64th ERSA Congress
S27 – Gender Equality in Regions in Europe and Beyond

R&D team gender diversity and green innovation: evidence from Europe

Faggian, A[1]., Dal Molin M[2]. And Leggerini, C[3].

[1] Gran Sasso Science Institute (Italy)
[2] Vilnius University (Lithuania)
[3] University of Brescia (Italy)

Abstract (200-400 words)

This research investigates the impact of gender diversity within R&D teams on green innovation across European countries, considering the influence of national gender equality contexts. Among innovation and green innovation studies, the drivers of innovation have been traditionally studied from two main perspectives: firm-level characteristics (Liu, 2024; Zhang et al., 2019) and contextual factors (Zhang & Wang, 2022; Du et al., 2019), while individual and team-level characteristics have been largely overlooked (Chu, 2024; Hemmert et al., 2024; Naveed et al., 2023; Wu et al., 2021). Only recently, in fact, individual characteristics at the team level have begun to attract scholarly attention, particularly regarding the positive impact that gender diversity may have on innovation and green innovation (Hemmert et al., 2024; Liu & Zhu, 2024; Wu et al., 2021). Gender diversity, providing different perspectives and problem-solving approaches due to different by male and female personal traits, can foster idea generation and innovation (Valantine & Collins, 2015; Griffin et al., 2021; Díaz-García et al., 2013; Page, 2007). Moreover, in this research, we also consider gender equality context which, at national or regional levels may stimulate gender diversity within firms (Campopiano et al., 2023; Chizema et al., 2015).
In this research, green innovation is measured using two patent-based indicators: the classification of patents as "green" and their citation count, as a proxy for the quality of green innovation. Gender equality is evaluated using the Global Gender Gap Index. Preliminary results indicate that, while gender diversity within R&D teams generally reduces the likelihood of green innovation, this effect becomes positive in countries with higher levels of gender equality. Specifically, the presence of female inventors is positively linked to the development of high-quality green innovations.

Extended abstract (1.200 -2.000 words)

This research investigates the impact of R&D team gender diversity on green innovation, a topic that has garnered increasing attention in recent years but received limited attention to date (Liu et al., 2024). We claim that further investigation is needed for, at least, three reasons.
First, at a general level, innovation drives growth, especially in today's dynamic, globalized, and complex world (Wu et al., 2021). At national and regional levels, innovation supports economic development (Lundvall, 1992), while, at the firm level, it can provide competitive advantage, reduce costs, and improve performance (Chen et al., 2021; Wu et al., 2021; Horbach & Jacob, 2017). In recent years, academic and policy debates have increasingly focused on innovations aimed at developing new products or processes that minimize environmental impact (Kraus et al., 2020; Rennings & Rammer, 2011; Frondel et al., 2008). Such innovations are typically labelled as "green" (Takalo & Tooranloo, 2021; Amore & Bennedsen, 2016),

"sustainable" (Cillo et al., 2019; Boons et al., 2013), or "environmental" (Horbach, 2008; Del Brío & Junquera, 2003).

Second, in both innovation and green innovation studies, the drivers of innovation have been studied from two main perspectives: firm-level characteristics (Liu, 2024; Zhang et al., 2019) and contextual factors (Zhang & Wang, 2022; Du et al., 2019). However, individual and team-level characteristics, despite being potentially crucial determinants, have been largely overlooked (Chu, 2024; Hemmert et al., 2024; Naveed et al., 2023; Wu et al., 2021). Recently, in fact, individual characteristics at the team level have begun to attract scholarly attention, particularly regarding the positive impact that gender diversity may have on innovation and green innovation (Hemmert et al., 2024; Liu & Zhu, 2024; Wu et al., 2021). There are compelling arguments that gender diversity, with its range of perspectives and problem-solving approaches informed by male and female personal traits, can foster idea generation and innovation (Valantine & Collins, 2015; Griffin et al., 2021; Díaz-García et al., 2013; Page, 2007). At a theoretical level, gender socialization theory suggests that men and women exhibit distinct traits that lead to different behaviors. Women, for instance, tend to show heightened concern for stakeholder welfare, embody communal ideals, and are more inclined to advocate for environmental initiatives while minimizing harm to communities (Nadeem et al., 2020; Ibrahim et al., 2009). Consequently, these distinctive characteristics among female R&D team members are expected to result in their: i) adhering more strictly to ethical codes than their male counterparts; ii) participating less frequently in unethical practices, including securities fraud, earnings manipulation, and tax evasion; iii) advocating for sustainability; and iv) mitigating corporate social irresponsibility. This aligns with theories like female caring theory and feminist ecology scholarship, which suggest that women have more pronounced pro-environmental concerns than men (Lakhal et al., 2024; Horbach and Jacob, 2018). From an empirical perspective, although the propensity of women toward green innovation is well established at the theoretical level, evidence remains largely limited to boards of directors, with mixed results (Liu et al., 2024). Some studies highlight a positive relationship between gender diversity and green innovation. For instance, Chu (2024) examined the impact of board gender diversity on corporate green technology innovation in China, finding that a greater percentage of women on the board fosters the development of more green patents. Similarly, Lakhal et al. (2024), using three different measures of gender diversity (percentage of women on boards, the Shannon Index, and the Blau Index), reported a positive relationship between board gender diversity and green innovation, measured by green patents. Conversely, Horbach and Jacob (2017), in an analysis based in Germany, found a negative association between gender diversity and green innovation at top management levels, where female leadership was linked to less success in green innovation initiatives.

Third, few studies examining team gender diversity's effect on green innovation (and innovation more broadly) consider contextual factors like gender equality, which at national or regional levels may stimulate gender diversity within firms (Campopiano et al., 2023; Chizema et al., 2015). In studying gender diversity and (green) innovation, the country or regional context in terms of gender equality has received limited attention, even though it plays a fundamental role in shaping expectations around gender roles within organizations (Campopiano et al., 2023). The country or regional context represents the collective social knowledge shared among individuals across different countries (Atinc et al., 2022), serving as the framework for encoding and interpreting information and shaping people's perceptions of their external environment (Lemma et al., 2022). This context, in turn, influences individual decisions and behaviors (Lemma et al., 2022). By way of example, Post and Byron (2015) demonstrate in their meta-analysis that the effect of board gender diversity on firm performance also depends on contextual factors: this effect is positive in countries with higher gender equality but becomes negative in those with lower gender equality. Similarly, Griffin et al.

(2021) found that the positive relationship between gender diversity and innovation is stronger in countries with a more masculine culture. Recently, Chu (2024) highlights how contextual gender equality factors influence the relationship between gender diversity and green innovation, showing a positive relationship between green innovation and gender diversity in Chinese regions with higher levels of gender equality. In contrast, in regions with low gender equality and limited female political representation, this relationship is not statistically significant (Chu, 2024).

Building on these premises, this research investigates the effect of gender diversity in R&D teams on green innovation across Europe. The European context was selected to address a significant gap in current research, which predominantly focuses on single-country case studies (e.g., Díaz-García et al., 2013). Examining cross-country differences, while accounting for contextual and cultural factors related to gender equality, is essential given that gender role expectations are shaped by cultural influences (Cropley & Cropley, 2017). Theoretically, this research also broadens understanding of gender diversity's role in green innovation by shifting focus from higher levels of management (e.g., corporate boards and top management teams, where most previous research has centered) to R&D teams, which are directly responsible for developing new technologies and sustainable solutions.

Green innovation is proxied using two patent-based measures. The first is a binary variable indicating whether a patent is classified as green. The second measure, following Wu et al. (2021), assesses the quality of green innovation by the number of citations green patents receive, serving as a proxy for the impact and relevance of the patented green innovations. The data is sourced from OECD REGPAT, which also provides information on the composition of R&D teams. National gender equality levels were measured using the Global Gender Gap Index (GGGI), which evaluates a country's gender equality based on education access, economic participation, health, and political influence.

Preliminary results indicate that the effect of gender diversity within R&D teams on green innovation significantly depends on the level of gender equality in the broader environment. Specifically, gender diversity has a negative, significant effect on green technology in low-gender-equality contexts, but the effect turns positive and significant in high-gender-equality contexts. Moreover, a supportive gender equality environment also increases the likelihood of developing green technology, as evidenced by the positive and significant gender equality coefficient. Focusing on green patent citations, our results further show that gender diversity within R&D teams is positively associated with the creation of higher-quality green technologies.

This study contributes to the expanding literature on team diversity and green innovation by emphasizing the importance of gender equality context in promoting green innovation and by highlighting the impact that R&D team gender diversity may have on advancing green innovation.