Investor Activism and the Green Transition*

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Abstract

We develop a model of impact activism in which activist investors contribute to a firm's green transition through engagement. Two intertwined free-rider problems imply that activists have limited or negative impact in equilibrium. First, an internal free-rider problem, where insiders and activists free-ride on each others' transition-related efforts, can render activism ineffective or even counter-productive. Second, an external free-rider problem, where activism-driven gains are reflected in the stock price and accrue to passive investors, prevents activists from investing or tilts investments towards firms that can transition without activist engagement. Carbon taxation strengthens these mechanisms. Sustainability preferences help overcome them.

Keywords: Activism, agency conflicts, contracting, sustainable finance, environmental policies

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There is widespread consensus that a green transition in production processes and technologies is necessary to address climate change (Acemoglu, Akcigit, Hanley, and Kerr, 2016; Besley and Persson, 2023). Over the past few years, financial markets have sought to foster this transition by directing companies toward environmental objectives through passive and active investment strategies. Passive strategies involve investing in "clean" firms and divesting from "dirty" firms to influence their cost of capital and incentivize investment in a green transition. In active strategies, investors exercise their control rights to impact firm outcomes, such as through board representation, management oversight, strategy development, or voting on proposals. Recent research suggests that passive strategies, despite their popularity, may have little impact on firm behavior (Heath, Macciocchi, Michaely, and Ringgenberg, 2023; Berk and Van Binsbergen, 2025; Pedersen, 2024) and could even have adverse environmental effects (Hartzmark and Shue, 2023). Investor activism has thus been increasingly advocated as a preferred and more effective approach to sustainable finance (Krueger, Sautner, and Starks, 2020; Broccardo, Hart, and Zingales, 2022).

Our objective in this paper is to understand whether and when investor activism can facilitate a firm's green transition. A defining challenge in this transition—whether in production processes or technology adoption—is overcoming pervasive free-rider problems that hinder effective activist engagement. This paper integrates two influential free-rider problems—the external free-rider problem in dispersed ownership and the internal free-rider problem in effort provision—into a unified framework to assess the potential and limitations of green investor activism.

The external free-rider problem arises because activist investors, who invest time and resources to influence firm behavior, cannot fully capture the benefits of their efforts. These gains are reflected in the stock price, benefiting passive investors who do not contribute and discouraging activists from engaging with firms where their efforts could be most impactful. Meanwhile, the internal free-rider problem emerges from the interaction between activist investors and firm insiders, both of whom must exert effort to drive the green transition. Since efforts are unobservable and subject to moral hazard, each party has an incentive to free-ride on the other's contributions. This double moral hazard results in underinvestment in effort, potentially making activism ineffective or even counterproductive.

By embedding these two free-rider problems in a setting of sustainable finance, our framework captures the dual challenge of incentivizing both activist entry and post-entry engagement in the presence of sustainability preferences and environmental regulation. We show how the external free-rider problem tilts activist investments toward firms that can transition independently, neglecting those with the greatest barriers to change. Simultaneously, the internal free-rider problem reduces the effectiveness of investor activism and, in certain circumstances, drives effort levels and transition rates below what can be achieved without activist engagement. While activism can have a significant positive impact when only one of these free-rider problems is present, their combination reduces activists' influence on the transition—potentially making it negligible or even negative in equilibrium. In particular, the interplay between the internal and external free-rider problems leads activists to adopt de facto "passive" investment strategies, engaging minimally with firms that can transition at low cost on their own. Our analysis further reveals that carbon taxes exacerbate both free-rider problems, compounding the challenges of impact activism.

To capture the key determinants of environmental activism, we develop a model in which a "brown" or polluting firm can invest to transition toward cleaner production technology or processes, which we refer to as a *green transition*.[1] Transitioning to a cleaner technology or processes reduces externalities, such as CO2 emissions, and can also lead to financial gains, through mechanisms like carbon taxes or higher consumer demand. However, the transition is both uncertain and costly, potentially resulting in a negative net present value (NPV). The likelihood of a successful transition depends on the efforts of firm insiders—key personnel and executives who influence firm outcomes. Their efforts may include implementing sustainability policies, investing in green technologies, and motivating employees to adopt sustainable practices. Since efforts are unobservable, costly, and subject to moral hazard, firm owners provide insiders with incentives to exert effort by making their compensation sensitive to the outcome of the transition process.[2]

[1]Green investments can take the form of tangible green projects such as the adoption of new technologies or of less tangible, effort-based strategies such as changes in business practices aimed at reducing CO2 emissions. In their survey, Anderson, Convery, and Di Maria (2010) document that in response to the adoption of the European Union Emissions Trading System (EU ETS) in 2005, 48% of responding firms employed new machinery or equipment while 74% made process or behavioral changes.

[2]Note that since the transition affects cash flows, compensation does not need to be explicitly tied to sustainability goals. It is sufficient to base contracts on cash flows; that is, the insiders' incentives to exert efforts for the transition may arise from both sustainability-linked compensation as well as more standard

While the firm is initially owned by passive investors, an activist may acquire an ownership stake by purchasing shares. The activist and passive investors differ in two dimensions. First, unlike passive investors, the activist exerts private and costly effort which, in addition to insiders effort, contributes to the green transition. The activist's effort captures its engagement with the firm, for instance, by monitoring management, appointing key personnel and board members, developing strategies, or changing business practices. Second, the activist has sustainability preferences and derives non-pecuniary benefits from owning the firm's stock if it transitions successfully.[3] That is, the activist has value-alignment preferences as in, e.g., Pástor, Stambaugh, and Taylor (2021), Pedersen, Fitzgibbons, and Pomorski (2021), Dangl, Halling, Wu, and Zechner (2023), and Landier and Lovo (2024).

We first show that, in first best with observable efforts (i.e., absent the internal free-rider problem), the efforts of the activist and insiders complement each other in the transition process so that activism unambiguously fosters the green transition. This is, however, no longer the case when efforts are unobservable, because activism introduces an internal free-rider problem that distorts incentives, which is not present under passive ownership.

Specifically, since both activists and insiders contribute to a firm's transition, but efforts are unobservable and costly, each has an incentive to underinvest, effectively free-riding on the other's contributions. While contracts can incentivize insiders, the interdependence of efforts makes it difficult to set them efficiently, resulting in suboptimal effort levels (Holmström, 1982). Activists, driven by sustainability preferences, help mitigate this internal free-rider problem. However, when their sustainability preferences are not particularly strong, activism has little impact in firms capable of transitioning independently and can even be detrimental in firms that require joint efforts from activists and insiders. Ultimately, activists only have significant influence in firms that struggle to transition on their own.

Paradoxically, activism fails to emerge in such cases due to the external free-rider problem. Indeed, activists create firm value through costly private effort. But if this value is fully reflected in the price of their equity stake, they cannot capture sufficient returns to justify their investment (Grossman and Hart, 1980). As a result, activists are discouraged from

performance-based compensation. We discuss this issue in greater detail in Section 3.5.

[3] Because only the difference in the passive investors' and activist's sustainability preferences matters in our model, we normalize preferences such that passive investors are purely financial investors.

investing in firms that need their support the most and in which their impact is high. This leads to an endogenous exclusion mechanism, where activists favor firms that can transition at a lower cost, rather than those that would benefit most from their involvement.

Our model highlights the compounding effects of the two free-rider problems. The external free-rider problem restricts activism to firms that are already capable of transitioning on their own, while the internal free-rider problem weakens its impact within these very firms. Due to the external free-rider problem, the activist invests only in firms where the internal free-rider problem results in limited or negative impact. When activist sustainability preferences are weak, this interplay leads to an equilibrium in which activism becomes largely ineffective, resembling passive investing with limited engagement and exclusion of brown firms. While activism can have a significant impact in the presence of just one of these free-rider problems, their combination stifles activism. Overall, our model suggests a weak and ambiguous relation between activist ownership and firms' green transition.

We next use our model to examine the impact of carbon taxes on the effectiveness of activism in the green transition. We show that carbon taxation crowds out investor activism, making them substitutes. Essentially, carbon taxes increase the financial gains of transitioning and, thus, post-entry efforts. While these effects enhance the green transition rate in isolation, they also strengthen the external free-rider problem and disincentivize entry, especially in firms that would benefit from activism. In particular, activists will not invest when carbon taxes exceed a certain threshold, which decreases with their expected contribution to the transition process. In addition, due to the internal free-rider problem, activism reduces the transition rate when carbon taxes are high and passive investors already provide strong incentives to insiders. Thus, carbon taxation exacerbates both free-rider problems. It therefore hinders impact activism both on the extensive margin, by preventing activist investment in firms that would benefit from it, and on the intensive margin, by reducing activists' post-entry impact compared to passive ownership. Furthermore, carbon taxes tilt activists' investments towards greener firms that can transition independently.

In our baseline, activists have value-alignment preferences and care about the absolute level of externalities produced by their investments. We also examine the effects of assuming that activists are consequentialists and care about the impact of their actions on the level of externalities relative to a counterfactual scenario in which they do not invest as in, e.g., Broccardo et al. (2022), Dangl, Halling, Wu, and Zechner (2024), Gupta, Kopytov, and Starmans (2024), and Oehmke and Opp (2024). In contrast with existing studies, the nature of investor preferences (i.e., consequentialist versus value-alignment) has little effect on our key findings, notably those related to the internal free-rider problem and the impact of activism conditional on entry. In addition, as in our baseline model, entry incentives increase with non-pecuniary benefits of transitioning, while they decrease with the financial benefits of transitioning. We show, however, that consequentialist preferences can alter entry incentives with the potential to either enhance or hinder the effectiveness of green activism depending on the interaction between preferences and financial benefits.

We also show the robustness of our findings by (i) endogenizing the size of the activist's stake, (ii) considering that the activist does not incentivize insiders, (iii) letting passive investors design contracts, (iv) allowing activists to capture some of the value created through their engagement, and (v) considering an arbitrarily large number of insiders. First, when activists can choose the size of their stake, they always invest but opt for inefficiently low ownership, especially in firms where they could have impact, which reduces their efforts and hampers the pace of the green transition. Second, when the activist does not contract with insiders, the internal free-rider problem is eliminated as insiders do not contribute to the transition. However, not incentivizing insiders exacerbates the external free-rider problem, preventing activist entry unless sustainability preferences are so strong that non-pecuniary benefits of transitioning exceed pecuniary benefits. Third, when passive investors design contracts, the internal and external free-rider problems intensify, making it less likely for activism to foster the transition. Fourth, giving activists a greater share of the value at entry mitigates the external free-rider problem but does not influence the internal free-rider problem and the effects of activism on the green transition rate conditional on entry. Fifth, when multiple insiders (as opposed to a single one) can contribute to the transition, the internal and external free-rider problems worsen, hampering the impact of activism.

There is a vast literature on shareholder activism, that is reviewed in Edmans and Holderness (2017). In related papers by Admati, Pfleiderer, and Zechner (1994), DeMarzo and Urošević (2006), and Back, Collin-Dufresne, Fos, Li, and Ljungqvist (2018), activists affect firm performance through their own effort, but entry is taken as exogenous and there is no internal free-rider problem (i.e. firm performance is purely exogenous absent activism). Instead, Grossman and Hart (1980), Shleifer and Vishny (1986), and Bolton and von Thadden (1998) focus on the "external" free-rider problem of dispersed shareholders associated with activist entry. Our main contribution with respect to this literature is to develop a model with endogenous entry and engagement and optimal contracting with insiders, highlighting the novel internal free-rider problem that arises when both insiders and activists help foster change. We combine the two free-rider problems in a parsimonious model, shed light on their interactions, and show how they may jointly hinder the impact of activism.

Our paper relates to the rapidly growing literature on sustainable finance (see, e.g., Heinkel, Kraus, and Zechner (2001), Albuquerque, Kroskinen, and Zhang (2019), Green and Roth (2024), Gollier and Pouget (2022), Jagannathan, Kim, McDonald, and Xia (2023), Broccardo et al. (2022), Allen, Barbalau, and Zeni (2025), Edmans, Levit, and Schneemeier (2023), Huang and Kopytov (2024), Dangl et al. (2023), Gupta et al. (2024), Landier and Lovo (2024), Oehmke and Opp (2024)). Models in this literature differ in how they incorporate sustainability preferences. Some assume that investors derive non-pecuniary benefits from holding shares in firms that align with their sustainability values, while others assume that investors only care about the consequences of *their* decisions on firms' negative externalities. Empirical studies in this literature generally show that socially conscious investors are driven more by the alignment of investment with their ethical values than by the perceived impact of their actions (see, e.g., Riedl and Smeets (2017), Cole, Jeng, Lerner, Rigol, and Roth (2023), Heeb, Kölbel, Paetzold, and Zeisberger (2023), and Bonnefon, Landier, Sastry, and Thesmar (2025)). Our modeling approach accords with these findings and features non-pecuniary payoffs that accrue to activist investors depending on the firm's externalities.

To the best of our knowledge, our paper is the first that explicitly models the role of activist investors in the green transition. As a result, it differs from existing frameworks in several key dimensions. First, both the activist and insiders contribute to the green transition by providing effort, generating an internal free-rider problem not present in existing papers. Second, the activist influences firm performance through the cash flow channel rather than the discount rate channel commonly emphasized in the literature. Third, an external free-rider problem hampers activist entry and endogenously leads activists to favor investments in firms than can more easily transition, effectively generating green tilts and exclusion of brown firms. Fourth and most importantly, we show how the combination of an internal and external free-rider problem hampers impact activism and leads activists to adopt a passive investment strategy with limited engagement and exclusion of brown firms.

Our analysis is motivated by the growing empirical literature on shareholder engagement and the green transition (Dimson, Karakaş, and Li, 2015; Kölbel, Heeb, Paetzold, and Busch, 2020; Cole et al., 2023; Wiedemann, 2023). According to a recent survey by Krueger et al. (2020), institutional investors consider engagement rather than divestment as a more effective approach to address climate risks. Akey and Appel (2020), Naaraayanan, Sachdeva, and Sharma (2023), Azar, Duro, Kadach, and Ormazabal (2021), and Bellon (2024) show that engagement by hedge funds, pension funds, large asset managers, and private equity funds cause firms to reduce their emissions. van der Kroft, Palacios, Rigobon, and Zheng (2024), Diaz-Rainey, Griffin, Lont, Mateo-Márquez, and Zamora-Ramírez (2023), and Li, Berentsen, Otneim, and Juranek (2024) find no significant effect of investor engagement on firms' carbon footprint. Taken together, the empirical evidence on the impact of investor activism on the green transition is mixed, in line with our findings.

1 A Model of Investor Activism and Green Transition

We present a model in which an activist can invest in a firm to change its production technology or processes into more sustainable ones, a process we refer to as a *green transition*. In this model, the activist investor can support this transition by putting in private effort and designing contracts that incentivize insiders to contribute their own efforts. The activist may represent a hedge fund, a pension fund, a private equity fund, or other types of active investors, such as wealthy individuals or philanthropists. Insiders represent the firm's key personnel and executives who are able to influence firm outcomes. Their transition efforts are interpreted broadly and may include implementing company-wide sustainability policies and business practices, investing in green technology, or motivating employees. The activist's private effort captures its engagement with the firm, for instance, by appointing key personnel and board members, developing strategies, providing industry connections, implementing business practices, or voting on proposals.

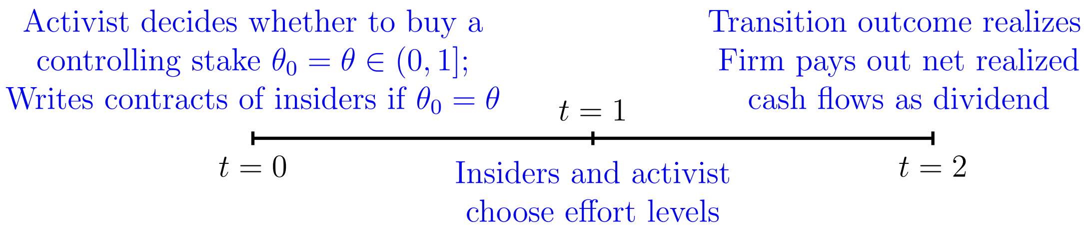

Figure 1: **Timeline of the model.**

Timing and Transition Process. We consider an economy with three dates, $t = 0, 1, 2$, and no discounting. There are three types of risk-neutral agents: an activist investor, a continuum of passive investors, and insider(s). The baseline model considers for simplicity a single agent representing insiders. Section 4.7 extends the model to allow for an arbitrary number of insiders who contribute to the transition. We consider a single firm that is all equity-financed with a number of shares normalized to one. The firm is initially fully owned by competitive and dispersed passive investors. The activist decides at $t = 0$ whether to buy a controlling stake $\theta_0 = \theta \in (0, 1]$; if the activist does not enter, then $\theta_0 = 0$.

The firm is initially "brown" or polluting, but it can reduce its environmental damage (e.g., carbon emissions) by transitioning to a clean production technology or clean processes. The outcome of this green transition is captured by a state $\omega \in \{G, B\}$ that is realized and publicly observed at $t = 2$.[4] The probability of a green transition depends on both the activist's effort a, provided the activist has invested in the firm and $\theta_0 = \theta$, and the efforts of insiders i, both of which are chosen at $t = 1$. With probability $a + i$, state $\omega = G$ realizes and the firm becomes clean. With probability $1 - a - i$, state $\omega = B$ realizes and the firm remains dirty. To ensure that the probability of transitioning is well-defined, we impose that a and i are bounded from above by $\overline{a}$ and $\overline{i}$ respectively and that parameters are such that optimal efforts are interior, in that $a \in (0, \overline{a})$ and $i \in (0, \overline{i})$. In our baseline specification, efforts affect the transition probability symmetrically and independently. Section 4.3 shows that our key findings remain qualitatively similar when efforts are complements.

[4]This model is similar to an infinite horizon model in which the timing of the transition would endogenously depend on the efforts of management and the activist. For instance, one could model the transition process as a jump process whereby the successful completion of the transition process depends on the efforts of the manager and the insiders, similar to the modeling in Gryglewicz, Mayer, and Morellec (2021).

The firm produces cash flows $X_\omega > 0$ at $t = 2$. A carbon tax is in place, which requires the firm to pay $T \geq 0$ dollars if $\omega = B$. More broadly, T may represent a pecuniary penalty or cost for causing environmental damage. That is, the firm's post-tax cash flows are X_G in state G and $X_B - T$ in state B, where the difference $X_G - X_B$ in pre-tax cash flows across states captures any gross financial payoff associated with a green transition. Such payoff may arise from a variety of sources, including consumer preferences for green products (see, e.g., Meier, Servaes, Wei, and Xiao (2023)) or the level of legal liability that a company faces if it undertakes polluting projects (see, e.g., Bellon (2024)). We define $\Delta := X_G - X_B + T$ as the gross financial gain from transition, including the carbon tax. We assume that $\Delta \geq 0$.

When $\Delta = 0$, the green transition has negative net present value, due to the costly effort required in the transition process. Under these circumstances, the transition cannot be achieved under passive ownership since passive investors, unlike activists, only care about financial payoffs, as specified later. Then, activism is necessary for a green transition. We abstract from the case $\Delta < 0$, i.e., the green transition has both a negative financial benefit and a financial cost as this case is analogous to the case $\Delta = 0$. When $\Delta \leq 0$ and the activist's sustainability preferences are sufficiently strong, the activist always enters and exerts positive effort, boosting the green transition rate relative to passive ownership.[5]

Preferences. In our baseline analysis, the activist derives a non-pecuniary benefit $\theta_0 \pi \geq 0$ from owning the firm's stock if the transition is successful, as in e.g. Pástor, Stambaugh, and Taylor (2022) and Landier and Lovo (2024). This benefit scales with the activist's stake in the firm $\theta_0 \in \{0, \theta\}$, reflecting so-called values-aligned or narrow sustainability preferences. Intuitively, the activist internalizes part of the positive externality of transitioning, giving rise to a non-pecuniary benefit. As a consequence, the activist may push for a green transition, even when $\Delta = 0$ and the transition has a negative financial payoff due to the cost of effort. Riedl and Smeets (2017), Bonnefon et al. (2025), and Heeb et al. (2023) provide empirical evidence on such preferences. Section 4.2 assumes instead that activists account for the level

[5] We view this case as both less interesting and less practically relevant. Our assumption that $\Delta \geq 0$ is consistent with the findings in the study by Derrien, Landier, Krueger, and Yao (2024), which documents significant downward revisions of earnings forecasts following the occurrence of negative ESG incidents. These downward revisions are due to negative revisions of future sales, suggesting that analysts expect consumers to react negatively to deteriorating ESG performance. They also find that analysts who downward adjust forecasts decrease forecast error compared to those who do not. Relatedly, Meier et al. (2023) use granular barcode-level sales data from retail stores to show that E&S ratings positively relate to local sales.

of externalities relative to a counterfactual scenario in which they do not invest, and shows that incorporating such consequentialist preferences has no bearing on our key findings.

Our objective is to determine if and when an activist with sustainability preferences can foster a green transition. For our analysis, only the difference between active and passive investors' preferences matters, so we do not explicitly model any sustainability preferences for passive investors. However, this is a normalization. We could equally assume that passive investors derive a non-pecuniary benefit $\pi^P \geq 0$ (per unit of stock) from owning the firm's stock after the green transition, like active investors. This model variant is then isomorphic to the baseline with purely financial passive investors and yields the same results upon replacing π by $\pi' = \pi - \pi^P$ and replacing Δ by $\Delta' + \pi^P$. That is, endowing passive investors with sustainability preferences is akin to raising Δ and lowering π by the same amount.

Moral Hazard and Optimal Contracting. The activist (insiders) chooses effort $a \geq 0$ (effort $i \geq 0$) against quadratic costs $\frac{\phi_a a^2}{2}$ $(\frac{\phi_i i^2}{2})$, where $\phi_a, \phi_i > 0$ are positive constants. Efforts at time $t = 1$ are unobservable and non-contractible, leading to an agency problem. To deal with this agency problem, the controlling shareholder—the activist (if $\theta_0 = \theta$) or the passive investor (if $\theta_0 = 0$)—can write at $t = 1$ (before efforts are chosen), a contract (C, R) to incentivize insiders. This contract stipulates a payment C to insiders in state B and a payment $C + R$ in state G. These payments are made out of the firm's cash flows, leading to net cash flows $X_G - C - R$ in state G and $X_B - C - T$ in state B. Given the contract and anticipating activist effort $\hat{a}$ (with $a = 0$ if the activist has not invested and $\theta_0 = 0$), insiders maximize

$$\max_{i \in [0, \bar{i}]} \left(C + (\hat{a} + i)R - \frac{\phi_i i^2}{2} \right), \tag{1}$$

leading to the incentive constraint

$$i = \frac{R}{\phi_i}. \tag{2}$$

assuming that effort is interior. We denote by $W \geq 0$ the outside option of insiders. Under the optimal contract, the participation constraint of insiders binds and

$$W = C + (\hat{a} + i)R - \frac{\phi_i i^2}{2}. \tag{3}$$

Two points are worth mentioning. First, because the transition affects cash flows, compensation does not need to be explicitly tied to sustainability goals. It is sufficient to base contracts on cash flows; that is, insiders' incentives to exert efforts for the transition may arise from both sustainability-linked as well as standard performance-based compensation; see Section 3.5. Second, the activist does not need to contract with insiders. But incentivizing insiders is optimal for the activist and helps with impact; see Section 4.5.

Payoffs. Conditional on entry, the activist's expected payoff equals

$$V = \max_{a\geq 0,(C,R)} \left\{ \big(1-(a+i)\big)\theta(X_B - C - T) + (a+i)\theta\big(X_G - C - R + \pi\big) - \frac{\phi_a a^2}{2} \right\}, \quad (4)$$

subject to (2) and (3). The activist and passive investors differ in two dimensions. First, the activist exerts private effort to foster change, while passive investors do not. Second, the activist has sustainability preferences and realizes a utility $\theta_0 \pi \geq 0$ in state G. One can view passive investors as an activist with $\phi_a \to \infty$ (prohibitively costly effort) and $\pi = 0$.

The firm's stock price at time $t = 1$, that is, passive investors' valuation for the firm, depends on whether the activist enters and $\theta_0 = \theta$ (i.e., active ownership) or not and $\theta_0 = 0$ (i.e., passive investor ownership). Under activist ownership, the fair time-1 stock price from passive investors' perspective, anticipating the efforts of the activist and insiders (a, i), equals

$$P = \big(1-(a+i)\big)\big(X_B - C - T\big) + (a+i)\big(X_G - C - R\big). \quad (5)$$

If the activist does not enter and $\theta_0 = 0$, then $a = 0$ and passive investors are in control of the firm and choose the manager's contract (C, R) to maximize firm value, i.e.,

$$P_0 = \max_{(C,R)} \left\{ \big(1-i\big)(X_B - C - T) + i(X_G - C - R) \right\}, \quad (6)$$

subject to (2) and (3). P_0 is also the firm's stock price under passive investor ownership.

Activist Entry and the Free-Rider Problem. The activist improves firm value through private and costly effort. However, if this value creation is fully reflected in the price at which it acquires a stake in the firm, the activist cannot capture the gains from activism. That is, activist entry is subject to an external free-rider problem that reduces the incentives to invest (Grossman and Hart, 1980). The baseline model considers this external free-rider problem in its purest version by assuming that the activist cannot hide its trade in a public firm or has no bargaining power in a private firm. Section 4.4 relaxes this assumption.

In the baseline model, the activist's endogenous stake in the firm θ_0 can only take two values, 0 or θ, where $\theta \in (0, 1)$ is an exogenous parameter (Section 4.1 relaxes this assumption). Since there is no discounting, the activist acquires its stake at time $t = 0$ at the fair stock price P, reflecting the gains from activism. As a result, the activist enters and $\theta_0 = \theta$ if and only if

$$V - \theta P = (a + i)\theta\pi - \frac{\phi_a a^2}{2} \geq 0, \tag{7}$$

where we normalize the value of the activist's outside option to zero. Under optimal efforts (a, i), the payoff from entering equals simply the activist's expected non-pecuniary payoff from transitioning minus its cost of effort. Note that activism can reduce passive investors' valuation of the firm, i.e. we can have $P < P_0$. Importantly, our findings remain the same if the activist must acquire its stake at price $\max\{P, P_0\}$.[6]

2 Solution

2.1 First-Best and Passive Ownership Benchmarks

We start by studying two benchmarks, i.e., passive ownership and first-best active ownership, and characterize efforts a and i and the rate of green transition, $a + i$, in both benchmarks.

First, consider first-best active ownership. That is, suppose that the activist owns fraction θ of the firm's equity, but there is no moral hazard, in that the activist's and manager's efforts are observable and contractible. Then, efforts are chosen to maximize the total surplus generated from the green transition from the activist's perspective, so that

$$(a^{FB}, i^{FB}) = \arg\max_{(a,i)} \left\{ \theta(\Delta + \pi)(a + i) - \frac{\phi_a a^2 + \theta \phi_i i^2}{2} \right\}, \tag{8}$$

where $\Delta + \pi$ is the activist's payoff per unit of ownership in case of a successful transition.

Second, suppose that the activist does not enter. Then, the firm is owned by passive

[6] To see this, note that one can calculate $V - \theta P_0 \geq 0$; this follows for instance from Proposition 10 upon setting $\eta = 0$ in this Proposition. Thus, $V - \theta P \geq 0$ and $V - \theta \max\{P, P_0\} \geq 0$ are equivalent. When $P > P_0$, the equivalence is immediate as $\max\{P, P_0\} = P$. When $P \leq P_0$, we have that $V - \theta P \geq V - \theta P_0 \geq 0$.

investors, there is no activist effort and insiders' effort solves $i^P = \arg\max_i \left\{\Delta i - \frac{\phi_i i^2}{2}\right\}$.

Proposition 1 characterizes efforts and, thus, the rate of transition in both benchmarks.

Proposition 1 (Benchmarks)**.** *Under first-best active ownership, efforts of the activist and insiders are given by*

$$a^{FB} = \frac{\theta(\Delta + \pi)}{\phi_a} \quad \text{and} \quad i^{FB} = \frac{\Delta + \pi}{\phi_i}.$$

Insiders' effort under passive ownership satisfies

$$i = i^P = \frac{\Delta}{\phi_i} < a^{FB} + i^{FB}.$$

Proposition 1 shows that first-best efforts a^{FB} and i^{FB} increase with non-pecuniary benefits of transitioning π and decrease with effort cost. The activist's effort also increases with its ownership stake θ, reflecting that, even absent moral hazard, the activist only internalizes part of the benefits of the transition yet incurs the full cost. The rate of transition in first best, i.e., $a^{FB} + i^{FB}$, exceeds the transition rate that prevails under passive ownership, $i^P = \frac{\Delta}{\phi_i}$. Absent moral hazard, the efforts of the activist and insiders complement each other in the transition process so that activism unambiguously fosters the green transition.

Interestingly, the effort of insiders under passive ownership equals i^P irrespective of whether there is moral hazard. The reason is that since insiders are risk-neutral and there are no further frictions, optimal contracting can fully resolve the moral hazard problem under passive ownership. As will become clear later, this changes under active ownership. When there are no financial benefits of transitioning, in that $\Delta = 0$, we have $i^P = 0$ and the transition cannot be achieved without the activist.

2.2 The Internal Free-Rider Problem and Effort Choices

Suppose that the activist has invested in the firm, in that $\theta_0 = \theta$. When choosing its own effort a, the activist takes the contract (C, R) and thus the effort of insiders i as given. The first-order condition with respect to a in the activist's objective (4) yields

$$a = \frac{\theta(\Delta + \pi - R)}{\phi_a}, \tag{9}$$

where $\Delta+\pi$ is the payoff per unit of ownership that the activist realizes in case of a successful transition. This payoff consists of a pecuniary component Δ and a non-pecuniary component π, both of which increase engagement. According to the activist's incentive condition (9), the effort of the activist and insiders incentives arise as (endogenous) substitutes. Higher effort incentives provided to insiders through larger payment R reduces the activist's payoff upon transformation, thus curbing the activist's effort a.

Having characterized the activist's effort a, we can now derive the contract (C, R) that maximizes the activist's payoff V in (4) subject to (2), (3), and (9). Using (3), we obtain $C = W - (a+i)R + \frac{\phi_i i^2}{2}$. Inserting C in (4), we can characterize the choice of the contract as follows

$$\max_{R} \left\{ -\left(\frac{\phi_a a^2 + \phi_i i^2}{2} \right) + \theta(a+i)(\Delta + \pi - R) \right\},$$

subject to (2) and (9). This yields the following result:

Proposition 2 (Investor activism and the green transition rate)**.** *Define the insiders' relative skills in fostering the transition as*

$$\xi := \frac{\phi_a}{\theta \phi_i}.$$

Optimal efforts with activist entry satisfy:

$$a = \frac{\Delta + \pi}{\phi_i} \left(\frac{1}{\xi(1+\xi)} \right) \quad \text{and} \quad i = \frac{\Delta + \pi}{\phi_i} \left(\frac{\xi}{1+\xi} \right), \tag{10}$$

with $a < a^{FB}$ and $i < i^{FB}$ for $\xi \in (0, \infty)$.

Proposition 2 shows that we can characterize an activist's impact on the green transition in terms of the relative costs of effort $\xi = \frac{\phi_a}{\theta \phi_i}$, capturing the relative ability of insiders to speed up the transition via their own effort. Keeping ϕ_a constant, we have $\xi \to 0$ when $\phi_i \to +\infty$ and the firm cannot transition without the activist. On the other hand, the activist plays no role in the transition process when $\xi \to \infty$, e.g., when $\theta \to 0$ or $\phi_a \to \infty$ (with ϕ_i such that $a + i < 1$ is ensured).[7] While the activist and insiders efforts complement each other in first best, they endogenously arise as substitutes with moral hazard, because

[7] In what follows, we analyze how Δ, π, and ξ shape activist engagement. In this analysis, one can always pick ϕ_i sufficiently large (holding all else equal) to ensure the restriction $a + i < 1$. That is, efforts scale linearly with $\frac{1}{\phi_i}$ and picking large ϕ_i comes at no loss, as we are primarily interested in relative changes.

efforts are unobservable and each party free-rides on the other's efforts. Increasing i requires a higher compensation R, thus lowering a, and vice versa. Consequently, the optimal contract incentivizes insiders' effort below the first-best level, in that $i < i^{FB}$. Put differently, due to double moral hazard, the activist's and insiders' effort incentives are interconnected, so they generally cannot be set efficiently and fall below their first-best levels. This internal free-rider problem ultimately reduces the transition rate, with the extent of this distortion depending on the relative significance of activist and insider effort in the transition process.

2.3 Activist Entry and the External Free-Rider Problem

Using the closed-form expressions for the activist's value function and the firm's stock price (Appendix A.2), we can also characterize the activist's entry decision in terms of the relative skill ratio ξ and the ratio of non-pecuniary and financial benefits $\frac{\pi}{\Delta}$. As discussed above activist entry is subject to an external free rider problem. In its extreme form, the external free-rider problem prevents activism from driving a green transition unless the activist derives non-pecuniary benefits from transitioning.

Proposition 3 (Activist entry)**.** *The activist enters if and only if the ratio of non-pecuniary and financial benefits to transitioning satisfies*

$$\frac{\pi}{\Delta} \geq \frac{1}{1 + 2\xi(1 + \xi + \xi^2)}, \tag{11}$$

where, with a slight abuse of notation, $\frac{\pi}{\Delta} := +\infty$ *if* $\Delta = 0$*. Under first-best active ownership, the activist enters if and only if*

$$\frac{\pi}{\Delta} \geq \frac{1}{1 + 2\xi}. \tag{12}$$

Condition (11) states that when the acquisition price of equity fully reflects the effects of activism, the activist enters if and only if the non-pecuniary benefits to transitioning π are large relative to the financial payoff of transitioning Δ. When $\Delta > 0$, an activist does not invest to facilitate the green transition in the absence of sustainability preferences. Such preferences make the activist internalize negative production externalities of the firm. Thus, engaging with the firm and speeding up the transition generates positive non-pecuniary utility to the activist and may motivate entry, even in the absence of financial gains.

Entry condition (12) in Proposition 3 is more restrictive than entry condition (11), i.e. the internal free-rider problem loosens the entry constraint. As a result, activists are more likely to invest in firms when the internal free-rider problem is present.

Lastly, Proposition 3 shows that the absence of a financial gain associated with transition, i.e., $\Delta = 0$, is a sufficient condition for entry as there is no external free-rider problem in this case. In fact, since transition requires costly effort, investment in the green transition has a negative NPV for passive owners. When the activist enters the firm, it pushes for green transition via its own effort and by allocating cash flows to implement firm-level efforts. As such, activist entry reduces the stock price. The following corollary generalizes this insight.

Corollary 1. *The activist always enters when activism reduces the stock price relative to passive ownership, in that $P \leq P_0$. This happens if and only if $\frac{\pi}{\Delta} \geq \frac{\xi^2+\xi+1+\sqrt{(\xi+1)^2(2\xi^2+1)}}{\xi^3}$.*

3 Can Investor Activism Foster the Green Transition?

This section characterizes the impact of activism in equilibrium. The analysis highlights that two parameters summarize the equilibrium and serve as sufficient statistics for quantifying the impact of activism on the green transition: (i) insiders' skills relative to the activist, given by $\xi = \frac{\phi_a}{\theta\phi_i}$, and (ii) the ratio of non-pecuniary to pecuniary benefits of transitioning, $\frac{\pi}{\Delta}$. The subsequent analysis examines how these quantities shape activist impact in equilibrium.

Before proceeding, note that $\frac{\pi}{\Delta}$ shapes the activist's objective. When $\frac{\pi}{\Delta}$ is large, the activist effectively maximizes the transition rate, disregarding financial considerations. Conversely, when $\frac{\pi}{\Delta}$ is small, the activist's objective is essentially financial. For intermediate values of this ratio, the activist cares both about the transition rate and the financial returns from investing. While it is not surprising that a larger $\frac{\pi}{\Delta}$ leads to greater activist impact, we show that both internal and external free-rider problems mitigate this impact at intermediate or low levels of $\frac{\pi}{\Delta}$.

3.1 Internal Free-Rider Problem and Impact: Intensive Margin

We start our analysis by characterizing the effects of activism on the rate of green transition, defined as the sum of efforts, i.e., $\lambda(\theta_0) = a+i$. The rate of green transition is a function of the activist's stake $\theta_0 \in \{0, \theta\}$. The intensive margin effect of activism on the green transition—relative to passive ownership—is characterized by the ratio of the transition rates with and without activism. Using Propositions 1 and 2, we can derive this ratio as:

$$\frac{\text{Green transition rate with activism}}{\text{Green transition rate without activism}} = \frac{\lambda(\theta)}{\lambda(0)} = \frac{a+i}{i^P} = \frac{1+\xi^2}{\xi+\xi^2}\left(1+\frac{\pi}{\Delta}\right). \tag{13}$$

When $\frac{\lambda(\theta)}{\lambda(0)} > 1$, i.e., $\lambda(\theta) > \lambda(0)$, activism fosters the green transition. When $\frac{\lambda(\theta)}{\lambda(0)} < 1$, i.e., $\lambda(\theta) < \lambda(0)$, activism hinders the green transition.

Equation (13) demonstrates that the intensive margin effect of activism in the green transition is fully characterized by (i) the relative skills of insiders ξ and (ii) the ratio of non-pecuniary to pecuniary benefits of transitioning $\frac{\pi}{\Delta}$. Activism can increase the green transition rate as non-pecuniary benefits of transitioning induce higher managerial and activist efforts. On the other hand, the first factor on the right hand side of (13) suggests that activism can reduce the transition rate, notably when insiders have high skills (and ξ is above one), due to the internal free-rider problem. The following proposition formalizes this intuition.

Proposition 4 (Intensive margin of activism)**.** *Activism hampers the transition and leads to a lower transition rate than passive ownership, in that* $\frac{\lambda(\theta)}{\lambda(0)} < 1$*, whenever* $\xi \in (\xi_-, \xi_+)$*, where*

$$\xi_\pm = \frac{\frac{1}{2} \pm \sqrt{\frac{1}{4} - \frac{\pi}{\Delta}\left(1+\frac{\pi}{\Delta}\right)}}{\frac{\pi}{\Delta}}, \tag{14}$$

with $\xi_+ > \xi_- \geq 1$*. Activism fosters the transition, i.e.* $\frac{\lambda(\theta)}{\lambda(0)} > 1$*, for* $\xi \notin [\xi_-, \xi_+]$*. In addition:*

1. *In the limit* $\frac{\pi}{\Delta} \to 0$*, we have* $\xi_- \to 1$ *and* $\xi_+ \to \infty$*.*[8] *When* $\frac{\pi}{\Delta}$ *is sufficiently large, activism always fosters the transition and* $\lambda(\theta) > \lambda(0)$ *for any* ξ*.*

2. *The function* $\frac{\lambda(\theta)}{\lambda(0)}$ *is U-shaped with* $\lim_{\xi\to 0}\frac{\lambda(\theta)}{\lambda(0)} = +\infty$ *and* $\lim_{\xi\to\infty}\frac{\lambda(\theta)}{\lambda(0)} = 1+\frac{\pi}{\Delta}$*. For* $\xi \geq \xi_+$*, we have* $\frac{\lambda(\theta)}{\lambda(0)} \in (1, 1+\frac{\pi}{\Delta})$*.*

Proposition 4 shows that while activism fosters the green transition under first best, this is not always the case under moral hazard. In particular, activism can reduce the transition

[8] This limit can be taken by letting $\pi \to 0$ or $\Delta \to \infty$. While the limit $\Delta \to \infty$ in (14) is mathematically well-defined, this limit would make the expressions for efforts in (10) exceed one. However, since (14) does not depend on ϕ_i, one could always take the double limit $(\Delta, \phi_i) \to (+\infty, +\infty)$ in an appropriate manner to ensure that $a + m \in (0, 1)$ is satisfied in the limit.

rate when both activist and insider efforts are critical for success, as each party has an incentive to free-ride on the other's effort. This internal free-rider problem is most severe when ξ takes intermediate values $\xi \in (\xi_-, \xi_+)$, that is when both the activist and insider contributions are essential, but neither party has a dominant role.

When ϕ_a and ξ are large or, alternatively, ϕ_i is low, the activist's effort is unimportant relative to that of insiders. In the limit $\phi_a \to \infty$, i.e., $\xi \to \infty$, the activist exerts no effort, and the internal free-rider problem vanishes. Optimal contracting is able to fully resolve the moral hazard problem, and efforts coincide with their first-best levels. Likewise, when ξ is low, the effort of insiders is unimportant relative to the activist's effort; in the limit $\xi \to 0$, (a, i) converge to first-best levels.

In sum, for intermediate levels of $\xi \in (\xi_-, \xi_+)$, the internal free-rider problem is severe, and activism reduces the transition rate, i.e., $\lambda(\theta) < \lambda(0)$, giving rise to "bad activism." When ξ is sufficiently low or high, activism increases the transition rate relative to passive investors owning the firm, i.e., $\lambda(\theta) > \lambda(0)$, giving rise to "good activism."

The magnitude of good activism is asymmetric. It is highly impactful for low ξ, with $\frac{\lambda(\theta)}{\lambda(0)} \to \infty$ as ξ goes to zero. However, it is of limited impact for high ξ, with $\frac{\lambda(\theta)}{\lambda(0)}$ capped by $1 + \frac{\pi}{\Delta}$ for large ξ. This implies that when $\frac{\pi}{\Delta}$ is small, the activist's impact on the transition rate is minimal for high ξ. Taken together, when the activist's sustainable preferences π are small relative to Δ, then the impact of activism can be characterized by three regions: high impact activism for low ξ, bad activism for intermediate ξ, and positive but low impact activism for high levels of ξ.

3.2 External Free-Rider Problem and Impact: Extensive Margin

So far our analysis has focused on the intensive margin of activism, examining activist impact conditional on entry. Using the entry condition, we can establish the following result regarding activist entry, i.e., the extensive margin of activism.

Proposition 5 (Extensive margin of activism)**.** *An activist's incentives to enter increase as the relative skills of insiders in fostering the green transition improve, i.e., as ξ increases. Provided that $\pi > 0$ and $\Delta \geq 0$, there exists unique ξ_E such that the activist enters if and only if $\xi \geq \xi_E$.*

Proposition 5 shows that an activist's incentives to enter increase as the relative skills of insiders improve. The reason is that, holding everything else equal, higher ξ reduces the activist's effort and impact, thereby mitigating the external free-rider problem. Hence, activists are more likely to invest in firms with high ξ (insider skills), but, conditional on investment, exert relatively low effort a which decreases in ξ (as shown in Proposition 2).

Building on these results, we now examine the activist's firm selection when firms differ in their ability to transition. Suppose an activist with effort cost ϕ_a can invest in a single firm, choosing among firms with different levels of ϕ_i within some range $[\underline{\phi}_i, \overline{\phi}_i]$, where $a + i < 1$. The following corollary shows that, due to the external free-rider problem, the activist's payoff from investing, $V - \theta P$, decreases with ϕ_i. Thus, the activist's payoff is maximized for the lowest possible value of ϕ_i. Consequently, the activist chooses the firm with the lowest ϕ_i and tilts its investments toward firms that can easily transition on their own without activism. This result holds irrespective of the strength of sustainability preferences, highlighting the external free-rider problem's bite in hampering impact activism.

Corollary 2 (Green tilts)**.** *The activist's payoff from entering a firm $V - \theta P$ in (7) decreases in the firm's cost of transitioning ϕ_i.*

3.3 Combining Internal and External Free-Rider Problems: Green Tilts, Brown Exclusion, and "Passive" Activists

The external free-rider problem discourages activists from investing in firms that need their intervention most—those with high transition costs ϕ_i and low insider skills ξ (see Proposition 5). Instead, activists tilt their investments toward firms that can transition independently at low cost. Crucially, this selection also reduces activist engagement: due to the internal free-rider problem, activists exert limited effort in these firms, leading to limited or even negative impact (see Proposition 4).

This tension highlights the interplay between external and internal free-rider problems in shaping activist behavior. The external free-rider problem dictates where activists invest, leading to an *endogenous exclusion mechanism* or a *green tilt*—a tendency to target firms already positioned for transition. The internal free-rider problem, in turn, reduces the effectiveness of activist engagement in these firms, making activism resemble passive investing

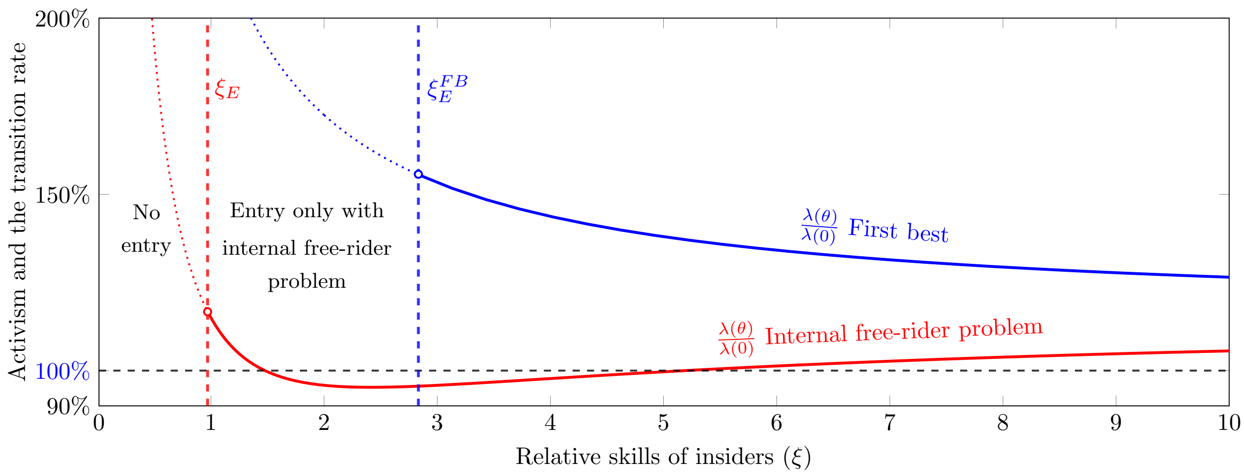

Figure 2: **Combining free-rider problems**: The figure plots the ratio of transition rates with and without activism under first best with observable efforts (solid blue line) and under moral hazard (solid red line). The first best entry threshold ξ_E^{FB} and the entry threshold under moral hazard ξ_E are also plotted as the vertical dashed blue and red lines. The figure assumes a ratio of non-pecuniary to pecuniary benefits of $\frac{\pi}{\Delta} = 0.15$.

with limited engagement. As a result, activism in equilibrium often has minimal or even negative impact unless sustainability preferences are strong enough to overcome both frictions. While activism can be effective when only one free-rider problem is present, their combination undermines activist engagement and the transition process.

To illustrate these findings, Figure A.2 plots the relative impact of activism on the transition rate—as captured by $\frac{\lambda(\theta)}{\lambda(0)}$—under different cases. The solid blue line represents the case without the internal free-rider problem (i.e. in first-best with observable efforts), where activism consistently improves the transition rate. However, the external free-rider problem prevents activist entry when $\xi < \xi_E^{FB}$, meaning activists fail to enter precisely when they could have the greatest impact.

The solid red line shows activist impact with both free-rider problems present. The external free-rider problem prevents entry when $\xi < \xi_E$. Because $\xi_E < \xi_E^{FB}$, there is more entry than in the first-best case—relatively more skilled activists invest in firms that could benefit more from activism. However, it is among these firms that the internal free-rider problem reduces the effectiveness of activism the most, as both activist and insiders efforts are key to the transition in such firms. As a result, activism either has a limited or negative impact on the transition, with $\frac{\lambda(\theta)}{\lambda(0)}$ staying slightly above or below 1.

3.4 Sustainability Preferences and Carbon Taxes

As shown in Proposition 3, sustainability preferences—that is, non-priced benefits of transitioning π—are necessary for activist entry. Surprisingly, however, greater financial benefits from transitioning hinder activism rather than promote it. The following proposition shows that any increase in the financial benefits of transitioning strengthens the external free-rider problem, discouraging activist entry, and, at the same time, reduces effort incentives relative to passive investing, limiting activism's incremental impact. As a result, financial gains that make green transitions more attractive can, paradoxically, crowd out impact activism. By contrast, sustainability preferences favor activism both on the extensive and intensive margin.

Proposition 6 (The effects of pecuniary and non-pecuniary benefits)**.** *A greater ratio of non-pecuniary to pecuniary benefits of transitioning* $\frac{\pi}{\Delta}$ *facilitates impact activism on the:*

1. *Extensive margin, i.e., the activist enters if and only if* $\frac{\pi}{\Delta} \geq \Gamma_E := \frac{1}{1+2\xi(1+\xi+\xi^2)}$ *or, equivalently,* $\xi \geq \xi_E$ *where the entry threshold* ξ_E *decreases with* $\frac{\pi}{\Delta}$*.*
2. *Intensive margin, i.e.,* $\frac{\lambda(\theta)}{\lambda(0)}$ *increases in* $\frac{\pi}{\Delta}$*, with* $\frac{\lambda(\theta)}{\lambda(0)} \gtreqless 1$ *if and only if* $\frac{\pi}{\Delta} \gtreqless \Gamma_G := \frac{\xi-1}{1+\xi^2}$*.*

Proposition 6 implies that, depending on the level of the ratio of non-pecuniary to pecuniary benefits of transitioning $\frac{\pi}{\Delta}$, three cases can arise. First, for $\frac{\pi}{\Delta} < \Gamma_E$, there is no activist entry. Second, for $\frac{\pi}{\Delta} \in (\Gamma_E, \Gamma_G)$, the activist enters but reduces the transition rate relative to passive ownership, giving rise to bad activism. Third, when $\frac{\pi}{\Delta} \geq \max\{\Gamma_E, \Gamma_G\}$, the activist enters and increases the transition rate relative to passive ownership, giving rise to good activism. (It can be that $\Gamma_E \geq \Gamma_G$, in which case activism, if it emerges, unambiguously fosters the green transition. This case prevails when ξ is sufficiently low.)

Figure 3 illustrates the findings in Proposition 6. The left panel plots the entry threshold ξ_E (solid red line) and the skill levels ξ_+ (dashed black line) and ξ_- (dashed blue line), which define the regions where activism improves or hampers the green transition rate, as functions of $\frac{\pi}{\Delta}$. Lower sustainability preferences π or higher financial benefits Δ hinder impact both by increasing ξ_E (reducing the quality of activists who invest) and by widening the range $\xi_+ - \xi_-$ where activism hampers transition. For sufficiently low (high) $\frac{\pi}{\Delta}$, activism unambiguously

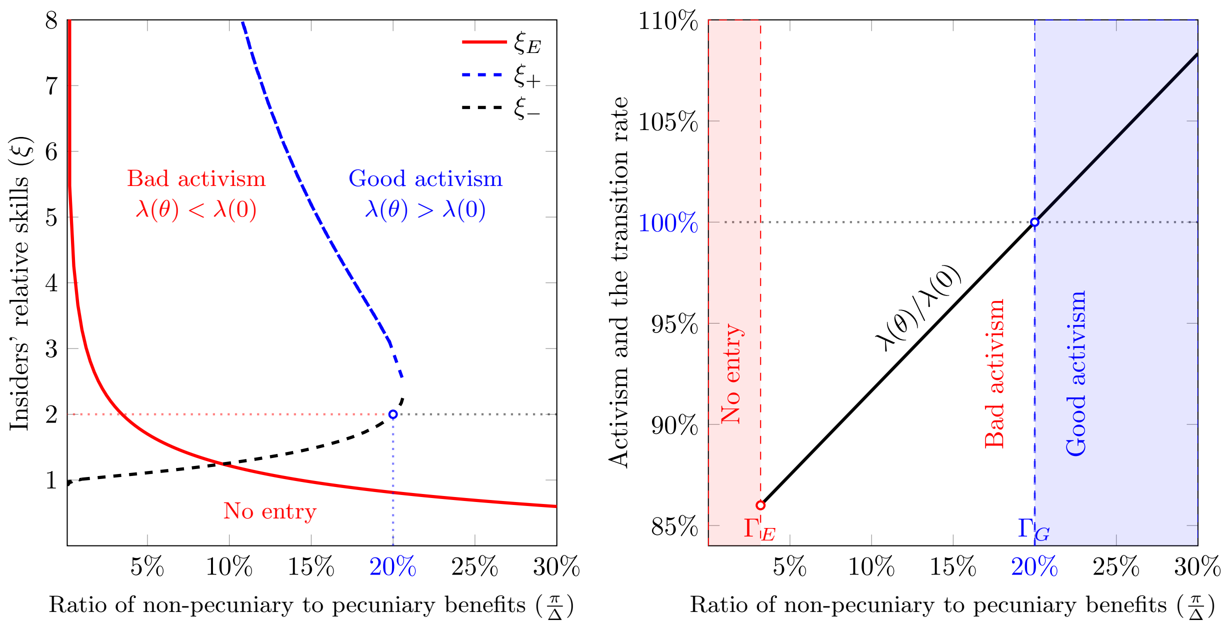

Figure 3: **Preferences, skills, and impact**: The left panel plots the entry threshold ξ_E and the skill levels ξ_+ and ξ_- over and below which activism improves the green transition rate as functions of the ratio of non-pecuniary to financial benefits of transitioning $\frac{\pi}{\Delta}$. The right panel plots the ratio of transition rates with and without activism as a function of the ratio of non-pecuniary to financial benefits of transitioning for $\xi = 2$.

reduces (increases) the transition rate. The right panel plots the ratio $\frac{\lambda(\theta)}{\lambda(0)}$ of the transition rates with and without activism when $\xi = 2$, showing that it increases in $\frac{\pi}{\Delta}$.

Proposition 6 suggests that higher carbon taxes, by increasing Δ and decreasing $\frac{\pi}{\Delta}$, may hinder activism. The following corollary formalizes this intuition:

Corollary 3. *An increase in carbon taxes hinders impact activism on the:*

1. *Extensive margin in that the activist enters if and only if* $T \leq T_E := \pi\left[1 + 2\xi(1 + \xi + \xi^2)\right] - (X_G - X_B)$*, where* T_E *increases in* ξ*.*

2. *Intensive margin in that* $\frac{\lambda(\theta)}{\lambda(0)}$ *decreases in* T*. When* $\xi > 1$*,* $\frac{\lambda(\theta)}{\lambda(0)} \geq 1$ *if and only if* $T \leq T_G := \frac{1+\xi^2}{\xi-1}\pi - (X_G - X_B)$*. For* $\xi \leq 1$*,* $\frac{\lambda(\theta)}{\lambda(0)} \geq 1$*.*

By increasing the financial benefits of transitioning, carbon taxes raise effort levels and amplify activism's impact on the stock price. However, this also strengthens the external free-rider problem, discouraging activist entry. As a result, there exists a carbon tax threshold T_E, above which activists no longer invest. This threshold increases with relative insider skill ξ, since higher insider expertise makes activism less critical. In addition, carbon taxation raises the entry threshold ξ_E, meaning that activists only invest in firms lower ϕ_i (or higher ξ). Thus, carbon taxes tilt activist investments toward firms that can transition independently at low cost, limiting activism where it is most needed.

Moreover, carbon taxes reduce the intensive margin of activism as captured by $\frac{\lambda(\theta)}{\lambda(0)}$. While they increase the financial benefits of transitioning and thus transition rates with and without activism, they do so more strongly under passive ownership without activism ($\lambda(0)$). When $\xi > 1$, there exists a threshold T_G for carbon taxes above which activism, if it arises, always reduces the green transition rate. Consequently, carbon taxes can also promote the emergence of bad activism, hindering the transition relative to passive ownership. These effects are illustrated in Figure 3, where higher Δ (or equivalently, higher T) decreases $\frac{\pi}{\Delta}$ and expands the regions where activism fails to emerge or hampers the transition.

3.5 Mechanism and External Validity

Our analysis demonstrates that absent strong sustainability preferences, the combination of internal and external free-rider problems hinder activist engagement, effectively leading to a passive equilibrium investment strategy, featuring limited engagement and exclusion of brown firms. In this section, we discuss the external validity of the two frictions.

The internal free-rider problem emerges when both insiders and activists contribute to firm outcomes and when the incentives of insiders and activists depend on overall transition outcomes, while individual actions cannot be contracted on. This means that, in practice, the internal free-rider problem is particularly pronounced when transition-relevant actions are difficult to contract upon or quantify. This is the case, for instance, when transition efforts involve multiple, less tangible actions by different insiders, such as organizational changes, process improvements, or behavioral shifts among employees, rather than tangible investments in green technologies, which are more easily contractible (see also footnote 1). Indeed, Section 4.7 and Appendix A.19 consider a model variant with many insiders who contribute to the transition through their unobservable efforts. We show that the presence of many insiders (rather than a single one) makes it harder to incentivize insider efforts and increases the severity of the internal and external free-rider problems.

A possible critique of the internal free-rider mechanism is that sustainability-linked compensation for key employees and executives constitutes only a small fraction of total pay and of a firm's overall expenses in practice. However, because the transition affects firm cash flows, performance-based compensation indirectly ties executive incentives to the transition outcome, even in the absence of explicit sustainability-linked pay. That is, as long as the transition influences firm value or cash flows, performance-based insider compensation—for instance, related to equity-based compensation or employee bonuses—creates inter-dependencies between insider and activist incentives, generating the internal free-rider problem.[9]

Overall, these arguments suggest that the internal free-rider problem is more likely to be severe in firms where (*i*) transition success depends on intangible inputs and efforts of insiders and activists, (*ii*) transition affects firm cash flows and value, and (*iii*) insider compensation depends on firm performance.

The external free-rider problem is particularly relevant in public markets, where ownership is highly dispersed among passive investors who will not coordinate to facilitate activism. In its extreme form, this coordination friction prevents activists from capturing any value gains from activism. However, even when activists retain a portion of these gains, as we allow in Section 4.4, the core mechanism remains intact. Empirical evidence, such as in Norli, Ostergaard, and Schindele (2015), supports the role of the external free-rider problem in hindering activist investment in publicly-traded target firms. In contrast, the external free-rider problem is weaker under concentrated ownership or in private capital markets, where investors have greater control and face fewer coordination barriers. Without the dilution of activist returns among passive shareholders, investors in these settings can more effectively internalize the gains from engagement, making activism a more viable strategy.

Taken together, the internal and external free-rider problems should be most prevalent in public firms where transition consists of multiple steps that are difficult to contract on, affects firm value, and employees' compensation is tied to firm value.

[9]Specifically, consider a model variant where the insider's cash flow-based compensation is exogenous—for instance because it is set to address incentive problems outside the model. This compensation component would then generate an internal free-rider problem through mechanisms analogous to those in our paper.

4 Robustness and Other Results

4.1 Endogenous Ownership Stake

Our analysis so far has assumed that the stake θ of activist investors was exogenous. We now endogenize the choice of θ by solving for the optimal activist stake

$$\theta^* = \arg\max_{\theta \in [0,1]} \{V - \theta P\}.$$

Since $\theta \mapsto V - \theta P$ is zero for $\theta = 0$ and increases in a neighborhood of zero, we have $\theta^* > 0$, that is, the activist always enters the firm in this model variant, but its stake can be arbitrarily small. One could impose that the activist must acquire a minimum stake in the firm to be able to exert control, but for the sake of simplicity, we abstract from such an assumption here as the qualitative findings would remain unchanged. We define the maximum ownership the activist could profitably acquire as $\overline{\theta} := \max\{\theta \in [0,1] : V - \theta P \geq 0\}$. Clearly, we also have $\overline{\theta} \geq \theta^*$. Solving the activist optimization problem yields the following results when θ^* is interior, where a sufficient condition for interior θ^* is $\frac{\phi_a}{\phi_i} \leq \xi_E$.

Proposition 7 (Activism and the transition rate with endogenous ownership)**.** *Define* $\Gamma^* = \frac{3\sqrt{5}}{10} - \frac{1}{2}$*. When* $\theta^* \in (0,1)$*, we have that:*

1. *When* $\frac{\pi}{\Delta} \geq \Gamma^*$*, then* $\lambda(\theta^*) > \lambda(0)$*.*

2. *When* $\frac{\pi}{\Delta} < \Gamma^*$*, then* $\lambda(\theta^*) < \lambda(0)$ *and* $\lambda(\theta^*) < \lambda(\overline{\theta})$*.*

3. *There exists* $\varepsilon > 0$ *such that* $\lambda(\theta^*) < \lambda(0) < \lambda(\overline{\theta})$ *for* $\frac{\pi}{\Delta} \in (\Gamma^* - \varepsilon, \Gamma^*)$*.*

Proposition 7 shows that when the ratio of non-pecuniary to financial benefits of transitioning is sufficiently large, i.e., when $\frac{\pi}{\Delta} \geq \Gamma^*$ (≈ 0.17), activism always improves the green transition rate. When sustainability preferences are such that this constraint is not satisfied (i.e., $\frac{\pi}{\Delta} < \Gamma^*$), the activist acquires an inefficiently low ownership stake θ^*, thereby hampering transition in that $\lambda(\theta^*) < \lambda(0)$. Strikingly, for intermediate levels of sustainability preferences π, we have $\lambda(\theta^*) < \lambda(0) < \lambda(\overline{\theta})$. In this case, the activist's entry and the acquisition of too small a stake θ^* hampers entry, although the activist would be capable of profitably fostering transition through the acquisition of a larger stake $\overline{\theta}$.

Next, we perform comparative statics in the endogenous ownership stake.

Proposition 8. *Suppose that θ^* is interior, i.e., $\theta^* \in (0,1)$. Then, θ^* decreases in ϕ_i, increases in ϕ_a, increases in π, and decreases in Δ.*

The above proposition shows that upon entering, skilled activists, characterized by lower ϕ_a, tend to acquire smaller ownership stakes. Moreover, an activist acquires a larger ownership stake when ϕ_i is low, and the firm could more easily transition on its own. Last, the ownership stake θ^* is larger when the activist has stronger sustainability preferences or the financial gains to transitioning are lower, resulting in a less severe free-rider problem.

Finally, we can jointly endogenize the choice of the ownership stake θ and the firm characterized by $\phi_i \in [\underline{\phi}_i, \overline{\phi}_i]$, maximizing $V - \theta P$. Notably, we have that:

Corollary 4. *The choice $\phi_i = \underline{\phi}_i$ solves $\max_{\theta \in [0,1], \phi_i \in [\underline{\phi}_i, \overline{\phi}_i]} V - \theta P$.*

Corollary 4 shows that the activist excludes investment in firms characterized by high ϕ_i. Instead, the activist invests in firms characterized by the lowest possible ϕ_i (i.e., $\phi_i = \underline{\phi}_i$). In light of Proposition 8, the activist selects a relatively large stake in such firms. In conclusion, we find that the activist tends to acquire large stakes in firms that can transition on their own at relatively low cost but excludes investment in firms where it could have more impact.

4.2 Consequentialist Preferences

In our baseline analysis, activists have value-alignment preferences and care about the absolute level of externalities produced by their investments. Evidence on such preferences for sustainable investing is provided by Riedl and Smeets (2017), Cole et al. (2023), Heeb et al. (2023), and Bonnefon et al. (2025). A number of papers have examined the implications of assuming that activists are consequentialists, and account for the level of externalities relative to a counterfactual scenario in which they do not invest in the firm; see, e.g., Oehmke and Opp (2024) and Gupta et al. (2024). To investigate the effects of such preferences on our results, we modify our specification of preferences by assuming that the activist gets a non-pecuniary payoff $\theta_0 \pi^N + \pi^C$ upon transitioning, relative to not transitioning. Part of the non-pecuniary payoff of transitioning scales with the activist's stake, namely π^N, and represents value-alignment preferences. In addition, there is a payoff component that does not depend on the activist's stake, namely π^C, which represents consequentialist preferences.

Whether activists are consequentialists only matters for entry. The solution after entry only depends on the total non-pecuniary benefits that the activist derives from transitioning. To be able to use the same notation as in the baseline, we consider that the activist enters the firm, i.e., $\theta_0 = \theta$. In this scenario, total non-pecuniary benefits from transitioning can be written as $\theta\pi$ with $\theta\pi := \theta\pi^N + \pi^C$.[10] Further, define the ratio of non-pecuniary benefits derived from value-alignment preferences as $1 - \alpha := \frac{\theta\pi^N}{\theta\pi}$ so that $\pi^C = \alpha\theta\pi$. When $\alpha = 1$, the activist has pure consequentialist preferences. When $\alpha = 0$, the activist has pure value-alignment preferences. More generally, α captures how "consequentialist" the activist's sustainability preferences are, holding fixed the total payoff from transitioning.

Conditional on entry, the solution remains identical, and the activist derives payoff $V - \theta P$ from entering. Without activist entry, the firm transitions with probability i^P, generating a payoff $\alpha\theta\pi$ to the activist. Thus, the entry condition changes to

$$\underbrace{V - \theta P}_{\text{Payoff from entering}} - \underbrace{\alpha\theta\pi i^P}_{\text{Payoff from not entering}} = \theta\pi\left[(a+i) - \alpha i^P\right] - \frac{\phi_a a^2}{2}, \tag{15}$$

which, unlike (7), accounts for the activist's sustainability references-driven payoff in case it does not invest. Using the same steps as in the baseline model, we get that:

Proposition 9. *With consequentialist preferences, efforts are as in the baseline model, characterized in (10), and do not depend on α. The activist enters if and only if*

$$E^B := \frac{\pi}{\Delta}\left[\frac{\pi}{\Delta}\left(1 + 2\xi\left(1 + \xi + \xi^2\right)\right) + 2\xi\left(1 + \xi + \xi^2 - \alpha(1+\xi)^2\right)\right] \geq 1. \tag{16}$$

E^B decreases in α and increases (decreases) in ξ for $\frac{\pi}{\Delta} \gtrless \frac{4\xi(2\alpha-1)-2\xi^2(1-\alpha)-2(1-\alpha)}{6\xi^2+4\xi+2}$, whereby $\alpha \leq \frac{1}{2}$ implies $\frac{\partial E^B}{\partial \xi} > 0$. Entry incentives increase in $\frac{\pi}{\Delta}$.

Proposition 9 shows that our key findings remain unchanged when incorporating consequentialist preferences into our framework. That is, entry incentives increase with the activist's non-pecuniary benefits of transitioning and decrease with the financial benefits of

[10]Note that θ is a parameter so it is without loss generality to scale these non-pecuniary benefits by θ.

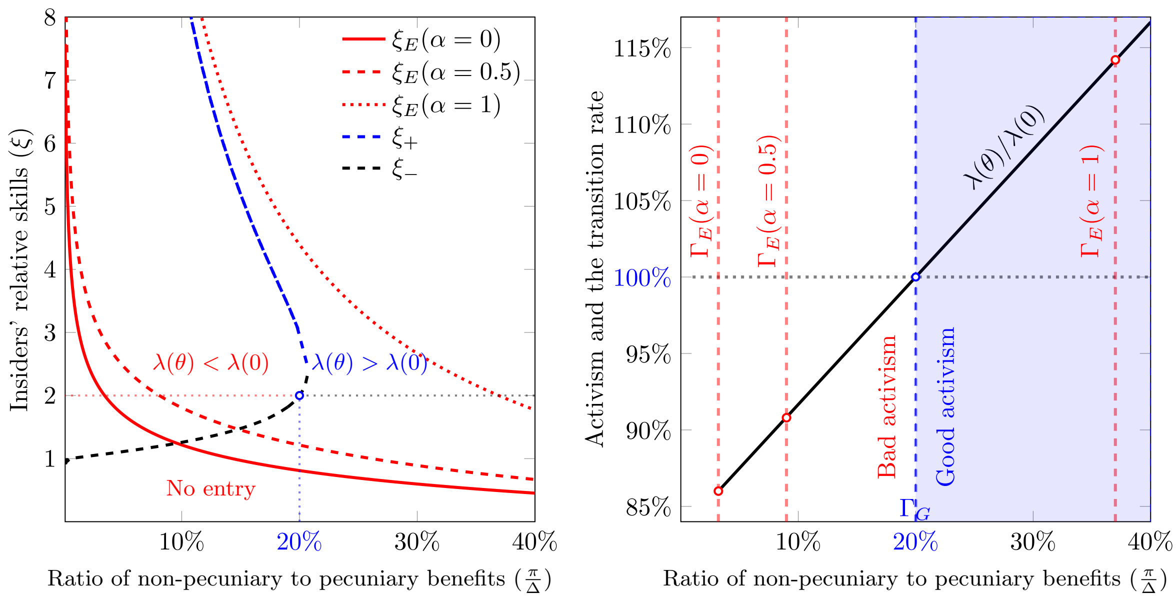

Figure 4: **Preferences, skills, and impact**: The left panel plots the entry thresholds $\xi_E(\alpha = 0)$, $\xi_E(\alpha = 0.5)$, and $\xi_E(\alpha = 1)$ and the skill levels ξ_+ and ξ_- over and below which activism improves the green transition rate. The right panel plots the ratio of transition rates with and without activism for $\xi = 2$.

transitioning and carbon taxation in particular.[11] Moreover, as long as α is not too large or $\frac{\pi}{\Delta}$ is large, entry incentives increase with ξ. Under these circumstances, the external free-rider problem tilts activists' investments toward firms that can transition at low cost (i.e., have low ϕ_i and ξ). Proposition 9 also shows that, conditional on entry, the nature of preferences has no impact on effort levels and the internal free-rider problem.

Second, holding the total sustainability preferences-driven payoff of transitioning fixed, the nature of preferences affects entry incentives. Notably, consequentialist preferences hamper activist entry in that E^B decreases with α. This effect can be positive or negative for the transition rate, as reduced entry incentives arising from more consequentialist preferences may prevent both good or bad activism. Specifically, sufficiently large values of α preclude bad activism. To see this note that by (15), a necessary condition for activist entry under $\alpha = 1$ is that $a + i > i^P$, i.e., activism increases the transition rate relative to passive investors owning the firm. That is, when activists' preferences are sufficiently consequentialist,

[11] To see how larger $\frac{\pi}{\Delta}$ unambiguously fosters entry, note that when the term in square brackets in (16) is positive, then the left-hand-side of the entry condition increases in $\frac{\pi}{\Delta}$. When the term in square brackets is negative, the entry condition is not met. Further, the term in square brackets itself strictly increases in $\frac{\pi}{\Delta}$. Thus, larger $\frac{\pi}{\Delta}$ makes it more likely that (16) holds or equivalently that $\mathbb{I}\{E^B \geq 1\}$ increases in $\frac{\pi}{\Delta}$.

activism is less likely to emerge but always improves the transition rate. Put differently, consequentialist preferences increase the skill and impact of activism. However, they may also preclude beneficial activism by hampering entry. Figure 4 illustrates these effects by adding to Figure 3 the entry thresholds when $\alpha > 0$ in addition to the baseline entry threshold.

4.3 Complementarity of Efforts in the Transition Process

In our baseline model, the efforts of the activist and insiders affect the transition probability $a + i$ symmetrically and independently. We now consider that efforts can inherently be substitutes or complements in fostering the green transition, in that the transition probability is given by $a+i+\omega ai$ where $\omega \gtreqless 0$ captures the interactions of efforts in the transition process; the baseline is obtained for $\omega = 0$. Denote by $\hat{a}$ the anticipated level of activist effort that coincides with a in optimum. Appendix A.11 shows that the incentive condition of insiders under a contract (W, R) becomes

$$i = \frac{R(1 + \omega\hat{a})}{\phi_i}, \tag{17}$$

Note that the effort of insiders now depends on the activist's effort $\hat{a}$, which satisfies the incentive condition

$$a = \frac{\theta(\Delta + \pi - R)(1 + \omega i)}{\phi_a}. \tag{18}$$

Higher effort incentives provided to insiders have an ambiguous effect. First, due to the exogenously assumed complementarity of efforts in the production technology, higher effort by insiders incentivizes activist effort when $\omega > 0$. Second, as in the baseline, insiders are incentivized through a reward R upon successful transition. When the activist increases its effort, part of the benefits accrue to insiders through the incentive contract, because the activist's effort is not contractible. Providing higher incentives to insiders by raising R therefore reduces the activist's incentives to exert effort, generating an endogenous substitutability between the two efforts under moral hazard.

Conditional on activist entry, the exogenous complementarity of the two efforts, which is not present under passive ownership, enhances the impact of activism on the transition rate. In contrast, the double moral hazard and endogenous substitutability of efforts, limit the effectiveness of activism and potentially give rise to bad activism, i.e., activism which

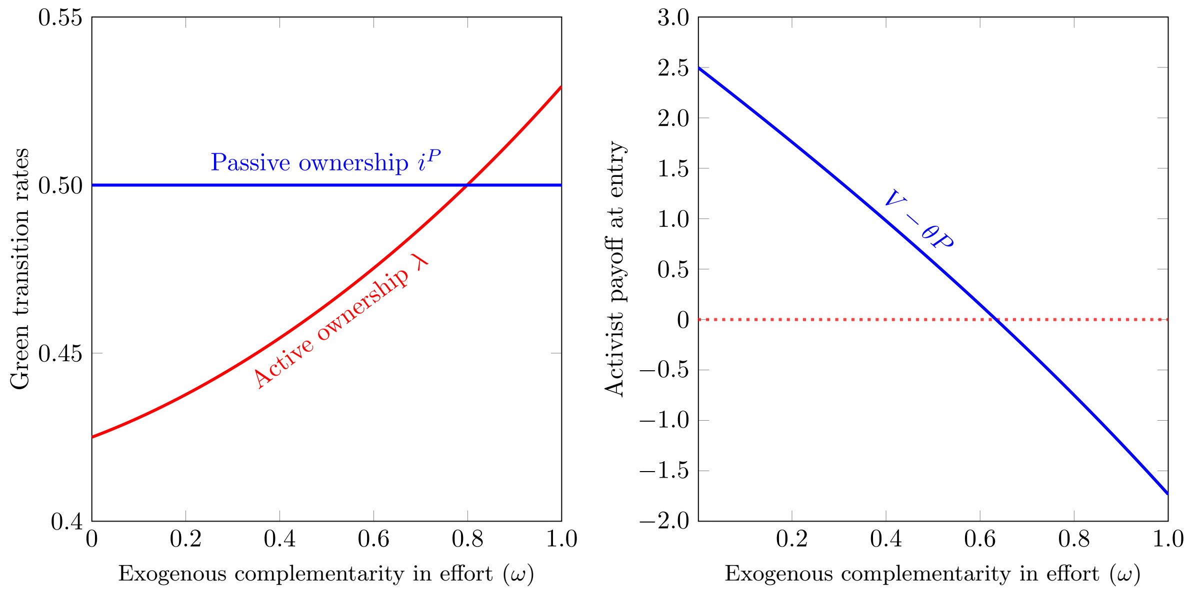

Figure 5: **Exogenous complementarity in efforts**: The left panel plots the transitions rates under active and passive ownership while the right panel plots the activist's payoff upon entry as functions of the exogenous level in complementarity ω. The numerical solution assumes $\phi_a = \phi_i = 1$, $\Delta = 0.5$, $\theta = 0.5$, and $\pi = 0.025$.

reduces the transition rate relative to passive ownership.

Whether activist engagement fosters or hampers the green transition ultimately depends on the strength of these two effects. To illustrate these effects, we solve the model numerically (with $\omega \neq 0$). To this end, Figure 5 plots both the efforts of insiders and the activist and their sum λ against ω. As can be seen from the left panel, which plots the transition rate under both active ownership (red line) and passive ownership (blue line), an increase in ω increases the transition rate and makes activism more valuable and bad activism less likely. Yet, bad activism (i.e., $\lambda < i^P$) can still arise when efforts are complements and $\omega > 0$, in that our key findings remain qualitatively similar under this alternative model variant.

Finally, because an increase in ω raises the transition rate under active ownership and induces higher activist efforts, it also exacerbates the external free-rider problem, thereby crowding out activism. Indeed, the right panel shows that the activist's entry payoff and, thus, its willingness to enter decreases with ω. Taken together, when the efforts of the activist and insiders are complements in the transition process, the activist, if it enters, has greater impact and is more likely to raise the transition rate. However, complementarity also hampers activist entry, which may preclude both good and bad activism. By worsening the external free-rider problem, the complementarity effectively also tilts activists' investments towards firms that can transition independently at relatively low cost. Likewise, substitutability of efforts in the transition process (i.e. $\omega < 0$) would alleviate the external free-rider problem, fostering entry, but hamper the activist's impact conditional on entry.

4.4 External Free-Rider Problem and Bargaining Power

Activists can typically acquire substantial ownership stakes before publicly revealing their investments in public companies, and they may possess bargaining power when investing in private companies.[12] Consequently, we explore in this section the implications of allowing activists to capture a portion of the value gains from activism. To do so, we consider that the activist can acquire a fraction $1 - \eta \in [0, 1]$ of its stake θ at the price P_0, defined in (6), that would prevail under passive ownership. The remaining fraction η is bought at a price P, defined in (5), that reflects the gains from activism. The activist then pays

$$K := \theta P_0 + \eta\theta(P - P_0) \tag{19}$$

to acquire ownership stake θ. With an outside option normalized to zero, the activist enters if and only if

$$V - K \geq 0. \tag{20}$$

Relative to the baseline, the new acquisition price affects activist entry, but leaves all other model outcomes (conditional on the entry decision) unchanged. Thus, in this model variant, efforts of the activist and insiders are the same as in the baseline model so that Propositions 1, 2, 4, and 6 still obtain. That is, the internal free-rider problem leads to underinvestment by the activist and insiders and activism leads to a lower transition rate than passive ownership whenever $\xi \in (\xi_-, \xi_+)$. Equation (20) implies that the activist enters if and only if

$$V - \underbrace{\theta P_0}_{\substack{\text{Cost without} \\ \text{Price Impact}}} - \underbrace{\eta\theta(P - P_0)}_{\substack{\text{Rents of Passive} \\ \text{Investors}}} \geq 0. \tag{21}$$

[12] In the U.S., for example, Section 13(d) of the 1934 Act and Regulation 13D requires owners of more than 5% of the equity of a public firm to file a report with the SEC, at which point the identity of an activist gets revealed and the price adjusts to reflect this information.

The following proposition uses this condition to characterize the activist's entry decision.

Proposition 10 (Bargaining Power and Entry)**.** *We have that*

1. *The activist enters, i.e.,* $V - \theta P_0 - \eta\theta(P - P_0) \geq 0$*, if and only if* $E \geq 0$ *with*

$$E := (\Delta+\pi)^2\big[\xi(1-\eta)+1-2\eta\big]+2(\Delta+\pi)\pi(1+\xi)\big[\eta+\xi(1-\eta)+\xi^2\big]-\pi^2(1-\eta)\xi(1+\xi)^2.$$

2. *The activist's incentives to enter increase as the skills of insiders improve in that* $\frac{\partial E}{\partial \xi} > 0$*. There exists unique* $\xi_B \in (0, \frac{2\eta-1}{1-\eta})$ *such that* $E(\xi) \geq 0$ *if and only if* $\xi \geq \xi_B$*.*

3. *Sustainability preferences foster entry in that* $\frac{\partial E}{\partial \pi} > 0$*. There exists unique* $\pi_B \geq 0$ *such that an activist enters if and only if* $\pi \geq \pi_B$*.*

The key findings are similar to those in the baseline analysis, which is obtained upon setting $\eta = 1$. Notably, the activist's entry incentives increase with the strength of its sustainability preferences π and decrease with its skills ξ. Thus, only activists who do not contribute much via their own effort and are characterized by $\xi \geq \xi_B$ have incentives to enter. Likewise, only activists with sufficiently strong sustainability preferences enter. Hence, our key findings are generally robust to relaxing the free-rider problem by allowing for $\eta < 1$.

Proposition 10 shows that when the bargaining power of activists is sufficiently strong, i.e., when $\eta \leq \frac{1}{2}$, activists always enter in that $V - \theta P_0 - \eta\theta(P - P_0) \geq 0$. That is, the activist's bargaining power fosters entry, suggesting that we should expect more activism in markets where activists have larger bargaining power, such as private capital markets.

4.5 What If Activists D Not Incentivize Insiders?

In our model, both the activist and insiders can contribute to the green transition. However, as we have shown, when insiders have incentives to exert transition-related efforts, an internal free-rider problem arises, where both the activist and insiders free-ride on each other's efforts. Specifically, when the activist enters and incentivizes insiders through a contract, its own incentives to exert effort diminish. A potential solution to this internal free-rider problem would be not to incentivize insiders. However, as we show, this approach generally backfires and hampers impact activism.

We now consider the scenario in which the activist abstains from offering a contract to insiders, implying that $C = R = 0$. We refer to this setting as the no-contracting benchmark and compare its outcomes to those under passive ownership and our baseline. Under no-contracting, insiders exert no effort ($i = i^N = 0$), while the activist chooses effort $a = a^N$ to satisfy

$$a^N = \arg\max_{a \geq 0} \left\{ \theta(\pi + \Delta) - \frac{\phi_a a^2}{2} \right\} = \frac{\Delta}{\phi_a} \frac{1}{\xi} \left(1 + \frac{\pi}{\Delta}\right) = a^{FB}.$$

The following proposition summarizes the outcomes under this benchmark and compares the prevailing transition rate to that under passive ownership, where passive owners incentivize insiders.

Proposition 11 (No Contracting)**.** *Suppose that $C = R = 0$, i.e., $i = 0$. Then, the activist's effort and the transition rate equal $\lambda^N(\theta) = a^{FB}$, with*

$$\frac{\lambda^N(\theta)}{\lambda(0)} = \frac{1}{\xi} \left(1 + \frac{\pi}{\Delta}\right) \quad \text{and} \quad \frac{\lambda^N(\theta)}{\lambda(\theta)} = \frac{1 + \xi}{1 + \xi^2}.$$

The activist enters if and only if $\frac{\pi}{\Delta} \geq 1$.

When the activist does not incentivize insiders, the internal free-rider problem is removed and activist effort is at the first-best level a^{FB}. Not incentivizing insiders can either increase or decrease the transition rate, relative to both the baseline and passive ownership. Specifically, when insider skill is low ($\xi < 1$), the transition rate is higher. Conversely, when insider skill is high ($\xi \geq 1$), the transition rate is always higher under the baseline and is also higher under passive ownership when $\frac{\pi}{\Delta}$ is low. Intuitively, abstaining from contracting with insiders can lead to a higher transition rate than in the baseline, as it eliminates the internal free-rider problem. This is the case when insiders' skill is relatively high.

While avoiding insider incentives mitigates the internal free-rider problem, it simultaneously worsens the external free-rider problem, ultimately hindering activist entry. Indeed, By not incentivizing insiders, the activist is compelled to exert greater effort. This, in turn, makes entry more difficult, as the activist bears the full cost of its efforts but cannot fully capture their benefits. When the activist does not incentivize insiders, it enters only if the non-pecuniary benefits of transitioning exceed the monetary incentives. Thus, avoiding insider incentives fails to enhance the overall impact of activism.

4.6 Insiders' Contracts Set by Passive Investors

So far, we have considered that activists contribute to a firm's green transition by exerting effort and contracting with insiders. Assume now that the contracts of insiders are set by passive investors rather than activists. As in the baseline model, incentive conditions (2) and (9) apply as well as the participation constraint (3). Passive investors choose the contract (C, R) to maximize the firm's stock price, in that

$$P = \max_{C,R} \left\{ \big(1 - (a+i)\big)\big(X_B - C - T\big) + (a+i)\big(X_G - C - R\big) \right\}.$$

The activist enters if and only if condition (7) is satisfied. We then have the following:

Proposition 12. *When passive investors set the contracts of insiders, we have that:*

1. *Efforts satisfy* $a = \frac{1}{\phi_i}\frac{\Delta+\pi\xi}{\xi^2}$ *and* $i = \frac{\Delta}{\phi_i}\frac{\xi-1}{\xi}$ *when relative skills are such that* $\xi > 1$*; and* $a = \frac{\Delta+\pi}{\phi_i}\frac{1}{\xi}$ *and* $i = 0$ *when* $\xi \leq 1$.
2. *The activist enters if and only if* $\frac{\pi}{\Delta} \geq \Gamma_E^p = 1 - \xi + \sqrt{\xi^2 - 2\xi + 1 + \xi^{-2}}$ *when* $\xi > 1$ *and* $\frac{\pi}{\Delta} \geq \Gamma_E^p = 1$ *when* $\xi \leq 1$.
3. *Investor activism improves the green transition rate in that* $\frac{\lambda(\theta)}{\lambda(0)} > 1$ *if and only if* $\xi \leq 1$ *or* $\frac{\pi}{\Delta} > \Gamma_G^p = \frac{\xi-1}{\xi}$ *when* $\xi > 1$.

Using the results in Propositions 2, 6, and Proposition 12, we have that:

Corollary 5. *When the contracts of insiders are set by passive investors rather than activists:*

1. *The activist effort* a *is higher and the insiders effort* m *is lower than in the baseline.*
2. *Impact activism is negatively affected on the extensive margin in that* $\Gamma_E^p \geq \Gamma_E$.
3. *Impact activism is negatively affected on the intensive margin for* $\xi > 1$ *in that the transition rate is lower than in the baseline and* $\Gamma_G^p > \Gamma_G$. *For* $\xi \leq 1$*, we have* $\Gamma_G, \Gamma_G^p \leq 0$ *and activism improves the transition rate in either scenario.*

Corollary 5 shows that when contracts are set by passive investors, insiders exert lower effort, and the activist exerts higher effort than in the baseline. To understand this result, recall that due to the internal free-rider problem, the efforts of the activist and the insiders function as substitutes. Because passive investors' payoff (the firm's stock price) does not directly reflect the activist's private cost of effort, it is cheap for passive investors to provide incentives to the activist. This effect results in lower incentives provided to insiders, when compared to the activist setting contracts. Moreover, passive investors do not have sustainability preferences and only care about the financial value of the firm. Consequently, the activist's sustainability preferences are not directly incorporated into the incentive contracts of insiders, further reducing their efforts.

Corollary 5 demonstrates that the impact of passive investors' control over the contracts of insiders on the transition rate $\lambda = a + i$ is influenced by the relative skills of insiders. When $\xi > 1$ and the relative skills of insiders are high, higher a and lower i result in a lower transition rate, relative to the baseline. This is because the contract designed by passive investors prioritizes the less efficient activist over insiders. Conversely, when $\xi \leq 1$, the activist is more efficient than insiders. The contract set by passive investors puts more weight on the more efficient party, thereby achieving a higher transition rate.

Crucially, the effect of passive investor control over insiders contracts on the extensive margin is unambiguously negative. As in the baseline model, the extensive margin interacts with the intensive margin: in cases when the activist could foster the transition effectively, the activist does not enter. In particular, when $\xi \leq 1$, the activist is sufficiently skilled and its engagement improves the transition rate, regardless of who determines the terms of the contracts of insiders. However, Proposition 12 shows that in this case the activist only enters when the non-pecuniary benefits of activism exceed its financial benefits in that entry occurs if and only if $\frac{\pi}{\Delta} \geq 1$. Combining all cases, our findings suggest that for activism to effectively promote the green transition, it is beneficial for activists to have the authority to influence the compensation of insiders, especially by integrating sustainability objectives into it.

These results are graphically illustrated in Figure 6. The left panel plots the ratio of non-pecuniary to pecuniary benefits $\frac{\pi}{\Delta}$ over which activism improves the green transition rate when the managerial contract is set by the activist (Γ_G; blue line) and by passive investors (Γ_G^p , red line) as functions of the activist's skills ξ. The figure also plots the entry thresholds Γ_E (solid black line) and Γ_E^p (dashed black line) when the managerial contract is set by the

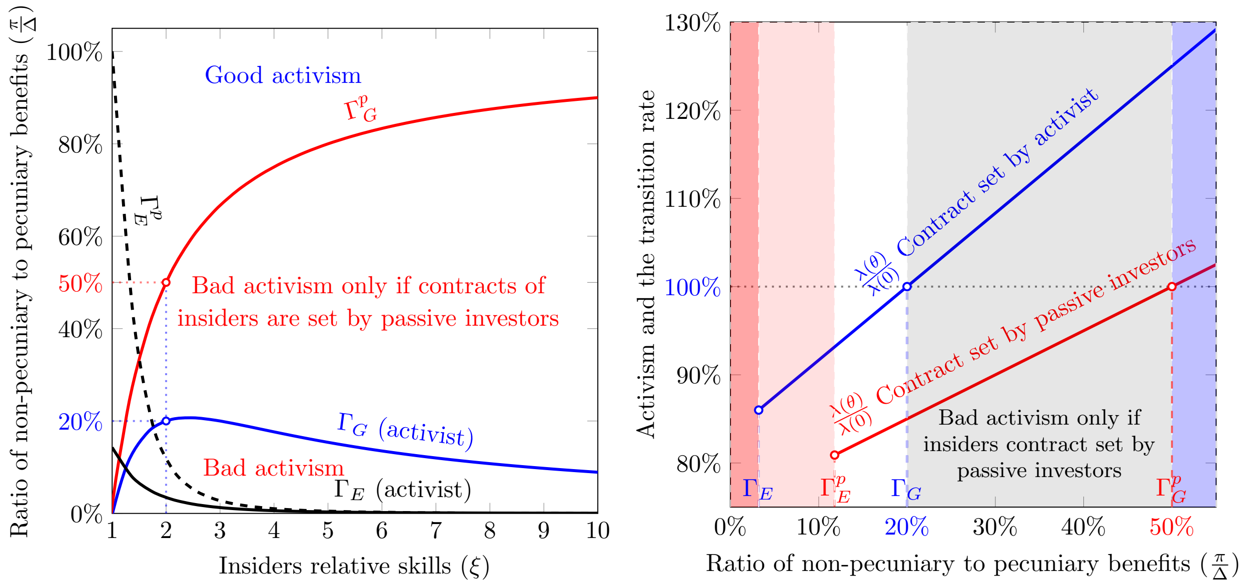

Figure 6: **Insiders contracts and activism**: The left panel plots the ratio of non-pecuniary to financial benefits over which activism improves the transition rate when the contracts of insiders are set by the activist (blue line) and by passive investors (red line) as functions of the relative skills of insiders ξ. The figure also plots the entry thresholds Γ_E (solid black line) and Γ_E^p (dashed black line). The right panel plots the ratio of transition rates with and without activism as a function of the ratio of non-pecuniary to financial benefits $\frac{\pi}{\Delta}$ for $\xi = 2$, when contracts are set by the activist (blue line) or by passive investors (red line).

activist and passive investors respectively. The plot shows that activism becomes more likely to reduce the transition rate when the contract is set by passive investors.

The right panel plots the ratio of transition rates with and without activism as a function of the ratio of non-pecuniary to financial benefits $\frac{\pi}{\Delta}$ for $\xi = 2$, when the contracts of insiders are set by the activist (blue line) or by passive investors (red line). In the dark red region, there is no activist entry. In the light red region, activists enter *only* if they set insiders contracts. In this region, activism hinders the green transition. In the white region, the activist always enters and hinders the transition. In the grey region, the activist enters but hinders the transition only if contracts are set by passive investors. In the blue region, the activist enters and facilitates the transition independently of who sets contracts. The value of $\frac{\pi}{\Delta}$ triggering entry is larger when passive investors set the contracts of insiders in that $\Gamma_E^p = 11.8\% > \Gamma_E = 3.2\%$. When passive investors (activists) set the contracts of insiders, the ratio of non-pecuniary to financial benefits of transitioning has to exceed $\Gamma_G^p = 50\%$ ($\Gamma_G = 20\%$) for activism to improve the green transition rate.

4.7 Multiple Insiders

In our model insiders represent key employees who contribute to the firm's green transition. The baseline model considers a single insider. Appendix A.19 presents a model variant in which the firm has N identical insiders contributing to the transition. To ensure comparability with the baseline model, we model the efforts of insiders such that the *first-best* efforts of the activist and insiders and the transition rate are independent of the number of insiders N. Crucially, we show that the transition rate under passive ownership is also independent of N, even though all of these N insiders are subject to moral hazard and free-ride on each others' efforts. Indeed, as in the baseline, the moral hazard problem can be fully resolved when the activist does not enter. Overall, we show that our key findings remain robust to allowing for many insiders, and the equilibrium is qualitatively similar for any N.

Interestingly, as in the baseline model, the insiders' moral hazard problem cannot be resolved with active ownership and efforts are subject to the internal free rider problem. Holding all else equal, it becomes harder to incentivize a given level of total insider effort when there are more insiders, as these insiders would like to free-ride on the activist's efforts as well as on each others' efforts. As a result, when insiders are sufficiently skilled and $\xi \geq 1$, the presence of $N > 1$ insiders (as opposed to a single insider) hampers activism on the intensive margin, thus reducing $\frac{\lambda(\theta)}{\lambda(0)}$ relative to the baseline. Intuitively, the presence of many insiders exacerbates the internal free-rider problem.

As efforts become hard to incentivize when there are many insiders, the activist optimally reduces incentives provided to insiders, potentially increasing its own efforts. These effects tend to worsen the external free-rider problem. As we show, when $N \to \infty$, incentivizing insiders is prohibitively difficult, insiders exert zero effort, and the external free-rider problem becomes highly severe, requiring non-pecuniary benefits π to exceed the monetary benefits from transitioning. This reproduces the outcome of Section 4.5.

In summary, our model can accommodate an arbitrary number of insiders. Our key findings go through for any number of insiders N, with an increase in N exacerbating both the internal and external free-rider problems. Therefore, a larger number of insiders N hampers impact activism, both on the intensive and the extensive margins. The mechanism underlying this result stems from the interplay between the external and internal free-rider problems. The external free-rider problem deters activist entry when insiders' relative skills are low—precisely when activism is most needed. This effect is amplified as the number of insiders increases. As a result, activists enter only firms that can transition relatively easily on their own. However, for these firms, a larger number of insiders exacerbates the internal free-rider problem, weakening activist impact compared to the case of a single insider.

5 Conclusion

This paper develops a model of investor activism with endogenous entry and engagement, in which activists contribute to a firm's green transition by providing effort and contracting with insiders. Using this model, we investigate how investor activism influences the pace of the green transition and the role of environmental policies in shaping shareholder engagement. In our model, activism increases the green transition rate under first best, but two frictions limit its effectiveness. First, the green transition rate depends on the efforts of both the activist and insiders, which are costly, unobserved, and subject to moral hazard, leading to an internal free-rider problem. Second, activist investors cannot fully capture the gains of activism due to an external free-rider problem at entry.

We show that absent strong sustainability preferences, the internal and external free-rider problems hinder activist engagement and impact, leading to a "passive" equilibrium investment strategy that excludes firms that would benefit most from activism (e.g., more polluting firms). The external free-rider problem either discourages investment altogether or pushes activists toward firms that can transition easily at low cost. In these firms, the activist exerts limited effort due to the internal free-rider problem, effectively behaving like passive investors. While activism can have a significant positive impact in the presence of just one of these free-rider problems, their combination implies that activists have a low or even negative impact on the transition in equilibrium. Environmental policies such as carbon taxes exacerbate these issues. Overall, our model suggests an empirically weak and ambiguous relationship between activist ownership and firms' green transition.

Based on our findings, we expect activism to have a greater impact on the green transition in private capital markets, where private equity (PE) funds are actively involved with firms. First, equity investments in private firms typically suffer less from the external free-rider problem of dispersed shareholders. Second, in our model, the contract between the activist and firm is restricted to equity, which hampers the resolution of the internal free-rider problem. That is, public firms, in which activists primarily engage by buying standard equity stakes as in our model, are less likely to benefit from impact activism. In contrast, PE funds may hold more complex claims in the firms they invest in, which could help mitigate the internal free-rider problem.

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Online Appendix

A Proofs

A.1 Proof of Proposition 1

To solve for (a^{FB}, i^{FB}), take the first order conditions with respect to a and i in (8), that is $\theta(\Delta+\pi) - \phi_a a = 0$ and $\theta(\Delta+\pi) - \theta\phi_i i = 0$, to solve for $a = a^{FB}$ and $i = i^{FB}$. Clearly, the second-order condition is satisfied.

To solve for i^P and the optimization problem in (6), insert (2) and (3) into (6) to obtain (for $\hat{a} = 0$):

$$\begin{aligned} P_0 &= \max_{(C,R)} \left\{ \big(1-i\big)(X_B - C - T) + i(X_G - C - R) \right\} \\ &= \max_R \left\{ X_B - W + iR - \frac{\phi_i i^2}{2} + i(\Delta - R) \right\} \\ &= \max_i \left\{ X_B - W - \frac{\phi_i i^2}{2} + i\Delta \right\}, \end{aligned}$$

where we used $\Delta = X_G - X_B + T$. Due to (2), we can optimize with respect to i. The first-order condition with respect to i becomes $\Delta - \phi_i i = 0$ which we can solve for $i^P = \frac{\Delta}{\phi_i}$.

Under optimal effort $i = i^P$, the stock price under passive ownership becomes

$$P_0 = X_G - \Delta - W + \frac{\Delta}{2\phi_i}. \tag{A.1}$$

A.2 Proof of Proposition 2

To prove Proposition 2, we solve the optimization problem in (4) subject to (2), (3), and (9). For this sake, we insert (3) into (4) to rewrite the activist's optimization as

$$\begin{aligned} V &= \max_R \left\{ \theta\big[X_B - W + (a+i)R - \frac{\phi_i i^2}{2} + (a+i)(\Delta + \pi - R)\big] - \frac{\phi_a a^2}{2} \right\} \\ &= \max_R \left\{ \theta\big[X_B - W - \frac{\phi_i i^2}{2} + (a+i)(\Delta+\pi)\big] - \frac{\phi_a a^2}{2} \right\}, \end{aligned}$$

subject to (2) and (9). Next, we use (2), i.e., $R = \phi_i i$, to rewrite (9) as $a = \frac{\theta(\Delta+\pi-\phi_i i)}{\phi_a}$. We insert this expression for a into the activist's optimization above to obtain:

$$V = \max_i \left\{ \theta \left[X_B - W - \frac{\phi_i i^2}{2} + \left(\frac{\theta(\Delta+\pi-\phi_i i)}{\phi_a} + i \right)(\Delta+\pi) \right] - \frac{\theta^2(\Delta+\pi-\phi_i i)^2}{2\phi_a} \right\}.$$

The first-order condition with respect to i becomes

$$\frac{\partial V}{\partial i} = 0 \quad \Longleftrightarrow \quad -\phi_i i + (\Delta+\pi)\left[1 - \frac{\theta\phi_i}{\phi_a}\right] + \frac{\phi_i\theta(\Delta+\pi-\phi_i i)}{\phi_a} = 0.$$

Thus,

$$\frac{\Delta+\pi}{\phi_i}\left(1-\frac{\theta\phi_i}{\phi_a}+\frac{\theta\phi_i}{\phi_a}\right)=i\left[1+\frac{\theta\phi_i}{\phi_a}\right].$$

Using $\xi=\frac{\phi_a}{\theta\phi_i}$, we therefore obtain

$$i=\frac{\Delta+\pi}{\phi_i}\left(\frac{1}{1+1/\xi}\right)=\frac{\Delta+\pi}{\phi_i}\left(\frac{\xi}{1+\xi}\right).$$

Inserting this expression for a into (9), we obtain

$$a=\frac{\theta(\Delta+\pi-\phi_i i)}{\phi_a}=\frac{\theta(\Delta+\pi)(1-\frac{\xi}{1+\xi})}{\phi_a}=\frac{\Delta+\pi}{\phi_i}\left(\frac{1}{\xi(1+\xi)}\right).$$

Efforts (a,i) lie below their first-best levels from Proposition 1. As $\frac{\xi}{1+\xi}<1$ for $\xi>0$, we have $i<i^{FB}$. Next, rewrite $a^{FB}=\frac{\Delta+\pi}{\phi_i\xi}$, implying $a<a^{FB}$ for $\xi>0$.

Finally, we can solve for the activist's value function and the firm's stock price in closed form (under optimal efforts) as follows:

$$V=\frac{\theta\left(1+\xi+\xi^2\right)(\Delta+\pi)^2}{2\xi(\xi+1)\phi_i}+\theta(X_G-\Delta-W) \tag{A.2}$$

$$P=\frac{(\Delta+\pi)\left[(2+2\xi+2\xi^2+\xi^3)\Delta-\xi^3\pi\right]}{2\xi(\xi+1)^2\phi_i}+X_G-\Delta-W. \tag{A.3}$$

A.3 Proof of Proposition 3

We derive the entry conditions both in our baseline (with both free-rider problems) and under first-best efforts.

Baseline. Under optimal efforts, one can express the stock price as

$$P=\frac{(\Delta+\pi)\left((2+\xi(2+\xi(2+\xi)))\Delta-\xi^3\pi\right)}{2\xi(\xi+1)^2\phi_i}+X_G-\Delta-W.$$

Analogously, the activist's value function becomes

$$V=\frac{(\Delta+\pi)\left[(2+2\xi+2\xi^2+\xi^3)\Delta-\xi^3\pi\right]}{2\xi(\xi+1)^2\phi_i}+X_G-\Delta-W.$$

Accordingly, the entry objective can be written as

$$V-\theta P=\frac{\theta(\Delta+\pi)\left((2\xi^3+2\xi^2+2\xi+1)\,\pi-\Delta\right)}{2\xi(\xi+1)^2\phi_i}. \tag{A.4}$$

Thus, as desired, the entry condition becomes

$$\frac{\pi}{\Delta}\geq\frac{1}{1+2\xi(1+\xi+\xi^2)},$$

which is (11).

First Best. Inserting the first-best efforts from Proposition 1 into (7), we get that the activist enters if and only if

$$(a^{FB} + i^{FB})\theta\pi - \frac{\phi_a (a^{FB})^2}{2} \geq 0$$

Under first-best effort levels $a^{FB} = \frac{\theta(\Delta+\pi)}{\phi_a}$ and $i^{FB} = \frac{\Delta+\pi}{\phi_i}$, this condition becomes

$$\frac{\pi}{\Delta} \geq \frac{1}{1+2\xi}.$$

A.4 Proof of Corollary 1

Using the closed-form expressions for P (see (A.3)) and P_0 (see (A.1)), it is immediate to show that $P \leq P_0$ is equivalent to

$$\frac{\pi}{\Delta} \geq \frac{\xi^2 + \sqrt{(\xi+1)^2\,(2\xi^2+1)} + \xi + 1}{\xi^3}.$$

Using the expressions for V (see (A.2)) and P_0 (see (A.1)), one can show that we always have $V - \theta P_0 \geq 0$ under our assumptions, so that the activist always enters when $P \leq P_0$. Importantly, our findings remain the same if we assume that the activist must acquire its stake at price $\max\{P, P_0\}$, i.e., the larger of the stock price under passive ownership P_0 and the stock price under active ownership P. To see this note that $V - \theta P \geq 0$ is equivalent to $V - \theta \max\{P_0, P\} \geq 0$. When $P > P_0$, the equivalence is immediate as $\max\{P, P_0\} = P$. When $P \leq P_0$, we have that $V - \theta P \geq V - \theta P_0 \geq 0$.

A.5 Proof of Proposition 4

We solve $\frac{\lambda(\theta)}{\lambda(0)} = 1$, that is:

$$\lambda(\theta) = \lambda(0) \quad \Longleftrightarrow \quad (1+\xi^2)(\Delta+\pi) = (\xi+\xi^2)\Delta \quad \Longleftrightarrow \quad \xi^2\pi - \xi\Delta + \Delta + \pi = 0.$$

for ξ. This quadratic equation has maximally two real roots. Provided their existence, i.e., for $\Delta^2 \geq 4(\Delta+\pi)\pi$, these roots are

$$\xi_{\pm} = \frac{\Delta \pm \sqrt{\Delta^2 - 4(\Delta+\pi)\pi}}{2\pi}$$

We can assume $\Delta > 0$. Dividing numerator and denominator by $\Delta > 0$, we get

$$\xi_{\pm} = \frac{1 \pm \sqrt{1 - 4\frac{\pi}{\Delta}\left(1 + \frac{\pi}{\Delta}\right)}}{2\frac{\pi}{\Delta}}.$$

This expression is equivalent to (14).

In the limit $\xi \to 0$, we have $\lim_{\xi\to 0} a = +\infty$. Thus, $\frac{\lambda(\theta)}{\lambda(0)}$ is U-shaped in ξ, so that $\lambda(\theta) < \lambda(0)$ if and only if $\xi \in (\xi_-, \xi_+)$. For $\xi \notin [\xi_-, \xi_+]$, we therefore have $\lambda(\theta) > \lambda(0)$.

In the limit, $\frac{\pi}{\Delta} \to 0$, we get

$$\lim_{\frac{\pi}{\Delta}\to 0} \xi_+ = \lim_{\frac{\pi}{\Delta}\to 0} \frac{1 + \sqrt{1 - 4\frac{\pi}{\Delta}\left(1 + \frac{\pi}{\Delta}\right)}}{2\frac{\pi}{\Delta}} = +\infty.$$

In addition, by L'Hopital's rule:

$$\lim_{\frac{\pi}{\Delta}\to 0} \xi_- = \lim_{\frac{\pi}{\Delta}\to 0} \frac{1 - \sqrt{1 - 4\frac{\pi}{\Delta}\left(1 + \frac{\pi}{\Delta}\right)}}{2\frac{\pi}{\Delta}} = \lim_{\frac{\pi}{\Delta}\to 0} \left(\frac{4(1 + 2\frac{\pi}{\Delta})}{4\sqrt{1 - 4\frac{\pi}{\Delta}\left(1 + \frac{\pi}{\Delta}\right)}} \right) = 1.$$

Finally, note that when $\Delta^2 < 4(\Delta+\pi)\pi \iff 1 < 4(1+\frac{\pi}{\Delta})\frac{\pi}{\Delta}$, which holds for $\frac{\pi}{\Delta}$ sufficiently large, the equation $\lambda(\theta) = \lambda(0)$ has no root in ξ. Then, $\lambda(\theta) > \lambda(0)$ for any $\xi \in (0, \infty)$.

A.6 Proof of Proposition 5

Suppose $\pi > 0$ and $\Delta > 0$. Recall that the activist enters if and only if

$$\frac{\pi}{\Delta} \geq \frac{1}{1 + 2\xi(1 + \xi + \xi^2)}.$$

The right-hand-side decreases in ξ, with $\lim_{\xi\to+\infty} \frac{1}{1+2\xi(1+\xi+\xi^2)} = 0$ and $\lim_{\xi\to 0} \frac{1}{1+2\xi(1+\xi+\xi^2)} = 1$. Define

$$\xi_E := \inf\left\{\xi \geq 0 : \frac{\pi}{\Delta} \geq \frac{1}{1 + 2\xi(1 + \xi + \xi^2)}\right\}.$$

When $\pi \geq \Delta$, then $\xi_E = 0$. When $\Delta = 0 < \pi$, then $\xi_E = 0$. When $\pi = 0 \leq \Delta$, then $\xi_E = +\infty$. Otherwise, for $\pi, \Delta > 0$, ξ_E is the unique solution on $(0, \infty)$ to

$$\frac{\pi}{\Delta} = \frac{1}{1 + 2\xi_E(1 + \xi_E + \xi_E^2)}.$$

A.7 Proof of Corollary 2

Using the closed-form expressions (A.2)-(A.3), the entry objective can be written as

$$V - \theta P = \frac{\theta(\Delta + \pi)\left((2\xi^3 + 2\xi^2 + 2\xi + 1)\pi - \Delta\right)}{2\xi(\xi + 1)^2\phi_i}.$$

One can calculate (noting that $\xi = \frac{\phi_a}{\phi_i\theta}$):

$$\frac{\partial(V - \theta P)}{\partial\phi_i} = -\left(\frac{\theta(\Delta + \pi)(\xi(\xi(\xi + 3) + 1)\pi + \Delta)}{(\xi + 1)^3\phi_i^2}\right) < 0.$$

Thus, the activist's ex-ante payoff $V - \theta P$ decreases in ϕ_i and, in particular, is maximized on $[\underline{\phi}_i, \overline{\phi}_i]$ for $\phi_i = \underline{\phi}_i$.

A.8 Proof of Proposition 6

Most claims follow from the previous results. If

$$\xi_E := \inf\left\{\xi \geq 0 : \frac{\pi}{\Delta} \geq \frac{1}{1 + 2\xi(1 + \xi + \xi^2)}\right\}.$$

satisfies $\xi_E \in (0, \infty)$, then it solves

$$\frac{\pi}{\Delta} = \frac{1}{1 + 2\xi_E(1 + \xi_E + \xi_E^2)}.$$

The left-hand-side increases in $\frac{\pi}{\Delta}$ while the right-hand-side decreases in ξ_E. As such, ξ_E decreases with $\frac{\pi}{\Delta}$.

Next, expression (13) readily implies that $\frac{\lambda(\theta)}{\lambda(0)}$ increases with $\frac{\pi}{\Delta}$. We solve $\frac{\lambda(\theta)}{\lambda(0)} = 1$ for $\frac{\pi}{\Delta}$ to obtain

$$(1 + \xi^2)\left(1 + \frac{\pi}{\Delta}\right) = \xi + \xi^2 \iff \frac{\pi}{\Delta} = \frac{\xi + \xi^2}{1 + \xi^2} - 1 = \frac{\xi - 1}{1 + \xi^2}.$$

Consequently, $\frac{\lambda(\theta)}{\lambda(0)} \gtreqless 1$ if and only if $\frac{\pi}{\Delta} \gtreqless \Gamma_G := \frac{\xi - 1}{1 + \xi^2}$.

A.9 Proof of Corollary 3

Recall that the activist enters if and only if

$$\frac{\pi}{\Delta} \geq \frac{1}{1 + 2\xi(1 + \xi + \xi^2)} \iff \Delta = T + X_G - X_B \leq \pi\big[1 + 2\xi(1 + \xi + \xi^2)\big].$$

Thus, the activist enters if and only if $T \leq T_E := \pi\big[1 + 2\xi(1 + \xi + \xi^2)\big] - (X_G - X_B)$.

As $\frac{\lambda(\theta)}{\lambda(0)}$ decreases with Δ, it also decreases with T. Recall that $\lambda(\theta) \geq \lambda(0)$ if and only if $\frac{\pi}{\Delta} \geq \frac{\xi - 1}{1 + \xi^2}$. When $\xi \leq 1$, this inequality is always satisfied. Suppose that $\xi > 1$. Then, $\lambda(\theta) > \lambda(0)$ if and only if $\Delta < \pi\frac{1 + \xi^2}{\xi - 1}$, that is, if and only if $T \leq T_G := \frac{1 + \xi^2}{\xi - 1}\pi - (X_G - X_B)$.

A.10 Proof of Proposition 9

Assume $\Delta > 0$. Using (A.2)-(A.3), we can rewrite the activist's payoff from entering as

$$V - \theta P = \frac{\theta(\Delta + \pi)\left((2\xi^3 + 2\xi^2 + 2\xi + 1)\pi - \Delta\right)}{2\xi(\xi + 1)^2\phi_i},$$

which does not depend on α, i.e., whether preferences are broad or narrow. With broad preferences characterized through the parameter α, the activist obtains payoff $i^P\alpha\theta\pi = \frac{\Delta\pi\alpha\theta}{\phi_i}$ when not entering, where $i^P = \frac{\Delta}{\phi_i}$ is the probability of transition under passive ownership.

We obtain that the activist enters if and only if $V - \theta P \geq \frac{\Delta\pi\alpha\theta}{\phi_i}$, which is equivalent to

$$\left(1 + \frac{\pi}{\Delta}\right)\left(\left(2\xi^3 + 2\xi^2 + 2\xi + 1\right)\pi - \Delta\right) - 2\alpha\xi(\xi+1)^2\pi \geq 0.$$

The above inequality can be rewritten as

$$\left(1 + \frac{\pi}{\Delta}\right)\left(\left(2\xi^3 + 2\xi^2 + 2\xi + 1\right)\frac{\pi}{\Delta} - 1\right) - 2\alpha\xi(\xi+1)^2\frac{\pi}{\Delta} \geq 0,$$

which we can simplify further to

$$E^B := \frac{\pi}{\Delta}\left[\frac{\pi}{\Delta}\left(2\xi^3 + 2\xi^2 + 2\xi + 1\right) + 2\xi^3(1-\alpha) + 2\xi^2(1-2\alpha) + 2\xi(1-\alpha)\right] \geq 1$$

Clearly, E^B decreases in α.

The derivative of E^B with respect to ξ reads

$$\frac{\partial E^B}{\partial \xi} = \frac{\pi}{\Delta}\left[\frac{\pi}{\Delta}\left(6\xi^2 + 4\xi + 2\right) + 3\xi^2(1-\alpha) + 4\xi(1-2\alpha) + 2(1-\alpha)\right]$$

which is positive if and only if

$$\frac{\pi}{\Delta} \geq \frac{4\xi(2\alpha-1) - 2\xi^2(1-\alpha) - 2(1-\alpha)}{6\xi^2 + 4\xi + 2}.$$

A sufficient condition for $\frac{\partial E^B}{\partial \xi} > 0$ is $\alpha \leq \frac{1}{2}$.

Finally, we prove that $\mathbb{I}\{E^B \geq 1\}$ increases in $\frac{\pi}{\Delta}$, meaning that entry incentives increase in the ratio of non-pecuniary to pecuniary transition payoffs. Note that

$$\mathcal{B} := \left[\frac{\pi}{\Delta}\left(2\xi^3 + 2\xi^2 + 2\xi + 1\right) + 2\xi^3(1-\alpha) + 2\xi^2(1-2\alpha) + 2\xi(1-\alpha)\right]$$

increases in $\frac{\pi}{\Delta}$. When $\mathcal{B} < 0$, then $\mathbb{I}\{E^B \geq 1\} = 0$ and $\frac{\partial \mathbb{I}\{E^B \geq 1\}}{\partial(\pi/\Delta)} = 0$. Otherwise, if $\mathcal{B} \geq 0$, then $\frac{\partial E^B}{\partial(\pi/\Delta)} \geq 0$ and strictly so, if $\mathcal{B} > 0$. Taken together, this implies $\mathbb{I}\{E^B \geq 1\}$ increases in $\frac{\pi}{\Delta}$.

A.11 Effort Complementarity — Solution Details

We now assume that the probability of transition is given by

$$\lambda = a + i + \omega a i,$$

where the parameter $\omega \gtreqless 0$ captures an exogenous complementarity (if $\omega > 0$) or substitutability (if $\omega < 0$) of efforts in the transition process. As we will see, the double-moral hazard problem, arising from the unobservability of efforts, will introduce an additional, endogenous substitutability of efforts. All other elements remain as in the baseline. Further, note that under passive ownership, i.e., $\theta_0 = 0$, the model solution coincides with the one of the baseline, since $a = 0$ in this case.

We start by analyzing the manager's choice of effort who faces a contract (C, R) stipulating a base payment of C and a reward upon successful transition. Anticipating activist effort $\hat{a}$, the manager solves

$$\max_{i \in [0, \bar{i}]} \left(C + (\hat{a} + i + \omega \hat{a} i) R - \frac{\phi_i i^2}{2} \right),$$

leading to the incentive constraint (under optimal interior effort)

$$i = \frac{R(1 + \omega \hat{a})}{\phi_i},$$

which is (17) We denote by $W \geq 0$ the manager's outside option. Under the optimal contract that maximizes the controlling shareholders' value, the manager breaks even so that its participation constraint binds and

$$W = C + (\hat{a} + i + \omega \hat{a} i) R - \frac{\phi_i i^2}{2}, \tag{A.5}$$

which we can solve for C.

The activist chooses (C, R) and to maximize

$$V = \max_{a \geq 0, (C,R)} \Big\{ \big(1 - (a + i + \omega a i)\big) \theta (X_B - C - T) + (a + i + \omega a i) \theta \big(X_G - C - R + \pi\big) - \frac{\phi_a a^2}{2} \Big\},$$

subject to (17) and (A.5). We now take the first-order condition with respect to a, yielding

$$(a + \omega i) \theta (\Delta - R) - \phi_a a = 0$$

which, upon solving for a, yields (18). When taking the first-order condition with respect to a, note that by (A.5) and (17), (C, R) and thus i depend on anticipated activist effort $\hat{a}$ but not on actual activist effort a (which is unobserved and not contractible).

Using (A.5), the activist's value function optimization can then be rewritten as

$$\begin{aligned} V &= \max_R \left\{ \theta \big[X_B - W + \lambda R - \frac{\phi_i i^2}{2} + \lambda (\Delta + \pi - R) \big] - \frac{\phi_a a^2}{2} \right\} \\ &= \max_R \left\{ \theta \big[X_B - W - \frac{\phi_i i^2}{2} + (a + i + \omega a i)(\Delta + \pi) \big] - \frac{\phi_a a^2}{2} \right\}, \end{aligned}$$

subject to (17) and (18) and $\lambda = a + i + \omega a i$. Unless $\omega = 0$, the solution cannot be characterized analytically. We then solve for optimal efforts (a, i) numerically.

Analogously to the baseline, the entry condition then becomes under the optimal efforts (a, i)

$$V - \theta P = (a + i + \omega a i) \theta \pi - \frac{\phi_a a^2}{2} \geq 0$$

A.12 Proof of Proposition 10

By the proof of Proposition 3, we recall (A.2)-(A.3), that is,

$$V = \frac{\theta\left(1+\xi+\xi^2\right)(\Delta+\pi)^2}{2\xi(\xi+1)\phi_i} + \theta(X_G - \Delta - W)$$
$$P = \frac{(\Delta+\pi)\left[(2+2\xi+2\xi^2+\xi^3)\Delta - \xi^3\pi\right]}{2\xi(\xi+1)^2\phi_i} + X_G - \Delta - W.$$

The stock price under passive ownership becomes (see (A.1)):

$$P_0 = X_G - \Delta - W + \frac{\Delta}{2\phi_i}.$$

With $\Phi_A = \phi_a/\theta$, the entry condition $V - \theta P_0 - \eta\theta(P - P_0) \geq 0$ becomes

$$(\Delta+\pi)^2\left(\frac{\phi_i\left[\Phi_a(1-\eta)+\phi_i(1-2\,\eta)\right]}{2\,\Phi_a\left(\Phi_a+\phi_i\right)^2}\right) - \frac{\pi^2(1-\eta)}{2\phi_i} + \frac{\pi(\Delta+\pi)\eta(\phi_i-\Phi_a)}{\Phi_a(\Phi_a+\phi_i)} + \frac{\pi\Delta}{\phi_i} \geq 0.$$

Multiply both sides by $2\Phi_a\ (\Phi_a+\phi_i)^2$. Then, divide both sides by ϕ_i^2 and use $\xi = \Phi_a/\phi_i$ to obtain

$$(\Delta+\pi)^2\left[\xi(1-\eta)+1-2\,\eta\right] + 2\pi(\Delta+\pi)\eta(1-\xi^2) + 2\pi\Delta\xi\ (1+\xi)^2 - \pi^2(1-\eta)\xi\ (1+\xi)^2 \geq 0.$$

Collecting terms yields, we can rewrite the above inequality to $E \geq 0$ with

$$E := (\Delta+\pi)^2\left[\xi(1-\eta)+1-2\eta\right] + 2(\Delta+\pi)\pi(1+\xi)\left[\eta+\xi(1-\eta)+\xi^2\right] - \pi^2(1-\eta)\xi(1+\xi)^2.$$

Next, calculate for $1-\eta > 0$:

$$\begin{aligned}\frac{\partial E}{\partial \xi} &= (\Delta+\pi)^2(1-\eta) + 2(\Delta+\pi)\pi\left[\eta+\xi(1-\eta)+\xi^2\right] \\ &\quad + 2(\Delta+\pi)\pi(1+\xi)\left[1-\eta+2\xi\right] - \pi^2(1-\eta)(1+\xi)^2 - 2\pi^2(1-\eta)\xi(1+\xi) \\ &> 2\pi^2(1+\xi)\left[1-\eta+2\xi\right] - \pi^2(1-\eta)(1+\xi)^2 - 2\pi^2(1-\eta)\xi(1+\xi) \\ &\propto 1 + \frac{4\xi}{1-\eta} - (1+\xi) - 2\xi > \xi \geq 0.\end{aligned}$$

The sign "$\propto$" means that the third and fourth lines have the same sign, where the fourth line is obtained upon dividing the third line by $\pi^2(1+\xi)(1-\eta) > 0$. Note that when $\Delta > 0$ or $\pi > 0$, $\lim_{\xi\to\infty} E = +\infty$. Thus, there exists unique $\xi_E \geq 0$ such that $E \geq 0$ and the activist enters if and only if $\xi \geq \xi_E$. Furthermore, it follows that

$$2(\Delta+\pi)\pi(1+\xi)\left[\eta+\xi(1-\eta)+\xi^2\right] - \pi^2(1-\eta)\xi(1+\xi)^2 \geq 0,$$

Therefore, a necessary condition for $E < 0$ is that $\xi < \frac{2\eta-1}{1-\eta}$. This implies that $\xi_E \in \left[0, \frac{2\eta-1}{1-\eta}\right]$.

Finally, we calculate

$$\begin{aligned}\frac{\partial E}{\partial \pi} &= 2(\Delta+\pi)\left[\xi(1-\eta)+1-2\eta\right] \\ &\quad + (2\Delta\pi+4\pi)(1+\xi)\left[\eta+\xi(1-\eta)+\xi^2\right] - 2\pi(1-\eta)\xi(1+\xi)^2 > 0.\end{aligned}$$

Thus, there exists π_E such that the activist enters if and only if $\pi \geq \pi_E$.

A.13 Proof of Proposition 7

Under the optimal interior $\theta = \theta^*$, let $\xi = \frac{\phi_a}{\phi_i \theta} = \frac{\phi_a}{\phi_i \theta^*}$ and $\bar{\xi} = \frac{\phi_a}{\phi_i \bar{\theta}}$.. By definition, $\bar{\xi} = \xi_E$. If $\pi \geq \Delta$, then $\xi_E = 0$. Otherwise, $\bar{\xi} = \xi_E$ is the unique solution to

$$\frac{\pi}{\Delta} = \frac{1}{1 + 2\xi_E(1 + \xi_E + \xi_E^2)}.$$

When choosing the size of its stake, the objective of the activist is to maximize

$$V - \theta P = \frac{\theta(\Delta + \pi)\left(\left(2\xi^3 + 2\xi^2 + 2\xi + 1\right)\pi - \Delta\right)}{2\xi(\xi + 1)^2 \phi_i}$$

If $\theta^* \in (0, 1)$, then $\theta = \theta^*$ solves the first-order condition $\frac{\partial(V - \theta P)}{\partial \theta} = 0$, which we can calculate as

$$\pi\left[1 + \xi(1 + \xi)(3 + \xi^2)\right] = \Delta(1 + 2\xi) \quad \Longleftrightarrow \quad \frac{\pi}{\Delta} = \frac{1 + 2\xi}{1 + \xi(1 + \xi)(3 + \xi^2)}. \tag{A.6}$$

Under $\theta = \theta^*$, we have $\lambda(\theta) \gtrless \lambda(0)$ if and only if $\frac{\pi}{\Delta} \gtrless \frac{\xi - 1}{1 + \xi^2}$. Thus, $\lambda(\theta^*) > \lambda(0)$ if and only if

$$\frac{\pi}{\Delta} = \frac{1 + 2\xi}{1 + \xi(1 + \xi)(3 + \xi^2)} \geq \frac{\xi - 1}{1 + \xi^2}.$$

Next, define the function

$$F(\xi) := \frac{1 + 2\xi}{1 + \xi(1 + \xi)(3 + \xi^2)} - \frac{\xi - 1}{1 + \xi^2}.$$

Notice that $\lambda(\theta^*) > \lambda(0)$ if and only if $F(\xi) > 0$ under the optimal $\theta = \theta^*$.

Crucially, the function $F(\xi)$ has precisely five (complex or real) roots. One can guess and verify that $F(\xi)$ has the following five roots: $\xi = -1$, $\xi \pm i\sqrt{2}$, and $\xi = \frac{1}{2}(1 \pm \sqrt{5})$. In particular, the only positive, real root is $\xi = \frac{1}{2}(1 + \sqrt{5})$.

For $\xi = \frac{1}{2}(1 + \sqrt{5})$, we have that $\frac{1+2\xi}{1+\xi(1+\xi)(3+\xi^2)} = \frac{\xi-1}{1+\xi^2} = \frac{3\sqrt{5}}{10} - \frac{1}{2} =: \Gamma^*$. Note that $F(0) > 0$, implying that $0 \gtrless F(\xi)$ for $\xi \gtrless \frac{1}{2}(1 + \sqrt{5})$. Additionally, we can calculate

$$\frac{\partial}{\partial \xi}\left(\frac{1 + 2\xi}{1 + \xi(1 + \xi)(3 + \xi^2)}\right) = -\frac{(1 + 6\xi + 9\xi^2 + 8\xi^3 + 6\xi^4)}{(1 + 3\xi + 3\xi^2 + \xi^3 + \xi^4)^2} < 0.$$

Because $\frac{1+2\xi}{1+\xi(1+\xi)(3+\xi^2)} = \Gamma^*$ for $\xi = \frac{1}{2}(1 + \sqrt{5})$ $\frac{1+2\xi}{1+\xi(1+\xi)(3+\xi^2)} = \Gamma^*$, it follows that $\frac{\pi}{\Delta} > \Gamma^*$ implies $\xi < \frac{1}{2}(1 + \sqrt{5})$ for $\theta = \theta^*$. Consequently, $\frac{\pi}{\Delta} > \Gamma^*$ implies $\frac{\pi}{\Delta} > \frac{\xi-1}{1+\xi^2}$ and therefore $\lambda(\theta^*) > \lambda(0)$. By contrast, for $\frac{\pi}{\Delta} < \Gamma^*$, we obtain $\frac{\pi}{\Delta} < \frac{\xi-1}{1+\xi^2}$ and so $\lambda(\theta^*) < \lambda(0)$.

Next, define the function

$$G(\xi) = \frac{1}{1 + 2\xi(1 + \xi + \xi^2)} - \frac{1 + 2\xi}{1 + \xi(1 + \xi)(3 + \xi^2)}$$

This function has precisely four roots. One can guess and verify that these roots are $\xi = -1$, $\xi = 0$, $\xi = -\frac{1}{3}i(\sqrt{2} - i)$, and $\xi = \frac{1}{3}i(\sqrt{2} + i)$. In particular, the function $G(\xi)$ does not possess any positive, real root. As can be checked, this implies that $G(\xi) < 0$ for $\xi \in (0, \infty)$.

Because $\frac{1}{1+2\xi_E(1+\xi_E+\xi_E^2)}$ clearly decreases in ξ_E and $\frac{\pi}{\Delta} = \frac{1}{1+2\xi_E(1+\xi_E+\xi_E^2)} = \frac{1+2\xi}{1+\xi(1+\xi)(3+\xi^2)}$, it follows that $\xi_E < \xi$, i.e., $\overline{\theta} > \theta^*$.

Further, calculate

$$\frac{\partial}{\partial \xi}\left(\frac{\xi - 1}{1+\xi^2}\right) = \frac{(-\xi^2 + 2\xi + 1)}{(1+\xi^2)^2}.$$

Note that $\frac{\partial}{\partial \xi}\left(\frac{\xi-1}{1+\xi^2}\right) > 0$ for $\xi < 1 + \sqrt{2}$.

For $\frac{\pi}{\Delta} = \Gamma^*$, we have under the optimal $\theta = \theta^*$ that $\xi = \frac{1}{2}(1+\sqrt{5}) < 1 + \sqrt{2}$. Thus,

$$\frac{\pi}{\Delta} = \frac{\xi - 1}{1+\xi^2} > \frac{\xi_E - 1}{1+\xi_E^2},$$

where we used $\xi_E < \xi < 1 + \sqrt{2}$ and that $\frac{1+2\xi}{1+\xi(1+\xi)(3+\xi^2)}$ increases in ξ for all $\xi < 1 + \sqrt{2}$. Since $\frac{\pi}{\Delta} < \Gamma^*$ implies $\frac{\pi}{\Delta} < \frac{\xi-1}{1+\xi^2}$ and thus $\lambda(\theta^*) < \lambda(0)$, there exists, by continuity, $\varepsilon > 0$ such that for $\frac{\pi}{\Delta} \in (\Gamma^* - \varepsilon, \Gamma^*)$ it holds $\frac{\xi-1}{1+\xi^2} > \frac{\pi}{\Delta} > \frac{\xi_E-1}{1+\xi_E^2}$ as well as $\lambda(\theta^*) < \lambda(0) < \lambda(\overline{\theta})$.

Finally, calculate $\frac{\partial \lambda(\theta)}{\partial \theta} \gtrless 0$ if and only if $\xi \gtrless 1 + \sqrt{2}$. Recall that for $\frac{\pi}{\Delta} < \Gamma^*$, we have $\xi_E < \xi < 1 + \sqrt{2}$, as well as $\overline{\theta} > \theta^*$. As a result, $\lambda(\overline{\theta}) > \lambda(\theta^*)$ for $\frac{\pi}{\Delta} < \Gamma^*$.

A.14 Proof of Proposition 8

The objective function is

$$V - \theta P = \frac{\theta(\Delta + \pi)\left(\left(2\xi^3 + 2\xi^2 + 2\xi + 1\right)\pi - \Delta\right)}{2\xi(\xi+1)^2\phi_i}.$$

If $\theta^* \in (0,1)$, then $\theta = \theta^*$ solves the first-order condition $\frac{\partial(V-\theta P)}{\partial \theta} = 0$, which we can calculate as

$$\frac{\pi}{\Delta} = \frac{1+2\xi}{1+\xi(1+\xi)(3+\xi^2)}. \tag{A.7}$$

Calculate

$$\frac{\partial}{\partial \xi}\left(\frac{1+2\xi}{1+\xi(1+\xi)(3+\xi^2)}\right) = -\frac{(1+6\xi+9\xi^2+8\xi^3+6\xi^4)}{(1+3\xi+3\xi^2+\xi^3+\xi^4)^2} < 0.$$

Thus, as $\frac{\pi}{\Delta}$ increases, the right-hand-side of the first-order condition (A.7) must increase, which requires ξ to decrease under the optimal $\theta = \theta^*$. Due to $\xi = \frac{\phi_a}{\phi_i \theta}$, this requires $\theta = \theta^*$ to increase. Consequently, θ^* increases with π but decreases with Δ.

Moreover, a change in ϕ_a or ϕ_i leaves the left-hand side of the first-order condition (A.7) unchanged. Thus, the right-hand side must remain unchanged, too. Due to $\xi = \frac{\phi_a}{\phi_i \theta}$, it therefore must be that $\frac{d}{dx}\left(\frac{\phi_a}{\phi_i \theta}\right)$ remains constant under optimal $\theta = \theta^*$. Thus, θ^* increases in ϕ_a but decreases in ϕ_i.

A.15 Proof of Corollary 4

Corollary 2 shows that for any θ, $V - \theta P$ decreases in ϕ_i and, therefore, is maximized on $[\underline{\phi}_i, \overline{\phi}_i]$ for $\phi_i = \underline{\phi}_i$. Thus, $\phi_i = \underline{\phi}_i$ maximizes $V - \theta P$ under the optimal choice of θ, i.e., under $\theta = \theta^*$.

A.16 Proof of Proposition 11

The claims regarding the transition rates follow by direct calculation. For the entry condition, note that no contracting is equivalent to setting $\xi = 0$ in condition (11), yielding the entry condition.

A.17 Proof of Proposition 12

When passive investors determine the manager's contract, the incentive conditions (2) and (9) apply, as well as the participation constraint (3). Then, passive investors maximize

$$P = \max_{C,R} \left\{ \left(1 - (a+i)\right)\left(X_B - C - T\right) + (a+i)\left(X_G - C - R\right) \right\}$$
$$= \max_{i} \left\{ X_B - W - \frac{\phi_i i^2}{2} + \left(\frac{\theta(\Delta + \pi - \phi_i i)}{\phi_a} + i \right) \Delta \right\}.$$

The first-order condition with respect to i becomes

$$-\phi_i i + \Delta \left(1 - \frac{1}{\xi}\right) = 0.$$

When $m > 0$ is interior, then

$$i = \frac{\Delta}{\phi_i} \frac{\xi - 1}{\xi}.$$

When $\xi \leq 1$, then $i = 0$. For $\xi > 1$, we can insert above expression for i into (9) to obtain

$$a = \frac{\theta(\Delta + \pi - \phi_i i)}{\phi_a} = \frac{\theta(\Delta/\xi + \pi)}{\phi_a} = \frac{1}{\phi_i} \frac{\Delta + \pi\xi}{\xi^2}.$$

For $\xi \leq 1$, we have $a = \frac{\Delta + \pi}{\phi_i} \frac{1}{\xi} > i^P = \frac{\Delta}{\phi_i}$. When $\xi > 1$, then

$$a + i = \frac{\Delta}{\phi_i} \left(1 - \frac{\xi - 1}{\xi^2}\right) + \frac{\pi}{\phi_i \xi},$$

and, therefore,

$$a + i - i^P = \frac{1 - \xi}{\xi^2} \frac{\Delta}{\phi_i} + \frac{\pi}{\phi_i \xi}. \tag{A.8}$$

This implies $\lambda(\theta) = a + i \geq \lambda(0) = i^P$ if and only if

$$\frac{\pi}{\Delta} \geq \Gamma_G^p := \frac{\xi - 1}{\xi}.$$

When $\xi \leq 1$, then $a + i = \frac{\Delta\pi}{\phi_i \xi}$ and

$$a + i - i^P = \frac{1 - \xi}{\xi} \frac{\Delta}{\phi_i} + \frac{\pi}{\phi_i \xi} \geq 0.$$

In this case, the activism improves the transition rate for all parameter values.

Using the effort levels calculated above, we can characterize the stock price under the optimal contract set by passive investors:

$$P = \frac{\Delta\left(2\xi\pi + \xi^2\Delta + \Delta\right)}{2\xi^2\phi_M} + X_G - \Delta - W$$

if $\xi > 1$ and

$$P = \frac{\Delta(\Delta+\pi)}{\xi\phi_M} + X_G - \Delta - W$$

if $\xi \leq 1$. The activist's value function becomes

$$V = \frac{\theta\left(\xi^2\pi^2 + \left(\xi^3 + \xi - 1\right)\Delta^2 + 2\xi^3\Delta\pi\right)}{2\xi^3\phi_i} + \theta(X_G - \Delta - W)$$

if $\xi > 1$ and

$$V = \frac{\theta(\Delta+\pi)^2}{2\xi\phi_i} - \theta(X_G - \Delta - W)$$

if $\xi \leq 1$. Rearranging the entry condition $V - \theta P$ and simplifying, we obtain that the activist enters and $V - \theta P \geq 0$ if and only if

$$\frac{\pi}{\Delta} \geq \Gamma_E^p := 1 - \xi + \sqrt{\xi^2 - 2\xi + 1 + \xi^{-2}} = 1 - \xi + \sqrt{(1-\xi)^2 + \xi^{-2}}.$$

A.18 Proof of Corollary 5

First, we start by showing that the activist's is higher and the manager's effort is lower than in the baseline. For $\xi \leq 1$, we have $i = 0$ (when passive investors set the contract, and it is clear that the manager's effort is lower than in the baseline. Moreover, $a = \frac{\Delta+\pi}{\phi_i}\frac{1}{\xi}$ clearly exceeds $\frac{\Delta+\pi}{\phi_i}\frac{1}{\xi(1+\xi)}$, i.e., the activist's effort in the baseline. Second, consider $\xi > 1$, so $i = \frac{\Delta}{\phi_i}\frac{\xi-1}{\xi} \leq \frac{\Delta+\pi}{\phi_i}\frac{\xi-1}{\xi}$. Next, note that $\frac{\xi-1}{\xi} \gtrless \frac{\xi}{1+\xi} \iff \xi^2 - 1 \gtrless \xi^2$. Thus, $\frac{\xi-1}{\xi} < \frac{\xi}{1+\xi}$, so managerial effort is lower than in the baseline. The activist's effort is $a = \frac{\Delta+\pi\xi}{\phi_i}\frac{1}{\xi^2} > \frac{\Delta+\pi}{\phi_i}\frac{1}{\xi^2}$. Clearly, $\frac{1}{\xi^2} > \frac{1}{\xi(1+\xi)}$, so the activist's effort is higher than in the baseline.

Second, we compare the transition rates both when passive investors set the contract and the activist sets the contract. When $\xi < 1$, we have $\lambda(\theta) = a = \frac{\Delta+\pi}{\phi_i}\frac{1}{\xi}$. The transition rate from the baseline equals $\frac{\Delta+\pi}{\phi_i}\frac{1+\xi^2}{\xi(1+\xi)} < \frac{\Delta+\pi}{\phi_i}\frac{1+\xi}{\xi(1+\xi)} = \lambda$ where we used $\xi < 1$. For $\xi > 1$, the transition rate becomes $\lambda = \frac{1}{\phi_i}\frac{\Delta+\pi\xi+\Delta\xi(\xi-1)}{\xi^2} < \frac{\Delta+\pi}{\phi_i}\frac{1+\xi-1}{\xi} =< \frac{\Delta+\pi}{\phi_i}\frac{1+\xi}{\xi(1+\xi)}$. This is smaller, due to $\xi > 1$, than the transition rate from the baseline, i.e., $\frac{\Delta+\pi}{\phi_i}\frac{1+\xi^2}{\xi(1+\xi)}$.

When active (passive) investors design the managerial contract, then $\lambda(\theta) \geq \lambda(0)$ if and only if $\frac{\pi}{\Delta} \geq \Gamma_G$ ($\frac{\pi}{\Delta} \geq \Gamma_G^p$. For $\xi > 1$, we have

$$\Gamma_G^p - \Gamma_G = \frac{\xi-1}{\xi} - \frac{\xi-1}{1+\xi^2} > 0.$$

for $\xi \leq 1$, activism improves transition rate and $\lambda(\theta) \geq \lambda(0)$ regardless of whether active or passive investors design the managerial contract, i.e., $\Gamma_G, \Gamma_G^p \leq 0$.

Third, recall $\Gamma_E = \frac{1}{1+2\xi(1+\xi+\xi^2)}$, while $\Gamma_E^p = 1 - \xi + \sqrt{\xi^2 - 2\xi + 1 + \xi^{-2}}$ for $\xi \geq 1$ and $\Gamma_E^p = 1$

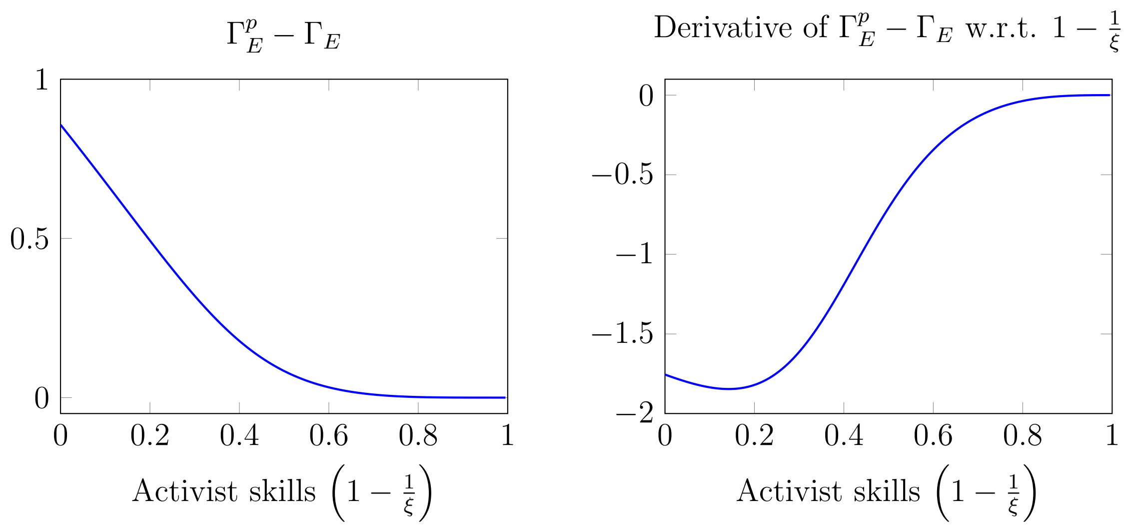

Figure A.1: $\Gamma_E^p - \Gamma_E$: The figure plots the difference $\Gamma_E^p - \Gamma_E$ between the entry threshold when the managerial contract is set by passive investors and the entry threshold when the managerial contract is set by activists in the case of $\xi > 1$. Both thresholds only depend on ξ. To show the whole unbounded domain of ξ in $[1, \infty)$, the figure uses a monotonic increasing function $1 - \frac{1}{\xi}$ to transform the domain to a bounded interval on $[0, 1)$. The right panel plots the derivative of $\Gamma_E^p - \Gamma_E$ with respect to $1 - \frac{1}{\xi}$.

for $\xi < 1$. It is immediate that for $\xi \leq 1$, we have $\Gamma_E^p > \Gamma_E$ for $\xi \geq 1$. Finally, we verify that

$$\Gamma_E^p - \Gamma_E = 1 - \xi + \sqrt{\xi^2 - 2\xi + 1 + \xi^{-2}} - \frac{1}{1 + 2\xi(1 + \xi + \xi^2)}$$

exceeds zero also for $\xi > 1$. We can readily show that $\lim_{\xi \to \infty}(\Gamma_E^p - \Gamma_E) = 0$, but otherwise $\Gamma_E^p - \Gamma_E$ is analytically fairly intractable on the whole domain. Since $\Gamma_E^p - \Gamma_E$ is a function of one variable ξ that does not involve any other model parameters, we use numerical evaluation to assess its sign. To evaluate $\Gamma_E^p - \Gamma_E$ on the whole unbounded domain of ξ in $(1, \infty)$, we use a monotonic increasing function $1 - \frac{1}{\xi}$ to transform the domain to a bounded interval on $(0, 1)$. Figure A.1 shows that $\Gamma_E^p - \Gamma_E$ is monotonically decreasing and positive on the whole domain, confirming the claim that $\Gamma_E^p - \Gamma_E$ is positive for $\xi > 1$.

A.19 Solution With $N \geq 1$ Insiders

In our baseline, the insider is meant to represent many key employees and insiders who all contribute to the firm's transition. We now present a model variant that explicitly models $N \geq 1$ insiders. These insiders are symmetric and indexed by $n \in \{1, 2, ...N\}$. For this sake, we assume that the transition probability equals

$$\lambda = a + \underbrace{\sum_{n=1}^{N} i_n}_{\equiv i}.$$

Each insider n exerts unobservable effort i_n against quadratic cost $\frac{\hat{\phi}_i(i_n)^2}{2}$ with $\hat{\phi}_i > 0$, taking the efforts of the activist and other insiders as given. We define $i = \sum_{n=1}^{N} i_n$. It is natural to focus on symmetric efforts, so that total effort is given by $i = Ni_n$.

In what follows, we solve the model with many insiders and highlight that the solution and outcomes are qualitatively similar to those in the baseline with $N = 1$. However, we also show that larger N generally hampers the impact of activism.

First Best. We start by solving first-best efforts that maximize

$$\max_{a,(i_n)} \left\{ \lambda(\Delta + \pi) - \frac{\phi_a a^2}{2} - \sum_{n=1}^{N} \frac{\hat{\phi}_i i_n^2}{2} \right\}.$$

In first best, total insider effort and activist effort are independent of the number of insiders N and satisfy:

$$a^{FB} = \frac{\Delta + \pi}{\phi_a} \quad \text{and} \quad i^{FB} = \frac{N(\Delta + \pi)}{\hat{\phi}_i} \quad \text{where} \quad i_n^{FB} = \frac{i^{FB}}{N}.$$

To hold first-best levels constant (for any N) and facilitate a comparison with our baseline, we assume that each insider's impact on the firm's transition diminishes as the number of insiders N grows. We model this by stipulating that the cost increases with N, in that:[13]

$$\hat{\phi}_i = N\phi_i.$$

Thus, the first-best level above coincides with those in the baseline with one insider, shown in Proposition 1. As a result, any differences in transition rates that arise relative to the baseline must be attributable to the interaction between the number of insiders N and the internal free-rider problem, i.e., moral hazard. We now solve the model with moral hazard.

Incentive Constraints. In the problem with moral hazard, it is natural to restrict attention to symmetric contracts (C_n, R_n)—i.e., C_n, R_n are constant over n—offered to insiders where we define total base wage $C \equiv NC_n$ and total reward $R \equiv NR_n$. Likewise, each insider has an outside option $W_n = \frac{W}{N}$. Thus, we have $i = Ni_n$ and the incentive condition for an individual insider becomes

$$i_n = \frac{R_n}{\hat{\phi}_i} = \frac{R_n}{\phi_i N} \iff i = \sum_{n=1}^{N} i_n = \frac{NR_n}{\phi_i N} = \frac{R}{N\phi_i}. \tag{A.9}$$

Upon transitioning, insiders are paid in total $R = NR_n$ dollars, so that equity holder's monetary payoff of transitioning equals $\Delta - R = \Delta - N\phi_i i$. This leads to the activist's incentive constraint:

$$a = \frac{\theta(\Delta + \pi - R)}{\phi_a} = \frac{\theta(\Delta + \pi - i\phi_i N)}{\phi_a}. \tag{A.10}$$

Finally, each insider's participation constraint binds, i.e.,

$$W_n = C_n + (\hat{a} + i)R_n - \frac{\phi_i N i_n^2}{2}.$$

[13] We could alternatively assume $\hat{\phi}_i = \phi_i$, but scale the contributions of insiders' efforts to the transition by $1/\sqrt{N}$, specifically, $\lambda = a + \frac{\sum_{n=1}^{N} i_n}{\sqrt{N}}$. Then, first-best efforts — maximizing $\lambda(\Delta + \pi) - \frac{\phi_a a^2}{2} - \sum_{n=1}^{N} \frac{\phi_i i_n^2}{2}$ —would satisfy $i_n = \frac{\Delta+\pi}{\sqrt{N}\phi_i}$, i.e., $\frac{\sum_{n=1}^{N} i_n}{\sqrt{N}} = \frac{\Delta+\pi}{\phi_i}$, generating the same transition rate as in the baseline.

Accordingly, we can sum both sides over n and solve for $C = NC_n$ using $i_n = \frac{i}{N}$:

$$C = W - (\hat{a} + i)R + \frac{\phi_i N^2 i_n^2}{2} = W - (\hat{a} + i)R + \frac{\phi_i i^2}{2}. \tag{A.11}$$

Passive Ownership. Passive ownership implies $\hat{a} = a = 0$. Passive owners maximize

$$P_0 = \max_{(C,R)} \big\{ \big(1 - i\big)(X_B - C - T) + i(X_G - C - R) \big\}$$

subject to (A.10) and (A.11). After some algebra, one can show that effort i is chosen to maximize

$$\max_{i \geq 0} \left(\Delta i - \frac{N^2 \phi_i i_n^2}{2} \right) \quad \text{s.t.} \quad i = N i_n.$$

Noting that $\Delta i - N \frac{N \phi_i i_n^2}{2} = \Delta i - \frac{\phi_i i^2}{2}$, we get

$$i^P = \frac{\Delta}{\phi_i} \tag{A.12}$$

which coincides with insider effort under passive ownership in the baseline; see Proposition 1.

Active Ownership. While the number of insiders does not matter in first best or under passive ownership, it exacerbates the internal free-rider problem with the activist. Indeed, holding total insider effort i fixed, the activist's incentives to exert effort in (A.10) decrease with the number of insiders N. The reason is that when there are more insiders, incentivizing a given level of i becomes harder and requires higher rewards, diminishing the share of transition surplus accruing to the activist. We now solve for efforts and transition rate under active ownership.

After entry, the activist's expected payoff is given by (4). We can insert aforementioned expression for C, i.e., (A.11), to rewrite the activist's optimization as follows:

$$\begin{aligned} V &= \max_R \left\{ \theta \big[X_B - W + (a + i)R - \frac{\phi_i i^2}{2} + (a + i)(\Delta + \pi - R) \big] - \frac{\phi_a a^2}{2} \right\} \\ &= \max_R \left\{ \theta \big[X_B - W - \frac{\phi_i i^2}{2} + (a + i)(\Delta + \pi) \big] - \frac{\phi_a a^2}{2} \right\}, \end{aligned}$$

subject to (A.9) and (A.10). Next, we use (A.10), i.e., $a = \frac{\theta(\Delta + \pi - N\phi_i i)}{\phi_a}$. We insert this expression for a into the activist's optimization above to obtain:

$$V = \max_i \left\{ \theta \left[X_B - W - \frac{\phi_i i^2}{2} + \left(\frac{\theta(\Delta + \pi - \phi_i N i)}{\phi_a} + i \right) (\Delta + \pi) \right] - \frac{\theta^2 (\Delta + \pi - \phi_i N i)^2}{2\phi_a} \right\}.$$

The first order condition with respect to i becomes

$$-\phi_i i + (\Delta + \pi) \left(1 - \frac{N}{\xi} \right) + \frac{N(\Delta + \pi - N\phi_i i)}{\xi} = 0,$$

leading to

$$i = \frac{\Delta + \pi}{\phi_i} \left(\frac{\xi}{\xi + N^2} \right).$$

Next, we use $a = \frac{\theta(\Delta+\pi-i\phi_i N)}{\phi_a} = \frac{(\Delta+\pi)/\phi_i - iN)}{\xi}$ to get

$$a = \frac{\Delta+\pi}{\phi_i}\left(\frac{N^2+\xi(1-N)}{\xi(\xi+N^2)}\right).$$

The transition rate, conditional on activist entry, then equals $\lambda(\theta) = a + i$.

Note that i decreases with N. As N increases, insiders' moral hazard worsens and incentive provision to them becomes more costly. As such, the activist reduces i when N increases.

Activism on the Intensive Margin and Internal Free-Rider Problem. We contrast the transition rate under active ownership to that under passive ownership, i.e., $i^P = \frac{\Delta}{\phi_i}$. Thus,

$$\frac{\lambda(\theta)}{\lambda(0)} = \frac{\xi^2+N^2+\xi(1-N)}{\xi^2+\xi N^2}\left(1+\frac{\pi}{\Delta}\right) =: \mathcal{F}(N). \tag{A.13}$$

Note that $\frac{\lambda(\theta)}{\lambda(0)}$ is non-monotonic and U-shaped in N: It decreases for $N < \xi + \sqrt{\xi^2+\xi}$, it increases for $N > \xi + \sqrt{\xi^2+\xi}$ and thus has a unique minimum at $N = \xi + \sqrt{\xi^2+\xi}$. As $N \to \infty$, we have $\frac{\lambda(\theta)}{\lambda(0)} \to \mathcal{F}(\infty) := \frac{1}{\xi}\left(1+\frac{\pi}{\Delta}\right)$.

This implies that

$$\mathcal{F}(1) > \mathcal{F}(N) \quad \text{for all} \quad N > 1 \quad \Longleftrightarrow \quad \mathcal{F}(1) > \mathcal{F}(\infty).$$

Note that $\mathcal{F}(1) = \frac{\xi^2+1}{\xi^2+\xi}\left(1+\frac{\pi}{\Delta}\right) > \mathcal{F}(\infty) = \frac{1}{\xi}\left(1+\frac{\pi}{\Delta}\right)$ is equivalent to $\xi^2+1 > \xi+1$ and thus to $\xi > 1$. Thus, for $\xi > 1$, i.e., relatively skilled insiders, having $N > 1$ insiders always leads to lower $\frac{\lambda(\theta)}{\lambda(0)}$ than under baseline with $N = 1$ insider.

That is, the presence of many insiders hampers activism on the intensive margin. The intuition is that when there are many insiders, it becomes harder to incentivize a given level of total insider effort i, as opposed to when there is a single insiders. Holding i fixed, the total reward promised to insiders increases with N, which in turn reduces the activist's incentives to exert transition efforts. In other words, the internal free-rider problem becomes more severe with many insiders, impeding incentive provision.

Activism on the Extensive Margin and External Free-Rider Problem. Finally, the entry condition becomes

$$V - \theta P = (a+i)\theta\pi - \frac{\phi_a a^2}{2} \geq 0.$$

Thus, for $x = \frac{\pi}{\Delta}$, we can rewrite the entry condition as:

$$\frac{x}{\xi(1+x)}\left(\frac{\xi^2+N^2+\xi(1-N)}{\xi^2+\xi N^2}\right) - \frac{1}{2}\left(\frac{N^2+\xi(1-N)}{\xi(\xi+N^2)}\right)^2 \geq 0$$

That is:

$$\frac{\pi}{\Delta} \geq \frac{\left[N^2+\xi(1-N)\right]^2}{2\xi^3+(N^2+1)\xi^2+2N^2(2-N)\,\xi+N^4}. \tag{A.14}$$

This expression simplifies to (11) upon setting $N = 1$ and becomes $\frac{\pi}{\Delta} \geq 1$ in the limit $N \to \infty$. Thus, the limit $N \to \infty$ results in a very severe external free-rider problem with activist entry only if non-pecuniary benefits of transitioning exceed monetary benefits.

As in the baseline, high ξ facilitates entry and implies a relatively mild external free-rider problem. The activist does not enter for low values of ξ.

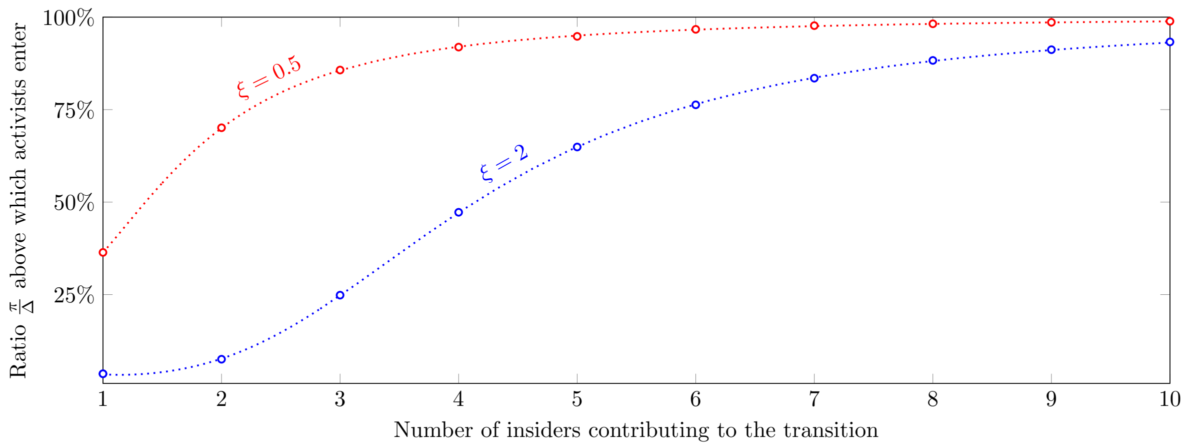

Figure A.2: The figure plots the right-hand-side of (A.14) against N for $\xi = 0.5$ and $\xi = 2$.

The limit cases $N = 1$ and $N \to \infty$ indicate that the right-hand-side of (A.14) increase in N. Figure A.2 confirms this intuition and plots the right-hand side of (A.14) against N for two different values of ξ, demonstrating that it increases with N. Thus, larger N exacerbates the external free-rider problem. The intuition is that as N increases, it becomes more costly to incentivize insiders, reducing contracted i and i_n. Thus, for large N, the activist curbs insiders' incentives, reducing the transition rate and potentially boosting its own incentives to exert effort. Both effects worsen the external free-rider problem at entry.

The Impact of Having Many Insiders, $N > 1$. Overall, our findings suggest that the presence of many insiders, i.e., $N > 1$, hampers the impact of activism, relative to the baseline with one insider only. First, the external free-rider problem — which becomes more severe with higher N — prevents activists from entering when ξ is low. Thus, the activist only enters when ξ is high. Second, higher N makes it harder to incentivize insiders, worsening the impact of activism on the intensive margin for large ξ. This reflects that a higher number of insiders worsens the internal free-rider problem, making it more costly to provide incentives to insiders and reducing insiders' incentives. Indeed, total insider effort i declines with N. In the limit $N \to \infty$, the internal free-rider problem becomes so severe that the activist refrains from providing incentives to insiders, in that $i = 0$ and $a = a^{FB}$.