

The Economics of Decarbonization Commitments

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Abstract

Actualizing the Nationally Determined Contributions (NDCs) under the Paris Agreement critically depends on firm-level decarbonization, yet only a limited share of the world's largest companies have formally committed to net zero by 2050. This paper develops a microeconomic model to analyze how a firm's climate transition capacity shapes its decision to adopt decarbonization commitments. Theoretically, we demonstrate a trade-off between transition credibility and future transition risk, resulting in three equilibrium types: signaling firms, legitimacy-seeking firms, and inactive firms. Consistent with our theoretical model, we empirically find a U-shaped relationship between firms' transition capacity and their likelihood of committing to decarbonization. Firms are more likely to forgo commitments when emission abatement costs are high or when emissions are not financially material, illustrating significant economic barriers to broader uptake of net-zero pledges. These findings offer new insights into the determinants of firm-level decarbonization commitments and inform more effective policy design for mobilizing corporate climate action.

Keywords: Decarbonization commitment; Net-zero commitment; Climate transition capacity; Asset redeployability; SBTi; Institutional ownership; Environmental performance

1. Introduction

Rising global temperatures and escalating climate risks have amplified the urgency of reducing greenhouse gas emissions worldwide. As corporations confront mounting stakeholder pressure to align with global climate goals, decarbonization commitments—especially net-zero targets—are positioned as pivotal drivers of climate mitigation. However, adoption remains uneven across firms, with substantial heterogeneity even among those exposed to similar sectoral and technical constraints. Capital-intensive sectors such as power generation, infrastructure, and heavy industry play a disproportionately large role, constrained by the long life cycles of their physical assets. Notably, existing energy infrastructure generates roughly 60% of global emissions, and—absent early asset retirements or technological disruption—this share could approach 100% by 2050 (IEA, 2020). Despite these formidable barriers, recent evidence reveals marked differences in the climate ambitions of firms facing similar structural challenges. For example, as of 2024, 32% of power generation firms, 30% in financial services, and 24% in infrastructure report ambitious (“all” or “many” tier) decarbonization strategies, yet only about 5% of firms overall have set Science-Based Targets initiative (SBTi) goals (CDP, 2024; Bolton & Kacperczyk, 2025). This pattern raises a critical, underexplored puzzle: Why do firms in comparable contexts diverge so substantially in their decarbonization commitments?

We posit that a key determinant is firms’ climate transition capacity. As mentioned by Chan et al. (2024), transition capacity refers to a firm’s ability to reconfigure physical and organizational resources in response to climate imperatives. Central to this

is asset redeployability, the degree to which a firm’s capital stock can be adapted or repurposed for alternative, lower-carbon uses. Within the context of a low-carbon transition, the International Sustainability Standards Board (ISSB) now requires disclosures on how climate scenarios could alter business models, strategy, and resource allocation. Limited asset redeployability constrains such adaptation, particularly in heavy industries reliant on capital-intensive, long-lived equipment, which slows deployment of innovative technologies (IEA, 2021). To operationalize transition capacity, we employ the asset redeployability index proposed by Kim and Kung (2017)—a construct reflecting both technological specificity and strategic flexibility. Despite its relevance, this concept has received minimal empirical attention in environmental economics or corporate strategy literatures.

Our study investigates the economics of firm-level decarbonization commitments. We develop a microeconomic framework to characterize the decision to set explicit, time-bound climate targets and examine the role of transition capacity in shaping this choice. Conventional wisdom suggests a monotonic relationship between transition capacity and the probability of a firm committing to climate targets—greater capacity should lead to more frequent commitments. Contrary to this expectation, our analysis uncovers a robust U-shaped relationship between transition capacity (proxied by asset redeployability) and the likelihood of SBTi adoption. Firms with either highly specialized (low redeployability) or highly flexible (high redeployability) assets are more likely to commit, while those with intermediate flexibility are least likely to do so. These findings are consistent with our microeconomic model, which shows that

firms' commitment decisions hinge on a trade-off between transition credibility and future transition risk. Specifically, firms with low capacity may seek legitimacy through aspirational targets; those with high capacity commit out of cost-effectiveness; whereas firms in the middle face high perceived costs and weak credibility, deterring commitment. Our results remain robust after employing an instrumental variable approach, suggesting that the relationship between asset redeployability and decarbonization commitment is likely causal.

Our empirical analysis further reveals heterogeneity in this U-shaped relationship across firm and industry characteristics. The U-shaped pattern is most pronounced among larger firms, those in non-hard-to-abate or low-carbon industries, companies with low operational cost intensity, without major environmental controversies, and US-based firms. These differences are principally driven by technological barriers and stakeholder scrutiny, which modulate marginal abatement costs and incentives for climate action. Our study also investigates how institutional investors influence and respond to corporate decarbonization commitments. On the one hand, institutional investors are known for prioritizing high-ESG firms (e.g., Starks et al., 2025). On the other hand, institutional investors push firms to improve their ESG performance (e.g., Dyck et al., 2019). We find results consistent with both views: decarbonization commitments increase subsequent institutional ownership in terms of both total holding value and ownership share, with stronger effects for firms with high ESG scores. This suggests that decarbonization commitments attract ESG-focused institutional investors, particularly when firms exhibit superior environmental performance. At the same time,

higher lagged institutional ownership positively predicts future SBTi commitments, indicating that institutional investors' governance and pressure drive firms toward sustainability goals. Taken together, both selection and activism channels are at play.

Our study makes several contributions. Theoretically, we develop a microeconomic model that explains firms' decarbonization commitment decisions. Despite the growing prominence of corporate decarbonization commitments, we are, to our knowledge, the first to propose such a theoretical model. Consistent with our theoretical model, we document a novel and surprising U-shaped relationship between firms' transition capacity and the adoption of decarbonization commitments, offering new insights into the heterogeneity of corporate behavior. Practically, our findings suggest opportunities for differentiated climate policies, such as targeted incentives to bridge the climate "transition gaps" among firms with intermediate capacity. These insights advance the understanding of corporate climate strategy, transition risk management, and sectoral decarbonization pathways.

2. Literature Review

Corporate environmental commitments are now central components of business sustainability strategies, with decarbonization pledges playing a pivotal role in mobilizing financial resources for the low-carbon transition. The adoption of such commitments, particularly Science-Based Targets initiative (SBTi) goals, has accelerated in recent years—serving as a robust empirical proxy for corporate climate ambition (Berkman et al., 2019; Bolton & Kacperczyk, 2025; Tolliver et al., 2020).

While uptake of biodiversity commitments has also gained traction since 2016, progress towards measurable, time-bound targets remains limited—for example, among Fortune 100 firms, biodiversity pledges doubled from 5 to 10 between 2016 and 2021, yet the absolute level is still modest (Ermgassen et al., 2022). The methodological rigor and broad acceptance of SBTi targets therefore underpin their value as a focal point in empirical research on corporate decarbonization.

The decision to commit to environmental targets is shaped by a complex interplay of firm-level capacities and stakeholder pressures. Central to this is corporate climate transition capacity—the ability of firms to adapt strategies, operations, and business models in line with low-carbon and climate-resilient pathways set by frameworks such as the Paris Agreement. Asset redeployability, reflecting the extent to which physical capital can be adapted for alternative uses, directly influences strategic flexibility under uncertainty and thus firms’ willingness and capacity to pursue ambitious environmental goals. Empirical studies underscore the salience of this concept: Kim and Kung (2017) demonstrate that asset redeployability helps firms navigate economic uncertainty by dampening the investment sensitivity to such shocks, while limited redeployability is associated with higher capital costs (Ortiz-Molina & Phillips, 2014). Financial flexibility also supports corporate investment (Almeida & Campello, 2007). Additionally, Chen (2025) finds that greater asset saleability, a specific form of redeployability, lowers toxic emissions by enhancing firms’ net worth.

However, the economics of decarbonization commitments are nuanced. Although firms may benefit from a positive stock market reaction when making forward-looking

statements on their environmental activities (Wang et al., 2019), the presence of a corporate commitment does not guarantee substantive change. Commitments can be symbolic or even enable greenwashing, especially in weak regulatory environments (Bansal & Clelland, 2004; Jiang et al., 2025). Voluntary initiatives such as SBTi have methodological limitations, with some firms achieving targets through practices such as renewable electricity purchases, rather than genuine operational transformation (Ruiz Manuel & Blok, 2023; Bjørn et al., 2022). This aligns with findings that companies may overstate their sustainability performance in response to external pressures (Kim & Lyon, 2015). To address the challenge of evaluating forward-looking corporate environmental claims, Chan et al. (2024) introduced the concept of corporate net-zero transition credibility, comprising transition ambition, transition urgency, and transition capacity. Building on this framework, Chan and Liao (2025) provided empirical evidence that climate-conscious investors actively assess the transition capacity of green bond issuers—measured via their decarbonization track records—when assigning green bond premium.

Various firm attributes further shape the propensity to adopt environmental commitments. Large companies, due to higher scrutiny and greater capacity, are more likely to set and meet sustainability targets (Drempetic et al., 2020). Industry context is equally crucial, as technological opportunity for decarbonization varies significantly across sectors (Brad et al., 2024). Moreover, Tomoda and Ouchida (2023) theoretically demonstrate that ex ante identical firms will decide whether to pursue corporate sustainability initiatives based on their stakeholders' sustainability preferences.

Stakeholder pressures, particularly from institutional investors, reinforce sustainability efforts—both through selection (favoring ESG-leading firms) and active engagement. Research has demonstrated that institutional ownership, particularly ESG-oriented and long-term investors, materially impacts portfolio firms' sustainability efforts through advocacy and governance (Dyck et al., 2019; Bolton & Kacperczyk, 2025; Chen, Dong, & Lin, 2020; Amel-Zadeh & Serafeim, 2018; Bolton & Kacperczyk, 2021). Nevertheless, investor preferences are heterogeneous: while some reward substantive change, others respond to mere presence of commitments, incentivizing symbolic behavior (Kim, 2024). Collaborative engagements have been shown to simultaneously drive ESG outcomes and firm performance (Dimson, Karakaş, & Li, 2015). Regional variation is also pronounced, with the "carbon premium"—reflecting the financial materiality of decarbonization—being highest in North America (Bolton & Kacperczyk, 2023).

In summary, the extant literature highlights that firms' strategic flexibility, especially asset redeployability, is a crucial determinant of their environmental commitments. These decisions are further influenced by firm capabilities, industry context, and the strength of stakeholder and investor pressures, which collectively shape corporate sustainability strategies.

3. Theoretical model

3.1 Description of the game

This model examines the microeconomics of corporate commitment to

decarbonize emissions. Central to the theory is the strategic value to a firm of commitment devices in shaping its investors' belief about its future emissions performance. Denote by $x \in \mathbb{R}$ the future emissions performance of the firm by some decarbonization “deadline”. Naturally, the former will be influenced by a multitude of factors beyond the firm's control and thus cannot be pinned down in a deterministic manner. For analytical tractability, let x follow the logistic distribution with mean $\mu \in \mathbb{R}$ and variance $\pi^2/3$. This means that the former is characterized by the cumulative distribution function:

$$F(x; \mu) = \frac{1}{1 + e^{-(x-\mu)}} \quad (1)$$

A positive $x > 0$ as demonstrating favorable emissions performance, such as successfully fulfilling a net-zero commitment, while a negative $x < 0$ is interpreted symmetrically as evidence of unfavorable emissions performance or failure to meet such commitments.

This is a dynamic game of perfect information played by the firm and its investors.

The sequence of events is as follows:

- **Stage 1:** The firm chooses the strength $\tau \in \mathbb{R}_{\geq 0}$ of its commitment to attaining a non-negative emissions performance in the future.
- **Stage 2:** After observing the commitment strength τ of the firm, its investors form an expectation of its future emissions performance $\mathbb{E}[x|\tau]$. The latter is in turn translated into present financial benefit to the firm, such as the green premium that

investors presently confer on the firm's asset prices. For some $\gamma \in \mathbb{R}_{>0}$, let $\gamma\mathbb{E}[x|\tau]$ be the present financial benefit. The parameter γ captures the materiality of its emissions performance to its investors.

- **Stage 3:** The status-quo distribution of x has a mean of $\bar{\mu} \in \mathbb{R}$. Nevertheless, the firm may exert efforts to shift the mean rightward, such that it is more likely to attain a non-negative future emissions performance. For some $\kappa \in \mathbb{R}_{>0}$, let $e^{\mu-\bar{\mu}}/\kappa$ be the abatement cost associated with the mean $\mu \geq \bar{\mu}$. This means that the cost rises exponentially as the firm becomes more aggressive in its emissions abatement $\mu - \bar{\mu}$. The parameter κ captures its transition capacity; see Chan, Cheung and Shen (2024) for an in-depth discussion.
- **Stage 4:** As the decarbonization deadline arrives, the emissions performance of the firm x is actualized. To honor its commitment, the firm has to incur a cost of τ if its emissions performance $x < 0$ turns out to be negative.

Based on the above setting, the expected profit of the firm is

$$\pi(\tau, \mu) = \gamma\mathbb{E}[x|\tau] - \frac{e^{\mu-\bar{\mu}}}{\kappa} - \tau F(0; \mu) \quad (2)$$

Its decision problem can then be formally stated as choosing $\tau \geq 0$ and $\mu \geq \bar{\mu}$ to maximize its expected profit $\pi(\tau, \mu)$. Finally, assume the firm has a lexicographic preference for declaring a decarbonization commitment, such that if two distinct commitment strengths τ and $\tau' < \tau$ yield the same expected profit, it will choose the former; such a preference could be justified by the unmodelled financial benefit of commitment conferred by stakeholders other than its investors. This completes the

description of the game-theoretic model.

3.2 Analysis of the game

In light of the dynamic nature of the game, we adopt the solution concept of sub-game perfect Nash equilibrium (SPNE). This entails backward induction of the optimal choices of the firm. As Stage 4 merely consists of a chance event, we start by analyzing the firm's abatement decision in Stage 3.

Proposition 1: In any SPNE of the game, the optimal abatement effort of the firm given the strength τ of its commitment is

$$\mu^*(\tau) = \begin{cases} \mu_1^*(\tau) \equiv \log(\sqrt{\tau\kappa e^{\bar{\mu}}} - 1), & \tau \geq \frac{(1 + e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}} \\ \mu_0^*(\tau) \equiv \bar{\mu}, & \tau < \frac{(1 + e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}} \end{cases} \quad (3)$$

Moreover, the solution is continuous.

Proof: The objective function is strictly concave in μ :

$$\frac{\partial^2 \pi(\tau, \mu)}{\partial \mu^2} = -\frac{e^{\mu - \bar{\mu}}}{\kappa} - \frac{\tau e^{\mu} (e^{\mu} - 1)}{(1 + e^{\mu})^3} < 0 \quad (4)$$

Thus, we could find the optimal μ^* by setting up the Lagrangian

$$\mathcal{L}_{\mu} = -\frac{e^{\mu - \bar{\mu}}}{\kappa} - \frac{\tau}{1 + e^{\mu}} + \lambda_{\mu}(\mu - \bar{\mu}) \quad (5)$$

where λ_{μ} is the Lagrange multiplier for the constraint $\mu \geq \bar{\mu}$.

First order condition yields

$$\frac{\partial \mathcal{L}_\mu}{\partial \mu} = -\frac{e^{\mu^* - \bar{\mu}}}{\kappa} + \frac{\tau e^{\mu^*}}{(1 + e^{\mu^*})^2} + \lambda_\mu = 0 \quad (6)$$

First, consider the case that $\tau \kappa e^{\bar{\mu}} \geq (1 + e^{\bar{\mu}})^2$. Then, $\lambda_\mu = \frac{e^{\mu^* - \bar{\mu}}}{\kappa} - \frac{\tau e^{\mu^*}}{(1 + e^{\mu^*})^2} \geq \frac{1}{\kappa} - \frac{\tau e^{\bar{\mu}}}{(1 + e^{\bar{\mu}})^2} \geq 0$. The first inequality follows since the expression on the LHS is increasing in μ^* , as proved in (4); the second holds by hypothesis. If the first inequality is strict, $\lambda_\mu > 0$ such that $\mu^*(\tau) = \bar{\mu}$ by complementary slackness; otherwise, still $\mu^*(\tau) = \bar{\mu}$, as desired.

Second, consider the case that $\tau \kappa e^{\bar{\mu}} < (1 + e^{\bar{\mu}})^2$. But then, it must be that $\mu^* > \bar{\mu}$; or else, $\lambda_\mu = \frac{1}{\kappa} - \frac{\tau e^{\bar{\mu}}}{(1 + e^{\bar{\mu}})^2} < 0$, a contradiction. By complementary slackness, $\lambda_\mu = 0$. Applying this to (6) yields the desired expression of $\mu^*(\tau)$.

Finally, the continuity follows from the fact that $\mu_1^* \left(\frac{(1 + e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}} \right) = \bar{\mu}$.

Q.E.D.

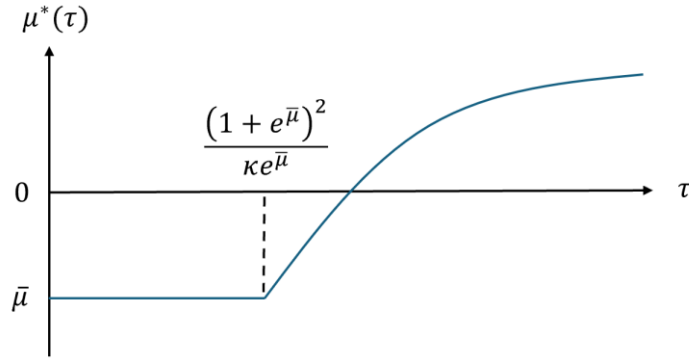
Proposition 1 shows that the optimal abatement effort μ^* of the firm hinges on various parameters. In essence, decarbonization commitments are a self-imposed transition risk that serves as a disciplining device to the firm. Interpreted as such, the firm is faced with a trade-off between addressing its transition risk and trimming its transition cost. Although more abatement effort comes at a cost, it improves the likelihood that its future emissions performance will be non-negative, such that the firm incurs the penalty of τ (which it has chosen in Stage 1) with a lower probability.

Interestingly, Proposition 1 shows that the firm has minimal incentive to improve

its emissions performance beyond the status-quo level $\bar{\mu}$ as long as its transition capacity κ or commitment strength τ (a self-imposed transition risk) is sufficiently low, such that the marginal cost of abatement overshadows the marginal benefit of lowering its penalty probability $F(0, \mu)$. Otherwise, its abatement effort is increasing in κ and τ .

The solution in Proposition 1 is depicted in Figure 1; evidently, the firm's optimal abatement effort μ^* is perfectly inelastic to its self-imposed transition risk τ until the latter surpasses the threshold $(1 + e^{\bar{\mu}})^2 / \kappa e^{\bar{\mu}}$.

Figure 1: Subgame perfect equilibrium abatement effort



In light of Proposition 1, investors rationally form their belief in Stage 2 as

$$\mathbb{E}[x|\tau] = \int_{-\infty}^{+\infty} x dF(x; \mu^*(\tau)) = \mu^*(\tau) \quad (7)$$

Evidently, $\mathbb{E}[x|\tau]$ is increasing in τ . The intuition is that the self-imposed transition risk of τ serves as a commitment device. By increasing the penalty in case of failing to attain a non-negative emissions performance, the firm convinces its investors that it has a stronger incentive to invest resources in emissions abatement; in

other words, the firm is strategically raising its future transition urgency, which is a key component of its transition credibility (Chan, Cheung & Shen, 2024).

As some of its investors are climate-conscious, this commitment signal in turn translates into its present financial benefit $\gamma\mathbb{E}[x|\tau]$. In particular, the objective function of the firm in Stage 1 becomes

$$\pi(\tau, \mu^*(\tau)) = \gamma\mu^*(\tau) - \frac{e^{\mu^*(\tau) - \bar{\mu}}}{\kappa} - \tau F(0; \mu^*(\tau)) \quad (8)$$

Before diving into the first-stage analysis, we first prove a technical lemma involving the principal branch of the Lambert W function W_0 . Define the function

$$G(\bar{\mu}) := \frac{e^{-\bar{\mu}} - 1}{W_0\left(\frac{e^{-\bar{\mu}} - 1}{2e}\right)} \quad (9)$$

Lemma 1: The function $G(\bar{\mu})$ is decreasing and bounded below by 2.

Proof: To prove the function is decreasing, note the standard result that

$$\frac{dW_0(z)}{dz} = \frac{W_0(z)}{z(1 + W_0(z))} \quad (10)$$

But then, the first derivative of $G(\bar{\mu})$ is

$$\begin{aligned}
\frac{dG(\bar{\mu})}{d\bar{\mu}} &= \frac{1}{\left(W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)\right)^2} \left(-e^{-\bar{\mu}}W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right) \right. \\
&\quad \left. - (e^{-\bar{\mu}}-1) \frac{W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)\left(\frac{-e^{-\bar{\mu}}}{2e}\right)}{\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)\left(1+W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)\right)} \right) \\
&= \frac{-e^{-\bar{\mu}}}{1+W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)} < 0
\end{aligned} \tag{11}$$

The inequality follows from the fact that $W_0(z) > -1$ for any $z > -e^{-1}$.

To prove the function is bounded below by 2, note the identity $W_0(z)e^{W_0(z)} = z$.

But then,

$$G(\bar{\mu}) = 2e \cdot \frac{\frac{e^{-\bar{\mu}}-1}{2e}}{W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)} = 2e^{1+W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)} > 2 \tag{12}$$

Q.E.D.

As will be shown, the function $G(\bar{\mu})$ will play a key role in characterizing the SPNE of the game. With the lemma, now we are ready to analyze Stage 1 of the game.

Proposition 2: In any SPNE of the game, the optimal commitment strength of the firm

is

$$\tau^* = \begin{cases} \tau_1^* \equiv \frac{1}{\kappa e^{\bar{\mu}}} \left(1 + \frac{\gamma \kappa e^{\bar{\mu}}}{2}\right)^2, & \gamma \kappa \geq G(\bar{\mu}) \\ \tau_0^* \equiv 0, & \gamma \kappa < G(\bar{\mu}) \end{cases} \tag{13}$$

Proof: The first derivative of $\pi(\tau, \mu^*(\tau))$ with respect to τ is

$$\begin{aligned} \frac{d\pi(\tau, \mu^*(\tau))}{d\tau} &= \frac{d\mu^*(\tau)}{d\tau} \left(\gamma - \frac{e^{\mu^*(\tau) - \bar{\mu}}}{\kappa} + \frac{\tau e^{\mu^*(\tau)}}{(1 + e^{\mu^*(\tau)})^2} \right) - \frac{1}{1 + e^{\mu^*(\tau)}} \\ &= \gamma \frac{d\mu^*(\tau)}{d\tau} - \frac{1}{1 + e^{\mu^*(\tau)}} \end{aligned} \quad (14)$$

The second equality follows because either $\frac{e^{\mu_1^*(\tau) - \bar{\mu}}}{\kappa} = \frac{\tau e^{\mu^*(\tau)}}{(1 + e^{\mu_1^*(\tau)})^2}$ or $\frac{d\mu_0^*(\tau)}{d\tau} = 0$

by Proposition 1. Since $\mu^*(\tau)$ is a piecewise function, we separately analyze the two sub-domains of τ .

Step 1: Find the optimal τ^* in the sub-domain $\tau < \frac{(1 + e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}}$.

As $\frac{d\mu_0^*(\tau)}{d\tau} = 0$, the derivative in (14) is negative, such that the optimal solution within the sub-domain is $\tau^* = 0 = \tau_0^*$, our first candidate solution.

Step 2: Find the optimal τ^* in the sub-domain $\tau \geq \frac{(1 + e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}}$.

By Proposition 1,

$$\frac{d\mu_1^*(\tau)}{d\tau} = \frac{\frac{\kappa e^{\bar{\mu}}}{2\sqrt{\tau \kappa e^{\bar{\mu}}}}}{\sqrt{\tau \kappa e^{\bar{\mu}}} - 1} = \frac{\kappa e^{\bar{\mu}}}{2e^{\mu_1^*(\tau)}(1 + e^{\mu_1^*(\tau)})} > 0 \quad (15)$$

Applying this to (14) yields

$$\frac{d\pi(\tau, \mu_1^*(\tau))}{d\tau} = \frac{1}{1 + e^{\mu_1^*(\tau)}} \left(\frac{\gamma \kappa e^{\bar{\mu}}}{2e^{\mu_1^*(\tau)}} - 1 \right) \quad (16)$$

In light of (15), the bracketed term in (16) is decreasing in τ . This means that the function $\pi(\tau, \mu_1^*(\tau))$ is strictly quasi-concave in τ here.

Thus, we could find the optimal τ^* by setting up the Lagrangian $\mathcal{L}_\tau \equiv \pi(\tau, \mu_1^*(\tau)) + \lambda_\tau \tau$, where λ_τ is the Lagrange multiplier for the constraint $\tau \geq \frac{(1+e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}}$. By (16), the first order condition yields $(1 + e^{\mu_1^*(\tau)})\lambda_\tau = 1 - \frac{\gamma \kappa e^{\bar{\mu}}}{2e^{\mu_1^*(\tau)}}$.

First, consider the case that $\gamma \kappa < 2$. But then, $1 - \frac{\gamma \kappa e^{\bar{\mu}}}{2e^{\mu_1^*(\tau)}} > 1 - \frac{e^{\bar{\mu}}}{e^{\mu_1^*(\tau)}} \geq 0$. As $\lambda_\tau > 0$, by complementary slackness, $\tau^* = \frac{(1+e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}}$.

Second, consider the case that $\gamma \kappa \geq 2$. But then, it must be that $\lambda_\tau = 0$; or else, $\tau^* = \frac{(1+e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}}$ by complementary slackness such that $\mu_1^*(\tau) = \bar{\mu}$, leading to the contradiction that $0 < (1 + e^{\mu_1^*(\tau)})\lambda_\tau = 1 - \frac{\gamma \kappa}{2} \leq 0$. Together with Proposition 1, the first order condition becomes $\sqrt{\tau \kappa e^{\bar{\mu}}} - 1 = e^{\mu_1^*(\tau)} = \frac{\gamma \kappa e^{\bar{\mu}}}{2}$. Re-arranging the expression yields $\tau^* = \frac{1}{\kappa e^{\bar{\mu}}} \left(1 + \frac{\gamma \kappa e^{\bar{\mu}}}{2}\right)^2 \equiv \tau_1^*$.

Note that τ_1^* is within the sub-domain since $\tau_1^* \geq \frac{(1+e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}}$ for $\gamma \kappa \geq 2$. Thus, the solution in the sub-domain is

$$\tau^* = \begin{cases} \frac{(1 + e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}}, & \gamma \kappa < 2 \\ \tau_1^*, & \gamma \kappa \geq 2 \end{cases} \quad (17)$$

As $\tau_1^* \rightarrow \frac{(1+e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}}$ as $\gamma \kappa \rightarrow 2^+$, the solution is continuous.

Now we combine the insights from Step 1 and Step 2 to solve the original first-stage optimization problem. Again, we separately analyze the two cases of $\gamma \kappa$.

Step 3: Find the optimal τ^* in the entire domain $\tau \geq 0$ for $\gamma \kappa < 2$.

The previous steps yield three candidate solutions. By (17), τ_1^* is ruled out. However, Step 1 shows that $\pi(\tau, \mu^*(\tau))$ is decreasing in τ for $\tau < \frac{(1+e^{\bar{\mu}})^2}{\kappa e^{\bar{\mu}}}$. Since

$\pi(\tau, \mu^*(\tau))$ is continuous in τ , $\pi(\tau_0^*, \mu^*(\tau_0^*)) > \pi\left(\frac{(1+e\bar{\mu})^2}{\kappa e\bar{\mu}}, \mu^*\left(\frac{(1+e\bar{\mu})^2}{\kappa e\bar{\mu}}\right)\right)$. Thus,

together with Step 2, τ_0^* is the solution.

Step 4: Find the optimal τ^* in the entire domain $\tau \geq 0$ for $\gamma\kappa \geq 2$.

By (17), only two candidate solutions, τ_0^* and τ_1^* , remain. Define the function $H(\gamma, \kappa, \bar{\mu}) := \pi(\tau_1^*, \mu^*(\tau_1^*)) - \pi(\tau_0^*, \mu^*(\tau_0^*))$. Re-arranging the expression yields

$$H(\gamma, \kappa, \bar{\mu}) = \frac{2e}{\kappa} \left(\left(\frac{\gamma\kappa}{2e} \right) \log \left(\frac{\gamma\kappa}{2e} \right) - \frac{e^{-\bar{\mu}} - 1}{2e} \right) \quad (18)$$

Note that H is increasing in $\bar{\mu}$ and that $H(\gamma, \kappa, \bar{\mu}) \rightarrow -\infty$ as $\bar{\mu} \rightarrow -\infty$.

Meanwhile, observe that

$$\lim_{\bar{\mu} \rightarrow +\infty} H(\gamma, \kappa, \bar{\mu}) = \frac{1}{\kappa} \left((\gamma\kappa) \log \left(\frac{\gamma\kappa}{2e} \right) + 1 \right) \geq 0 \leftrightarrow \gamma\kappa \geq \lim_{\bar{\mu} \rightarrow +\infty} G(\bar{\mu}) \quad (19)$$

If $\gamma\kappa \leq \lim_{\bar{\mu} \rightarrow +\infty} G(\bar{\mu})$, then it must be that $\pi(\tau_0^*, \mu^*(\tau_0^*)) > \pi(\tau_1^*, \mu^*(\tau_1^*))$, such that τ_0^* is optimal. Now, consider the remaining case that $\gamma\kappa > \lim_{\bar{\mu} \rightarrow +\infty} G(\bar{\mu})$. As H is continuous and monotonic in $\bar{\mu}$, by the Intermediate Value Theorem, there exists a unique $\bar{\mu}(\gamma, \kappa) \in \mathbb{R}$ such that $H(\gamma, \kappa, \bar{\mu}(\gamma, \kappa)) = 0$.

Since $\frac{e^{-\bar{\mu}(\gamma, \kappa)} - 1}{2e} > -e^{-1}$, the Lambert W function $W\left(\frac{e^{-\bar{\mu}(\gamma, \kappa)} - 1}{2e}\right)$ is well-defined. Consequently, from (18), $W\left(\frac{e^{-\bar{\mu}(\gamma, \kappa)} - 1}{2e}\right) = W\left(\left(\frac{\gamma\kappa}{2e}\right) \log\left(\frac{\gamma\kappa}{2e}\right)\right) = \log\left(\frac{\gamma\kappa}{2e}\right) = \frac{e^{-\bar{\mu}(\gamma, \kappa)} - 1}{\gamma\kappa}$. As $\frac{e^{-\bar{\mu}(\gamma, \kappa)} - 1}{\gamma\kappa} > \frac{-1}{\gamma\kappa} \geq -\frac{1}{2} > -1$, only the principal branch W_0 is applicable. But then,

$$\gamma\kappa = \frac{e^{-\bar{\mu}(\gamma,\kappa)} - 1}{W_0 \left(\frac{e^{-\bar{\mu}(\gamma,\kappa)} - 1}{2e} \right)} = G(\bar{\mu}(\gamma,\kappa)) \quad (20)$$

Now we are ready to characterize the solution. Observe that H is increasing in $\bar{\mu}$, whereas Lemma 1 shows that G is decreasing in $\bar{\mu}$. In light of (20),

$$H(\gamma,\kappa,\bar{\mu}) \geq H(\gamma,\kappa,\bar{\mu}(\gamma,\kappa)) = 0 \leftrightarrow \gamma\kappa = G(\bar{\mu}(\gamma,\kappa)) \geq G(\bar{\mu}) \quad (21)$$

Recall from Lemma 1 that $G' < 0$ and $G > 2$. By the lexicographic preference, τ_1^* is preferred to τ_0^* if and only if $\gamma\kappa \geq \min \left\{ G(\bar{\mu}), \lim_{\bar{\mu} \rightarrow +\infty} G(\bar{\mu}), 2 \right\} = G(\bar{\mu})$. This yields the characterization in the proposition.

Q.E.D.

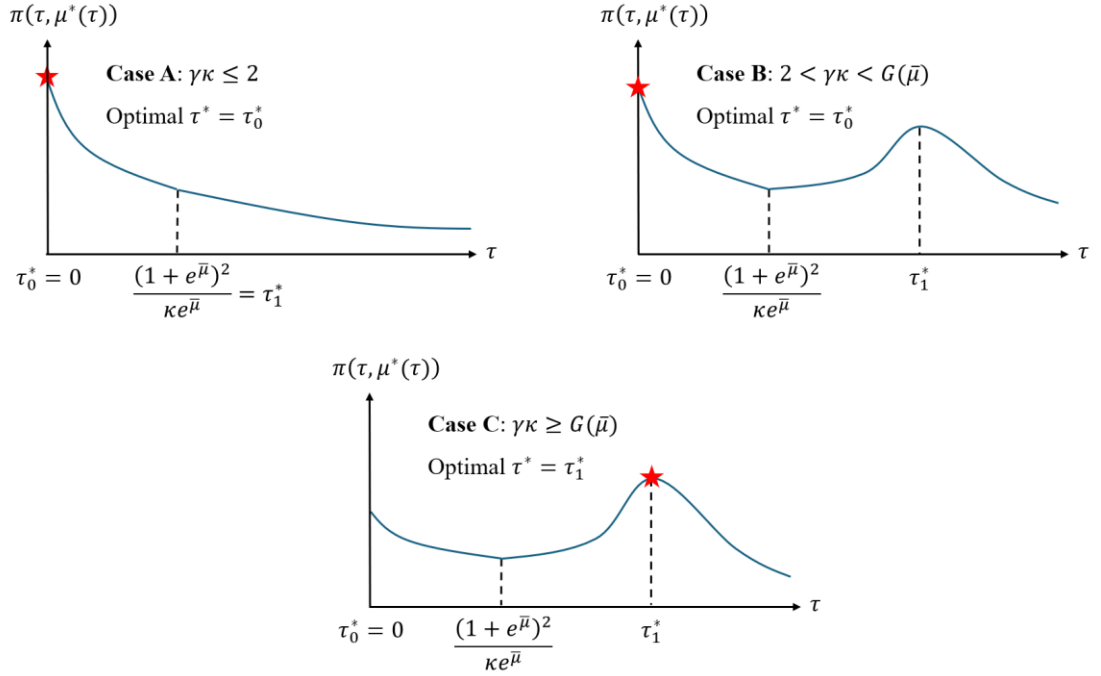
Proposition 2 shows that the optimal commitment strength τ^* of the firm hinges on various parameters. In essence, the firm is faced with a tradeoff between convincing its investors that its transition plan is credible and managing its future transition risk. While a stronger commitment raises the stakes of transition failure, it makes the firm's transition plan more credible to the investors, which translates into present financial benefit in the form of green premium, for instance.

Interestingly, the firm has an incentive to make a meaningful commitment $\tau_1^* > 0$ only if its transition capacity κ , its status-quo emissions performance $\bar{\mu}$, or the materiality of its emissions performance to its investors γ is sufficiently high. Accordingly, Proposition 2 predicts that firms in hard-to-abate sectors (low κ), in carbon-intensive sectors (low $\bar{\mu}$), or with high ESG controversy (low γ due to self-

selection of investors) are resistant to the idea of decarbonization commitment, such that $\tau_0^* = 0$.

The solution in Proposition 2 is depicted in Figure 2; evidently, the firm's optimal commitment strength τ^* discontinuously jumps from zero as $\gamma\kappa$ surpasses the threshold $G(\bar{\mu})$.

Figure 2: Subgame perfect equilibrium commitment strength



Corollary 1: If $\bar{\mu} < -\frac{3}{2} - W_0\left(-\frac{1}{2}e^{-\frac{3}{2}}\right)$, the firm's optimal commitment strength τ_1^* is U-shaped in its transition capacity κ ; otherwise, τ_1^* is increasing in κ .

Proof: Note the first derivative of τ_1^* with respect to κ :

$$\frac{d\tau_1^*}{d\kappa} = \frac{\gamma^2 e^{\bar{\mu}}}{4} - \frac{1}{\kappa^2 e^{\bar{\mu}}} \stackrel{\leq}{\geq} 0 \leftrightarrow \kappa \stackrel{\geq}{\leq} \frac{2}{\gamma e^{\bar{\mu}}} \quad (22)$$

This means the “turning point” of the U-shaped relationship takes place at $\kappa =$

$\frac{2}{\gamma e^{\bar{\mu}}}$. However, by Proposition 2, $\tau^* = \tau_1^*$ is applicable if and only if $\kappa \geq \frac{G(\bar{\mu})}{\gamma}$. Thus, it remains to characterize when $G(\bar{\mu}) < 2e^{-\bar{\mu}}$, such that the turning point is applicable.

But then, by (12), this is equivalent to characterizing when the function $P(\bar{\mu}) := 1 + W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right) + \bar{\mu} < 0$, because

$$G(\bar{\mu}) = 2e^{1+W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)} = 2e^{P(\bar{\mu})-\bar{\mu}} \quad (23)$$

Meanwhile, note that $P(\bar{\mu})$ is increasing in $\bar{\mu}$:

$$\begin{aligned} \frac{dP(\bar{\mu})}{d\bar{\mu}} &= 1 + \frac{W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)\left(\frac{-e^{-\bar{\mu}}}{2e}\right)}{\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)\left(1+W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)\right)} \\ &= \frac{2e - W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)\left(\frac{2e}{e^{-\bar{\mu}}-1}\right)}{2e\left(1+W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)\right)} \\ &= \frac{1 - \frac{1}{2}e^{-1-W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)}}{1+W_0\left(\frac{e^{-\bar{\mu}}-1}{2e}\right)} > 0 \end{aligned} \quad (24)$$

Since $P(\bar{\mu}) = 0$ if and only if $\bar{\mu} = -\frac{3}{2} - W_0\left(-\frac{1}{2}e^{-\frac{3}{2}}\right)$, the claim follows.

Q.E.D.

Corollary 1 shows that the relationship between the firm's optimal commitment strength τ^* and its transition capacity κ is non-monotonic if the firm's status-quo emissions performance $\bar{\mu}$ is sufficiently negative. Taken together, we can characterize firms into three equilibrium types.

- **Signaling firms:** $\kappa \geq 2/\gamma e^{\bar{\mu}}$

The firm has a stronger incentive to make a commitment as κ rises because it is more confident in attaining the decarbonization target, such that the marginal cost of commitment is lower; this is in line with the voluntary disclosure theory of non-financial disclosure.

- **Legitimacy-seeking firms:** $G(\bar{\mu})/\gamma < \kappa < 2/\gamma e^{\bar{\mu}}$

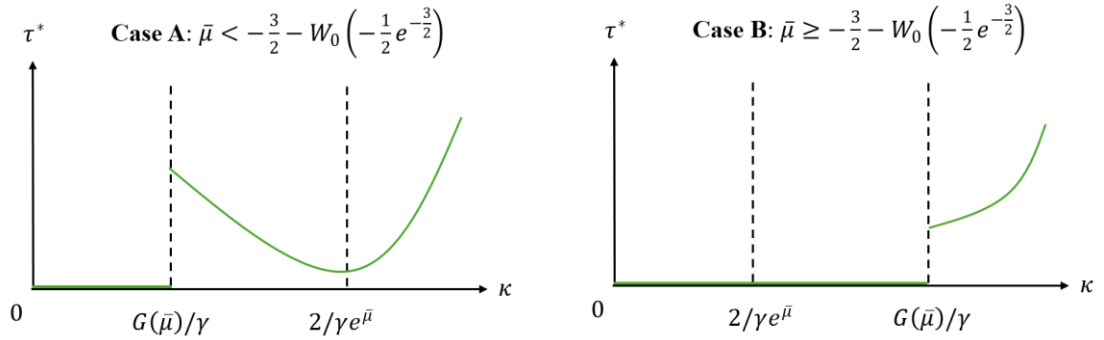
The firm has a stronger incentive to make a commitment as κ drops, as there is a greater urgent to convince its investors of its determination in emissions abatement, such that the marginal benefit of commitment is higher; this is in line with the legitimacy theory of non-financial disclosure.

- **Inactive firms:** $\kappa \leq G(\bar{\mu})/\gamma$

The firm's transition capacity is so low that investors could hardly believe the firm is ever capable of attaining the decarbonization target. With little marginal financial benefit $\partial\gamma\mathbb{E}[x|\tau]/\partial\tau$, any commitment is mostly a cost burden to the firm. As such, it simply gives up signaling its emissions abatement determination.

On the other hand, if the firm's status-quo emissions performance $\bar{\mu}$ is sufficiently positive, the "legitimacy stage" disappears. The solution in Corollary 1 is depicted in Figure 3.

Figure 3: Equilibrium commitment strength and transition capacity



This completes the analysis of the game-theoretic model.

4. Data and empirical results

4.1 Data

We extract firm-year financial data on the constituents of the STOXX 1800 index from LSEG Datastream. The STOXX 1800 index includes 600 firms from North America, 600 firms from Europe, and 600 firms from Asia-Pacific. We drop observations with missing financial information. We proxy firms' transition capacity by their asset redeployability score, obtained from Kim and Kung (2017).¹ Finally, we matched our sample with the list of decarbonization commitments obtained from the Science-Based Targets Initiative. The sample consists of observations from 22 countries between 2012 and 2022. All non-binary variables are winsorized at the 3rd and 97th percentiles. Appendix A presents variable definitions.

Table 1 reports the descriptive statistics. Panel A presents the descriptive statistics

¹ The authors periodically update their indicators, which allows us to include several years after the publication of their article.

for the full sample. Panel B provides the descriptive statistics for the sample categorized by whether firms belong to a Hard-to-abate (HTA) sector or not. Panel C presents descriptive statistics for firms categorized by whether they operate in carbon-intensive industries.

4.2 Baseline results

Our baseline regression is as follows:

$$SBTi_{it} = \alpha + \beta_1 \text{Redeployability Score}_{it} + \beta_2 \text{Redeployability Score}^2_{it} + \beta_3 X_{it} + \beta_4 Z_{it} + \varepsilon_{it} \quad (1)$$

$SBTi_{it}$ refers to firms' participation in the Science Based Targets initiative, a binary indicator of commitment to science-based climate goals, $\text{Redeployability Score}_{it}$ and $\text{Redeployability Score}^2_{it}$ capture the linear and potential non-linear effects of asset flexibility, measuring the extent to which a firm's assets can be repurposed across different uses. X_{it} is a vector of controls that have been shown to affect the firms' environmental actions and Z_{it} is a vector of fixed effects.

Our baseline results are presented in Table 2 and examine the relationship between asset redeployability and the likelihood of firms committing to the Science Based Targets initiative (SBTi) using ordinary least squares (OLS) regressions. The model tests for a U-shaped effect by including the Redeployability Score and its squared term as key independent variables, with SBTi as the dependent variable. Columns (1) and (2) incorporate year and industry fixed effects, while Columns (3) and (4) use industry-year fixed effects to control for time-varying industry shocks. Columns (2) and (4)

include firm-level controls, including firm size, debt ratios, R&D intensity, PPE/Total Assets, OpEx/Total Assets, Net Income/Total Assets and Working capital/Total Assets.. The results provide evidence of a U-shaped relationship between Redeployability Score and the likelihood of SBTi commitment. Following the guidelines of Haans, Pieters, and He (2016), the estimated coefficients satisfy all three necessary conditions for a true U-shaped effect: (1) The coefficient on the linear term is significantly negative, while its coefficient on the square term is significantly positive. (2) The turning point is within the range of variable values. (3) The slope of the curve changes within the observed range of the independent variable. This U-shape suggests that firms with very low redeployability may commit to SBTi to signal environmental responsibility, while high-redeployability firms leverage flexible assets to pursue ambitious decarbonization goals, due to lower transition costs.

This U-shaped relationship aligns with Proposition 2 and Corollary 1 from our theoretical model, which posits that firms' commitment decisions reflect a trade-off between transition credibility and future transition risk. Ex-ante, our framework allows for two distinct scenarios depending on firms' baseline environmental performance (Figure 3). In Case A, where status-quo environmental performance is sufficiently negative, a U-shaped relationship between asset redeployability (our proxy for climate transition capacity) and commitment strength is expected. In this scenario, firms with low redeployability operate in the legitimacy stage, committing to SBTi to signal environmental responsibility and gain legitimacy despite high abatement costs, as the marginal benefits of signaling outweigh the costs. Conversely, firms with high

redeployability fall into the signaling stage, leveraging flexible assets to pursue ambitious decarbonization goals with lower transition costs, thereby enhancing commitment credibility. In contrast, Case B applies when status-quo environmental performance is sufficiently positive. Here, the legitimacy stage disappears, and commitment strength is expected to increase monotonically with redeployability, as firms face lower marginal costs of commitment across the board.

In the empirical analysis, we explicitly test for both scenarios by estimating models with and without the quadratic term. The specification without the quadratic term (testing for a linear relationship) yields insignificant coefficients, effectively ruling out Case B. This step is crucial to ensure that the U-shaped pattern is not simply the result of overfitting a quadratic curve to inherently linear data. Our main results support Case A, as the U-shaped relationship is robust across specifications.

4.3 Heterogeneity analysis

Table 3 conducts a heterogeneity analysis to explore how the U-shaped relationship between asset redeployability and SBTi commitment varies across firm and industry characteristics, using subsamples based on firm size (high vs. low LnSize), hard-to-abate (HTA) sector status, environmental controversy history, carbon-intensive industry classification, operational cost intensity (OpEx/Total Assets), and the country of origin (US or non-US firm). Based on the theoretical model above, we categorize these analyses into two groups: those pertaining to the firm's climate transition capacity (κ), which reflects the ease of repurposing physical capital or implementing environmental

strategies, and those pertaining to the financial materiality of environmental performance to investors (γ), which captures how much investors value a firm's environmental efforts.

In Panel A of Table 3, we examine subsamples where the U-shaped relationship is expected to be more pronounced due to variations in climate transition capacity (κ). We use three proxies for climate transition capacity. First, we refer to Ilhan et al. (2021) to distinguish between high- and low-carbon industries. Second, we leverage reports from the International Energy Agency and the United Nations Environment Programme to identify hard-to-abate sectors. Third, we build subsamples based on the ratio of operating expenses to total assets, as firms with high operating expenses generally have less operational flexibility (e.g., Novy-Marx, 2011). The U-shaped relationship is not found in the subsamples of carbon-intensive industries (Column 1), HTA sectors (Column 3), and high operating expenses (Column 5), but exists for non-carbon-intensive industries (Column 2), non-HTA sectors (Column 4), and those with low operating expenses (Column 6). The subsamples of low-capacity firms (Columns 1, 3, and 5) correspond to the first flat stage in Case A in Figure 3 (forgoing stage). In contrast, the results in Columns 2, 4, and 6 satisfy the three conditions outlined by Haans et al. (2016) to properly characterize a U-shape. Our results suggest that the U-shaped relationship between asset redeployability and decarbonization commitment primarily exists for firms that are above a minimal threshold of transition capacity. Conditional of being above a threshold level of transition capacity, we observe a U-shaped relationship: low-capacity firms pursue substantive commitments to improve their

corporate legitimacy, whereas high-capacity firms face lower abatement costs or greater resource availability for environmental investments. While the results in Columns (1) to (6) use industry and year fixed effects, we show in Columns (7) to (12) that our results are similar when we use industry-year fixed effects.

In Panel B of Table 3, we also test subsamples where the financial materiality of environmental performance to investors (γ) influences commitment decisions. Larger firms face greater visibility and stakeholder scrutiny, which can increase the financial materiality of their environmental performance (Drempetic et al., 2020). Smaller firms, or firms with environmental controversies may be less scrutinized or have a damaged reputation, such that the financial benefit of committing to decarbonization may be more limited (low γ). Furthermore, empirical evidence suggests that the financial materiality of carbon emissions tends to be higher for North American firms (Bolton and Kacperczyk, 2025), indicating greater financial benefits of commitment (γ). On the contrary, lower carbon premium for non-US firms may provide reduced financial incentives for commitment, which should translate into an absence of a U-shaped relationship for non-US firms.

Consistent with these intuitions, we find evidence of a U-shaped relationship larger firms (Column 1), firms without environmental controversies (Column 4), and US firms (Column 5). These results satisfy the conditions to characterize a U-shape (Haans et al., 2016). Conversely, we do not find evidence of a U-shape for smaller firms (Column 2), firms with environmental controversies (Column 3), and non-US firms (Column 6). These findings align with our theoretical model, as represented in Figure

3. If the financial materiality of environmental performance is too low, firms will not commit (forgoing stage), whereas there is a U-shaped relationship between transition capacity and the adoption of decarbonization commitment when the financial materiality of firms' emission performance is sufficiently high.

4.4 Financial benefits of decarbonization commitments

In our theoretical model, stakeholders value environmental performance. Their expectations of a firm's future environmental outcomes influence the firm's commitment strength and abatement efforts, as firms with good expected performance enjoy financial benefits. In practice, institutional owners are known to value firms' environmental performance. Therefore, one of the potential financial benefits of committing to decarbonization targets is attracting institutional ownership. Our tests empirically assess this idea. The empirical results in Table 4 examine the impact of decarbonization commitment on subsequent changes in institutional ownership, using two binary dependent variables: increases in the total value of institutional holdings and increases in ownership share. Columns (1) and (2) employ OLS with year and industry fixed effects, Columns (3) and (4) use industry-year fixed effects, and Columns (5) and (6) include firm and industry-year fixed effects. The results are further confirmed after controlling for the past value of institutional ownership (Columns 7 and 8). Across our specifications, decarbonization commitments are significantly associated with increased institutional ownership across all models. Additionally, the interaction term between institutional ownership and the high ESG combined score introduced in Panel

B further refines these findings. The inclusion of this interaction term reveals that the positive effect of decarbonization commitment on institutional ownership growth is amplified in firms with high ESG performance. This suggests that institutional investors, particularly those focused on ESG criteria, may view firms with both decarbonization commitments and strong ESG performance as more attractive for long-term investment. This result is consistent with prior literature showing that institutional investors have a preference for sustainability performance in investment decisions (Hartzmark & Sussman, 2019).

4.5 Institutional Ownership as a predictor of decarbonization commitments

As discussed in the previous section, institutional investors prefer firms with stronger sustainability practices. At the same time, the presence of institutional investors can also push firms to adopt sustainability-related practices. Table 5 investigates whether higher lagged institutional ownership predicts future decarbonization commitment, using a continuous measure of institutional ownership value and a binary above-median indicator. Columns (1) and (2) include year and industry fixed effects, while Columns (3) and (4) use industry-year fixed effects. Across our specifications, we document that institutional ownership has a significant positive effect on the probability of having a decarbonization commitment. These findings suggest that institutional investors, with their significant ownership stakes, may exert pressure on firms to adopt decarbonization commitments, possibly due to their focus

on ESG criteria and long-term risk management. Higher institutional ownership likely aligns firm strategies with sustainability goals, as these investors advocate for decarbonization to enhance firm reputation and mitigate regulatory climate risks.

4.6 Robustness tests

Asset redeployability may be correlated with unobserved firm traits (e.g., managerial quality). We use an instrumental variable approach to mitigate the concern of omitted variable bias. The results are reported in Table 6. We instrument the firm's current score with historical values of the redeployability score. In Column (1), we instrument the current redeployability score with the firm's redeployability score from ten years ago. Column (2) uses the firm's redeployability score from 15 years ago. Here, our underlying assumption is that past redeployability only indirectly influences current environmental initiatives, through its influence on the firm's current redeployability. However, this exclusion restriction may not hold if the unobserved characteristics that potential bias our estimations are strongly persistent over time. To mitigate this concern, we instrument the firm's current redeployability score with the historical average industry-year redeployability, as shown in Columns (3) and (4). We use the average industry-year redeployability from 10 and 15 years ago, respectively. We argue that while industry-level average asset redeployability from 10 or 15 years ago may influence the firm's current redeployability, it is unlikely to have a direct impact on the firm's current environmental initiatives.

To validate the soundness of our instrumental variable approaches, we employ

several diagnostic procedures. We use the Cragg and Donald (1993) and Stock and Yogo (2002) approaches to test for instrument weakness. The results, reported at the bottom of Panel A, lead us to reject the null hypothesis of instrument weakness. In Panel B, we use the test of D'Haultfoeuille, Hoderlein, and Sasaki (2024) to assess the validity of our exclusion restriction assumptions. The high p-values indicate that we fail to reject the null hypothesis that the exclusion restriction is satisfied.

Overall, the results obtained with our instrumental variable approaches suggest that the relationship between redeployability and decarbonization commitments is likely causal.

5. Conclusion

This study investigates the economics of decarbonization commitments through an integrated theoretical and empirical approach. Leveraging a novel microeconomic model, we illuminate the underlying logic guiding firms' decisions to adopt time-bound decarbonization commitments. Testing our theoretical predictions with robust data on SBTi decarbonization pledges, we uncover a consistent U-shaped pattern: firms with high or low transition capacity are more likely to commit, whereas those with intermediate capacity are least likely to do so. Our findings suggest that low-capacity firms often pursue commitments to manage investor expectations about future environmental performance, while high-capacity firms commit due to lower costs of abatement and heightened strategic flexibility. In contrast, firms facing high costs of

emissions abatement, or for whom the financial materiality of such actions is muted, generally refrain from making ambitious decarbonization pledges.

Though our empirical focus is on decarbonization pledges as standardized by the SBTi—the most widely recognized benchmark for corporate climate ambition—our theoretical model is broadly applicable to multiple forms of environmental commitments. Analogous initiatives such as the Science Based Targets Network (SBTN) are emerging in domains like biodiversity, supporting the applicability of our conceptual framework beyond emissions targets.

Crucially, our theoretical model also accounts for instances of commitment withdrawal, highlighting how shifts in market sentiment—such as the recent rise of anti-ESG movements—can affect the integration of corporate environmental performance into financial valuations and thereby reshape firms' optimal strategies. These dynamics emphasize the economic, strategic, and market contingencies that condition the effectiveness and durability of corporate environmental commitments. Altogether, the study advances understanding of the determinants and implications of firm-level environmental commitments, providing guidance for both policymakers and investors seeking to mobilize meaningful corporate environmental action.

Table 1

Descriptive statistics.

This table reports summary statistics. All variables are winsorized at the 3rd and 97th percentiles. Appendix A presents variable definitions. The sample consists of observations from 22 countries between 2012 and 2022. Panel A presents the descriptive statistics for all samples. Panel B provides the descriptive statistics for the sample categorized by whether firms belong to a Hard-to-abate (HTA) sector, with differences in key variables across the groups. Panel C presents descriptive statistics for firms categorized by whether they operate in carbon-intensive industries, highlighting variations in the data based on sector-specific characteristics.

Panel A. Descriptive statistics for all samples

Variable	N	Mean	St.D.	P25	Median	P75
<i>SBTi</i>	5947	0.052	0.222	0	0	0
<i>Redeployability Score</i>	5947	0.393	0.145	0.331	0.397	0.458
<i>Redeployability Score²</i>	5947	0.176	0.114	0.110	0.158	0.210
<i>LnSize</i>	5947	9.949	1.159	9.182	9.909	10.75
<i>Total Debt/Equity</i>	5947	117.2	148.4	37.21	75.53	142.0
<i>R&D/Sales</i>	5947	4.076	6.682	0	0.140	5.460
<i>PPE/Total Assets</i>	5947	0.272	0.258	0.069	0.174	0.438
<i>OpEx/Total Assets</i>	5947	0.573	0.470	0.244	0.463	0.749
<i>Net Income/Total Assets</i>	5947	0.061	0.061	0.020	0.050	0.094
<i>Working Capital/Total Assets</i>	5947	0.114	0.162	0	0.062	0.194

Panel B. Descriptive statistics for HTA sub-samples

Variable	HTA Sectors						Non-HTA Sectors						T-Test	P-Value
	N	Mean	St.D.	P25	Median	P75	N	Mean	St.D.	P25	Median	P75		
<i>SBTi</i>	1270	0.035	0.185	0	0	0	4677	0.056	0.231	0	0	0	2.99	0.0028
<i>Redeployability Score</i>	1270	0.349	0.086	0.299	0.389	0.418	4677	0.405	0.156	0.342	0.399	0.489	12.36	0.0000
<i>Redeployability Score^2</i>	1270	0.129	0.055	0.090	0.151	0.174	4677	0.188	0.122	0.117	0.159	0.240	16.83	0.0000
<i>LnSize</i>	1270	10.07	1.064	9.330	9.976	10.80	4677	9.915	1.182	9.128	9.894	10.74	-4.26	0.0000
<i>Total Debt/Equity</i>	1270	130.2	137.3	48.88	102.0	158.5	4677	113.7	151.1	33.92	70.25	135.1	-3.52	0.0004
<i>R&D/Sales</i>	1270	4.755	7.811	0	0.120	6.610	4677	3.891	6.329	0	0.170	5.360	-4.09	0.0000
<i>PPE/Total Assets</i>	1270	0.433	0.261	0.178	0.436	0.674	4677	0.228	0.239	0.053	0.135	0.317	-26.49	0.0000
<i>OpEx/Total Assets</i>	1270	0.448	0.309	0.221	0.364	0.584	4677	0.607	0.500	0.260	0.499	0.790	10.78	0.0000
<i>Net Income/Total Assets</i>	1270	0.055	0.059	0.022	0.041	0.084	4677	0.063	0.062	0.019	0.052	0.097	4.21	0.0000
<i>Working Capital/Total Assets</i>	1270	0.077	0.151	-	0.022	0.148	4677	0.124	0.164	0	0.071	0.206	9.11	0.0000

Panel C. Descriptive statistics for Carbon Intensive Industry sub-samples

Variable	Carbon Intensive Industries						Non-Carbon Intensive Industries						T-Test	P-Value
	N	Mean	St.D.	P25	Median	P75	N	Mean	St.D.	P25	Median	P75		
<i>SBTi</i>	2365	0.055	0.229	0	0	0	3582	0.050	0.217	0	0	0	-0.97	0.3326
<i>Redeployability Score</i>	2365	0.355	0.102	0.307	0.383	0.414	3582	0.418	0.163	0.342	0.418	0.516	16.78	0.0000
<i>Redeployability Score^2</i>	2365	0.136	0.067	0.094	0.147	0.171	3582	0.201	0.130	0.117	0.175	0.266	22.54	0.0000
<i>LnSize</i>	2365	10.12	1.115	9.362	10.06	10.90	3582	9.834	1.173	9.036	9.802	10.63	-9.49	0.0000
<i>Total Debt/Equity</i>	2365	120.2	135.1	46.86	87.93	146.1	3582	115.2	156.6	28.99	69.20	136.2	-1.27	0.2055
<i>R&D/Sales</i>	2365	3.251	6.220	0	0.240	2.940	3582	4.620	6.917	0	0	6.900	7.77	0.0000
<i>PPE/Total Assets</i>	2365	0.399	0.256	0.168	0.357	0.626	3582	0.189	0.223	0.039	0.102	0.237	-33.47	0.0000
<i>OpEx/Total Assets</i>	2365	0.582	0.429	0.272	0.470	0.757	3582	0.568	0.495	0.207	0.457	0.741	-1.16	0.2460
<i>Net Income/Total Assets</i>	2365	0.056	0.058	0.023	0.049	0.086	3582	0.065	0.063	0.016	0.052	0.100	5.61	0.0000
<i>Working Capital/Total Assets</i>	2365	0.084	0.141	-0.016	0.049	0.142	3582	0.134	0.172	0	0.0760	0.230	11.68	0.0000

Table 2

Asset redeployability and decarbonization commitments: baseline results

This table presents estimates of the effects of Redeployability Score and Redeployability Score² on the likelihood of having a decarbonization commitment, using SBT_i as the dependent variable. Columns (1) to (4) report OLS estimates. Regressions (1) and (2) include year fixed effects and industry fixed effects (2-digit sic codes). Regressions (3) and (4) include industry-year fixed effects. Appendix A presents variable definitions. Standard errors are clustered at the firm level. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

VARIABLES	(1)	(2)	(3)	(4)
			SBT _i	
Redeployability Score	-0.217*	-0.327***	-0.217*	-0.343***
	(-1.88)	(-2.77)	(-1.87)	(-2.89)
Redeployability Score ²	0.334**	0.473***	0.331*	0.486***
	(1.98)	(2.82)	(1.88)	(2.79)
LnSize		0.009***		0.009***
		(4.44)		(4.32)
Total Debt/Equity		0.000		0.000
		(0.75)		(1.08)
R&D/Sales		0.001*		0.001
		(1.75)		(1.54)
PPE/Total Assets		-0.014		-0.022
		(-0.83)		(-1.24)
OpEx/Total Assets		0.024***		0.027***
		(3.39)		(3.57)
Net Income/Total Assets		-0.130***		-0.124***
		(-3.25)		(-2.68)
Working Capital/Total Assets		-0.050***		-0.045***
		(-3.12)		(-2.64)
Constant	0.007	-0.056*	0.035*	-0.036
	(0.34)	(-1.70)	(1.78)	(-1.02)
Year fixed effects	Y	Y	N	N
Industry fixed effects	Y	Y	N	N
Year * Industry fixed effects	N	N	Y	Y
Observations	5,213	5,213	5,213	5,213
R-squared	0.066	0.075	0.184	0.192

Table 3

Asset redeployability and decarbonization commitments: subsample analysis

This table presents sub-sample analyses of the relationship between asset redeployability and the likelihood of committing to decarbonization (SBTi commitment). Panel A focuses on subsamples based on transition capacity, with Columns (1) to (6) controlling for year and industry fixed effects, and Columns (7) to (12) control for industry-year fixed effects. In Columns (1), (2), (7) and (8), the subsamples are based on whether the firm operates in a carbon-intensive industry. In Columns (3), (4), (9), and (10), the subsamples are based on whether the firm belongs to a hard-to-abate (HTA) sector. In Columns (5), (6), (11), and (12), the subsamples are based on operating costs. Panel B focuses on subsamples based on the financial materiality of environmental performance to investors, with Columns (1) to (6) controlling for year and industry fixed effects, and Columns (7) to (12) control for industry-year fixed effects. In Columns (1), (2), (7) and (8), the subsamples are based on the firm's market capitalization. In Columns (3), (4), (9), and (10), the subsamples are based on whether the firm has any environmental controversies, environmental controversy history serves as a reputational marker. In Columns (5), (6), (11), and (12), the subsamples are based on whether the firm is from the US. All regressions are estimated using OLS. Standard errors are clustered at the firm level and t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Subsample analysis based on transition capacity

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	SBTi											
	Carbon Intensive Industry		HTA Sectors		OpEx / Total Assets		Carbon Intensive Industry		HTA Sectors		OpEx / Total Assets	
	Yes	No	Yes	No	High	Low	Yes	No	Yes	No	High	Low
Redeployability Score	-0.292 (-1.29)	-0.356* (-1.93)	0.352 (1.48)	-0.369*** (-2.81)	0.057 (0.37)	-0.412** (-2.26)	-0.297 (-1.40)	-0.335* (-1.76)	0.371 (1.45)	-0.392*** (-2.99)	0.003 (0.02)	-0.432** (-2.11)
Redeployability Score^2	0.443 (1.14)	0.505** (2.22)	-0.554 (-1.39)	0.537*** (2.97)	-0.108 (-0.56)	0.629** (2.28)	0.405 (1.08)	0.484** (2.04)	-0.600 (-1.42)	0.556*** (3.00)	-0.079 (-0.44)	0.672** (2.16)
LnSize	0.008** (2.24)	0.010*** (3.85)	0.005 (1.23)	0.010*** (4.12)	0.006* (1.96)	0.011*** (4.29)	0.007* (1.92)	0.011*** (3.89)	0.006 (1.35)	0.010*** (4.05)	0.009** (2.50)	0.010*** (3.73)
Total Debt/Equity	0.000 (1.31)	-0.000 (-0.02)	0.000 (0.34)	0.000 (0.71)	0.000 (1.33)	-0.000 (-0.54)	0.000** (2.09)	-0.000 (-0.05)	0.000 (0.81)	0.000 (0.85)	0.000* (1.89)	-0.000 (-0.76)
R&D/Sales	0.001 (0.76)	0.001 (1.58)	0.000 (0.16)	0.001** (2.07)	0.001** (2.15)	0.000 (0.52)	0.001 (0.65)	0.001 (1.42)	-0.000 (-0.02)	0.001* (1.89)	0.001 (1.63)	0.000 (0.49)
PPE/Total Assets	-0.014 (-0.58)	-0.018 (-0.67)	-0.054* (-1.71)	-0.001 (-0.06)	0.059** (2.39)	-0.055** (-2.17)	-0.023 (-0.97)	-0.022 (-0.82)	-0.052* (-1.67)	-0.013 (-0.58)	0.040 (1.53)	-0.055** (-2.02)
OpEx/Total Assets	0.025** (2.02)	0.023** (2.55)	0.024 (1.62)	0.024*** (3.01)	0.019* (1.77)	-0.001 (-0.02)	0.028** (2.14)	0.025*** (2.71)	0.020 (1.30)	0.028*** (3.30)	0.017 (1.49)	0.003 (0.08)
Net Income/Total Assets	-0.114* (-1.93)	-0.140** (-2.49)	-0.096 (-1.17)	-0.139*** (-2.97)	-0.175*** (-3.21)	-0.124* (-1.91)	-0.089 (-1.27)	-0.154** (-2.45)	-0.146 (-1.53)	-0.115** (-2.11)	-0.136** (-2.09)	-0.152** (-1.97)
Working Capital/Total Assets	-0.056* (-1.73)	-0.048** (-2.57)	-0.060 (-1.63)	-0.051*** (-2.79)	-0.060*** (-2.70)	-0.040 (-1.46)	-0.046 (-1.33)	-0.042** (-2.17)	-0.045 (-1.20)	-0.049** (-2.54)	-0.057** (-2.37)	-0.038 (-1.29)
Constant	-0.051 (-0.96)	-0.047 (-0.96)	-0.081 (-1.53)	-0.067* (-1.73)	-0.141*** (-3.02)	-0.018 (-0.39)	-0.016 (-0.31)	-0.028 (-0.55)	-0.089 (-1.64)	-0.043 (-1.06)	-0.093* (-1.87)	0.000 (0.00)
Year fixed effects	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
Industry fixed effects	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
Year * Industry fixed effects	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
Observations	2,071	3,142	1,131	4,082	2,578	2,635	2,071	3,142	1,131	4,082	2,578	2,635
R-squared	0.082	0.072	0.068	0.077	0.113	0.059	0.213	0.178	0.114	0.209	0.285	0.168

Panel B. Subsample analysis based on the financial materiality of its environmental performance to its investors

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	SBTi											
	LnSize		Environmental Controversies		Country of origin (US)		LnSize		Environmental Controversies		Country of origin (US)	
	High	Low	Yes	No	Yes	No	High	Low	Yes	No	Yes	No
Redeployability Score	-0.441** (-2.49)	-0.196* (-1.72)	-0.407 (-1.26)	-0.404*** (-3.03)	-0.416*** (-3.12)	-0.339 (-1.36)	-0.435** (-2.33)	-0.284*** (-2.82)	-0.463 (-1.41)	-0.392*** (-3.00)	-0.437*** (-3.22)	-0.348 (-1.30)
Redeployability Score^2	0.741*** (3.03)	0.213 (1.53)	0.804 (1.45)	0.483*** (2.73)	0.593*** (3.17)	0.435 (1.40)	0.734*** (2.80)	0.313** (2.41)	0.888 (1.57)	0.450** (2.54)	0.616*** (3.10)	0.416 (1.26)
LnSize	0.010 (1.54)	0.003 (1.13)	0.008** (1.99)	0.009*** (3.65)	0.010*** (4.55)	0.014** (2.61)	0.012* (1.67)	0.003 (0.97)	0.008* (1.77)	0.010*** (4.09)	0.011*** (4.66)	0.011* (1.97)
Total Debt/Equity	0.000 (1.43)	-0.000 (-0.87)	0.000 (0.00)	0.000 (0.86)	0.000 (1.07)	-0.000 (-0.59)	0.000 (1.33)	-0.000 (-0.28)	0.000 (0.45)	0.000 (0.93)	0.000 (1.32)	-0.000 (-0.35)
R&D/Sales	0.001 (1.39)	-0.000 (-0.12)	0.001 (0.72)	0.001 (1.51)	0.001 (1.20)	0.002 (1.63)	0.001 (1.07)	-0.000 (-0.16)	0.001 (0.74)	0.001 (1.17)	0.001 (1.13)	0.002 (1.43)
PPE/Total Assets	0.012 (0.43)	-0.040** (-2.24)	0.013 (0.51)	-0.043* (-1.80)	-0.012 (-0.59)	-0.015 (-0.34)	0.002 (0.08)	-0.046** (-2.41)	0.009 (0.37)	-0.052** (-2.04)	-0.012 (-0.61)	-0.045 (-0.86)
OpEx/Total Assets	0.042*** (2.88)	0.003 (0.40)	0.016 (1.42)	0.030*** (2.98)	0.029*** (3.46)	0.004 (0.24)	0.047*** (2.96)	0.006 (0.68)	0.017 (1.46)	0.031*** (2.97)	0.032*** (3.61)	0.011 (0.55)
Net Income/Total Assets	-0.203** (-2.41)	-0.087** (-2.48)	-0.161** (-2.36)	-0.100* (-1.88)	-0.105** (-2.51)	-0.265** (-2.05)	-0.220** (-2.08)	-0.081** (-2.18)	-0.135* (-1.78)	-0.109* (-1.81)	-0.110** (-2.23)	-0.206 (-1.31)
Working Capital/Total Assets	-0.078** (-2.39)	-0.029** (-1.97)	-0.071** (-2.18)	-0.041** (-2.22)	-0.051*** (-2.89)	-0.021 (-0.47)	-0.060 (-1.63)	-0.026* (-1.70)	-0.068** (-2.12)	-0.034* (-1.71)	-0.047** (-2.42)	-0.024 (-0.46)
Constant	-0.080 (-1.03)	0.044 (1.31)	-0.057 (-0.95)	-0.005 (-0.12)	-0.069** (-2.16)	-0.094 (-1.26)	-0.077 (-0.91)	0.055* (1.79)	-0.031 (-0.49)	0.009 (0.23)	-0.044 (-1.28)	-0.027 (-0.32)
Year fixed effects	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
Industry fixed effects	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
Year * Industry fixed effects	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
Observations	2,663	2,550	1,953	3,260	4,327	1,620	2,663	2,550	1,953	3,260	4,327	1,620
R-squared	0.101	0.083	0.095	0.092	0.078	0.090	0.243	0.293	0.161	0.215	0.220	0.303

Table 4

Decarbonization commitment and subsequent institutional ownership.

This table examines the relationship between firms' decarbonization commitment, high ESG combined score, and subsequent changes in institutional ownership. The dependent variables are two binary indicators capturing whether institutional ownership has increased from the previous year, either in terms of the total value of institutional holdings or the ownership share. In Panel A, Columns (1) and (2) employ OLS regressions with year and industry fixed effects; Column (1) focuses on changes in the total value, while Column (2) shifts to changes in ownership share. Columns (3) and (4) introduce industry-year fixed effects. Columns (5) and (6) include both firm fixed effects and industry-year fixed effects. Column (5) examines changes in institutional holding value, while Column (6) analyzes changes in ownership share. Columns (7) and (8) further control for the lagged values of institutional ownership, specifically the lagged institutional holding value in Column (7) and the lagged ownership share in Column (8). Panel B follows the same structure as Panel A but introduces an interaction term between institutional ownership and *High ESG Combined Score*. Standard errors are clustered at the firm level, and t-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. SBTi and institutional ownership

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Increase in IO (value)	Increase in IO (share)	Increase in IO (value)	Increase in IO (share)	Increase in IO (value)	Increase in IO (share)	Increase in IO (value)	Increase in IO (share)
SBTi	0.318*** (41.90)	0.306*** (40.75)	0.314*** (13.93)	0.304*** (12.98)	0.304*** (13.65)	0.295*** (13.00)	0.318*** (15.97)	0.306*** (14.98)
LnSize	0.002 (0.56)	0.002 (0.56)	0.000 (0.20)	-0.000 (-0.28)	-0.001 (-0.17)	-0.000 (-0.05)	0.007* (1.69)	0.005 (1.30)
Total Debt/Equity	0.000 (0.11)	-0.000 (-0.26)	0.000 (0.32)	-0.000 (-0.16)	-0.000 (-0.48)	-0.000 (-0.96)	0.000 (0.27)	-0.000 (-0.23)
R&D/Sales	0.001 (0.56)	0.001 (0.65)	0.000 (0.79)	0.000 (1.06)	0.000 (0.35)	0.001 (0.51)	0.001 (1.51)	0.001 (1.58)
PPE/Total Assets	0.048 (1.50)	0.050 (1.55)	0.013* (1.78)	0.013* (1.78)	0.033 (1.34)	0.048** (2.11)	0.060** (2.30)	0.060** (2.20)
OpEx/Total Assets	-0.024** (-2.10)	-0.025** (-2.17)	0.001 (0.31)	0.001 (0.26)	-0.030** (-2.50)	-0.031*** (-2.69)	-0.027** (-2.35)	-0.027** (-2.30)
Net Income/Total Assets	0.044 (1.11)	0.046 (1.17)	0.007 (0.33)	0.001 (0.04)	0.030 (0.72)	0.022 (0.54)	0.045 (1.08)	0.048 (1.20)
Working Capital/Total Assets	0.015 (0.67)	0.018 (0.81)	-0.001 (-0.11)	-0.004 (-0.49)	0.004 (0.20)	0.008 (0.39)	0.020 (0.89)	0.024 (1.06)
Lagged Institutional Ownership (value)							-0.007*** (-3.06)	
Lagged Institutional Ownership (share)								-0.007*** (-3.10)
Constant	-0.014 (-0.29)	-0.014 (-0.30)	-0.011 (-0.98)	-0.006 (-0.57)	-0.042 (-0.90)	-0.046 (-0.95)	-0.021 (-0.55)	-0.008 (-0.21)
Year fixed effects	Y	Y	N	N	N	N	Y	Y
Firm fixed effects	Y	Y	N	N	Y	Y	Y	Y
Year * Industry fixed effects	N	N	Y	Y	Y	Y	N	N
Observations	5,947	5,947	5,947	5,947	5,947	5,947	5,304	5,304
R-squared	0.409	0.397	0.469	0.454	0.502	0.490	0.413	0.402

Panel B. SBTi, high ESG Combined Score and institutional ownership

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Increase in IO (value)	Increase in IO (share)	Increase in IO (value)	Increase in IO (share)	Increase in IO (value)	Increase in IO (share)	Increase in IO (value)	Increase in IO (share)
SBTi	0.270*** (11.45)	0.256*** (10.53)	0.275*** (11.51)	0.262*** (10.14)	0.260*** (10.70)	0.248*** (9.85)	0.269*** (11.38)	0.255*** (10.51)
High ESG Combined Score	0.000 (0.09)	-0.000 (-0.05)	-0.003* (-1.75)	-0.003* (-1.91)	0.004 (1.13)	0.002 (0.71)	0.001 (0.16)	-0.000 (-0.03)
SBTi * High ESG Combined	0.134*** (3.15)	0.140*** (3.13)	0.105*** (2.69)	0.115*** (2.81)	0.124*** (3.06)	0.132*** (3.14)	0.136*** (3.19)	0.143*** (3.17)
LnSize	0.002 (0.71)	0.002 (0.71)	0.001 (0.99)	0.001 (0.62)	-0.000 (-0.10)	0.000 (0.02)	0.007 (1.63)	0.005 (1.28)
Total Debt/Equity	-0.000 (-0.15)	-0.000 (-0.73)	0.000 (0.05)	-0.000 (-0.42)	-0.000 (-0.79)	-0.000 (-1.29)	-0.000 (-0.09)	-0.000 (-0.62)
R&D/Sales	0.001 (1.02)	0.001 (1.13)	0.000 (0.93)	0.000 (1.21)	0.001 (0.65)	0.001 (0.81)	0.002* (1.70)	0.002* (1.77)
PPE/Total Assets	0.042* (1.93)	0.042* (1.88)	0.015* (1.95)	0.015* (1.96)	0.026 (1.07)	0.041* (1.84)	0.052* (1.90)	0.051* (1.82)
OpEx/Total Assets	-0.025*** (-2.82)	-0.026*** (-2.81)	0.002 (0.46)	0.002 (0.41)	-0.029*** (-2.61)	-0.030*** (-2.81)	-0.028** (-2.52)	-0.028** (-2.45)
Net Income/Total Assets	0.038 (1.07)	0.040 (1.19)	0.005 (0.21)	-0.002 (-0.08)	0.027 (0.63)	0.019 (0.47)	0.038 (0.90)	0.041 (1.02)
Working Capital/Total Assets	0.010 (0.55)	0.013 (0.69)	-0.000 (-0.03)	-0.004 (-0.42)	0.001 (0.04)	0.005 (0.23)	0.013 (0.62)	0.017 (0.78)
Lagged Institutional Ownership (value)							-0.006*** (-3.00)	
Lagged Institutional Ownership (share)								-0.007*** (-3.11)
Constant	-0.013 (-0.45)	-0.013 (-0.44)	-0.020 (-1.63)	-0.015 (-1.29)	-0.007 (-0.19)	-0.022 (-0.54)	-0.019 (-0.48)	-0.006 (-0.14)
Year fixed effects	Y	Y	N	N	N	N	Y	Y
Firm fixed effects	Y	Y	N	N	Y	Y	Y	Y
Year * Industry fixed effects	N	N	Y	Y	Y	Y	N	N
Observations	5,938	5,938	5,938	5,938	5,938	5,938	5,298	5,298
R-squared	0.420	0.410	0.476	0.463	0.510	0.500	0.425	0.415

Table 5

Past institutional ownership as a predictor of decarbonization commitment.

This table investigates whether higher levels of institutional ownership are associated with an increased likelihood that a firm will commit to science-based decarbonization targets. The key independent variables are two alternative measures of lagged institutional ownership: (1) the total value of institutional holdings, and (2) a binary indicator equal to one if the firm's institutional ownership value is above the sample median in the previous year. In Column (1), we use the continuous measure of institutional ownership value and estimate an OLS regression including year and industry fixed effects to control for common shocks across time and sector-specific influences. Column (2) replaces the continuous measure with the above-median indicator. Columns (3) and (4) build on these specifications by incorporating industry-year fixed effects. Column (3) uses the continuous value measure, while Column (4) again applies the binary indicator. All regressions are estimated using OLS, and standard errors are clustered at the firm level. T-statistics are reported in parentheses, and significance is denoted at the 1%, 5%, and 10% levels by ***, **, and *, respectively.

VARIABLES	(1)	(2)	(3)	(4)
	SBTi			
Lagged Institutional Ownership (value)	0.015*** (3.48)		0.008*** (2.97)	
Lagged Institutional Ownership (high_value)		0.022*** (2.66)		0.010* (1.80)
LnSize	0.013** (2.31)	0.016*** (3.08)	0.005** (2.07)	0.007*** (2.85)
Total Debt/Equity	0.000 (1.40)	0.000 (1.39)	0.000 (1.23)	0.000 (1.22)
R&D/Sales	0.002* (1.67)	0.002* (1.67)	0.001 (1.25)	0.001 (1.22)
PPE/Total Assets	-0.017 (-0.51)	-0.018 (-0.53)	-0.011 (-0.67)	-0.012 (-0.71)
OpEx/Total Assets	0.041** (2.18)	0.042** (2.20)	0.023*** (2.93)	0.023*** (2.95)
Net Income/Total Assets	-0.223*** (-3.03)	-0.225*** (-3.06)	-0.116** (-2.45)	-0.117** (-2.47)
Working Capital/Total Assets	-0.084*** (-2.61)	-0.081** (-2.53)	-0.044** (-2.54)	-0.043** (-2.47)
Constant	-0.282*** (-4.24)	-0.221*** (-3.45)	-0.118*** (-3.81)	-0.085*** (-2.81)
Year fixed effects	Y	Y	N	N
Industry fixed effects	Y	Y	N	N
Year * Industry fixed effects	N	N	Y	Y
Observations	5,304	5,304	5,128	5,128
R-squared	0.174	0.173	0.193	0.192

Table 6

Robustness tests.

This table presents robustness checks on the relationship between asset redeployability and the likelihood of committing to science-based targets (SBTi), using instrumental variable approaches. In Columns (1) and (2), we use the firm's lagged redeployability score to instrument for its current redeployability score. In Columns (3) and (4), we use the lagged average redeployability score at the industry-year level to instrument for the firm's current redeployability score. In Columns (1) and (3), we use 10-year lags. In Columns (2) and (4), we use 15-year lags. but uses the 15-year lagged versions of the firm-level and industry-level redeployability scores and their squared terms as instrumental variables. All regressions control for year and industry fixed effects. T-statistics are reported in parentheses, and ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Panel B presents the D'Haultfoeuille, Hoderlein, and Sasaki (2024) test for the exclusion restriction of the instrumental variables.

Panel A. Instrumental variable approaches

VARIABLES	(1)	(2)	(3)	(4)
	Second Stage			
	SBTi			
	Instrument: Lagged firm-year redeployability score		Instrument: Lagged industry-year average redeployability score	
	10-year lag	15-year lag	10-year lag	15-year lag
Redeployability Score (Instrumented)	-0.716*	-0.643*	-0.627***	-0.794***
	(-1.92)	(-1.74)	(-2.96)	(-3.03)
Redeployability Score ² (Instrumented)	0.890**	0.770*	0.884***	1.162***
	(1.97)	(1.90)	(2.71)	(2.66)
LnSize	0.010***	0.010***	0.010***	0.010***
	(4.64)	(3.94)	(4.73)	(4.79)
Total Debt/Equity	0.000	0.000	0.000	0.000
	(0.60)	(0.76)	(0.60)	(0.48)
R&D/Sales	0.001	0.000	0.001**	0.001**
	(1.61)	(0.71)	(2.00)	(2.20)
PPE/Total Assets	-0.035	-0.043	-0.023	-0.023
	(-1.42)	(-1.37)	(-1.22)	(-1.24)
Opex/Total Assets	0.030***	0.028***	0.028***	0.029***
	(3.50)	(2.95)	(3.74)	(3.90)
Net Income/Total Assets	-0.129***	-0.134***	-0.132***	-0.135***
	(-3.21)	(-3.14)	(-3.30)	(-3.33)
Working Capital/Total Assets	-0.048***	-0.049***	-0.050***	-0.050***
	(-2.95)	(-2.67)	(-3.09)	(-3.07)
Constant	0.018	0.018	-0.007	0.015
	(0.24)	(0.22)	(-0.17)	(0.32)
Year fixed effects	Y	Y	Y	Y
Industry fixed effects	Y	Y	Y	Y
Observations	5,213	4,895	5,213	5,213
Donald Wald F statistic	120.407	329.503	445.671	184.907
Stock and Yogo statistic	10% maximal	10% maximal	10% maximal	10% maximal
	IV size: 7.03	IV size: 7.03	IV size: 7.03	IV size: 7.03

Panel B. Exclusion restriction test results

VARIABLES	(1)	(2)	(3)	(4)
	KS statistic	P-value	KS statistic	P-value
10-year Lagged Redeployability Score (firm level)	0.039	0.826		
10-year Lagged Redeployability Score ² (firm level)			0.060	0.539
10-year Lagged Redeployability Score (industry level)	0.129	0.238		
10-year Lagged Redeployability Score ² (industry level)			0.054	0.709
15-year Lagged Redeployability Score (firm level)	0.053	0.626		
15-year Lagged Redeployability Score ² (firm level)			0.153	0.256
15-year Lagged Redeployability Score (industry level)	0.092	0.441		
15-year Lagged Redeployability Score ² (industry level)			0.069	0.690

Appendix A. Variable Definitions

Variable	Definition
<i>Carbon Intensive Industry</i>	An indicator variable equals 1 if the firm operates in a high-carbon industry, as defined by the Top-20 industries by Scope 1 emissions, and 0 otherwise. From Ilhan et al. (2021).
<i>Environmental Controversies</i>	An indicator variable equals 1 if the firm itself or any of its industry peers has any recorded environmental controversy in a given year, and 0 otherwise. Retrieved from Refinitiv Datastream.
<i>High ESG combined score</i>	This variable is a binary indicator of a firm's environmental, social, and governance (ESG) performance. It takes a value of 1 if the firm's ESG combined score is greater than 75%, indicating superior ESG performance, and 0 otherwise. The ESG combined score integrates multiple sub-scores across environmental, social, and governance dimensions, with a higher score reflecting better overall ESG performance. Retrieved from Refinitiv Datastream.
<i>High LnSize</i>	An indicator equals 1 if a firm's <i>LnSize</i> is above the sample median in a given year, and 0 otherwise. Retrieved from Refinitiv Datastream.
<i>High OpEx</i>	An indicator equals 1 if a firm's <i>OpEx/Total Assets</i> is above the sample median in a given year, and 0 otherwise. Retrieved from Refinitiv Datastream.
<i>HTA sector</i>	An indicator variable equals 1 if the firm operates in a high-to-abate (HTA) sector, and 0 otherwise. HTA sectors are defined based on two-digit SIC codes that correspond to industries with significant decarbonization challenges. Specifically, the variable equals one if the firm's primary SIC code falls within the following: 28, 32, 33, 40, 41, 44, 45, 47, or 49. These industries include chemicals, steel, cement, transportation, electric services, natural gas, and waste management. Retrieved from reports from the International Energy Agency and the United Nations Environment Programme.
<i>Increase in IO (share)</i>	The dummy variable indicates that if the company experiences an increase in the <i>Institutional ownership (share)</i> after its SBTi commitment, it is equal to 1, and 0 otherwise. Retrieved from Refinitiv Datastream.
<i>Increase in IO (value)</i>	The dummy variable indicates that if the company experiences an increase in the <i>Institutional ownership (value)</i> after its SBTi commitment, it is equal to 1, and 0 otherwise. Retrieved from Refinitiv Datastream.
<i>Institutional ownership (share)</i>	The percentage of a firm's outstanding shares held by institutional investors, reflecting their proportional equity stake. Higher <i>Institutional ownership (share)</i> indicates stronger corporate governance, stability, and greater market credibility. Retrieved from Refinitiv Datastream.
<i>Institutional ownership (value)</i>	The total monetary value of a firm's equity holdings owned by institutional investors, including mutual funds, pension funds, and investment firms. Higher <i>Institutional ownership (value)</i> indicates a greater financial commitment from institutional investors. Retrieved from Refinitiv

	Datastream.
<i>LnSize</i>	This variable indicates the logarithm of the market capitalization of companies. Higher <i>LnSize</i> indicates a larger firm size. Retrieved from Refinitiv Datastream.
<i>Net Income/Total Assets</i>	This variable indicates the firm's profitability in utilizing its Total Assets to generate Net Income. Higher <i>Net Income/Total Assets</i> represents better asset efficiency and profitability. Retrieved from Refinitiv Datastream.
<i>OpEx/Total Assets</i>	This variable reflects the level of operating expenses incurred relative to the firm's Total Assets, serving as an indicator of cost structure and efficiency. Higher <i>OpEx/Total Assets</i> indicates lower operational efficiency. Retrieved from Refinitiv Datastream.
<i>PPE/Total Assets</i>	This variable captures the proportion of a firm's assets invested in physical capital, indicating dependence on tangible production capacity. Higher <i>PPE/Total Assets</i> indicates that a company is more capital-intensive, meaning a larger portion of its assets is tied up in fixed, long-term assets. Retrieved from Refinitiv Datastream.
<i>R&D/Sales</i>	This variable measures the firm's investment in innovation activities relative to its sales revenue. Higher <i>R&D/Sales</i> indicates that a company is heavily investing in innovation and future growth relative to its current revenue. Retrieved from Refinitiv Datastream.
<i>Redeployability Score</i>	This variable measures the ease with which a firm's assets can be repurposed for alternative uses. A higher <i>Redeployability Score</i> indicates a higher redeployability level. Retrieved from Kim & Kung (2017).
<i>Redeployability Score</i> ²	Squared term of <i>Redeployability Score</i> . Retrieved from Kim & Kung (2017).
<i>Redeployability Score_alternative</i>	This variable measures the ease with which a firm's assets can be repurposed for alternative uses, calculated as the R-squared-weighted average of industry-level redeployability indices across a firm's business segments. Higher <i>Redeployability Score_alternative</i> value indicates higher redeployability level. Retrieved from Kim & Kung (2017).
<i>SBTi</i>	Dummy variable equals 1 if a firm has an emission reduction commitment to the Science-Based Targets initiative (SBTi), and 0 otherwise. Retrieved from the official SBTi website.
<i>Total Debt/Equity</i>	The variable is calculated as total debt divided by total shareholders' equity. Presented in the form of percentages. Higher <i>Total Debt/Equity</i> indicates greater financial leverage, meaning the company is relying more on debt financing relative to equity. Retrieved from Refinitiv Datastream.
<i>Working Capital/Total Assets</i>	This variable represents the firm's liquidity position and operational flexibility, measured by the proportion of Working Capital in Total Assets. Higher <i>Working Capital/Total Assets</i> indicates stronger short-term financial health and liquidity. Retrieved from Refinitiv Datastream.

References

- Almeida, H., & Campello, M. (2007). Financial constraints, asset tangibility, and corporate investment. *Review of Financial Studies*, 20(5), 1429–1460.
- Amel-Zadeh, A., & Serafeim, G. (2018). Why and how investors use ESG information. *Financial Analysts Journal*, 74(3), 87–103.
- Bansal, P., & Clelland, I. (2004). Talking trash: Legitimacy, impression management, and unsystematic risk. *Academy of Management Journal*, 47(1), 93–103.
- Berkman, H., Jona, J., & Soderstrom, N. (2019). Firm value and government commitment to combating climate change. *Pacific-Basin Finance Journal*, 53, 297 – 307.
- Bjørn, A., Tilsted, J.P., Addas, A. et al. Can Science-Based Targets Make the Private Sector Paris-Aligned? A Review of the Emerging Evidence. *Curr Clim Change Rep* 8, 53–69 (2022).
- Bolton, P., & Kacperczyk, M. (2021). Do investors care about carbon risk? *Journal of Financial Economics*, 142(2), 517–549.
- Bolton, P., & Kacperczyk, M. (2025). Firm commitments. *Management Science*. Forthcoming.
- Bolton, P., & Kacperczyk, M. (2023). Global Pricing of Carbon-Transition Risk. *Journal of Finance*, 78(6), 3677-3754.
- Brad, A., Haas, T., & Schneider, E. (2024). Whose negative emissions? Exploring emergent perspectives on CDR from the EU's hard to abate and fossil industries. *Frontiers in Climate*, 5, 1268736.
- CDP. (2024). *Climate Transition Plans 2024*. <https://www.cdp.net/en/research/global-reports/climate-transition-plans>
- Chan, K. J. D., Cheung, B., & Shen, L. Y. (2024). An economic foundation for assessing the credibility of corporate net zero transition pathways. *Business Strategy and the Environment*, 33(8), 8868-8881.
- Chan, K. J. D., and Liao, V. Y. (2025). Sustainability Commitment, Environmental Achievement, and Green Bond Premium. *Journal of Environmental Management*, 392, 126875.
- Chen, J. (2025). Redeploying dirty assets: The impact of environmental liability. *Journal of Financial Economics*, 170, 104070.
- Chen, T., Dong, H., & Lin, C. (2020). Institutional shareholders and corporate social responsibility. *Journal of Financial Economics*, 135(2), 483–504.
- Cragg, J. G., & Donald, S. G. (1993). Testing identifiability and specification in instrumental variable models. *Econometric theory*, 9(2), 222-240.
- D'Haultfœuille, X., Hoderlein, S., & Sasaki, Y. (2024). Testing and relaxing the exclusion restriction in the control function approach. *Journal of Econometrics*, 240(2), 105075.
- Dimson, E., Karakaş, O., & Li, X. (2015). Active ownership. *Review of Financial Studies*, 28(12), 3225–3268.
- Drempetic, S., Klein, C., & Zwergel, B. (2020). The influence of firm size on the ESG score: Corporate sustainability ratings under review. *Journal of business ethics*, 167(2),

333-360.

Dyck, A., Lins, K. V., Roth, L., & Wagner, H. F. (2019). Do institutional investors drive corporate social responsibility? *Journal of Financial Economics*, 131(3), 693–714.

Ermgassen, S. O. S. E., Howard, M., Bennun, L., Addison, P. F. E., Bull, J. W., Loveridge, R., Pollard, E., & Starkey, M. (2022). Are corporate biodiversity commitments consistent with delivering ‘nature-positive’ outcomes? A review of ‘nature-positive’ definitions, company progress and challenges. *Journal of Cleaner Production*, 379(Part 2), 134798.

Haans, R. F. J., Pieters, C., & He, Z. L. (2016). Thinking about U: Theorizing and testing U-shaped relationships. *Strategic Management Journal*, 37(7), 1177–1195.

Hartzmark, S. M., & Sussman, A. B. (2019). Do investors value sustainability? A natural experiment examining ranking and fund flows. *The Journal of Finance*, 74(6), 2789–2837.

International Energy Agency. (2020). *Energy Technology Perspectives 2020*. <https://www.iea.org/reports/energy-technology-perspectives-2020>

International Energy Agency. (2021). *Net Zero by 2050 2021*. <https://www.iea.org/reports/net-zero-by-2050>

Jiang, X., Kim, S. & Lu, S. Limited accountability and awareness of corporate emissions target outcomes. *Nat. Clim. Chang.* 15, 279–286 (2025).

Kim, E. H., & Lyon, T. P. (2015). Greenwash vs. brownwash: Exaggeration and undue modesty in corporate sustainability disclosure. *Organization Science*, 26(3), 705–723.

Kim, H., & Kung, H. (2017). The asset redeployability channel: How uncertainty affects corporate investment. *Review of Financial Studies*, 30(1), 245–280.

Kim, S. (2024). Investor Preferences and Responses to Disclosure: Evidence from Carbon Net-Zero Pledges. Available at SSRN 4846045.

Novy-Marx, R. (2011). Operating leverage. *Review of Finance*, 15(1), 103-134.

Ortiz-Molina, H., & Phillips, G. M. (2014). Real Asset Illiquidity and the Cost of Capital. *The Journal of Financial and Quantitative Analysis*, 49(1), 1–32.

Ruiz Manuel, I., Blok, K. Quantitative evaluation of large corporate climate action initiatives shows mixed progress in their first half-decade. *Nat Commun* 14, 3487 (2023).

SBTi (2021). *Corporate Net-Zero Standard. Science Based Targets Initiative*. Available at sciencebasedtargets.org/resources/files/Net-Zero-Standard.pdf

Starks, L. T., Venkat, P., & Zhu, Q. (2025). Corporate ESG profiles and investor horizons. *Journal of Finance*. Forthcoming.

Stock, J. H., & Yogo, M. (2002). Testing for weak instruments in linear IV regression.

Tolliver, C., Keeley, A. R., & Managi, S. (2020). Policy targets behind green bonds for renewable energy: Do climate commitments matter? *Technological Forecasting and Social Change*, 157, 120051.

Tomoda, Y., & Ouchida, Y. (2023). Endogenous bifurcation into environmental CSR and non-environmental CSR firms by activist shareholders. *Journal of Environmental Economics and Management*, 122, 102883.

Wang, Y., Delgado, M. S., Khanna, N., & Bogan, V. L. (2019). Good news for environmental self-regulation? Finding the right link. *Journal of Environmental Economics and management*, 94, 217-235.