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Citation: Al-Najjar, Basil and Salama, Aly (2022) Mind the gap: are female directors and executives more sensitive to the environment in high-tech us firms? Technological Forecasting and Social Change, 184. p. 122024. ISSN 0040-1625

Published by: Elsevier

URL: https://doi.org/10.1016/j.techfore.2022.122024 <https://doi.org/10.1016/j.techfore.2022.122024>

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MIND THE GAP:
ARE FEMALE DIRECTORS AND EXECUTIVES MORE SENSITIVE TO THE ENVIRONMENT IN HIGH-TECH US FIRMS?

ABSTRACT

Female directors are under-representative in the technology sector. There is a distinct lack of research into the relationship between board gender diversity and environmental performance, particularly in US high-tech firms. This study fills the gap in the literature by exploring the importance of female directors and executives in environmental decisions within US high-tech firms. We employ different environmental measurements, including an overall environmental score, emissions score, ISO14001, and whether firms have products to overcome climate change risks. Using the US publicly traded technology firms listed in S&P 500 and S&P 1000 from 2006 to 2020, we detect a positive impact of both board diversity and executive diversity on environmental performance (environmental score and emission score). This finding is robust after controlling for endogeneity and using different econometric techniques such as quantile regression analysis and across the different environmental performance proxies. Our results have empirical implications on the high-tech sector by stressing the importance of having female directors and executives as they are more sensitive to environmental issues than their male counterparts.

Keywords: Board diversity; Female executives; Environmental performance; High-Tech firms

Acknowledgement

The authors would like to thank the Editor-in-Chief, Professor Scott Cunningham, and the three anonymous reviewers for the constructive comments and detailed suggestions on this research.

1. Introduction

Organisations have increasingly integrated global warming policies into their strategic management decision-making and adopted various environmental strategies (Alsaifi et al., 2020). Climate change is not only an environmental crisis; but also, a growing social concern that drives us to handle pressing issues of inequality on various levels, e.g., between men and women (The World Bank, 2021). The role of female directors in governing firms is gaining much attention in the literature. There is a clear demand for more females to serve on the boards and act as executive directors. Corporate governance literature has addressed gender diversity from firm performance perspectives (e.g., Sarhan et al., 2019); corporate fraud (e.g., Sun et al., 2017); Corporate Social Responsibility (CSR) (e.g., Beji et al., 2021). Our study is considered within the stream literature related to female directors but focuses on their role within a unique context of high-tech US firms. The big US tech organisations seem to be able to lead in mitigating climate change (Ovide, 2021). As such, they need to be part of the resolution to bring fundamental changes in combating climate change threats by establishing mitigation targets and effective goals to lessen environmental problems caused by greenhouse gas (GHG) emissions from their institutions and supply chains (CES, 2021). Big Tech's energy usage and emissions are significant, and some large tech companies have enormous delivery systems or *carbon-intensive hardware manufacturing supply chains* and logistics all over the globe (Varro & Kamiya, 2021). In a KPMG survey, technology companies see climate change as the biggest risk to their growth, determined by their capability to shift to a clean technology economy; however, only 26% of tech companies have embedded environmental practices into their strategic planning and operations (KPMG, 2020). We, therefore, aim to investigate environmental performance within such an important sector in the US.

Accordingly, the importance of our research has two folds: i) we examine the under-research relationship between female directors in high tech firms as this sector has a clear trend of low representation of female directors, and ii) to complement the literature on the importance of board diversity in strategic decisions such as environmental decisions. This is because gender diversity is related to an increased variety of opinions and effective governance and positively affects employee productivity and financial performance (Gilley et al., 2019). The workforce's

lack of gender diversity could be a transitioning barrier to a more sustainable society (Pearl-Martinez & Stephens, 2016). Women and men see problems differently, and women bring unique ideas to solve problems (Araminaite-Pivore, 2021). Female directors influence board behaviour and decision-making and help boards make better decisions (Gilley et al., 2019). They consider morality as a responsibility or obligation to exercise care and concern and avoid hurt for others and a duty to ease the recognisable problems of the world (Gilligan, 1977). Women maintain different responsible values, ethical beliefs, and associate behaviours than men and are naturally socialised into communal values reflecting a concern for others, selflessness, and a passion for being at one with others (Mason & Mudrack, 1996). Ferreira (2015) concludes, "*When discussing policies that promote women in business, it is better to focus on potential benefits to society beyond narrow profitability measures*" (p.110).

Stakeholders increasingly call for gender diversity and corporate social and environmental responsibility initiatives (Campopiano et al., 2022) and are agitated about the environment. Board gender diversity, as one of the corporate governance mechanisms, represents both challenges and opportunities for board practices, can positively affect board performance, and has been the subject of active policymaking; hence it is essential to understand its role (Adams et al., 2015). Gender diversity is vital to all workplaces and presents different skills, talents, and creativity, which are critical for developing tech products and solutions (Araminaite-Pivore, 2021). It is evident that the tech industry has an inherent issue with gender diversity (e.g., Raré, 2020); women remain widely underrepresented in IT roles (White, 2021), and they only hold 26.5% of senior-level management in firms listed at S&P 500 (Richter, 2021). The sector trails behind the rest of the US job market when employing women in managerial or technical roles (Daley, 2021). This board-gender diversity issue shows the importance of shedding light on females within the senior management team in the high-tech sector.

Undoubtedly, effective corporate governance mechanisms help drive a firm's environmental policies and reduce agency conflicts by aligning management and stakeholders' interests (Shahab et al., 2022). Corporate governance and management literature have extensively researched the board of directors' composition and independence. As the organisation's decision-maker, an effective board will have a sound balance of diversified, competent directors with the firm-specific knowledge, experience, skills, and expertise essential

for effective corporate governance to meet the challenges of a rapidly changing global marketplace (Harper, 2007). As Jizi et al. (2014) put it, "*The way that boards discharge their duty of supervision and control depends not only on their fiduciary duties but also on their membership and organisation*" (p.603). The role of independent directors is essential to guarantee stakeholders' interests. Larger boards are also more likely to represent the interests of multiple stakeholders than smaller boards (Jain & Zaman, 2020). Jizi et al. (2014) find evidence that board independence and size positively relate to CSR. Similarly, Shahab et al. (2022) conclude that board size and independence are positively and significantly associated with the level of waste produced. Accordingly, we control for specific board-level governance mechanisms in this study, including board size and independence.

Previous studies have explored the influence of board diversity on CSR and environmental performance. For example, Konadu et al. (2022) examine the impact of board diversity on carbon emissions and report the importance of board diversity in enhancing board efficiency. Gabaldon et al. (2016) report that women have different perspectives than men when dealing with the environment as women are more dedicated to environmental issues than men, who are mainly concerned about the trade-off of such issues. In the same vein, but from a social performance viewpoint, the literature supports a positive impact of women on social performance (e.g., Byron and Post, 2016). Many previous studies have examined the impact of board diversity on CSR by exploring social performance as the main index for firms to be more socially responsible. Terjesen et al. (2009) find a direct impact of female directors on social performance and sustainability. This approach would treat all elements of social activities similarly and would not differentiate between social activities and those related to the environment. Indeed, it is important to distinguish between environmental aspects and social activities as the former has a more long-term strategic nature, leading to higher risks related to environmental activities (e.g., Lu & Herremans, 2019; Walls et al., 2012).

One problem with previous studies is the lack of focus on industry-specific studies, as industries may vary in terms of conditions, mobility, and other characteristics that affect the workforce composition (Baker et al., 2020). Another issue is that prior literature often uses one measure of environmental indexes, such as GHG (Konadu et al., 2022). Our study contributes to the literature in different ways. First, this paper bridges the literature gap and responds to the call from Konadu et al. (2022) to examine different environmental indexes in an under-

researched context. Hence, unlike other studies that used one environmental performance proxy, our first contribution is empirical as we employ four proxies covering an overall environmental score, emissions score, ISO 14001, and if firms have products to tackle climate changes. Second, unlike other studies investigating gender diversity and environmental performance across different sectors, the current study is context-driven and provides a unique context of high-tech firms, given the importance of such firms and the under-representation of female directors within this sector. Third, this study is management-driven as we prove to managers in high-tech firms that female directors play a crucial role in strategic decisions, such as environmental practices. Our results are robust using different econometric techniques, such as panel regression analysis, IV models, quantile regressions, and panel logit models. Fourth, unlike previous studies employing a single theory in examining the relationship between female directors and environmental performance, the current study is also theoretically driven and employs a multi-theoretical approach to build conceptual underpinnings to support empirical findings. Given that there is no single theoretical lens that can comprehensively explain the impact of board gender diversity on firms' environmental performance (Elmagrhi et al. (2019), and following calls for theoretical pluralism (Haque & Ntim, 2018), we use a multi-theoretical framework to explore the effect of board gender diversity on environmental performance in US high-tech firms. Specifically, our analysis is informed by theoretical insights drawn from the agency, stakeholder, resource dependence, and upper echelons theories.

Our results reveal a significant positive relationship between board diversity and environmental and emissions scores, indicating that the female presence on the board enhances environmental practices to minimise environmental risks. Female directors engage more in environmental activities and are more concerned about the environment than their male counterparts. The results also show a positive association between executive gender diversity and environmental and emission scores. Thus, we confirm that female directors and executives are more engaged in environmental practices and improve the board's efficiency in managing environmental risks within the high-tech publicly listed firms. An integrating multi-theoretical framework can explain these results. We argue that board and executive gender diversity supervise and monitor managers' discretion to safeguard stakeholders' interests, as underpinned

by agency theory, and bring necessary resources to the firm, as reinforced by resource dependency theory, to enhance environmental performance. In addition, our results align with stakeholder theory. We argue that female directors can persuade firms to adopt different environmental practices to meet stakeholders' expectations. Our results are also consistent with the UET viewpoint that gender diversity is strongly related to motives, drivers, and outcomes of environmental performance and, more generally, CSR activities. Accordingly, women directors contribute to board effectiveness as they are expected to be more socially oriented.

The remaining paper is organised as follows. Section 2 discusses the background of this research; Section 3 provides the theoretical framework; Section 4 presents the empirical literature review and hypothesis development; Section 5 highlights our research design; Section 6 provides the empirical results, and Section 7 concludes.

2. Background

Wakefield et al. (2021) assert that board gender diversity remains a primary corporate governance objective globally, and the US has achieved considerable progress on gender diversity at many large publicly traded companies. They use information from the DirectorMoves database, which contains information from thousands of companies with market capitalisations of $150 million, to understand women's progress on boards. They conclude that "*US companies have made great strides towards a balance of gender diversity on boards. Over the past five years (2017-2021), cultural, legislative, and governance factors have strongly influenced board diversity, resulting in an increase in women directors serving on US public company boards*" (Wakefield et al., 2021). Wakefield et al. also report a significant increase in women on board seats within S&P 500 firms, which is about 30% compared to 18% five years ago. They also detect that women board members increased by a net amount of around 2700 compared to a decrease in male directors.

Global climate change and environmental issues are significant ecological and social challenges of the twenty-first century. The tech sector is responsible for 2-3 per cent of global greenhouse gas emissions. However, much of the attention at COP26 focused on the manufacturing and transportation industries rather than on the impact of newer technologies and the related climate price (Goodin, 2021). As global warming raises an enormous challenge

and a severe threat, organisations in general and tech companies, in particular, need a leadership that is willing to act and be capable of driving adaption to change how they work, think and plan. Garnett (2019) asserts that tech leaders should become examples and take responsibility for turning the industry into energy-conscious by changing how software products, platforms, and infrastructures are planned and built to include much greater concern for environmental impact. Such commitments should include, for example, lowering energy usage throughout the entire product development cycle, moving to cleaner energy sources, recycling, reducing carbon footprint, and setting goals for the following years. Although the big US tech companies are coming out with proactive commitments to tackle their climate impact, their engagement in advocating for robust climate policies is almost absent (Paddison, 2021).

Women are seen as more vulnerable than men to the effects of climate change because they are proportionally more dependent on endangered natural resources (Osman-Elasha, 2022). Ballew et al. (2018) find that women consistently have higher risk perceptions that global warming will harm them personally, American people, plants, animals, and future generations. The UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), a global centre of excellence on biodiversity and nature's contribution to society and the economy, claims that "*Women have unique knowledge and responsibilities in the sustainable use and conservation of biodiversity, and they are agents of transformational change. However, women's representation in environmental decision-making remains insufficient*" (UNEP-WCMC, 2020). During the International Women's Day official UN Observance on 8 March 2022, Secretary-General António Guterres stressed the critical role of women in battling climate change risks and impacts. He said, "*We need more women environment ministers, business leaders, presidents, and prime ministers. They can push countries to address the climate crisis, develop green jobs and build a more just and sustainable world*" (United Nations Daily Press Briefing, 2022). Women's inclusion in decision-making processes and participation in natural resource management are critical to effective climate action and associated with better resource governance and conservation outcomes because they possess unique knowledge and experience (UN-WOMEN, 2022).

Desrochers et al. (2019) empirically examine how personality mediates the relationship between gender and environmentalism. They find that women are more conscientious and have stronger attitudes toward protecting the environment and engaging in pro-environmental behaviours than males. Mavisakalyan & Tarverdi (2019) also examine whether female political

representation in national parliaments influences climate change policy outcomes. They show that female representation leads countries to adopt more strict climate change policies, resulting in lower carbon dioxide emissions. Mavisakalyan & Tarverdi conclude that female political representation may be an under-represented monitoring mechanism for addressing climate change risks and impacts.

Technical innovation is crucial in every economic sector, and information technology is one of the fastest-growing US industries (Montilla, 2020). Women in tech leadership roles are making the fastest advances, and approximately one in four leadership positions at large global technology companies are expected to be held by women in 2022 (Hupfer et al., 2022). Recognising women's contributions to the tech industry will ultimately make tech companies the winners (Kong, 2022). According to Tucker (2016) and Montilla (2020), we need women in tech to take on leadership positions for the myriad benefits of having women in leadership. First, gender diversity on technical work teams is linked to greater productivity and associated with better dedication to project schedules, lower project costs, and increased employee performance ratings. Gender-balanced teams are likely to experiment, be innovative, share knowledge and accomplish tasks. Second, companies with diverse leadership are successful and gain a competitive advantage, which extends to all stakeholders. Expanding the diversity of leadership teams to include female tech directors and executives leads to increased and better innovation. It will have a tangible impact on many aspects of company performance. Women see things differently and have unique experiences and perspectives that can yield better product outcomes and spur innovation. Women's presence makes people expect differences in views and perspectives and think they will need to work harder to agree on better problem-solving, which can boost corporate performance. As leading tech users of the internet, social media, and healthcare gadgets, women have become a demographic that technology companies cannot neglect. Getting more women into design, research, and development can lead to better products and positive customer experiences tailored for those who buy and use them. Third, having women in leadership positions will lead to better team dynamics. Women's presence can boost confidence among team members, improve collaboration and cohesion, and increase a group's collective intelligence. They excel in interpersonal interactions and consistently score higher than men in emotional intelligence and social sensitivity, which enable them to promote the positive behaviours and attributes of listening, constructive criticism and open-mindedness that

create healthy team dynamics. Fourth, when tech companies bring women into senior roles, they signal that others have an opportunity to succeed too.

3. Theoretical Framework

Amorelli & García-Sánchez (2021) conduct a bibliometric and bibliographic review of 89 studies to determine the impact of board gender diversity on the level of business commitment to sustainable development and stakeholder engagement. They conclude that this emerging research has been a stupendous development since 2016. There is a paradigm evolution in the theoretical frameworks supporting studies investigating the factors that support female skills and capabilities in forming strategies. According to Amorelli & García-Sánchez (2021), the most commonly used theories include agency, stakeholder, and resource dependence.

Notably, there are increasing recent calls for theoretical pluralism and development to explain the issues relating to firms' environmental performance (Haque & Ntim, 2018; Elmagrhi et al., 2019). Nguyen et al. (2020) provide a comprehensive systematic review of the existing literature on women on corporate boards. They find that many existing studies are descriptive or draw on a single theory rather than multi-theoretical lenses. They conclude that as each theoretical perspective has limitations, future research should adopt multi-theoretical frameworks comprising two or more perspectives relating to economic and corporate governance theories and sociological and psychological theories.

Cormier et al. (2005) use a multi-theoretical framework that relies on economic incentives, public pressures and institutional theory to study environmental disclosure quality in large German Companies. Elmagrhi et al. (2019) also use a multi-theoretical framework that integrates insights from agency, legitimacy, resource dependence, and stakeholder theoretical perspectives to examine the impact of board gender diversity/female directors on the environmental performance of Chinese publicly listed corporations. They argue that the capability of an individual theory to comprehensively explain the impact of female directors on firms' environmental performance is restricted, and it is essential to utilise a multi-theoretical framework by adopting insights from different theories that complement each other regarding their strengths and weakness (Adu, 2022). Similarly, Shahab et al. (2022) use a multi-theoretical framework drawn from stakeholder, resource-based, and agency views to examine the effect of

corporate governance mechanisms (e.g., board gender diversity) on the waste produced and recycled by firms across the world.

Theoretically, organisations may voluntarily engage in environmentally friendly activities to obtain competitive advantages, access crucial resources, and legitimise their operations by getting the wider community's approval (Nguyen al., 2021). The effect of board gender diversity/female directors on firms' environmental performance can be explained using many theories (Elmagrhi et al., 2019). Given that there is no single theoretical lens that can comprehensively elucidate the impact of board gender diversity on firms' environmental performance (Elmagrhi et al. (2019), and following calls for theoretical pluralism (Haque & Ntim, 2018), we use a multi-theoretical framework to explore the effect of board gender diversity on environmental performance in US high-tech firms. Specifically, our analysis is informed by theoretical insights drawn from the agency, stakeholder, resource dependence, and upper echelons theories.

Agency theory (Jensen & Meckling, 1976; Fama, 1980; Fama & Jensen, 1983; Eisenhardt, 1989) suggests a conflict between the interests of principals (shareholders) and those of the agents (managers, as self-interested actors) running the company on their behalf (Cadbury, 2000). It proposes that managers are generally opportunistic, often self-motivated, and mainly focusing on maximising their own benefits. As a supervision and control mechanism intended to deal with the conflict of interests, the board of directors' monitoring role is to mitigate agency conflicts, protect principals' interests, and lessen agency costs through governance structures to shape executive actions in the organisation (Adams et al., 2015; Sajko et al., 2021).

However, boards regularly fail at this fundamental task (see Main et al., 1995; Gilley et al., 2019), and the agency perspective has been challenged (see McWilliams & Siegel, 2001). One issue of debate is that agency scholars have not considered heterogeneous board abilities' specific role in improving a board's monitoring function (Hillman & Dalziel, 2003). Board members bring various qualities that may impact firm decisions and performance. An effective board will have a sound balance of well-chosen, competent directors with diverse gender, ethnicity, experience, and backgrounds essential for effective governance to meet the rapidly changing global marketplace (Harper, 2007). Pfeffer and Salancik (1978) state that *"when an organisation appoints an individual to a board, it expects the individual will come to support the organisation, will concern himself with its problems, will favourably present it to others,*

and will try to aid it" (Salancik, 1978, p. 163). Boards exercise independent control and serve as strategic consultants to top managers (Carpenter & Westphal, 2001).

The board of directors, which guarantees the protection of stakeholders' and shareholders' interests, could be the primary driver of implementing eco-innovation and eco-design strategies (García-Sánchez et al., 2021). For example, the presence of independent directors on the board is one of the most common dimensions of monitoring senior management's behaviour, reducing agency costs, implementing socially responsible strategies, supporting long-term green investment, and reducing managerial opportunism concerning proactive environmental strategies (García-Sánchez et al., 2019; García-Sánchez et al., 2021; Nuber & Velte, 2021). Jizi et al. (2014) and Beji et al. (2021) provide evidence that outside directors care about CSR performance. García-Sánchez et al. (2021) also show that independent directors play a crucial role in implementing eco-innovation and eco-design projects.

Notably, board gender diversity/female directors may contribute to board independence by bringing different perspectives and opinions to board discussions leading the board to make better decisions, and favouring more effective supervision and more rigorous ethical conduct (Elmagrhi et al., 2019; Amorelli & GarcíaSánchez, 2021; Songini et al. 2022). Elmagrhi et al. (2019) and Nguyen et al. (2021) argue that agency theory regards increasing the proportion of female directors to control managers' opportunistic behaviours is associated with enhancing board independence and effectiveness since they bring relational and human capital into a boardroom, which can impact positively on firms' environmental performance.

Agency theory is usually connected with the stakeholder theory foundations in extending the agency problem to a multidimensional relationship with various stakeholders and theorising the framework for most research on gender diversity/ female directors and CSR (Amorelli & García-Sánchez, 2021). Organisations are not isolated from the external world. They have relationships with many constituent groups, and these stakeholders both influence and are influenced by the firm's actions (Freeman, 1984). Stakeholder theory (Freeman & Reed, 1983; Freeman, 1984) argues that organisations are built on the foundations of society and are part of it and should balance the expectations of all stakeholders (Zhao et al., 2022). It suggests a contractual relationship between managers and stakeholders, whereby managers are committed to representing and meeting stakeholders' expectations to obtain their approval (Elmagrhi et al., 2019). That is, demonstrating greater accountability via an increased commitment to sound

environmental practices and engaging in environmentally friendly activities will satisfy and balance the interests of various stakeholders (Nguyen al., 2021).

The stakeholder perspective is therefore based on legitimacy considerations: "*The concept of legitimacy is important in analysing the relationships between organisations and their environments. Legitimacy and social norms and values constrain the actions taken by individual organisations*" (Dowling and Pfeffer, 1975, p. 131). Stakeholder theory is the most prominent theoretical lens in the CSR–leadership research domain (Zhao et al., 2022) and one of the theories adopted in explaining issues related to women on corporate boards (Nguyen et al., 2020). Board gender diversity/female directors can persuade firms to adopt different environmental practices to meet stakeholders' expectations (Elmagrhi et al., 2019). Under the stakeholder theory, female board representation is strongly related to CSR, as women tend to focus more on solving social and environmental issues than men (Nguyen et al., 2020).

While agency theory emphasises managerial opportunism, agency costs, and the board's incentives and its role as a control mechanism, resource dependence theory, on the other hand, focuses on resources as essential drivers of firms' performance and dismisses incentives that might promote the resources provided to the firm (Hillman & Dalziel, 2003). Resource dependence theorists view the board as a supplier of strategic resources such as advice, connections with the external environment, counsel, expertise, and information provision rather than management monitoring (Pfeffer & Salancik, 1978). They suggest that resources provide legitimacy, knowledge, and expertise and help reduce dependency between the organisation and external contingencies, decrease uncertainties, lower transaction costs, and eventually contribute to organisational survival (Hillman & Dalziel, 2003). In practice, boards of directors serve two critical roles for organisations: monitoring or control function and providing resources function (or strategy and service roles; Zahra and Pearce, 1989; Johnson et al., 1996), and therefore combining agency and resource dependence perspectives is essential (Hillman & Dalziel, 2003).

Resource dependence theory indicates that good governance, often associated with independent and diverse boards, can pressure organisations to engage in environmentally friendly activities and improve the corporate image (Nguyen et al., 2021). It suggests that firms should appoint more women as directors because women on boards can offer firms several benefits, such as better access to resources, business contacts and information channels, different perspectives, skills and values, and advice (Nguyen et al., 2020; Amorelli & García-

Sánchez, 2021). Accordingly, more diverse boards can improve decision-making dynamics, favouring the adoption of environmental policies (Amorelli & García-Sánchez, 2021).

The Upper Echelons Theory (UET) (Hambrick & Mason, 1984; Hambrick, 2007; Finkelstein et al., 2009; Abatecola & Cristofaro, 2020; Martínez-García et al., 2021) suggests the managerial background characteristics of top managers predict strategic decision-making processes and ultimately organisational outcomes. According to their interpretation of reality, executives make strategic choices stemming from their cognitive base values, beliefs, perceptions, personalities, and ethical conduct norms. The UET focuses on the importance of powerful organisational actors' psychological and other observable characteristics in interpreting the external environment and forming firms' strategic decisions and outcomes (Hambrick, 2007). According to UET, "organisational outcomes—strategic choices and performance levels— are partially predicted by managerial background characteristics" (Hambrick & Mason, 1984; p.193). The basis of UET is that the choices of decision-makers can vary broadly, allowing them to inject their unique features (e.g., "qualities of the feminine, such as caring, nurturing and reconciling" – Marshall, 2007; p.175) into such strategic decisions to impact performance (Waldman et al., 2004). Supporting this view, McGuire et al. (2003) argue that "*Managerial beliefs and discretion, rather than the constraints and incentives provided by corporate governance, are likely to be the principal drivers of exemplary social performance*" (p.343). In line with UET, female directors have professional experiences, values, and knowledge, tend to be more sensitive to CSR activities, and are likely to influence decision-making (Beji et al., 2021). In this sense, female directors and executives can play a vital role in promoting environmental performance.

Taken together, we respond to the literature's call (see, among others, Elmagrhi et al., 2019) to adopt a multi-theoretical framework underpinned by the integration of four necessary stands: agency, stakeholders, resource dependence, and upper echelons theories, as we argue that the interaction of these theories would provide a clearer understanding of the relationship between female directors and environmental performance. In doing so, we support the view that one individual theory might not be able to explain the interrelationships between gender diversity and environmental aspects facing high-tech firms.

4. Empirical Literature and Hypothesis Development

In this section, we review the empirical literature and develop a hypothesis based on prior studies examining the impact of gender diversity on environmental performance in US high-tech firms. Lu & Herremans (2019) argue that research on board diversity and firm performance has yielded inconclusive results, while studies investigating different aspects of CSR report a generally positive female impact on various dimensions of social performance.

When reviewing the studies investigating board diversity and environmental performance, we find evidence of such a relationship. For example, Nuber & Velte (2021) examine the impact of board gender diversity on firms' carbon performance based on total carbon emission intensity. They find that board gender diversity positively impacts carbon performance. Lu & Herremans (2019) posit and find a positive association between board diversity and environmental performance. In addition, Post et al. (2011), Walls et al. (2012), and Kassinis et al. (2016) also find some evidence of a direct association between board gender diversity (board demographics) and environmental activities. Notably, board diversity helps in adding important resources to the firm. For example, Martínez-García et al. (2022) state that board diversity will help to "*…increase firms' desire to acquire resources, communication channels, commitments, and legitimacy from insiders, business experts*" (Martínez-García et al., 2022, p.758).

Many authors combine agency and resource dependence theories in investigating the empirical relationship between board diversity and corporate social performance. For example, Hafsi and Turgut (2013) examine the influence of board diversity from two dimensions on the social performance of firms listed on the S&P 500 and find that diversity in boards is significantly and positively related to social performance. They suggest that "*gender diversity breeds better sensitivity to social issues. Women contribute to better social performance, and (they) can be seen as providing the sensitivity and guidance that makes the difference in corporate social performance*" (Hafsi and Turgut, 2013, p.474). Hoang et al. (2018) also combine agency and resource dependence theories to empirically investigate board diversity's effect on Vietnamese listed firms' corporate social disclosure and find that greater diversity in boards leads to higher social disclosure. They conclude that the board of directors delivers two essential functions: it supervises and monitors managers' discretion to safeguard shareholder interests, as underpinned by agency theory, and brings necessary resources to the firm, as underpinned by resource dependency theory, to enhance corporate social and environmental

responsibility. Consistent with the resource dependence theory, Martínez-García et al. (2022) find that after a non-punitive law is passed, Spanish boards seek to appoint more female directors with human capital attributes that will reduce uncertainty and bring necessary resources to firms.

A line of research also adopts stakeholder theory to examine the effects of board diversity, including gender diversity, on corporate social performance. For example, Harjoto et al. (2015) examine the impact of board diversity on firms' CSR performance across 1,489 U.S. firms from 1999 to 2011. They find that gender diversity is one of the driving factors of firms' CSR activities. According to Harjoto et al. (2015), board diversity significantly increases CSR performance by enriching CSR strengths and decreasing CSR concerns for firms producing consumer-oriented products and operating in more competitive industries. In a more recent study, Francoeur et al. (2019) examine the influence of gender-diverse boards on different groups of stakeholders for Fortune 500 companies in the USA. They find that gender-diverse boards are positively related to CSR dimensions related to less powerful stakeholders such as the environment, contractors, and the community.

Using UET, several authors have studied the impact of women on boards on CSR, concluding that gender diversity on boards is strongly related to motives, drivers, and outcomes of CSR. For example, Huse et al. (2009) study a Norwegian data set and find that women contribute to board effectiveness as they are expected to be more socially oriented than men, engage in more active and creative discussions in the boardroom, and have the potential to broaden discussions on strategic and CSR control issues. In a more recent study, Beji et al. (2021) also show that female directors in French firms have a positive and significant association with two specific areas of CSR, namely human rights and corporate governance.

Drawing on UET and based on a meta-analysis of 87 independent samples, Byron & Post (2016) examine whether women directors influence firms' engagement in socially responsible business practices and reputation among diverse stakeholders. They find that the female board representation-social performance relationship is generally positive and that this relationship is even more positive in national contexts characterised by higher stakeholder protections and gender parity. The study suggests that "*future research continues to explore boundary conditions of the relationship between board diversity and firm outcomes such as social performance*" (Byron & Post, 2016, p.437). Campopiano et al. (2022) also present a literature review of articles examining the influence of women directors on corporate social performance.

They find that several authors have examined this relationship using UET, finding that the presence of women or gender diversity on boards is strongly related to CSR goals and outcomes. They call for future researchers to focus on novel research questions and innovative research designs to examine women's contributions to CSR and challenge the theoretical underpinnings about the role of women on boards.

By integrating agency, stakeholder, resource dependence, and upper echelons theories and reviewing the related empirical research findings, the current research supports the view that female directors and executives will be an essential addition to the board and impact environmental performance. Hence, we argue that female directors are more sensitive to the environment, particularly in the high-tech industry. This reasoning leads us to posit a positive association between board diversity and environmental performance.

H1a: There is a positive relationship between board gender diversity and environmental performance in US high-tech firms.

In addition, we add an interesting insight to this research by including executive directors' gender diversity. This is because female representation on the board might be only among non-executive directors. According to Vinnicombe et al. (2019), non-executive female directors in the UK represent 93% of women holding directorships in FTSE100 and FTSE250 firms. Hence to bridge this gap, it is important to investigate those female directors who hold executive directorships. Executive directors, including female directors, will support CEOs in managing their firms. We expect female executive directors to follow the same pattern as the female directors serving on the board to support environmental practices. Hence, based on our theoretical expectations, we posit a positive association between female executive directors and environmental performance. Cambrea et al. (2020) employ the same definition of executive gender diversity. Thus, our *H1b* hypothesis is:

H1b: There is a positive relationship between executive gender diversity and environmental performance in US high-tech firms.

Data and Research Design

Data

Our sample comprises publicly listed high-tech firms in the US market (S&P 500 and S&P 1000). We find 193 publicly listed firms within the technology sector, and after screening for environmental and corporate governance factors, we find around 1725 firm-year observations representing 193 firms from 2006 to 2020. Our sample is an unbalanced panel, and we allow firms to freely enter and exit the market to avoid any survivorship bias. We use the Eikon database to collect environmental performance, corporate governance, and firm financial data. We provide a detailed discussion about the sample in Table 1a, and the summary statistics are provided in Table 1b.

Insert Table 1a about here

Insert Table 1b about here

The descriptive statistics show an average of 33.39 for the environmental pillar score with a maximum score of 98.5, while our second environmental factor, emission score, has an average of 35.46 and a maximum score of 99.8. These scores, on average, are low in our sample of high-tech firms. This might indicate that these firms might not strongly engage in activities to support the environment. As regards our main independent variable, we report that the board diversity ratio is, on average, 16%, with a maximum of more than half of the board members being females. Similar findings for our executives' gender diversity with an average of 12% and a maximum of 66.6% of the executives are females. This provides further evidence that female directors are under-representative in high-tech firms.

Regarding other board characteristics, we find that the average board size is nine; on average, 81% of the board members are independent directors. In addition, 98% of the board members have business qualifications, and on average, board members are engaged with one other business. Finally, 48% of the sampled firms appoint their previous CEOs as chairs of their boards. These governance aspects reflect that our sampled high-tech firms adopt effective governance mechanisms.

To test for multicollinearity issues in our models, we report the correlation matrix in Table 2. There are no high-bivariate correlations between the independent variables. As expected, board size positively correlates with firm size, indicating that large high-tech firms have large

boards compared to their small counterparties. Therefore, our models have no multicollinearity issue.

Insert Table 2 about here

The technology sector's importance has been addressed in different contexts, such as institutional fit (e.g., Fernandez-Giordano et al., 2021). High-tech firms are suitable to formulate our context, as such firms have a lower representation of female directors. Ovide (2021) suggests that high-tech firms are more to lead in minimising the impact of climate change. Such firms significantly impact emissions due to their logistics, supply chains, and factories operating within the globe (Varro & Kamiya, 2021). High-tech firms are key players in tackling environmental issues. It is argued that high-tech firms are keen on the environment because they can adopt new "*environmental protection measures*" than firms operating in other sectors (Cañón-de-Francia et al., 2007). Previous studies have reported that firms with more R&D intensity are more able to accept and embrace any changes related to the environment as these firms will be able to adjust to changes in more efficient ways (e.g., Nakamura et al., 2001; Sanchez, 1997; Cañón-de-Francia et al., 2007).

Such firms with high intensity in R&D investments can turn such environmental changes into profitable outcomes (e.g., Cañón-de-Francia et al., 2007; Arora & Cason, 1996). Accordingly, high-tech firms have the right (technological) experience and knowledge to change their strategic directions and profit from new environmental directions. Thus, such firms can adjust to any change promptly to maintain their competitive advantage. Other firms with limited technology experience will be less able to adapt to environmental changes, making them less active in responding to such changes and experience weak performance. Accordingly, high-tech firms possess the know-how and have a long-term strategic view to tackle issues related to the environment, such as climate change.

Research Design

To test our main hypothesis (*H1a*/*H1b*), we employ different econometric modelling; our baseline model is the fixed effects model, where we control for firm-specific and time effects. The following equations represent the model:

$$\text{ENV-SCORE}_{i,t} = \beta_0 + \beta_1 \text{Board Diversity}_{i,t} + \beta_2 \text{ Executive Diversity}_{i,t} + \gamma \text{BOS}_{i,t} + \delta \text{ firm -specific}_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$\text{EMI-SCORE}_{i,t} = \beta_0 + \beta_1 \text{Board Diversity}_{i,t} + \beta_2 \text{ Executive Diversity}_{i,t} \gamma \text{BOS}_{i,t} + \delta \text{ firm -specific}_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where ENV-SCORE is measured by Eikon environmental pillar score that reflects firms' management practices to tackle environmental risks and capitalise on environmental opportunities, the higher the score, the better the environmental management practices. The second dependent variable is the Eikon emissions score, which measures how effectively the management reduces environmental emissions in their operational and production processes. The higher the score shows, the better management practice to reduce emissions. The two main independent variables in our models are board gender diversity, measured as the percentage of females on the board, and executive gender diversity, which measures the percentage of female executives to total executives.

We control for other board characteristics, γ is a vector of corporate governance factors including board size (number of directors composing the board of directors); board independence (the percentage of independent directors); board skills (the percentage of the board with specific financial or industry backgrounds); board busyness (number of other corporate affiliations of the board members); and CEO-chair (reflecting firms that appoint their ex-CEOs as chair of the board). δ is a vector of firm-specific control factors (firm size, profitability, leverage, and liquidity) in our models; $\varepsilon_{i,t}$ is the error term.

To encounter any lag-effect of our main independent variables on the environmental performance, we re-estimate our models by using the first lag of each independent variable. All the variables have the same definitions as the previous two equations. Our models are represented by:

$$\text{ENV-SCORE}_{i,t} = \beta_0 + \beta_1 \text{Board Diversity}_{i,t-1} + \beta_2 \text{ Executive Diversity}_{i,t-1} + \gamma \text{BOS}_{i,t-1} + \delta \text{ firm -specific}_{i,t-1} + \varepsilon_{i,t-1} \quad (3)$$

$$\text{EMI-SCORE}_{i,t} = \beta_0 + \beta_1 \text{Board Diversity}_{i,t-1} + \beta_2 \text{ Executive Diversity}_{i,t-1} + \gamma \text{BOS}_{i,t-1} + \delta \text{ firm -specific}_{i,t-1} + \varepsilon_{i,t-1} \quad (4)$$

Furthermore, we examine whether our results are consistent within low and high quantiles by estimating quantile regression models at 25%, 50%, 75% and 90% quantiles. We run these models for the two dependent variables, ENV-SCORE and EMI-SCORE.

Environmental management, CSR, CG and the finance literature, generally examining the cause-effect of strategic decisions, have to deal with endogeneity issues. It is argued that it is not a simple task to find exogenous factors for the examined relationships (Wintoki et al., 2012: 581). Therefore, using lagged CG endogenous factors as instruments is a common practice in previous studies (e.g., Li et al., 2021). We tested the validity of our instruments using the Sargan test (reported in our tables), which shows that such instruments are valid. Finally, we run further models to control for endogeneity issues and investigate if board diversity will affect ISO14001 decisions and if the firm has special products to mitigate climate change. To do so, we estimate our models using random-effects logistics regression models. To run these models, we employ the following random effects logistic regression models:

$$\text{ISO 14001}_{i,t} = \beta_0 + \beta_1 \text{Board Diversity}_{i,t} + \beta_2 \text{ Executive Diversity}_{i,t} + \gamma \text{BOS}_{i,t\text{-}1} + \delta \text{ firm-specific}_{i,t\text{-}1} + \varepsilon_{i,t} \quad (5)$$

$$\text{PCC}_{i,t} = \beta_0 + \beta_1 \text{Board Diversity}_{i,t} + \beta_2 \text{ Executive Diversity}_{i,t} + \gamma \text{BOS}_{i,t\text{-}1} + \delta \text{ firm-specific}_{i,t\text{-}1} + \varepsilon_{i,t} \quad (6)$$

Where ISO 14001 is a dichotomous variable that takes 1 if a firm has an ISO 14001 certificate or/and EMS certification. PCC is a dichotomous variable that takes 1 if the company is aware of climate change risks and develops products to overcome such risks. All these models control for cross-sectional and time effects.

Variable definitions

We report the full definition of our variables in Table 3. We have three categories for our variables: dependent variables related to the overall environmental pillar score and the emission score; independent variables including board gender diversity and executive gender diversity. Finally, we control for board characteristics and firm-specific factors.

Insert Table 3 about here

6. Empirical results

We provide our baseline regression results in Table 4, reporting the fixed effects regression models. There are eight models; Models 1 - 4 include the environmental score as the dependent variable, and Models 5 - 8 employ emissions score as the dependent variable. Models 1,2, 5 and 6 include board gender diversity as the main independent variable, and the other models include executive gender diversity as the main independent variable.

Insert Table 4 about here

The results in Table 4 show a significant positive relationship between board diversity and both environmental and emissions scores. This result aligns with our main hypothesis H1a and indicates that the female presence on the board enhances environmental practices to minimise environmental risks. This result also shows that female directors engage more in environmental activities and are more concerned about the environment than their male counterparts. It is in line with other empirical studies (Bernardi & Arnold 1997; Beji et al., 2021) and consistent with the view of Nielsen & Huse (2010), who argue that women directors are more concerned with the environment than men and might influence management decisions regarding the environment. Our result is also in line with Braun (2010), who argues that female directors are more involved in green-related issues, and their presence on the board would help enhance board efficiency in issues related to the environment.

Regarding executive gender diversity, our results show a positive association with both environmental and emission scores, confirming the previous findings and supporting (H1b). Accordingly, our results prove that female directors and executives are more engaged in environmental practices and improve the board's efficiency in managing environmental risks within the high-tech publicly listed firms. These results are in line with different studies (e.g., Nuber & Velte, 2021; Lu & Herremans, 2019; Post et al., 2011; Walls et al., 2012; Kassinis et al., 2016; Hafsi and Turgut, 2013; Hoang et al., 2018) and can be explained by the integration of our multi-theoretical- approach as we argue that board and executive gender diversity supervise and monitor managers' discretion to safeguard shareholder interests, as underpinned by agency theory, and brings necessary resources to the firm, as underpinned by resource dependency theory, to enhance corporate social and environmental responsibility (Hafsi and Turgut, 2013; Hoang et al., 2018). Thus, from the resource dependency perspective, firms

appoint more female directors with the necessary human capital attributes that will reduce uncertainty and bring necessary resources to firms, and hence improve firms' environmental performance. In addition, our results align with stakeholder theory, in which we argue that female directors can persuade firms to adopt different environmental practices to meet stakeholders' expectations (Elmagrhi et al., 2019). Finally, our results are consistent with the UET viewpoint that gender diversity is strongly related to motives, drivers, and outcomes of environmental performance and, more generally, CSR activities. Accordingly, women directors contribute to board effectiveness as they are expected to be more socially oriented (Beji et al., 2021; Huse et al., 2009).

Regarding our board control variables, we find that board size is positively associated with both environment and emissions scores, and hence large boards are more engaged in related environmental issues. This result is consistent with previous studies such as De Villiers et al. (2011), who report a positive effect of board size on environmental performance and suggest that large boards would have more experience members with environmental knowledge to enhance board efficiency in related environmental issues. Our finding is also consistent with the overall argument provided by Beji et al. (2021) that large boards enhance firms to be more socially responsible. Therefore, we provide further evidence for the importance of large boards in engaging with environmental activities from the high-tech publicly listed firms' context. Moreover, we detect a positive influence of independent directors on environmental activities, which is in line with the view that independent directors provide firms with the right experience and knowledge, enhancing the board's efficiency. De Villiers et al. (2011) and Beji et al. (2021) support the importance of board independence on environmental performance. Hence, we provide evidence to support the independent directors' role in environmental performance within the high-tech sector.

Furthermore, our results show that there is some evidence for a positive effect of board skills and environmental performance, and this is consistent with different studies such as Shahgholian (2017), who indicates that highly educated directors are more engaged in environmental activities as such directors will provide the necessary skills to enhance the board efficiency in environmental aspects and a similar argument was put forward by Beji et al. (2021). We also provide evidence that firms appointing their ex-CEOs as chairs of the board are more engaged in environmental activities as such CEOs have the right experience to improve the board efficiency as well as there is a negative influence of board busyness on

environmental activities, that might indicate such directors are busy and less focused on strategic firms' decisions. Finally, the results reported in Table 4 show that larger and liquid firms are positively associated with environmental decisions.

Accordingly, we can conclude that board diversity has a significant positive influence on environmental decisions. This result is consistent when we use the two indexes to reflect environmental performance (overall environmental pillar score and Emissions score) and employ board gender diversity and executive gender diversity. Hence, we provide support for our main hypothesis (*H1a/H1b*), and the results align with theoretical insights drawn from the agency, stakeholder, resource dependence, and upper echelons theories.

To control for any possible lag effect in our models, we re-estimated the models in Table 4 using a one-year lag for all the independent variables. We report these results in Table 5. Like Table 4, Table 5 has eight models representing the two dependent and the main independent variables. Our variables of interest are Board-div$_{t-1}$ and Executive-div$_{t-1.}$ The results show a positive association between board gender diversity and environmental performance (Models 1, 2, 5 and 6), confirming the previous results reported in Table 4. In addition, there is evidence of a positive influence of executive gender diversity and environmental performance (Models 3, 7 and 8). Therefore, our results using a one-year lag for board (executives) diversity support our main hypothesis and align with the previous studies (Beji et al., 2021; Nielsen & Huse, 2010).

Insert Table 5 about here

As regards board structure, we report that board size, board independence and ex-CEO chair are positively related to environmental performance. Hence, we support the importance of these board structure factors on environmental performance. Thus, we confirm that large boards appointing independent directors and employing their ex-CEOs as chairs are more engaged in environmental activities. These results are consistent with the previous studies (such as Shahgholian, 2017; Beji et al., 2021). We find that large firms with more liquid assets can enhance environmental performance.

Finally, to control for any endogeneity issue, we employ instrumental variables regression using 2SLS and re-estimate our main models. The results are reported in Table 6, where we

have eight models to represent the environmental performance-dependent variables and board gender diversity and executive gender diversity (main independent variables).

Insert Table 6 about here

Table 6 confirms the positive association between board gender diversity and environmental performance. This result is consistent with Tables 4 and 5 and in line with *H1a*. Similarly, executives' board gender diversity positively impacts environmental performance (the results are found in Models 7 and 8), which is consistent with H1b. These results are also in line with our theoretical predictions. Accordingly, these results confirm the importance of female directors and executives in enhancing board efficiency in improving environmental performance and managing environmental risks. In addition, we confirm a positive impact of board size on environmental performance while board skills and busyness are negatively associated with environmental performance. Finally, consistent with the previous findings, large firms with high liquid assets are more engaged in environmental issues.

We employed lagged endogenous board structure factors and the lagged board duration for our instruments. The Sargan test is insignificant in all these models, indicating that these instruments are valid. Accordingly, our results are robust after controlling for endogeneity and using different environmental measurements and both executives and board gender diversity, confirming the positive impact of female directors and executives on environmental performance.

Our results are robust and show the importance of female directors and female executives in environmental decisions within the US high-tech sectors. One explanation for these results is that female directors and executives are more sensitive to the environment. They will take more key actions to support environmental initiatives than male directors and executives. Therefore, this study provides evidence of the important role of the board and executive diversity in strategic decisions, such as those related to the environment.

Further Analyses

As an additional analysis, we investigate the consistency of our results at different quantiles. This analysis aims to examine if there are any changes in our results at low and high quantiles of the environmental performance measurements. We employ 25%,50%, 75%, and 90% quantiles and report our models in Tables 7a (board gender diversity) and 7b (executive gender diversity).

Insert Table 7a about here

Insert Table7b about here

The results show a positive association between board gender diversity and environmental performance (as reported in Table 7a) and between executives' board diversity and environmental performance (as reported in Table 7b). Hence, our results are consistent in the low and the high quantiles and support that female directors and executives strongly influence the board efficiency and enhance environmental performance (Beji et al., 2021; Nielsen and Huse, 2010), leading to support for *H1a* and *H1b* and our theoretical stand. In addition, there is evidence that large boards and boards employing their ex-CEOs as Chairs of the board are positively associated with environmental performance, while there is some evidence that directors' busyness and board skills are negatively linked to environmental performance.

Finally, we employ two different environmental performance measures. The first is a dichotomous variable representing whether a firm has an ISO 140001 or EMS certification. The second is a dichotomous variable that reflects whether a firm has special products to tackle climate change issues. We estimate random effects logistic regressions and report the results in Table 8. Our main variables of interest are board gender diversity and executive gender diversity.

Insert Table 8 about here

The results show a positive association between board diversity and ISO 14001. Similar results are reported for executive gender diversity, indicating that female directors and executives enhance board effectiveness in engaging with environmental activities such as obtaining ISO140001 or tackling climate changes by producing special products. This result aligns with the previous findings, is consistent with H1a and H1b, and supports our theoretical

stands. Regarding board structure control variables, we report that large boards employing independent directors are more engaged in environmental activities, while board busyness is negatively associated with environmental activities. Thus, our results are consistent with our previously reported findings. We employed additional models, including lagged models, OLS models with clustered errors, and the results align with the findings reported in the paper. For parsimony, we did not include these models.

Finally, we re-estimated our main models in Tables 4 and 6 by including additional control variables. We aim to check the robustness of our results against any possible omitting variables bias. Our control variables include R&D intensity measured as R&D to sales ratio, free cash flow measured as the total free cash flows after positive investments scaled to sales, CSR report measured as 1 if a firm has a standalone CSR report and zero otherwise, and final growth in sales. We report the results in Table 9. Our main variables of interest are related to board diversity and executive diversity. We find that board gender diversity is positive and significant in Models 1,3, and 7, while executive gender diversity is positive and significant in Models 4 and 8. Therefore, we provide evidence that the positive effect of women serving on the board or executive directors positively influences firms' decisions regarding environmental management. This is in line with *H1a* and *H1b* and supports our theoretical predictions.

Insert Table 9 about here

Thus, our further analyses support the notion that female directors and executives enhance the efficiency of the board and the firm's involvement in environmental performance. Their role is essential as female directors and executives are more engaged and concerned about environmental issues.

7. Conclusion

This paper sheds light on an important topic of board gender diversity and environmental performance using US high-tech publicly listed firms. We employ different environmental performance measures. First, we use Eikon Environmental Pillar Score, which shows how effectively firms manage their environmental risks to improve performance. Second, we employ Eikon Emissions Score, which reflects how efficiently the firm minimises its emissions.

Thirdly, as further analyses, we include a dichotomous variable reflecting firms obtaining ISO 140001 and/or any other EMS certifications. Finally, we employ a dichotomous variable to reflect the ability of a firm to produce products to tackle climate change.

Our study contributes to the overall CSR literature by adopting a more focused approach using environmental performance (as such activities are long-term strategic decisions compared to other social activities). In addition, we contribute to the environmental studies by examining the high-tech sector as such firms have a low female representation on the board, hence the importance of such sector within the environmental context. We also contribute to the literature by using a multi-theoretical approach integrating gender socialisation theory with Upper echelons theory to develop our main hypothesis. Finally, we employ different econometric techniques to shed further light on the relationship between board diversity and environmental performance.

Our results show that gender diversity positively impacts environmental performance, implying that female directors and executives improve the board's efficiency in enhancing environmental performance. This result is important as it is driven by the under-researched US high-tech sector. Accordingly, this study sheds further light on the importance of adopting a multi-theoretical approach to explain the relationship between gender diversity and environmental performance. We also report the importance of board size, board independence, board skills, board busyness and ex-CEOs appointed as chairs in environmental performance. These results are robust and consistent after controlling for endogeneity and using different measurements to reflect environmental performance.

There are distinct implications for this study. First, appointing female directors or female executives on the board is a healthy phenomenon as such directors and executives will enhance board efficiency in managing strategic decisions, such as environmental decisions. Thus, the study suggests that firms and policymakers encourage gender diversity among boards and executives in the high-tech sector. Second, managers and policymakers need to encourage appointing independent directors and skilful directors within large boards as these directors will provide the required skills and knowledge to deal with complex decisions such as those related to environmental activities. Thirdly, firms and policymakers are encouraged to highlight the importance of the skills and the knowledge the ex-CEOs can provide to firm management, as these CEOs can add the necessary skills and know-how to firms' management. Finally, our results should motivate academics to research the impact of board structure and corporate

governance on environmental and social performance, especially in important sectors such as the IT sector.

This study has it is own limitations. For example, larger samples are encouraged, and further cross-country analysis would help provide further insights into the relationship between board diversity and environmental performance. Secondly, the data availability concerning corporate governance and environmental performance measures might be another limitation of this study, so further data related to corporate governance, board structure and environmental measures will be highly encouraged. Also, future research is encouraged to control for different firm-specific factors such as adverting expenses and technological phases within the corporation. Moreover, we encourage future research to provide additional underlying channel tests related to high-tech industries and examine how females on board can affect environmental and social performance within this sector. Finally, we encourage more studies about different CEO themes such as CEO seasonality, horizon and tenure and their link to environmental performance. All these issues are beyond the scope of this paper.

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Table 1 sample and descriptive statistics

1a Sample selection and composition

	Number of firms
US firms- IT	935
Less:	
non-listed firms in S&P 500 &S&P1000	742
Total final sample	**193**
IT speciality	
Communication equipments	18
Electric equipments	39
IT services	31
Semi-conductors	47
Software	45
Technology hardware	9
Other IT services and equipments	4
Total final sample	**193**

Table 1b descriptive statistics

Variable	Mean	Std. dev.	Min	Max
ENV-score	33.39494	29.27601	0	98.54581
EMM-Score	35.45643	35.34469	0	99.80315
Board-div	16.22798	10.23305	0	55.55556
Executive-div	12.32147	11.96354	0	66.66666
Board Size	9.213498	1.949152	2	16
Board-indep	81.28926	9.728566	0	100
Board Skills	98.57236	11.86666	0	100
Board-bszy	1	1.105232	0	19.33333
CEO-Chair	0.48475	0.49993	0	1
Size	22.17171	1.502737	18.63087	26.65104
profitability	7.047198	12.94778	-95.2017	65.3924

Leverage	15.54443	15.79127	0.01	78.11403
Liquidity	0.512837	0.185269	0.092795	0.934419

Variables are defined in Table 3.

Table 2 Correlation Matrix

	Board-div	Executive-div	Board Size	Board-indep	Board Skills	Board-bszy	CEO-Chair	Size	profitability	Leverage	Liquidity
Board-div	1										
Executive-div	0.2154	1									
Board Size	0.2729	0.179	1								
Board-indep	0.2136	0.0911	0.1469	1							
Board Skills	0.0116	0.0357	-0.0513	0.0374	1						
Board-bszy	0.1603	0.0498	0.2793	0.1073	-0.096	1					
CEO-Chair	0.0502	0.0506	0.1088	-0.2087	-0.0145	-0.0959	1				
Size	0.2695	0.193	0.5906	0.1002	-0.0691	0.3606	0.0718	1			
profitability	0.0986	0.0067	0.0062	0.0326	0.0632	0.0318	-0.0061	-0.0048	1		
Leverage	-0.1038	-0.0061	-0.0224	-0.0805	-0.0299	-0.0046	0.0722	-0.0661	-0.1024	1	
Liquidity	-0.0528	0.0374	-0.1069	-0.0538	0.011	0.034	-0.0116	-0.1528	-0.0326	0.0761	1

Variables are defined in Table 3.

Table 3 variables definitions

Variable	Definition	EIKON-code
	Dependent variables	
ENV-SCORE	EIKON environment pillar score to *reflect how well the company is in employing best management practices to avoid environmental risks and capitalise on environmental opportunities*	TR.ENVIONMENTPILLARSCOE
EMI-SCORE	EIKON emission score to reflect how good the firms are in employing best practices to minimise emissions scores	TR.ESGEMISSIONSSCORE
		Corporate governance- control variables
Board-div	The percentage of females appointed in the board	TR.ANALYTICBOARDFEMALE
Executive-div	The percentage of female executives	TR.ANALYTICEXECUTIVEMEMBERSGENDERDIVERSITY
Board size	Total number of board members	TR.BOARDSIZE
Board-indep	Percentage of non-executive director to the total number of board members	TR.ANALYTICNONEXECBOARD
Board skills	Percentage of board members of board members with financial or industry backgrounds	TR.ANALYTICBOARDSPECIFICSKILLS
Board-busy	Number of corporate affiliations the board members have	TR.ANALYTICBOARDAFFILIATIONS
CEO-Chair	A dichotomous variable indicating if a firm employs their ex-CEO as the chair of the board	TR.CHAIRMANEXCEO

Firm Specific control variables

Size	The natural logarithm of total assets	TR.TOTALASSETSREPORTED
Profitability	ROA	TR.INVTRNETINCOME/ TR.TOTALASSETSREPORTED
Leverage	Total debt to total assets ratio	TR.TOTALDEBTOUTSTANDING/TR.TOTALASSETSREPORTED
Liquidity	Current assets to current liabilities	TR.TOTALCURRENTASSETS/ TR.TOTALCURRLIABILITIES

Table 4- Regression Analysis

	ENV-SCORE				EMM-SCORE			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Board-div	0.709***	0.439***			0.902***	0.579***		
	(0.0483)	(0.0524)			(0.0577)	(0.0631)		
Executive-div			0.193***	0.0825*			0.267***	0.144**
			(0.0492)	(0.0475)			(0.0593)	(0.0574)
Board size	1.260***	0.485	1.943***	0.774**	1.578***	0.609	2.436***	0.964**
	(0.320)	(0.349)	(0.337)	(0.359)	(0.382)	(0.420)	(0.406)	(0.433)
Board-indep	0.165***	0.110*	0.354***	0.199***	0.172***	0.0750	0.399***	0.193***
	(0.0544)	(0.0581)	(0.0570)	(0.0586)	(0.0650)	(0.0699)	(0.0687)	(0.0708)
Board skills	0.0682*	0.0697**	0.0656*	0.0668*	0.0594	0.0620	0.0564	0.0576
	(0.0354)	(0.0333)	(0.0376)	(0.0341)	(0.0423)	(0.0401)	(0.0453)	(0.0412)
Board-busy	-0.0177***	-0.0434***	-0.0189***	-0.0417***	-0.00699	-0.0202*	-0.00353	-0.0174
	(0.00566)	(0.00902)	(0.00671)	(0.00928)	(0.00677)	(0.0108)	(0.00809)	(0.0112)
CEO-Chair	4.608***	3.175**	5.880***	3.232**	5.811***	4.405***	7.443***	4.496***
	(1.211)	(1.241)	(1.282)	(1.272)	(1.448)	(1.493)	(1.544)	(1.536)
Size		13.06***		15.43***		15.84***		18.87***
		(0.976)		(0.958)		(1.174)		(1.157)
Profitability		-0.0413		-0.0260		-0.0286		-0.00937
		(0.0354)		(0.0362)		(0.0426)		(0.0438)
Leverage		-0.0137		-0.0385		-0.0163		-0.0492
		(0.0319)		(0.0326)		(0.0384)		(0.0394)
Liquidity		10.76***		9.701**		17.20***		15.71***
		(4.101)		(4.204)		(4.934)		(5.077)
Constant	-11.02*	-286.1***	-23.62***	-341.5***	-16.49**	-351.7***	-32.06***	-422.6***
	(6.019)	(22.14)	(6.328)	(21.66)	(7.191)	(26.63)	(7.625)	(26.15)
Observations	1,725	1,542	1,723	1,541	1,725	1,542	1,723	1,541
R-squared	0.191	0.310	0.090	0.276	0.200	0.306	0.085	0.266
Number of id	193	175	193	175	193	175	193	175
firm year-dummies	Yes	yes	Yes	yes	yes	yes	Yes	Yes

Standard errors in parentheses; ***; p<0.01, ** p<0.05, * p<0.1; variables are defined in Table 3.

Table 5 1st lagged regression analysis

	ENV-score				EMM-Score			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Board-div$_{t-1}$	0.747***	0.526***			1.007***	0.722***		
	(0.0548)	(0.0581)			(0.0661)	(0.0700)		
Executive-div$_{t-1}$			0.118**	0.0302			0.223***	0.125**
			(0.0515)	(0.0503)			(0.0629)	(0.0610)
Board size $_{t-1}$	1.124***	0.332	1.688***	0.653*	1.365***	0.219	2.088***	0.622
	(0.322)	(0.356)	(0.340)	(0.367)	(0.388)	(0.429)	(0.416)	(0.445)
Board-indep $_{t-1}$	0.111**	0.0455	0.286***	0.155***	0.160**	0.0790	0.383***	0.226***
	(0.0544)	(0.0589)	(0.0571)	(0.0596)	(0.0656)	(0.0709)	(0.0698)	(0.0724)
Board skills $_{t-1}$	0.0113	0.00940	0.00578	0.00396	0.00105	-0.00321	-0.00729	-0.0122
	(0.0339)	(0.0320)	(0.0361)	(0.0331)	(0.0409)	(0.0385)	(0.0441)	(0.0402)
Board-busy $_{t-1}$	-0.00796	-0.0124	-0.00780	-0.0122	-0.00320	0.00265	-0.000495	0.00318
	(0.00546)	(0.00879)	(0.00649)	(0.00909)	(0.00658)	(0.0106)	(0.00792)	(0.0110)
CEO-Chair $_{t-1}$	4.998***	3.566***	6.593***	3.934***	6.167***	4.107***	8.272***	4.599***
	(1.251)	(1.289)	(1.326)	(1.332)	(1.508)	(1.552)	(1.619)	(1.617)
size $_{t-1}$		12.49***		14.79***		16.26***		19.18***
		(1.014)		(1.022)		(1.221)		(1.240)
profitability $_{t-1}$		-0.0218		-0.00890		-0.0366		-0.0212
		(0.0361)		(0.0373)		(0.0435)		(0.0453)
Leverage $_{t-1}$		0.0119		-0.0164		0.00836		-0.0315
		(0.0326)		(0.0336)		(0.0393)		(0.0407)
Liquidity $_{t-1}$		7.098*		6.265		14.72***		13.21**
		(4.152)		(4.297)		(4.999)		(5.215)
Constant	1.637	-261.1***	-7.928	-315.2***	-6.377	-351.5***	-18.78**	-420.5***
	(5.884)	(23.06)	(6.230)	(23.18)	(7.095)	(27.76)	(7.608)	(28.13)
Observations	1,531	1,368	1,529	1,367	1,531	1,368	1,529	1,367
R-squared	0.179	0.290	0.070	0.241	0.208	0.317	0.079	0.258
Number of id	191	175	190	174	191	175	190	174
firm year-dummies	yes	yes	Yes	yes	Yes	Yes	yes	yes

Standard errors in parentheses; ***; p<0.01, ** p<0.05, * p<0.1; variables are defined in Table 3.

Table 6 Instrumental Variables models

	IVREG							
	ENV-SCORE				EMM-SCORE			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Board-div	0.653***	0.769***			0.978***	1.190***		
	(0.192)	(0.188)			(0.199)	(0.212)		
Executive-div			0.128	0.208			0.375**	0.503***
			(0.138)	(0.137)			(0.155)	(0.162)
Board size	3.316***	6.220***	3.626***	6.778***	4.668***	8.399***	4.918***	8.872***
	(1.075)	(0.978)	(1.142)	(0.951)	(1.366)	(1.210)	(1.498)	(1.189)
Board-indep	-0.272	-0.308	-0.172	-0.172	-0.208	-0.162	-0.0780	0.0347
	(0.207)	(0.189)	(0.222)	(0.208)	(0.231)	(0.237)	(0.261)	(0.282)
Board skills	-0.345***	-0.390***	-0.381***	-0.437***	-0.419***	-0.452***	-0.482***	-0.533***
	(0.0438)	(0.0309)	(0.0489)	(0.0318)	(0.0625)	(0.0580)	(0.0617)	(0.0545)
Board-busy	-0.00273	0.0547***	0.00605	0.0691***	-0.000772	0.0582***	0.0136	0.0815***
	(0.0198)	(0.0162)	(0.0231)	(0.0175)	(0.0214)	(0.0130)	(0.0244)	(0.0148)
CEO-Chair	3.970	3.840	3.946	3.948	5.850	7.049	5.428	6.989
	(3.467)	(3.516)	(3.572)	(3.646)	(4.154)	(4.368)	(4.343)	(4.634)
Size	7.352***		7.874***		9.602***		10.13***	
	(1.273)		(1.334)		(1.518)		(1.624)	
Profitability	-0.0184		0.0239		0.0501		0.120	
	(0.120)		(0.118)		(0.127)		(0.132)	
Leverage	-0.0521		-0.0712		-0.0497		-0.0798	
	(0.0864)		(0.0872)		(0.0962)		(0.0955)	
Liquidity	11.18		11.65		26.45***		25.93***	
	(8.577)		(8.772)		(9.840)		(9.848)	
Constant	-120.1***	20.23	-129.6***	19.15	-194.1***	-13.92	-199.9***	-12.44
	(28.92)	(17.11)	(31.05)	(18.52)	(32.44)	(22.16)	(35.15)	(24.87)
Observations	898	998	897	997	898	998	897	997
R-squared	0.379	0.254	0.370	0.235	0.462	0.310	0.454	0.290
firm year-dummies	Yes	yes	yes	Yes	yes	yes	yes	yes
Sargan Test	2.524	6.20	3.2083	6.1	3.491	5.50	5.20	5.51

Standard errors in parentheses; ***; p<0.01, ** p<0.05, * p<0.1; variables are defined in Table 3.

Table 7a Quantile regression-board diversity

	ENV-SCORE				EMM-SCORE			
VARIABLES	(25)	(50)	(75)	(90)	(25)	(50)	(75)	(90)
Board-div	0.399***	0.516***	0.589***	0.296***	0.320***	0.703***	0.681***	0.511***
	(0.0875)	(0.0807)	(0.107)	(0.0987)	(0.124)	(0.0913)	(0.128)	(0.135)
Board size	1.321**	2.196***	2.409***	2.323***	2.119***	3.226***	1.907**	2.980***
	(0.547)	(0.505)	(0.668)	(0.617)	(0.774)	(0.570)	(0.798)	(0.841)
Board-indep	0.0231	-0.0772	-0.177	-0.0680	-0.0607	-0.0166	0.0360	0.148
	(0.0927)	(0.0856)	(0.113)	(0.105)	(0.131)	(0.0968)	(0.135)	(0.143)
Board skills	-0.0969	-0.192***	-0.199**	-0.0871	-0.161	-0.326***	-0.288***	-0.154
	(0.0723)	(0.0668)	(0.0884)	(0.0816)	(0.102)	(0.0755)	(0.106)	(0.111)
Board-busy	-0.0312**	-0.0200*	-0.0181	-0.00683	-0.0284	-0.0216	-0.00894	-0.00786
	(0.0127)	(0.0117)	(0.0155)	(0.0143)	(0.0179)	(0.0132)	(0.0185)	(0.0195)
CEO-Chair	0.282	2.208	0.185	2.223	0.816	5.293***	4.486*	2.870
	(1.781)	(1.644)	(2.177)	(2.009)	(2.520)	(1.858)	(2.599)	(2.738)
Size	8.449***	9.902***	10.17***	8.467***	9.606***	12.68***	13.85***	10.12***
	(0.739)	(0.682)	(0.903)	(0.834)	(1.046)	(0.771)	(1.079)	(1.136)
Profitability	-0.131**	-0.173***	-0.0530	0.0791	-0.0396	-0.00797	0.143	0.216**
	(0.0665)	(0.0614)	(0.0813)	(0.0750)	(0.0941)	(0.0694)	(0.0971)	(0.102)
Leverage	0.0144	-0.0180	-0.000129	0.0133	-0.000175	-0.0376	0.0758	0.119
	(0.0548)	(0.0506)	(0.0670)	(0.0618)	(0.0775)	(0.0572)	(0.0800)	(0.0842)
Liquidity	4.831	8.276*	12.93**	10.92**	18.01***	23.94***	18.42***	24.28***
	(4.675)	(4.315)	(5.715)	(5.275)	(6.616)	(4.877)	(6.824)	(7.188)
Constant	-181.8***	-192.5***	-177.8***	-140.7***	-209.9***	-266.7***	-269.4***	-200.9***
	(17.92)	(16.54)	(21.91)	(20.22)	(25.36)	(18.69)	(26.16)	(27.55)
Observations	1,542	1,542	1,542	1,542	1,542	1,542	1,542	1,542
firm year-dummies	Yes	yes	yes	Yes	Yes	yes	yes	yes

Standard errors in parentheses; ***; p<0.01, ** p<0.05, * p<0.1; variables are defined in Table 3.

Table 7b Quantile regression- executives diversity

	ENV-SCORE				EMM-SCORE			
VARIABLES	(25)	(50)	(75)	(90)	(25)	(50)	(75)	(90)
executive-div	0.262***	0.134*	0.0865	0.114	0.286***	0.379***	0.414***	0.257**
	(0.0759)	(0.0716)	(0.0981)	(0.0818)	(0.106)	(0.0808)	(0.108)	(0.113)
Board size	1.493***	2.633***	2.369***	1.916***	2.007**	3.557***	2.368***	2.081**
	(0.572)	(0.539)	(0.738)	(0.615)	(0.799)	(0.609)	(0.812)	(0.850)
Board-indep	0.172*	-0.00537	-0.0350	-0.0757	0.102	0.159	0.0160	0.158
	(0.0949)	(0.0894)	(0.122)	(0.102)	(0.133)	(0.101)	(0.135)	(0.141)

Board skills	-0.0796	-0.222***	-0.158	-0.0713	-0.168	-0.376***	-0.205*	-0.117
	(0.0751)	(0.0708)	(0.0969)	(0.0808)	(0.105)	(0.0799)	(0.107)	(0.112)
Board-busy	-0.0269**	-0.0188	0.00592	0.00132	-0.0225	-0.00573	0.00843	0.0277
	(0.0132)	(0.0124)	(0.0170)	(0.0142)	(0.0184)	(0.0140)	(0.0187)	(0.0196)
CEO-Chair	0.936	1.100	2.747	1.862	1.698	4.906**	7.051***	2.452
	(1.843)	(1.738)	(2.380)	(1.984)	(2.575)	(1.962)	(2.617)	(2.739)
Size	9.339***	10.29***	10.47***	8.313***	9.789***	12.79***	13.95***	11.25***
	(0.767)	(0.723)	(0.990)	(0.825)	(1.072)	(0.816)	(1.089)	(1.140)
Profitability	-0.0493	-0.171***	-0.0312	0.134*	-0.0492	0.0347	0.168*	0.286***
	(0.0687)	(0.0648)	(0.0887)	(0.0740)	(0.0960)	(0.0731)	(0.0976)	(0.102)
Leverage	-0.000761	-0.0190	0.0110	0.0337	-0.0386	-0.0670	0.0545	0.0870
	(0.0567)	(0.0534)	(0.0732)	(0.0610)	(0.0792)	(0.0603)	(0.0805)	(0.0843)
Liquidity	4.088	6.490	16.43***	0.355	16.54**	22.29***	22.66***	15.74**
	(4.871)	(4.593)	(6.291)	(5.244)	(6.808)	(5.185)	(6.918)	(7.241)
Constant	-214.3***	-200.6***	-195.9***	-126.8***	-223.6***	-275.8***	-279.9***	-216.4***
	(18.57)	(17.51)	(23.98)	(19.99)	(25.95)	(19.77)	(26.37)	(27.60)
Observations	1,541	1,541	1,541	1,541	1,541	1,541	1,541	1,541
firm year-dummies	yes	yes	Yes	yes	Yes	yes	yes	yes

Standard errors in parentheses; ***; p<0.01, ** p<0.05, * p<0.1; variables are defined in Table 3.

Table 8- Random effect logit models

	IS14001				If firm has products to tackle climate changes			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Board-div	0.120***	0.0444			0.0995***	0.0720***		
	(0.0204)	(0.0281)			(0.0124)	(0.0154)		
Executive-div			0.0703***	0.0458*			0.0446***	0.0328**
			(0.0182)	(0.0235)			(0.0103)	(0.0129)
Board size	0.204*	0.221	0.291***	0.201	0.289***	0.0341	0.340***	0.0516
	(0.121)	(0.161)	(0.111)	(0.164)	(0.0702)	(0.0922)	(0.0673)	(0.0920)
Board-indep	0.0665***	-0.00464	0.0745***	0.00324	0.00546	-0.00132	0.0220*	0.00690
	(0.0199)	(0.0280)	(0.0190)	(0.0269)	(0.0124)	(0.0158)	(0.0121)	(0.0156)
Board skills	-0.0123	-0.0119	-0.0167	-0.0118	-0.00675	-0.00513	-0.00773	-0.00698
	(0.0110)	(0.0122)	(0.0105)	(0.0122)	(0.00700)	(0.00677)	(0.00693)	(0.00684)
Board-busy	-0.0216***	-0.0243***	-0.0221***	-0.0258***	0.000602	-0.00289	0.00136	-0.00289
	(0.00205)	(0.00536)	(0.00387)	(0.00550)	(0.00121)	(0.00202)	(0.00131)	(0.00204)
CEO-Chair	-0.0411	-0.613	-0.0133	-0.495	0.302	0.0898	0.437*	0.165
	(0.399)	(0.581)	(0.384)	(0.559)	(0.253)	(0.333)	(0.243)	(0.332)
Size		4.211***		4.085***		2.814***		3.053***
		(0.387)		(0.454)		(0.312)		(0.320)
Profitability		0.00654		0.0106		0.0327***		0.0379***
		(0.0177)		(0.0180)		(0.0111)		(0.0113)
Leverage		-0.0210		-0.0273*		0.0337***		0.0286***
		(0.0143)		(0.0146)		(0.00809)		(0.00791)
Liquidity		4.378**		3.935**		1.503		1.449
		(1.955)		(1.924)		(1.090)		(1.095)
Constant	-14.66***	-96.55***	-13.87***	-94.66***	-6.882***	-67.27***	-7.393***	-72.38***
	(2.484)	(8.600)	(2.158)	(9.952)	(1.375)	(7.086)	(1.342)	(7.252)
Observations	1,726	1,543	1,724	1,542	1,726	1,543	1,724	1,542
Number of id	193	175	193	175	193	175	193	175
firm year-dummies	Yes	yes	Yes	Yes	Yes	yes	yes	yes

Standard errors in parentheses; ***; p<0.01, ** p<0.05, * p<0.1; variables are defined in Table 3. The new dependent variables are ISO 140001 defined as dichotomous variable that takes 1 if the firm has ISO 140001 and 0 otherwise; and dichotomous variables that takes 1 If firm has products to tackle climate changes and zero otherwise

Table 9- robust models including new control variables

				OLS			IV	
VARIABLES	ENV M1	ENV M2	EM M3	EM M4	ENV M5	ENV M6	EM M7	EM M8
Board-div	0.226***		0.344***		0.253		0.475***	
	(0.0481)		(0.0585)		(0.160)		(0.156)	
Executive-div		0.0491		0.0884*		0.0448		0.257**
		(0.0415)		(0.0507)		(0.104)		(0.111)
Board size	0.0643	0.207	0.0267	0.241	2.412***	2.546***	3.383***	3.497***
	(0.307)	(0.308)	(0.373)	(0.376)	(0.752)	(0.765)	(0.917)	(0.968)
Board-indep	0.0627	0.103**	0.0274	0.0881	-0.207	-0.167	-0.134	-0.0814
	(0.0528)	(0.0524)	(0.0642)	(0.0641)	(0.155)	(0.157)	(0.159)	(0.163)
Board skills	-0.0292	-0.0321	0.0105	0.00562	-0.177***	-0.186***	-0.208***	-0.236***
	(0.0364)	(0.0367)	(0.0443)	(0.0449)	(0.0390)	(0.0415)	(0.0417)	(0.0434)
Board-busy	-0.0172**	-0.0159*	-0.00326	-0.00123	-0.00900	-0.00603	-0.00825	-0.00230
	(0.00862)	(0.00870)	(0.0105)	(0.0106)	(0.0153)	(0.0162)	(0.0157)	(0.0163)
CEO-Chair	4.136***	4.259***	5.658***	5.850***	2.964	2.963	4.492	4.096
	(1.105)	(1.114)	(1.344)	(1.361)	(2.731)	(2.767)	(3.095)	(3.135)
Size	8.406***	9.233***	9.188***	10.41***	3.775***	3.835***	5.035***	4.973***
	(0.929)	(0.921)	(1.131)	(1.126)	(1.009)	(1.026)	(1.063)	(1.059)
Profitability	-0.0358	-0.0260	-0.0478	-0.0330	-0.0771	-0.0622	-0.0197	0.0154
	(0.0317)	(0.0319)	(0.0386)	(0.0390)	(0.0914)	(0.0887)	(0.0902)	(0.0909)
Leverage	0.0417	0.0315	0.0429	0.0272	-0.0249	-0.0309	-0.0140	-0.0282
	(0.0280)	(0.0281)	(0.0341)	(0.0344)	(0.0676)	(0.0674)	(0.0684)	(0.0658)
Liquidity	3.205	1.941	8.287*	6.321	-1.884	-2.249	9.378	8.001
	(3.616)	(3.640)	(4.401)	(4.449)	(6.918)	(6.914)	(7.032)	(6.889)
CSR-report	20.15***	21.07***	24.59***	25.98***	30.57***	31.49***	38.50***	39.89***
	(1.014)	(1.002)	(1.235)	(1.225)	(2.975)	(2.841)	(3.330)	(3.222)
R&D intensity	0.173**	0.192**	0.0158	0.0491	6.222**	6.638**	4.732	5.670*
	(0.0842)	(0.0861)	(0.103)	(0.105)	(2.930)	(2.946)	(3.202)	(3.361)
Free cash flow	-0.0449	0.190	1.108*	1.464**	-2.458***	-2.392***	-2.179***	-2.346***
	(0.533)	(0.535)	(0.649)	(0.654)	(0.675)	(0.709)	(0.820)	(0.857)
Growth rate	-0.142	-0.150	-0.169	-0.183	-0.124	-0.136	-0.319***	-0.360***
	(0.182)	(0.184)	(0.221)	(0.224)	(0.0941)	(0.0945)	(0.104)	(0.100)

Constant	-169.7***	-189.1***	-194.2***	-223.1***	-53.67**	-55.11**	-106.3***	-102.4***
	(21.10)	(20.87)	(25.69)	(25.51)	(22.84)	(23.69)	(22.82)	(23.02)
Observations	1,452	1,452	1,452	1,452	879	879	879	879
R-squared	0.460	0.451	0.461	0.448	0.595	0.595	0.677	0.679
Number of id2	172	172	172	172	172	172	172	172
firm year-dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses; ***; p<0.01, ** p<0.05, * p<0.1; variables are defined in Table 3. The new control variables are defined as follows CSR report: a dichotomous variable that takes 1 if the firm has a standalone CSR report; R&D intensity is R&D expenses scaled to sales; FCF is total free cash flows after positive investments scaled to sales; Growth rate is growth in sales.