Shareholder litigation and carbon emissions

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Abstract

Using the staggered implementation of universal demand (UD) laws as an exogenous source of variation in shareholder lawsuit rights, we study whether and to what extent shareholder litigation influences company carbon emissions. We find that companies significantly reduce their carbon emissions after UD laws made it more difficult for shareholders to seek legal redress against company directors or officers for breach of fiduciary duty. Specifically, a reduction in shareholder lawsuit rights is associated with a significant 19% decline in company carbon emissions. Our findings are robust to a variety of tests, including Oster's (2019) coefficient stability, entropy balancing, and placebo tests. Overall, our results support the stakeholder legitimacy, corporate legitimacy, and trade-off hypotheses that companies are more inclined to reduce carbon emissions when they are shielded from shareholder litigation.

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1. Introduction

In July 2023, the hottest month ever recorded in our history, the United Nations chief, António Guterres suggests that *"the era of global warming has ended and the era of global boiling has arrived,"* and calls for the G20 countries emitting 80% of global emission to act now[1]. It is therefore more important than ever for all countries to take serious actions to reduce carbon footprints, a major cause of global boiling. Since the sustainable development goals (SDGs) launched by the United Nations (UN) in 2015, various attempts have been made by many corporations to incorporate environmental strategies that reduce their carbon footprint and improve non-financial performance, especially the environmental component (Apostu et al., 2022). Given the seriousness of climate changes, businesses are encouraged to adopt corporate strategies to improve environmental performance and reduce carbon emissions. Current climate ambition is increasingly expressed as a specific target date for reaching net-zero emissions, typically linked to the peak temperature goals of the Paris Agreement (Fankhauser et al., 2022). Transitioning to a low carbon energy future is essential to meet the Paris Agreement targets and SDGs. It is imperative that decision-makers adopt a more holistic approach to energy transitions in the coming decades to avoid the unintended consequences of siloed policymaking (Dalafield et al., 2021).

To mitigate environment risk, the "net zero transition" is one of the key global efforts for combating climate change and offers multiple benefits across economic, health, and environmental domains. This transition aims to limit global warming in line with the Paris Agreement goals by balancing emitted and removed greenhouse gases. To reduce the impacts of climate change, many regulators, organizations, and individuals are committing to net zero

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[1] https://news.un.org/en/story/2023/07/1139162

goals by limiting global warming to well below 2 degrees Celsius above pre-industrial levels, as outlined in the Paris Agreement. The 2015 Paris Agreement is a reference document through concrete measures and targets aimed at reducing carbon emissions (Gurtu et al. 2016; Pianta and Lucchese 2020; Adebayo et al. 2021; Chunling et al. 2021; Ponce and Khan2021). However, it has become a challenge since last few decades to reduce greenhouse gas emissions to the point where any remaining emissions are balanced. The journey towards net zero emissions stands as a crucial milestone in the global fight against climate change, reflecting the shared goal to balance the amount of greenhouse gases emitted with those removed from the atmosphere.

For corporations, the net zero transition represents both a formidable challenge and a golden opportunity to redefine their environmental footprint, innovate in green technologies, and lead in sustainable business practices. As the urgency of climate change demands decisive action, corporations are pivotal in leading the shift towards net zero emissions because corporations play an essential role by overhauling their operational, investment, and innovation strategies to reduce carbon emissions. Corporations can significantly accelerate the transition to a net zero future because they can set their long-term policies and institutions that can enable and foster private sector investments in clean innovation and assets quickly and at scale (Stern and Valero, 2021). Bian et al. (2023) document that a higher low-carbon transition level enhances the increase of research and development (R&D) investment to generate enterprise value. Since the path to net zero is not solely driven by corporate goodwill or market forces, it also involves the intricate play of governance mechanisms, among which Shareholder litigation arises as a powerful mechanism. Since shareholder litigation plays an important role in enforcing managers' fiduciary duties and securities laws, shareholder litigation can effectively influence corporate behavior towards more sustainable practices. For instance, corporations can use their favorable innovation environment to significantly mitigate carbon dioxide

emissions (Guo et al. 2024), use their green technological progress to reduce carbon emissions (Liu et al. 2024), reduce their firm's default risk to reduce carbon emissions (Park et al. 2023), and use their financial structure to reduce energy intensity and carbon emission intensity (Wen et al. 2021). In addition, firm with better-networked CEOs have better carbon performance because close social networks between CEOs and top management teams can enhance resource provision rather than aggravate agency problems (Li et al. 2023).

It has been observed that among various strategies used to prompt corporations towards sustainable practices, shareholder litigation stands out as a powerful approach involving shareholders taking legal action against corporations for failing to mitigate or disclose the environmental risks associated with their operations. This approach is to ensure that companies take their environmental responsibilities seriously, reduce emissions significantly, and foster a corporate culture that prioritizes sustainability and environmental stewardship. As more shareholders recognize the impact of their legal actions, this strategy may become an increasingly common and effective tool in the fight against climate change.

Numerous studies report evidence that the adoption of Universal Disclosure (UD) Laws has led to negative outcomes for shareholders, including a significant increase in a firm's payouts (Zhang et al. 2024), deteriorating company performance (Appel 2019), reduced investment efficiency (Li, Monroe, and Coulton 2018), and higher costs of debt (Ni and Yin 2018) and equity (Houston, Lin, and Xie 2018). Additionally, there is evidence of greater managerial entrenchment such as through the formation of classified boards (Appel 2019), and a significant rise in the level and profitability of insider trading (Boone, Fich, and Griffin 2019). On the other hand, some studies suggest that UD Laws have facilitated more effective company operations due to a less restrictive litigation environment. For example, Lin, Liu, and Manso (2019) observed increased investments in research and development and innovation, Chu and Zhao (2020) noted improvements in mergers and acquisitions and Freund et al. (2023)

documented weaker shareholder litigation rights lead to lower CSR scores. In addition, Bourveau, Lou, and Wang (2018) reported an increase in voluntary disclosures after the adoption of the UD Laws, which they attribute to increased shareholder demand for monitoring managers. Therefore, the impact of UD Laws on corporate outcomes appears to be mixed, with evidence supporting both positive and negative effects.

In this study, we investigate whether and to what extent shareholder litigation influences company carbon emissions. The results indicate that a reduction in shareholder lawsuit rights is associated with a significant 19% decline in company carbon emissions, confirming that companies significantly reduce their carbon emissions after the implementation of UD laws made it more difficult for shareholders to seek legal redress against company directors or officers for breach of fiduciary duty. Our findings have several practical implications for companies, investors, and the broader society. First, companies facing less shareholder litigation over carbon emissions may incur decreasing legal costs and operating expenses. Second, less shareholder litigation related to carbon emissions can signal to the market and investors about the less potential risks associated with investing in companies that are not actively managing their environmental impact. Third, our findings can prompt policymakers to evaluate the effectiveness of current environmental regulations and enforcement mechanisms (i.e. the staggered implementation of universal demand (UD) laws) whether they reduce corporate carbon emissions and address environment concerns.

Out study makes several contributions to the literature. First, by exploiting the passage of UD laws as an exogenous change in shareholder litigation risk, we provide cleaner evidence on the causal relationship between shareholder litigation and a firm's carbon emissions. Second, our study broadens the understanding of the role of shareholder litigation on climate change and carbon emissions. Third, our study is closely related to the growing literature on the role of shareholder litigation in a corporate social responsibility. And fourth, the study can

prompt policymakers to evaluate the effectiveness of current environmental regulations and enforcement mechanisms to reduce corporate carbon emissions and address environment concerns. For instance, Zhou (2024) examines the incentive effect of policy combinations in carbon-reduction pilot cities and offer valuable insights for policymakers, urban planners, and stakeholders involved in advancing environmental sustainability through policy interventions in carbon-reduction pilot cities.

The rest of the paper is organized as follows. Section 2 provides the literature review and hypothesis development. Section 3 describes the research design. We present data in section 4 and results in section 5. We conclude in section 6.

2. Literature review and hypothesis development

2.1. Shareholder litigation and universal demand laws

Shareholder litigation involves legal actions by shareholders against a company's management or board for alleged mismanagement, fiduciary breaches, or legal violations, aiming to rectify harm and enforce corporate accountability and normally refers to lawsuits initiated by shareholders of a company. Even though these lawsuits can be either against the company itself such as the company management and board of directors or other shareholders, we observe that most cases are those against the company itself. In most cases, for instance, shareholder derivative lawsuits are filed by shareholders on behalf of the corporation in an effort to persuade the board of directors to take appropriate action or avert harm to the business and, ultimately, its investors by deterring managerial misconduct (Chen 2017). Thus, a shareholder (stockholder) derivative suit is a lawsuit filed on behalf of a corporation by a single or group of shareholders against board of directors, directors, officers, or other third parties who have breached the shareholder derivative actions.

Shareholder derivative lawsuits cause both the business and all shareholders to lose benefits because they constitute derivative litigations as misconducts and are detrimental to the business as a whole. Nevertheless, the likelihood of a lawsuit's demands being rejected is high due to directors' common involvement in derivative processes. To counteract this, the judiciary introduced the futility exception, allowing plaintiff shareholders to bypass the demand requirement by arguing that the board member who violated the legislation is unable to provide an impartial decision, was created by courts to prohibit directors from improperly obstructing a derivative action. (Chatjuthamard & Jiraporn, 2021). Consequently, shareholder lawsuits serve as a crucial mechanism for corporate governance, primarily aimed for corporate governance reform (Manchiraju et al., 2020). This reform provides a valuable framework for assessing the impact of shareholder litigation rights on carbon emissions, highlighting their significance in promoting environmental accountability within corporations.

Enacted by the 23 US states between 1989 and 2005, Universal demand (UD) laws require shareholders to request the company's board of directors address alleged wrongdoing before filing a derivative lawsuit. This gives the board a chance to rectify issues internally which aims to minimize litigation that could harm the corporation. These UD laws are designed to balance the need for internal resolution with the shareholders' rights to seek legal recourse and require plaintiff shareholders to make a demand on the board before suing for breach of fiduciary duties or other derivative actions, hence raising the difficulty of shareholders lawsuits and decrease the shareholders' ability to litigate the board (Appel, 2015; Chen, Li, and Xu, 2019, Lin et al., 2020; Chatjuthamard & Jiraporn, 2021; Solomon et al., 2022).

According to legal and financial literature, shareholder lawsuits are intended to protect the interests of small shareholders. (e.g., La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998: Lin et al., 2020). These lawsuits are vital for the protection of shareholders and the enhancement of corporate governance practices by offering essential protection to shareholders

for improving corporate governance measures. In order to fulfill their legal obligations, managers and directors are obligated by fiduciary duty to prioritize the interests of shareholders. If managers advance their personal interests at the expense of shareholders, shareholders may file a lawsuit for misconduct. CEOs and directors can face personal liability in court if they violate their fiduciary obligations. According to prior studies, a conflict between shareholders and management is minimized by liability laws and private enforcement (La Porta et al., 1998; Lin et al., 2020). As a result, shareholder litigation rights serve as an essential mechanism for external governance (e.g. Chung et al., 2020).

2.2. Carbon Emissions

Carbon emissions, especially carbon dioxide (CO_2) emission, are viewed as one of the most prominent factors of climate change and are considered the prime cause of current environmental issues (Rehman et al., 2021). It is a major contributor of the severity of climate crisis including global warming. There is a huge demand on global effort to decrease the amount of carbon dioxide and other greenhouse gases, causing heat and contributing to global warming.

According to the legitimacy theory, the amount and disclosure of carbon emissions are crucial in the stakeholder and public perception. A widely held assumption or conviction that an entity's activities are desirable, acceptable, or appropriate within a socially built system of norms, values, beliefs, and definitions is referred to as legitimacy, according to Suchman (1995); Aouadi & Marsat, (2016); Treepongkaruna et al., (2021a); Treepongkaruna et al., (2021b). Therefore, carbon emission reduction is crucial for a firm's long-term value.

CO_2 emissions are closely linked to multiple factors, including but not limited to, industrial structure, economic growth, research and development investment, urbanization, and the

growth rate of energy consumption, with the quantity of released carbon emissions closely correlated to economic growth (Liu at al., 2021). However, according to Matsumura et al., (2014), there is a $212,000 drop in firm value for every thousand more metric tons of carbon emissions. Moreover, Matsumura et al., (2014) discover that the median value of businesses that publicly report their carbon emissions is around $2.3 billion greater than the median value of businesses that do not publicly report. These findings illustrate that while the markets penalize all businesses for their carbon emissions, businesses that fail to declare their emissions are subject to an additional penalty. The findings support the claim that corporate valuations in the capital markets consider both carbon emissions and the voluntary disclosure of this information, thus supporting the aforementioned legitimacy theory. In addition, investing in carbon emission reduction projects such as prioritizing of the use of capital toward R&D investment in renewable resources and green technologies and energy consumption within the optimal range promote higher future firm value. These findings support the corporate legitimacy theory and the quiet life theory hypotheses.

2.3 Stakeholder legitimacy hypothesis

The stakeholder legitimacy hypothesis suggests that organizations will engage in actions that are deemed legitimate by their key stakeholders, including investors, customers, employees, and the broader community. This hypothesis acknowledges the dynamic and complex relationships between organizations and their stakeholders because these relationships involve responsibility and accountability (Gray et al,1996) and offer explanation of accountability to stakeholders (Van der Lann, 2009). Prior studies document that stakeholder theory and legitimacy theory have developed from the broader political economy perspective (Gray et al, 1996; Deegan, 2002) and they should not be regarded as clearly distinct and delineated (Van der Lann, 2009). Thus, we can also threat these two theories as overlapping

hypotheses on issues situated in a framework of assumptions supporting 'political economy' (Deegan, 2000: Gray et al, 1995).

In this study, the stakeholder legitimacy hypothesis refers to a situation that organizations when having responsibilities to various stakeholder groups might prioritize their strategies, goals, and actions to respond to universal demand forces on climate change. In an era where corporate social responsibility and ethical business practices are highly emphasized, stakeholder legitimacy hypothesis encourages companies to move beyond a solely profit-driven approach to an approach that incorporates ethical and societal considerations in their decision-making processes. However, Kreuzer and Priberny (2022) documents that high CSR board efforts show higher carbon emissions and the importance of time varying effects within a company changed as a consequence of the Paris Agreement in 2015. Thus, we posit that companies are more inclined to reduce carbon emissions when shielded from shareholder litigation.

2.4 Corporate legitimacy hypothesis

The corporate legitimacy hypothesis posits that companies seek to maintain or enhance their legitimacy in the eyes of their stakeholders by aligning their operations and strategies with societal norms and values, including environmental responsibility. This hypothesis is based on the idea that a company's survival and success depend on its social license to operate, which is granted by stakeholders. Thus, this theory assumes organizations will operate with the bounds and norms of their respective societies. (Deegan, 2000) so that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions (Suchman, 1995) and we posit that companies are more inclined to reduce carbon emissions when shielded from shareholder litigation.

2.5 The trade-off hypothesis

The trade-off hypothesis in the context of corporate environmental strategy posits that companies often face decisions where they must balance between economic performance and environmental responsibility. This hypothesis suggests that companies can find viable pathways to reduce carbon emissions without significantly compromising their profitability or operational efficiency. The trade-off hypothesis refers to a situation that managers are carefully trading off different sources of risk that they face. Companies, for instance, face a trade-off between reducing carbon emissions and maintaining short-term financial performance or a trade-off situation to decide whether to proactively reduce emissions and potentially gain a competitive advantage as a more sustainable company or to take a more reactive approach, which might save costs in the short term but could lead to litigation and other risks in the long term. Therefore, the trade-off hypothesis highlights the complex decisions companies must make regarding managing shareholder expectations, litigation risks, and the imperative to reduce carbon emissions. If companies can successfully navigate these trade-offs, they can potentially mitigate litigation risks, enhance their reputation, and contribute to environmental sustainability, supporting long-term shareholder value. However, companies that fail to adequately balance these competing priorities may face increased litigation risk, regulatory penalties, and damage to their reputation and financial performance. We believe that when shareholder litigation risk is dropped, managers set their priority to maintain short-term financial performance and are ready to accept higher risk in the form of more engagement in carbon emissions. As a result, a decline in shareholder litigation risk will bring about more carbon emissions and this view predicts that an exogenous reduction in shareholder litigation rights results in more carbon emissions.

2.6 The quiet life hypothesis

The quiet life hypothesis, initially introduced in the context of managerial behavior and firm performance, suggests that managers may prefer a "quiet life" by avoiding significant changes or challenges that could disrupt the status quo within the organization (i.e. avoidance of risky investments, resistance to expansion, and use of indirect promotion of sustainability). Therefore, managers when subject to less litigation risk, they may become less motivated or less effective in fulfilling their regulatory responsibilities and thus prefer to live a "quiet life". For example, risk-averse managers when insulated from external pressures tend to deliberately avoid risky and complex investments that require more managerial time and effort (Bertrand and Mullainathan, 2003). In practices, managers when shielded from external pressures can better adopt corporate policies that suit their own self-interested risk preferences. Unlike typical shareholders with diversified portfolios, managers face greater exposure to firm-specific risk because their human capital is uniquely tied to the firm. As a result, they are inclined to be more risk-averse, favoring corporate policies and strategies that entail lower risk (Amihud and Lev, 1981; Smith and Stulz, 1985). Another example is when managers avoid proactive measures to reduce carbon emissions due to the perceived effort, cost, and disruption involved. This avoidance leads to increased carbon emissions, which in turn could heighten the risk of shareholder litigation. Based on this hypothesis, we believe that environmental concerned shareholders might litigate against companies that fail to address or reduce their carbon footprints, arguing that such inaction diminishes long-term shareholder value and exposes the company to regulatory risks. However, investments in environmental projects require long-term commitments and deem to be risky, managers who prefer a quiet life and short-term performance are less inclined to be involved in such risky and contentious actions. This view

therefore predicts that an exogenous drop in shareholder litigation rights brings about more carbon emissions.

3. Data and Research design

We obtain the data from several sources. Following Bolton and Kacperczyk (2021), we collect the data on carbon emissions of companies from S&P Trucost. The Center for Research in Security Prices (CRSP) provides data on stock returns and market capitalization. Compustat provides accounting data for estimating firm-level control variables, whilst Refinitiv supplies ESG scores.[2] Board characteristics are from Institutional Shareholders Services (ISS). We retrieve historical state of incorporation of firm i from Bill McDonald's website (https://sraf.nd.edu/data/). The sample period of our study covers from 2002 to 2016, and is essentially the result of merging different data from the aforementioned datasets, as well as ensuring that it largely coincides with the staggered adoption of UD laws in US.[3]

We use the staggered implementation of UD laws in U.S. as an exogenous source of variation in shareholder lawsuit rights, and study whether and to what extent shareholder litigation shapes company carbon emissions. To this end, we estimate the following difference-in-differences (DID) specification:

$$\text{Ln}(CO_{it}) = \alpha + \beta UDL_{it} + \gamma \text{Controls}_{it} + \theta_{it} + \delta_{it} + \varepsilon_{it},$$

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[2] According to Refinitiv, the ESG score is based on 23 contentious ESG topics. Because a percentile rank algorithm is used for each industry group, a company's ESG score reflects the extent to which it is involved in ESG conflicts relative to peers, with a higher score indicating less ESG-related conflicts. We refer interested readers to Refinitiv for more details on the construction and definition of the ESG score.

[3] Specifically, our sample begins in 2002 since the ESG data provided by S&P Trucost began in 2002. Our sample concludes in 2016 since the most recent UD laws were passed in 2005. By 2016, therefore, sufficient time has elapsed to observe the effect (if any). Extending the sample period beyond 2016 would contain observations that are too far from the most recent adoption of UD laws, which then muddles the analysis.

The Ln(CO_{it}) dependent variable is the natural logarithmic of carbon intensity of firm i in year t. The carbon intensity is measured as the amount of carbons emissions (in units of tons of CO_2 and CO_2 equivalent)[4] scaled by firm revenue. As Bolton and Kacperczyk (2021, p.521) contend that data on Scope 1 have been more systematically reported and accurately measured due to their more stringent disclosure requirements, our carbon intensity is derived from Scope 1 data. Our key variable of interest is UDL_{it}, defined as a dichotomous variable equal to one if company i is incorporated in a state has a UD law adopted in year t, and zero otherwise (see Bourveau et al., 2018; Manchiraju et al., 2021). Thus, regression equation (1) is a DID model in which firms incorporated in states that have not implemented UD laws in a given year serve as the control group for the treatment group of firms incorporated in states that have enacted UD laws in that year. The coefficient of interest, β, is the DID estimate, which is the average effect of UD laws on firms in the treatment group relative to firms in the control group. Following Bourveau et al. (2018) and many others, we use the information provided by Bill McDonald to determine if a company is incorporated in a state that implemented UD law in a particular year. Bill McDonald obtained the historical state of incorporation of firm i from its 10-K filings on the Securities and Exchange Commission's (SEC) Electronic Data Gathering, Analysis and Retrieval (EDGAR) database. Finally, we omit firms whose state of incorporation have changed over the sample period considered in this study.

In addition, we also control for firm attributes, firm and year fixed effects. θ_{it} refers to firm fixed effects to control for time-invariant firm attributes and reduce omitted-variable bias, δ_{it} is year fixed effect to account for unobservable heterogeneity across time, and Controls$_{it}$ denotes a set of covariates that prior studies have shown to influence company carbon

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[4] The GHG Protocol Corporate Standard classifies a company's carbon emissions into three categories, namely: emissions directly produced from sources owned or managed by the company (Scope 1), emissions indirectly generated from purchased energy like electricity and heat (Scope 2), and further indirect emissions stemming from the company's operations and activities but originating from sources not under its ownership or control, such as material production, product usage, and waste management (Scope 3).

emissions. In particular, we follow Tanthanongsakkun et al. (2023a) and Tanthanongsakkun et al. (2023b) and include the following firm-level attributes: firm size, leverage, profitability, capital investments, research and development (R&D), advertising expenses, dividend payouts, cash holdings and discretionary spending. We also include the ESG score as an additional control variable to account for company i's ESG efforts in year t, since it is likely that ESG could relate to carbon footprints (Baratta et al. 2023; Luo et al. 2022). Finally, shareholder litigation rights are often regarded as an instrument of external governance, thus we also control for internal governance such as board characteristics. We use board size and board independence as surrogates for board characteristics, as per Yermack (1996), Cotter, Shivdasani, and Zenner (1997), and Rosenstein and Wyatt (1990). Table 1 details the estimation of all the dependent and independent variables.

Table 1 reports summary statistics of the variables. On average, firms in our sample emit, for every dollar of revenues, 353.4 tons of CO_2 and CO_2 equivalent emissions and 13.5% of firm-years are observations with a universal demand law being implemented. The table also reports summary statistics for all the independent variables. The average firm has a log of total assets of 8.898, and the average firm leverage (defined as the ratio of total debt to total assets) is 26%.

4. Results

4.1. Baseline regression

Table 2 reports the results for the parsimonious regression equation (1), with the parenthesized standard errors are clustered by firm. We begin with a baseline regression model devoid of any control variables, since some of the control variables may be endogenous, and this might skew the analysis (Gormley and Matsa, 2016). Column (1) reports the estimates for the baseline model: the DID coefficient estimate is negative (β = -0.402) and statistically

significant at 1%. Next, we incorporate all of the control variables outlined in Section 3, and re-estimate the regression equation (1). As can be seen in Table 2 Column (2), the addition of the control variables had little effect on the study's core conclusion that an exogenous reduction in shareholder litigation rights is negatively associated with carbon emissions (β = -0.391 and it is statistically significant at 1%. Thus, our findings from both columns are consistent and support the stakeholder and corporate legitimacy hypotheses that managers are more inclined to invest in long-term projects that are environmentally friendly and emit a lower amount of carbons when shielded from shareholder litigation.

Our finding is also economically meaningful. The DID coefficient is -0.391, implying that the implementation of universal demand laws is associated with a reduction in carbon emissions by 0.391. Given the standard deviation of the natural logarithm of carbon emissions is 2.06, an exogenous rise in shareholder litigation risk lowers carbon emissions by 0.391 divided by 2.06, which is 19%. Notably, because our empirical strategy is based on the staggered passage of universal demand laws across different states, our results are considerably less susceptible to endogeneity and should reflect a causal influence, rather than a mere correlation.

4.2. Robustness checks

4.2.1. Oster's (2019) approach for testing coefficient stability

To ensure our findings are not distorted by omitted-variable bias, we leverage the insight suggested by Oster (2019) to estimate the magnitude of the influence of unobservable variables necessary to overcome the effect of the influence of observable variables, thereby reducing the validity of our conclusions (Chintrakarn, Jiraporn, Tong, Jiraporn, and Proctor, 2020). This Oster's (2019) approach is the method to tackle omitted-variable bias arising when a model excludes important variables and helps in evaluating the validity of empirical research findings

by considering the effects of unobservable variables, especially in social sciences where not all influencing factors can be observed or measured. Applying Oster's (2019) approach to our regressions shown in Table 2, we estimate that the impact of unobserved variables would need to be between 0.67 to 1.15 times the impact of observed variables to render our findings invalid. In the literature, a ratio exceeding one generally signifies that the findings are reliable. Therefore, our findings based on Oster's (2019) approach are unaffected by the bias due to omitted variables.

4.2.2. Controlling for board characteristics as internal governance

Given that shareholder litigation rights serve as an instrument for external governance, it can be proposed that our analysis should control for internal governance mechanisms. Since the board of directors represents the ultimate internal governance mechanism, we control for board quality using board size and board independence. These two proxies are the two most important board characteristics that have been used as proxies for board quality and frequently investigated in the literature (Yermack, 1996; Rosenstein and Wyatt, 1990; Cotter, Shivdasani, and Zenner, 1997; Nguyen and Nielsen, 2010; Jenwittayaroje and Jiraporn, 2017).

Therefore, we have incorporated both board size and independence as control variables in our analysis. The reason these variables were not part of the initial tests is due to the absence of board characteristic data for all observations within the entire sample. The outcomes of the regression analysis are presented in Table 3. Even with the inclusion of board size and independence as controlling factors, the UDL coefficient remains notably negative, exhibiting a more pronounced effect, with a value of -0.484, an increase from the previously reported -0.391 in Table 2. This indicates that the impact of shareholder litigation rights maintains its

significance at 1% level, affirming its robustness even when internal governance variables are controlled.

4.2.3. Entropy balancing

Current research often highlights the concept of observable selection. To challenge this notion, we utilize the entropy balancing approach introduced by Hainmueller in 2012, which is a modification of conventional matching algorithms. This Entropy balancing is a statistical technique used to reweight a sample of units in observational studies to create a balanced sample across treatment and control groups, aiming to adjust for confounding variables and to ensure that the treated and control groups are comparable on a set of pre-treatment covariates. Therefore, this method achieves a substantial level of balance among covariates by incorporating covariate balance directly into the weighting function used on sample units (Hainmueller, 2012: Balima 2020). Hainmueller (2012) discusses entropy balancing in much detail and recent studies extensively used this novel matching approach (McMullin and Schonberger, 2020; Wilde, 2017; Neuenkirch and Tillmann, 2016; Freier, Schumann, and Siedler, 2015; Bol, Giani, Blais, and Loewen, 2020; Neuenkirch and Neumeier, 2016; Glendening, Mauldin, and Shaw, 2019; Truex, 2014; Marcus, 2013; Ongsakul, Chatjuthamard, Jiraporn, and Chaivisuttangkun, 2021; Chatjuthamard, Ongsakul, and Jiraporn, 2021).

Table 4 presents the regression results after applying entropy balancing. The coefficient of UDL remains negative (-0.376) and is statistically significant at the 1% level. This indicates that an exogenous increase (or decrease) in shareholder litigation rights leads to a reduction (or surge) in carbon emission intensity, suggesting a shift towards more (or less) carbon friendly projects. These results further corroborate the stakeholder and corporate legitimacy theories once again.

4.2.4. Placebo Test

In a placebo test, the efficacy of an actual treatment is evaluated against a fake treatment, known as a placebo, to determine the genuine effectiveness of the treatment. Following Padungsaksawasdi and Treepongkaruna (2024), we conduct a placebo test using a panel regression model for a dichotomous variable which carries value of one for the year, right before the adoption of the Universal Demand Laws (UDL$_{t-1}$) and zero otherwise. The regression results are reported in Table 5 where the estimated coefficient of UDL$_{t-1}$ is insignificant. This insignificant UDL$_{t-1}$ coefficient suggests no difference in emission intensity before the implementation of universal demand laws. There, this test further validates our identification strategy and the main findings of the study.

5. Conclusion

Carbon emissions is a major cause of global warming and climate changes. Corporations are encouraged to adopt corporate strategies to improve environmental performance and reduce carbon emissions including as a net-zero transition that typically linked to the peak temperature goals of the Paris Agreement (Fankhauser et al., 2022). With the urgency of climate change demands decisive action, corporations can play an essential role by overhauling their operational, investment, and innovation strategies and setting their short-term and long-term policies to reduce carbon emissions. Since the path to net zero is not solely driven by corporate goodwill or market forces, it also involves the intricate play of governance mechanisms, among which shareholder litigation arises as a powerful mechanism and a powerful approach involving shareholders taking legal action against corporations for failing to mitigate or disclose the environmental risks associated with their operations.

In this paper, we view shareholder litigation as an integral part of corporate governance and investigate how shareholder litigation plays a role in reducing carbon emissions by relying on the staggered adoption of universal demand laws. We find that making it harder for shareholders to file a lawsuit against top management does good to environment because a reduction in shareholder lawsuit rights is associated with a significant 19% decline in company carbon emissions after UD laws made it more difficult for shareholders to seek legal redress against company directors or officers for breach of fiduciary duty. Our results remain strong across different analyses, such as Oster's (2019) stability of coefficients, entropy balancing, and tests using placebos. In essence, our findings back the theories of stakeholder legitimacy, corporate legitimacy, and the trade-off, suggesting that companies tend to lower their carbon emissions when protected against lawsuits from shareholders.

Our findings on the intersection of shareholder litigation and carbon emissions have several practical implications for companies, investors, and the broader society because these implications span legal, financial, operational, and reputational domains. First, companies facing less shareholder litigation over carbon emissions may incur decreasing legal costs and operating expenses because they have less need for enhanced compliance and reporting mechanisms to meet environmental regulations and shareholder expectations. Second, market and investors receive a signal on the less potential risks associated with investing in companies that are not actively managing their environmental impact. Third, our findings can prompt policymakers to evaluate the effectiveness of current environmental regulations and enforcement mechanisms such as the staggered implementation of universal demand (UD) laws and confirm whether they reduce corporate carbon emissions and address environment concerns. Therefore, these practical implications highlight the growing importance of environmental considerations in corporate decision-making as companies must proactively

manage their environmental impacts to mitigate legal risks, protect their reputation, and ensure

long-term sustainability and success.

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Table 1: Descriptive statistics

This table reports summary statistics (number of observations, averages, standard deviations, 25th percentile, median and 75th percentile) for the variables used in the key regression equation (1). The second column of the table provides a definition of all the dependent and independent variables.

Variable	Definition	Mean	Std dev	25th pctl	50th pctl	75th pctl
Carbon Emission	Scope 1 carbon emissions (in tons), scaled by firm revenues.	353.4131	1237.503	8.302622	21.16622	68.46946
Ln (Carbon Emission)	Natural logarithm of Scope 1 carbon emissions (in tons), scaled by firm revenues.	3.3510	2.06222	2.120203	3.054224	4.227246
Universal Demand Law (UDL)	Binary variable equal to one if company i is incorporated in a state has a UD law adopted in year t, and zero otherwise.	0.13485	0.34159	0	0	0
Firm Size	Log of total assets	8.898408	1.196395	8.035482	8.771177	9.64627
Leverage	Total Debt/Total Assets	0.261678	0.186302	0.135949	0.243633	0.358876
Profitability	EBIT/Total Assets	0.10945	0.104529	0.062244	0.100449	0.151053
Capital investments	Capital Expenditures/Total Assets	0.052177	0.051767	0.020485	0.037224	0.064517
R&D expenses	R&D Expense/Total Assets	0.024723	0.047819	0	0	0.02802
Advertising expenses	Advertising Expense/Total Assets	0.013653	0.034727	0	0	0.011418
Dividend payouts	Dividends/Total Assets	0.019137	0.034088	0	0.011272	0.0257
Cash holdings	Cash Holdings/Total Assets	0.135313	0.138394	0.032717	0.088932	0.191977
Discretionary spending	SG&A Expense/Total Assets	0.186533	0.174849	0.053401	0.142149	0.270854
ESG score	Provided by Refinitiv	42.07641	19.6959	26.395	39.415	56.7
% Independent directors	Percentage of independent directors on the board	80.07027	11.03733	75	81.81818	88.88889
Board size	The number of directors on the board	2.394636	0.17932	2.302585	2.397895	2.484907

Table 2: Estimates for regression equation (1)

Column (1) reports the estimates for the DID regression equation (1) without any control variables, and Column (2) reports the estimates when control variables are included. Robust t-statistics, with standard errors are clustered by firm, are in parentheses. The dependent variable is the natural logarithm of amount of Scope 1 carbons emitted by company i in year t scaled by firm revenue. The key independent variable, UDL_{it}, is a binary variable equal to one if company i is incorporated in a state that has a UD law adopted in year t, and zero otherwise, with the DID coefficient estimates are highlighted in bold to facilitate readability. Others independent control variables are defined in Table 1. *, ** and *** denote significance levels at 10%, 5% and 1%, respectively.

	(1) Ln(Carbon Emission)	(2) Ln(Carbon Emission)
Universal Demand Laws (UDL)	**-0.402***	**-0.391***
	(-3.659)	**(-3.519)**
Firm Size		-0.178***
		(-2.815)
Leverage		-0.049
		(-0.400)
Profitability		-0.266**
		(-2.094)
Capital Investments		-0.237
		(-0.589)
R&D Intensity		1.374*
		(1.846)
Advertising Intensity		2.198
		(1.378)
Dividend Payouts		-0.432
		(-1.550)
Cash Holdings		-0.029
		(-0.117)
Discretionary Spending		-0.422
		(-1.345)
ESG score		-0.004***
		(-2.684)
Constant	3.406***	5.224***
	(229.251)	(8.704)
Observations	6,226	6,226
R-squared	0.943	0.944
Firm FE	Yes	Yes
Year FE	Yes	Yes
Clustered Firm	Yes	Yes
Adj R-squared	0.936	0.937

Robust t-statistics in parentheses

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

Table 3: Controlling for board characteristics

Carbon emission is direct of CO2 and CO2 equivalents emission in tonnes, which is direct emissions from sources that are owned or controlled by the company (scope 1 emissions) and includes following gases: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCS), perfluorinated compound (PFCS), sulfur hexafluoride (SF6), nitrogen trifluoride (NF3). Universal Demand Laws (UDL) is a binary variable for a firm incorporated in a state where a universal demand law has been implemented in a given year, and zero otherwise. SG&A Expense is selling, general, and administrative expense. ESG score is from Refinitiv.

	Ln(Carbon Emission)
Universal Demand Laws (UDL)	**-0.484***
	(-4.909)
Firm Size	-0.133*
	(-1.837)
Leverage	-0.244*
	(-1.750)
Profitability	-0.396***
	(-2.769)
Capital Investments	-0.413
	(-0.917)
R&D Intensity	2.634***
	(3.488)
Advertising Intensity	0.824
	(0.587)
Dividend Payouts	-1.242**
	(-2.274)
Cash Holdings	0.093
	(0.315)
Discretionary Spending	-0.081
	(-0.223)
ESG score	-0.002
	(-1.613)
% Independent Directors	-0.000
	(-0.013)
Board Size	-0.165
	(-1.398)
Constant	5.261***
	(7.219)
Observations	5,148
R-squared	0.947
Adj R-squared	0.940
Firm FE	Yes
Year FE	Yes
Clustered Firm	Yes

Table 4: Entropy balancing

Carbon emission is direct of CO2 and CO2 equivalents emission in tonnes, which is direct emissions from sources that are owned or controlled by the company (scope 1 emissions) and includes following gases: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCS), perfluorinated compound (PFCS), sulfur hexafluoride (SF6), nitrogen trifluoride (NF3). Universal Demand Laws (UDL) is a binary variable for a firm incorporated in a state where a universal demand law has been implemented in a given year, and zero otherwise. SG&A Expense is selling, general, and administrative expense. ESG score is from Refinitiv.

	Ln(Carbon Emission)
Universal Demand Laws (UDL)	**-0.376*****
	(-4.539)
Firm Size	0.076
	(1.110)
Leverage	-0.501**
	(-1.998)
Profitability	-0.429*
	(-1.892)
Capital Investments	-0.078
	(-0.095)
R&D Intensity	2.450*
	(1.703)
Advertising Intensity	2.379
	(0.631)
Dividend Payouts	-0.753
	(-1.457)
Cash Holdings	0.232
	(0.904)
Discretionary Spending	0.574
	(1.289)
ESG score	-0.003
	(-1.504)
% Independent Directors	-0.002
	(-0.815)
Board Size	-0.220
	(-1.260)
Constant	4.263***
	(5.761)
Observations	5,148
R-squared	0.966
Industry FE	Yes
Year FE	Yes
Clustered Firm	Yes
Adj R-squared	0.962

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Placebo test based on the year before UDL is adopted

Carbon emission is direct of CO2 and CO2 equivalents emission in tonnes, which is direct emissions from sources that are owned or controlled by the company (scope 1 emissions) and includes following gases: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCS), perfluorinated compound (PFCS), sulfur hexafluoride (SF6), nitrogen trifluoride (NF3). Universal Demand Laws (UDL) is a binary variable for a firm incorporated in a state where a universal demand law has been implemented in a given year, and zero otherwise. SG&A Expense is selling, general, and administrative expense. ESG score is from Refinitiv. UDL (t-1) is equal to one for the year immediately before the passage of universal demand laws.

	Ln(Carbon Emission)
UDL (t-1)	**-0.048**
	(-0.392)
Firm Size	-0.125*
	(-1.682)
Leverage	-0.235
	(-1.585)
Profitability	-0.389***
	(-2.747)
Capital Investments	-0.644
	(-1.371)
R&D Intensity	2.837***
	(3.435)
Advertising Intensity	0.971
	(0.611)
Dividend Payouts	-1.325**
	(-2.413)
Cash Holdings	0.029
	(0.094)
Discretionary Spending	-0.122
	(-0.319)
ESG score	-0.002
	(-1.501)
% Independent director	-0.000
	(-0.096)
Board Size	-0.173
	(-1.412)
Constant	5.157***
	(6.910)
Observations	4,668
R-squared	0.951
Firm FE	Yes
Year FE	Yes
Clustered Firm	Yes
Adj R-squared	0.944

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1