Breaking the e-waste stigma: how corporate gender diversity drives sustainable change in the UK

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Abstract
Purpose – This study aims to investigate the relationship between female leaders at board and executive levels and e-waste reduction in firms listed on the FTSE All-Share Index.
Design/methodology/approach – The study uses a sample of nonfinancial firms listed in the FTSE All-Share Index between 2004 and 2021, comprising 2,523 firm observations. The primary technique used is ordinary least squares, with subsample analysis and the two-stage least squares method used to address endogeneity concerns.
Findings – This study suggests that the presence of female directors and executives can bring a more comprehensive and diverse approach to e-waste management, which can contribute to improved e-waste reduction initiatives. However, the study also highlights that the impact of female leadership on e-waste reduction may vary based on factors such as the size of the firm and the industry’s carbon footprint.
Practical implications – The practical implications of this research have noteworthy implications for companies and policymakers alike. By placing importance on gender diversity, companies can reap the benefits of diverse perspectives and approaches when addressing environmental challenges. Policymakers, on the other hand, can contribute to positive environmental outcomes by advocating for gender diversity in corporate leadership.
Originality/value – The novelty of this research stems from its discovery that having female directors and executives in a firm leads to a broader and more varied approach to managing e-waste, ultimately enhancing efforts to reduce it. This underscores the significance of gender diversity in advancing sustainable practices within organizations. The study highlights the distinct viewpoints and experiences that women offer when tackling environmental issues in the corporate sphere.
Keywords Corporate governance, Board gender diversity, Female executives, E-waste reduction initiatives, Sustainability

Introduction
Climate change is a significant global challenge caused by the release of greenhouse gases, primarily carbon dioxide, into the atmosphere. The generation of solid e-waste is a significant contributor to releasing pollutants such as carbon dioxide and volatile organic compounds into the air. Landfills are the largest human-related source of methane emissions in the globe, which is a potent greenhouse gas with a global warming potential 28 times greater than carbon dioxide over 100 years (European Commission, 2022). According to the
UN's Global E-waste Monitor (2020), global electronic waste reached 53.6 million metric tonnes in 2019, with a 21% increase in just five years. Efforts like the UN’s Sustainable Development Goal (SDG) 12 and EU policies aim to reduce waste and promote recycling and sustainable practices (European Commission, 2018).

However, the effectiveness of such reduction policies depends on the corporations, as they are the primary contributors to e-waste through their large-scale production and use of electronic products (Gull et al., 2023). There is evidence indicating that corporations may experience improved overall performance as a result of implementing environmentally friendly practices (Bartolacci et al., 2020; Issa, 2023a; Issa and Hanaysha, 2023c). However, the adoption of expensive programs, such as e-waste reduction, may depend on the decisions of upper management and corporate governance structures, specifically the role and decision-making power of the board of directors (Bui et al., 2020; Carvajal et al., 2022; Issa et al., 2022b; Konadu et al., 2022; Nuber and Velte, 2021). According to several studies (Issa and Bensalem, 2022; Liao et al., 2015; Liu, 2018; Rao and Tilt, 2016), there is evidence to suggest that female managers and directors may be more inclined to support environmentally friendly activities within companies and have greater sensitivity toward environmental issues. As a result, it is believed that having female directors on a company’s board is likely to lead to greater implementation of e-waste management practices.

A significant body of research has studied the association between the board and executive gender diversity and environmental sustainability (Beji et al., 2021; Bravo and Reguera-Alvarado, 2018; Élmaghrbi et al., 2019; Husted and Sousa-Filho, 2019; Issa and Zaid, 2021; Marchini et al., 2022; Issa and In’airat, 2023). While this research has provided some insight, further study is needed to fully understand the relationship of such conjunction. For instance, some studies show a positive association (Francoeur et al., 2019; Galletta et al., 2022; Liu, 2018; Post et al., 2015) and others find no significant relationship (Coffey and Wang, 1998; Giannarakis et al., 2014; Walls et al., 2012). Those who believe there is no significant relationship or a negative relationship argue that the appointment of female directors may be tokenistic and not lead to improved environmental performance (Torchia et al., 2011). On the other hand, those who believe there is a positive relationship argue that female board members, particularly when forming a critical mass of independent directors, are more likely to demonstrate heightened environmental concern and responsibility, fostering a collective voice for impactful action (Issa and Hanaysha, 2023a; Lefley and Janecek, 2023a, 2023b). Multiple studies have suggested that gender diversity on boards and in executive positions can bring several benefits, including improvement in environmental practices (Birindelli et al., 2019; Tran, 2022), greater engagement with stakeholders (Galletta et al., 2022; Manner, 2010), reduced environmental fines (Liu, 2018), increased research and development (R&D) investments (Tsui et al., 2022) and support the UN’s SDGs (Kiefner et al., 2022). Furthermore, recent research has shown that female leaders play an important role in addressing climate change through their support for renewables initiatives (Atif et al., 2021) and biodiversity conservation (Haque and Jones, 2020; Issa and Zaid, 2023). Given the evidence that female leaders tend to support environmentally-friendly actions and initiatives, it is reasonable to expect that they would also advocate for measures to reduce e-waste within their corporations.

This study proposes that firms with more women on their boards and female CEOs are likely to have stronger e-waste reduction initiatives. Drawing on diversity theory and gender socialization theory, the presence of female leaders can bring diverse perspectives and creative solutions to e-waste management challenges (Liu, 2018). This diversity of thought enhances decision-making and implementation of eco-friendly measures. Female leaders, according to gender socialization theory, are more inclined to prioritize stakeholder
well-being and take preventive actions against environmental hazards (Carvajal et al., 2022). Furthermore, research indicates that female decision-makers exhibit lower overconfidence, seek expert advice more often and contribute to reducing a company’s environmental impact (Chen et al., 2019; Issa, 2023b; Liu, 2018).

This study examines a sample of firms from the FTSE all-shares index, using data from the Eikon Refinitiv database spanning 2004–2021. The findings confirm a positive association between e-waste reduction performance and the representation of women in director and executive positions. The study suggests that the relationship between gender diversity and e-waste reduction is influenced by factors like firm size and industry carbon-intensity, which shape environmental decision-making within the company. These results hold across various regression models, e-waste reduction indicators, considerations of other governance and firm-level factors and subsample analysis.

This study contributes to the existing literature on gender diversity and corporate governance in several ways. First, prior research focused on the impact of women on boards and the main pillars of ESG (De Masi et al., 2021; Velte, 2016; Wasiuzzaman and Wan Mohammad, 2020), whereas fewer studies have examined the impact of gender diversity on subdimensions of each pillar. Neglecting subdimensions can result in ESG decoupling (García-Sánchez et al., 2022), leading to limited understanding of a firm’s ESG performance and missed opportunities for improvement. Limited studies investigate the connection between female directors and subcategories, such as biodiversity (Haque and Jones, 2020; Issa and Zaid, 2023), renewable energy use (Atif et al., 2021) and waste management (Gull et al., 2023). In addition, this study distinguishes itself by specifically focusing on e-waste, unlike Gull et al. (2023), which examined the broader category of total waste generated by a firm. This study provides novel evidence to the existing research on the relationship between gender diversity and e-waste reduction, which contributes to a more comprehensive understanding of the impact of diversity on different subdimensions of ESG.

Second, this study has important implications for global policies that aim to promote gender diversity in corporate leadership and decision-making. The findings of this study suggest that increasing the number of women in leadership positions could have a positive impact on corporate environmental initiatives. These insights can inform the development of policies and initiatives that aim to improve gender diversity in leadership and promote environmentally responsible practices.

Finally, this study delves into the factors that may influence the relationship between gender diversity in boards and executive positions and a company’s e-waste reduction performance. The results suggest that this relationship is more pronounced in larger companies with lower carbon emissions, a lack of environmental controversies, high overall environmental performance and transparent sustainability reporting. These findings provide insight into potential drivers that can be considered when developing strategies to promote gender diversity and reduce e-waste within companies.

The paper is structured as follows: Section 2 reviews relevant literature and develops the hypotheses. Section 3 provides details on the research methodology used. The results of the study are presented in Section 4. Section 5 discusses the study’s findings. Finally, the final section summarizes conclusions, highlights the implications of the research and identifies potential limitations of the study.

**Literature review and hypotheses development**

A body of research has found that having board and executive gender diversity in a firm leads to better decision-making (Adams et al., 2011; Adams and Ferreira, 2004; Gull et al., 2021; Issa et al., 2021; Miller and del Carmen Triana, 2009). Diversity theory supports this...
idea, as it suggests that having a diverse group can lead to a wider variety of ideas and information being generated, as individuals with different backgrounds, experiences and perspectives bring unique knowledge to the table (Siciliano, 1996). The representation of female directors on a board could improve the quality of decisions and choices by bringing in unique cognitive abilities and skills that are associated with their gender (Francoeur et al., 2019). This can result from the unique expertise and skills that are linked to gender characteristics. This diversity of perspectives and ideas can enhance the board’s decision-making process and help to ensure that potential risks and challenges are thoroughly evaluated and addressed. In addition, the unique skills and experiences that female leaders bring to the table can be beneficial in understanding and addressing environmental issues such as e-waste.

Furthermore, having female directors and executives in a firm can improve the effectiveness of firm’s governance practices. For instance, research has shown that female directors have a positive impact on the board’s monitoring function, such as by promoting frequent board meetings and boosting attendance at these meetings (Adams and Ferreira, 2009). Zalata et al. (2022) argue that having a mix of genders on a board may lead to a decrease in trust among board members. Peni and Vähämäa (2010) suggest that female executives are less likely to manipulate earnings and financial disclosure. Similarly, Kim et al. (2017) suggest that gender diversity in senior management prevents opportunistic financial reporting even in a heavily male-dominated corporate setting. This can occur when there is a diverse group of people with varying backgrounds, experiences and perspectives, which can lead to more skepticism and examination of each other’s actions and decisions (Issa et al., 2021). This increased level of attention and scrutiny can lead to better decision-making when it comes to environmental matters. With improved monitoring, the board would be more likely to pay closer attention to potential environmental risks, make more informed decisions to prevent them and minimize e-waste. However, it is essential to highlight that the attainment of a critical mass in board gender diversity (BGD) is a pivotal factor for reaping its benefits. As highlighted by Lefley and Janeček (2023a), the effectiveness of gender diversity may hinge on the presence of a critical mass, particularly consisting of independent women directors. This critical mass plays a crucial role in cultivating a collective voice that fosters collaborative and impactful actions within the board. Lefley and Janeček (2023b) further argue against prescribing a specific equitable percentage for women on corporate boards. They stress that true progress is achieved when gender equality is no longer viewed as an issue, and individuals, regardless of gender, are treated with equality. In this envisioned scenario, qualifications, experience and ability become the primary considerations in board selection, overshadowing gender. The authors advocate for a shift in focus toward merit-based criteria, asserting that genuine gender equality in boardrooms arises when qualifications and competence take precedence over gender considerations.

Furthermore, according to gender socialization theory, men and women may have different personality traits, which can influence their decision-making styles and behaviors (Stockard, 2006). For example, women are commonly perceived as having communal traits, such as generosity, a focus on social connections and an inclination toward considering the needs of others. In contrast, men are frequently seen as having agentic characteristics, such as ambition, self-motivation and a desire for personal growth (Eagly and Johnson, 1990; Eagly and Johannesen-Schmidt, 2001). Such communal traits of female directors may be related to the awareness and the will to act on the negative impacts of e-waste on the environment and communities. According to Galbreath (2018), female traits are often associated with a strong sense of concern for the welfare of society and the environment.
Furthermore, empirical studies have shown that companies with a higher representation of women on their boards tend to be more philanthropic (Lin et al., 2018; ben Selma et al., 2022) and implement programs that address social and environmental concerns, such as environmental sustainability and community development (Boulouta, 2013; Hafsi and Turgut, 2013; Issa and Fang, 2019; Zhang, 2012). Moreover, it is suggested that women may view morality and ethics differently than men (Bear et al., 2010; Galbreath, 2018; Grosvold, 2011). Specifically, it is proposed that women tend to see morality as being closely tied to responsibilities, such as the duty to take care of others and be concerned for their well-being. Empirical studies have examined potential differences in ethical perspectives and behaviors between females and males. For example, studies have found that female directors are less likely to condone unethical behavior, such as financial manipulation (Wahid, 2019), exhibit positive attitudes towards ethical conduct (García-Sánchez et al., 2015) and advocate for the use of effective waste management for environmental preservation (Gull et al., 2023).

Based on the above discussion, it is reasonable to argue that firms with more women in leadership positions may be more likely to implement programs or policies related to e-waste reduction. This could include initiatives such as promoting recycling, encouraging the use of more sustainable products and implementing regulations to reduce the amount of e-waste generated. Therefore, the propositions of this study are as follows:

\[ H1. \] Firms with higher proportion of female directors on their boards are more likely to reduce e-waste generation.

\[ H2. \] Firms with higher proportion of female executives are more likely to reduce e-waste generation.

**Methodology**

**Sample**

This study uses a sample of firms listed in the FTSE All-Share index with data available in the Eikon Refinitiv database from 2004 to 2021. The sample commences in 2004 due to the availability of data on e-waste reduction initiative scores, and it concludes in 2021, which represents the latest year for which data was accessible at the time of data collection. Firm-year observations were excluded from the analysis if data was missing for any of the variables required for the analysis. The financial firms were dropped from the sample due to their unique disclosure requirements. The final sample consists of 2,523 firm-year observations.

**Table 1** displays the sample distribution and key variables (e.g. e-waste reduction score, BGD, executive gender diversity) by industry and year. Panel A highlights that the consumer discretionary sector (27.11%) and industrial sector (25.68%) contribute significantly to the firm-year observations. The telecommunications sector demonstrates the highest e-waste reduction score (50.531%), whereas the energy sector has the lowest score (1%). Regarding gender diversity, the technology sector has the highest representation of women on boards (24.614%), and the health-care sector has the highest executive gender diversity (19.617%). Notably, Panel B indicates a rise in female representation and the number of observations over the sample period (2004–2021). The proportion of women on boards increased from 6.177% in 2004 to 35.642% in 2021. Executive women positions also rose from 3.24% in 2004 to 21.555% in 2021. Furthermore, the e-waste reduction score experienced substantial growth, from 1.213% in 2004 to 17.731% in 2021, indicating improved e-waste management and recycling, likely influenced by policies and regulations. This progress signifies greater sustainability in business practices, combining increased female leadership representation with enhanced e-waste reduction scores.
Empirical model and variables

The ordinary least squares (OLS) technique is used in this study, using the following econometric models to ascertain how female leaders at the top management level impact the e-waste reduction initiative:

\[
EWASTE\_SCORE_{it} = \beta_0 + \beta_1 BGD_{it} + \beta_2 CEOG + \sum_{i=0}^{n} \beta_i Control\ Variables_{it} + \varepsilon_{it} \quad (1)
\]

\[
EWASTE\_DUM_{it} = \beta_0 + \beta_1 BGD_{it} + \beta_2 CEOG + \sum_{i=0}^{n} \beta_i Control\ Variables_{it} + \varepsilon_{it} \quad (2)
\]

This study uses the e-waste reduction initiative as a dependent variable. E-waste reduction score (EWASTE\_SCORE) measures the company’s disclosure on initiatives to recycle, Table 1.

<table>
<thead>
<tr>
<th>Industries</th>
<th>N</th>
<th>%</th>
<th>EWASTE_SCORE (%)</th>
<th>BGD (%)</th>
<th>CEOG (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic materials</td>
<td>215</td>
<td>8.52</td>
<td>19.684</td>
<td>14.733</td>
<td>8.022</td>
</tr>
<tr>
<td>Consumer discretionary</td>
<td>684</td>
<td>27.11</td>
<td>18.472</td>
<td>21.449</td>
<td>15.187</td>
</tr>
<tr>
<td>Consumer staples</td>
<td>247</td>
<td>9.79</td>
<td>1.847</td>
<td>22.407</td>
<td>12.708</td>
</tr>
<tr>
<td>Energy</td>
<td>153</td>
<td>6.06</td>
<td>1</td>
<td>14.507</td>
<td>9.302</td>
</tr>
<tr>
<td>Health care</td>
<td>89</td>
<td>3.53</td>
<td>15.972</td>
<td>22.751</td>
<td>19.617</td>
</tr>
<tr>
<td>Industrials</td>
<td>648</td>
<td>25.68</td>
<td>9.856</td>
<td>17.402</td>
<td>9.379</td>
</tr>
<tr>
<td>Real estate</td>
<td>226</td>
<td>8.96</td>
<td>7.314</td>
<td>16.155</td>
<td>18.24</td>
</tr>
<tr>
<td>Technology</td>
<td>81</td>
<td>3.21</td>
<td>18.25</td>
<td>24.614</td>
<td>17.066</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>53</td>
<td>2.10</td>
<td>50.531</td>
<td>19.688</td>
<td>15.813</td>
</tr>
<tr>
<td>Utilities</td>
<td>127</td>
<td>5.03</td>
<td>7.395</td>
<td>20.793</td>
<td>16.431</td>
</tr>
<tr>
<td>All industries</td>
<td>2523</td>
<td>100</td>
<td>13.003</td>
<td>19.113</td>
<td>13.051</td>
</tr>
</tbody>
</table>

Panel A: Sample distribution by industry

Panel B: Sample distribution by year

2004 | 85 | 3.37 | 1.213 | 6.177 | 3.24 |
2005 | 127 | 5.03 | 3.462 | 6.574 | 5.792 |
2006 | 126 | 4.99 | 4.12 | 7.055 | 7.161 |
2007 | 138 | 5.47 | 8.462 | 8.458 | 7.681 |
2008 | 143 | 5.67 | 14.906 | 9 | 6.991 |
2009 | 95 | 3.77 | 15.263 | 11.255 | 8.652 |
2010 | 105 | 4.16 | 15.119 | 11.256 | 10.767 |
2011 | 114 | 4.52 | 14.844 | 12.051 | 12.625 |
2012 | 114 | 4.52 | 15.886 | 13.803 | 11.679 |
2013 | 118 | 4.68 | 16.668 | 16.87 | 13.516 |
2014 | 140 | 5.55 | 12.102 | 19.606 | 13.948 |
2015 | 161 | 6.38 | 13.752 | 20.962 | 13.262 |
2018 | 187 | 7.41 | 15.497 | 26.452 | 15.745 |
2019 | 193 | 7.65 | 13.708 | 29.443 | 17.837 |
All years | 2523 | 100 | 13.003 | 19.113 | 13.051 |

Notes: This table shows the breakdown of the sample by industry and year. The final sample consists of 2523 firm-year observations between 2004 and 2021.

Source: Authors’ own creation/work.

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reduce, reuse, substitute, treat or phase out e-waste. The e-waste reduction score is a measure of how well a company is doing in terms of reducing e-waste, which includes all types of waste that contain electronic components such as computers, mobile phones and printers. The score is a percentile rank, with a higher score indicating better e-waste reduction initiatives. A dummy variable (EWASTE_DUM) is also used to determine whether a company has set a target for e-waste reduction. These measures are sourced from the Eikon Refinitiv database. The study also looks at the impact of board and executive gender diversity on e-waste reduction initiatives, where BGD is the proportion of women on the board and executive gender diversity (CEOG) is the proportion of women executives to the total number of executives.

Moreover, this study builds upon previous research (Bear et al., 2010; Boulouta, 2013; Issa and Hanaysha, 2023b; Issa and Zaid, 2021; Liu, 2018; Rao and Tilt, 2016; Issa and Hanaysha, 2023d; Ali Gull et al., 2021) by including several control variables. These variables consist of board size (B_SIZE), board independence (B_IND), CEO duality (CEOD), board tenure (B_TENURE), presence of a sustainability committee (SUS_COM), presence of a corporate governance committee (GOV_COM), firm size (F_SIZE), return-on-asset ratio (ROA), market-to-book value ratio (M_TO_B) and leverage (LEV). We incorporate industry dummy variables for 10 sectors to account for variations in the nature of each industry. In addition, we introduce year dummy variables to control for potential time-specific effects that may influence the relationship between gender diversity and e-waste reduction initiatives. Table 2 provides a detailed explanation of all the variables used in the model, including their definitions and measurement methods.

**Results and discussion**

*Descriptive statistics and correlation analysis*

Table 3 presents the summary statistics for all the variables included in the model, such as mean, standard deviation minimum and maximum values. The mean value of e-waste score (EWASTE) and the e-waste dummy variable (WASTE_DUM) is 12.929 and 0.145, respectively. The former indicates the average score of e-waste for the companies in the sample, whereas the latter indicates whether the companies have implemented e-waste reduction initiatives or not. As for the corporate governance characteristics, the average percentage of female directors (BGD), the average proportion of female executives (CEOG) and the average board size (B_SIZE) are 19.296%, 13.379% and 2.215, respectively. Over half (58.229%) of the board directors are not affiliated with the company in an operational capacity and about 9.3% of the boards have a structure where the CEO also holds the position of chairman of the board (CEOD). The typical length of time for board members in their position is 5.734 years in the companies included in the sample. Concerning committees, the average proportion of companies that have a sustainability committee (SUS_COM) is 71.4%, whereas the average proportion of companies that have a governance committee (GOV_COM) is 15.2%. These values provide an indication of the level of commitment to sustainability and governance within the sample of companies. In regard to the firm-level control variables, Table 3 presents that the mean value of firm size (F_SIZE) is 8.858, which indicates the average size of the companies in the sample. The average return on assets (ROA) is 0.085, which is a measure of the company’s profitability. The average market-to-book value ratio (M_TO_B) is 1.55, this ratio compares a firm’s market value to its book value and it reflects the investor’s perception of the company’s future growth prospects. Finally, the mean value of leverage (LEV) is 1.191, which is a measure of a company’s level of debt financing.

The results of correlation analysis in Table 4 suggest that there is no significant correlation between the variables in the data set, indicating no issues with multicollinearity.
In addition, the variance inflation factors values are less than 5, further confirming that there are no multicollinearity issues in the data set (O’brien, 2007).

**Multivariate analysis**

Table 5 presents the results of OLS regressions that estimate the relationship between e-waste reduction score, BGD and executive gender diversity.

As presented in Table 5, Model 1 tests the connection between BGD and e-waste reduction scores, whereas Model 2 examines the correlation between executive gender diversity and e-waste reduction scores. As seen in Models 1 and 2, the results reveal that
there is a positive and significant relationship between board and executive gender diversity and e-waste reduction score ($\beta = 0.126$, $p < 0.10$) and ($\beta = 0.116$, $p < 0.05$), respectively. In Models 3 and 4, we introduce one-year lagged variables for board and executive gender diversity to assess the persistent and stable relationship with e-waste reduction initiatives over time. The results consistently confirm the enduring nature of this association, reinforcing its stability when considering the lagged variables for both board and executive gender diversity.

Finally, in Model 5, it is found that when both proxies of board and executive gender diversity are included, the coefficients for both remained positive and significant at $p < 0.10$ and $p < 0.05$, respectively. This suggests that both board and executive gender diversity have a significant positive impact on e-waste reduction scores and that having a diverse group of women in both leadership positions is beneficial for a company in terms of reducing e-waste. These findings support the acceptance of both $H1$ and $H2$, aligning with established theoretical frameworks. The demonstrated positive impact of having a diverse group of women in leadership positions emphasizes the value of incorporating various perspectives, experiences and skills (Hamplová et al., 2022; Issa et al., 2022a). This diversity proves particularly beneficial in the context of reducing e-waste, as it enhances the decision-making process. According to diversity theory, having a diverse group of individuals with different perspectives, experiences and backgrounds on a corporate board can lead to a more well-rounded and effective decision-making process (Siciliano, 1996). Female directors and executives, with their unique experiences and perspectives, can bring a different approach to e-waste management, leading to improved performance in this area. For instance, women may bring a more holistic and long-term perspective to e-waste management, considering not only the environmental impacts but also the social and economic implications of e-waste. They may also bring a stronger focus on stakeholder engagement and collaboration, which can help to build support for e-waste reduction initiatives and drive positive change. Moreover, having more women in leadership positions can increase monitoring and accountability on a board (Adams and Ferreira, 2009), leading to a more comprehensive approach to managing environmental sustainability, including e-waste reduction. Furthermore, the presence of female directors and executives can also lead to a more

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>EWASTE</td>
<td>12.929</td>
<td>31.539</td>
<td>0</td>
<td>99.569</td>
</tr>
<tr>
<td>EWASTE_DUM</td>
<td>0.145</td>
<td>0.352</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>BGD</td>
<td>19.296</td>
<td>13.459</td>
<td>0</td>
<td>66.67</td>
</tr>
<tr>
<td>CEOG</td>
<td>13.379</td>
<td>15.17</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>B_SIZE</td>
<td>2.215</td>
<td>0.252</td>
<td>0</td>
<td>3.091</td>
</tr>
<tr>
<td>B_IND</td>
<td>58.229</td>
<td>13.559</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>CEOD</td>
<td>0.093</td>
<td>0.29</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>B_TENURE</td>
<td>5.734</td>
<td>2.352</td>
<td>0.083</td>
<td>17.625</td>
</tr>
<tr>
<td>SUS_COM</td>
<td>0.714</td>
<td>0.452</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>GOV_COM</td>
<td>0.152</td>
<td>0.359</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>F_SIZE</td>
<td>8.858</td>
<td>1.965</td>
<td>2.485</td>
<td>13.299</td>
</tr>
<tr>
<td>ROA</td>
<td>0.085</td>
<td>0.147</td>
<td>-0.242</td>
<td>2.493</td>
</tr>
<tr>
<td>M_TO_B</td>
<td>1.55</td>
<td>3.906</td>
<td>0.021</td>
<td>78.168</td>
</tr>
<tr>
<td>LEV</td>
<td>1.191</td>
<td>3.906</td>
<td>0</td>
<td>100.209</td>
</tr>
</tbody>
</table>

**Table 3.** Descriptive statistics

Breaking the E-Waste stigma

Note: This table displays the results of the descriptive statistics for all used variables

Source: Authors’ own creation/work
<table>
<thead>
<tr>
<th>Variables</th>
<th>VIF</th>
<th>1/vIF</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
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<th>(12)</th>
<th>(13)</th>
<th>(14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EWASTE_SCORE</td>
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<td></td>
<td>1.00</td>
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<td>-0.176***</td>
<td>0.207***</td>
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<td>0.124***</td>
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<td>0.150***</td>
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<td>0.988</td>
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<td>-0.004</td>
<td>0.041**</td>
<td>0.017</td>
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<td>-0.023</td>
<td>-0.003</td>
<td>1.000</td>
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</tbody>
</table>

Notes: This table displays the results of the correlation analysis. The definitions of all variables can be found in Table 2. *Indicates significance at the 10% level; **indicates significance at the 5% level; ***indicates significance at the 1% level

Source: Authors’ own creation/work
<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3 lag BGD</th>
<th>Model 4 lag CEO gender</th>
<th>Model 5</th>
<th>Model 6 standardized coefficients</th>
</tr>
</thead>
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<tr>
<td>BGD</td>
<td>0.126* (1.70)</td>
<td>0.116*** (2.24)</td>
<td>0.134*** (2.17)</td>
<td>0.109*** (2.11)</td>
<td>0.117* (1.90)</td>
<td>0.052**</td>
</tr>
<tr>
<td>CEOG</td>
<td>0.051* (1.69)</td>
<td>4.962* (1.67)</td>
<td>5.049 (1.64)</td>
<td>4.775 (1.54)</td>
<td>3.71 (1.24)</td>
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<tr>
<td>B_SIZE</td>
<td>5.051* (1.96)</td>
<td>5.33** (2.05)</td>
<td>5.382* (1.90)</td>
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<td>5.054* (1.93)</td>
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</tr>
<tr>
<td>CEOD</td>
<td>0.788*** (2.62)</td>
<td>0.864*** (2.83)</td>
<td>0.875*** (2.65)</td>
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<td>0.814*** (2.64)</td>
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<td>B_TENURE</td>
<td>-2.91*** (–2.38)</td>
<td>-2.274** (–2.37)</td>
<td>-2.535 (–1.49)</td>
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<td>10.71*** (4.81)</td>
<td>10.504*** (4.70)</td>
<td>12.022*** (5.40)</td>
<td>11.935*** (5.34)</td>
<td>11.739*** (5.35)</td>
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<td>GOV_COM</td>
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<td>-4.57 (–0.51)</td>
<td>19.649*** (1.97)</td>
<td>18.15* (1.82)</td>
<td>-6.552 (–0.78)</td>
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<tr>
<td>F_SIZE</td>
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<td>0.855* (1.78)</td>
<td>0.509 (1.03)</td>
<td>0.647 (1.30)</td>
<td>0.568 (1.20)</td>
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<td>-9.306 (–0.81)</td>
<td>-10.152 (–0.84)</td>
<td>-12.226 (–1.00)</td>
<td>-3.855 (–0.73)</td>
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<td>0.251 (0.60)</td>
<td>0.324 (0.74)</td>
<td>0.388* (0.88)</td>
<td>0.303 (0.50)</td>
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<td>0.162 (1.24)</td>
<td>0.162 (1.16)</td>
<td>0.181 (1.37)</td>
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<td>-4.57 (–0.51)</td>
<td>19.649*** (1.97)</td>
<td>18.15* (1.82)</td>
<td>-6.552 (–0.78)</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Observation</td>
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<td>2.523</td>
<td>2.115</td>
<td>2.112</td>
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<td>R-squared</td>
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<td>0.113</td>
<td>0.113</td>
<td>0.109</td>
<td>0.121</td>
</tr>
<tr>
<td>F(p-value)</td>
<td>9.930 (0.000)</td>
<td>9.973 (0.000)</td>
<td>18.308 (0.000)</td>
<td>18.02 (0.000)</td>
<td>16.74 (0.000)</td>
<td>–</td>
</tr>
</tbody>
</table>

**Notes:** This table shows the results of the ordinary least square (OLS) regression. The reported coefficients are accompanied by t-tests in parentheses. Standard errors are robust to account for heteroscedasticity. The definitions of all variables can be found in Table 2. *Indicates significance at the 10% level; **indicates significance at the 5% level; ***indicates significance at the 1% level. 

**Source:** Authors' own creation/work

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**Table 5.** OLS Regressions using e-waste reduction score

**Breaking the E-Waste Stigma**
inclusive and diverse corporate culture (Francoeur et al., 2019), which can facilitate open discussions and collaboration around e-waste reduction initiatives and drive innovation and progress in this area.

Gender socialization theory, on the other hand, suggests that individuals are socialized into gendered roles and behaviors that are associated with being male or female (Stockard, 2006). In the context of corporate sustainability, women may be more likely to prioritize environmental and social issues (Bear et al., 2010; Boulouta, 2013; Galbreath, 2018), leading to a stronger focus on e-waste management. For example, women may be more likely to consider the social and environmental impacts of e-waste and prioritize efforts to reduce e-waste in a responsible and sustainable manner. They may also bring a more stakeholder-focused approach to e-waste management, working to build support and engagement among stakeholders and drive positive change. This can lead to more effective and comprehensive sustainability strategies that are better able to address the complex and interconnected challenges of e-waste reduction.

Furthermore, the model is re-estimated using standardized coefficients in Model 8. Standardized coefficients are a way to compare the relative importance of independent variables within a regression model. They are calculated by dividing the unstandardized coefficients (also known as “raw” or “ordinary” coefficients) by the standard deviation of the independent variable (Kaufman, 1996). As reported in Model 8, the standardized coefficient of executive gender diversity is ($\beta = 0.068, p < 0.05$) and BGD is ($\beta = 0.052, p < 0.05$). These are the fourth and fifth largest standardized coefficients among all independent variables in the model, ranked below only governance committee (GOV_COM), firm size (F_SIZE) and CEO duality (CEOD) in terms of absolute value (with standardized coefficients of 0.134, 0.082 and 0.071, respectively). The order of the standardized coefficients suggests that executive and BGD is among the most influential factors in predicting e-waste reduction score, following governance committee, firm size and CEO duality.

These results contribute to the literature by providing empirical evidence supporting the positive impact of diversity in leadership, specifically gender diversity, on corporate sustainability practices. They add to the growing body of research on the business case for diversity and the importance of considering diversity in top management positions. The results can inform future studies on the topic and inform stakeholders such as investors and policymakers on the benefits of gender diversity in leadership for environmental sustainability.

**Robustness checks**

The robustness tests are conducted to further strengthen the validity of the baseline findings by using alternative measures of e-waste reduction initiatives in Table 6, analyzing subsamples of the data based on different characteristics such as firm size and industry nature. For correcting the endogeneity issue, this study uses the two-stage least squares (2SLS) method.

First, to assess the impact of different measures on the results, an alternative measure for e-waste reduction is considered in this study. This measure is a binary variable indicating whether a firm has implemented e-waste reduction initiatives, with a value of 1 for implemented initiatives and 0 for non-implemented ones. It is found that the results (not reported for brevity) using this binary measure align closely with those obtained from the original e-waste reduction score measure. Second, Table 6 examines whether the link between gender diversity in leadership roles and e-waste reduction scores holds consistently across firms of different sizes. The findings from Models 1, 2 and 3 in the subsample analysis indicate a more pronounced impact of gender diversity in board and executive
<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 FTSE large cap</th>
<th>Model 2 FTSE large cap</th>
<th>Model 3 FTSE large cap</th>
<th>Model 4 FTSE mid cap</th>
<th>Model 5 FTSE mid cap</th>
<th>Model 6 FTSE mid cap</th>
<th>Model 7 FTSE small cap</th>
<th>Model 8 FTSE small cap</th>
<th>Model 9 FTSE small cap</th>
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</thead>
<tbody>
<tr>
<td>BGD</td>
<td>0.247*** (2.70)</td>
<td>0.388*** (3.35)</td>
<td>0.157 (1.38)</td>
<td>0.157 (1.38)</td>
<td>0.676** (2.62)</td>
<td>0.601** (2.20)</td>
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<td>CEOG</td>
<td>0.085** (1.83)</td>
<td>0.167*** (2.60)</td>
<td>0.108 (1.32)</td>
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<td>10.06 (0.000)</td>
<td>8.56 (0.000)</td>
<td>4.51 (0.000)</td>
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<td>8.21 (0.000)</td>
<td>7.109 (0.000)</td>
<td>8.322 (0.000)</td>
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</table>

**Notes:** This table shows the results of the ordinary least square (OLS) regression. The reported coefficients are accompanied by $t$-tests in parentheses. Standard errors are robust to account for heteroscedasticity. The definitions of all variables can be found in Table 2. *Indicates significance at the 10% level; **indicates significance at the 5% level; ***indicates significance at the 1% level.

**Source:** Authors' own creation/work
positions on e-waste reduction initiatives within large-cap firms. However, Models 4, 5 and 6 reveal an insignificant link between gender diversity and e-waste reduction initiatives in mid-cap companies. In the case of small-cap firms, Models 7, 8 and 9 highlight that only BGD exhibits a significant influence on e-waste reduction initiatives. These results suggest that the association between gender diversity and e-waste reduction may exhibit greater significance in larger firms and may vary based on the firm’s size.

Third, Table 7 reevaluates the baseline model, categorizing firms based on carbon performance. The findings indicate a strong link between diverse executive teams and e-waste reduction in low-emission companies in Models 1, 2 and 3, whereas the relationship is weaker in high-emission companies as shown in Models 4, 5 and 6. In contrast, gender diversity on the board does not significantly impact e-waste reduction in low-emission companies.

Finally, to address reverse causality/simultaneity issue, the study uses the 2SLS method, incorporating industry-level data on female board members and female executives, following Issa and Zaid (2021), Nadeem et al. (2020). These instrumental variables are exogenous (not correlated with the error term of the equation of interest), and they are not correlated with any other explanatory variables. The industry level of female board members is a variable that is not directly affected by the firm’s e-waste reduction score, but it may impact the corporate board and executive gender diversity (endogenous variable) at the firm level. The untabulated results obtained using the 2SLS method align with those from the basic model, indicating that reverse causality or simultaneity has minimal impact on the analysis results.

**Conclusion**

The study explores a sample of firms listed on the FTSE All-Share Index from 2004 to 2021, with a total of 2,523 observations. This study suggests that the presence of female directors and executives on corporate boards can bring a more comprehensive and diverse approach to e-waste management, which can contribute to improved e-waste reduction initiatives. This is attributed to the diverse perspectives and experiences they bring to the table, as well as the nurturing and community-oriented traits associated with women. These results underscore the importance of gender diversity in promoting corporate sustainability practices and fostering inclusive work cultures. However, the study also highlights that the impact of female leadership on e-waste reduction may vary based on factors such as the size of the firm and the industry’s carbon footprint. For instance, bigger firms may be more agile in implementing sustainability initiatives, whereas firms in high-emissions industries may face greater challenges in reducing their environmental impact. Overall, these findings emphasize the importance of considering a range of factors when assessing the role of gender diversity in promoting sustainability practices in the corporate world.

These findings provide important implications for businesses, regulators and stakeholders. For businesses, the study suggests that promoting gender diversity in leadership positions can help improve e-waste reduction initiatives. By including a range of perspectives and experiences in decision-making processes, companies can develop more effective and innovative solutions for managing their environmental impact. In addition, companies can benefit from creating more inclusive work cultures that value diversity and promote a sense of community and social responsibility. For regulators, the study highlights the importance of considering the role of gender diversity in promoting sustainable practices. Policies and regulations can be developed to encourage companies to prioritize gender diversity in their leadership teams and to hold them accountable for implementing effective e-waste management practices. For stakeholders, the study suggests that they can
<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 non-GHG-intensive firms</th>
<th>Model 2 non-GHG-intensive firms</th>
<th>Model 3 non-GHG-intensive firms</th>
<th>Model 4 GHG-intensive firms</th>
<th>Model 5 GHG-intensive firms</th>
<th>Model 6 GHG-intensive firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGD</td>
<td>0.075 (0.70)</td>
<td>0.404*** (4.77)</td>
<td>−0.081 (−0.77)</td>
<td>0.137 (1.44)</td>
<td>−0.012 (−0.20)</td>
<td>0.191* (1.74)</td>
</tr>
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<td>Yes</td>
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<td>Yes</td>
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<td>0.152</td>
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</tr>
<tr>
<td>$F$($p$-value)</td>
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<td>3.53 (0.000)</td>
<td>3.44 (0.000)</td>
<td>10.38 (0.000)</td>
<td>10.55 (0.000)</td>
<td>10.26 (0.000)</td>
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Notes: This table shows the results of the ordinary least square (OLS) regression. The reported coefficients are accompanied by $t$-tests in parentheses. Standard errors are robust to account for heteroscedasticity. The definitions of all variables can be found in Table 2. *Indicates significance at the 10% level; **indicates significance at the 5% level; ***indicates significance at the 1% level

Source: Authors' own creation/work
play an important role in promoting sustainability practices by supporting companies that prioritize gender diversity and sustainable initiatives. By investing in companies that value diversity and demonstrate a commitment to environmental responsibility, stakeholders can help drive positive change in the corporate world.

This study has some shortcomings. This study uses a sample conducted in a single country. Cross-country analysis can provide a more comprehensive understanding of the issue and capture regional differences. In addition, using multiple research methods can help to strengthen the findings of the current study and provide a more in-depth understanding of the mechanisms that female directors employ to shape e-waste management activities. By addressing these limitations, future research can build on the current study and provide a more comprehensive understanding of the relationship between female directors and e-waste reduction initiatives. This study does not account for potential external factors that could influence the results. Acknowledging this limitation, we recommend that future research takes into account specific event periods, such as changes in national laws and policies or financial crises, which may introduce confounding variables and impact companies’ e-waste reduction performance independently of or in conjunction with the presence of female leaders in director and executive positions. This can enhance the analysis and provide a more comprehensive understanding of the relationship between gender diversity and e-waste reduction initiatives.

Finally, this study concentrates only on gender diversity as the primary indicator of board and executive diversity. Other forms of diversity, such as financial and industry expertise, have not been explored in this paper. Therefore, future research can expand upon the current literature by investigating how other types of diversity impact waste management.

References


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