Internationalisation, waste management, and board attributes

Abstract

We investigate whether Internationalisation is significantly associated with waste management. Secondly, by focusing on two critical board attributes, we investigate whether female and tenured directors help enable Internationalised firms' better waste management. We find that more Internationalised firms produce more waste; this result is robust to various waste proxies such as total waste, hazardous and non-hazardous waste, and waste scaled by turnover. Although they tend to engage with less recycling, the result is insignificant. Furthermore, we find that both female and tenured directors significantly moderate between Internationalisation and waste management; they help reduce waste in Internationalised firms. However, they cannot significantly moderate between Internationalisation and waste recycling which seems a missing link in better waste management of Internationalised firms. The results imply that multinationals pollute the environment by producing more waste and not engaging in waste recycling. Given the cross-border scale of their manufacturing, sales, and/or logistics operations, the findings are of critical importance for multinationals, their governance structure, and stakeholders. We posit that international firms are more exposed to visibility, and hence are under scrutiny of stakeholders such as regulatory bodies, the press, and environmentalists. Waste production and lack of waste recycling might trigger legitimacy concerns and incompatibility sanctions.

Keywords: Internationalisation; waste management; board structure; board gender diversity; board tenure

1. Introduction

The global crisis of climate change has increased the pressure on companies from a wide range of stakeholders including governments, policymakers, and environmental groups, to show their commitment by improving their environmental practices (Albitar et al., 2023; Al-Shaer et al., 2024). However, despite the heightened pressure, there is considerable anecdotal evidence that shed light on corporate misbehaviour which contributes to the deterioration of the planet's environmental conditions. For example, according to the British Plastic Foundation, evidence showed that European countries such as Germany and the UK export their plastic waste and send it to overseas countries with lax environmental laws where it is dumped or burned. In 2020, on average one million tons of plastic was exported from Germany annually and the UK exported 61% of its plastic waste to foreign countries.[1] Moreover, a report by Tearfund showed that multinational companies including Pepsi-Cola, Coca-Cola, Nestle, and Unilever dump around half a million tons annually in developing countries with low-income and weak waste management systems.[2] A recent UN study has looked at the activities of 3000 biggest global companies and estimated that these companies would lose one-third of their profit had they been held financially accountable and forced to pay for the cost of pollution and other damage caused to the natural environment.[3]

There is a vociferous debate around the challenges and real-world issues that relate to international businesses, yet the research evidence has been mixed regarding the effects arising

---

[1] See 'Waste colonialism': World grapples with West's unwanted plastic | Plastics | The Guardian

[2] Tearfund is an international Christian relief and development agency based in the UK that focuses on supporting those in poverty and providing disaster relief for disadvantaged communities. See Multinationals dump 500,000 tons of plastic waste in developing countries every year - Plastic Soup Foundation.

[3] See World's top firms cause $2.2tn of environmental damage, report estimates | Pollution | The Guardian

from internationalisation. For example, Contractor et al. (2007), Hajela and Akbar (2013), and Singla and Georga (2013) show a positive effect of internationalisation on firm performance among multinational firms from emerging markets. On the other hand, Geringer et al. (2000) find the impact of internationalisation of firm performance varies over time among Japanese multinational firms. In terms of corporate social responsibility (CSR), the research evidence has also been mixed (e.g., Kang, 2013; Surroca et al., 2013; Cho et al., 2015; Attig et al., 2016; Zhang et al., 2021). Academic scholars provide two opposing arguments about the environmentally responsible behaviour of internationalised firms. A group of scholars argue that internationalised firms transmit their good environmental practice overseas which increases firms' exposure to global actors and a variety of stakeholders (Attig et al., 2016; Gómez-Bolaños et al, 2020). The second group argues that internationalised firms are more likely to engage in environmentally irresponsible actions and transfer their polluting activities overseas by taking advantage of low stakeholder pressure and exploiting market imperfections in foreign countries (Surroca et al., 2013; Li and Zhou, 2017). Moreover, due to the complexity of operations, internationalised firms face difficulties in monitoring and controlling their resources overseas due to the physical and cultural void (Capar and Kotabe, 2003; Strike et al., 2006; Aguilera et al., 2017).

This study aims to shed light on the debate regarding internationalised firms' environmental behaviour and investigate the association between internationalised firms and waste management. To do so, we employ institutional theory and utilise the notion of institutional arbitrage (Sharfman et al., 2004; Surroca et al., 2013) which states that the increased pressure from stakeholders may trigger an act of resistance in firms instead of conformity to stakeholders' expectations (Elsbach and Sutton, 1992; Surroca et al., 2013). As pressure increases, internationalised firms may exit the area of high pressure to a sphere of low pressure (Surroca et

al., 2013). The notion of institutional arbitrage has drawn little empirical attention from the academic community (Surroca et al., 2013). Our study utilizes this notion in examining the association between internationalisation and waste management. We further investigate whether specific firm-level governance variables may interfere as moderators in the association between internationalised firms and waste management. In particular, we investigate whether female and tenured directors help enable internationalised firms to engage in effective waste management systems. To do so, we utilise the upper echelon-theory which suggests that demographic attributes of directors and top managers affect firm outcomes and performance (Carpenter et al., 2004; Hambrick, 2007), and the resource dependency theory (RDT) which suggests that the board of directors offers firms with critical resources (Hillman et al., 2009).

Using an international and cross-sector sample from 2002 to 2021, the result shows that more Internationalised firms produce more waste. This finding is robust to various waste proxies such as total waste, hazardous and non-hazardous waste, and waste scaled by turnover. Furthermore, we find that both female and tenured directors significantly moderate between Internationalisation and waste management and help provide an effective waste management system in Internationalised firms. However, these variables do not moderate between Internationalisation and waste recycling which seems a missing link in better waste management of Internationalised firms. With further tests, we find that the results are consistent in earlier and recent periods, polluting versus non-polluting industries, and high- and low-Worldwide Governance Indicators (WGI) countries.

This study contributes to the literature in the following ways. *First*, waste is a great driver of climate change and a source of greenhouse gas emissions (Konadu et al., 2022; Ahsan et al., 2024; Uyar et al., 2024). Firms are one of the major polluters and waste generators around the

world because of production and logistics operations (Benjamin et al., 2023; Gull et al., 2023; Gull et al., 2024). Thus, we believe that drawing attention to exclusively international firms' waste management may contribute to the resolution of the climate change issues.

Second, despite the recent academic work on waste management of firms (Shahab et al., 2022; Gull et al., 2023; Albitar et al., 2024; Uyar et al., 2024), research that investigates the role of internationalised firms in waste management is scarce. Existing studies on waste management do not exclusively focus on internationalised firms (Shahab et al., 2022; Gull et al., 2023; Albitar et al., 2024; Gull et al., 2024; Uyar et al., 2024). Hence, this topic is of critical importance as there are serious concerns that internationalised firms transfer their operations to foreign countries that they consider "the pollution haven" due to low stakeholders' pressure and lax environmental laws (Li and Zhou, 2017; Gómez-Bolaños et al., 2020).

Third, we focus on two critical attributes of the corporate board and investigate whether female and tenured directors play a role in the waste management of internationalised firms. We chose board gender diversity as potential moderator since female directors' role is unclear in international firms; for instance, Pergelova et al. (2019) and Ren and Zeng (2022) argue that female directors are risk-averse, and so they slow down the internationalisation process. Thus, it would be interesting to explore the role of female directors in international firms concerning cleaner operational processes which might help those firms in re-shaping their board structures. In addition, previous literature provides mixed evidence on the association between director tenure and social and environmental practices (Lewis et al., 2014; Chen et al., 2019). Some researchers argue that tenured directors are committed to long-term projects due to not having career concerns like junior directors (Chen et al., 2019; Al-Shaer et al., 2023b), others argue that they are rigid and more resistant to strategic change that stakeholders expect (Finkelstein and Hambrick, 1990).

Thus, we empirically test whether tenured directors are helpful in better waste management of international firms. When it comes to the link between female and tenure directors and waste management of internationalising companies, there is trivial evidence, and it tends to be unclear. The role of these two moderating variables can add to existing knowledge that has scholarly and practical relevance concerning the upper echelon's role in alleviating ecological concerns.

Fourth, by testing whether hypothesized relationships vary depending on institutional environments, we aim to help policymakers who need to formulate new policies and regulations for better waste management and logistic operations, and corporate managers who need to take immediate actions on waste management, enhance innovation, and move towards more sustainable business practices. Finally, we make a theoretical contribution to the literature by focusing on the interplay between the pollution haven hypothesis, upper echelon theory, and RDT on the nexus of environmental management, international business, and corporate governance.

In summary, we seek answers to the following two research questions:

R1: Is Internationalisation negatively associated with waste management supporting the "pollution haven hypothesis"?

R2: Do female and tenured directors help international firms better manage their waste by reducing waste production and increasing waste recycling?

The remainder of the paper is structured as follows. The second section provides a theoretical background and develops hypotheses. The third section presents the methodology. In section four, we present our empirical results and in section five, we discuss these results and conclude. Finally, the last section suggests implications and avenues for future research.

2. Theoretical Background and Hypotheses Development

2.1. Internationalised firms and waste management

Internationalised firms face a high level of complexity that is associated with international diversification (Capar and Kotabe, 2003; Strike et al., 2006). Diverse cultural and national subsidiaries have numerous demands and activities which require internationalised firms to manage costs that can impose a strain on firms' resources and capabilities (Kostova and Zaheer, 1999). According to institutional theory, firms must conform to institutional pressures and meet stakeholders' expectations and demands. The agency approach within the framework of institutional theory proposes that companies may engage in self-interested behaviour by promoting acts of resistance instead of provoking conformity to stakeholders' prospects (Elsbach and Sutton, 1992). Internationalised firms may assign their nonconforming operations in areas that are not subject to public scrutiny while still emerging as organizations that conform to stakeholders' expectations (Surroca et al., 2013). As a result, internationalised firms may prioritize profit maximization over societal demands when stakeholder pressure is low (Campbell et al., 2012; Surroca et al., 2013) so that firms may escape the field of high pressure to another institutional environment in which pressure is less imposed (Oliver, 1991). This is particularly the case when a firm operates in different countries where stakeholders' expectations vary which entails differences in the costs of achieving legitimacy (Campbell et al., 2012). Thus, firms may exploit an institutional arbitrage and engage in self-seeking practices by avoiding the sphere of high pressure but still attain institutional legitimacy in their operating environment (Sharfman et al., 2004; Surroca et al., 2013).

This behaviour is referred to as the 'pollution haven hypothesis' when related to the natural environment (Copeland and Taylor, 2004). The pollution haven hypothesis posits that internationalised firms transfer their polluting activities to foreign countries with low stakeholder pressure without causing legitimacy loss in their home operating environment (Candau and Dienesch, 2017; Li and Zhou, 2017; Gómez-Bolaños et al., 2020). As a result, waste producers can export their waste to places overseas that lack effective waste management systems or environmental legislation. Moreover, internationalised firms are more inclined to diversify their operations in overseas markets to exploit market imperfections such as weak environmental policies, low costs of labour, and abundant raw materials (Surroca et al., 2013; Li and Zhou, 2017; Gómez-Bolaños et al, 2020). Consequently, internationalised firms are likely to produce more waste due to their complex operations and engage in less waste recycling because it is cheaper to export their waste to markets with low stakeholder pressure than to develop local recycling infrastructures and environmental technologies. Based on the aforementioned discussion, we propose the following hypothesis:

H1: Internationalisation is negatively associated with waste management. With waste management, we mean producing less waste but recycling more waste. Hence, the hypothesis implies that higher internationalisation leads to greater waste production and less waste recycling.

2.2. The moderating role of the board gender diversity

It is important to consider the strength of the effects related to managers' role in organisation decision-making to have a thorough understanding of a firm's international strategy (Popli et al., 2022). The firm's top management team holds the responsibility to deal with complexities associated with diversification such as operational, governance, and transaction costs

(Sanders and Carpenter, 1998; Capar and Kotabe, 2003). Moreover, a firm-level governance system can impact waste reduction and recycling because it helps reform the complex internal processes and systems' cost structure (Shahab et al., 2022). The upper-echelon theory identifies that the demographic characteristics of directors and top managers affect firms' outcomes and strategic decisions (Carpenter et al., 2004; Hambrick, 2007; Kaczmarek and Ruigrok, 2013). This can include decisions related to the natural environment. Gender diversity on the board can impact how firms deal with issues related to the natural environment such as waste management because females and males can vary socially and traditionally (Konadu et al., 2022). Previous literature has examined the direct association between female directors and waste management and found a significant association, suggesting that female directors are more socially responsible as compared to their male peers (e.g., Shahab et al., 2022; Gull et al., 2023)

The RDT suggests that the board of directors offers firms with critical resources (Hillman et al., 2009). The presence of female directors is a critical resource for firms that can provide insightful voice on environmental issues. The RDT posits that board gender diversity enriches the resource capacity of the board claiming that female directors bring different approaches to problem-solving such as those related to environmental issues (Konadu et al., 2022). The endorsement of diverse perspectives is critical for producing varied solutions and approaches to different problems and mitigating bias and narrow views in strategic decision-making (Galia and Zenou, 2012). According to RDT, board gender diversity is an effective governance mechanism that secures access to strategic resources, networks, and knowledge base, by gaining the support and approval of influential stakeholders (Branco and Rodrigues, 2006).

The association between a firm's degree of internationalisation and waste management can be affected by its governance structure. Firms may be able to manage and cope with the complexity

10

of operations and information processing demands through gender-diverse boards. Female directors are more participatory, less self-centred, and enjoy a relationship-building ability (Al-Shaer and Zaman, 2016; Chen et al., 2016) which can help in dealing with foreign market imperfections and opportunities. Internationalised firms require a large network and the capacity to communicate and establish relationships in international contexts. Previous research suggests that board gender diversity can facilitate working across different cultural and institutional systems (Javidan et al., 2016; Hoobler et al., 2018). Because female directors are more socially oriented, they tend to focus more on stakeholders' needs (Post et al., 2011). Consequently, they are likely to spend more effort in coordinating and balancing the numerous demands of stakeholders from different institutional environments. Women tend to adopt a transformational and participative managerial style that is based on ethical and social values (Gull et al., 2018). Previous research has shown that female directors are more sympathetic to environmental issues and concerns such as those related to climate change and are likely to foster engagements in environmental activities (Atif et al., 2021; Gull et al., 2023). It follows that a high representation of female directors in firms can provide effective governance and oversight and prevent firms from transferring their polluting activities to countries with lax environmental laws and regulations to save costs and resources. Based on the aforementioned discussion, we argue that female directors help reinforce an effective waste management system and support waste recycling in Internationalised firms. We, thus, propose the following hypothesis:

H2: Board gender diversity significantly and positively moderates between Internationalisation and waste management.

2.3. The moderating role of board tenure

Director tenure can play a moderation role in the association between internationalisation and waste management. Previous literature examines the direct association between director tenure and social and environmental practices and provides mixed results (e.g., Lewis et al., 2014; Chen et al., 2019). Based on the upper-echelon theory, director tenure can have a significant impact on corporate performance and strategic decisions related to social and environmental practices (Lewis et al., 2014; Al-Shaer et al., 2023b). Long-serving directors are more aware of the needs of their companies' stakeholders (Veprauskaitė and Adams, 2013) and know how to respond to stakeholders' demands when the pressure is high. On the other hand, short-tenured directors can be motivated to engage in long-term projects such as those related to the natural environment to achieve competence and mitigate career concerns in the early years of their companies (Chen et al., 2019; Al-Shaer et al., 2023b).

Empirical evidence on the direct association between director tenure and firm internationalisation is also mixed. On the one hand, long-serving directors tend to be more rigid and consistent in their views during their serving years and more resistant to strategic change (Finkelstein and Hambrick, 1990). From an agency cost perspective, long-serving directors are more willing to promote directors who share similar interests and motives (Al-Shaer et al., 2023a). Old-tenure directors who are approaching retirement age tend to avoid risky activities and long-term engagements such as international diversification (Matta and Beamish, 2008). On the other hand, well-established directors can be more socially experienced and have a wide business network which can encourage communications and improve effective thinking about strategic decisions (Westhead et al., 2001) and thus impact the degree of internationalisation of firms (Chen, 2011; Xie, 2014). Given the mixed evidence in the literature, we expect that director tenure is

likely to play a moderation role (either negative or positive) in the association between internationalisation and waste management and propose the following hypothesis:

H3: Tenured directors significantly moderate between Internationalisation and waste management.

3. Research methodology

3.1. Variables

Dependent variables: First, we measure waste management with several proxies including waste recycling ratio (WRR), amount of total waste produced in tons scaled by total sales turnover (Waste/Sales), the natural logarithm of amount of waste produced in tons (LnTW), the natural logarithm of amount of hazardous waste in tons (LnHW), and the natural logarithm of non-hazardous waste in tons (LnNHW) (Shahab et al., 2022; Gull et al., 2023; Gull et al., 2024; Uyar et al., 2024).

Independent variables: Second, we measured firm Internationalisation with international sales scaled by total sales (Internationalisation) in line with extant literature (Aabo et al., 2015; Yong and Laing, 2021; Bhandari et al., 2023). In line with H1, we expect a negative association between Internationalisation and waste management anticipating a negative association between Internationalisation and waste recycling (i.e., WRR) but a positive association between Internationalisation and waste production (i.e., LnTW, Waste/Sales, LnHW, LnNHW).

Moderating variables: Third, we assessed board gender diversity with female directors' proportion on the board (Bgdiversity) and board tenure with the average number of years each board member has been on the board (Btenure) (Al-Shaer et al., 2023b). In line with H2, we expect

that board gender diversity significantly and positively moderates between Internationalisation and waste management. Thus, we predict that female directors help International firms enhance their waste recycling (i.e., WRR) and reduce their waste production (i.e., LnTW, Waste/Sales, LnHW, LnNHW). Concerning board tenure, in line with H3, we expect a significant but non-directional moderating effect of board tenure between internationalisation and waste management as discussed in the literature review part.

Control variables: Finally, we control several firm attributes and institutional environment. We posit that internal governance plays a critical role in multinationals' decision-making concerning sustainability which necessitates integrating board size (Bsize), board independence (Bindependence), and CEO duality (CEOduality) into the research model (Kuzey et al., 2022; Uyar et al., 2023; Gull et al., 2023). Board size could be negatively associated with waste management since larger boards are inefficient in monitoring but could also be positively associated since larger boards imply a greater board capital pool which enriches decision-making. However, independent directors are key to monitoring function and hence, are expected to contribute to better waste management. CEO duality is expected to negatively affect waste management as power diminishes check and control ability.

Financial characteristics of multinationals are also an important predictor of waste management such as firm size (Fsize), firm profitability (ROA), indebtedness (Leverage), Liquidity, capital expenditures (Cexpenditure), and research and development expenditures (RDexpenditure) (Kuzey et al., 2022; Gull et al., 2023; Uyar et al., 2023; Zaman et al., 2024). For example, while larger firms tend to produce more waste given the magnitude of their operations and engage with less waste recycling, innovative firms committing higher resources for research and development tend to produce less waste and engage with more waste recycling. While firms

making more capital expenditures tend to produce more waste and engage with less waste recycling, more liquid and profitable firms can more easily find essential funds for waste management. Besides, indebted firms are obliged to comply with loan contracting obligations and have to protect their legitimacy, therefore, they tend to engage with better waste management. In addition, firms' ownership structure is proxied by the free float percentage of shares (FFloat) is of critical importance in exercising shareholders' monitoring of firms, and hence it is expected to enhance firms' waste management practices. Finally, the institutional environment is proxied by the (Worldwide Governance Indicators (WGI), and economic development is proxied by GDP[4] might play a role in the waste management tendency of multinationals as they indicate a stronger institutional environment (Leal Filho et al., 2016; Kuzey et al., 2022; Uyar et al., 2023).

INSERT TABLE 1 HERE

3.2. Sample

The research sample comprises observations from non-financial sectors, countries with more than ten firms, and case-wise available data on specific variables. The data for waste management, board, Internationalisation, and financial variables were fetched from the London Stock Exchange Group (LSEG) Workspace database (formerly Refinitiv and Asset4), whereas WGI and GDP data were extracted from the World Bank. The LSEG Workspace database provides waste management data back until 2002 which determines our sample initiation period. We capped the sample in 2021 which was the latest period for which data were available at the time we started to develop the study. The LSEG Workspace database has been well-acknowledged for its rigour and integrity in providing environmental and social performance data of enterprises and has been

---

[4] Natural logarithm of Gross Domestic Product per capita.

the source of data for prior waste management studies as well (Shahab et al., 2022; Gull et al., 2023; Uyar et al., 2024; Zaman et al., 2024). The World Bank is the main data source for macro-economic variables including GDP[5] and public governance strength via WGI[6].

Once the raw data set is obtained, it undergoes several data preprocessing steps before the research models can be tested. These steps are crucial in preparing the data for accurate and reliable analysis, enabling the subsequent testing of the research models (Hair et al., 2019). The initial summary statistics of the research variables revealed that certain variables exhibited heavy skewness and contained extreme values. To address this, we employed the technique of winsorization on specific variables. In our case, we winsorized the following variables at the one per cent level of the two tails by replacing the extreme values with the winsorized counterpart values (Cox, 2006): Waste/Sales, Internationalisation, Bsize, ROA, Leverage, Liquidity, Cexpenditure, and RDexpenditure. By winsorizing these variables, we aimed to mitigate the impact of extreme values and reduce the heavy skewness. We further examined multivariate outliers using the Minimum Covariance Determinant (MCD) method (Verardi & Dehon, 2010). This method is a robust approach to outlier detection that is not sensitive to the distribution of the data. We identified 21 multivariate outliers, which we subsequently eliminated from the research sample.

In our analysis, we examined the sampling distributions at various levels. Initially, we began with a dataset containing 75,063 observations. However, we excluded observations from the financial sector due to the differing financial characteristics of that sector, resulting in the removal of 12,023 records from the initial dataset. Next, we removed case-wise missing

---

[5] https://data.worldbank.org/indicator
[6] https://www.worldbank.org/en/publication/worldwide-governance-indicators

observations of variables such as LnTW, Waste/Sales, Internationalisation, and the control variables, which accounted for the elimination of 51,784 records[7]. Additionally, we excluded countries with less than ten firms[8], which amounted to the removal of 278 records from the dataset. Lastly, we identified and excluded multivariate outliers, resulting in the removal of 21 records. After implementing these exclusion criteria, the final sample size was reduced to 10,957 observations (Table 2, Panel A).

When examining the sector-level sampling distributions, we observed that the ratios varied across different sectors. The range of ratios spanned from 1.59% in the Utilities sector to 20.54% in the Industrials sector. Furthermore, when considering the year-level distributions, our study encompassed data from the periods spanning 2002 to 2021. The range of ratios extended from 0.10% in the year 2006 to 12.81% in the year 2020. These sector-level and year-level distributions, as presented in Table 2, Panel B, provide valuable insights into the composition and distribution of observations within our sample.

In terms of the country-level sampling distributions, our study encompasses data from a total of 33 countries. Within these countries, we have identified and included data from 1,953 unique firms. The overall sample size consists of 10,957 data points. These country-level sampling distributions, as presented in Table 2, Panel C.

INSERT TABLE 2 HERE

3.3 Research models

---

[7] Our sample is largely constrained by the availability of waste data.
[8] The inclusion of countries with a small number of observations might not yield reliable results.

The research models we have developed incorporate country, industry, and year-fixed effects to account for the potential heterogeneity across these factors. To capture these fixed effects, we include country, industry, and year variables as dummy variables in our regression model. This approach, known as the Least Squares Dummy Variable (LSDV) method, allows us to control heterogeneity by assigning each entity its own intercept. By employing the LSDV method, we can effectively address country, industry, and year-specific heterogeneity. This methodology, as described by Gujarati (2014), provides a reliable means to control for heterogeneity and capture the fixed effects associated with country, industry, and year groups. By incorporating the LSDV method in our research models, we aim to eliminate the potential bias introduced by unobserved heterogeneity and ensure that our analysis accurately captures the relationship between the independent and dependent variables while accounting for the specific contexts provided by country, industry, and year factors.

The linear associations are formulated using the equation (1) below.

$$(Y)_{i,t,c} = \beta_0 + \beta_1(X)_{i,t,c} + \beta_2(Controls)_{i,t,c} + \beta_3\sum(Country)_c + \beta_4\sum(Industry)_i + \beta_5\sum(Year)_t + \varepsilon_{i,t,c} \qquad (1)$$

where i, t, and c refer to firm, year, and country respectively.

In our study, the dependent variable (Y) encompasses various waste management proxies. These proxies include WRR, Waste/Sales, LnTW, and LnHW and LnNHW. H1 implies that Internationalization is negatively associated with waste recycling (WRR) but positively associated with waste production (Waste/Sales, LnTW, and LnHW and LnNHW). On the other hand, the independent testing variable of interest (X) represents Internationalisation. In addition to the dependent variable (Y) and the independent testing variable of interest (X), our research model incorporates several control variables. These control variables are included to account for other

factors that may influence the relationship between firm Internationalisation and waste management proxies. The control variables used in our study are as follows: Bsize, Bindependence, CEOduality, Fsize, ROA, Leverage, Liquidity, Cexpenditure, RDexpenditure, FFloat, WGI, and GDP which are described in the variable section in detail.

To examine the moderating effect of Bgdiversity and Btenure, we incorporate them into our research model using equation (2). This equation is formulated based on the country, industry, and year fixed-effects regression model.

$$(Y)_{i,t,c} = \beta_0 + \beta_1(X)_{i,t,c} + \beta_2(M)_{i,t,c} + \beta_3(X*M)_{i,t,c} + \beta_4(Controls)_{i,t,c} + \beta_5\sum(Country)_c +$$
$$\beta_6\sum(Industry)_i + \beta_7\sum(Year)_t + \varepsilon_{i,t,c} \tag{2}$$

where i, t, and c refer to firm, year, and country respectively.

In equation (2), the dependent variables (Y) represent the waste management proxies, including WRR, LnTW, Waste/Sales, LnHW, and LnNHW. The testing variable of interest (X) is firm Internationalisation. The moderating variable (M) is Bgdiversity and Btenure. The interaction term (X*M) in equation (2) represents the interaction between the firm Internationalisation (X) and the board gender diversity as well as board tenure (M). This interaction term allows us to examine how the relationship between firm Internationalisation and waste management is influenced by the level of board gender diversity and board tenure.

In our regression analysis, we address the heteroscedasticity issue by reporting robust standard errors clustered by firms (Wooldridge, 2010). This enables us to account for the potential correlation of errors within firms, which may arise from various factors and reflect underlying heterogeneity within firms. By clustering the standard errors at the firm level, we acknowledge

that there may be a correlation among the observations within the same firm. Clustering the standard errors in this manner allows us to obtain more accurate estimates of the standard errors, resulting in more precise and reliable inferences about the coefficients in our regression model.

4. Findings

4.1. Descriptive statistics

In Table 3, we present the summary statistics of the research variables, with a particular focus on the waste management proxies. First, the mean value of the Waste Recycling Ratio (WRR) is approximately 61.15%. Second, the mean value of Waste/Sales is 0.002. The average value of LnTW (Natural Logarithm of Amount of Waste Produced in Tons) is 10.83. Third, the mean value of LnHW (Natural Logarithm of Amount of Hazardous Waste) is 7.71. Finally, the average value of LnNHW (Natural Logarithm of Amount of Non-Hazardous Waste) is 10.81. The summary statistics provide an overview of the waste management proxies, giving us insights into the average levels and variations of these variables in the research sample.

About the testing variable of interest, the mean value of firm Internationalisation with international sales scaled by total sales (Internationalisation) is 54.95. As for the moderating variables, the mean proportion of female directors on the board (Bgdiversity) is 18.87%. Additionally, the average number of years each board member has been on the board (Btenure) is 7.01 years. These summary statistics provide valuable insights into the characteristics of the testing variable (Internationalisation) and the two moderating variables (Bgdiversity and Btenure) in the research sample.

INSERT TABLE 3 HERE

20

4.2. Correlation analysis

In Table 4, we present the linear pair-wise Pearson's correlation coefficients between firm Internationalisation and waste management proxies. The results indicate that there is a linear and significantly negative correlation between firm Internationalisation and WRR, whereas there is a linear and significantly positive correlation between firm Internationalisation and LnTW, Waste/Sales, LnHW, and LnNHW ($p<0.05$).

Multicollinearity: In our analysis, we assessed the presence of multicollinearity among the independent variables of the baseline research models. To do this, we calculated the variance inflation factors (VIF) for each independent variable. The VIF values ranged between 1.03 and 3.03. It is important to note that VIF values below 10 are generally considered to indicate no significant multicollinearity among the independent variables (Rencher, 2002). In our case, all VIF values are well below this threshold, with the highest value being 3.03. This suggests that there is no substantial multicollinearity issue among the independent variables in the baseline research models.

INSERT TABLE 4 HERE

4.3. Baseline analysis

In our analysis, we investigated the linear baseline research models using regression analysis with country, industry, and year-fixed effects. The results of this analysis are presented in Table 4. Based on the findings, we observe that Internationalisation demonstrates a significantly positive relationship with most of the waste management proxies, except WRR. This means that as the level of firm Internationalisation increases, there is a positive association with LnTW,

Waste/Sales, LnHW, and LnNHW. However, there is no significant relationship between Internationalisation and WRR. Nevertheless, we would like to note that we found a significant negative relationship between Internationalisation and WRR when we use an alternative Internationalisation proxy (Foreign Assets/Total assets) in the robustness test[9]. In consequence, the results confirm H1 such that greater internationalisation leads to better waste management.

INSERT TABLE 5 HERE

In our moderation analysis, we investigated the moderating role of Bgdiversity between firm Internationalisation and various waste management proxies. The results of this analysis are presented in Table 6. According to the findings, the interaction term Internationalisation*Bgdiversity has a significantly negative relationship with the majority of the waste management proxies, including LnTW, Waste/Sales, and LnNHW. This suggests that the joint effect of firm Internationalisation and board gender diversity has a negative influence on these waste production indicators. However, it is important to note that the interaction term Internationalisation*Bgdiversity does not have a significant association with WRR and LnHW. This finding partially supports H2 such that female directors help internationalised firms engage with better waste management by reducing waste amount.

INSERT TABLE 6 HERE

In our analysis, we also explored the moderating role of Btenure on the relationship between firm Internationalisation and various waste management proxies. The results of this examination are presented in Table 7. According to the findings, the interaction term

---

[9] We discuss the outcome of this additional test in the robustness section.

Internationalisation*Btenure has a significantly negative relationship with the majority of the waste management proxies, including LnTW, LnHW, and LnNHW. This suggests that the joint effect of firm Internationalisation and board tenure has a negative influence on these waste production indicators. On the other hand, the interaction term Internationalisation*Btenure does not have a significant impact on WRR and Waste/Sales. This finding partially supports H3 such that tenured directors significantly moderate between Internationalisation and waste management by diminishing waste production.

INSERT TABLE 7 HERE

Overall, it appears that female and tenured directors help reduce waste amount in international firms but do not improve waste recycling.

4.4. Robustness checks

In our study, we sought to ensure the robustness of the baseline analysis by employing several alternative methodologies. These methodologies include the one-year lag model, the Generalized Method of Moments (GMM)-based dynamic panel regression analysis, Two-Stage Least Squares (2SLS) regression analysis, Entropy balancing, and propensity score matching (PSM) approaches.

In our baseline research models, we initially incorporated the one-year lag of the independent variables to reinforce the causality between Internationalisation and waste management. By employing the one-year lag regression model, we also aimed to capture any time-dependent associations and account for temporal effects. This approach offers several advantages in our analysis. Firstly, it helps us control autocorrelation, address the omitted variable bias

problem (Brown and Warner, 1985), and minimize the risk of reverse causality (Steinberg & Malhotra, 2014). The findings obtained through the one-year lag model approach are presented in Table 8. The results are consistent with the initial analysis results supporting that cross-border operations might cause pollution in the subsequent period as well.

INSERT TABLE 8 HERE

As a second step, we utilized dynamic panel regression analysis based on the GMM estimator to address potential endogeneity issues and mitigate biases that may arise from reverse causality or omitted variable biases (Arellano and Bond, 1991). The results presented in Table 9 show that the baseline findings hold again.

INSERT TABLE 9 HERE

Moreover, to address the endogeneity issue and potential biases arising from omitted variable bias, simultaneous causality, sample selection, or measurement error (Hill et al., 2021), we employed 2SLS regression analysis. In our 2SLS regression analysis, we used the one-year lag of Internationalisation and the industry year average of Internationalisation, excluding focal firms, as the instrumental variables by providing exogenous sources of variation for the independent variable, which allows us to isolate the causal effect more accurately (Wooldridge, 2010). We report the first stage, second stage, Wu-Hausman test of endogeneity, overidentifying restriction test, and weak instrument test in Table 10. The results of the first stage analysis demonstrated the significance of the coefficients of the instrumental variables, thereby satisfying the relevance of the selected instruments. Additionally, the Durbin-Wu-Hausman test for endogeneity indicated that Internationalisation(t-1) and Internationalisation-IndAve are endogenous regressors. Moreover, the outcomes of the overidentifying restrictions test suggested that

24

Internationalisation(t-1) and Internationalisation-IndAve are valid instruments. Finally, the results of the weak instrument test revealed that Internationalisation(t-1) and Internationalisation-IndAve are not weak, as the test statistics values exceed the suggested threshold of ten. After addressing endogeneity with 2SLS, the baseline results are confirmed.

INSERT TABLE 10 HERE

In addition to the previous methodologies, we applied two further approaches, namely entropy balancing and PSM, to address the endogeneity issues in our research. The PSM approach (Leuven and Sianesi, 2003), estimates propensity scores representing the conditional probability of receiving treatment (in our case, firm Internationalisation) given observed covariates. By matching treated and control groups using the propensity scores, PSM creates comparable groups with similar observed characteristics, effectively removing bias due to all observed covariates (Rosenbaum & Rubin, 1983). This approach helps to achieve a covariate balance between the treated and control groups and ensures a more accurate estimation of the causal effects of firm Internationalisation on waste management proxies.

To address the endogeneity concerns, we employed the entropy balance method (Hainmueller, 2012) as a further approach. The entropy balancing method is a weighting technique that aims to minimize the covariate imbalance between the treatment and control groups by assigning appropriate weights to each observation based on their covariate characteristics. This reweighting process ensures that the control group matches the covariate moments of the treatment group (Hainmueller, 2012), resulting in improved covariate balance. The entropy balancing approach was chosen based on recent research to mitigate self-selection bias that may arise from observable characteristics (Hainmueller, 2012; Fei, 2022). By employing this method, we create

more comparable treatment and control groups, reducing the potential bias introduced by self-selection.

In both PSM and entropy balancing approaches, we defined the treatment group with the observations of the top quartile of firm Internationalisation, assigned a value of one, while the control group consists of the remaining observations with lower levels of Internationalisation, assigned a value of zero. The results of the PSM and entropy balancing methods reported in Table 11 and Table 12, respectively confirm the baseline findings again.

INSERT TABLE 11 HERE

INSERT TABLE 12 HERE

Finally, although the proxy we used for internationalization[10], defined as the ratio of foreign sales to total sales, is widely used in the literature, but it may not fully capture the relationship between internationalization and waste management. One key aspect that this proxy might overlook is the operational and production facilities and assets abroad. Considering that the international companies in the sample are likely to operate across multiple regions, a high level of internationalization may also be reflected in the geographic dispersion of their production facilities and assets, which can influence waste management practices independently of their sales distribution. Thus, we integrated an alternative test variable (Kuzey et al., 2024), Internationalisation_alt (calculated by Foreign assets/Total assets)*,* into our baseline model and re-ran the analysis. The findings remain largely consistent with the initial results indicating that international firms are weak in waste management (see Table 13). Indeed, this alternative

---

[10] We thank the anonymous reviewer for this insightful suggestion.

internationalisation proxy has produced a stronger negative association with waste recycling ratio than baseline analysis. This might imply that international firms with foreign production facilities and assets are weaker in waste management exploiting local institutional arbitrage.

INSERT TABLE 13 HERE

The consistent results across the GMM-based dynamic panel regression analysis, 2SLS regression analysis, entropy balancing, PSM, and incorporating an alternative test variable further validate the robustness of our findings. By employing these diverse methodologies, we have effectively addressed potential endogeneity concerns and obtained reliable estimates for the relationships between firm Internationalisation and waste management proxies. The obtained results are robust to various methodologies and approaches.

4.5. Further tests

We conducted three further tests to explore whether the association between Internationalisation and waste management varies across periods, polluting versus non-polluting sectors, and high- and low-WGI countries respectively. While the first test is conducted to see if the waste management of multinational firms ameliorates or exacerbates over time, the sectoral test is conducted to see whether mimetic factors proposed by the institutional theory play a role in multinationals' waste management practices. Finally, the WGI test is conducted to explore if coercive factors posited by the institutional theory play a role in multinationals' waste management.

Overall, with those further tests, we find that the results do not diverge at all in earlier versus recent periods (Table 14), polluting versus non-polluting industries (Table 15), and high-

and low-WGI countries (Table 16). They are largely converging to the baseline findings. However, the first exception is that while the link between Internationalisation and hazardous waste production in non-polluting industries is significant and positive, it is not significant in polluting industries. This might imply that non-polluting industries are less regulated and also escape from the scrutiny of stakeholders. Second, while the link between Internationalisation and non-hazardous waste production in multinationals domiciled in low-WGI countries is significant and positive, it is not significant in multinationals domiciled in high-WGI countries. This means that a poor institutional environment triggers greater environmental exploitation of multinationals which suggests policymaking implications for low-WGI countries.

INSERT TABLE 14

INSERT TABLE 15

INSERT TABLE 16

5. Discussions

Despite the growing interest of practitioners and academics in climate change issues and ecological concerns, waste management has not received sufficient attention from them. Waste production is considered a major source of hazardous emissions, and its negative effect on climate change and other environmental concerns is inevitable (Clifford, 2021; Konadu et al., 2022). In addition, multinational firms are intensively engaged with waste production given that their manufacturing, sales, and/or logistics operations are cross-border. Thus, waste management in multinational firms is essential to contribute to a cleaner world. Despite recent studies on waste management of firms, multinational firms are yet to be the focus of a separate research study.

Lastly, by focusing on two critical board attributes, we investigate whether female and tenured directors help enable multinationals' better waste management. The investigation of the subject is important for policy-making as well.

We find that multinational firms produce more waste; this result is robust to various waste proxies such as total waste, hazardous and non-hazardous waste, and waste scaled by turnover. Although they tend to engage with less recycling, the result is not significant. However, when we adopt the foreign assets ratio for the internationalization proxy, the negative association holds meaning that international firms are engaged with less waste recycling. Furthermore, we find that both female and tenured directors significantly moderate between Internationalisation and waste management; they help reduce waste in multinational firms. However, they can not significantly moderate between Internationalisation and waste recycling in multinational firms which seems a missing link in better waste management of multinationals. With further tests, we find that the results are largely alike in earlier and recent periods, polluting versus non-polluting industries, and high- and low-WGI countries. The exceptions are that; first, while the link between Internationalisation and hazardous waste production in non-polluting industries is significant and positive, it is not significant in polluting industries, and second, while the link between Internationalisation and non-hazardous waste production in multinationals domiciled in low-WGI countries is significant and positive, it is not significant in multinationals domiciled in high-WGI countries.

The findings confirm the 'pollution haven hypothesis' which posits that internationalised firms transfer their operations to foreign countries with lax environmental laws and regulations and cause environmental pollution by producing more waste (Candau and Dienesch, 2017; Li and Zhou, 2017; Gómez-Bolaños et al., 2020). Thus, internationalised firms tend to diversify their

operations in overseas markets to exploit market imperfections characterised by weak environmental regulations, low costs of labour, and rich sources of raw materials (Surroca et al., 2013; Gómez-Bolaños et al, 2020). The results also confirm that internationalised firms may escape from the area of high pressure towards a sphere of low pressure to benefit from lax regulations but still maintain their corporate legitimacy in their operating environment (Sharfman et al., 2004; Surroca et al., 2013). Indeed, our finding confirms Tearfund's (an international Christian relief and development agency based in the UK)[11] report that multinationals dump their waste into emerging countries with weak waste management systems.

On the other hand, the findings confirm the upper echelon's role in better waste management. In line with this theory, we found that female and tenured directors help international firms reduce their waste. Previously, Shahab et al. (2022) found that female directors are helpful in reducing firms' waste production, so we extend their study by exploring female directors' usefulness in international firms in that respect. Indeed, Kuzey et al. (2024) recently also indicated that international firms prefer to have fewer women on their boards due to their risk or investment preferences. However, our finding indicates that female directors may help international firms protect their legitimacy by developing waste management policies and practices.

Given that there are two opposing views about tenured directors' position concerning sustainability issues, our finding supports a favourable perspective indicating their utility in lessening waste production of international firms. Although earlier studies argue that tenured directors are rigid and more resistant to strategic change that stakeholders expect (Finkelstein and Hambrick, 1990), recent studies are more positive about their engagement for long-term projects

---

[11] See the website in the Introduction section.

such as sustainability (Chen et al., 2019; Al-Shaer et al., 2023b). This might mean that they are increasingly recognizing stakeholders' non-financial concerns beyond financial ones. Our finding supports Gallego-Álvarez and Rodriguez-Dominguez (2023) and Paolone et al. (2023) showing tenured directors' contribution to environmental sustainability positively.

In line with the resource dependency theory, female and tenured directors are rich sources of board capital that aligns the interests of firms with those of stakeholders by helping internationalised firms operate in a more sustainable way and with a long-term perspective (Veprauskaitė and Adams, 2013; Konadu et al., 2022; Al-Shaer et al., 2023b; Gull et al., 2023). While female directors might help international firms build a network of connections with civil society and environmental and social organizations, and tenured directors might help them access a broad network of connections in the industry and transfer recent cutting-edge developments.

6. Implications and avenues for future research

We draw several theoretical implications drawing on our findings. The results imply that international firms might be exploiting institutional arbitrage and hence shifting their operations toward pollution havens as civil organizations also voice such concern. This means that the world is becoming polluted with big multinationals' operations in weakly regulated environments which implies shifting the problem to another geography. Solutions could be strengthening the environmental regulations all around the world and strengthening the upper echelon of firms. Our findings confirm that top management team characteristics are of critical importance in reducing waste and contributing to the resolution of climate change.

Practical implications are that multinationals pollute the environment by producing more waste and not engaging in waste recycling. Especially, using recyclable materials in packaging

and transforming the supply chain towards greener practices are of critical importance in multinational firms' better waste management. Given the cross-border scale of their manufacturing, sales, and/or logistics operations, the findings are of critical importance for multinationals, their governance structure, and stakeholders. We posit that international firms are more exposed to visibility, and hence are under scrutiny of stakeholders such as regulatory bodies, the press, and environmentalists. Waste production and lack of waste recycling might trigger legitimacy concerns and incompatibility sanctions. Although they may not be sanctioned by the local authorities sufficiently, international stakeholders and observers scrutinize them which might cause a backlash, legitimacy concerns, and customer boycotts[12].

Concerning the female and tenured directors' role, it is useful to highlight that their role in waste recycling is limited although they help reduce waste. Thus, the board capital needs to focus on recycling waste for resource-saving and polluting the environment less. The moderating analyses indicated the influential effect of female and tenured directors on the waste management of multinationals which suggests they re-shape their corporate boards aligning the interests of shareholders and stakeholders. Policymakers also might suggest to firms how to shape boards for better environmental sustainability as some nations impose gender quotas.

Given that the results do not vary over the periods in further tests, there is no substantial improvement in the situation over time. For example, taking into account that the recent period overlaps with the post-Paris treaty period in our analysis, the lack of any significant change implies that there is no amelioration in the waste management behaviour of international firms. Again, this might be the result of shifting international operations towards pollution havens. Thus, maybe,

---

[12] Coca-Cola, criticized for plastic pollution, pledges 25% reusable packaging | Reuters

tougher transnational sanctions and stakeholder pressure are needed to mitigate pollution for better waste management. In line with other further tests, multinationals in non-polluting sectors produce more hazardous waste than polluting ones; this could be probably due to the rogatory bodies' focus on polluting sectors. Thus, stakeholders need to keep an eye on both non-polluting sectors as well as polluting sectors. In addition, it appears that weak public governance triggers multinationals' greater waste production which invites policymakers to be more vigilant in such institutional environments.

Our sample is bounded by the limited number of observations having waste data which might be useful for readers in assessing the results. Due to this limitation, our sample is unbalanced. Future studies could expand the discussion on drivers and consequences of waste production and management. For example, they can assess the effect of stakeholder power (e.g., environmentalists and press) on multinationals' waste management practices, and whether waste management has a consequence on firm market and operational performance. Future studies can also investigate whether internal sustainability governance and practices such as sustainability committees and sustainable supply chain practices reinforce waste management practices in multinationals. Finally, as our study finds that waste recycling is the weak point that female and tenured directors cannot improve in international firms, future studies could deepen the investigation on the internal and external drivers of waste recycling in international firms.

References

Aabo, T., Pantzalis, C., & Park, J. C. (2015). Multinationality and opaqueness. *Journal of Corporate Finance*, *30*, 65-84.

Aguilera, R. V., Ciravegna, L., Cuervo-Cazurra, A., & Gonzalez-Perez, M. A. (2017). Multilatinas and the internationalization of Latin American firms. *Journal of World Business*, *52*(4), 447-460.

Ahsan, T., Albitar, K., Gull, A. A., & Hussainey, K. (2024). Does climate governance affect waste disclosure? Evidence from the US. *Applied Economics*, *56*(43), 5146-5162.

Albitar, K., Al-Shaer, H., & Liu, Y. S. (2023). Corporate commitment to climate change: The effect of eco-innovation and climate governance. *Research Policy*, *52*(2), 104697.

Albitar, K., Nasrallah, N., Hussainey, K., & Wang, Y. (2024). Eco-innovation and corporate waste management: The moderating role of ESG performance. *Review of Quantitative Finance and Accounting*, 1-25.

Al-Shaer, H., & Zaman, M. (2016). Board gender diversity and sustainability reporting quality. *Journal of Contemporary Accounting & Economics*, *12*(3), 210-222.

Al-Shaer, H., Albitar, K., & Liu, J. (2023a). CEO power and CSR-linked compensation for corporate environmental responsibility: UK evidence. *Review of Quantitative Finance and Accounting*, *60*(3), 1025-1063.

Al-Shaer, H., Kuzey, C., Uyar, A., & Karaman, A. S. (2023b). Corporate strategy, board composition, and firm value. *International Journal of Finance & Economics*, in press, https://doi.org/10.1002/ijfe.2827.

Al-Shaer, H., Liu, Y. S., & Albitar, K. (2024). Driving businesses towards a better climate: Macro and micro mechanisms to protect the planet. *Business Strategy and the Environment*, *33*(3), 1810-1833.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), 277-297.

Atif, M., Hossain, M., Alam, M. S., & Goergen, M. (2021). Does board gender diversity affect renewable energy consumption?. *Journal of Corporate Finance*, *66*, 101665.

Attig, N., Boubakri, N., El Ghoul, S., & Guedhami, O. (2016). Firm internationalization and corporate social responsibility. *Journal of Business Ethics*, *134*, 171-197.

Benjamin, S. J., Biswas, P. K., Wellalage, N. H., & Man, Y. (2023). Environmental disclosure and its relation to waste performance. *Meditari Accountancy Research*, *31*(6), 1545-1577.

Bhandari, K. R., Zámborský, P., Ranta, M., & Salo, J. (2023). Digitalization, internationalization, and firm performance: A resource-orchestration perspective on new OLI advantages. *International Business Review*, 102135.

Branco, M. C., & Rodrigues, L. L. (2006). Corporate social responsibility and resource-based perspectives. *Journal of Business Ethics*, *69*, 111-132.

Brown, S. J., & Warner, J. B. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics*, 14(1), 3–31.

Campbell, J. T., Eden, L., & Miller, S. R. (2012). Multinationals and corporate social responsibility in host countries: Does distance matter?. *Journal of International Business Studies*, *43*, 84-106.

Candau, F., & Dienesch, E. (2017). Pollution haven and corruption paradise. *Journal of Environmental Economics and Management*, *85*, 171-192.

Capar, N., & Kotabe, M. (2003). The relationship between international diversification and performance in service firms. *Journal of International Business Studies*, 34, 345-355.

Carpenter, M. A., Geletkanycz, M. A., & Sanders, W. G. (2004). Upper echelons research revisited: Antecedents, elements, and consequences of top management team composition. *Journal of Management*, *30*(6), 749-778.

Chen, H. L. (2011). Does board independence influence the top management team? Evidence from strategic decisions toward internationalization. *Corporate Governance: An International Review*, *19*(4), 334-350.

Chen, S., Ni, X., & Tong, J. Y. (2016). Gender diversity in the boardroom and risk management: A case of R&D investment. *Journal of Business Ethics*, *136*, 599-621.

Chen, W. T., Zhou, G. S., & Zhu, X. K. (2019). CEO tenure and corporate social responsibility performance. *Journal of Business Research*, *95*, 292-302.

Cho, E., Chun, S., & Choi, D. (2015). International diversification, corporate social responsibility, and corporate governance: Evidence from Korea. *Journal of Applied Business Research*, *31*(2), 743.

Clifford, C. (2021). Trillions of pounds of trash: New technology tries to solve an old garbage problem. Consumer News and Business Channel. Available at https://www. cnbc.com/2021/05/29/can-new-technology-solve-a-trillion-pound-garbage-problem.html

Contractor, F. J., Kumar, V., & Kundu, S. K. (2007). Nature of the relationship between international expansion and performance: The case of emerging market firms. *Journal of World Business*, *42*(4), 401-417.

Copeland, B. R., & Taylor, M. S. (2004). Trade, growth, and the environment. *Journal of Economic literature*, *42*(1), 7-71.

Cox, N. (2006). *WINSOR: Stata module to Winsorize a variable*. Statistical Software Components S361402, Boston College Department of Economics, Massachusetts, US.

Elsbach, K. D., & Sutton, R. I. (1992). Acquiring organizational legitimacy through illegitimate actions: A marriage of institutional and impression management theories. *Academy of Management Journal*, *35*(4), 699-738.

Fei, X. (2022). Nondisclosure and analyst behavior: Evidence from redaction of proprietary information from public filings. *Journal of Corporate Finance*, *72*, 102166.

Finkelstein, S., & Hambrick, D. C. (1990). Top-management-team tenure and organizational outcomes: The moderating role of managerial discretion. *Administrative Science Quarterly*, 484-503.

Galia, F., & Zenou, E. (2012). Board composition and forms of innovation: does diversity make a difference?. *European Journal of International Management*, *6*(6), 630-650.

Gallego-Álvarez, I., & Rodriguez-Dominguez, L. (2023). Board of directors and environmental practices: the effect of board experience, culture, and tenure. *Environment, Development and Sustainability*, 1-26.

Geringer, J. M., Tallman, S., & Olsen, D. M. (2000). Product and international diversification among Japanese multinational firms. *Strategic Management Journal*, *21*(1), 51-80.

Gómez-Bolaños, E., Hurtado-Torres, N. E., & Delgado-Márquez, B. L. (2020). Disentangling the influence of internationalization on sustainability development: Evidence from the energy sector. *Business Strategy and the Environment*, *29*(1), 229-239.

Gujarati, D. (2014). Econometrics by example. Bloomsbury Publishing.

Gull, A. A., Atif, M., & Hussain, N. (2023). Board gender composition and waste management: Cross-country evidence. *The British Accounting Review*, *55*(1), 101097.

Gull, A. A., Luong, H., & Nadeem, M. (2024). Board co-option and corporate environmental orientation: New insights from the waste management perspective. *Corporate Governance: An International Review*, in press, https://doi.org/10.1111/corg.12567

Gull, A. A., Nekhili, M., Nagati, H., & Chtioui, T. (2018). Beyond gender diversity: How specific attributes of female directors affect earnings management. *The British Accounting Review*, *50*(3), 255-274.

Hainmueller, J. (2012). Entropy Balancing for Causal Effects: A Multivariate Reweighting Method to Produce Balanced Samples in Observational Studies. *Political Analysis*, 20(1), 25–46.

Hair Jr, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis*. Cengage Learning, Hampshire, United Kingdom.

Hajela, A., & Akbar, M. (2013). Internationalisation of small and medium software firms from India. *International Journal of Technological Learning, Innovation and Development 2*, *6*(1-2), 88-101.

Hambrick, D. C. (2007). Upper echelons theory: An update. *Academy of Management Review*, *32*(2), 334-343.

Hill, A. D., Johnson, S. G., Greco, L. M., O'Boyle, E. H., & Walter, S. L. (2021). Endogeneity: A review and agenda for the methodology-practice divide affecting micro and macro research. *Journal of Management*, 47(1), 105-143.

Hillman, A. J., Withers, M. C., & Collins, B. J. (2009). Resource dependence theory: A review. *Journal of Management*, *35*(6), 1404-1427.

Hoobler, J. M., Masterson, C. R., Nkomo, S. M., & Michel, E. J. (2018). The business case for women leaders: Meta-analysis, research critique, and path forward. *Journal of Management*, *44*(6), 2473-2499.

Javidan, M., Bullough, A., & Dibble, R. (2016). Mind the gap: Gender differences in global leadership self-efficacies. *Academy of Management Perspectives*, *30*(1), 59-73.

Kaczmarek, S., & Ruigrok, W. (2013). In at the deep end of firm internationalization: Nationality diversity on top management teams matters. *Management International Review*, *53*, 513-534.

Kang, J. (2013). The relationship between corporate diversification and corporate social performance. *Strategic Management Journal*, *34*(1), 94-109.

Konadu, R., Ahinful, G. S., Boakye, D. J., & Elbardan, H. (2022). Board gender diversity, environmental innovation and corporate carbon emissions. *Technological Forecasting and Social Change*, *174*, 121279.

Kostova, T., & Zaheer, S. (1999). Organizational legitimacy under conditions of complexity: The case of the multinational enterprise. *Academy of Management Review*, *24*(1), 64-81.

Kuzey, C., Fritz, M. M., Uyar, A., & Karaman, A. S. (2022). Board gender diversity, CSR strategy, and eco-friendly initiatives in the transportation and logistics sector. *International Journal of Production Economics*, *247*, 108436.

Kuzey, C., Gerged, A. M., Uyar, A., & Karaman, A. S. (2024). Rethinking board structures in the age of multinational corporations: A global investigation. *Journal of International Management*, *30*(5), 101175.

Leal Filho, W., Platje, J., Gerstlberger, W., Ciegis, R., Kääriä, J., Klavins, M., & Kliucininkas, L. (2016). The role of governance in realising the transition towards sustainable societies. *Journal of Cleaner Production*, *113*, 755-766.

Leuven, E., and Sianesi, B. (2003). PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing. *Statistical Software Components S432001*, Boston College Department of Economics.

Lewis, B. W., Walls, J. L., & Dowell, G. W. (2014). Difference in degrees: CEO characteristics and firm environmental disclosure. *Strategic Management Journal*, *35*(5), 712-722.

Li, X., & Zhou, Y. M. (2017). Offshoring pollution while offshoring production?. *Strategic Management Journal*, *38*(11), 2310-2329.

Matta, E., & Beamish, P. W. (2008). The accentuated CEO career horizon problem: Evidence from international acquisitions. *Strategic Management Journal*, *29*(7), 683-700.

Oliver, C. (1991). Strategic responses to institutional processes. *Academy of Management Review*, *16*(1), 145-179.

Paolone, F., Pozzoli, M., Cucari, N., & Bianco, R. (2023). Longer board tenure and audit committee tenure. How do they impact environmental performance? A European study. *Corporate Social Responsibility and Environmental Management*, *30*(1), 358-368.

Pergelova, A., Manolova, T., Simeonova-Ganeva, R., & Yordanova, D. (2019). Democratising entrepreneurship? Digital technologies and the internationalisation of female-led SMEs. *Journal of Small Business Management*, *57*(1), 14-39.

Popli, M., Ahsan, F. M., & Mukherjee, D. (2022). Upper echelons and firm internationalization: A critical review and future directions. *Journal of Business Research*, *152*, 505-521.

Post, C., Rahman, N., & Rubow, E. (2011). Green governance: Boards of directors' composition and environmental corporate social responsibility. *Business & Society*, *50*(1), 189-223.

Ren, G., & Zeng, P. (2022). Board gender diversity and firms' internationalisation speed: the role of female directors' characteristics. *Baltic Journal of Management*, *17*(1), 72-88.

Rencher, A. C. (2002). Linear models in statistics. New York, NY: Wiley.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, *70*(1), 41-55.

Sanders, W. G., & Carpenter, M. A. (1998). Internationalization and firm governance: The roles of CEO compensation, top team composition, and board structure. *Academy of Management Journal*, *41*(2), 158-178.

Shahab, Y., Gull, A. A., Rind, A. A., Sarang, A. A. A., & Ahsan, T. (2022). Do corporate governance mechanisms curb the anti-environmental behavior of firms worldwide? An illustration through waste management. *Journal of Environmental Management*, *310*, 114707.

Sharfman, M. P., Shaft, T. M., & Tihanyi, L. (2004). A model of the global and institutional antecedents of high-level corporate environmental performance. *Business & Society*, *43*(1), 6-36.

Singla, C., & George, R. (2013). Internationalization and performance: A contextual analysis of Indian firms. *Journal of Business Research*, *66*(12), 2500-2506.

Steinberg, David A., and Krishna Malhotra (2014). The Effect of Authoritarian Regime Type on Exchange Rate Policy. *World Politics,* 66(3): 491-529.

Strike, V. M., Gao, J., & Bansal, P. (2006). Being good while being bad: Social responsibility and the international diversification of US firms. *Journal of International Business Studies*, *37*, 850-862.

Surroca, J., Tribó, J. A., & Zahra, S. A. (2013). Stakeholder pressure on MNEs and the transfer of socially irresponsible practices to subsidiaries. *Academy of Management Journal*, *56*(2), 549-572.

Uyar, A., Al-Shaer, H., Kuzey, C., & Karaman, A. S. (2024). Do foreign directors reinforce better waste management? The moderating role of eco-innovation. *Business Strategy and the Environment, 33*(3), 2040-2065.

Uyar, A., Kuzey, C., Gerged, A. M., & Karaman, A. S. (2023). Research and development intensity, environmental performance, and firm value: Unraveling the nexus in the energy sector worldwide. *Business Strategy and the Environment*, *32*(4), 1582-1602.

Veprauskaitė, E., & Adams, M. (2013). Do powerful chief executives influence the financial performance of UK firms?. *The British Accounting Review*, *45*(3), 229-241.

Verardi, V., & Dehon, C. (2010). Multivariate outlier detection in Stata. *The Stata Journal*, 10(2), 259-266.

Westhead, P., Wright, M., & Ucbasaran, D. (2001). The internationalization of new and small firms: A resource-based view. *Journal of Business Venturing*, *16*(4), 333-358.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press, Cambridge, MA, US.

Xie, Q. (2014). CEO tenure and ownership mode choice of Chinese firms: The moderating roles of managerial discretion. *International Business Review*, *23*(5), 910-919.

Yong, H. H. A., & Laing, E. (2021). Stock market reaction to COVID-19: Evidence from US Firms' International exposure. *International Review of Financial Analysis*, *76*, 101656.

Zaman, R., Asiaei, K., Nadeem, M., Malik, I., & Arif, M. (2024). Board demographic, structural diversity, and eco-innovation: International evidence. *Corporate Governance: An International Review*, *32*(3), 374-390.

Zhang, G., Wang, L., Guo, F., & Yang, G. (2021). Does corporate internationalization affect corporate social responsibility? Evidence from China. *Emerging Markets Review*, *46*, 100794.

Table 1: Variables

WRR	Waste recycling ratio = (waste recycled/total waste)*100.
LnTW	Natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons.
Waste/Sales	Total amount of waste divided by total sales.
LnHW	Natural logarithm of the total amount of hazardous waste produced in tons.
LnNHW	Natural logarithm of the total amount of non-hazardous waste produced in tons.
Internationalisation	The proportion of international sales to total sales.
Bgdiversity	Female directors' proportion on board.
Btenure	The average number of years each board member has been on the board.
Bsize	Number of directors on board.
Bindependence	Independent directors' proportion on board.
CEOduality	CEO duality which is an indicator variable taking 1 if board chair and CEO positions are held by the same person, and 0 otherwise.
Fsize	Natural logarithm of total assets.
ROA	Income before tax scaled by total assets.
Leverage	Total debt is scaled by total assets.
Liquidity	Current assets are scaled by total current liabilities.
Cexpenditure	Capital expenditures are scaled by total assets.
RDexpenditure	Research and development expenditures scaled by total assets.
FFloat	Free float percentage of shares.
WGI	Worldwide Governance Indicators' average includes political stability and absence of violence/terrorism, government effectiveness, control of corruption, voice and accountability, rule of law, and regulatory quality. (All metrics' values range from -2.5 to 2.5).
GDP	Natural logarithm of Gross Domestic Product per capita.

This table defines the variables.

Table 2: Sampling distributions

Panel A

Initial sample	75,063
(-) Financials	12,023
(-) Case wise missing records of LnTW, Waste/Sales, Internationalisation, and the controls	51,784
(-) Countries with less than ten firms	278
(-) Multivariate outliers	21
Final sample	10,957

Panel B

Variable	Category	Freq.	Percent
Sector	Basic Materials	2,187	19.96
	Consumer Cyclicals	1,719	15.69
	Consumer Non-Cyclicals	1,179	10.76
	Energy	772	7.05
	Healthcare	985	8.99
	Industrials	2,251	20.54
	Real Estate	310	2.83
	Technology	1,380	12.59
	Utilities	174	1.59
	Total	10,957	100.00
Year	2002	28	0.26
	2003	50	0.46
	2004	88	0.80
	2005	155	1.41
	2006	11	0.10
	2007	219	2.00
	2008	280	2.56
	2009	360	3.29
	2010	554	5.06
	2011	528	4.82
	2012	578	5.28
	2013	627	5.72
	2014	666	6.08
	2015	714	6.52
	2016	790	7.21
	2017	937	8.55
	2018	1,093	9.98
	2019	1,261	11.51
	2020	1,404	12.81
	2021	614	5.60
	Total	10,957	100.00

Panel C

	Country	Unique firms	Percent	Data points	Percent
1	Australia	47	2.41	334	3.05
2	Austria	22	1.13	99	0.90
3	Belgium	19	0.97	136	1.24
4	Brazil	12	0.61	31	0.28
5	Canada	62	3.17	331	3.02
6	Chile	17	0.87	94	0.86
7	China	186	9.52	512	4.67
8	Denmark	21	1.08	144	1.31
9	Finland	37	1.89	290	2.65
10	France	93	4.76	692	6.32
11	Germany	92	4.71	507	4.63
12	Hong Kong	59	3.02	253	2.31
13	India	46	2.36	216	1.97
14	Indonesia	10	0.51	41	0.37
15	Ireland; Republic of	17	0.87	123	1.12
16	Italy	52	2.66	222	2.03

17	Japan	197	10.09	1,063	9.70
18	Korea; Republic (S. Korea)	68	3.48	488	4.45
19	Malaysia	31	1.59	125	1.14
20	Mexico	17	0.87	110	1.00
21	Netherlands	32	1.64	231	2.11
22	Norway	25	1.28	153	1.40
23	Peru	11	0.56	38	0.35
24	Poland	14	0.72	63	0.57
25	Russia	17	0.87	146	1.33
26	Singapore	36	1.84	142	1.30
27	South Africa	42	2.15	253	2.31
28	Spain	42	2.15	276	2.52
29	Sweden	56	2.87	331	3.02
30	Switzerland	64	3.28	384	3.50
31	Thailand	27	1.38	84	0.77
32	United Kingdom	138	7.07	957	8.73
33	United States of America	344	17.61	2,088	19.06
	Total	1,953	100	10,957	100

This table presents the sample formation and distribution.

Table 3: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
WRR	7,817	61.153	29.308	0.000	100.000
LnTW	10,957	10.829	2.985	0.000	21.936
Waste/Sales	10,957	0.002	0.010	0.000	0.077
LnHW	6,825	7.709	3.344	0.000	21.242
LnNHW	6,776	10.810	3.271	-16.085	21.482
Internationalisation	10,957	54.947	29.920	0.479	98.010
Bgdiversity	10,906	18.871	14.032	0.000	66.667
Btenure	10,584	7.012	3.391	0.000	28.583
Bsize	10,957	10.850	3.265	4.000	21.000
Bindependence	10,957	58.144	26.689	0.000	100.000
CEOduality	10,957	0.369	0.482	0.000	1.000
Fsize	10,957	22.872	1.436	17.755	27.405
ROA	10,957	0.068	0.086	-0.672	0.362
Leverage	10,957	0.253	0.151	0.000	0.837
Liquidity	10,957	1.759	1.210	0.226	17.658
Cexpenditure	10,957	0.049	0.037	0.000	0.252
RDexpenditure	10,957	0.017	0.033	0.000	0.370
FFloat	10,957	76.129	25.635	1.517	100.000
WGI	10,957	1.100	0.604	-0.787	1.947
GDP	10,957	10.480	0.755	6.901	11.542

This table presents the descriptive statistics. All variables are defined in Table 1.

Table 4: Correlation analysis

	Variables	1	2	3	4	5	6	7	8	9	10
1	WRR	1									
2	LnTW	-0.140*	1								
3	Waste/Sales	-0.243*	0.459*	1							
4	LnHW	-0.145*	0.592*	0.122*	1						
5	LnNHW	-0.161*	0.953*	0.483*	0.492*	1					
6	Multinationality	-0.032*	0.105*	0.114*	0.155*	0.119*	1				
7	Bgdiversity	-0.001	-0.070*	-0.034*	-0.036*	-0.078*	0.107*	1			
8	Btenure	-0.039*	-0.035*	0.004	-0.089*	-0.009	0.051*	-0.021*	1		
9	Bsize	0.063*	0.231*	0.024*	0.180*	0.202*	0.019	-0.004	0.075*	1	
10	Bindependence	-0.104*	0.026*	0.058*	0.058*	0.022	0.092*	0.346*	0.047*	-0.174*	1
11	CEOduality	0.064*	-0.005	-0.078*	0.004	-0.024	-0.056*	-0.034*	0.242*	0.132*	0.031*
12	Fsize	0.024*	0.445*	-0.002	0.394*	0.374*	0.046*	-0.038*	-0.047*	0.429*	0.096*
13	ROA	0.076*	-0.048*	-0.047*	-0.014	-0.048*	0.011	0.004	0.118*	-0.023*	0.050*
14	Leverage	-0.034*	0.057*	-0.055*	-0.009	0.01	-0.081*	0.081*	-0.019*	0.091*	0.100*
15	Liquidity	-0.071*	-0.140*	0.090*	-0.049*	-0.089*	0.088*	-0.098*	0.139*	-0.159*	0
16	Cexpenditure	-0.109*	0.147*	0.142*	0.143*	0.104*	-0.01	-0.084*	-0.079*	0.015	-0.046*
17	RDexpenditure	0.059*	-0.202*	-0.060*	-0.023	-0.211*	0.110*	-0.009	0.031*	-0.028*	0.104*
18	FFloat	0.016	0.012	-0.001	0.090*	0.023	0.069*	0.127*	0.009	-0.016	0.428*
19	WGI	0.085*	-0.093*	-0.073*	0.046*	-0.034*	0.227*	0.196*	-0.033*	-0.101*	0.227*
20	GDP	0.056*	-0.098*	-0.157*	0.069*	-0.051*	0.116*	0.217*	0	-0.092*	0.265*

	Variables	11	12	13	14	15	16	17	18	19	20
11	CEOduality	1									
12	Fsize	0.143*	1								
13	ROA	0.055*	-0.042*	1							
14	Leverage	0.005	0.174*	-0.278*	1						
15	Liquidity	0.018	-0.247*	0.127*	-0.321*	1					
16	Cexpenditure	-0.072*	0.002	0.090*	-0.016	-0.037*	1				
17	RDexpenditure	0.095*	-0.014	0.078*	-0.171*	0.217*	-0.031*	1			
18	FFloat	0.074*	0.116*	0.01	0.004	0.021*	-0.060*	0.176*	1		
19	WGI	-0.048*	-0.012	-0.040*	-0.068*	0.022*	-0.101*	0.114*	0.417*	1	
20	GDP	0.062*	0.051*	-0.043*	-0.007	0.035*	-0.121*	0.160*	0.413*	0.855*	1

This table presents the correlation analysis. All variables are defined in Table 1. *p<0.05

Baseline

Table 5: The association between Internationalisation and waste management

	Expected sign for Model (1)	Model (2)-(5)	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation (H1)	−	+	-0.028	0.0075***	0.000021**	0.011***	0.0079***
			(-1.118)	(3.821)	(2.198)	(3.623)	(2.830)
Bsize	−/+	−/+	0.42*	0.014	0.000012	-0.0041	0.0067
			(1.868)	(0.771)	(0.165)	(-0.150)	(0.263)
Bindependence	+	−	0.0065	-0.0011	0.0000017	-0.00060	-0.0017
			(0.190)	(-0.479)	(0.254)	(-0.180)	(-0.557)
CEOduality	−	+	0.54	-0.029	-0.00092**	0.14	-0.059
			(0.382)	(-0.278)	(-2.356)	(0.912)	(-0.402)
Fsize	−	+	-0.36	1.00***	0.00058***	0.98***	1.01***
			(-0.622)	(21.198)	(3.514)	(15.162)	(16.917)
ROA	+	−	22.2***	-1.08**	-0.0078***	-0.21	-1.19*
			(3.202)	(-2.113)	(-3.289)	(-0.281)	(-1.877)
Leverage	+	−	1.46	-1.21***	-0.0039***	-0.72	-1.57***
			(0.313)	(-3.407)	(-2.983)	(-1.444)	(-3.349)
Liquidity	+	−	-1.53**	-0.093	0.00049	0.035	0.011
			(-2.055)	(-1.057)	(1.604)	(0.538)	(0.187)
Cexpenditure	−	+	-59.7***	6.01***	0.021***	5.39***	3.25*
			(-3.524)	(3.832)	(3.154)	(2.666)	(1.848)
RDexpenditure	+	−	-11.3	-2.73**	0.0019	1.98	-4.47**
			(-0.506)	(-1.974)	(0.521)	(0.743)	(-2.208)
FFloat	+	−	-0.0092	-0.0022	-0.000029**	0.0011	-0.0032
			(-0.258)	(-0.765)	(-2.012)	(0.286)	(-0.841)
WGI	+	−	0.94	-0.29	-0.0041***	1.19*	-0.86
			(0.164)	(-0.728)	(-2.644)	(1.705)	(-1.370)
GDP	+	−	-2.04	-0.29	-0.0033**	1.27**	-0.64
			(-0.388)	(-0.855)	(-2.077)	(2.254)	(-1.211)
Constant			79.3	-5.34	0.038**	-26.6***	-0.92
			(1.341)	(-1.402)	(2.074)	(-4.296)	(-0.160)
Country, industry, and year FE			Yes	Yes	Yes	Yes	Yes
N			7817	10957	10957	6825	6776
Adj. R^2			0.256	0.511	0.241	0.417	0.449
F-stat.			59.268***	25.565***	11.440***	15.865***	16.583***

The table presents the association between Internationalisation and waste management. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales.

t statistics in parentheses. All variables are defined in Table 1. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by firm.

Table 6: The moderating effect of board gender diversity between Internationalisation and waste management

	Expected sign for Model (1)	Model (2)-(5)	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation	−	+	0.013	0.0096***	0.000027***	0.0094***	0.011***
			(0.374)	(7.754)	(5.337)	(4.599)	(5.631)
Bgdiversity	+	−	0.17*	-0.0013	-0.000018	-0.011*	-0.0027
			(1.753)	(-0.365)	(-1.281)	(-1.953)	(-0.484)
Internationalisation*Bgdiversity (H2)	+	−	-0.0021	-0.00012**	-0.00000034*	0.000093	-0.00017**
			(-1.567)	(-2.404)	(-1.667)	(1.149)	(-2.227)
Bsize	−/+	−/+	0.44*	0.015*	0.000018	-0.0036	0.0085
			(1.941)	(1.779)	(0.538)	(-0.267)	(0.669)
Bindependence	+	−	0.0049	-0.00059	0.0000043	-0.00035	-0.00071
			(0.144)	(-0.463)	(0.842)	(-0.175)	(-0.371)
CEOduality	−	+	0.56	-0.026	-0.00091***	0.15*	-0.061
			(0.392)	(-0.531)	(-4.656)	(1.910)	(-0.832)
Fsize	−	+	-0.45	1.01***	0.00060***	0.98***	1.02***
			(-0.765)	(54.983)	(8.162)	(34.078)	(36.999)
ROA	+	−	22.2***	-1.00***	-0.0076***	-0.16	-1.07***
			(3.222)	(-3.877)	(-7.234)	(-0.409)	(-2.843)
Leverage	+	−	1.61	-1.26***	-0.0040***	-0.72***	-1.60***
			(0.346)	(-8.165)	(-6.491)	(-2.975)	(-6.909)
Liquidity	+	−	-1.52**	-0.099***	0.00047***	0.032	0.0048
			(-2.083)	(-5.127)	(5.997)	(1.030)	(0.163)
Cexpenditure	−	+	-61.9***	5.88***	0.021***	5.36***	3.12***
			(-3.665)	(9.628)	(8.343)	(5.815)	(3.546)
RDexpenditure	+	−	-8.73	-2.60***	0.0022	1.82	-4.43***
			(-0.393)	(-3.273)	(0.692)	(1.421)	(-3.626)
FFloat	+	−	-0.0090	-0.0019*	-0.000028***	0.0010	-0.0029*
			(-0.250)	(-1.683)	(-6.145)	(0.586)	(-1.746)
WGI	+	−	1.59	-0.41	-0.0046***	1.11**	-0.87**
			(0.272)	(-1.442)	(-4.017)	(2.431)	(-2.000)
GDP	+	−	-1.21	-0.35	-0.0036***	1.21***	-0.83**
			(-0.228)	(-1.560)	(-3.977)	(3.293)	(-2.343)
Constant			68.3	-4.73*	0.042***	-25.8***	0.74
			(1.146)	(-1.954)	(4.267)	(-6.660)	(0.199)
Country, industry, and year FE			Yes	Yes	Yes	Yes	Yes
N			7798	10906	10906	6811	6762
Adj. R²			0.257	0.512	0.242	0.418	0.451
F-stat.			34.601***	95.657***	48.074***	67.011***	76.022***

The table presents the moderating effect of board gender diversity between Internationalisation and waste management. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales. All variables are defined in Table 1. t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by firm.

Table 7: The moderating effect of board tenure between Internationalisation and waste management

	Expected sign for Model (1)	Model (2)-(5)	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation	−	+	-0.020	0.013***	0.000019***	0.018***	0.017***
			(-0.833)	(7.655)	(2.804)	(7.103)	(7.043)
Btenure	−/+	−/+	0.49**	0.045***	-0.000067	0.029	0.099***
			(2.411)	(3.248)	(-1.195)	(1.305)	(4.779)
Internationalisation*Btenure (H3)	−/+	−/+	-0.0023	-0.00071***	0.00000039	-0.00090***	-0.0013***
			(-0.733)	(-3.351)	(0.451)	(-2.812)	(-4.343)
Bsize	−/+	−/+	0.52***	0.0074	0.000017	-0.0034	0.0034
			(4.163)	(0.862)	(0.480)	(-0.252)	(0.264)
Bindependence	+	−	0.016	-0.0016	0.00000020	-0.0011	-0.0013
			(0.867)	(-1.231)	(0.038)	(-0.570)	(-0.674)
CEOduality	−	+	-0.060	-0.017	-0.00086***	0.18**	-0.056
			(-0.082)	(-0.345)	(-4.217)	(2.294)	(-0.742)
Fsize	−	+	-0.40	1.00***	0.00057***	0.98***	1.01***
			(-1.480)	(54.024)	(7.516)	(33.713)	(36.540)
ROA	+	−	21.9***	-0.97***	-0.0078***	0.11	-1.08***
			(5.757)	(-3.662)	(-7.305)	(0.268)	(-2.856)
Leverage	+	−	2.13	-1.22***	-0.0041***	-0.78***	-1.52***
			(0.927)	(-7.766)	(-6.435)	(-3.166)	(-6.516)
Liquidity	+	−	-1.58***	-0.10***	0.00049***	0.032	0.018
			(-4.955)	(-5.098)	(6.084)	(0.980)	(0.582)
Cexpenditure	−	+	-60.3***	6.09***	0.022***	5.14***	3.25***
			(-6.587)	(9.771)	(8.600)	(5.514)	(3.662)
RDexpenditure	+	−	-6.07	-2.62***	0.0018	1.72	-4.50***
			(-0.520)	(-3.238)	(0.541)	(1.317)	(-3.635)
FFloat	+	−	-0.00063	-0.0018	-0.000030***	0.0022	-0.0027
			(-0.036)	(-1.582)	(-6.230)	(1.224)	(-1.622)
WGI	+	−	0.88	-0.23	-0.0041***	1.57***	-0.60
			(0.205)	(-0.776)	(-3.447)	(3.383)	(-1.349)
GDP	+	−	-2.66	-0.31	-0.0030***	1.29***	-0.68*
			(-0.783)	(-1.356)	(-3.175)	(3.479)	(-1.912)
Constant			81.9**	-5.48**	0.036***	-27.7***	-1.69
			(1.999)	(-2.213)	(3.567)	(-7.114)	(-0.450)
Country, industry, and year FE			Yes	Yes	Yes	Yes	Yes
N			7593	10584	10584	6658	6609
Adj. R^2			0.254	0.515	0.241	0.422	0.456
F-stat.			36.402***	152.779***	46.515***	66.564***	75.966***

The table presents the moderating effect of board tenure between Internationalisation and waste management. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales. All variables are defined in Table 1. t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by firm.

Robustness Checks

Table 8: One-year lag model

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation(t-1)	-0.040	0.0083***	0.000017*	0.014***	0.0094***
	(-1.535)	(3.962)	(1.745)	(4.067)	(3.146)
Controls	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes
N	6969	9510	9510	6074	6030
Adj. R^2	0.254	0.509	0.243	0.412	0.452
F-stat.	53.976***	23.940***	1.558***	14.716***	15.617***

The table presents the association between Internationalisation and waste management based on the lag model. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales. t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by firm.

Table 9: GMM-based dynamic panel regression

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
WRR(t-1)	0.36***				
	(5.537)				
LnTW(t-1)		0.29***			
		(5.669)			
Waste/Sales(t-1)			0.38***		
			(3.960)		
LnHW(t-1)				0.42***	
				(6.631)	
LnNHW(t-1)					0.28***
					(3.710)
Internationalisation	0.013	0.0013*	0.000047**	0.0043***	0.00035*
	(0.753)	(1.775)	(2.356)	(2.702)	(1.732)
Controls	Included	Included	Included	Included	Included
N	5026	7114	7096	4280	4157
χ^2-stat.	43.496***	123.892***	50.621***	93.618***	45.651***

The table presents the association between Internationalisation and waste management based on GMM-based dynamic panel regression. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales. *t* statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by firm.

Table 10: Two-Stages Least Square (2SLS) regression analysis

	(1) Internationalisation	(2) WRR	(3) Internationalisation	(4) LnTW	(5) Internationalisation	(6) Waste/Sales	(7) Internationalisation	(8) LnHW	(9) Internationalisation	(10) LnNHW
	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
Internationalisation(t-1)	0.91*** (223.359)		0.91*** (223.359)		0.91*** (223.359)		0.91*** (223.359)		0.91*** (223.359)	
Internationalisation-IndAve	-0.039* (-1.669)		-0.039* (-1.669)		-0.039* (-1.669)		-0.039* (-1.669)		-0.039* (-1.669)	
Internationalisation		-0.038 (-1.345)		0.0087*** (3.848)		0.000019* (1.831)		0.015*** (4.003)		0.0097*** (2.951)
Controls	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WU		3.24*		12.57**		2.99*		16.89***		6.41**
OV		0.31		1.18		1.99		1.99		1.62
WE		6369.21		8301.34		8301.34		3872.15		3850.57
N	10026	7285	10026	10026	10026	10026	10026	6299	10026	6254
Adj. R^2	0.880	0.257	0.880	0.505	0.880	0.241	0.880	0.414	0.880	0.449
F-stat.	1022.889***		1022.889***		1022.889***		1022.889***		1022.889***	
χ^2-stat.		3969.744***		1698.711***		113.187***		1044.613***		1108.773***

The table presents the association between Internationalisation and waste management based on 2SLS regression. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales. t statistics in parentheses. $^* p < 0.10$, $^{**} p < 0.05$, $^{***} p < 0.01$.

Instruments: One-year lag of Internationalisation and Industry average of Internationalisation excluding focal firms.

WU: Wu-Hausman test of endogeneity
OV: Overidentifying restriction test (Sargan)
WE: Weak instrument test (F-value)

Table 11: Entropy balancing

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation	-0.067	0.0076***	0.000044***	0.0028*	0.0079***
	(-1.021)	(2.973)	(3.062)	(1.700)	(2.670)
Controls	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes
N	7817	10957	10957	6825	6776
Adj. R^2	0.302	0.561	0.279	0.451	0.568
F-stat.	1794.748***	18.590***	5.672***	14.089***	17.115***

The table presents the association between Internationalisation and waste management based on Entropy balancing. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales. t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 12: Propensity score matching

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation	-0.055	0.0076***	0.000032**	0.0045*	0.0076**
	(-1.295)	(3.015)	(2.083)	(1.718)	(2.200)
Controls	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes
N	3262	4419	4419	3166	3151
Adj. R^2	0.319	0.575	0.295	0.452	0.573
F-stat.	14.322***	19.908***	5.505***	12.297***	15.781***

The table presents the association between Internationalisation and waste management based on PSM. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales. t statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 13: Alternative test variable

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation_alt	-0.044**	0.0033***	0.0000094*	-0.0021	0.0041**
	(-2.492)	(2.681)	(1.737)	(-1.015)	(2.293)
Controls	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes
N	5078	6941	6941	4228	4202
Adj. R^2	0.290	0.515	0.269	0.417	0.490
F-stat.	7.824***	254.831***	15.555***	82.585***	112.106***

The table presents the association between Internationalisation and waste management based on alternative test variable. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation_alt is the proportion of foreign assets to total assets. t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Further Tests

Table 14: Earlier versus recent periods

Panel A: Earlier periods: Years between 2002 and 2015

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation	-0.018	0.0089***	0.000029**	0.014***	0.0071*
	(-0.544)	(3.287)	(2.087)	(2.924)	(1.773)
Controls	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes
N	3376	4858	4858	2692	2668
Adj. R^2	0.274	0.508	0.303	0.437	0.471
F-stat.	40.581***	15.794***	4.267***	10.278***	10.732***

Panel B: Recent periods – Years between 2016 and 2021

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation	-0.033	0.0061***	0.000011*	0.011***	0.0078***
	(-1.161)	(2.993)	(1.665)	(3.299)	(2.580)
Controls	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes
N	4441	6099	6099	4133	4108
Adj. R^2	0.249	0.509	0.210	0.404	0.441
F-stat.	9.065***	31.803***	4.527***	17.424***	19.678***

The table presents the association between Internationalisation and waste management for earlier and recent periods. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales. t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 15: Polluting versus non-polluting sectors

Panel A: Polluting industries (Basic materials, energy, industrials and utilities)

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation	-0.061	0.0074**	0.000046**	0.00092	0.0085*
	(-1.559)	(2.182)	(2.315)	(0.209)	(1.857)
Controls	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes
N	3680	5384	5384	3654	3624
Adj. R^2	0.260	0.462	0.274	0.366	0.411
F-stat.	22.842***	12.447***	4.659***	9.816***	9.503***

Panel B: Non-polluting industries

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation	0.019	0.0083***	0.0000011*	0.020***	0.0090***
	(0.643)	(4.372)	(1.837)	(5.381)	(3.534)
Controls	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes
N	4137	5573	5573	3171	3152
Adj. R^2	0.215	0.555	0.116	0.439	0.478
F-stat.	18.41***	49.35***	4.627***	24.05***	87.544***

The table presents the association between Internationalisation and waste management for polluting versus non-polluting sectors. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales. t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 16: High- and low-WGI countries

Panel A: High WGI (WGI>=Median of WGI)

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation	-0.017	0.0066**	0.000020	0.011**	0.0047
	(-0.510)	(2.512)	(1.602)	(2.285)	(1.290)
Controls	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes
N	4155	5597	5597	3287	3278
Adj. R^2	0.282	0.527	0.256	0.444	0.519
F-stat.	21.235***	18.368***	3.853***	12.349***	13.809***

Panel B: Low WGI (WGI< Median of WGI)

	(1) WRR	(2) LnTW	(3) Waste/Sales	(4) LnHW	(5) LnNHW
Internationalisation	-0.043	0.0081***	0.000022	0.012***	0.010***
	(-1.250)	(3.021)	(1.644)	(3.393)	(2.689)
Controls	Included	Included	Included	Included	Included
Country, industry, and year FE	Yes	Yes	Yes	Yes	Yes
N	3662	5360	5360	3538	3498
Adj. R^2	0.242	0.501	0.232	0.401	0.405
F-stat.	21.854***	20.861***	4.214***	24.158***	30.015***

The table presents the association between Internationalisation and waste management for high- and low-WGI countries. WRR is waste recycling ratio = (waste recycled/total waste)*100. LnTW is the natural logarithm of the total amount of non-hazardous waste plus hazardous waste in tons. Waste/Sales is the Total amount of waste divided by total sales. LnHW is the natural logarithm of the total amount of hazardous waste produced in tons. LnNHW is the natural logarithm of the total amount of non-hazardous waste produced in tons. Internationalisation is the proportion of international sales to total sales. t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.