing corporate social responsibility practices. These perspectives encourage a more comprehensive understanding of how gender diversity influences the dynamics of BoD and the success of companies in the marketplace.

2.2 Research hypotheses

2.2.1 Effect of female presence on the board on firm performance. Despite numerous studies having explored the link between female board representation and firm performance, the results seem to be ambiguous. Most of the studies argue that gender diversity influences the efficacy of a firm's performance while enhancing the company's competitive advantage (Cox and Blake, 1991; Elsbach, 2003; Smith *et al.*, 2006; Campbell and Mínguez-Vera, 2008; Adams and Ferreira, 2009; Westphal and Zajac, 2013). Previous empirical evidence indicates that women on boards observe more closely than male directors and contribute with a wide range of perspectives and expertise to the board, helping to improve the efficacy of board actions and the validity of organizational processes (Adams and Ferreira, 2009; Hillman *et al.*, 2007).

Similarly, some studies found that women on boards tend to improve asset returns along with producing financial gains (Singh *et al.*, 2001; Campbell and Mínguez-Vera, 2008; Liu *et al.*, 2014; Brahma *et al.*, 2021). According to the findings of Terjesen *et al.* (2016), companies that have a greater number of women participating on BoD display a greater value on the market and better financial performance. In addition, greater board gender diversity is crucial for improving corporate performance, and the presence of both members of underrepresented groups and women on BoD has a positive influence on the value of the company. Female participation in management and business administration is also associated with better levels of company performance (Carter *et al.*, 2003; Achkar and Bouri, 2021; La Rocca *et al.*, 2024). The above-mentioned studies are centred on large corporations, particularly, active public companies listed on the stock exchange rather than on SMEs.

At the Italian level, Gordini and Rancati (2017) analysed the relationship between board gender diversity and firm financial performance with specific consideration given to Law 120/2011 mandating gender quotas for BoD. The study, investigating this relationship by using firms listed on the Italian stock exchange from 2011 to 2014, revealed that the mere inclusion of at least one woman on a BoD does not impact a firm's financial performance. However, when taking into account gender diversity measured by the percentage of women on boards and the Blau and Shannon indexes, this relationship is positive and significant.

Rubino *et al.* (2021), using a sample of Italian publicly traded corporations from 2006 to 2015, found that the favourable impact of independent and executive female directors on a company's performance is influenced by the distinct attributes of women directors. The results indicated that female individuals from abroad or with demanding schedules have a negative effect on company performance. On the other hand, female directors who completed their graduate studies enhance the positive association between women in executive positions and the performance of the company.

Mari and Poggesi (2020), in their study on the influence of gender on the performance of Italian Innovative SMEs during the period 2014–2017, found that, unlike their male counterparts, women are more likely to perform, using "Growth in number of employees" and "Growth in revenues" as performance measures, instead of accounting performance indicators such as return on assets.

However, while some studies indicate that having more women on a board has no significant effect on a company's profitability, others show a negative impact of female representation on boards demonstrated by diminishing accounting returns (Darmadi, 2011; Mínguez-Vera and Martin, 2011). Using a sample of publicly traded firms in Vietnam, Nguyen *et al.* (2015) demonstrated that the beneficial impact of gender diversity on performance shifts to a negative effect at a certain critical threshold which is around 20% of female presence on boards, showing that after this point, the costs associated with diversity surpass any possible advantages. Some studies proved that gender diversity is positively related to corporate performance by boosting financial efficiency but negatively connected to both operational and economic risk and decreasing market-based performance (Mohsni *et al.*, 2021; Bennouri *et al.*, 2018). Other studies suggested that greater gender diversity may bring disadvantages

to the firm; it could increase the likelihood of conflicts (Richard *et al.*, 2004; Joshi *et al.*, 2006), slow decision-making process (Hambrick *et al.*, 1996) and differences in responding to risks (Jianakoplos and Bernasek, 1998). Adams and Ferreira (2009) demonstrated that diversity has a favourable influence on performance in companies that have inadequate governance, as assessed by their capabilities to avoid hostile takeovers, however, in companies with strong governance, implementing female quotas in the boardroom might reduce shareholder value. According to the authors, gender diversity in these companies leads to a higher risk of excessive surveillance. In general, the findings of the research indicate that female directors have a significant and value-relevant influence on the composition of boards of directors but not enough to suggest reforms based on quotas that would, on average, increase business performance.

Based on the presented arguments, and considering that the majority of studies suggest a positive effect between the presence of women on boards and firm performance, it is possible to formulate the following hypothesis:

H1. The presence of women on the BoD has a positive effect on firm performance.

2.2.2 Analysing sector-specific effects: the impact of female BoD presence on firm performance. Questioning if gender diversity in the boardroom of Italian innovative SMEs has a measurable impact on performance, depending on the different sectors, this study offers new evidence relevant to the current debate.

Christensen and Gordon (1999) discovered that the correlation between culture and financial performance is influenced by the type of industry, indicating that certain characteristics may be effective in one industry but ineffective in another. According to research conducted by Hemmert *et al.* (2022), the relationship between gender diversity and innovation performance in the manufacturing sector is not enhanced by team-level attributes such as intellectual ability and willingness to external knowledge. The impact of top management team gender diversity on innovation performance is positive and more pronounced in Germany compared to India, suggesting that cultural norms at a country level play a significant role in embracing the benefits of gender diversity. However, Mukarram *et al.* (2018) found that in the high-tech industry, the presence of women directors on corporate boards of Indian companies generates a positive response in terms of market prices. Conversely, the inclusion of female representation on corporate boards has a negative impact on the market outcomes of companies operating in the non-high-tech industry.

Within the Italian context, Arena *et al.* (2023), in their analysis of the impact of fintech on performance in the banking sector, found that the presence of independent women in the boardroom mitigates the negative relationship between fintech and the uncertain nature of Italian banks' assets, which contributes to reducing disagreements between investors, debtholders and societal management. When looking at the composition of boards in Italy, Bianco *et al.* (2011) noted that on the one hand, women who are connected with family-run companies are more likely to serve on BoD in smaller companies that have limited ownership and are active in the consumer goods industry. On the other, women who are not connected, are particularly prevalent in the IT/telecommunications industry. The study revealed no significant association between the presence of women and performance, observing a negative relationship between certain indicators of "good governance" and the presence of women.

As stated by Cropley and Cropley (2017), the presence of a gender imbalance in different sectors of advanced countries might potentially result in three distinct outcomes, all of which have the potential to limit the ability to implement innovation, particularly during a critical period where invention is of greatest importance. One primary concern arising from this disparity in gender representation is its effect on performance. Companies operating in industries such as engineering and manufacturing, which are predominantly male-

dominated, could exhibit inferior performance in terms of innovation. However, these organizations may lack awareness of their underperformance due to their tendency to compare themselves with similarly imbalanced counterparts. Furthermore, the presence of a workplace that is dominated by men can give rise to an organizational culture that actively discourages women from participating in these types of companies. This can lead to a detrimental cycle where gender-related factors contribute to a decrease in innovative performance.

According to [Surroca et al. \(2010\)](#), the expansion of a sector could encourage the establishment of innovation mindsets in companies that are committed to social responsibility, increasing their profitability. However, the process of knowledge exchange and combination, which is essential for the development of innovative solutions, not only encourages a work environment that is collaborative and adaptable among the company workforce but also increases the positive outcomes on organizational performance, in particular, in the context of high-growth industries, where agility and innovation are essential ([Lepak et al., 2003](#); [Surroca et al., 2010](#)). According to the study by [Russo and Fouts \(1997\)](#), organizations that operate in high-growth sectors have a greater probability of attaining financial gains through reputation enhancement than those in low-growth sectors, due to the comparatively lower level of public awareness regarding corporate operations.

Based on the arguments presented, it is possible to formulate the following hypothesis:

H2. Sector growth opportunities positively moderate the effect of women in the BoD on firm performance.

3. Methodology and data

3.1 Research context

Our empirical analysis is focused on Italy as it provides a suitable laboratory to investigate the role of innovative SMEs. In order to promote technological development and growth of the country, the Italian government established the Innovative SME business category in 2015 defining them as companies actively engaged in innovation with certain specific characteristics, such as ownership rights related to intellectual property, skilled workers with a doctorate or with previous experience in research activities in public or private institutes and a specific amount of R&D investments ([MISE, 2015](#)). The regulation on innovative SMEs was, specifically, introduced with Law Decree n. 179/2012, with the aim of boosting the competitiveness of the Italian productive system and promoting technological innovations. The expression “Innovative SMEs” refers to a category of SMEs registered in a dedicated innovative SME section of the Italian Chamber of Commerce. These companies must meet certain criteria outlined in the European standard in order to be classified as SMEs (EU recommendation 2003/361). However, there are no limitations regarding the industry, based on the assumption that technological innovation is a characteristic that can be observed in any business sector. In order to be considered innovative SMEs, companies should satisfy a minimum of two of the following criteria: (1) R&D expenditures should equate to at least 3% of the higher amount between the Value of Production and the Cost of Production; (2) the employees should consist of either one-fifth of individuals holding Ph.D. degrees, graduates or researchers (with a minimum of three years of certified research experience) or one-third of the team should possess a Master’s degree; and (3) the company must be the holder, depository or licensee of a patent or be the owner/author of original registered software.

According to the 2022 annual report of the Ministry of Enterprises and Made in Italy (MIMIT), the number of innovative SMEs is continually growing as well as the employment rate. From a geographical standpoint, there are noticeable concentrations of these companies, with around 39% of firms located in North-Western Italy. Lombardy alone accounts for

29.8% of these companies, solidifying its prominent position. The Central region is home to approximately 22% of these enterprises, while the Southern regions house one-fifth of all innovative Italian SMEs (MIMIT, 2022). The total number of employees in 2021 was approximately 43,400 with a combined turnover exceeding €6.4bn, reflecting their strong production value (MIMIT, 2022). Regarding the sectors, adopting the ATECO 2007 classification of economic activity, 38.2% of innovative SMEs are involved in information and communication services which accounts for 31.4% of the total in Italy. These companies are primarily involved in software production, IT consultancy and related activities. In comparison to 2020, there was a significant increase of over 25%. Within the field of professional, scientific and technological activities, there is a noteworthy level of activity, with 25% of innovative SMEs operating in this sector. This category includes scientific research and development, as well as business management and management consultancy, emerging as predominant areas of engagement. In addition, manufacturing activities account for 21% of the country's overall contribution, with 460 firms contributing to this sector's vitality. The manufacturing sector encompasses notable industries such as computer, electronic and optical product manufacturing as well as mechanical engineering. The presence of innovative SMEs in numerous professional, scientific and technical sectors highlights the diverse and significant contributions they provide to the Italian economy (MIMIT, 2022).

Examining the representation of women in innovative SMEs during the years 2020–2021, the “Majority” category (from 50% to 66% female presence) showed an increase from 45 individuals in 2020 to 51 in 2021, as well as the “Strong” category (from 66% to 100%) showing an increase from 63 to 77. On the other hand, the “Exclusive” category (100%) witnessed a decline in the number of females present (from 35 to 38) and a decrease in percentage weight from 2.0% to 1.7% (MIMIT, 2022).

Hence, Italian innovative SMEs were considered for the analysis as they present a particularly interesting context due to recent advancements in the country's innovation regulatory framework. This designation incentivizes companies to invest in R&D, ultimately fostering their competitiveness in both national and international markets (MISE, 2022). The government aimed to foster a more dynamic and technology-driven corporate climate by classifying specific SMEs as innovative companies. These classified companies are perceived as more inclined to participate in global competition, thereby making a substantial contribution to the improvement of Italy's international market position (ISTAT, 2021). Hence, the establishment of the Innovative SME classification in Italy is a strategic attempt aimed at leveraging the capabilities of technology-driven companies since this classification not only promotes their expansion but also plays a crucial role in positioning the country as a competitor in the global market.

3.2 Sample

The present study adopted a quantitative methodology based on a sample of 2,264 Italian innovative SMEs [1] operating in non-financial sectors, collected from AIDA, a Bureau van Dijk (BVD) database that offers accounting information at firm level, as well as details on both directors and corporate governance. The sample was selected from AIDA in March 2023. Considering that financial data were available up to 2021 (the balance sheets of 2022 were not yet available), we extracted a sample from 2016 to 2021 since the Innovative SMEs business category was introduced in 2015. We began the investigation in 2016 since the Italian Chamber of Commerce's Company Register was launched in the latter part of 2015 and companies qualify for inclusion in the sample if they possess a minimum of two years balance sheet data.

To sum up we employed an unbalanced panel involving a period from 2016 to 2021, with a total of 12,173 observations.

3.3 Econometric model

We want to test our first hypothesis (H1) according to the following model.

$$\text{Firm performance} = f(\text{Women on Board, controls}) \quad (1)$$

In Model (1), we used ROA as the dependent variable, calculated as the ratio between EBIT and total assets. This is a traditional firm performance measure (Adams and Ferreira, 2009; Easterwood *et al.*, 2012; Zona *et al.*, 2018), which allows to obtain information on operative performance, and the profitability of the core business.

The main explanatory variable is “Women on Board,” the percentage of women among all members of the BoD (ratio of women on BoD to the total number of board members) in line with previous studies, such as Byron and Post (2016), Campbell and Mínguez-Vera (2008).

To verify H2, we used an extension of the previous model.

$$\begin{aligned} \text{Firm performance} = f(\text{Women on Board, Women on Board} \\ \times \text{Sector Growth Opportunities, controls}) \end{aligned} \quad (2)$$

In particular, in Model (2), according to what is assumed in H2, we want to investigate how this main effect is conditioned by Sector Growth Opportunities, the degree of growth opportunities there among different two-digit sectors.

According to Czerwinska *et al.* (2022), there is a lack of presence of women in high-tech and science, technology, engineering and mathematics (STEM) fields. Their absence means that one of the most dynamic areas of economic growth, high technology and innovation is evolving without considering the potential input, experiences and perspectives of half the population (women). De facto, it would appear that few women are involved in high-growth sectors (Czerwinska *et al.*, 2022). However, we are interested in seeing whether the (low) presence of women in high-growth sectors can amplify company performance, with a positive contribution.

To investigate the moderator role of sector growth opportunities, we consider sales growth measured as the sales of the year (t) minus sales of the year ($t-1$) scaled by sales of the year ($t-1$). We then took the median value of sales growth in each two-digit sector the firms are affiliated with. Based on 25 sectors, from agriculture to manufacture and other services, we considered the median value of sector growth opportunities to split the sample.

Specifically, we created an interaction between Women on Board and the measure of sector growth opportunities (Women on Board \times Sector Growth Opportunities).

A comprehensive description of the variables used in our analysis can be found in Table 1.

As control variables, we considered traditional firm-specific measures, commonly used in literature. We accounted for board-specific features such as Age Board, estimated as the natural logarithm of the (mean) age of the BoD members. We added other measures to account for the company commitment to invest in innovation. In particular, we considered the variables R&D expenses, Patent expenses and Licensing expenses. All these three measures were scaled by total assets. Finally, our model combined other traditional accounting controls: Tangibility as a proxy of firm tangible assets is the ratio of tangible assets to total assets that account for a firm’s availability of collaterals; Cash Holding, amount of liquidity the company has; Long-Term Debt, as financial (interest bearing) long-term debt (Campbell and Mínguez-Vera, 2008), both scaled by total assets. This set of financial variables can portray a broad idea of the firm’s financial resources that could be, potentially, invested in strategic projects, such as those related to innovation. Moreover, we controlled for firm Size (natural logarithm of total assets) and firm Age (natural logarithm of a number of years since the firm foundation plus one), as a proxy for the reputation and track-record that a firm earns over the years (Campbell and Mínguez-Vera, 2008; Low *et al.*, 2015). Dummy Listing is a dummy equal to 1 if the firm is listed in a stock exchange, 0 otherwise. Dummy Delisting is

Table 1.
Description of
variables

Variable	Description
<i>Dependent variable</i>	
ROA	Ratio between EBIT and total assets
<i>Explanatory variable</i>	
Women on board	Ratio of women on BoD to the total number of board members
<i>Moderator variable</i>	
Sector growth opportunities	Median value of sales growth, measured as the sales of the year (<i>t</i>) minus sales of the year (<i>t-1</i>) scaled by sales of the year (<i>t-1</i>), in each two-digit sector the firms are affiliated with
<i>Control variables</i>	
Age board	Natural logarithm of the age of the BoD components
R&D expenses	R&D expenses on total assets
Patent expenses	Patent expenses on total assets
Licensing expenses	Licensing expenses on total assets
Tangibility	Tangible assets to total assets
Cash Holding	Cash and cash equivalent on total assets
Long-term debt	Long-term financial debt on total assets
Firm size	Natural logarithm of total assets
Firm age	Natural logarithm of number of years since the firm foundation plus one
Dummy Listing	Binary variable with value 1 when the firm is listed in a stock exchange, 0 otherwise
Dummy Delisting	Binary variable with value 1 in the event of delisting, and 0 otherwise
Dummy South	Binary variable with value 1 when the firm is in the south of Italy, 0 otherwise
Source(s): Authors' own work	

equal to 1 in the event of delisting and 0 otherwise. To take into account the differences between the north and south of the country, we used Dummy South, a dummy that equals 1 if the firm is located in Southern Italy and 0 otherwise. In our model, we also included Year dummies and Industry dummies.

4. Results

4.1 Descriptive statistics

For a general overview of the sample, the following tables show some descriptive statistics. Our sample composition of the Italian Innovative SMEs is in [Table 2](#) with a specific focus on the presence of women on BoD. As shown in [Table 2](#), in 40.38% of the Italian innovative SMEs sample there is at least one woman present on the BoD. In 8.09% of our sample, there are at least three women on boards.

As additional descriptive statistics, the following [Table 3](#) shows our sample distribution by sector considering NACE Rev. 2.

[Table 4](#) illustrates the descriptive statistics of the full sample analysed, in particular, the mean, median, standard deviation, quartiles, minimum and maximum values of the variables considered in the analysis.

From [Table 4](#), it is possible to see that the mean value of ROA is 26.3% and, as expected for innovative SMEs, there is a huge variability in this measure of performance. The minimum negative value of ROA is -107.61 while the maximum is 57.330. This wide range of variation is quite common in a sample based on innovative firms [Biga-Diambeidou et al. \(2019\)](#), [Cabeza-García et al. \(2021\)](#).

Concerning Women on Board, approximately 60% of the firms in the sample do not have women on the BoD. Other control variables present values that are in line with the main

Female presence	Freq.	%	Cum.	Male presence	Freq.	%	Cum.
0	7,258	59.62	59.62	0	624	5.13	5.13
1	2,642	21.70	81.32	1	3,568	29.31	34.44
2	1,289	10.59	91.91	2	1,614	13.26	47.70
3	576	4.73	96.64	3	1,434	11.78	59.48
4	218	1.79	98.43	4	1,244	10.22	69.70
5	104	0.85	99.28	5	873	7.17	76.87
6	42	0.35	99.63	6	715	5.87	82.74
7	11	0.09	99.72	7	449	3.69	86.43
8	11	0.09	99.81	8	363	2.98	89.41
9	4	0.04	99.85	9	319	2.62	92.03
10+	18	0.15	100.00	10+	970	7.97	100.00
<i>Total obs.</i>	12,173	100.00		<i>Total obs</i>	12,173	100.00	

Source(s): Authors' own work

Table 2.
Female and male
presence in the BoD

Sector	N. obs.	Mean
Accommodation	62	0.064
Administrative and support service activities	299	0.172
Agriculture, forestry and fishing	25	0.298
Arts, entertainment and recreation	57	0.195
Chemical and pharmaceutical	248	0.167
Construction	229	0.099
Education	65	0.116
Food, drink and tobacco industry	105	0.208
Human health and social work activities	79	0.159
ICT	4,790	0.086
Mining and quarrying	6	0.000
Manufacture non-metallic products	125	0.138
Manufacture of metal products	156	0.158
Manufacture refined petroleum	6	0.000
Mechanical electrics electronics	1,528	0.108
Other services	37	0.000
Other manufacturing	251	0.096
Professional, scientific, technical activities	3,064	0.106
Paper and allied products	69	0.065
Printing and publishing	21	0.294
Real estate activities	30	0.197
Transportation and storage	30	0.003
Textile and clothing industry	90	0.166
Water sewerage waste management	50	0.040
Wholesale and retail trade	751	0.112
Total	12,173	0.104

Source(s): Authors' own work

Table 3.
Distribution of the
sample companies by
sector (NACE Rev.2)

similar studies. The average age of BoD members is 51, showing a mean and median that are very close. The youngest member of the BoD is 25 years old, while the oldest is 90 years old. Twenty-two percent of firms have at least one patent in their portfolio.

Table 5 reports the descriptives for two sub-samples of firms operating in sectors having high compared to low levels of sector growth opportunities.

Table 4.
Descriptive statistics of
the full sample

	Mean	Median	sd	Min	1° quartile	3° quartile	Max
ROA	0.263	2.870	21.838	-107.61	-3.180	9.340	57.330
Women on board	0.104	0.000	0.171	0.000	0.000	0.182	0.800
Age board (log)	3.928	3.938	0.172	3.219	3.834	4.043	4.500
R&D expenses	0.028	0.000	0.094	0.000	0.000	0.000	0.910
Patent expenses	0.014	0.000	0.063	0.000	0.000	0.000	0.976
Licensing expenses	0.005	0.000	0.035	0.000	0.000	0.000	0.889
Tangibility	0.084	0.026	0.133	0.000	0.007	0.096	0.700
Cash Holding	0.178	0.111	0.190	0.000	0.029	0.272	0.841
Size	6.960	6.953	1.612	2.392	5.853	8.107	10.528
Long-term debt	0.246	0.180	0.259	0.000	0.000	0.430	1.000
Firm age (log)	2.087	2.079	0.786	0.000	1.609	2.639	4.394
Dummy Listing	0.032	0.000	0.175	0.000	0.000	0.000	1.000
Dummy Delisting	0.001	0.000	0.030	0.000	0.000	0.000	1.000
Dummy South	0.207	0.000	0.405	0.000	0.000	0.000	1.000

Note(s): N: 12,173
Source(s): Authors' own work

Table 5.
Descriptive statistics of
two sub-samples:
innovative SMEs in
high compared to low
sector growth
opportunities

	Innovative SMEs in Low-Sector Growth Opportunities			Innovative SMEs in High-Sector Growth Opportunities		
	Mean	Median	Sd	Mean	Median	Sd
ROA	0.554	3.040	21.647	-0.193	2.570	22.129
Women on board	0.099	0.000	0.165	0.112	0.000	0.180
Age board (log)	3.932	3.942	0.165	3.921	3.932	0.180
R&D expenses	0.032	0.000	0.101	0.021	0.000	0.081
Patent expenses	0.014	0.000	0.064	0.012	0.000	0.061
Licensing expenses	0.005	0.000	0.035	0.005	0.000	0.035
Tangibility	0.082	0.026	0.128	0.087	0.027	0.142
Cash Holding	0.175	0.112	0.185	0.183	0.109	0.196
Size	7.074	7.096	1.606	6.782	6.737	1.605
Long term debt	0.255	0.200	0.253	0.232	0.130	0.267
Firm age (log)	2.134	2.079	0.804	2.015	1.946	0.752
Dummy Listing	0.029	0.000	0.169	0.035	0.000	0.185
Dummy Delisting	0.001	0.000	0.028	0.001	0.000	0.032
Dummy South	0.214	0.000	0.410	0.194	0.000	0.396

Note(s): Sub-sample "Innovative SMEs in High Growth Sectors" N. obs: 4,746; sub-sample "Innovative SMEs in Low Growth Sectors" N. obs: 7,427

Source(s): Authors' own work

Comparing the outcomes for ROA and Women on Board, we see that in the sub-group of firms operating in sectors with high growth sales, the mean value of ROA is negative in comparison to a positive value for the sub-group of innovative SMEs acting in sectors with low growth in sales. We also see that in the first subgroup there is a higher percentage of women sitting on BoD in comparison with the second sub-group. Considering both ROA and Women on Board, a *t*-test suggests that the difference in the mean is statistically significant.

Table 6 reports the correlation matrix of the variables. Additionally, we tested possible multicollinearity among the independent variables by using variance inflation factors (VIFs). The maximum VIF in the model is 1.51 (mean of 1.12), which is far below the generally accepted cut-off of 10 (or, more prudently, 5) for regression models (Kutner *et al.*, 2005), suggesting that multicollinearity is not a problem in this study.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	VIF	
1	ROA	1.00														1.04
2	Women on board	-0.03	1.00													1.12
3	Age board (log)	0.06	0.06	1.00												1.03
4	R&D expenses	-0.09	-0.01	-0.01	1.00											1.02
5	Patent expenses	-0.07	0.03	0.04	0.07	1.00										1.01
6	Licensing exp.	-0.04	0.01	-0.01	0.04	0.05	1.00									1.12
7	Tangibility	0.04	0.06	0.07	-0.07	-0.06	-0.02	1.00								1.09
8	Cash Holding	0.03	0.02	-0.13	-0.11	-0.06	-0.03	1.00	1.00							1.51
9	Size	0.06	0.16	0.22	0.02	0.07	0.06	-0.14	0.17	1.00						1.07
10	Long term debt	-0.11	0.02	0.03	0.07	0.05	0.06	-0.11	0.17	1.00						1.44
11	Firm age (log)	0.16	0.10	0.30	-0.02	0.01	0.15	-0.12	0.50	0.06	1.00					1.10
12	D. listing	0.01	0.08	0.05	-0.00	0.06	-0.02	-0.03	0.22	0.01	0.04	1.00				1.03
13	D. Delisting	-0.04	0.03	-0.00	-0.01	-0.00	0.00	-0.02	0.05	0.01	0.00	0.17	1.00			1.03
14	D. south	0.09	-0.06	-0.03	0.04	-0.02	0.12	-0.02	-0.03	0.03	0.04	-0.07	-0.02	1.00		1.03

Source(s): Authors' own work

Table 6.
Correlation matrix

4.2 Main model: regression results

The main results of our study are presented in [Table 7](#) (basic model).

In Column (1), [Table 7](#), the main model results are reported. In Columns (2)–(7), the cross-sectional results in each year of analysis are shown.

In Column 1, the negative and statistically significant coefficient of the variable Women on Board reveals that a female presence on the BoD decreases SME performance (ROA). Thus, board gender diversity has a relevant negative effect on firm performance; therefore, the first hypothesis has been rejected. This result is in contrast with many previous studies ([Brahma et al., 2021](#); [Arvanitis et al., 2022](#)), while it is in line with some other empirical studies ([Adams and Ferreira, 2009](#); [Fernández-Temprano and Tejerina-Gaite, 2020](#)). The other columns show a similar negative effect considering cross-sectional regressions in each of the years included in the analysis.

Almost all control variables are statistically significant, and their estimated coefficients are generally consistent with those found in previous studies.

Moreover, considering [Hypothesis 2](#), [Table 8](#) presents results for the impact of Women on Board on Firm Performance moderated by Sector Growth Opportunities.

Specifically, [Table 8](#) Column (1) shows the results concerning Model [2] with regard to the moderating effect, using the variable Sector Growth Opportunities in interaction with Women on Board. The direct effect of Women on BoD on firm performance is no longer statistically significant, as in [Table 8](#). However, the interaction term shows a negative and statistically significant coefficient. The negative effect of Women on Board on ROA is even more negative for higher levels of sector growth in sales. Thus, for higher degrees of Sector Growth Opportunities, female representation on BoD damages firm performance. It may be that the need for investments to sustain the growth dampens firm performance and having women on the BoD reduces performance.

From [Table 8](#), it can be observed that the negative effect of female representation on BoD and ROA becomes even more negative as it increases growth opportunities in sectors. However, these figures do not convey the full information on the magnitude, sign and significance of the marginal effect of Women on Board. The marginal effect of Women on Board may change sign and gain or lose significance according to all the values of the Sector Growth Opportunities variable. In other words, while the estimated parameter shown in [Table 8](#) Column (1) represents the Women on Board marginal effect when Sector Growth Opportunities is 0, we are interested in appraising whether the Women on Board effect on ROA is different in magnitude and significance according to different levels of Sector Growth Opportunities. This interaction term, considering two continuous variables, needs a graphical analysis for an appropriate interpretation of this effect. Therefore, we need a graph to provide a specific picture.

[Figure 1](#) refers to Column 1 of [Table 8](#), which allows us to interpret the moderating effect between two continuous variables: Women on Board and Sector Growth Opportunities. To provide a concise report on these figures, we graphed the marginal effect of Women on Board on ROA – along with its 95% (or 90%) confidence intervals – across the range of the Sector Growth Opportunities regressor.

According to this graph, reported in [Figure 1](#), the effect of female representation on BoD on firm performance is indeed dependent on the degree of growth in the sector. At low levels of growth in the sector, the Women on Board estimated marginal effect on ROA is not statistically significant (the confidence band does include the zero line). While, after a level of around 1 in sector growth, when the growth becomes substantial, the negative effect of the marginal effect of Women on Board on firm performance is, again, even more negative and statistically significant (the confidence band does not include the zero line). Thus, the effect of Women on Board on ROA turns out to be statistically significant beyond a threshold value of about 1. It is worth mentioning that more than 65% of our sample observations fall within the significance area.

	(1)						
	Model [1]						
	OLS with year and industry dummies						
	(2)	(3)	(4)	(5)	(6)	(7)	
	2021	2020	2019	2018	2017	2016	
<i>Women on board</i>	-5.264*** (1.139)	-5.621** (2.610)	-7.401*** (2.678)	-1.943 (2.663)	-5.057* (2.931)	-2.139 (3.170)	
Age board (log)	1.528 (1.301)	1.245 (2.756)	2.848 (2.970)	3.105 (3.523)	2.112 (3.369)	-1.932 (3.678)	
R&D expenses	-17.20*** (2.110)	-20.85*** (4.612)	-13.93*** (4.780)	-19.54*** (5.293)	-19.13*** (5.326)	-15.76*** (5.597)	
Patent expenses	-18.37*** (3.183)	-13.74*** (5.066)	-26.90*** (8.286)	-27.02*** (11.609)	-22.23*** (8.569)	-23.40*** (10.985)	
Licensing expenses	-9.659 (6.027)	-17.969 (14.997)	-23.531 (14.558)	-17.153 (16.962)	9.654 (13.480)	4.233 (16.514)	
Tangibility	5.957*** (1.306)	7.448** (2.927)	7.918*** (2.747)	3.593 (3.436)	10.659*** (3.247)	-1.531 (3.838)	
Cash Holding	4.822*** (1.225)	8.632*** (2.819)	9.575*** (3.020)	0.744 (3.427)	2.745 (3.119)	1.790 (3.253)	
Size	0.406** (0.177)	0.932** (0.408)	1.023** (0.432)	-0.221 (0.436)	0.547 (0.454)	-0.293 (0.468)	
Long term debt	-9.483*** (0.798)	-10.02*** (1.787)	-8.710*** (1.910)	-7.260*** (1.903)	-12.13*** (2.289)	-11.66*** (2.258)	
Age (log)	4.086*** (0.282)	4.903*** (0.782)	3.779*** (0.718)	4.078*** (0.703)	3.680*** (0.648)	4.786*** (0.693)	
Dummy Listing	1.841** (0.932)	-0.851 (2.504)	2.499 (2.163)	1.506 (2.871)	3.583** (1.812)	2.376 (2.565)	
Dummy Delisting	-27.14*** (7.209)	-33.76*** (2.482)	-32.057* (19.270)	-33.553* (18.591)	-22.195* (12.787)	-21.551 (15.469)	
Dummy South	4.508*** (0.414)	5.112*** (0.930)	5.112*** (0.968)	4.126*** (1.045)	2.236* (1.143)	5.084*** (1.125)	
R ²	0.078	0.102	0.080	0.069	0.080	0.078	
Observations	12,173	2,021	2,096	2,065	1,998	1,882	

Note(s): For a description of variables, see Table 1. Year and Industry dummies are included in the model although not reported. Robust standard errors are reported in brackets. ***, ** denotes significance at the 1% level, * denotes significance at the 5% level, . denotes significance at the 10% level. The variable “Women on Board” is the number of women on board divided by the total number of board members

Source(s): Authors’ own work

Table 7.
Results concerning the
effect of women on
board on firm
performance (main
model and year-by-
year results)

	(1) Model [2] Moderating effect between continuous variables	(2) Robustness Moderating effect with dummy high growth sector (median)
Women on board	3.444 (4.384)	0.123 (1.745)
Sector growth opportunities	3.512*** (0.806)	
<i>Women on board</i> × <i>sector growth opportunities</i> (continuous variable of growth)	-7.467** (3.778)	
Dummy high growth		-7.374** (3.314)
<i>Women on board</i> × <i>dummy high growth</i> (dummy variable of growth)		-7.044*** (2.205)
Age board (log)	1.539 (1.301)	1.646 (1.302)
R&D expenses	-17.193*** (2.110)	-17.184*** (2.108)
Patent expenses	-18.414*** (3.184)	-18.254*** (3.182)
Licensing expenses	-9.680 (6.030)	-9.503 (6.008)
Tangibility	5.878*** (1.307)	5.674*** (1.312)
Cash Holding	4.832*** (1.225)	4.844*** (1.224)
Size	0.397** (0.177)	0.389** (0.176)
Long term debt	-9.449*** (0.799)	-9.425*** (0.799)
Age (log)	4.092*** (0.282)	4.067*** (0.282)
Dummy Listing	1.820* (0.931)	1.834** (0.931)
Dummy Delisting	-27.120*** (7.208)	-26.953*** (7.327)
Dummy South	4.512*** (0.414)	4.498*** (0.414)
R^2	0.079	0.079
Observations	12,173	12,173

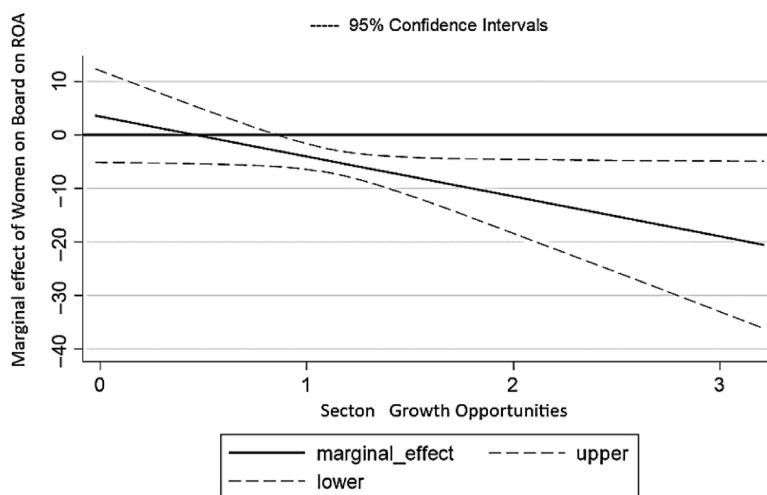
Table 8.

Results concerning the effect of Women on Board on firm performance moderated by sector growth opportunities. Analysis based on moderating effect

Note(s): For a description of variables, see Table 1. Year and Industry dummies are included in the model although not reported. Robust standard errors are reported in brackets. ***: denotes significance at the 1% level; **: denotes significance at the 5% level; *: denotes significance at the 10% level. The interaction variable “Women on Board × Sector Growth Opportunities” is the multiplication of the “Women on Board” and the “Sector Growth Opportunities” variables. The interaction variable “Women on Board × Dummy High Growth” is the multiplication of the “Women on Board” and the “Dummy High Growth” variables

Source(s): Authors’ own work

To sum-up, in innovative SMEs operating in high-growth sectors, the presence of women on BoD has a negative and significant effect on firm performance. The negative effect of the variable Women on Board on ROA is significant for increasing levels of the variable Sector Growth Opportunities. Thus, our research hypothesis H2 is, surprisingly, not confirmed.



Source(s): Authors' own work

Figure 1.
Marginal effect of
women on board on
ROA moderated by
sector growth
opportunities

4.3 Robustness and further tests

Moreover, in Table 8 Column (2), as robustness, we used a dummy variable (Dummy High Growth), which is a dichotomization of the continuous variables "Sector Growth Opportunities," to split the sample between firms operating in high growth sectors and firms operating in low growth sectors. According to the median value, we split the sample into two subgroups of sectors: a subgroup showing high-growth in sales and a sub-group of sectors showing low-growth in sales. Results in Table 8 Column (2) are in line with insights provided in Table 8 Column (1) and Figure 1.

To ensure the reliability of the analysis in assessing the influence of female representation on boards, an additional test with the variable *Critical Mass* was performed to enrich the analysis and to understand whether our main results are in line with the Critical Mass Theory (Torchia et al., 2011). The binary variable *Critical Mass* has a value 1 if there is the presence of at least 3 women on the BoD and 0 otherwise.

Table 9 reports the regression results for the sample of innovative SMEs with a critical mass of Women on Board. Also, in this case, our results are negative and statistically significant.

Table 10 shows our results of the analysis based on the moderating effect concerning the effect of Critical Mass and Firm Performance moderated by Sector Growth Opportunities. Results confirm the negative and statistically significant effect.

5. Discussion and conclusion

This paper investigated the effect of women in the BoD on firm performance using a sample of Italian Innovative SMEs, operating in non-financial sectors. After analysing this effect, our research aimed to test whether the influence of gender diversity on firm performance differs by sector.

The empirical analysis, conducted on a sample of 2,264 Italian innovative SMEs, from 2016 to 2021, highlights a negative and significant effect of the presence of Women in BoD on ROA. Moreover, the moderating effects of sector growth opportunities confirm this negative influence as, in sectors characterized by high growth opportunities, the presence of women on boards was found to have a slightly less statistically significant but still negative outcome.

Table 9.
Further test: results concerning critical mass and firm performance (main model and year by year results)

	Model [1] OLS with year and industry dummies						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		2021	2020	2019	2018	2017	2016
<i>Critical mass</i>	-6.264*** (0.822)	-7.093*** (2.086)	-5.069*** (1.888)	-7.683*** (2.099)	-6.124*** (2.172)	-6.903*** (1.804)	-4.558*** (1.988)
Age board (log)	1.141 (1.302)	1.499 (3.084)	0.945 (2.766)	2.374 (2.973)	2.722 (3.528)	1.667 (3.375)	-2.234 (3.677)
R&D expenses	-17.131*** (2.115)	-21.040*** (5.762)	-14.178*** (4.621)	-13.560*** (4.794)	-19.404*** (5.256)	-19.390*** (5.338)	-15.656*** (5.621)
Patent expenses	-18.200*** (3.156)	-13.335*** (5.060)	-11.290* (5.977)	-26.632*** (8.476)	-26.512** (11.478)	-22.035*** (8.392)	-23.468** (10.768)
Licensing expenses	-9.685 (5.984)	-18.688 (15.047)	-1.108 (7.178)	-22.277* (13.519)	-16.997 (17.291)	11.313 (13.691)	3.695 (16.481)
Tangibility	5.482*** (1.302)	6.634** (2.924)	6.519** (2.897)	7.385*** (2.734)	3.369 (3.421)	10.253*** (3.228)	-1.950 (3.835)
Cash Holding	4.890*** (1.222)	8.146*** (2.802)	9.624*** (2.597)	4.752 (3.018)	1.130 (3.429)	2.843 (3.114)	1.987 (3.251)
Size	0.546*** (0.175)	1.035** (0.404)	1.113*** (0.421)	0.488 (0.426)	-0.029 (0.431)	0.715 (0.452)	-0.173 (0.469)
Long term debt	-9.641*** (0.796)	-10.303*** (1.788)	-8.797*** (1.735)	-7.558*** (1.900)	-7.339*** (1.900)	-12.283*** (2.282)	-11.775*** (2.259)
Age (log)	4.054*** (0.280)	4.887*** (0.778)	3.767*** (0.713)	4.012*** (0.674)	4.075*** (0.697)	3.618*** (0.641)	4.771*** (0.691)
Dummy Listing	4.495*** (1.054)	2.040 (3.958)	3.846** (1.908)	5.640** (2.439)	4.258 (3.206)	6.589*** (1.974)	4.392 (2.785)
Dummy Delisting	-25.295*** (4.436***)	-30.760*** (5.012***)	-21.656* (5.274***)	-29.984 (5.055***)	-31.449* (3.982***)	-20.396* (2.155*)	-20.061 (4.997***)
Dummy South	0.082 (0.412)	0.120 (0.929)	0.104 (0.889)	0.085 (0.962)	0.073 (1.035)	0.084 (1.136)	0.080 (1.122)
R^2	0.082	0.201	0.104	0.085	0.073	0.084	0.080
Observations	12,173	2,021	2,111	2,096	2,065	1,998	1,882

Note(s): For a description of variables, see Table 1. Critical Mass is measured by a binary variable with the value of 1 if there is the presence of at least 3 women on the BoD and 0 otherwise. Year and Industry dummies are included in the model although not reported. Robust standard errors are reported in brackets. ***, ** denotes significance at the 1% level; *, denotes significance at the 5% level; . denotes significance at the 10% level. The variable "Critical Mass" is a binary variable with a value equal to 1 if there is the presence of at least 3 women on the board, 0 otherwise

Source(s): Authors' own work

	(1) Model 2 Moderating effect between continuous variables	(2) Robustness moderating effect with dummy high growth sector (median)
Critical mass	1.604 (2.356)	-3.061*** (0.955)
Sector growth opportunities	3.044*** (0.791)	
<i>Critical mass</i> × <i>sector growth opportunities</i>	-6.870*** (2.059)	
Dummy high growth		-8.194** (3.367)
<i>Critical mass</i> × <i>dummy high growth</i>		-4.517*** (1.315)
Age board (log)	1.145 (1.303)	1.231 (1.303)
R&D expenses	-17.181*** (2.114)	-17.333*** (2.115)
Patent expenses	-18.366*** (3.157)	-18.188*** (3.150)
Licensing expenses	-9.723 (5.983)	-9.628 (5.968)
Tangibility	5.430*** (1.300)	5.265*** (1.305)
Cash Holding	4.903*** (1.222)	4.916*** (1.220)
Size	0.559*** (0.175)	0.561*** (0.175)
Long term debt	-9.645*** (0.796)	-9.583*** (0.796)
Age (log)	4.004*** (0.281)	3.991*** (0.279)
Dummy Listing	4.469*** (1.053)	4.546*** (1.056)
Dummy Delisting	-25.379*** (7.020)	-26.430*** (7.554)
Dummy South	4.458*** (0.412)	4.430*** (0.412)
R^2	0.082	0.082
Observations	12,173	12,173

Note(s): For a description of variables, see Table 1. Critical Mass is measured by binary variable with the value of 1 if there is the presence of at least 3 women on the BoD and 0 otherwise. Year and Industry dummies are included in the model although not reported. Robust standard errors are reported in brackets. ***: denotes significance at the 1% level; **: denotes significance at the 5% level; *: denotes significance at the 10% level. The interaction variable “Critical Mass × Sector Growth Opportunities” is the multiplication of the “Critical Mass” and the “Sector Growth Opportunities” variables. The interaction variable “Critical Mass × Dummy High Growth” is the multiplication of the “Critical Mass” and the “Dummy High Growth” variables

Source(s): Authors' own work

Table 10.
Further tests: results concerning critical mass and firm performance moderated by sector growth opportunities.
Analysis based on moderating effect

This may indicate that the expected advantages of gender diversity may be more contingent on particular conditions.

The results of our study reveal an intricate impact that is not in line with the positive promises of critical mass and token theories. The concept of critical mass suggests that in order to have a beneficial influence on board dynamics and firm performance, a minimum

level of minority representation, typically defined as at least three women on a board, is crucial for creating a positive impact (Torchia *et al.*, 2011; Joecks *et al.*, 2012).

On the other hand, according to token theory (Kanter, 1977), a solo or token woman may experience increased visibility and performance pressures, potentially impacting their effectiveness. Our findings present a different perspective by demonstrating that even in a sample where the presence of women is significant, the expected positive effects on performance did not emerge. This suggests the possibility of excessive monitoring and conflicts arising within diverse boards, potentially undermining the effectiveness of decision-making, particularly, in high-growth sectors where strategic decisions are crucial, and the risks are significant (Goodstein *et al.*, 1994; Hambrick *et al.*, 1996; Jianakoplos and Bernasek, 1998; Richard *et al.*, 2004; Joshi *et al.*, 2006; Adams and Ferreira, 2009; Van Peteghem *et al.*, 2018).

Additionally, the present study contradicts both the prevailing literature which demonstrates that more gender diversity on corporate boards leads to improved financial performance and innovation and previous studies exploring the relationship between board gender diversity and company financial performance in Italy (Torchia *et al.*, 2011; Gordini and Rancati, 2017; Rubino *et al.*, 2021; Mari and Poggese, 2020). However, the findings align with social identity theory as it suggests that the presence of female directors might have negative consequences (Turner and Tajfel, 1986; Christopher Weber and Geneste, 2014). For instance, a board that is predominantly male may reinforce group divisions and limit women from serving as directors (Turner and Tajfel, 1986). Accordingly, Christopher Weber and Geneste (2014), in line with social feminism theory, provide evidence that female business managers prioritize personal welfare and self-fulfilment over financial performance, which may account for their reduced inclination to engage in strategic decision-making, such as innovation endeavours.

Furthermore, the results indicate that women serving on boards might attribute higher importance to long-term sustainability rather than immediate profitability. This perspective might explain the observed negative influence on ROA in the short term but also suggests the possibility of beneficial benefits in the long term. Xie *et al.* (2020), in their study on the presence of women on BoD and the adoption of proactive environmental initiatives, found that these strategies relate to sustained competitive advantage and positive long-term financial performance. The results of this study underline the important role that women play on BoD regarding sustainable development strategies that may not result in immediate financial rewards but contribute to long-term sustainability and profitability.

This perspective emphasizes the significance of combining the composition of the BoD with the strategic direction of the company, especially in innovative SMEs where rapid growth and market dynamics may necessitate specialized governance requirements that cannot be satisfied only by gender diversity.

Our study makes several significant contributions to the body of knowledge on innovative SMEs and corporate governance mechanisms, stimulating the discussion on the presence of women on BoD, and its impact on company performance. We add new insights to the literature by presenting a broader understanding of innovative SMEs. First of all, we extend previous works through focusing on board gender diversity of innovative SMEs investigating specifically the influence of the presence of women in the boardroom on company performance outcomes, using variables and performance measures in line with the board gender diversity literature.

In addition, we provide an overview of this effect considering also high-growth and low-growth sectors. This represents a novelty for the research stream on innovative SMEs, since, to the best of our knowledge, no study has provided an integrative perspective on the impact of board female percentage on corporate performance of this SME category.

We suggest that the advantages of gender diversity may depend on several factors such as the specific characteristics of the industry, the strategies employed by the company and potentially the nature of the innovation process.

From a managerial point of view, firms should not consider adding women to a board with the expectation that this presence will automatically increase their performance. Considering the specific characteristics of innovation of innovative SMEs, the lower risk propensity of women could represent a “constraint” (Jianakoplos and Bernasek, 1998). Our results underline the need for further investigation. As stated by Adams *et al.* (2015), social categorization processes may increase conflict and diminish performance and board diversity may foster social categorization within boards that can be expected to disrupt board effectiveness. Bernile *et al.* (2018) propose that having a diverse gender composition on a board might result in negative outcomes, including difficulties with communication, decreased cooperation, higher conflict, prolonged decision-making processes and slower response times, all of which can impede effective decision-making. As a consequence of the challenges associated with incorporating every board member into a cohesive and efficient team (Huse, 2007; Piekkari *et al.*, 2015), resolving interpersonal differences among board members may require more time (Milliken and Martins, 1996).

However, to overcome the still current phenomenon of female underrepresentation in diverse sectors, policymakers should pay more attention and provide support to women across all sectors and countries, especially in fields with a male preponderance where preconceptions are likely to exist.

Our empirical results do not confirm our research hypotheses, but further investigations are needed and raise questions about the reasons for this negative effect of female presence on the BoD of Italian innovative SMEs. The work offers several starting points for further research. Future analysis could consider the role of moderating variables and, in this regard, more advanced econometric techniques could be useful to better understand the impact of board gender diversity on corporate performance or other robust methods of addressing the endogeneity of gender diversity could be applied.

Moreover, considering that innovative SMEs with high growth sales include companies with many investments, ROA, as an accounting performance indicator, can assess the “asset in place” component but not the “growth opportunity” component, i.e. benefits that will be generated in the future by current investments. Thus, a market performance indicator, such as “market-to-book ratio” may be more suitable for this kind of investigation.

Our research has some limitations, including the fact that our empirical analysis involves just the Italian context, considered a civil-law country, and thus the results could be unique to this environment and may not be generalized in a different institutional context (common law countries).

Note

1. The list of registered innovative SMEs is publicly available on <http://pminnovative.registroimprese.it>; the database is updated weekly and published in open format.

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Corresponding author

Valeria Schifilliti can be contacted at: vschifilliti@unime.it