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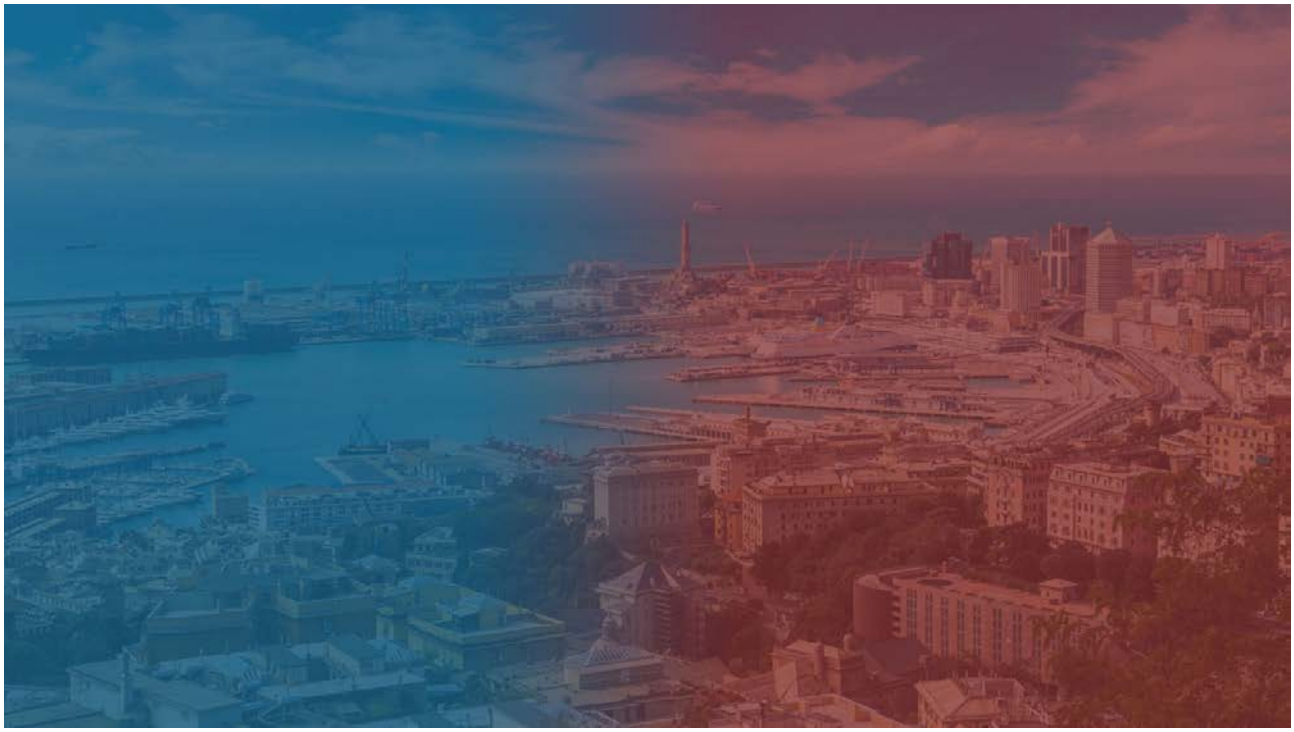

Tertiarization & sustainability new challenges for management in the digital era

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No Women No Innovation?
The Effect of Women on Boards on Patent Activity in SMEs

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Abstract

Women directors are often perceived as more risk-averse than men counterparts, potentially compromising firm's innovative performance. Contrasting studies reveal instead an improvement in the decision-making process due to greater diversity on board. Consequently, how is innovation influenced by women representation on boardrooms? Limited empirical research exists on investigating the influence of women on board (WOB) on innovative performance of SMEs. Using a longitudinal dataset of innovative Italian SMEs, our study examines whether innovative SMEs lead by women exhibit any substantial differences in innovative performance compared to male-led innovative SMEs. Our findings potentially reveal significant differences in innovation between the two groups, highlighting the need for more caution in providing general subsidies to spur innovation, by shifting the focus to alternative rewards based on measurable innovative contributions of firms, rather than remaining anchored to general passive tax subsidies to innovation.

Framing of the research. *In recent decades, academics and practitioners have strongly debated the role of women on boards, attracting increasing attention of policy makers. Several countries (e.g., Spain, Italy, Norway, California and many others) have consequently introduced laws to guarantee a more balanced and fair composition of corporate boards (Greene et al., 2020; Smulowitz et al., 2025). Besides social equality consequences, these political interventions also positively influence the value maximization of the firm. Value maximization literature states that more women on boards positively impact firm value through a better decision-making process (Griffin et al., 2021), influencing monitoring and resource provision (Hillman and Dalziel, 2003). Nevertheless, frequently women are placed into board positions due to tokenism (King et al., 2010; Yoder and Sinnet, 1985; Kanter, 1977), without actually having an impact on firm's management, or they are welcomed on board during crisis periods and high-risk situations, commonly called "glass cliff" situation (Ryan and Haslam, 2007, 2005). Additionally, female board members often perceive a lower status, and they are less valued as a group member (Vial et al., 2016; Duguid et al., 2012).*

An important strand of literature investigates the influence of women board membership on innovation outputs, but there is no common agreement on whether this influence is positive or negative (Smulowitz et al., 2025). Some studies state that women are more risk-averse negatively influencing the level of innovation in the firm (e.g., Nelson, 2015; Faccio et al., 2016). Empirical research has shown that on average women choose options with fewer financial risks than male counterparts (Sapienza et al., 2009; Byrnes et al., 1999; Jianakoplos and Bernasek, 1998). Additionally, women often see their position as more precarious than the one of their male counterparts, amplifying their risk-averse approach (Glass and Cook, 2020; Smith et al., 2019; Vial et al., 2016; Smulowitz et al., 2025) Other works provide opposite results mainly focusing on the improvement of decision-making process given by the gender diversity on the board that results in more innovation (Smulowitz and Smulowitz, 2024; Hemmert et al., 2022; Griffin et al., 2021; Vafaei et al., 2021; Cumming et al., 2015; Adams and Ferreira, 2009). Heterogeneity in boards spurs broader perspectives which allow the management to be involved in in-depth conversations and find various alternatives (Rao and Tilt, 2015; Van Knippenberg et al., 2004; Watson et al., 1998; Robinson and Dechant, 1997).

Smulowitz et al. (2025) investigate this controversial situation by shedding light on big firms. Specifically, they empirically demonstrate that women on board can be both more risk averse, but also more innovative, depending on the firms' performance relative to aspirations (PRA) (Chen and Miller, 2007; Eggers and Suh, 2019; Greve, 2003). This research seems to overcome the debate on the impact of women on board on innovation of big firms, however, are those results valid also for SMEs? A recent study from Teruel and Segarra-Blasco (2017) confirms that the size of the firm exerts a moderating role between gender diversity in boardrooms and innovation, highlighting a greater difficulty for SMEs in capturing advantages from gender diversity during the innovation process, compared to large firms. However,

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no studies specifically focus on small and medium enterprises to understand the impact of women on board on innovation. We aim to investigate the impact of women on board on innovation in SMEs, contributing to filling the gap in the literature.

To address this gap, we will focus on the Italian context as Italy is characterized by a widespread SMEs ecosystem. Specifically, about 80% of the workforce is employed in small and medium enterprises (Cucino et al., 2024; ISTAT, 2023). Additionally, the Italian Ministry of Development (MISE, 2020) significantly focuses on firms transitioning towards Industry 4.0, initiating various interventions to spur digitalization and innovation among firms. Consequently, Italy is a strong empirical setting to validate our hypotheses and provide significant contributions to the literature (Martinelli et al., 2021).

Purpose of the paper. *The present work aims to investigate the impact of women board membership on innovative performance of small and medium enterprises (SMEs). While past research has focused on the role of women on corporate boards in large firms, in relation to firm innovation, there remains a gap in understanding how these dynamics works for SMEs. Existing literature presents conflicting perspectives, where some works argue that women's risk aversion hinders innovation, while others highlight their contribution to enhance decision-making processes that foster innovation. A recent study from Smulowitz et al. (2025) suggest that the relationship between women on board and innovation relates to firms' performance relative to aspirations (PRA), solving the debate for large firms. This study aims to extend the empirical investigation by exploring whether similar effects hold for SMEs, contributing to the broader understanding of gender diversity's role in corporate governance and innovation within smaller enterprises.*

Methodology. *We build a unique dataset collecting information from the Italian Chamber of Commerce database, Aida-BvD database, and Orbis IP. The Italian Chamber of Commerce database is a national institution responsible for validating all companies' administrative and legal requirements. The law requires that all innovative SMEs must register in a specific section of the Italian Chamber of Commerce's register and provide information regarding board composition. From this dataset, we obtain about 3,000 innovative SMEs in Italy founded between the 2013 and the 2023. Among this, 2190 have a majority of women in their boards. Moreover, to collect financial information, since the Italian Chamber of Commerce does not provide this kind of information, we employ the Aida database provided by Bureau van Dijk (BvD). By merging data from both sources, we collect comprehensive financial information on 1,937 innovative SMEs. Finally, we collect patent data employing Orbis IP. As such, we are able to conduct our empirical analysis on a comprehensive sample of 1,937 SMEs consisting of non-financial information (such as board composition information, location, industry, and so on), financial information (like revenues, profitability measures, etc.), patent information (regarding quantity, scope, citations, IPS and CPC).*

We will test our hypotheses by employing a difference in difference approach followed by a propensity score matching method. The difference in difference (Diff-in-Diff) is a widely spread methodology (Zambelli et al., 2024; Potì and Wang, 2023; Becalli et al., 2023; Srivastav and Vallascas, 2022) adopted to compare a treated group and a control group. Specifically, the Diff-in-Diff methodology estimates the effect of a specific treatment by comparing the changes in outcomes over time between the two groups of treated and control observations (Zambelli et al., 2024). Both groups will be evaluated before and after the treatment. We aim to compare the treated group of innovative SMEs with the majority of board components represented by women, and the control group of innovative SMEs with the majority of man in the board. Our treatment effect is, indeed, represented by having a majority of women on board, while our outcome is the number of patents the firm has licensed. Moreover, consistently with past literature, our model will include control variables, described as follows: (1) whether the SME operates in a high-tech industry or not (Messeni Petruzzelli et al., 2022), (2) the SME's age (Kelly & Amburgey, 1991), (3) the SME's size (Arbore & Ordanini, 2006; Horváth & Szabó, 2019), (4) the SME's potential and realized absorptive capacity (i.e., the R&D expenses on total revenue (Cassetta et al., 2020; Zahra & George, 2002), and (5) the digital skills of the SME's human resources (measured as the percentage of employees with a STEM degree (Agostini & Filippini, 2019; Eller et al., 2020; Giotopoulos et al., 2017; Horváth & Szabó, 2019). We will extend our model by employing a propensity score matching (PSM) methodology (in line with Zambelli et al., 2024; Ayadi et al., 2021; Casu et al., 2013; Caliendo and Kopeining, 2008). The PSM is a statistical methodology commonly used to estimate causal treatment effects in non-randomized environments. To perform this method, we will identify the treatment, which is to have the majority of board components represented by women, a group of treated observations, and a control group (Casu et al., 2013; Rosenbaum and Rubin, 1983). Applying this research strategy we will be able to rigorously identifying the impact of women on board on innovation of SMEs, significantly contributing to the literature.

Results. *The study will potentially reveal key insights into the relationship between women board representation and innovation in SMEs, measured by the number of patents licensed. Based on prior literature and theoretical perspectives, several possible outcomes may emerge. However, we expect that the presence of women on board in SMEs positively impact innovation processes, enhancing decision-making quality, resource allocation, and strategic vision. This would be reflected in a greater number of licensed patents, particularly in firms operating in high-tech industries, where diverse perspectives may drive creativity and problem-solving. Another possible result is that female board representation does not significantly influence innovation in SMEs (e.g., Audretsch et al., 2022), suggesting that other factors, such as firm size, industry, and absorptive capacity (Zahra and George, 2002), play a more dominant role in driving patenting activity. We could also expect a negative relationship between women on board and innovation, demonstrating that Smulowitz et al. (2025) results do not hold for SMEs, and reopening the debate and providing interesting insights for deepening the field.*

Research limitations. *Despite its strong contributions to the academic field, the present study could present some limitations. First, the study focuses exclusively on the Italian innovative SMEs, which may limit the applicability of findings to other countries with different regulatory environments, cultural attitudes toward gender diversity, and innovation ecosystems. Future research could explore similar dynamics in other contexts to validate the results. Second, the study uses a dummy variable to indicate whether the majority of board members are woman, but this not accurately capture the actual influence of female directors. On the same vein, patents are a widely used measure of innovation (Block et al., 2025; Nagaoka et al., 2010; Encaoua et al., 2006), but they may not fully capture all forms of innovative activity, like non-patentable technological advancements. Future research could incorporate additional measures of female influence and innovation.*

Managerial implications. *This study has several important implications for managers and entrepreneurs seeking to foster innovation and improve corporate governance in SMEs. If the study finds a positive relationship between women on board and innovation, SMEs managers or entrepreneurs should start actively promoting gender diversity in board composition, leading to more balanced decision-making and enhanced vision and culture of innovation. If, on the contrary, the impact on innovation is negative due to the higher level of risk aversion, managers should moderate risk exposure of the firm mitigating this effect.*

Originality of the paper. *This research contributes to the literature by addressing a significant gap in the field, investigating the impact of women board representation on innovation within small and medium enterprises. While previous studies have extensively addressed this relationship in large corporations, limited attention has been given to SMEs. However, SMEs play a crucial role in economic growth and technological advancements, especially in Europe. For example, Italy counts a significant presence of small and medium enterprises, which employ about 80% of the national workforce (ISTAT, 2023). This empirical reality supports the importance of our findings for the entrepreneurial ecosystem. Additionally, by integrating data from the Italian chamber of commerce, Aida-BvD, and Orbis IP, this study constructs a unique dataset that combines board compositions, financial information, and patent data. This allows for a more rigorous analysis of the relationship between women on board and innovation in SMEs.*

Key words: *Women on Board; Gender; Patent; Innovation*

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