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Abstract

We examine the association between CEOs' unrealized long-term capital gains tax liabilities (tax burdens) and corporate environmental performance. Prior research suggests that managers facing higher tax burdens are less likely to sell stock and therefore become more exposed to firm-specific risk. This greater undiversified exposure reduces their willingness to undertake risky corporate actions and increases their focus on long-term firm stability. We therefore hypothesize that higher tax burdens make CEOs more attentive to corporate environmental misconduct. We find that toxic waste generation declines as CEOs' tax burdens increase. This negative association is stronger among firms with weaker internal governance, less stringent environmental regulatory scrutiny, and CEOs facing stronger career-related pressure to prioritize near-term results or having fewer opportunities to diversify risk. Channel tests suggest that higher CEO tax burdens reduce toxic waste generation by improving corporate productive efficiency and increasing green innovation. Overall, our findings highlight the importance of CEOs' personal tax burdens in shaping corporate environmental policy.

Keywords: capital gains taxes, corporate environmental performance, corporate toxic waste generation, compensation

1. Introduction

Early research documents that the tax lock-in effect significantly influences external investors, as capital gains taxes may reduce their willingness to sell appreciated assets. This effect can, in turn, distort asset prices and alter portfolio choices (e.g., Feldstein et al., 1980; Dammon et al., 2004). Extending this perspective to CEOs, who directly influence firms' decision-making processes, recent studies show that substantial unrealized personal capital gains tax liabilities (hereafter, CEOs' tax burdens) discourage CEOs from selling vested shares (e.g., Yost, 2018; Armstrong et al., 2019). Consequently, CEOs' tax burdens play an important role in shaping corporate behaviour, influencing outcomes such as risk-taking (Yost, 2018), the structure and value of acquisitions (Hanlon et al., 2021), accounting conservatism (Lonare, 2024), debt contracting terms (Kubick et al., 2025) and share pledging (Underwood and Yost, 2026).

In this paper, we extend this line of research by examining whether and how CEOs' tax burdens affect corporate environmental performance. We focus on this issue for two main reasons. First, environmental practices have become a critical dimension of corporate policy and therefore warrant careful attention in firms' operations. From 2003 to 2021, U.S. registered plants disposed of or otherwise released an average of 3.89 billion pounds of toxic chemicals into the environment each year (Environmental Protection Agency (EPA), 2022). Because severe pollution and toxic releases can significantly impair firm value (Barth and McNichols, 1994), reduce worker productivity (Zivin and Neidell, 2012), weaken labour supply (Hanna and Oliva, 2015), and increase a range of health risks (Landrigan et al., 2018), corporate executives face growing pressure to reduce environmental violations and improve environmental performance.[1] Second, practitioners continue to emphasize the need for a deeper

[1] For instance, a recent article in the Wall Street Journal Pro points out that customers still view sustainability and other environmental issues as priorities for chief executives. This article can be viewed online from https://www.wsj.com/articles/sustainability-is-falling-on-the-ceo-to-do-list-customers-still-see-it-as-a-priority-bfb8d4d2.

understanding of how changes in CEOs' long-term orientation, potentially shaped by their incentives, affect firms' environmental practices (Munk, 2024). Motivated by these considerations, we examine how changes in CEOs' capital gains tax burdens influence corporate environmental performance.

Our central hypothesis is that higher CEO tax burdens improve corporate environmental performance. This prediction is grounded in two strands of literature. First, firms' environmental performance is often integral to their long-term sustainable strategies, whereas failure to comply with environmental regulations and mitigate environmental liabilities can be highly consequential (e.g., Barth and McNichols, 1994; White, 2002; Schneider, 2011; Jo et al., 2015; Chang et al., 2021a). Recent studies further show that high environmental liabilities and poor environmental performance significantly increase firms' uncertainty and downside risk, intensify litigation and regulatory enforcement, and raise the likelihood of financial difficulty and bankruptcy (e.g., Schneider, 2011; Chava, 2014; El Ghoul et al., 2018; Bolton and Kacperczyk, 2021; Chang et al., 2021a; Ilhan et al., 2021). Second, prior studies suggest that personal taxes create asymmetric payoffs that can influence an individual's risk-taking behaviour (e.g., Domar and Musgrave 1944; Feldstein, 1969; Stiglitz, 1969). Because CEOs typically hold a substantial portion of their personal wealth in firm equity (e.g., Hall and Murphy, 2002; Conyon et al., 2011), higher tax burdens can discourage them from selling stocks and thereby increase their exposure to firm-specific risks (Jin and Kothari, 2008; Yost, 2018; Kubick et al., 2025). This greater undiversified exposure can make CEOs less willing to undertake risky decisions (Yost, 2018) and more likely to emphasize a longer-term orientation favoured by stakeholders (Lonare, 2024; Kubick et al., 2025). Collectively, these arguments suggest that the tax lock-in effect may make relatively undiversified CEOs more sensitive to firm-specific risk exposure, thereby discouraging environmental risky behaviour and improving the environmental performance that supports sustainable firm value.

To measure corporate environmental performance, we use data from the Toxic Release Inventory (TRI) program developed by the EPA, which provides information on the release and management of more than 650 toxic chemicals by over 20,000 facilities in the United States. We aggregate the total amount of waste generated across all facilities operated by a firm in a given year and weight each chemical by its EPA-defined toxicity. We then take the natural logarithm of the total amount of toxicity-weighted waste and scale by total sales to control for the production scale.[2] A higher ratio indicates greater environmental liabilities and, hence, poorer environmental performance. Our proxy for corporate environmental performance therefore serves as a direct firm-year measure of toxic waste generated that is closely tied to environmental regulation, litigation and enforcement actions (e.g., De Franco et al., 2012; Banerjee et al., 2014; Chang et al., 2021a). Following Jin and Kothari (2008), Yost (2018), and Underwood and Yost (2026), we measure CEOs' tax burdens on their equity holdings in the firm as the percentage of a CEO's total equity holdings that would be owed in federal and state capital gains taxes upon a hypothetical sale of those shares.[3]

Consistent with our hypothesis, the baseline results show that higher CEO tax burdens are significantly and negatively associated with corporate toxic waste generation. The effect is also economically meaningful. An interquartile movement in CEO tax burden corresponds to a 6.9% reduction in toxicity-weighted waste generation relative to the sample mean. These findings suggest that higher CEO capital gains tax burdens improve corporate environmental performance.

One potential concern in our study is that an omitted variable may drive the observed association between CEO tax burdens and corporate environmental performance, thereby

[2] This issue arises because the aggregation process may generate extreme values owing to the substantial variation in the toxicity of TRI chemicals, which spans seven orders of magnitude on a pound-for-pound basis. For instance, as noted by Chang et al. (2021b), less toxic chemicals such as formic acid and ethylene have toxicity levels below one, whereas highly toxic chemicals such as asbestos and benzidine can have toxicity levels exceeding 150 million.

[3] The information about CEO tax burden can be obtained from https://sites.google.com/bc.edu/ben-yost/home

biasing our baseline findings. For example, the relationship between poorer environmental performance and higher CEO tax burdens may reflect CEO- or firm-level strategic choices that are not fully captured by the control variables and fixed effects included in our models. To address this concern and strengthen the causal interpretation of our baseline findings, we employ three identification strategies. The first two strategies are propensity score matching (PSM) and entropy balancing matching (EB), which allow us to compare firms whose CEOs face higher tax burdens with otherwise comparable firms whose CEOs face lower tax burdens. The results show that the negative association between CEO tax burdens and toxicity-weighted waste generation remains robust.

Our third strategy exploits the enactment of the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA 2003), which reduced the top capital gains tax rate from 20% to 15%, as an exogenous shock to CEO tax burdens.[4] Although this tax cut applied to all executives at the same time, CEOs with higher tax burdens prior to the reform stood to benefit more from the change in tax law (Yost, 2018; Kubick et al., 2025). Yost (2018) and Kubick et al. (2025) demonstrate that the reduction in the top marginal long-term capital gains tax rate had an immediate and unforeseen impact on CEO tax burdens and significantly increased CEO stock sales. Building on these findings, we argue that the reduction in CEOs' tax burdens following the reform mitigated the tax lock-in effect and reduced CEOs' exposure to firm-specific risk by increasing their propensities to sell their shares. Thus, if our baseline findings hold, the reduction in tax burdens following the adoption of JGTRRA 2003 should be associated with an increase in toxic waste generation, and this association should be more pronounced among firms whose CEOs faced greater tax burdens prior to the 2003 tax cut than

[4] The enactment of JGTRRA 2003 provides an ideal setting to examine the impact of exogenous changes in the top capital gains tax rate on corporate environmental performance. Unlike the Taxpayer Relief Act of 1997 (TRA 1997), which offered broad tax relief to individuals, including child tax credit and education-related tax incentives, JGTRRA 2003 particularly aimed to spur economic growth following the 2001 recession through a reduction in long-term capital gains taxes. As Lucas (1988, p.5) notes, "Once one starts to think about [economic growth], it is hard to think about anything else". The introduction of JGTRRA 2003 thus allows for a specific examination of how tax reductions intended to stimulate economic activity may also influence environmental outcomes, building on insights from the extant literature (e.g., Xepapadeas, 2005).

among firms whose CEOs faced lower tax burdens. We test this prediction using a difference-in-differences (DiD) design and find a positive and statistically significant coefficient on the interaction term between CEOs' pre-cut tax burdens and a post-reform indicator. This result suggests a causal relation between CEO tax burdens and corporate toxicity-weighted waste generation. Further, a dynamic treatment analysis suggests that there is no evidence of differential pre-trends related to CEOs' pre-cut tax burdens prior to the enactment of JGTRRA 2003, suggesting that our findings are unlikely to be driven by reverse causality.

We next examine cross-sectional heterogeneity in the effect of CEO tax burdens on corporate environmental performance. We find that the negative association between CEO tax burdens and corporate toxicity-weighted waste generation is more pronounced among firms with weaker internal governance, firms facing less stringent environmental regulatory scrutiny, and firms led by CEOs who face stronger career-related pressure to prioritize near-term results or have fewer opportunities to diversify risk. These findings further reinforce our argument that higher CEO tax burdens act as an internal control mechanism that discourages environmentally risky behaviour by aligning CEOs' personal incentives with long-term firm value and reducing agency-driven externalities.

Prior research suggests that higher pollution levels and toxic emissions reflect firms' inefficient use of resources (e.g., Porter and Van der Linde, 1995a, 1995b). In addition, greater engagement in green innovation is an important driver of improved corporate environmental performance (e.g., Carrión-Flores and Innes, 2010; Amore and Bennedsen, 2016; Cheng et al., 2025). Following these studies, we conduct formal mediation analyses to explore the mechanisms underlying our main findings. The results suggest that improvements in productive efficiency and greater engagement in green innovation are two potential channels through which higher CEO tax burdens enhance corporate environmental performance.

We also conduct several additional tests to assess the robustness of our main findings. First, we re-estimate the baseline regression model by incorporating additional CEO-level variables, such as total compensation and incentive pay. We also control for several state-level proxies for environmental conditions and regulatory effectiveness. Second, to account for unobserved changes in industry conditions, we include not only firm fixed effects but also industry-year fixed effects. To further control for time-varying, state-specific factors that may affect our main findings, we include headquarter-state-by-year fixed effects in the baseline regressions. In addition, we include CEO fixed effects to account for any differences in personal traits between CEOs that are invariant throughout our sample period. To address non-random matching between CEOs and firms, along with time-invariant and unobserved CEO heterogeneity, we replace firm fixed effects with CEO-firm fixed effects. We also employ Fama-MacBeth regressions with Newey-West standard errors to examine the cross-sectional relation between CEO tax burdens and environmental performance. Third, we use an alternative measure of corporate environmental performance based on the release of toxicity-weighted waste. Finally, we decompose our main variable of interest into federal and state tax burden components. The results confirm that our main findings remain robust across all of these specifications.

Our study contributes to two important strands of literature. First, we add to the growing body of research examining the implications of managers' personal tax frictions for corporate decision-making. Prior studies, such as Jin and Kothari (2008) and Armstrong et al. (2015), document that CEO capital gains tax burdens can induce a lock-in effect that discourages the sale of firm shares. More recent empirical studies show that higher CEO tax burdens can significantly reduce firm risk-taking (Yost, 2018), influence acquisition deal structure and premiums in ways that minimize personal tax liabilities (Hanlon et al., 2021), reduce the demand for accounting conservatism (Lonare, 2024), lower loan spreads and increase the

likelihood of ratings upgrades (Kubick et al., 2025) and increase the likelihood of share pledging (Underwood and Yost, 2026). We extend this line of research by providing evidence on the implications of tax-induced frictions for corporate environmental policy. Specifically, our results reveal a negative and significant association between CEO tax burdens and corporate toxic waste generation.

Second, we contribute to the literature on the determinants of corporate environmental performance. Recent studies provide important evidence on whether and how environmental performance is shaped by changes in regulation (Shapiro and Walker, 2018), concentrated ownership and short-termism (Shive and Forster, 2020), long-term institutional investor activism (Flammer et al., 2021), strengthened parent limited liability protection (Akey and Appel, 2021), financial constraints (Xu and Kim, 2022), and analyst coverage (Jing et al., 2024). Our study adds to this line of research by focusing on the relation between CEOs' capital gains tax burdens and corporate environmental performance. More broadly, whereas much of the recent literature examines how corporate social responsibility (CSR) or CSR-related objectives affect CEO incentives (e.g., Cai et al., 2011; Flammer et al., 2019; Dunbar et al., 2020; Ikram et al., 2023), our study sheds new light on how changes in CEO incentives influence corporate environmental activities, which constitute a central component of CSR.

The remainder of this paper is organized as follows. Section 2 discusses the related literature and develops our main hypothesis. Section 3 describes the data and provides descriptive statistics. Section 4 presents empirical findings. Section 5 concludes.

2. Related Literature and Hypothesis Development

2.1 Prior Research on CEO Incentive Pay, Tax Burdens, and Risk

Prior studies grounded in agency theory highlight the role of equity-based compensation in aligning CEOs' interests with those of shareholders (e.g., Jensen and Meckling, 1976; Hall and Murphy, 2002; Coles et al., 2006; Armstrong and Vashishtha, 2012). For

example, some scholars posit that increasing the convexity of managerial payoffs can mitigate managers' tendency to take less risk than shareholders desire due to risk aversion (e.g., Guay, 1999; Gormley et al., 2013; Gormley and Matsa, 2016). However, a growing body of research indicates that greater risk-taking incentives can aggravate agency conflicts between managers and shareholders by inducing managers to undertake levels of firm risk that exceed shareholders' preferences (e.g., Dong et al., 2010; Kuang and Qin, 2013; Hong et al., 2021; Kubick et al., 2024). Empirical evidence has shown that greater pay convexity significantly increases firm risk, such as systematic risk (Armstrong and Vashishtha, 2012), left-tail risk (Gormley et al., 2013; Kubick et al., 2024), and misreporting risk (Armstrong et al., 2013). Moreover, heightened risk exposure arising from compensation incentives can impose costs on stakeholders. Liu et al. (2021a) find that CEO stock option compensation imposes significant costs on firm's customers, both ex post and ex ante, leading to more fragile customer relationships through weakened trade reliability. In a related vein, Chircop et al. (2025) show that CEOs with stronger risk-taking incentives are more likely to misbehave and take riskier actions to enhance productivity and performance, which in turn increases workplace misconduct such as health and safety violations.

Recent studies show that such excessive risk-taking incentives arising from payoff convexity can be mitigated by the personal capital gains taxes faced by CEOs (e.g., Yost, 2018; Kubick et al., 2025).[5] Because CEOs cannot diversify their firm-specific risk to the same extent as outside shareholders, higher capital gains taxes discourage the sale of appreciated shares and induce CEOs to retain substantial vested equity.[6] This tax-induced lock-in increases their

[5] Theoretical discussions of how the sensitivity of a CEO's personal wealth to fluctuations in the firm's stock price may alleviate her risk-taking appetite can be found in Lambert et al. (1991), Carpenter, (2000), Ross (2004), and Lewellen (2006). In addition, Nagar et al. (2003) provide empirical evidence that stock-price-based incentives can mitigate agency conflicts related to managerial disclosure. They find that firms' disclosures are positively associated with both the fraction of CEO compensation tied to stock prices and the value of shares owned by the CEO, suggesting that such incentives can help align managers' and investors' long-term disclosure preferences.

[6] Jin and Kothari (2008) examine the determinants of CEOs' stock-selling behaviour and find that, after controlling for other determinants, CEOs are less likely to sell vested shares as their tax burdens increase. Armstrong et al. (2015) find a positive and significant relationship between CEOs' expected tax liabilities upon selling their shares and the amount of unrestricted equity they hold.

exposure to firm-specific risk and, in turn, dampens incentives for excessive risk-taking. Empirical evidence lends support to this tax-friction effect on firm risk. Focusing on CEOs' unrealized capital gains tax liabilities, which are assessed on their accumulated vested stock holdings, Yost (2018) finds that higher tax burdens significantly reduce CEOs' willingness to make risky corporate decisions. Following the findings of Yost (2018), prior research further shows that firms managed by CEOs with high tax burdens are associated with lower demand for accounting conservatism from creditors (Lonare, 2024) and with lower loan spreads as well as credit rating upgrades (Kubick et al., 2025).[7]

2.2 Prior Research on Corporate Environmental Management

The extant literature on corporate environmental policy can be broadly categorized into two strands. The first comprises research that examines the association between environmental policy and economic performance. The main findings of these studies suggest that stock markets value firms' environmental performance: portfolios consisting of low-pollution firms exhibit higher returns than those of high-pollution firms (Cohen et al., 1995), and markets reward firms that disclose positive environmental news while penalizing firms associated with negative environmental events (e.g., Hamilton, 1995; Klassen and McLaughlin, 1996; Karpoff et al., 1999).[8] Furthermore, socially responsible environmental policy also increases firms' financial performance. Pollution-reduction efforts and related technologies have been linked to higher returns on sales (Hart and Ahuja, 1996), stronger profit growth (Nehrt, 1996), and higher return on assets (Russo and Fouts, 1997).[9]

[7] Recent studies also examine the effect of CEO tax burdens on stock price crash risk. Agcayazi et al. (2024) argue that CEOs facing a tax lock-in effect have stronger incentives to withhold negative information because their wealth is closely tied to firm performance and the lock-in effect induces them to retain vested appreciated shares to defer capital gains taxes. In contrast, Haß et al. (2024) document an opposing effect, suggesting that CEOs facing higher tax burdens become more risk-averse and adopt a longer-term orientation, thereby reducing the likelihood of stock price crashes.

[8] Beyond event-based analyses, studies show that firms adopting stricter environmental management systems and reducing toxic emissions are rewarded by the market (e.g., Dowell et al., 2000; Konar and Cohen, 2001).

[9] Notably, some studies argue that high environmental performance can be associated with increased costs, which may decrease corporate earnings and market value (e.g., Jaggi and Freedman, 1992; Walley and Whitehead, 1994; Hassel et al., 2005). However, other research suggests that effective environmental management can enhance operational efficiency by lowering energy consumption, reducing material waste, and decreasing labour intensity (e.g., Rothenberg et al., 2001; Sroufe, 2003). Sharfman and Fernando (2008) find that firms with stronger environmental performance show more efficient resource

The second strand examines the impact of environmental management on firm risk, as investors and analysts increasingly incorporate environmental considerations into their investment decisions and recommendations (e.g., Heinkel et al., 2001; Mackey et al., 2007; Griffin et al., 2017; Bolton and Kacperczyk, 2021). Consistent with this view, recent evidence shows that investors tend to avoid firms with high environmental risk exposure (Fernando et al., 2017) and concentrate their engagement efforts on large firms with high CO_2 emissions in which they hold significant ownership stakes (Azar et al., 2021). Moreover, Hsu et al. (2023) document that corporate pollution constitutes a source of systematic risk for which investors demand higher risk premia as compensation.

At the firm level, Schneider (2011) documents that poor environmental management exposes firms to significant downside risk through higher expected future cleanup and regulatory compliance costs. Because these costs can be sufficiently large to impair a polluting firm's ability to meet its debt obligations, bondholders incorporate poor environmental performance as a risk factor into bond pricing. Similarly, Chava (2014) shows that firms with greater environmental concerns face heightened regulatory and litigation risk, which increases their credit risk. Accordingly, lenders charge higher borrowing costs on loans extended to these firms. Based on approaches that can estimate a firm's expected cost of equity financing, El Ghoul et al. (2018) provide international evidence that investment in environmental responsibility significantly reduces firms' cost of equity by lowering equity investors' perceived risk. Extending the pricing perspective to the option market, Ilhan et al. (2021) find that options written on carbon-intensive firms command higher prices, consistent with greater demand for protection against their downside tail risk. Chang et al. (2021a) document that, analogous to financial distress arising from a firm's inability to service its debt, failure to comply with environmental regulations can generate substantial environmental liabilities that

utilization and improved access to debt markets.

may ultimately lead to bankruptcy. Further, Lel (2025) shows that shareholders are particularly sensitive to risks arising from corporate environmental violations, given the associated liabilities, legal penalties, and adverse media coverage.

2.3 Hypothesis Development

Firms frequently generate toxic chemicals and wastes during their production processes that adversely affect the environment, and inadequate mitigation of such pollution can give rise to substantial environmental liabilities. Reducing these liabilities requires long-term commitments and significant firm inputs, including energy, labour, raw materials, innovative technologies, and contracted services (e.g., Chang et al., 2021a; Xu and Kim, 2022). At the same time, the benefits of responsible environmental management are not fully internalized by firms, as improvements in environmental quality generate positive externalities for society while the negative externalities associated with pollution are not fully borne by firms (e.g., Porter and van der Linde, 1995a). Because environmental investments are long-term in nature and unlikely to generate immediate improvements in short-term profitability, managers incentivized by short-term performance may underweight such investments (e.g., Shive and Forster, 2020).[10] Overall, decisions related to environmental abatement involve a trade-off between current abatement expenditures and the future costs associated with environmental liabilities (e.g., Shapira and Zingales, 2017; Xu and Kim, 2022).

Capital gains taxes act as an important friction in capital markets that discourages share sales (e.g., Feldstein et al., 1980; Landsman and Shackelford, 1995; Dai et al., 2008). Higher tax burdens therefore make CEOs less likely to sell their own-firm equity and become overexposed to firm-specific risk (e.g., Yost, 2018). CEOs with increased undiversified exposure, in turn, tend to limit firm risk in order to safeguard the value of their concentrated equity holdings. Meanwhile, because higher tax burdens induce CEOs to retain and accumulate

[10] For example, prior research documents that firms increase pollution emissions when facing earnings pressures (Liu et al., 2021b) and when they just meet or beat their earning benchmarks (Thomas et al., 2022).

own-firm shareholdings, this tax-induced lock-in effect can also attenuate the short-term orientation associated with convex incentive payoffs and reduce agency-driven externalities by encouraging greater commitment to long-term investments that enhance firm sustainability and shareholder value.[11]

We believe that, in this context, CEO tax burdens may be closely related to responsible environmental practices. Specifically, beyond the value relevance of improved environmental performance discussed in the earlier section, responsible environmental engagement may also serve to mitigate firm risk. Unlike environmental violations, which are associated with significant risk, responsible environmental practices reduce investors' perceptions of firm risk (e.g., Sharfman and Fernando, 2008), lower firms' exposure to political and regulatory scrutiny (e.g., Cho et al., 2012), and support firm performance during periods of uncertainty (e.g., Garel and Petit-Romec, 2021). More broadly, as environmental policy constitutes a core dimension of corporate social responsibility (CSR), these empirical findings accord with a growing body of literature showing that CSR provides insurance-like protection against adverse shocks (e.g., Godfrey et al., 2009; Shiu and Yang, 2017). For instance, firms with stronger CSR engagement exhibit superior stock performance during the 2008–2009 financial crisis (Lins et al., 2017) and lower exposure to policy uncertainty (Peng et al., 2023). Using an industry equilibrium model in which firms can engage in CSR activities, Albuquerque et al. (2019) show that CSR reduces firms' systematic risk, increases firm value, and leads portfolios tilted toward high-CSR firms to exhibit lower overall risk. Collectively, these findings suggest that responsible environmental practices are not merely social or ethical considerations, but also strategic tools

[11] Substantial increases in incentive pay have been criticized for encouraging managers to place excessive weight on short-term performance at the expense of long-term value creation (e.g., Peng and Röell, 2014; Edmans et al., 2022). Consistent with this view, studies find that greater amounts of CEOs' stocks and options scheduled to vest in a given quarter, as well as accelerated option exercises, are associated with subsequent declines in firms' future growth and reductions in long-term investment (e.g., Edmans et al., 2017; Ladika and Sautner, 2020).

for risk mitigation that are consistent with long-term firm value and the preservation of CEOs' personal wealth.[12]

Taken together, if higher tax burdens increase CEOs' undiversified exposure to firm-specific risk, they are likely to increase managerial sensitivity to the potential risks associated with substantial environmental liabilities. CEOs facing greater tax-induced lock-in therefore have stronger incentives to improve environmental performance in ways that mitigate liability risk and enhance the sustainability of firm value. Accordingly, we hypothesize that higher CEO tax burdens are positively associated with corporate environmental performance, as reflected in lower environmental liabilities.

3. Sample and Variable Measurement

3.1 Data and Sample

Our sample comprises all CEO-years from Execucomp database over the period 1993-2015. Although Execucomp begins coverage of CEO data in 1992, our sample starts in 1993 because we require at least one year of prior Execucomp data to calculate CEOs' tax burdens on equity holdings (Yost, 2018; Hanlon et al., 2021).[13] We end the sample in 2015 because TRI data are available from the EPA only through that year.[14] Financial data are sourced from Compustat. We exclude financial firms (SIC 6000-6999) (e.g., Chang et al., 2021a) and observations with missing values for variables used in the regressions. Our final sample consists of 8,677 firm-year observations from 830 unique firms at the intersection of these databases.

3.2 CEO Tax Burden

Following Yost (2018) and Kubick et al. (2025), we measure a CEO's tax burden in year *t* as the tax liability from the sale of all vested stock in year *t*. We then scale this tax liability

[12] We thank an anonymous referee for pointing this out to us.
[13] The CEO tax burden data is obtained from Yost (2018) and Hanlon et al. (2021), who construct the variable using the data from Execucomp. The data is available at: https://sites.google.com/bc.edu/ben-yost/home
[14] https://www.epa.gov/toxics-release-inventory-tri-program/tri-data-and-tools

by the total value of the CEO's vested and unvested stock and option holdings of the firm in the same year. The CEO's tax burden is calculated as follows:

$$CEO\ Tax\ Burden_t = \frac{\sum_{n=1}^{t}(P_t - P_n) \times N_n \times t_{cg}}{CEO\ Total\ Equity_t} \quad (1)$$

where n=1 represents the first year the CEO owns vested stock in the firm; P_t is the firm's stock price at the end of year t; P_n is the price at the end of year n in which the CEO received the stock; N_n is the number of vested shares held at time t that were obtained in year n; t_{cg} is the maximum long-term capital gain tax rate (federal plus state) faced by the CEO in year t upon selling the shares;[15] and $CEO\ Total\ Equity_t$ represents the stock equivalent value from the CEO's holdings of all stock and options at the end of year t.

Previous studies, including Yost (2018), Kubick et al. (2025), and Underwood and Yost (2026), identify several distinct factors that drive variation in CEO tax burdens. The first is the combined federal and state capital gains tax rate the CEO faces upon selling shares.[16] The second is the difference between the firm's current stock price and the stock price at the grant date, which determines whether the CEO realizes a net capital gain or loss. The third is the number of shares granted in a given year, n, relative to the total number of vested shares held by the CEO, which ensures that shares granted in each year are appropriately weighted in the tax burden calculation. Finally, the total value of the CEO's equity holdings also affects the tax burden. All else equal, CEOs with larger equity holdings face lower tax burdens. Taken together, these factors highlight the important role of capital gains taxes in shaping CEOs' ability to diversify their personal wealth.

3.3 Corporate Environmental Performance

[15] As noted in Yost (2018), Hanlon et al. (2021), and Kubick et al. (2025), state tax rate data are retrieved from the National Bureau of Economic Research. The maximum state capital gains tax rate is based on the firm's headquarters state and assumes the location of the firm's headquarters reflects the CEO's state of residence.

[16] Yost (2018) raises concerns about inaccuracies in Compustat's data concerning the historical locations of the firm's headquarters. However, this issue has been addressed using resources from Heider and Ljungqvist (2015). Thus, the state information used to construct the CEO's tax burden reflects the corrected historical locations of the firm headquarters.

To measure corporate environmental performance, we use toxic emission data from the EPA's TRI program, an approach that is widely adopted in prior studies (e.g., De Franco et al., 2012; Cai et al., 2016; Kim et al., 2019; Chang et al., 2021a). The TRI program was established under Section 313 Emergency Planning and Community Right-to-Know Act of 1987. Over the past three decades, TRI has expanded to collect information on more than 650 toxic chemicals from over 20,000 US industrial facilities. Chang et al. (2021a) assert that the TRI program offers more quantitative and verifiable measures of corporate environmental performance compared to the other criteria developed by major social raters such as Kinder, Lydenberg, and Domini Research and Analytics. This advantage stems from the EPA's close regulatory oversight and the reduced scope for subjective assessment.[17] After comparing TRI-listed chemicals with the EPA's list of priority pollutants under various regulations, Xu and Kim (2022) conclude that TRI chemicals are particularly important in terms of environmental and public health impacts as well as regulatory concern. Moreover, the EPA Scientific Advisory Board (2016) describes TRI data as "the only reliable source of longitudinal data" for evaluating corporate environmental performance and the risk of toxic substance releases. TRI data are also less likely to be affected by managerial discretion because environmental reporting under TRI is mandated by law. Each year, facilities must report the quantities of chemicals disposed of or released into the environment, as well as the quantities treated, recycled, or recovered.

We measure corporate environmental performance primarily using the total amount of toxic waste generated during production, for which firms are ultimately liable (e.g., Chang et al., 2021a). We first compute facility-level production-related waste by summing all chemical waste generated in a specific year. To account for heterogeneity across chemicals, we multiply

[17] To ensure the accuracy and reliability of TRI data, the EPA reviews submissions for potential errors, contacts facilities regarding potentially inaccurate reports, provides guidance on reporting requirements, and takes enforcement actions against facilities that fail to comply with TRI requirements (https://19january2017snapshot.epa.gov/toxics-release-inventory-tri-program/tri-data-quality_.html).

the mass of each chemical by its toxicity, obtained from the EPA's Risk-Screening Environmental Indicators model.[18] We then construct firm-level toxicity-weighted waste amount (*Weighted Waste*) by aggregating toxicity-weighted waste across all facilities of a firm. Following prior studies such as Delmas and Toffel (2008), Akey and Appel (2021), and Chang et al., (2021a), we take the natural logarithm of firm-level toxicity-weighted waste and scale by total sales to control for production scale. The resulting variable, *T_Waste*, is used as the dependent variable in our regression analysis, where higher values indicate poorer corporate environmental performance.

3.4 Control Variables and Summary Statistics

Following prior studies (e.g., McWilliams and Siegel, 2000; Clarkson et al., 2011; Custódio et al., 2013; Yost, 2018; Chen et al., 2020; Chang et al., 2021a, 2021b; Xu and Kim, 2022; Underwood and Yost, 2026), we control for a vector of firm- and CEO-level characteristics that may also influence corporate environmental performance. These variables include firm size (*Size*), the market-to-book ratio (*Market-to-book*), leverage ratio (*Leverage*), profitability (*ROA*), cash and short-term investments (*Cash*), capital expenditures (*Capex*), research and development expenses (*R&D*), CEO age (*CEO Age*), gender (*CEO Gender*), educational background (*CEO Education*), and CEO ownership of the firm's outstanding common stock (*CEO Ownership*). All continuous variables are winsorized at the 1st and 99th percentile values.

Panel A of Table 1 presents summary statistics for all variables used in the baseline regression. The mean (median) values of *T_Waste* and *CEO Tax Burden* are 0.016 (0.008) and 0.052 (0.053), respectively. For the control variables, the average firm in our sample has a *Size*

[18] Depending on the exposure pathway, the EPA provides two toxicity weights: an inhalation toxicity weight and an oral toxicity weight. Following the EPA's methodology, we use the inhalation toxicity weight for releases (or transfers) to fugitive air, stack air, and off-site incineration, and the oral toxicity weight for releases (or transfers) to direct water and publicly owned treatment works. If the pathway through which a chemical is released (or transferred) is unknown, we use the higher of the two toxicity weights. For chemicals for which the EPA does not assign a toxicity weight, we set toxicity equal to zero (e.g., Chang et al., 2021a, 2021b).

of 6.432, a *Market-to-book* of 2.927, *Leverage* of 21.2%, *ROA* of 14.3%, *Cash* of 9.8%, *Capex* of 5.1%, and *R&D* of 2.5%. The average CEO in our sample is about 56.9 years old, 1.5% are female, 35.2% hold a degree from an Ivy League university, and the average *CEO Ownership* is 1.6%. These descriptive statistics are comparable to those reported in Custódio et al. (2013), Cronqvist and Yu (2017), Yost (2018), Chen et al. (2020), and Chen et al. (2026).

Panel B of Table 1 reports the results of the univariate analysis. We classify firm-year observations in which CEOs' tax burdens are above the sample median as the high-tax-burden group and those in which CEOs' tax burdens are below the sample median as the low-tax-burden group. On average, firms in the high-tax-burden group exhibit better environmental performance than firms in the low-tax-burden group. In addition, these firms are smaller, have better growth opportunities, lower leverage, higher profitability, greater cash holdings, and higher capital expenditures. CEOs in the high-tax-burden group are older, less likely to be female, and hold greater ownership stakes in their firms.

[Please Insert Table 1 Here]

4. Main Results

4.1 CEO Tax Burdens and Corporate Environmental Performance

To examine the association between CEO tax burdens and corporate environmental performance, we estimate the following regression model:

$$T\_Waste_{i,t} = \alpha + \beta_1 CEO\ Tax\ Burden_{i,t-1} + \beta_k Control_{i,t-1} + D_i + \gamma_t + \varepsilon_{i,t} \qquad (2)$$

where $T\_Waste_{i,t}$ measures the corporate environmental performance for firm *i* in year *t*. $CEO\ Tax\ Burden_{i,t-1}$ represents the CEO's tax burden of firm *i* in year *t-1*. $Control_{i,t-1}$ denotes firm-level control variables discussed in Section 3.4. Detailed definitions of all variables are provided in Appdendix A. In addition, we control for the unobserved heterogeneity attributable to firm-specific characteristics and time trends by incorporating firm fixed effects (D_i) and year fixed effects (γ_t) into the regression model. Standard errors are

clustered at the firm level.[19] The main variable of interest in Equation (2) is *CEO Tax Burden*, and we expect its coefficient estimate, β_1, to be negative and statistically significant. This implies that higher CEO tax burdens are associated with better corporate environmental performance, as the level of toxicity-weighted waste generation decreases.

Table 2 reports the estimation results from the baseline regression model specified in Equation (2). In column (1), we include only the main variable of interest, *CEO Tax Burden*, together with firm and year fixed effects. The coefficient on *CEO Tax Burden* is negative and statistically significant at the 1% level. In column (2), we add the control variables to the model and continue to find a negative and significant association between CEO tax burdens and firms' toxic waste generation. In terms of economic magnitude, we find that moving *CEO Tax Burden* from the 25th percentile to the 75th percentile (a difference of 0.123) is associated with a 6.9% (=(-0.009×0.123)/0.016) decline in *T_Waste* relative to its sample mean.

[Please Insert Table 2 Here]

4.2 Endogeneity Issues

One potential concern is that our main findings may be subject to endogeneity issues. For instance, omitted variables could influence both the CEO's incentive pay and corporate environmental outcomes, while the matching between firms and CEOs may not be random. Additionally, firms with stronger environmental performance may enjoy better social standing, stronger performance, and lower volatility, which could in turn increase CEOs' capital gains and thus affect their tax burdens (Christie, 1982; Yost, 2018). To address these concerns, we employ three identification strategies. The first two rely on PSM and EB to improve comparability between firm-years with high-tax burden CEOs and those with low-tax burden

[19] Following recent studies on CEO tax burdens (e.g., Lonare, 2024; Kubick et al., 2025; Ge et al., 2026; Underwood and Yost, 2026), we cluster standard errors at the firm level because, although our measure of CEO tax burdens incorporates state-level capital gains tax rates, its primary cross-sectional and time-series variation arises from firm-specific factors rather than state-level factors. Our results remain robust to alternative standard-error clustering methods.

CEOs. Our third strategy exploits plausibly exogenous variation in the capital gains tax rate to mitigate concerns related to reverse causality and omitted factors.

4.2.1 PSM and EB Estimates

To implement the PSM analysis, we first estimate propensity scores using the logit model shown in column (1) of Panel A of Table OA1, which predicts the likelihood that a firm is led by a high-tax-burden CEO. We include the same control variables as in the baseline regression model. To ensure that firms with high-tax-burden CEOs (the treatment group) are matched with otherwise comparable firms with low-tax-burden CEOs (the control group), we employ nearest-neighbour matching and pair each treatment firm with a control firm that is from the same industry and has the closest propensity score. If a control firm is matched to more than one treatment firm, we retain only the pair with the smallest propensity score difference. We also require that the absolute difference in propensity scores between a treatment firm and its matched control firm not exceed 0.5%.

We conduct two diagnostic tests to verify that the observable characteristics in the treatment and control groups are sufficiently similar. The first test re-estimates the logit model using the matched sample. The results, reported in column (2) of Panel A in Table OA1, show that none of the coefficient estimates is statistically significant, and that the pseudo-R^2 declines from 0.132 in the pre-match sample to 0.006 in the post-match sample. The second diagnostic test examines the mean differences in each observable characteristic between the treatment and control groups. As shown in Panel B of Table OA1, none of these differences is statistically significant, further confirming the evidence from the first test. Overall, these diagnostic tests suggest that PSM effectively reduces observable differences in characteristics between the treatment and control groups, apart from the difference in CEO tax burdens. Therefore, any observed difference in corporate environmental performance between the two groups is likely attributable to differences in CEOs' tax burdens. We then re-estimate the baseline regression

model using the matched sample of 375 firm pairs and report the results in columns (1) and (2) of Table 3. We find that the coefficient on *CEO Tax Burden* remains negative and statistically significant at the 1% level.

We also implement the EB approach, which reweights observations by imposing constraints to adjust the mean and variance of observable characteristics, thereby achieving a tight covariate balance. Unlike PSM, EB retains all observations from the baseline regression analysis rather than excluding unmatched ones. DeFond et al. (2016) note that EB can achieve covariate balance without relying on a particular matching design, thereby reducing concerns that the results are sensitive to model specification. In addition, Hainmueller (2012) argues that the improved balance achieved by EB can reduce approximation bias and lessen reliance on model specification in finite samples. The results reported in Table OA2 indicate that, after applying EB, the treatment and control groups have identical means and variances for the observable characteristics. In columns (3) and (4) of Table 3, we re-estimate the baseline regression model using the entropy-balanced sample and find that the coefficient on *CEO Tax Burden* is still negative and statistically significant at the 5% level or better. Taken together, the results from the PSM and EB analyses further reinforce our finding that firms led by high-tax burden CEOs exhibit better corporate environmental performance.

[Please Insert Table 3 Here]

4.2.2 DiD Analysis

We next conduct a DiD analysis to assess the impact of JGTRRA 2003, which lowered the top individual capital gains tax rate from 20 percent to 15 percent, on corporate environmental performance. Yost (2018) argues that the enactment of JGTRRA 2003 provides a useful empirical setting because it represents a significant and plausibly unanticipated reduction in the capital gains tax rate, making it unlikely that CEOs adjusted corporate decisions in anticipation of the reform. If our main hypothesis holds, the reduction in CEOs' capital gains tax rates following the tax reform should attenuate the tax lock-in effect and

reduce CEOs' exposure to firm-specific risk by increasing their propensities to sell shares. This reasoning implies a positive association between the adoption of JGTRRA 2003 and corporate toxic waste generation. To test this prediction, we estimate the following regression:

$$T\_Waste_{i,t} = \alpha + \beta_1 Pre\_Tax\_Burden_i \times Post\_Cut_t + \beta_k Control_{i,t-1} + D_i + \gamma_t + \varepsilon_{i,t} \quad (3)$$

Our sample spans a nine-year period from 1999 to 2007. We exclude observations in 2003 to mitigate ambiguous information in the transitory year (Lonare, 2024). We also require sample firms to have at least two consecutive years of non-missing data both before and after the 2003 tax cut. $T\_Waste_{i,t}$ denotes the level of corporate toxic waste generation for firm *i* in year *t*. $Pre\_Tax\_Burden_i$ represents the CEO's tax burden at the end of 2002. Yost (2018) shows that although the tax reform affected all CEOs simultaneously, its impact was more pronounced for those facing higher tax burdens prior to the reform. Because these CEOs were more likely to be undiversified as a result of the tax lock-in effect, they had stronger incentives to reduce firm risk. In addition, while the tax cut lowered the cost of selling shares for all CEOs, those previously constrained by higher tax burdens benefited more from the decline in capital gains tax rates. $Post\_Cut_t$ is an indicator variable set to one for the post-JGTRRA period (i.e., 2004-2007) and zero for the pre-JGTRRA period (i.e., 1999-2002). $Control_{i,t-1}$ is a vector of control variables as used in the baseline regression model. D_i and γ_t denote firm fixed effects and year fixed effects, respectively. We expect the coefficient on $Pre\_Tax\_Burden_i \times Post\_Cut_t$ to be positive and statistically significant, suggesting that firms whose CEOs faced higher tax burdens prior to the tax cut experienced a more pronounced increase in corporate toxic waste generation following the reform than firms whose CEOs faced lower tax burdens.

Column (1) of Table 4 presents the estimation results from Equation (3). Consistent with our conjecture, the coefficient on $Pre\_Tax\_Burden_i \times Post\_Cut_t$ is positive and significant at the 1% level. Economically, a one standard deviation increase in *Pre_Tax_Burden*

(i.e., CEO tax burdens in 2002) increases *T_Waste* in the post-JGTRRA period by 10.02%.[20] These results are consistent with our conjecture that high-tax-burden CEOs exhibit a more pronounced increase in corporate toxic waste generation following the tax cut reform. Furthermore, to mitigate the concern that the results from DiD analysis may be driven by differences between firms with high-tax burden CEOs and those with low-tax burden CEOs, we re-estimate Equation (3) using a matched sample based on PSM. We match each firm whose CEO had an above-median tax burden (treatment firm) in the year prior to the tax cut to a firm whose CEO had a below-median tax burden (control firm) in the same year, with the remaining matching criteria following the procedure outlined in Section 4.2.1. The diagnostic tests for our matching are reported in Table OA3. The results from the PSM DiD analysis are presented in column (2). Again, the coefficient on the interaction term, $Pre\_Tax\_Burden_i \times Post\_Cut_t$, remains positive and significant at the 1% level. Collectively, these results support our central hypothesis that higher CEO tax burdens improve corporate environmental performance.

A key identifying assumption underlying our DiD analyses is that, absent the enactment of JGTRRA 2003, corporate toxic waste generation for treatment firms would have followed a trend similar to that of control firms (i.e., the parallel trends assumption). To examine this assumption, we re-estimate Equation (3) by replacing the interaction term, $Pre\_Tax\_Burden_i \times Post\_Cut_t$, with seven interaction terms: $Before^{-3} \times Pre\_Tax\_Burden_i$, $Before^{-2} \times Pre\_Tax\_Burden_i$, $Before^{-1} \times Pre\_Tax\_Burden_i$, $After^{+1} \times Pre\_Tax\_Burden_i$, $After^{+2} \times Pre\_Tax\_Burden_i$, $After^{+3} \times Pre\_Tax\_Burden_i$, and $After^{+4} \times Pre\_Tax\_Burden_i$, respectively. These variables indicate years relative to the adoption of the tax cut reform. For example, $Before^{-3} \times Pre\_Tax\_Burden_i$ corresponds to three years before the adoption of JGTRRA 2003, whereas $After^{+4} \times Pre\_Tax\_Burden_i$ corresponds to four years after the reform.

[20] The standard deviation of *Pre_Tax_Burden* in 2002 is 0.1637, and the mean value of *T_Waste* in post-JGTRRA period is 0.0147.

We omit $Before^{-4} \times Pre\_Tax\_Burden_i$ from the regression and use it as the baseline year period. Particularly, we focus on the coefficients on $Before^{-3} \times Pre\_Tax\_Burden_i$, $Before^{-2} \times Pre\_Tax\_Burden_i$, and $Before^{-1} \times Pre\_Tax\_Burden_i$, as their magnitude and statistical significance indicate whether the parallel trends assumption is violated.

Column (3) presents the results of this dynamic treatment analysis. We find that the coefficients on $Before^{-3} \times Pre\_Tax\_Burden_i$, $Before^{-2} \times Pre\_Tax\_Burden_i$, and $Before^{-1} \times Pre\_Tax\_Burden_i$ are relatively small and statistically insignificant. By contrast, the increase in *T_Waste* emerges only after the enactment of JGTRRA 2003, as the coefficients on $After^{+1} \times Pre\_Tax\_Burden_i$, $After^{+2} \times Pre\_Tax\_Burden_i$, $After^{+3} \times Pre\_Tax\_Burden_i$, and $After^{+4} \times Pre\_Tax\_Burden_i$ are positive and statistically significant. We also conduct the analysis using a propensity-score-matched sample and report the results in column (4).[21] The results remain similar as the coefficients on the pre-trend indicators are statistically insignificant, whereas the coefficients on the post-trend indicators are positive and statistically significant. Taken together, these findings support the validity of the parallel trends assumption and suggest that our DiD results are unlikely to be driven by pre-existing trends.

[Please Insert Table 4 Here]

4.3 Cross-sectional Heterogeneity

We next conduct the cross-sectional analyses to further strengthen our evidence on the negative association between CEO tax burdens and corporate toxic waste generation. As discussed in our hypothesis, higher tax burdens increase CEOs' sensitivity to the long-term liability risks associated with environmental misconduct and align their personal incentives with long-term firm value. They therefore may function as an internal control mechanism that discourages agency-driven environmentally risky behaviour. Under this view, the effect of CEO tax burdens on corporate toxic waste generation should be stronger among firms that are

[21] Using CEO tax burden and firm- and CEO-level characteristics measured in 2002, we construct the propensity-score-matched sample following procedures similar to those discussed in Section 4.2.1.

more prone to environmental misconduct. Moreover, these heterogeneity analyses also help alleviate concerns that omitted variables drive our results, because any such confounder would need to be orthogonal to the included controls and simultaneously account for the predicted cross-sectional variation in the effect of CEO tax burdens.

We first use board independence and board co-option as two proxies for the effectiveness of internal corporate governance. Prior studies suggest that more effective governance plays an important role in disciplining managers' agency-related behaviour (e.g., Jensen and Meckling, 1976; Fama and Jensen, 1983; Coles et al., 2014). Relatedly, environmental performance is stronger in firms with more independent directors (e.g., Kassinis and Vafeas, 2002; Post et al., 2015) and fewer co-opted directors (e.g., Saeed et al., 2025). We therefore predict that the effect of tax burdens on corporate waste generation should be stronger for firms with weaker governance systems. In Panel A of Table 5, our first proxy, *Low Board Independence*, is an indicator variable equal to one if the proportion of independent directors on a firm's board is below the industry-year sample median, and zero otherwise. Our second proxy, *High Co-opted Board*, is an indicator variable equal to one if the proportion of directors appointed after the CEO assumed office is above the industry-year sample median, and zero otherwise (Coles et al., 2014). As expected, the coefficients on the interaction terms *CEO Tax Burden* × *Low Board Independence* and *CEO Tax Burden* × *High Co-opted Board* are negative and statistically significant at the 5% level.

In Panel B of Table 5, we partition our sample based on the stringency of state-level environmental regulatory scrutiny. We predict that the negative effect of CEO tax burdens on corporate toxic waste generation should be more pronounced among firms facing less stringent environmental regulatory scrutiny. Our first proxy is based on the Regional Greenhouse Gas Initiative (RGGI) cap-and-trade program, a mandatory market-based program to limit

greenhouse gas emissions in the United States.[22] We thereby construct an indicator variable, *Non-RGGI*, which equals one for firms headquartered in states that never adopted RGGI during our sample period, and zero otherwise. In addition, prior research finds that regulatory monitoring and enforcement intensity decline with distance from enforcement agencies, leading to weaker oversight and greater managerial discretion (e.g., Becker, 1968; Helland, 1998; Gray and Shimshack, 2011; Kahn and Mansur, 2013). We thus construct an indicator variable, *Large Distance from EPA*, which equals one if the distance (in kilometres) between a firm's headquarters and the nearest EPA office is above the industry-year sample median, and zero otherwise. The estimation results support our prediction as the coefficients on *CEO Tax Burden* × *Non-RGGI* and *CEO Tax Burden* × *Large Distance from EPA* are negative and statistically significant.

We next examine how the relation between CEO tax burdens and environmental performance varies with CEOs' career-related pressure. Our first proxy captures pressure to consistently meet short-term earnings benchmarks. As in prior studies (e.g., Graham et al., 2005; Pae et al., 2016; Liu et al., 2021b), the managerial labour market uses firm earnings to assess managerial ability, thereby creating pressure to consistently meet or beat earnings benchmarks, often at the expense of long-term value. Consistent with this view, firms that meet or just beat analysts' earnings expectations exhibit higher levels of pollution (e.g., Liu et al., 2021b; Thomas et al., 2022). We thus construct an indicator variable, *Meet or Just Beat*, which equals one if a firm meets or just beats the consensus analyst EPS forecast by less than one cent per share, and zero otherwise. Our second proxy captures greater exposure to the managerial labour

[22] The RGGI program was formally established in December 2005, when seven states: Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont signed a Memorandum of Understanding (MOU). Massachusetts, Rhode Island, and Maryland joined in 2007, bringing total membership to ten states. The first compliance period began on January 1, 2009, when RGGI became operational and required covered power plants in participating states to hold allowances sufficient to cover their CO_2 emissions. Regarding our sample period of 1993 to 2015, ten states participated in RGGI beginning in 2009, although New Jersey withdrew effective January 1, 2012. For more information, see: https://www.c2es.org/content/regional-greenhouse-gas-initiative-rggi/.

market. Because managers' employment prospects depend on current firm performance, CEOs with greater labour market exposure may place more weight on short-term projects and less weight on long-term investments whose outcomes are more uncertain and take longer to materialize (e.g., Narayanan, 1985; Stein, 1989; Bebchuk and Stole, 1993). Prior studies show that generalist CEOs, whose skills are more transferable across firms and industries, are more likely to engage in job hopping and are therefore more intensively evaluated by the labour market (e.g., Murphy and Zabojnik, 2007; Lazear, 2009; Giannetti, 2011; Custódio et al., 2013). As a result, they have stronger incentives to pursue investments with near-term payoffs (e.g., Chen et al., 2020). We therefore construct an indicator variable, *High GAI*, which equals one if the CEO's general ability index is above the industry-year sample median, and zero otherwise. The results, reported in Panel C of Table 5, show that the coefficients on *CEO Tax Burden* × *Meet or Just Beat* and *CEO Tax Burden* × *High GAI* are negative and statistically significant. These findings suggest that the negative effect of tax burdens on waste generation is more prominent for CEOs facing greater career-related pressure, as reflected in the need to maintain short-term earnings consistency and greater exposure to the managerial labour market.

Panel D partitions the sample based on CEOs' risk diversification opportunities. If higher tax burdens increase CEOs' exposure to firm-specific risk and thus heighten their sensitivity to the risks associated with environmental misconduct, we expect the negative association between CEO tax burdens and toxic waste generation to be more pronounced for CEOs with fewer opportunities to diversify risks. To test this prediction, we follow prior studies (e.g., Dittmann and Maug, 2007; Underwood and Yost, 2026) and construct our first proxy, *Low Outside Wealth*, an indicator variable equal to one if the ratio of a CEO's wealth not invested in the firm to the CEO's total wealth is below the industry-year sample median, and zero otherwise.[23] Prior studies also suggest that managers with greater hedging opportunities

[23] We obtain CEO outside wealth data from Ingolf Dittmann's personal website (Dittmann and Maug, 2007). This measure estimates the CEO's personal wealth held outside of the firm. Because CEOs are typically heavily exposed to firm-specific

are less sensitive to firm-specific risk exposure and less likely to prioritize long-term investments (e.g., Gao, 2010; Hung et al., 2019; Park et al., 2023). Following this literature, we construct our second proxy, *Low Hedging Opportunity*, an indicator variable equal to one if the firm's average daily trading volume is below the industry-year sample median, and zero otherwise. Consistent with our prediction, the results in Panel D show that the coefficients on *CEO Tax Burden* × *Low Outside Wealth* and *CEO Tax Burden* × *Low Hedging Opportunity* are negative and statistically significant.

Overall, the cross-sectional analyses suggest that the negative association between CEO tax burdens and toxic waste generation is stronger among firms with weaker internal governance, less stringent environmental regulatory scrutiny, and CEOs facing greater career-related pressure or more limited opportunities to diversify risk. These findings support our argument that higher tax burdens act as an internal control mechanism by increasing CEOs' sensitivity to the risks associated with substantial environmental liabilities and reducing their tendency to prioritize short-term gains.

[Please Insert Table 5 Here]

4.4 Underlying Mechanisms

4.4.1 CEO Tax Burdens and Corporate Productive Efficiency

We now explore the mechanisms through which higher CEO tax burdens may reduce corporate toxic waste generation. Earlier research suggests that pollution is fundamentally a form of waste and thus reflects inefficient resource use in the production process. Emissions of scrap materials, hazardous substances, or various forms of energy into the environment indicate that firms have failed to operate resources efficiently (e.g., Porter and Van der Linde, 1995a, 1995b). Accordingly, one possible channel is that higher tax burdens reduce toxic waste

risk through their equity and option holdings, they are inherently underdiversified. Higher outside wealth mitigates this underdiversification by reducing the relative weight of firm-specific equity in the CEO's overall portfolio, thereby decreasing their sensitivity to idiosyncratic risk (Hall and Murphy, 2002).

generation by improving corporate productive efficiency. We construct two proxies to test this channel. We use total factor productivity (*TFP*) as a proxy for firm-level productive efficiency. *TFP* is measured as the residuals from a log-linear Cobb-Douglas production function estimated following Olley and Pakes (1996) (e.g., İmrohoroğlu and Tüzel., 2014; Gkikopoulos et al., 2025). Our second measure is firm-level operating efficiency (*Operating Efficiency*), measured as one minus firm-level loss of efficiency estimated via the stochastic frontier estimation methodology with a half-normal distribution (Battese and Coelli, 1988; Qiu et al., 2022).

Following prior studies such as Fedaseyeu et al. (2018) and Azevedo et al. (2024), we conduct a formal mediation analysis to examine whether productive efficiency helps explain the relationship between CEO tax burdens and corporate toxic waste generation.[24] Panel A of Table 6 reports the results. Columns (1)-(3) present the mediation analysis for *TFP*. The results in column (1) indicate that CEO tax burdens are positively and significantly associated with *TFP*. Column (2) shows that firms with greater *TFP* generate significantly less toxic waste. In column (3), we include both *CEO Tax Burden* and *TFP* in the regression model, with *T_Waste* as the dependent variable. The coefficients on both variables are negative and statistically significant. The Sobel test further shows that the indirect effect through *TFP* is statistically significant at the 5% level, suggesting that *TFP* helps transmit the effect of CEO tax burdens on corporate toxic waste generation. Specifically, approximately 7.5% of the total effect is mediated through *TFP*.

Columns (4)-(6) present the mediation analysis for *Operating Efficiency*. The results yield a similar pattern: CEO tax burdens are positively and significantly associated with

[24] We thank the anonymous referee for encouraging us to conduct the mediation analyses. We construct the sample for the mediation analyses of corporate productive efficiency using the Execucomp and Compustat datasets over the same period as in the baseline analysis, while financial firms are excluded. Specifically, each mediation analysis is conducted using a common sample that requires non-missing values for variables related to CEO tax burdens, corporate toxic waste generation, the corresponding mediator, and all control variables.

Operating Efficiency, and firms with higher *Operating Efficiency* significantly reduce their toxic waste generation. In the regression of *T_Waste* on both *CEO Tax Burden* and *Operating Efficiency*, the coefficients on both variables are negative and statistically significant. The Sobel test indicates that the indirect effect is statistically significant at the 1% level, with *Operating Efficiency* accounting for approximately 6.2% of the total effect. Collectively, the results in Panel A suggest that corporate productive efficiency, proxied by *TFP* and *Operating Efficiency*, is a potential mechanism through which CEO tax burdens reduce corporate toxic waste generation.

4.4.2 CEO Tax Burdens and Green Innovation

Prior literature also suggests that green innovation plays an important role in enhancing corporate environmental performance (e.g., Carrión-Flores and Innes, 2010; Amore and Bennedsen, 2016; Cheng et al., 2025). However, as a central component of firms' CSR strategies, the benefits of green innovation are not realized immediately and typically require a longer time horizon to materialize (e.g., Oh et al., 2016). Building on these perspectives, we examine whether green innovation constitutes a potential channel through which unrealized capital gains tax burdens affect corporate environmental performance.

To measure green innovation, we use patent data obtained from the USPTO, linked to U.S. public firms in the Compustat database following the procedures in Kogan et al. (2017) and Stoffman et al. (2022). Similar to Brunnermeier and Cohen (2003) and Amore and Bennedsen (2016), we classify a patent as green if its primary USPTO technology class falls within environment-related categories, including air pollution abatement, water purification and liquid treatment, hazardous waste prevention and control, recycling, and alternative energy technologies. As in Kogan et al. (2017) and Stoffman et al. (2022), patents are assigned to the fiscal year in which they are granted.

Our first measure captures the quantity of a firm's green innovation output: *Ln*(*1+G-Patent Count*), defined as the natural logarithm of one plus the total number of green patents granted to the firm in a given fiscal year. Our second measure captures the economic value of green innovation: *Ln*(*1+G-Patent Value*), defined as the natural logarithm of one plus the total stock-market-based value of green patents granted to the firm in a given fiscal year, where patent values are estimated following Kogan et al. (2017).[25] Panel B of Table 6 reports the mediation analyses for the two green innovation measures.[26] Columns (1) and (4) show that CEO tax burdens are positively and significantly associated with *Ln*(*1+G-Patent Count*) and *Ln*(*1+G-Patent Value*), respectively. Columns (2) and (5) show that higher values of these green innovation measures are associated with lower *T_Waste*, consistent with the view that firms with more green innovation generate less toxic waste. In columns (3) and (6), we regress *T_Waste* on both *CEO Tax Burden* and each green innovation measure. The coefficients on *CEO Tax Burden* and the corresponding green innovation measure are negative and statistically significant. The Sobel tests confirm that the indirect effects are statistically significant, with *Ln*(*1+G-Patent Count*) and *Ln*(*1+G-Patent Value*) accounting for approximately 24.1% and 17.5% of the total effect, respectively. Taken together, these results suggest that green innovation is another potential mechanism through which CEO tax burdens reduce corporate toxic waste generation.

Overall, the findings presented in Table 6 suggest that unrealized capital gains tax burdens improve corporate environmental performance by enhancing firms' productive efficiency and increasing their engagement in green innovation. This evidence reinforces the notion that higher tax burdens heighten CEOs' concerns about the risks associated with

[25] We acknowledge that grant-year assignment introduces a lag relative to the timing of innovative activity, as patents are typically granted two to three years after application. Therefore, our green innovation analyses should be interpreted as a supplementary mechanism test rather than a precise contemporaneous measure.

[26] Similar to the procedures discussed in Panel A of Table 6, the sample for these mediation analyses is constructed from the Execucomp and Compustat datasets over the same baseline sample period, excluding financial firms. Both mediation analyses are conducted based on a common sample that requires non-missing values for variables related to CEO tax burdens, corporate toxic waste generation, the corresponding mediator, and all control variables.

environmental liabilities and increase their focus on the long-term sustainability of corporate operations and investment.

[Please Insert Table 6 Here]

4.5 Robustness Tests

In this section, we conduct several additional tests to assess the robustness of our main results as shown in Section 4.1. First, following previous studies (e.g., Core and Guay, 2002; Coles et al., 2006), we augment the baseline model with additional CEO compensation controls. We include CEO total compensation (*Ln*(*Total Pay*)), CEO Vega (*Ln*(*1+Vega*)), and CEO Delta (*Ln*(*1+Delta*)). The results are reported in column (1) of Panel A of Table 7. Additionally, state-level environmental regulatory environments may vary substantially across states and potentially confound the relation between CEO tax burdens and firms' environmental performance. We thus construct three state-level variables that capture per capita greenhouse gas emissions (*Emission Per Capita*), emissions intensity (*Emission Intensity*), and recent emissions trends potentially associated with regulatory actions (*Regulatory Effectiveness*). We add these variables to the baseline regression model and report the results in column (2) of Panel A of Table 7. In both columns, the estimated coefficient on *CEO Tax Burden* remains negative and statistically significant at the 1% level.

Second, we incorporate CEO fixed effects to account for time-invariant differences in CEOs' personal traits, which may influence both their vested stock holdings and decisions regarding corporate environmental performance. We then replace firm fixed effects with CEO-firm fixed effects to absorb unobserved heterogeneity associated with a given CEO-firm match that remains constant during the CEO's tenure. This specification allows us to exploit within-CEO-firm variation over time and examine how changes in a CEO's tax burden are associated with changes in environmental performance for the same CEO working at the same firm. We also replace year fixed effects with industry-year fixed effects, which enables us to control for

unobserved changes in industry conditions and to compare firms with high-tax-burden CEOs and those with low-tax-burden CEOs within the same industry and year. To address concerns about unobserved state-level heterogeneity, we further include headquarters-state-by-year fixed effects in the baseline regressions, which absorb time-varying, state-specific factors, including environmental policies, regulatory enforcement, and macroeconomic conditions, that may simultaneously affect firms headquartered in the same state.[27] In addition, we employ Fama–MacBeth regressions with Newey–West standard errors to examine the cross-sectional relation between CEO tax burdens and corporate environmental performance. The results are reported in Panel B of Table 7. The coefficient on *CEO Tax Burden* remains negative and statistically significant at the 1% level across all columns.

Third, to further strengthen the validity and generalizability of our baseline findings, we re-estimate the baseline regression model in Panel C of Table 7 using an alternative dependent variable based on toxic waste releases (*T_Release*). Chang et al. (2021a) show that toxic waste releases are also closely associated with environmental regulation, litigation, and enforcement actions, and that higher values of *T_Release* indicate poorer corporate environmental performance. Re-estimating the baseline regressions under several alternative fixed-effect specifications, we continue to find that the coefficient on *CEO Tax Burden* remains negative and statistically significant at the 1% level across all columns.

Finally, we decompose our main variable of interest, *CEO Tax Burden*, into two separate components: *CEO Federal Tax Burden* and *CEO State Tax Burden*. While our previous analyses use an aggregate measure of CEO tax burden, the decomposition allows us to investigate whether the observed negative relation remains when federal and state tax burdens

[27] In untabulated results, we also re-estimate the baseline regression model after excluding firms that change their headquarters state during the sample period. The results remain unchanged. Moreover, we re-estimate the main results, DiD analyses, and additional empirical specifications using alternative standard-error clustering methods at either the industry or state level. The results remain robust.

are considered separately. We follow Hanlon et al. (2021) and reconstruct federal- and state-level CEO tax burdens using the following formulas:

$$CEO\ Federal\ Tax\ Burden_t = \frac{\sum_{n=1}^{t} t_{fr} \times N_n \times (P_t - P_n)}{CEO\ Total\ Equity_t} \quad (4)$$

$$CEO\ State\ Tax\ Burden_t = \frac{\sum_{n=1}^{t} t_{sr} \times N_n \times (P_t - P_n)}{CEO\ Total\ Equity_t} \quad (5)$$

In Equations (4) and (5), t_{fr} and t_{sr} denote the total capital gains tax rates at the federal and state levels, respectively. We then re-estimate the baseline regression model specified in Equation (2), using these two new tax burden measures as the main variables of interest while keeping all control variables unchanged. The results are reported in Panel D of Table 7. We find that the coefficient estimates of both *CEO Federal Tax Burden* and *CEO State Tax Burden* are negative and statistically significant at the 1% level. These results further confirm the robustness of our main findings, showing that the negative relation between CEO tax burden and corporate toxic waste generation still holds when tax burden is decomposed into federal and state components.

[Please Insert Table 7 Here]

5. Conclusion

Recent studies document that environmental policies have become an increasingly important consideration in corporate decision-making. This development reflects the fact that environmental issues create long-term and recurring obligations for firms to comply with environmental laws and regulations, and that failure to fulfil these obligations can lead to environmental liabilities with substantial consequences. In this paper, we examine the effect of CEOs' tax burdens on corporate toxic waste generation, which directly reflects environmental liabilities and poor environmental performance. We conjecture that, because higher tax burdens

increase CEOs' exposure to firm-specific risk, they discourage environmentally risky behaviour and improve environmental performance that supports sustainable value creation.

Consistent with our conjecture, we find that corporate toxic waste generation decreases as CEOs' tax burdens increase. To address endogeneity concerns, we first conduct PSM and EB analyses to improve comparability between firms led by high-tax-burden CEOs and those led by low-tax-burden CEOs. We also use the enactment of JGTRRA 2003 as a plausible exogenous shock to CEOs' personal tax burdens and confirm that the tax lock-in effect significantly reduces corporate toxic waste generation. Results from cross-sectional analyses indicate that the reduction in corporate toxic waste is more pronounced among firms with weaker internal governance, less stringent state-level environmental regulation, and firms led by CEOs who face heightened career-related pressure to prioritize near-term results or have fewer opportunities to diversify risk. We further explore the mechanisms underlying our main results and find that higher tax burdens reduce toxic waste generation by improving corporate productive efficiency and increasing green innovation.

Overall, our study contributes to the growing body of literature that examines the implications of CEOs' tax burdens for corporate policies. Recent studies document that higher tax burdens influence firm risk-taking, M&A deal structure, loan spreads, and accounting conservatism. Our research extends this literature by demonstrating a significant and robust association between CEOs' tax burdens and corporate environmental performance. Our work also enriches the literature on CEO incentives and corporate environmental policies. By exploiting a federal capital gains tax cut as a plausibly exogenous shock to CEOs' equity-related tax burdens, we provide evidence that CEOs' capital gains taxes can meaningfully influence firms' environmental performance. These findings offer useful insights for stakeholders and policymakers regarding the role of CEOs' personal taxes in shaping corporate environmental strategies.

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Table 1. Summary Statistics

This table reports descriptive statistics for the variables used in the baseline regression analysis. Panel A presents the summary statistics for the full sample, which consists of 8,677 firm-year observations over the period 1993-2015. Variable definitions are provided in Appendix A. All continuous variables are winsorized at the 1st and 99th percentiles. Panel B presents univariate analyses comparing firms managed by CEOs with higher tax burdens to those managed by CEOs with lower tax burdens. *t*-tests and Wilcoxon-Mann-Whitney tests are used to test for differences in means and medians. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Panel A: Summary Statistics

Variables	N	Mean	Std.Dev.	P25	P50	P75
T_Waste	8,677	0.016	0.024	0.003	0.008	0.020
CEO Tax Burden	8,677	0.052	0.120	0.000	0.053	0.123
Size	8,677	6.432	0.676	5.919	6.371	6.896
Market-to-book	8,677	2.927	3.515	1.503	2.180	3.393
Leverage	8,677	0.212	0.142	0.109	0.204	0.303
ROA	8,677	0.143	0.069	0.098	0.136	0.180
Cash	8,677	0.098	0.112	0.019	0.056	0.135
Capex	8,677	0.051	0.036	0.026	0.042	0.067
R&D	8,677	0.025	0.035	0.000	0.012	0.033
CEO Age	8,677	56.93	6.463	53.000	57.000	61.000
CEO Gender	8,677	0.015	0.122	0.000	0.000	0.000
CEO Education	8,677	0.352	0.478	0.000	0.000	1.000
CEO Ownership	8,677	0.016	0.044	0.001	0.002	0.008

Panel B: Univariate Analyses

Variables	Low-tax-burden CEOs (N=4,389)		High-tax-burden CEOs (N=4,288)		Test of Difference	
	Mean	Median	Mean	Median	Mean	Median
T_Waste	0.017	0.008	0.016	0.008	0.001**	0.000**
Size	6.461	6.408	6.402	6.335	0.059***	0.073***
Market-to-book	2.471	1.839	3.394	2.572	-0.922***	-0.732***
Leverage	0.230	0.223	0.194	0.186	0.036***	0.037***
ROA	0.126	0.121	0.160	0.153	-0.033***	-0.031***
Cash	0.090	0.052	0.105	0.061	-0.015***	-0.009***
Capex	0.048	0.040	0.055	0.044	-0.006***	-0.004***
R&D	0.024	0.013	0.025	0.011	0.000	0.001
CEO Age	56.260	57.000	57.616	58.000	-1.356***	-1.000***
CEO Gender	0.022	0.000	0.008	0.000	0.013***	0.000***
CEO Education	0.356	0.000	0.348	0.000	0.008	0.000
CEO Ownership	0.010	0.002	0.022	0.004	-0.013***	-0.002***

Table 2. Baseline Results

This table presents the effect of CEOs' tax burdens on the generation of corporate toxic waste. The dependent variable is *T_Waste,* and the main variable of interest is *CEO Tax Burden*. Column (1) reports the regression results including only *CEO Tax Burden*, whereas column (2) reports the results after additionally controlling for firm- and CEO-level characteristics. Variable definitions are provided in Appendix A. All specifications include year and firm fixed effects. Statistical significance is based on standard errors, reported in parentheses, that are heteroskedasticity-robust and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: T_Waste	
	(1)	(2)
CEO Tax Burden	-0.013***	-0.009***
	(0.002)	(0.002)
Size		-0.025***
		(0.002)
Market-to-book		-0.001
		(0.001)
Leverage		-0.003
		(0.003)
ROA		-0.019***
		(0.005)
Cash		0.009*
		(0.005)
Capex		0.013
		(0.011)
R&D		-0.060***
		(0.018)
CEO Age		-0.001
		(0.001)
CEO Gender		-0.000
		(0.002)
CEO Education		-0.001*
		(0.001)
CEO Ownership		0.020
		(0.012)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	8,677	8,677
Adjusted R^2	0.805	0.835

Table 3. Propensity Score Matching (PSM) and Entropy Balancing (EB) Analyses

This table reports the main results based on the PSM and EB analyses. The dependent variable is *T_Waste,* and the main variable of interest is *CEO Tax Burden*. Columns (1) and (2) report the estimation results from the PSM analysis, while columns (3) and (4) report the estimation results from the EB analysis. Columns (1) and (3) include only *CEO Tax Burden*, whereas columns (2) and (4) additionally include firm- and CEO-level control variables. Variable definitions are provided in Appendix A. All specifications include year and firm fixed effects. Statistical significance is based on standard errors, reported in parentheses, that are heteroskedasticity-robust and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: T_Waste			
	PSM		EB	
	(1)	(2)	(3)	(4)
CEO Tax Burden	-0.016***	-0.013***	-0.012***	-0.007***
	(0.003)	(0.003)	(0.002)	(0.002)
Size		-0.023***		-0.024***
		(0.002)		(0.003)
Market-to-book		-0.001		-0.000
		(0.000)		(0.001)
Leverage		-0.003		-0.005
		(0.003)		(0.003)
ROA		-0.013***		-0.020***
		(0.005)		(0.007)
Cash		0.010*		0.011**
		(0.005)		(0.005)
Capex		0.015*		0.015
		(0.013)		(0.015)
R&D		-0.051**		-0.086**
		(0.022)		(0.034)
CEO Age		0.001		-0.000
		(0.000)		(0.001)
CEO Gender		0.002		0.000
		(0.001)		(0.002)
CEO Education		-0.001		-0.001
		(0.001)		(0.001)
CEO Ownership		0.021		0.021
		(0.013)		(0.013)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	5,468	5,468	8,677	8,677
Adjusted R^2	0.813	0.841	0.810	0.837

Table 4. Difference-in-differences (DiD) Analysis of the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA 2003)

This table exploits the adoption of JGTRRA 2003 as an exogenous shock to CEO tax burdens and examines its effect on corporate toxic waste generation. JGTRRA 2003 reduced the top capital gains tax rate from 20% to 15%, and hence, CEOs with higher tax burdens prior to the reform should benefit more from the change in tax law. The sample covers a nine-year window from 1999 to 2007, excluding observations from 2003 to avoid ambiguity associated with the transition year. The dependent variable is *T_Waste*. Column (1) reports the DiD estimation results. *Pre_Tax_Burden* denotes the CEO's tax burden at the end of 2002. *Post_Cut* is an indicator variable equal to one for the post-JGTRRA period, 2004–2007, and zero for the pre-JGTRRA period, 1999–2002. Column (2) reports the DiD estimation results based on the PSM sample. Columns (3) and (4) report the dynamic treatment analyses based on the baseline sample and the PSM sample, respectively. $Before^{-3}$, $Before^{-2}$, and $Before^{-1}$ are indicator variables equal to one in the third, second, and first year prior to the enactment of JGTRRA 2003, respectively. $After^{+1}$, $After^{+2}$, $After^{+3}$, and $After^{+4}$ are indicator variables equal to one in the first, second, third, and fourth year after the enactment of JGTRRA 2003, respectively. Variable definitions are provided in Appendix A. All specifications include firm and year fixed effects. Statistical significance is based on standard errors, reported in parentheses, that are heteroskedasticity-robust and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: T_Waste			
	DiD	DiD-PSM	DiD	DiD-PSM
	(1)	(2)	(3)	(4)
Pre_Tax_Burden × Post_Cut	0.009***	0.012***		
	(0.003)	(0.004)		
$Before^{-3}$ × Pre_Tax_Burden			0.001	-0.007
			(0.004)	(0.007)
$Before^{-2}$ × Pre_Tax_Burden			-0.003	-0.004
			(0.003)	(0.003)
$Before^{-1}$ × Pre_Tax_Burden			-0.002	-0.002
			(0.002)	(0.002)
$After^{+1}$ × Pre_Tax_Burden			0.005***	0.005**
			(0.002)	(0.003)
$After^{+2}$ × Pre_Tax_Burden			0.009***	0.007**
			(0.003)	(0.003)
$After^{+3}$ × Pre_Tax_Burden			0.009***	0.010**
			(0.003)	(0.004)
$After^{+4}$ × Pre_Tax_Burden			0.012***	0.015***
			(0.003)	(0.005)
All Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	2,870	1,581	2,870	1,581
Adjusted R^2	0.914	0.924	0.914	0.924

Table 5. Cross-sectional Heterogeneity

This table reports cross-sectional analyses of the effect of CEOs' tax burdens on corporate toxic waste generation. The dependent variable is *T_Waste*. Panel A partitions the sample based on the effectiveness of internal corporate governance. *Low Board Independence* is an indicator variable equal to one if the proportion of independent directors on a firm's board is below the industry-year sample median, and zero otherwise. *High Co-opted Board* is an indicator variable equal to one if the proportion of directors appointed after the CEO assumed office is above the industry-year sample median, and zero otherwise. Panel B partitions the sample based on the stringency of state-level environmental regulatory scrutiny. *Non-RGGI* is an indicator variable equal to one for firms headquartered in states that never adopted RGGI during our sample period, and zero otherwise. *Large Distance from EPA* is an indicator variable equal to one if the distance, in kilometres, between a firm's headquarters and the nearest EPA office is above the industry-year sample median, and zero otherwise. Panel C partitions the sample based on CEOs' career-related pressure. *Meet or Just Beat* captures pressure to consistently meet short-term earnings benchmarks and equals one if a firm meets or just beats the consensus analyst EPS forecast by less than one cent per share, and zero otherwise. *High GAI* captures greater exposure to the managerial labour market and equals one if the CEO's general ability index is above the industry-year sample median, and zero otherwise. Panel D partitions the sample based on CEOs' risk diversification opportunities. *Low Outside Wealth* is an indicator variable equal to one if the ratio of a CEO's wealth not invested in the firm to the CEO's total wealth is below the industry-year sample median, and zero otherwise. *Low Hedging Opportunity* is an indicator variable equal to one if the firm's average daily trading volume is below the industry-year sample median, and zero otherwise. Variable definitions are provided in Appendix A. All specifications include firm and year fixed effects. Statistical significance is based on standard errors, reported in parentheses, that are heteroskedasticity-robust and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Effectiveness of Corporate Internal Governance

	Dependent Variable: T_Waste	
	(1)	(2)
CEO Tax Burden	-0.003*	0.003
	(0.002)	(0.005)
CEO Tax Burden × Low Board Independence	-0.007**	
	(0.003)	
CEO Tax Burden × High Co-opted Board		-0.008**
		(0.004)
Low Board Independence	0.002***	
	(0.001)	
High Co-opted Board		0.000
		(0.000)
All Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	8,677	8,677
Adjusted R^2	0.836	0.835

Panel B: Stringency of State-level Environmental Regulatory Scrutiny

	Dependent Variable: T_Waste	
	(1)	(2)
CEO Tax Burden	0.003	-0.004
	(0.004)	(0.003)
CEO Tax Burden × Non-RGGI	-0.012***	
	(0.004)	
CEO Tax Burden × Large Distance from EPA		-0.013**
		(0.006)
Non-RGGI	0.000	
	(0.001)	
Large Distance from EPA		0.001
		(0.001)
All Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes

Observations	8,677	6,254
Adjusted R^2	0.835	0.871

Panel C: CEO Career-related Pressure

	Dependent Variable: T_Waste	
	(1)	(2)
CEO Tax Burden	-0.006**	0.002
	(0.003)	(0.006)
CEO Tax Burden × Meet or Just Beat	-0.010**	
	(0.004)	
CEO Tax Burden × High GAI		-0.007*
		(0.004)
Meet or Just Beat	0.001*	
	(0.000)	
High GAI		-0.000
		(0.000)
All Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	6,797	7,471
Adjusted R^2	0.833	0.847

Panel D: CEOs' Risk Diversification Opportunities

	Dependent Variable: T_Waste	
	(1)	(2)
CEO Tax Burden	-0.004	-0.004**
	(0.003)	(0.002)
CEO Tax Burden × Low Outside Wealth	-0.008**	
	(0.003)	
CEO Tax Burden × Low Hedging Opportunity		-0.008***
		(0.003)
Low Outside Wealth	0.001	
	(0.000)	
Low Hedging Opportunity		0.001
		(0.000)
All Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	7,776	7,672
Adjusted R^2	0.832	0.854

Table 6. Underlying Mechanisms

This table examines the potential mechanisms underlying the effect of CEOs' tax burdens on corporate toxic waste generation using mediation analyses. Panel A reports the results of mediation analyses for corporate productive efficiency, measured by total factor productivity (*TFP*) and operating efficiency (*Operating Efficiency*). *TFP* is measured as the residual from a log-linear Cobb-Douglas production function estimated following Olley and Pakes (1996) (e.g., İmrohoroğlu and Tüzel., 2014; Gkikopoulos et al., 2025). *Operating Efficiency* is measured as one minus firm-level loss of efficiency estimated via the stochastic frontier estimation methodology with a half-normal distribution (Battese and Coelli 1988; Qiu et al. 2022). Panel B reports the results of mediation analyses for corporate green innovation, measured by the quantity of green innovation output, *Ln(1+G-Patent Count)*, and the economic value of green innovation, *Ln(1+G-Patent Value)*. For each mediation analysis, we first regress the mediator on *CEO Tax Burden*. We then regress *T_Waste* on the mediator, and finally regress *T_Waste* on both *CEO Tax Burden* and the corresponding mediator. The Sobel test assesses the statistical significance of the indirect effect, and *Proportion Mediated* reports the proportion of the total effect transmitted through the corresponding mediator. Variable definitions are provided in Appendix A. All specifications include firm and year fixed effects. Statistical significance is based on standard errors, reported in parentheses, that are heteroskedasticity-robust and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Productive Efficiency

	TFP	T_Waste	T_Waste	Operating Efficiency	T_Waste	T_Waste
	(1)	(2)	(3)	(4)	(5)	(6)
CEO Tax Burden	0.205***		-0.006**	0.132***		-0.009***
	(0.049)		(0.003)	(0.036)		(0.002)
TFP		-0.003***	-0.002***			
		(0.001)	(0.001)			
Operating Efficiency					-0.005***	-0.005***
					(0.001)	(0.001)
Sobel Test			-2.238**			-2.682***
(P-value)			(0.025)			(0.007)
Proportion Mediated			7.5%			6.2%
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,680	7,680	7,680	4,390	4,390	4,390
Adjusted R^2	0.677	0.836	0.836	0.376	0.858	0.859

Panel B: Green Innovation

	Ln(1+G-Patent Count)	T_Waste	T_Waste	Ln(1+G-Patent Value)	T_Waste	T_Waste
	(1)	(2)	(3)	(4)	(5)	(6)
CEO Tax Burden	0.341***		-0.007**	0.580***		-0.008***
	(0.069)		(0.003)	(0.174)		(0.003)
Ln(1+G-Patent Count)		-0.008***	-0.007**			
		(0.003)	(0.003)			
Ln(1+G-Patent Value)					-0.003***	-0.003**
					(0.001)	(0.001)
Sobel Test			-2.000**			-1.759*
(P-value)			(0.046)			(0.079)
Proportion Mediated			24.1%			17.5%
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,871	3,871	3,871	3,871	3,871	3,871
Adjusted R^2	0.779	0.860	0.861	0.753	0.859	0.860

Table 7. Robustness Tests

This table presents robustness checks of our baseline findings. In column (1) of Panel A, we augment the baseline model with additional CEO compensation controls, including CEO total compensation (*Ln*(*Total Pay*)), CEO Vega (*Ln*(*1+Vega*)), and CEO Delta (*Ln*(*1+Delta*)). In column (2) of Panel A, we control for additional state-level variables that capture per capita greenhouse gas emissions (*Emission Per Capita*), emissions intensity (*Emission Intensity*), and recent emissions trends potentially associated with regulatory actions (*Regulatory Effectiveness*). Panel B reports the baseline results under alternative empirical specifications. Columns (1) to (5) of Panel B include CEO fixed effects, CEO-firm fixed effects, industry-year fixed effects, headquarters-state-by-year fixed effects, and Fama-MacBeth regressions, respectively. Panel C reports the baseline results using an alternative dependent variable based on corporate toxic waste releases (*T_Release*). Panel D reports the results after decomposing *CEO Tax Burden* into two separate components: *CEO Federal Tax Burden* and *CEO State Tax Burden*. Variable definitions are provided in Appendix A. Statistical significance is based on standard errors, reported in parentheses, that are heteroskedasticity-robust and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Additional Controls

	Dependent Variable: T_Waste	
	(1)	(2)
CEO Tax Burden	-0.008***	-0.009***
	(0.003)	(0.002)
Ln(Total Pay)	-0.000	
	(0.000)	
Ln(1+Vega)	0.001*	
	(0.000)	
Ln(1+Delta)	-0.001*	
	(0.000)	
Emission Per Capita		0.021
		(0.039)
Emission Intensity		-0.012
		(0.015)
Regulatory Effectiveness		-0.021
		(0.025)
All Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	8,469	8,677
Adjusted R^2	0.834	0.835

Panel B. Alternative Empirical Specifications

	Dependent Variable: T_Waste				
	(1)	(2)	(3)	(4)	(5)
CEO Tax Burden	-0.009***	-0.009***	-0.008***	-0.008***	-0.016***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.004)
All Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	-	-	-
Firm FE	-	-	Yes	Yes	-
CEO FE	Yes	-	-	-	-
CEO-firm FE	-	Yes	-	-	-
Industry-year FE	-	-	Yes	-	-
Headquarter-state-by-year FE	-	-	-	Yes	-
Fama-MacBeth	-	-	-	-	Yes
Observations	8,677	8,677	8,677	8,677	8,677
Adjusted R^2	0.881	0.883	0.853	0.850	0.452

Panel C. Alternative Measure of Corporate Toxic Waste

	Dependent Variable: T_Release				
	(1)	(2)	(3)	(4)	(5)
CEO Tax Burden	-0.008***	-0.009***	-0.009***	-0.008***	-0.007***

	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
All Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	-	-
Firm FE	Yes	-	-	Yes	Yes
CEO FE	-	Yes	-	-	-
CEO-firm FE	-	-	Yes	-	-
Industry-year FE	-	-	-	Yes	-
Headquarter-state-by-year FE	-	-	-	-	Yes
Observations	8,677	8,677	8,677	8,677	8,677
Adjusted R^2	0.816	0.867	0.868	0.827	0.831

Panel D. Alternative Measure of CEOs' Tax Burdens

	Dependent Variable: T_Waste	
	(1)	(2)
CEO Federal Tax Burden	-0.010***	
	(0.003)	
CEO State Tax Burden		-0.030***
		(0.010)
All Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	8,677	8,677
Adjusted R^2	0.834	0.835

Appendix A. Variable Definitions

Variables	Definition
Panel A: Main Dependent and Independent Variables	
T_Waste	Calculated as the log-transform of firm-level toxicity-weighted waste, and scale by total sales (in million US dollars).
CEO Tax Burden	Following Yost (2018), the *CEO tax burden* is computed as: $$CEO\ Tax\ Burden_t = \frac{\sum_{n=1}^{t}(P_t - P_n) \times N_n \times t_{cg}}{CEO\ Total\ Equity_t}$$ where n=1 represents the first year the CEO owns vested stock in the firm; P_t is the firm's stock price at the end of year t; P_n is the price at the end of year n in which the CEO received the stock; N_n is the number of vested shares held at time t that were obtained in year n; t_{cg} is the maximum long-term capital gain tax rate (federal plus state) faced by the CEO in year t upon selling the shares; and $CEO\ Total\ Equity_t$ represents the stock equivalent value from the CEO's holdings of all stock and options at the end of year t.
Panel B: Firm and CEO Characteristics	
Size	Natural logarithm of the firm's book value of total assets.
Market-to-book	Sum of total assets plus market value of equity minus book value of equity and divided by total assets.
Leverage	Long-term debt divided by total assets.
ROA	Operating income divided by total assets.
Cash	Cash and short-term investments divided by total assets.
Capex	Capital expenditures divided by total assets.
R&D	Research and development expenses divided by total assets.
CEO Age	Age of CEO in years.
CEO Gender	Indicator variable that takes a value of one if a CEO is female and zero otherwise.
CEO Education	Indicator variable that takes a value of one if a CEO attended an Ivy League university (i.e., Brown University, Columbia University, Cornell University, Dartmouth College, Harvard University, Princeton University, University of Pennsylvania, and Yale University) at any academic level and zero otherwise.
CEO Ownership	The percentage of the firm's outstanding common stock held by the CEO at the fiscal year-end.
Panel C: Variables Used in Cross-sectional, Channel, and Robustness Analyses	
Low Board Independence	Indicator variable equal to one if the proportion of independent directors on a firm's board is below the industry-year sample median, and zero otherwise.
High Co-opted Board	Indicator variable equal to one if the proportion of directors appointed after the CEO assumed office is above the industry-year sample median, and zero otherwise (Coles et al., 2014).
Meet or Just Beat	Indicator variable equal to one if a firm meets or just beats the consensus analyst EPS forecast by less than one cent per share, and zero otherwise.
High GAI	Indicator variable equal to one if the CEO's general ability index is above the industry-year sample median, and zero otherwise.
Non-RGGI	Indicator variable equal to one if a firm's headquarters state never adopts the Regional Greenhouse Gas Initiative (RGGI) cap-and-trade program, and zero otherwise.
Large Distance from EPA	Indicator variable equal to one if the distance (in kilometres) between a firm's headquarters and the nearest EPA office is above the industry-year sample median, and zero otherwise.
Low Outside Wealth	Indicator variable equal to one if the ratio of a CEO's wealth not invested in the firm to the CEO's total wealth is below the industry-year sample median, and zero otherwise (Dittmann and Maug, 2007).
Low Hedging Opportunity	Indicator variable equal to one if the firm's average daily trading volume is below the industry-year sample median, and zero otherwise.
TFP	Residual from a log-linear Cobb-Douglas production function calculated following Olley and Pakes (1996).
Operating Efficiency	One minus firm-level loss of efficiency estimated via the stochastic frontier estimation methodology with a half-normal distribution.
Ln(1+G-Patent Count)	Natural logarithm of one plus the total number of green patents granted to the firm in a given fiscal year.

Ln(1+G-Patent Value)	Natural logarithm of one plus the total stock-market-based value of green patents granted to the firm in a given fiscal year, where patent values are estimated following Kogan et al. (2017).
Ln(Total Pay)	Natural logarithm of total CEO compensation in thousands of dollars. It includes salary, bonus, value of restricted stock granted, value of options granted, long-term incentive payout, and other compensation.
Ln(1+Vega)	Natural logarithm of one plus the CEO's Vega, where Vega is defined as the change in the value of the CEO's wealth due to a 0.01 increase in the annualized standard deviation of the firm's stock return.
Ln(1+Delta)	Natural logarithm of one plus the CEO's delta, where delta is defined as the change in the value of the CEO's wealth due to a 1% increase in the firm's stock price.
Emission Per Capita	Total emissions (in metric tons) divided by state population.
Emission Intensity	Total emissions (in metric tons) scaled by real state GDP.
Regulatory Effectiveness	The negative year-over-year change in state emissions.
T_Release	Ratio of the log-transform of firm-level toxic waste released to total sales (in million US dollars).
CEO Federal Tax Burden	Following Hanlon et al. (2021), the *CEO Federal Tax Burden* is computed as: $$CEO\ Federal\ Tax\ Burden_t = \frac{\sum_{n=1}^{t} t_{fr} \times N_n \times (P_t - P_n)}{CEO\ total\ equity_t}$$ Where t_{fr} is the unadjusted maximum statutory federal long-term capital gain tax rate for individuals in year t.
CEO State Tax Burden	Following Hanlon et al. (2021), the *CEO State Tax Burden* is computed as: $$CEO\ State\ Tax\ Burden_t = \frac{\sum_{n=1}^{t} t_{sr} \times N_n \times (P_t - P_n)}{CEO\ total\ equity_t}$$ Where t_{sr} is the unadjusted maximum statutory state long-term capital gain tax rate for individuals in year t.

Online Appendix for

"CEOs' Capital Gains Taxes and Corporate Environmental Performance"

Table OA1. Pre-match Propensity Score Regression and Two Diagnostic Tests

This table is related to the PSM analysis of the effect of tax burdens on corporate toxic waste generation. Panel A reports the parameter estimates from the logit model used to estimate the propensity scores. The dependent variable is an indicator variable for the presence of a high tax burden CEO in a firm for a given year, and zero otherwise. Panel B shows the univariate comparisons of firm characteristics between firms with high and low tax burden CEOs, as well as the corresponding t-statistics. Variable definitions are provided in Appendix A. Statistical significance is based on standard errors, reported in parentheses, that are heteroskedasticity-robust and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Pre-match Propensity Score Regression and Post-match Diagnostic Regression

	Dependent variable: Dummy equals 1 for high tax burden CEOs and 0 otherwise	
	Pre-matching	Post-matching
	(1)	(2)
Size	-0.070	0.015
	(0.082)	(0.088)
Market-to-book	0.057***	0.005
	(0.014)	(0.013)
Leverage	-1.553***	0.005
	(0.371)	(0.376)
ROA	7.145***	-0.428
	(0.745)	(0.776)
Cash	1.319***	-0.022
	(0.456)	(0.480)
Capex	4.071***	-1.106
	(1.300)	(1.435)
R&D	-7.526***	1.026
	(1.851)	(1.912)
CEO Age	0.033***	-0.003
	(0.007)	(0.007)
CEO Gender	-0.783**	-0.175
	(0.339)	(0.366)
CEO Education	0.066	0.056
	(0.096)	(0.101)
CEO Ownership	9.233***	0.678
	(2.406)	(1.715)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	8,677	5,468
Pseudo R^2	0.132	0.006

Panel B: Post-match Differences in Firm Characteristics

	Low-tax-burden CEOs	High-tax-burden CEOs	Difference	t-statistics
Size	6.477	6.476	0.000	0.021
Market-to-book	2.878	2.912	-0.033	-0.374
Leverage	0.218	0.216	0.001	0.317
ROA	0.142	0.142	0.001	0.434
Cash	0.095	0.095	-0.001	-0.238
Capex	0.051	0.051	0.001	0.539
R&D	0.024	0.024	-0.000	-0.515
CEO Age	56.801	56.751	0.050	0.299
CEO Gender	0.015	0.013	0.003	0.803
CEO Education	0.346	0.355	-0.010	-0.737
CEO Ownership	0.011	0.012	-0.001	-0.921

Table OA2. Covariate Balance before and after Entropy Balancing

This table presents the balance of covariates' first and second moments between the treatment group (firms with high-tax-burden CEOs) and reweighted control firms. Variable definitions are provided in Appendix A.

	Before: Without Weighting				After: With Weighting			
	Treatment		Control		Treatment		Control	
	Mean	Variance	Mean	Variance	Mean	Variance	Mean	Variance
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Size	6.402	0.446	6.461	0.467	6.402	0.446	6.402	0.446
Market-to-book	3.394	12.980	2.471	11.330	3.394	12.980	3.393	12.990
Leverage	0.194	0.019	0.230	0.021	0.194	0.019	0.194	0.019
ROA	0.160	0.005	0.126	0.004	0.160	0.005	0.160	0.005
Cash	0.105	0.014	0.090	0.011	0.105	0.014	0.105	0.014
Capex	0.055	0.002	0.048	0.001	0.055	0.002	0.055	0.002
R&D	0.025	0.001	0.024	0.001	0.025	0.001	0.025	0.001
CEO Age	57.616	45.260	56.260	37.450	57.620	45.260	57.620	45.260
CEO Gender	0.008	0.008	0.022	0.021	0.008	0.008	0.008	0.008
CEO Education	0.348	0.227	0.356	0.229	0.348	0.227	0.348	0.227
CEO Ownership	0.022	0.003	0.010	0.001	0.022	0.003	0.022	0.003

Table OA3. Balance Test for PSM in the DiD Analysis

This table presents differences in sample means for firm characteristics between the treatment group (firms with high-tax-burden CEOs) and the control group (firms with low-tax-burden CEOs) in the DiD analysis reported in columns (2) and (4) of Table 4. Variable definitions are provided in Appendix A.

	The Control Group	The Treatment Group	Difference	t-statistics
Size	6.432	6.442	-0.010	-0.122
Market-to-book	2.789	2.843	-0.055	-0.161
Leverage	0.247	0.252	-0.005	-0.271
ROA	0.130	0.127	0.003	0.380
Cash	0.085	0.087	-0.003	-0.183
Capex	0.054	0.054	-0.000	-0.100
R&D	0.024	0.027	-0.003	-0.632
CEO Age	56.250	56.565	-0.315	-0.376
CEO Gender	0.008	0.008	0.000	0.000
CEO Education	0.363	0.379	-0.016	-0.262
CEO Ownership	0.012	0.013	-0.001	-0.250