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ORIGINAL PAPER

Sustainable Governance: Board Sustainability Experience and the Interplay with Board Age for Firm Sustainability

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Abstract

The growing emphasis on sustainability in the business landscape has prompted scholars and industry practitioners to explore the role of corporate governance, particularly the board of directors, in promoting corporate sustainability. Companies are called upon to operate ethically and to redefine their objectives beyond mere economic pursuits to create social impacts that contribute to sustainability challenges. Corporate governance plays a key role in this regard, as it defines the purpose and ethical orientation of the firm, thereby shaping its sustainability. While previous research has primarily focused on observable board characteristics, this study delves into a critical yet underexplored aspect of sustainable boards, i.e., the sustainability experience. Drawing on the upper echelon and resource dependency theories, our research examines how the sustainability experience of board members influences a firm's sustainability performance, investigating the moderating effect of board age. We analyzed European listed companies from 2014 to 2020, and our findings show that the effect of board sustainability experience on firm performance is contingent on board age. Specifically, our results show that younger boards amplify the positive effect of sustainability experience, while for older boards, this effect diminishes, up to the point of being completely mitigated, highlighting a potential misalignment between sustainability efforts and ethical business conduct. This study is pioneering in investigating the joint effects of board sustainability experience and board age on a firm's sustainability, thus, providing valuable contributions to theory and practical recommendations for firms in director recruitment, as well as recommendations for regulatory practices.

Keywords Board of directors · Sustainability experience · Board age · Sustainability performance · ESG

Introduction

In the current socio-economic environment, companies are expected to operate ethically, creating a positive impact on society and moving beyond the traditional emphasis on profit generation alone (Battilana et al., 2019). Such a transition calls for a shift towards ethical business management that connects the economic and ethical dimensions of management to improve the human condition (Grassl & Habisch, 2011).

The contemporary business landscape is witnessing a pivotal shift towards sustainable practices. Organizations are under growing pressure to adopt environmentally and socially responsible behaviors in order to cater to the diverse needs and expectations of various stakeholders, including investors, employees, customers, and regulators (Broman & Robèrt, 2017; Centobelli et al., 2020; Porter & Kramer, 2011; Stål et al., 2023). In this context, companies engage in sustainability practices to establish their legitimacy; however, in practice, this is not necessarily reflected in the ethical behavior of the company, which may not align with the expectations of their stakeholders (García-Sánchez et al., 2021; Gull et al., 2023).

The heightened emphasis on sustainability has sparked a growing interest among scholars, policymakers, and industry practitioners in exploring ways to promote sustainability within companies (Arena et al., 2015; García Martín & Herrero, 2020). This, in turn, has increased concerns about how companies are governed and what governance mechanisms

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can effectively influence corporate ethical behavior toward sustainable practices (Ben-Amar et al., 2017; Walls et al., 2012). Corporate governance plays a key role in leading sustainability since it defines the company's purpose and ethical orientation (Collevecchio & Gionfriddo, 2023; Mayer, 2021), which is critical to lead an actual sustainable transition as companies should navigate the trade-offs between financial interests and social concerns (Lynn, 2021).

Literature on corporate governance and sustainability has grown substantially, and special emphasis has been placed on the role of the board of directors in steering organizations toward a sustainable transition in recent years (Aguilera et al., 2021; De Masi et al., 2021; Karpoff, 2021; Konadu et al., 2021; Liao et al., 2021; Naciti et al., 2022). Indeed, as boards wield considerable influence on strategic decision-making and organizational outcomes, understanding the factors that shape the ethical behavior of the firm and the orientation towards sustainability is crucial in driving the firm's sustainable transition.

While previous research has predominantly focused on easily observable board characteristics, such as board size, chairman-CEO duality, directors' independence, and gender diversity (Chams & García-Blandón, 2019; Cosma et al., 2021; De Masi et al., 2021; de Villiers et al., 2011; Naciti, 2019), this study aims to contribute to this burgeoning field of research by delving deeper into less visible aspects of sustainable boards. In particular, we examine the impact of board members' sustainability experience on firm sustainability performance, as well as the potential moderating effect of board age.

Building on the upper echelons theory (Hambrick, 2007; Hambrick & Mason, 1984) and resource dependency theory (Hillman et al., 2000; Pfeffer & Salancik, 1979), we posit that the sustainability expertise of board members plays a key role in guiding a firm's sustainable orientation, which can ultimately result in higher sustainability performance. Specific expertise is essential for sustainability, as it enables individuals to grasp the complexities of sustainability (Amui et al., 2017), in particular when considering the need to manage the tensions deriving from the co-occurrence of multiple objective functions in conflict (Haffar & Searcy, 2019); tensions which did not cease to grow during the last years, according to CEOs perspective (Lacy et al., 2011). Indeed, when equipped with the necessary skills and competencies, directors play a vital role in initiating sustainability implementation (Chams & García-Blandón, 2019).

Few studies have analyzed the relationship between the sustainability-related expertise of board members and sustainability outputs, showing heterogeneous results (Velte, 2023b). Such conflicting results suggest that sustainable boards can serve as mere symbolic gestures for firms, raising greenwashing concerns, or can genuinely support firms' sustainability efforts, reflecting intrinsic motivation from decision-making (Velte, 2023a). In line with this, we posit that holding sustainability expertise is not sufficient to leverage firm sustainability if the intrinsic motivation of the board does not support it.

Existent research has primarily focused on institutionalized forms of integrating sustainability expertise within the board of directors, such as the presence of CSR committees (Fuente et al., 2017; Javeed et al., 2022; Velte & Stawinoga, 2020) or a chief sustainability officer (CSO) (Kanashiro & Rivera, 2019; Peters & Romi, 2015; Velte & Stawinoga, 2020; Velte, 2023b). However, individual board members' characteristics may also be relevant for sustainable boards. As a genuine commitment to sustainability entails its full integration as a core aspect of corporate strategy rather than a subsidiary activity (Galpin & Whittington, 2012; Lynn, 2021; Siltaloppi et al., 2021), sustainability issues should be discussed within the board alongside corporate strategies, rather than being solely confined to specific roles or committees. In this regard, while prior research has focused on the sustainability expertise of specific directors, such as corporate sustainability officers (CSOs) (Peters et al., 2019), we emphasize the relevance of the individual characteristics of all board members, as they contribute to the overall sustainability expertise of the board and can drive the firm's sustainability efforts to greater success.

In particular, we argue that the prior sustainability experience of the board is instrumental in shaping a firm's approach to sustainable development. Indeed, directors with sustainability experience have a greater understanding and appreciation of sustainability issues, leading to an increase in sustainability disclosure (Alodat et al., 2023).

Only a few studies have focused explicitly on the sustainability experience of the board, providing evidence that it positively affects sustainability outcomes. Homroy and Slechten (2019) conducted a study utilizing data from FTSE 350 firms over the period 2006–2014, with a specific focus on environmental performance. Their findings revealed that companies with directors with solid networks and specific environmental expertise exhibit lower greenhouse gas emissions. Jamil et al. (2021) analyzed sustainability reporting quality in Malaysian firms from 2010 to 2014, showing that it is positively affected by the percentage of directors with sustainability-related experience. Similarly, the recent research conducted by Subramaniam et al. (2023), examining the top-150 Australian companies, found that the presence of board members with sustainability experience positively impacts the quality of reporting related to Sustainable Development Goals.

However, despite these initial findings, there is limited knowledge about the impact of board sustainability experience on firm sustainability performance in the European capital market (Velte, 2023a). Given the increasing focus on the role of governance, and in particular, of the board of

directors in ensuring ethical corporate behavior that leads to generational sustainability in the European context (e.g., Directive (EU) 2022/2464), European companies are increasingly adopting sustainable governance mechanisms, such as establishing sustainability committees and pushing sustainability expertise on the board (Gull et al., 2023). Therefore, understanding the effect of board sustainability experience on sustainability performance in European companies would offer vital insights for a comprehensive grasp of what constitutes a sustainable board within this specific context. Nevertheless, to the best of our knowledge, the only study exploring this relationship in the EU context is currently by Velte (2023b), which examines the sustainability experience of CSOs and its effect on biodiversity disclosure, finding a positive association. Thus, further exploration is needed to understand the broader effect of overall board sustainability experience on firm sustainability performance in the European context.

In addition, while the sustainability experience of board members will increase sustainability performance, boundary conditions may influence this relationship. As argued above, board sustainability expertise may not be sufficient to leverage firm sustainability if not supported by board members' intrinsic motivation toward social and environmental responsibility. For instance, by analyzing the impact of CSOs and their expertise on the sustainability performance of US firms, Peters et al. (2019) found that appointing a CSO can be more symbolic than substantive governance. Thus, other board characteristics may intervene in the relationship between board sustainability experience and firm sustainability performance.

In particular, we posit that the age of board members can influence the association between board sustainability experience and firm performance, as younger and older directors may have different levels of attention, awareness, and sensitivity toward sustainability issues (Cosma et al., 2021; Gardiner, 2022; He et al., 2023), an aspect that addresses generational sustainability and intergenerational justice, for aspects that are considered of lesser importance today can become problematized by the next generation (Greenwood & Freeman, 2018). This difference translates into distinct intrinsic motivations to leverage sustainability experience in promoting a sustainable transition. Thus, we speculate that board age may influence the effect that the board sustainability experience has on firm sustainability performance.

In light of the above, the objective of this study is to investigate whether board sustainability experience influences firm sustainability performance and whether this relationship depends upon board age. Thus, we pose the following research questions:

RQ1: Does board sustainability experience affect firm sustainability performance?
RQ2: Does the relation between board sustainability experience and firm sustainability performance depend on board age?

To address these questions, we carried out propensity score matching and panel regression analyses on a sample of European listed companies from 2014 to 2020. Results confirm our arguments by showing that the effect of board sustainability experience on firm sustainability performance depends on board age. In so doing, we propose a novel construct of sustainability experience, i.e., the cumulative years of experience in sustainability-related roles held, on average, by directors.

This research makes several theoretical and practical contributions. It is the first study to investigate the impacts of board sustainability experience and board age together, revealing that board age moderates the effect of board sustainability experience on sustainability performance.

By focusing on a tiny explored board characteristic, i.e., sustainability experience, we advance the literature on the relationship between board composition and corporate sustainability. In so doing, we also contribute to corporate responsibility research by showing that the intrinsic motivation of the board members towards sustainability is essential to exploit the benefits coming from sustainability experience positively. In addition, we provide useful recommendations to firms in recruiting directors and offer interesting insights for regulation.

The remainder of the paper is structured as follows. In the next section, the theoretical framework and the hypotheses are described. The third section presents the method, data, and variables. The fourth section presents the results and the robustness checks. Finally, in the fifth section, we discuss the results, highlight our theoretical and practical contributions, and draw limitations and future research.

Theoretical Background and Hypothesis Development

According to Elkington's definition, corporate governance (CG) "is fundamentally about such questions as what business is for—and in whose interests companies should be run, and how" (Elkington, 2006, p. 522); therefore, sustainability decisions are dictated by CG arrangements. Among the CG mechanisms, the board of directors is the most important as it plays a vital role in integrating sustainability into corporate governance (Ludwig & Sassen, 2022). The board defines the corporate purpose, sets priorities, and directs and monitors business strategies (Battilana et al., 2022; Castellanos & George, 2020; Kim et al., 2009). In so doing, it

shapes a firm's sustainable orientation, playing a pivotal role in driving sustainability strategies and affecting its sustainability performance (Naciti, 2019).

In this sense, the study and application of moral principles and values in the business environment examines ethical conduct and actions at the organizational and individual levels in order to establish standards of moral conduct in business, leading to societal well-being beyond the economic sphere (Grassl & Habisch, 2011). Corporate sustainability shares this objective for, being broadly studied and rich in available definitions (Meuer et al., 2020), can be regarded as "meeting the needs of a firm's direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities, etc.), without compromising its ability to meet the needs of future stakeholders as well" (Dyllick & Hockerts, 2002, p. 131).

The relationship between the board of directors and firm sustainability is explained by several theories, including stakeholder theory, agency theory, upper echelons theory, resource dependency theory, and legitimacy theory (for a review, see, for instance, Madhani, 2017). In line with prior research (e.g., Cosma et al., 2021; Velte, 2023b), we focus on the upper echelons theory and resource dependency theory to investigate the relationship between board sustainability experience, board age and firm sustainability performance.

The upper echelons theory (Hambrick, 2007; Hambrick & Mason, 1984) posits that an organization's strategic choices, behaviors, and outcomes are significantly influenced by the individual characteristics of its leadership, namely the top management team and the board of directors. According to this theory, individual differences in background, experiences, values, and cognitive styles among upper echelons contribute to how they approach and make decisions, influencing strategic choices and corporate performance (Carpenter et al., 2004). This intersects with ethical considerations, as the values of directors are central to shaping the ethical environment of the business (Wesley et al., 2021). Based on this theory, the characteristics of the upper echelons serve as drivers for strategic choices concerning corporate sustainability, impacting the sustainability performance of the companies in which they operate (Velte, 2023b). Given the board's strategic and resource integration function (Hillman & Dalziel, 2003; Pugliese et al., 2009; Ruigrok et al., 2006), the background of the board as a whole—and not only of the executives—is of interest as a driver of strategic choices and corporate results, such as sustainability (Dobija et al., 2023; Martínez-García et al., 2022).

The resource dependency theory (Hillman et al., 2000; Pfeffer & Salancik, 1979) posits that the board of directors serves as a resource provider for a company, offering a wealth of skills, qualities, and human capital. Based on the premise that the external environment contains limited resources that are crucial for business survival, this theory emphasizes the critical role of the board in providing resources for the organization and minimizing its dependence on external resources (Arioglu, 2021; Jamil et al., 2021). Board members offer valuable resources to the firm not only through their networks but also through their professional and personal competencies (Huse, 2005). According to Hillman and Dalziel (Hillman & Dalziel, 2003), the experience and expertise of the board are the primary factors leading to better resource provision for the company.

As previous research has shown, implementing and integrating sustainable strategies involve challenges and complexities that must be effectively managed, requiring specific resources and competencies not always available within companies. (Amui et al., 2017). This is not trivial, as an apparent contradiction arises between the ethic-nature goals and the narrow organizational goals. From an ethical standpoint, firms are subject to sustainability tensions deriving from the co-occurrence of multiple objective functions in conflict with each other (Greenwood & Freeman, 2018; Haffar & Searcy, 2019; Van der Byl & Slawinski, 2015). Hence, directors involved in corporate sustainability must then face paradoxical tensions (Carollo & Guerci, 2018). With adequate expertise, board members can, thus, promote the implementation of sustainability within the firm, helping managers adopt pro-social behaviors and enhance the sustainable value created by the company (Berrone & Gomez-Mejia, 2009; Chams & García-Blandón, 2019).

Combining these two theoretical lenses, it emerges that the board's composition influences decision-making, thus, affecting corporate performance, as members with different characteristics have different views and perceptions of issues, particularly regarding sustainability, and bring different resources and capital to the company. Consequently, examining board characteristics has emerged as a topic of considerable interest in management literature concerning sustainability (Disli et al., 2022; Endrikat et al., 2021; García Martín & Herrero, 2020; Ludwig & Sassen, 2022; Ortiz-de-Mandojana & Aragon-Correa, 2015).

In particular, the prior sustainability-related experience of board members represents a factor of particular interest, as the directors' background influences their sensitivity, awareness, and preparedness on sustainable issues, thus, impacting the board's sustainable orientation (Subramaniam et al., 2023; Velte, 2023a). Thus, the board's ability to provide strategic direction responsive to society and the environment's needs depends on its experience and expertise, based on which it interprets and recognizes institutional pressures (Hillman & Dalziel, 2003; Walls & Hoffman, 2013), such as sustainable development. Therefore, we contend that the board's previous experience in sustainability-related roles

can be even more crucial in affecting corporate sustainability performance.

Board Sustainability Experience and Firm Sustainability Performance

Experience represents a crucial cognitive filter for processing and comprehending information, shaping the way reality is interpreted (Hambrick, 2007; Starbuck & Milliken, 1988). In line with the upper echelons theory, board members will determine strategic priorities and crucial issues to bring to the board's attention based on their experience (Tuggle et al., 2010). Moreover, according to resource dependency theory, experience is a fundamental asset of the human capital provided by the board of directors (Walls & Hoffman, 2013).

Gaining experience in specific roles allows people to develop specialized and innovative skills and knowledge, allowing organizations to break away from established norms (Battilana, 2006; Sewell, 1992). The sustainable transition represents a challenge requiring companies to innovate their business models and move beyond established norms, developing novel solutions with positive societal and environmental impacts (Delmas et al., 2019; Schaltegger et al., 2016). Thus, the board's specific sustainability-related experience can facilitate the implementation of sustainable strategies leading to high sustainability performance (Homroy & Slechten, 2019; Subramaniam et al., 2023).

Sustainability experience allows for in-depth knowledge of sustainability-related issues (Jamil et al., 2021). This knowledge can help board members to better identify and understand opportunities and challenges arising from managing sustainability. Therefore, a deep understanding of sustainability issues is a fundamental prerequisite for initiating sustainability implementation by adopting sustainable strategies and practices that can drive sustainability performance (Chams & García-Blandón, 2019).

Furthermore, board members with sustainability experience will be more skilled in integrating sustainability dimensions into corporate decision-making processes, preventing it from becoming a merely symbolic, ancillary activity of the leading business strategy. Indeed, prior research argued that sustainability experience should reduce the risk of greenwashing (Fu et al., 2020) and lead to more balanced and sustainable decisions, considering the interests of various stakeholders (Velte, 2023b), resulting in high sustainability performance (Supino et al., 2016; Wanner & Pröbstl-Haider, 2019).

Additionally, integrating sustainability into corporate strategy involves trade-offs between economic, social, and environmental objectives (Battilana et al., 2022), which becomes particularly difficult in times of high uncertainty and severe consequences of wrongly-made decisions (Kay et al., 1999). Such trade-offs bring organizational paradoxes deriving from the unavoidable conflicts between sustainability and the narrower organizational goals (Greenwood & Freeman, 2018), tensions that the firm's leadership must face (Carollo & Guerci, 2018). Board members with sustainability experience are already familiar with these trade-offs and tensions. Hence, they can better manage them, thus, achieving improved sustainability performance.

Therefore, in line with emerging research on the topic (Jamil et al., 2021; Peters & Romi, 2014; Subramaniam et al., 2023; Velte, 2023b), we hypothesize the following:

Hypothesis 1 - Previous sustainability experience of the board of directors has a positive effect on firm sustainability performance.

The Moderating Effect of Board Age

Among board characteristics, age is an important attribute that deserves specific attention, given the current trend toward actively promoting younger directors entering the boardroom (Gardiner, 2022). As reported by the PWC's Census of Directors 50 and Under (PWC, 2018), despite being still underrepresented on corporate boards, the presence of young directors has been increasing in the last few years. However, board age has not gotten as much attention in the literature as other board characteristics, and previous research has produced conflicting results about its effect on firm outcomes, pointing to the contingent impact of board age (Gardiner, 2022; Kagzi & Guha, 2018).

Age is an important demographic characteristic of the board, as it reflects the attitudes, opinions, and values of its members (Gardiner, 2022; Talavera et al., 2018; Xu et al., 2018). Notably, older and younger individuals have considerable differences in interests, experiences, technology usage, social network affiliations, and focus on sustainability issues (He et al., 2023; Janahi et al., 2022). Following the upper echelons and resource dependency theories, board members of varying ages bring various resources and perspectives to the table (Harrison & Klein, 2007; Hillman et al., 2000), ultimately shaping the decision-making process and influencing organizational outcomes.

Although implementing sustainability within a company requires specific knowledge and skills, which can stem from board sustainability experience, if an intrinsic motivation towards sustainability does not support these, they may not translate into positive sustainability outcomes (Velte, 2023a).

Sustainability is not only an essential requirement for remaining competitive in the market, given the growing attention from stakeholders, but it also concerns the social role of companies (Morrison & Mota, 2023). Since integrating sustainability involves managing a trade-off between financial and socio-environmental objectives

(Battilana et al., 2022), if sustainability efforts are driven mainly by economic goals, they will remain secondary and difficult to genuinely incorporate into the organization to achieve good sustainability outcomes. For a thorough and genuine integration of sustainability, a firm must recognize its responsibility towards society and strive to leave a lasting impact for a better world (Battilana et al., 2019; Brosch, 2023; Henderson, 2021). In this regard, the values and motivation of people guiding the firm's decisions are fundamental to shaping the ethical behavior of the company.

Values are particularly significant drivers of human action, which are substantially reflected in directors' economic decisions (Adams et al., 2011), and recent research has highlighted a strong connection between age and values (Arioglu, 2021; Talavera et al., 2018). Individuals' worldviews and value foundations develop based on diverse experiences, social, political, and economic environments, and events (Katmon et al., 2019). Consequently, the coexistence of different generations within the board implies the presence of varying cultural norms and mindsets that influence the decision-making approach of the directors (Talavera et al., 2018).

Considering that the average age of the European boards is around 56 years (Heidrick and Struggles, 2021), the younger directors have grown up in a period when social expectations for corporate behavior have changed, and the concept of corporate social responsibility has become increasingly important for investors and business leaders. They have formed their personalities in a context where sustainability has become a mainstream corporate activity and a familiar term (He et al., 2023). Therefore, younger directors are more familiar with sustainability issues and have developed greater awareness and sensitivity towards the social and environmental impact of corporate activities (Gardiner, 2022). In addition, from an ethical perspective, young directors might be more sensitive to generational sustainability, calling for the responsibility of directors with the future shareholders and stakeholders of the firm (Majumdar, 2019).

Based on these arguments, we assume that younger boards will be more motivated to integrate sustainability within the company. Therefore, they will be more inclined to leverage and value the expertise of directors with sustainability experience on the board to promote sustainability, leading to better sustainability performance.

On the contrary, older directors may be less motivated to promote sustainable change within the company. An actual sustainable transformation that changes a company's ethical behavior in order to achieve long-term sustainability performance necessitates considerable effort, not only in terms of investments but also in reforming mindsets. However, senior directors are often less willing to shift their thinking habits, as they tend to be more risk-averse and conservative (Bertrand & Schoar, 2003; Chindasombatcharoen et al., 2023; Kagzi & Guha, 2018; Wiersema & Bantel, 1992). At the same time, ideas taken for granted by one generation are often considered problems to be solved by the next one (Greenwood & Freeman, 2018).

Furthermore, while younger generations have grown up in an era of significant social and environmental challenges, older directors have not fully experienced the times of CSR transformation and may be less aware and sensitive about environmental and social issues (He et al., 2023). Thus, in older boards, directors will be less motivated to exploit their sustainability-related experience to introduce actual changes affecting ethical behavior to drive firm sustainability, weakening the effect of board sustainability experience on sustainability performance.

From the above, we expect that boards of directors with a higher average age neglect the potential of the board sustainability experience to improve firm sustainability performance, thus, weakening the relationship, while younger boards enhance the effect of sustainability experience on firm sustainability performance. Based on this, we introduce our second hypothesis:

> *Hypothesis 2 - Board age negatively moderates the effect of board sustainability experience on firm sustainability performance.*

The theoretical framework tested in the study is represented in Fig. 1.

Methods

Sample

To test our hypotheses, we perform multivariate analyses on a sample of European listed companies analyzed from 2014 to 2020.

The choice of the European capital context is based on two main factors. First, the European Union places significant emphasis on corporate governance mechanisms

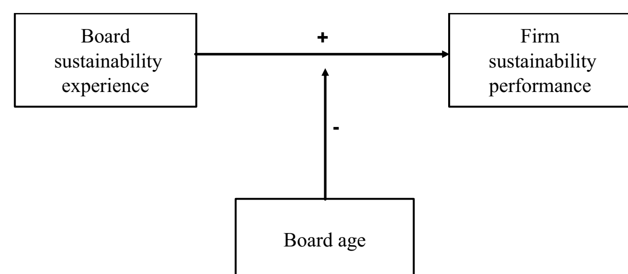

Fig. 1 Theoretical model

that can guide companies toward sustainable transitions, recognizing the board's role in sustainability matters, as highlighted by Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022. Nevertheless, over the last few years, the heightened academic focus on gender diversity (Ben-Amar et al., 2017; Cordeiro et al., 2020; Liu, 2018) has overshadowed the importance of other board characteristics, such as sustainability expertise and age (Gardiner, 2022; Zattoni et al., 2022). As a result, investigating the effects of these characteristics on the sustainability of European companies could offer valuable insights for policymakers and regulators. Second, emerging studies concerning the sustainability-related experience of the board have predominantly focused on individual countries (Homroy & Slechten, 2019; Janahi et al., 2022; Subramaniam et al., 2023) or the US context (Peters & Romi, 2014), leaving the European setting largely unexplored.

Following a purposive sample selection process, we first considered all the European companies included in the BoardEx database, which allows to collect data on directors' characteristics. BoardEx provides data for 4842 European companies, and we focused only on companies with available board information for the period of interest. We then merged information with the Refinitiv Eikon database, from which we retrieved firms' financial and sustainability data. After dropping cases with all missing data, our final sample consists of 452 unique European listed companies included in both BoardEx and Refinitiv Eikon databases, over six years, for a total of 1352 observations.

Variables

Dependent Variable – Corporate Sustainability Performance

In line with previous research (Disli et al., 2022; Drempetic et al., 2020; Iamandi et al., 2019; Rajesh, 2020; Shaukat et al., 2016), we measured firm sustainability performance through the ESG scores provided by Refinitiv Eikon. ESG score is an aggregate environmental, social and governance rating representing a good proxy for firm sustainability performance. Indeed, ESG scores serve as crucial indicators of a firm's non-financial performance, focusing on assessing its sustainable and ethical practices (Boerner, 2007). Thus, by incorporating ESG scores, stakeholders can gain insights into the organization's commitment to sustainability and responsible practices.

ESG scores assigned by Refinitiv Eikon go from 0 to 100 and are built on 186 metrics grouped into the environmental, social and governance dimensions that cover issues related to ten main themes: resource use, emissions, innovation, workforce, human rights, community, product responsibility, management, shareholders, and corporate social responsibility strategy.

Independent Variable – Board Sustainability Experience

While prior research has focused on the sustainability expertise of specific figures on the board, such as the CSO (Peters et al., 2019), we introduced a novel construct to measure the sustainability experience of the board, that is, the years of experience in sustainability-related roles held, on average, by directors.

Information about directors' professional experience was drawn from the BoardEx database, which provides information about directors' employment history related to board and non-board roles. To assess the sustainability experience of the board, we considered all sustainability-related roles held by each director prior to the year of interest (*t*). To this end, we conducted a content analysis of the role's description provided by BoardEx. Following Fu et al. (2020), we used the following keywords to conduct an initial screening of sustainability-related roles: sustainability/sustainable, ethic/s, responsibility, environment/environmental, ESG, and CSR. We then read the full descriptions of the resulting roles to confirm their relevance to sustainability, ultimately identifying those roles that were indeed related to sustainability. Once these roles were identified, the board's sustainability experience was measured as the sum of the years of experience in sustainability-related roles accumulated by all board members up to year *t*. This measure was scaled by board size to arrive at sustainability experience held, on average, by the board members (*Sust Exp*), calculated as cumulated years of experience held by all directors divided by the number of board members.

Moderator Variable – Board Age

We included the moderator variable *Board age* in the analysis to test our second hypothesis. In line with prior research, we measured board age by the average age (in years) of board members (Xu et al., 2018; Zhong et al., 2022).

While the growing emphasis on board diversity encourages research to concentrate on board age diversity (Gardiner, 2022), which refers to the variation in ages of board members within a given board (age spread), our interest lies in understanding how younger or older boards influence the relationship between sustainability experience and sustainability performance. In this context, the average age of the board serves as a more appropriate measure than age diversity since these two concepts are separate

from one another, and age diversity does not indicate if the board is relatively elderly or young (Prior Jonson et al., 2020; Stefanelli et al., 2023).

Control Variables

In order to control the effects of alternative explanatory factors and avoid biased results, we include several control variables in our analysis concerning board- and firm- aspects, in line with prior research. We included *Board size*, measured as the natural logarithm of the total number of directors on the board, as previous studies showed that the size of the board could affect sustainability performance. We also controlled for the board's independence by including the percentage of non-executive directors (*NED*) and *CEO duality*, a dummy variable gauging the value of 1 if the Chairman is also the CEO of the company and 0 otherwise. Board tenure (*Tenure*) is measured as the average number of years the directors have been on the board of the firm, on average. Moreover, as prior research highlighted that board diversity might affect sustainability performance (Naciti, 2019), we control for gender diversity and nationality diversity. *Women* is the percentage of female directors on the board. *Nationalities* is the percentage of different nationalities within the board. Furthermore, since the creation of a sustainability committee is an increasingly popular sustainability governance mechanism (Gull et al., 2023), we also control for the presence of a sustainability committee on the board by including a dummy variable that takes the value 1 if the company has a board sustainability committee and 0 otherwise (*Sust comm*).

We have also included several firm-level control variables in our model. In line with previous literature, we control for firm size, measured as the natural logarithm of the firm's total assets (*Firm Size*), and firm performance, measured as the return on total assets (*ROA*). In addition, as sustainability performance is increasingly important for access to the capital market, we control for firms' external financing needs by including in the model the variables *Debt*, the natural logarithm of the firm's total long-term debt, and *LEV*, i.e., the firm's leverage defined as total debt divided by total assets. Finally, we control for the age of the firm, measured as the number of years since the date of incorporation (*Firm age*). Finally, following Peters et al. (2019), we control for the influence of institutional investors by including the variable *Inst Own*, a dummy equal to 1 when institutional ownership of the firm is above the median and 0 otherwise. We also include year dummies and firm fixed effects.

Endogeneity

Corporate governance mechanisms are self-defined by the companies, and thus, firms' characteristics determine the composition of the board. Accordingly, previous research showed that firms hire directors based on their previous experience (Harford & Schonlau, 2013). Therefore, sustainability-experienced boards are not randomly selected. To address this endogeneity concern, we applied propensity score matching (PSM) (Rosenbaum & Rubin, 1983) to ensure that firms are similar on all variables except the dependent (*ESG*) and the independent variables of most interest, i.e., sustainability experience (*Sust Exp*) and *Board age*. In this way, PSM allows for neutralizing the effect of other variables and helps to provide evidence that board sustainability experience is associated with sustainability performance (Lu & Herremans, 2019).

First, we estimated the propensity scores, i.e., the probability of a company to be treated, given a vector of covariates X_i (Rosenbaum & Rubin, 1983), through the following logistic regression:

$$\text{treat}_{i,t} = \beta_0 + \beta X_i + \varepsilon_{i,t}$$

where for firm i and year t, treat is a dummy that gauges value 1 if there is at least one director with past sustainability experience and 0 otherwise, and X_i represents the matching variables. In line with prior research, we adopted the one-by-one nearest neighbor matching without replacement with a caliper of 0.01 (Oyotode-Adebile & Raja, 2019).

We execute the balance diagnostic test to verify that our matching is appropriate. The results shown in Table 1 confirm the goodness of the matching, resulting in comparable treated and non-treated samples after matching. Indeed, after the matching, there are no significant differences in means ($p > 0.1$), and the %bias is lower than 5% for any of the covariates.

In addition, all independent, moderator and control variables are lagged one year ($t-1$) to reduce the possibility of the results being driven by reverse causality (Joecks et al., 2013; Liu, 2018; Xu et al., 2019; Zhong et al., 2022).

Regression Models

To test our hypotheses, we carried out panel regression analysis on the matched sample resulting from the PSM analysis. Since there may be unobserved heterogeneity in a pooled OLS model for panel data, regardless of how many firm-specific features we add, which results in biased and inconsistent OLS estimators (Wooldridge, 2010), we tested the model using the fixed effects model. We used a Hausman test to confirm the choice of fixed effects over random effects.

The full econometric model for estimation is specified in the following equation:

Table 1 PSM balance diagnostic test

Variable	Unmatched	Mean		%bias	%reduct	*t* test	
	Matched	Treated	Control	%bias	|bias|	*t*	*p* > |*t*|
Board size	U	0.11	0.00	32.10		8.35	0.00
	M	0.07	0.06	0.70	97.80	0.13	0.90
NED	U	0.07	− 0.01	29.90		7.78	0.00
	M	0.04	0.04	0.40	98.50	0.08	0.93
CEO duality	U	0.37	0.26	23.90		6.30	0.00
	M	0.30	0.27	5.10	78.80	0.96	0.34
Women	U	0.04	0.00	35.20		9.24	0.00
	M	0.02	0.01	3.50	90.10	0.66	0.51
Nationalities	U	0.05	− 0.01	39.90		10.48	0.00
	M	0.03	0.03	− 3.70	90.80	− 0.66	0.51
Tenure	U	− 0.23	− 0.08	− 5.10		− 1.33	0.18
	M	− 0.17	− 0.25	2.80	45.30	0.53	0.60
Sust comm	U	0.24	0.03	65.30		16.51	0.00
	M	0.06	0.06	1.70	97.40	0.41	0.69
Firm size	U	0.59	0.00	37.10		9.66	0.00
	M	0.29	0.34	− 3.70	90.20	− 0.69	0.49
ROA	U	− 1.87	4.92	− 3.50		− 0.87	0.38
	M	− 1.46	− 1.61	0.10	97.80	0.44	0.66
Debt	U	0.66	− 0.10	30.90		8.03	0.00
	M	0.27	0.31	− 1.70	94.50	− 0.32	0.75
LEV	U	− 0.05	0.01	− 2.70		− 0.70	0.48
	M	0.04	0.00	1.70	37.90	0.27	0.79
Firm age	U	0.59	1.04	− 1.40		− 0.36	0.72
	M	− 0.78	− 0.88	0.30	78.40	0.05	0.96
INST OWN	U	0.56	0.51	9.20		2.38	0.02
	M	0.55	0.53	3.60	60.50	0.66	0.51

$$\begin{aligned}\mathrm{ESG}_t = {} & \beta_0 + \beta_1 Sust\ Exp_{t-1} + \beta_2 Board\ age_{t-1} \\ & + \beta_3 Sust\ Exp_{t-1} * Board\ age_{t-1} \\ & + Controls_{t-1} + year\ fixed\ effect_t \\ & + firm\ fixed\ effect_t + \varepsilon_{i,t}\end{aligned}$$

Results

Summary statistics of the variables included in the analysis are reported in Table 2, while Table 3 shows the sample breakdown in terms of country. The firms in our sample have an average ESG score of 60, ranging from 0.5 to 95, with a standard deviation of 18.37. Therefore, our sample consists of rather diverse companies in terms of sustainability performance, in line with the evidence provided by previous research (Iamandi et al., 2019). The average sustainability experience of the boards of directors in our sample is 1.92 years, ranging from 0 (no sustainability experience) to 36.39, with a standard deviation of 3. The board age is, on average, 58, with a minimum value of 41 and a maximum

Table 2 Descriptive statistics

Variable	Mean	Std. dev	Min	Max
ESG	60.58	18.24	0.47	94.93
Sust Exp	1.92	3.07	0	36.39
Board age	57.68	4.08	41.33	73
Board size	2.53	0.35	1.61	3.43
Board age DIV	0.87	0.05	0.00	0.95
NED	0.54	0.26	0	1
CEO duality	0.29	0.45	0	1
Women	0.23	0.13	0	0.64
Nationalities	0.28	0.17	0	1
Tenure	5.87	2.81	0.04	19.83
Sust comm	0.10	0.29	0	1
Firm size	23.17	1.54	19.33	27.31
ROA	6.04	6.30	− 43.82	53.41
Debt	21.07	2.44	12.28	25.84
LEV	0.45	2.41	0	55.78
Firm age	33.12	34.35	0	183
Inst Own	0.55	0.50	0	1

Table 3 Sample breakdown: Country

Country	Percent	Country	Percent
Austria	1.3%	Monaco	0.4%
Belgium	2.6%	Netherlands	7.8%
Cyprus	0.4%	Norway	4.4%
Denmark	5.0%	Poland	1.1%
Finland	4.7%	Portugal	0.6%
France	9.0%	Republic of Ireland	6.4%
Germany	20.4%	Russian Federation	2.9%
Greece	0.6%	Spain	6.1%
Hungary	0.4%	Sweden	4.9%
Italy	0.4%	Switzerland	12.8%
Luxembourg	2.7%	Turkey	3.9%

value of 73. The boards of the companies in our sample are lowly diversified in gender and nationalities, with less than 25% of women directors and 28% of different nationalities within the board, on average. Moreover, only 10% of our sample has a sustainability committee on the board.

The firms in our sample are large and quite homogeneous in terms of size (mean *Firm size* = 23.17, SD = 1.54), and are pretty established, with a mean *Firm age* of 33 years.

Autocorrelation is not an issue in our sample, as shown by the coefficients in the correlation matrix (Table 4), which are all lower than the threshold of 0.7 (Mela & Kopalle, 2002), except for debt, which has a coefficient of 0.72 with firm size. However, the VIF test, reported in Table 5, shows all values lower than 5, confirming that autocorrelation between variables is not a problem.

Results from the regression models are shown in Table 6. Model 1 includes control variables only, Models 2 and 3 include the independent variable (*Sust Exp*) and the moderator variable (*Board age*), respectively, while Model 4 also includes the interaction term between the independent and the moderator variables.

Hypothesis 1 predicted that board sustainability experience has a positive effect on firm sustainability performance. Models 2, 3 and 4 show that the coefficients of *Sust Exp* are positive and statistically significant at conventional levels. In particular, firms with highly experienced boards in sustainability have, on average, 11% higher ESG compared to firms with less experienced sustainability boards. This result provides support for our first hypothesis.

Hypothesis 2 predicted a negative moderation effect of board age. The results reported in Model 4 show that the coefficient of the interaction term *Sust Exp* × *Board age* is significantly negative (beta = -0.06, $p < 0.05$). This result shows that the average age of the board is a significant moderator of the relationship between sustainability experience and sustainability performance. Indeed, the older the board, the weaker the positive effect of *Sust Exp* on *ESG*. Therefore, hypothesis 2 is supported. The moderating effect of *Board age* on the relationship between *Sust Exp* and *ESG* is shown in Fig. 2.

The graph illustrates that at low levels of sustainability experience, both firms with young and old boards have average ESG levels (around 60). As sustainability experience increases, its impact on ESG improves significantly for young boards (about 40 years). However, as the board age increases, the effect of sustainability experience on ESG becomes smaller, up to becoming negative for very elderly boards. Indeed, when the board age is above 64, a high level of sustainability experience leads to a reduction in ESG results, up to reversing the relationship.

In addition, results show that having a higher proportion of women on the board leads to higher ESG, as the coefficient of *Women* is significantly positive (beta = 15.67, $p < 0.01$ in all models). While the percentage of independent directors does not have a significant impact on ESG, the CEO duality has a negative and significant effect. It.

Tenured boards reach about 4.7 higher sustainability performance compared to the smaller ones. *Firm size* and *Firm age* also have a positive and significant effect on ESG scores ($p < 0.01$), showing that larger and older firms reach higher sustainability performance.

Robustness Check

To further validate our results, we perform sensitivity analyses.

In the literature, board age is alternatively measured in terms of average age or board age diversity (Gardiner, 2022). As explained, we focused the analysis on average board age, as we are interested in the role of young rather than old board. However, since European boards are generally characterized by relatively old directors (average age = 57 years), the entry of young people onto the board not only lowers the average age but also leads to greater generational diversity within the board. Therefore, to test the robustness of the moderating role of board age, we also perform additional analyses using age diversity, measured by Blau's index (Harrison & Klein, 2007), which is defined as: $1 - \sum p_k^2$, where p is the proportion of members in the group in category k, in this case, the number of board members of the same age. The Blau's index ranges from 0 (perfect age homogeneity), when all directors are in the same age category, to 1 (maximum age heterogeneity), when directors are evenly distributed across all age categories. Results reported in Table 7 confirm the moderating effect of board age, showing that, contrary to average board age, age diversity positively moderates the relationship between the board's sustainability experience and sustainability performance. In other words, the greater the generational diversity of the board, the greater the positive effect of sustainability experience on firm sustainability.

Table 4 Correlation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
(1) ESG	1																						
(2) Sust Exp	0.05	1																					
(3) Board age	0.05	0.11	1																				
(4) Board size	0.28	0.02	− 0.14	1																			
(5) NED	0.17	− 0.02	0.21	− 0.31	1																		
(6) CEO duality	0.07	− 0.06	0.05	0.32	− 0.09	1																	
(7) Women	0.31	− 0.05	− 0.09	0.02	0.21	0.02	1																
(8) Nation-alities	− 0.01	0.09	0.17	− 0.50	0.28	− 0.24	− 0.05	1															
(9) Ten-ure	0.01	0.11	0.38	0.09	− 0.11	0.07	0.01	− 0.09	1														
(10) Sust comm	0.03	0.09	0.06	− 0.06	− 0.02	0.02	0.15	0.00	− 0.01	1													
(11) Firm size	0.22	0.08	− 0.06	0.31	− 0.05	− 0.05	0.00	− 0.16	− 0.01	0.00	1												
(12) ROA	0.03	− 0.02	0.01	− 0.07	0.04	− 0.02	− 0.04	0.04	0.08	− 0.06	− 0.06	1											
(13) Debt	0.20	0.04	− 0.05	0.24	0.04	− 0.03	0.05	− 0.11	− 0.10	0.06	0.72	− 0.18	1										
(14) LEV	− 0.06	− 0.03	0.01	− 0.03	− 0.05	− 0.05	− 0.12	0.01	− 0.05	0.09	0.20	0.02	0.18	1									
(15) Firm age	0.17	0.10	0.07	0.07	− 0.12	0.02	0.04	− 0.03	0.21	− 0.02	0.08	− 0.05	0.04	− 0.05	1								
(16) Inst Own	0.14	− 0.03	0.00	− 0.02	0.36	0.06	0.14	0.12	− 0.13	− 0.05	− 0.06	0.04	− 0.01	− 0.08	− 0.07	1							
(17) 2014	− 0.09	0.00	− 0.01	0.00	− 0.02	0.03	− 0.15	− 0.01	0.02	− 0.01	0.00	0.00	− 0.02	− 0.01	− 0.01	− 0.03	1						
(18) 2015	− 0.06	0.01	− 0.02	− 0.03	− 0.01	0.00	− 0.11	− 0.01	0.03	− 0.01	0.01	0.01	− 0.01	0.00	0.05	0.00	− 0.13	1					
(19) 2016	− 0.05	− 0.02	− 0.05	0.03	− 0.05	− 0.01	− 0.10	− 0.01	0.00	0.01	0.06	− 0.07	0.05	0.04	− 0.04	− 0.03	− 0.15	− 0.15	1				
(20) 2017	− 0.05	0.00	− 0.01	0.01	− 0.01	0.00	0.00	0.00	0.00	− 0.02	− 0.01	0.02	− 0.03	0.04	− 0.01	− 0.02	− 0.15	− 0.15	− 0.18	1			
(21) 2018	0.02	0.02	0.03	0.01	0.00	− 0.03	0.04	0.00	0.03	− 0.01	0.00	0.04	0.00	− 0.02	0.01	− 0.01	− 0.16	− 0.16	− 0.19	− 0.19	1		
(22) 2019	0.06	0.01	0.02	− 0.04	0.04	0.00	0.12	0.02	− 0.04	0.03	− 0.06	0.01	− 0.02	− 0.03	− 0.03	0.00	− 0.18	− 0.18	− 0.21	− 0.21	− 0.22	1	
(23) 2020	0.18	− 0.02	0.04	0.02	0.05	0.01	0.17	0.01	− 0.02	0.02	0.00	− 0.01	0.03	− 0.02	0.03	0.10	− 0.12	− 0.12	− 0.14	− 0.15	− 0.15	− 0.17	1

Table 5 VIF test

Variable	VIF	1/VIF
Firm size	2.58	0.39
Debt	2.44	0.41
Board size	1.63	0.61
NED	1.52	0.66
Board age	1.44	0.69
Nationalities	1.42	0.70
Tenure	1.34	0.75
CEO duality	1.19	0.84
Inst Own	1.18	0.85
Women	1.17	0.85
Sust Exp	1.17	0.85
Sust comm	1.13	0.89
Firm age	1.08	0.93
LEV	1.06	0.94
ROA	1	1.00
Mean VIF	1.42	

Table 6 Regression models

Variables	Model 1	Model 2	Model 3	Model 4
Sust Exp		0.327*	0.331*	0.372**
Board age			− 0.049	− 0.007
Sust Exp × Board age				− 0.060**
Board size	1.474	0.991	1.043	0.417
NED	0.317	0.338	0.455	0.597
CEO duality	− 2.143**	− 2.204**	− 2.224**	− 2.278**
Women	15.400***	16.152***	15.944***	15.230***
Nationalities	− 2.896	− 3.901	− 3.861	− 3.369
Tenure	0.225	0.184	0.218	0.201
Sust comm	2.663	2.819	2.734	2.963*
Firm size	4.715***	4.697***	4.737***	4.926***
ROA	− 0.069	− 0.071	− 0.072	− 0.069
Debt	− 0.189	− 0.196	− 0.2	− 0.221
LEV	0.378	0.382	0.37	0.383
Firm age	2.658***	2.645***	2.640***	2.682***
Inst Own	1.196	1.292	1.283	1.293
Year dummies	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Constant	57.956***	57.899***	57.949***	57.878***
Observations	1352	1352	1352	1352
Number of firms	452	452	452	452
R-squared	0.39	0.39	0.39	0.40

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

As discussed earlier, endogeneity is a critical issue in corporate governance studies that we addressed by running a PSM analysis. To further validate our results, taking into account the potential influence of endogeneity, we ran a two-stage least squares regression model. Thus, we re-estimated our models with an instrumental variable approach, instrumenting the endogenous variable Sust Exp. In line with previous research (Korphaibool et al., 2023; Oliveira & Zhang, 2022; Ongsakul et al., 2020), we introduced at the first step an instrumental variable measured as the experience in sustainability held on average by directors of all firms operating in the same sector, excluding firm i. The results of IV analyses are reported in Table 8. As expected, the first-level regressions, in which the dependent variable is board experience in sustainability, show significantly positive coefficients. The second-level regressions show the effect of the instrumented sustainability experience on sustainability performance. Results are consistent with our main models.

Discussion and Conclusions

In this study, we examined the relationship between board sustainability experience and firm sustainability performance, focusing on the moderation effect of the board age.

Drawing from the upper echelons and resource dependency theories, we contended that sustainability-related experience provides directors with the necessary expertise to manage and incorporate sustainability into ethical behavior more effectively, thus, affecting sustainability performance. However, holding high sustainability experience by itself is not sufficient to lead sustainability performance, as it does not necessarily reflect the ethical orientation of the firm, which can just be interested in developing sustainable governance to gain legitimacy (Peters et al., 2019; Velte, 2023a, 2023b). In order to capitalize on sustainability experience to drive sustainability performance, the board should have an intrinsic motivation towards sustainability, leading its ethical behavior. We posited that board age might be a good proxy for the directors' motivation towards sustainability, as it reflects different generational values (Arioglu, 2021; Talavera et al., 2018).

By analyzing 452 European listed companies over the period 2014–2020, we found evidence that the sustainability experience of the board of directors has a positive impact on firm sustainability performance, thus, supporting our first hypothesis. Indeed, a deep understanding of sustainability issues is a fundamental driver of sustainability performance (Chams & García-Blandón, 2019). According to the resource dependence theory (Hillman et al., 2000), directors' sustainability-related experience may bring to the company the necessary expertise to manage sustainability challenges and trade-offs to respond to sustainability pressures (Homroy & Slechten, 2019; Jamil et al., 2021). At the same time, sustainability experience may shape how directors approach and make decisions related to sustainability, as they will

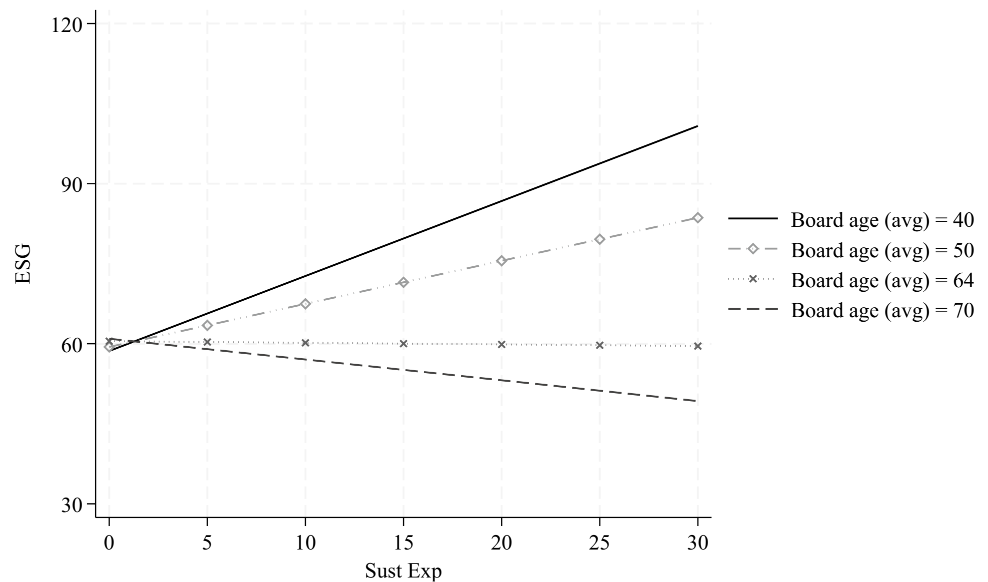

Fig. 2 Moderation effect of board age on the relationship between Sustainability experience and ESG. The graph shows the effect of board sustainability experience on sustainability performance (ESG) for different levels of board age. The solid line represents the effect of board sustainability experience on sustainability performance (ESG) for companies with the youngest board in the sample (average age = 40). Conversely, the dashed line illustrates the effect of board sustainability experience on sustainability performance for companies with the oldest board of directors in the sample (average age = 70)

Table 7 Robustness check: Board age diversity

Variables	Model 5	Model 6	Model 7
Sust Exp	0.324*	0.325*	0.309*
Age diversity		3.566	2.236
Sust Exp × Age diversity			4.778*
Board size	1.735	1.308	1.322
NED	− 0.443	− 0.508	− 0.188
CEO duality	− 1.888	− 1.871	− 1.749
Women	16.895***	16.873***	16.586***
Nationalities	− 3.036	− 3.052	− 3.653
Tenure	0.459**	0.454**	0.476**
Sust comm	0.999	1.048	1.24
Firm size	2.140*	2.145*	2.212**
ROA	− 0.015	− 0.014	− 0.016
Debt	− 0.302	− 0.303	− 0.361
LEV	0.559	0.56	0.544
Firm age	4.318***	4.327***	4.321***
Inst Own	1.894	1.904	1.844
Year dummies	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Constant	42.386***	42.335***	42.353***
Observations	1290	1290	1290
Number of firms	435	435	435
R-squared	0.38	0.38	0.38

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

influence corporate performance, as theorized by the upper echelons theory (Peters et al., 2019).

However, results from the moderation analysis revealed that the effect of board sustainability depends on board age, as hypothesized in Hypothesis 2, showing that while young boards can enhance the positive effect of sustainability experience, in older boards such an effect becomes smaller and smaller, up to be completely mitigated when the average age of the board overcome 64 years. These findings suggest that while companies are moving to implement sustainable governance, increasingly favoring directors with sustainability experience, such actions risk being superficial if they are not accompanied by an intrinsic motivation that sees sustainability as an indispensable ethical behavior for the company. Such a motivation exists among young people. As highlighted by prior literature, board age reflects values and sustainability sensitivity and awareness of directors (Arioglu, 2021; Chindasombatcharoen et al., 2023; Gardiner, 2022; Kagzi & Guha, 2018; Talavera et al., 2018; Xu et al., 2018).

Knowing that the average age of the boards in the analyzed firms is 57 years, it can be inferred that, in younger boards, directors have grown up in a time when sustainability has become a major concern and a mainstream business activity (He et al., 2023). As a result, they possess a deeper understanding of sustainability issues and increased awareness of the social and environmental impacts of corporate actions (Gardiner, 2022). This, in turn, fuels a strong desire to make a difference and contribute to a better world. Driven by their intrinsic motivation, these directors may harness the expertise stemming from sustainability experience within the board in order to effectively address sustainability challenges. Therefore, in younger boards, the motivation to put into practice the knowledge acquired from sustainability experience leads to improved sustainability performance.

On the contrary, in older boards, directors tend to be, on average, less aware and sensitive to social issues compared to their younger counterparts. Additionally, since older directors are more conservative and less inclined to

Table 8 Instrumental variable analysis

Variables	Model 1		Model 2		Model 3	
	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
	Sust Exp	ESG	Sust Exp	ESG	Sust Exp	ESG
Sust Exp (country avg)	0.12***		0.39***		0.11***	
Sust Exp		7.18***		0.23**		8.54***
Board age	0.01***	− 0.12***			0.01***	− 0.14***
Sust Exp × Board age			− 0.001	0.154	− 0.02***	0.41***
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3183	3013	3183	3013	3183	3013
Number of firms	740	570	740	570	740	570
R-squared		0.35		0.36		0.35

***$p < 0.01$, ** $p < 0.05$, * $p < 0.1$

take risks and embrace change (Ararat et al., 2015; Arioglu, 2021; Chen & Hao, 2022), they may be reluctant to promote sustainable transitions, which entail complex challenges to be managed and yield long-term effects that they may not personally benefit from. The overall lack of motivation among older boards to integrate sustainability into corporate strategies can stifle the potential advantages stemming from sustainability experience, leading to suboptimal sustainability performance.

Sensitivity checks conducted through age diversity confirm the significant moderating role of the board age, indicating that the effect of sustainability experience on sustainability performance increases as age diversity grows. This result suggests that having a mix of both elderly and young people on the board can enhance the effect of the board's sustainability experience on sustainability performance. Indeed, while senior directors may have experience with sustainability, given that it has been in the corporate environment for nearly two decades (Kay et al., 1999) and the awareness campaigns developed over the years to promote and integrate the concept of sustainability into daily business ecosystems (Lacy et al., 2011), they lack the same level of motivation as younger individuals to capitalize on this experience to drive sustainability performance. The coexistence of young and old directors on board can guarantee both a high sustainability experience and the motivation to translate it into ethical behavior to drive sustainability.

Regarding control variables, although the PSM analysis enabled us to isolate the effects of the variables of interest, namely sustainability experience and board age, the results indicate that the percentage of women on the board, CEO duality, and firm size and age significantly influence sustainability performance. Since the PSM tests demonstrated that treated and untreated firms are comparable in terms of control variables, these findings imply that even slight differences in these factors can impact sustainability performance, suggesting that they may warrant special consideration. These results corroborate the crucial role of gender diversity in driving corporate sustainability, as extensively highlighted in the literature (Ben-Amar et al., 2017; Glass et al., 2016; Lu & Herremans, 2019; Wu et al., 2022).

Theoretical Implications

This study makes several theoretical contributions. First, we contribute to corporate sustainability research by analyzing board characteristics that represent social factors, such as sustainability experience and age of board members, as antecedents of sustainability performance. Such factors have a potential impact on balancing the tensions and trade-offs that emerge from adopting ethical behavior, which is crucial in promoting generational sustainability through sustainable corporate performance.

Second, we add to the corporate governance literature by exploring a very little-explored characteristic of the board of directors, i.e., board sustainability experience, showing that it plays a key role as a driver of firm sustainability performance. While recent research has started to examine institutionalized forms of integration of sustainability expertise within the board, such as the presence of CSR committees or a chief sustainability officer (Fu et al., 2020; Fuente et al., 2017; Gull et al., 2023; Javeed et al., 2022; Peters et al., 2019; Velte & Stawinoga, 2020; Velte, 2023b), little attention has been paid to board expertise derived from non-institutionalized roles. Thus, by focusing on specific sustainability-related experience held by directors, this study contributes to advancing knowledge in this field. In addition, our findings indicate that the board's experience in sustainability, if not underpinned by a genuine commitment to ethical behavior, may have little to no positive impact, or

could even be harmful, to sustainability performance, thus, contributing to the discussion on business ethics and corporate governance.

Third, we refer to resource dependence and upper echelons theories to study the impact of the board sustainability experience and board age on sustainability performance. While the upper echelons theory traditionally focused on top management teams, primarily considering executive roles, we have broadened its scope to encompass the entire board of directors, arguing that the individual characteristics of all directors on the board are important in leading corporate results (Dobija et al., 2023; Martínez-García et al., 2022). Indeed, the board plays a crucial role in defining corporate purpose, influencing strategic choices and ethical conduct within the firm (Collevecchio & Gionfriddo, 2023).

Fourth, while other studies have measured sustainability expertise by analyzing corporate disclosure documents (Jamil et al., 2021; Subramaniam et al., 2023), we have focused on experience derived from previously holding sustainability-related roles. To this end, we employed secondary data provided by BoardEx, which, besides being more objective, allowed us to obtain data for an extended period and conduct a longitudinal analysis. This approach is particularly suitable for understanding the effect of board characteristics, as board decisions may take years to influence corporate performance (Gardiner, 2022).

Fifth, to the best of our knowledge, this is the first study that brought the impacts of board sustainability experience and board age on sustainability performance together by examining the moderating effect of board age on the relationship between board sustainability experience and firm sustainability performance. In particular, we highlighted that while board age does not primarily affect sustainability performance, it significantly moderates the effect of board sustainability experience. More specifically, we argued that age is reflective of the intrinsic motivation of the board towards sustainability, which can translate sustainability experience in positive sustainability performance. In this way, we also respond to the call to explore the cognitive attributes of the board (Kent Baker et al., 2020; Zattoni et al., 2022), which are little explored in the literature as they are more difficult to be observed. In addition, by showing that the impact of board sustainability experience is contingent on the age of the board, we contribute to shedding light on the inconclusive findings related to the effect of board age (Gardiner, 2022; Kagzi & Guha, 2018).

Sixth, this study helps broaden our understanding of sustainable boards in the European context, an area previously underexplored in research (Velte, 2023a, 2023b). In doing so, we move beyond the single-country focus of prior studies (Homroy & Slechten, 2019; Janahi et al., 2022; Subramaniam et al., 2023) and conduct a multi-country analysis, enabling us to offer more generalizable findings.

Finally, by performing a propensity score matching analysis and an instrumental variable approach, we adopted a more rigorous methodology to address the endogeneity, which is an under-considered issue in previous studies (Zattoni et al., 2022).

Practical Implications

This research also offers implications of practical value. First, our findings emphasize the value of directors' specialized experience in sustainability. Specifically, we demonstrate that boards with substantial sustainability-related experience deliver higher firm sustainability performance. Therefore, companies aiming to improve their sustainability performance and create a positive social and environmental impact should consider sustainability expertise when selecting board members.

However, such expertise derived from prior sustainability experience may not be sufficient to promote a thorough integration of sustainability within the company that can drive high sustainability performance. Indeed, our findings indicate that without the board's intrinsic motivation to adopt ethical behavior, their experience in sustainability might have minimal or even detrimental effects on sustainability performance. Consequently, firms should pay attention not only to specific sustainability-related expertise but also to the values and characteristics of board members.

In this regard, the age of directors represents an important characteristic, as it generally reflects the values, priorities, and mindsets of different generations. Our results show that both the average age and age diversity of the board act as significant moderators that can enhance the effect of sustainability experience to drive higher sustainability performance. Thus, companies should encourage the inclusion of younger directors on their boards to foster an organizational culture oriented toward sustainability.

This research also provides relevant implications for regulators, urging them to consider such board characteristics in regulations related to board composition. While the EU context encourages companies to consider board diversification and communicate the adopted policies in this regard (see, for instance, Directive EU 2022/2464 of the European Parliament and of the Council of 14 December 2022), explicit measures have so far only been taken concerning gender diversity (Directive EU 2022/2381 of the European Parliament and of the Council of 23 November 2022 on improving the gender balance among directors of listed companies). To facilitate firms' sustainable transition, regulators should consider introducing explicit and mandatory sustainability expertise requirements for boards. Moreover, the results of this study encourage lawmakers to include generational diversity as a key component in good corporate governance codes. Although we believe setting quotas for young

members (similar to gender quotas) may be counterproductive, regulators could address, for instance, this issue through appropriate retirement policies.

Limitations and Future Research

This study is not exempt from limitations that pave the way for future developments. When measuring sustainability experience, we considered the total years of experience in board and non-board sustainability-related roles previously held by directors. However, experience in sustainability can also derive from the educational background of directors (Peters et al., 2019), as well as from personal experience, volunteer work, etc. Therefore, future studies may consider these additional aspects. Furthermore, while we have used the information from the BoardEx database, future research may supplement this data with alternative sources.

In addition, we focused on the board's age, which, as a reflection of the directors' values and worldview, serves as a proxy for the board's intrinsic motivation toward sustainability. We acknowledge, however, that this motivation could also arise from other individual characteristics that are not easily observable. Future research could attempt to gather primary data using alternative methods, such as surveys and interviews, to gain insights into board members' values, awareness, and sensitivity regarding sustainability issues. Nevertheless, conducting such research could be challenging, as directors may hesitate to provide truthful answers due to the sensitivity of the topic, and the collected information could be biased.

We used ESG scores provided by the Refinitiv Eikon database to assess firm sustainability performance. Although it is an authoritative and widely used source in the literature, future research could explore other sources of ESG scores, such as Bloomberg, Sustainalytics or MSCI, to validate the results. Furthermore, ESG scores are one possible measure of sustainability, and future studies could use alternative measures to gauge sustainability performance.

Furthermore, while we considered listed companies, which may have different human capital because they are subject to particular standards in terms of corporate governance, scholars could also assess the impact of the sustainability experience in unlisted companies.

Author Contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Francesca Collevecchio. The first draft of the manuscript was written by Francesca Collevecchio and all authors commented on previous versions of the manuscript. The amendments in the manuscript during the revision process were developed by Francesca Collevecchio and Angel Meseguer-Martinez. All authors read and approved the final manuscript.

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Declarations

Conflict of interest We have no known conflict of interests to disclose.

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