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 by exerting effort and contracting with management. Due to a free-rider problem at entry, activists either avoid investing or tilt their investments toward greener firms with lower transition costs. In addition, while activism facilitates the green transition when efforts are observable, management and activist efforts become substitutes under moral hazard, which can lead to ineffective or even counterproductive activism. Carbon taxation and green investment subsidies strengthen these mechanisms, further reducing the effectiveness of impact activism.

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

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There is widespread consensus that a green transition in production 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 so as to influence their cost of capital and incentivize investment in 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, 2022; Pedersen, 2024) and could even have adverse environmental effects (Hartzmark and Shue, 2023). Investor activism is thus increasingly being advocated as the 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 green transition in production technologies. To do so, we develop a model of investor activism with endogenous activist entry and engagement, where an activist may foster a firm's green transition both by providing effort and contracting with management. Our model incorporates two frictions that impact the effectiveness of activist-driven change. First, the green transition rate depends on the efforts of both the activist and management, which are costly and unobserved, giving rise to a double-sided moral hazard problem. Second, activists cannot fully capture the financial benefits of their activism, as these gains are partially reflected in the acquisition price of their equity stake. We show that the latter friction implies an endogenous selection mechanism that tilts activists' investments towards "greener" firms that can transition at low cost and, thus, benefit less from activist engagement. The former friction, together with the fact that activists' goals do not fully align with maximizing the green transition rate, implies that activism may hamper the green transition. That is, similar to models of passive strategies that rely on the discount rate channel, our results suggest that active strategies may have little impact on the green transition and, in some instances, could even obstruct it. We show that environmental policies, such as carbon taxation or green investment subsidies, strengthen these mechanisms and hamper an activist's impact on a green transition.

To capture the key determinants of environmental activism, we consider a firm with a polluting production technology that can invest to transition toward a clean production technology, which we refer to as a *green transition*. Transitioning to a cleaner technology generates financial benefits arising from factors such as carbon taxation and increased consumer demand. However, the transition process is uncertain and costly, and potentially has a negative net present value (NPV). The probability of a successful green transition increases with the effort of the firm's management, broadly representing key personnel and executives that affect firm outcomes. As effort is unobservable, costly, and subject to moral hazard, firm owners provide management with incentives to exert effort by making their compensation sensitive to the outcome of the transition process.

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 managerial 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. That is, the activist has value-alignment preferences and derives a non-pecuniary dividend if the firm is green 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, activist and manager efforts 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 as activism introduces a double moral hazard problem that distorts incentives, which is not present under passive ownership. Specifically, because effort is unobservable, the activist cannot commit to a specific effort level and instead responds to incentives shaped by its equity stake. These incentives are tied to the sensitivity of equity to the transition outcome. However, this sensitivity is not independent of management's incentives, as equity is a residual claim. Part of the transition surplus is allocated to management through its incentive contract, with the remaining surplus accruing to equity, thus shaping the activist's incentives. As a result, the efforts of the activist and management arise as endogenous substitutes, even though they affect the transition rate symmetrically and independently. That is, because effort incentives are interconnected, they generally cannot be set efficiently and fall below their first-best levels (Holmström, 1982). When this double moral hazard problem is sufficiently severe, activism decreases the green transition rate compared to passive investors owning the firm. This arises, for instance, when the activist and management are both key to the transition or when the cost of transitioning is low (i.e. when the target firm is "greener"), in which case passive investors already motivate management to put in a high level of effort .

In the model, the activist improves firm value through private and costly effort. However, if this value creation is fully reflected in the acquisition price of its equity stake, the activist cannot capture the gains from activism and hence cannot profitably invest. That is, activist entry is subject to a free-rider problem that reduces activists' incentives to invest (Grossman and Hart, 1980; Shleifer and Vishny, 1986). This free-rider problem discourages investment by high-skill activists, particularly in firms that struggle to transition independently and would benefit the most from activism. In essence, the free-rider problem leads to an endogenous exclusion mechanism whereby activists tilt their portfolios towards "greener" firms capable of transitioning at low cost. Consequently, when activism is most needed, it may fail to materialize due to the free-rider problem. Larger financial benefits of transitioning intensify the free-rider problem, which is not present when financial gains are low or negative. In contrast, sustainability preferences not only facilitate activist entry, as expected, but also incentivize activists to invest in firms that face higher costs of transitioning.

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 active sustainable finance, making them substitutes. Essentially, carbon taxes increase the financial gains of transitioning and, thus, the activist's and management's post-entry efforts. While these effects enhance the green transition rate in isolation, they also strengthen the free-rider problem and disincentivize entry, especially by skilled activists. In particular, activists will not invest when carbon taxes exceed a certain threshold, which decreases with their skill. In addition, due to the double moral hazard, activism reduces the transition rate when carbon taxes are high and passive investors already provide strong incentives to management. In sum, carbon taxes hinder impact activism both on the extensive margin, by preventing the entry of skilled activists, 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 and benefit less from activism.

We also investigate how investment subsidies, like those outlined in the U.S. Inflation Reduction Act, influence the role of activism in the green transition. Such subsidies lower the cost of investment at the firm level and make it optimal to incentivize higher managerial effort, which, in our setting, is akin to firm-level investment. However, higher firm-level investment also requires increased incentive compensation for management, which diminishes the incentives for activist effort, thereby crowding it out. This crowding-out effect limits the impact of investor activism on the green transition and, importantly, makes investor activism more likely to negatively affect the green transition rate.

A key friction limiting the effectiveness of activism in our model is the double moral hazard, which implies that the activist's and management's efforts arise as endogenous substitutes even though they affect the transition rate symmetrically and independently. We show that our results remain robust to introducing an *exogenous complementarity* of efforts in the transition process. In addition, while such complementarity generally enhances the impact of activism conditional on entry, it induces higher activist effort and, therefore, exacerbates the free-rider problem, thereby crowding out activism.

In our model, activists have value-alignment preferences, i.e., they 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., Gupta, Kopytov, and Starmans (2024) and Broccardo et al. (2022). In contrast with many existing studies (e.g., Landier and Lovo (2024) or Oehmke and Opp (2024)), we find that the nature of investor preferences (i.e. consequentialist versus value-alignment) has little effect on our key findings, notably those related to double moral hazard 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 and carbon taxation in particular. We show, however, that consequentialist preferences (sometimes referred to as impact preferences) can change the effectiveness of green activism through entry incentives.

We also show the robustness of our findings by considering three additional extensions: (*i*) endogenizing the size of the activist's stake, (*ii*) letting passive investors set managerial contracts, and (*iii*) allowing activists to capture some of the value created through their activism. First, when activists can choose the size of their stake, they generally opt for inefficiently low ownership, which reduces their efforts and hampers the pace of the green transition. Second, we demonstrate that when passive investors design contracts, both the double moral hazard problem and the free-rider problem regarding entry intensify, making it less likely for activism to foster the green transition. Because passive investors neither have sustainability preferences nor internalize the activist's private cost of effort, they incentivize low managerial effort. To offset this effect, the activist optimally exerts more effort, resulting in a higher private cost of transitioning. Third, as expected, giving activists a greater share of the value at entry mitigates the free-rider problem but does not influence the double moral hazard problem and the activism's effect on the green transition rate.

In summary, our analysis highlights that the combination of moral hazard and the free-rider problem may lead to ineffective or even counterproductive activism. Environmental policies such as carbon taxes and green investment subsidies fail to address these issues and may, in fact, exacerbate them. 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, while our analysis assumes that activists engage by buying an equity stake, PE funds may hold more complex claims in the firms they invest in, which could help mitigate the moral hazard problem. Second, PE funds may have a greater ability to capture some of the value created through their activism, for instance, because investments in private firms suffer less from the free-rider problem of dispersed shareholders.

There is a vast literature on shareholder activism in which activists affect firm performance via their own effort (see, e.g., Admati, Pfleiderer, and Zechner (1994), DeMarzo and Urošević (2006), and Back, Collin-Dufresne, Fos, Li, and Ljungqvist (2018)). Our main contribution with respect to this literature is to develop a model of investor activism with endogenous entry and engagement and optimal contracting with management. Another key difference is that our model emphasizes an endogenous selection mechanism that tilts activists' investments towards "greener" firms that can transition on their own. That is, in our model, activists endogenously select investment strategies that resemble exclusion strategies used in practice by passive investors.

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 (2021), Gollier and Pouget (2022), Jagannathan, Kim, McDonald, and Xia (2022), Broccardo et al. (2022), Allen, Barbalau, and Zeni (2023), Edmans, Levit, and Schneemeier (2023), Huang and Kopytov (2023), Dangl et al. (2023), Gupta et al. (2024), Landier and Lovo (2024), Oehmke and Opp (2024)). The 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 provide insights into the nature of these preferences, generally showing 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 (2024)). 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, in our framework both the activist's and management's efforts contribute to the green transition by providing effort. Second, the activist influences firm performance through the cash flow channel rather than the discount rate channel commonly emphasized in the literature. Third, a free-rider problem hampers activist entry and endogenously leads activists to favor investments in greener 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 (2022) show that engagements 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. Our theory contributes to this literature by identifying the circumstances under which investor activism is more likely to foster the green transition and by highlighting economic mechanisms that limit or favor impact activism.

1 A Model of Investor Activism and Green Transition

We present a model of investor activism in which an activist decides whether to invest in a firm to transform its production technology into a more sustainable one, a process we refer to as a *green transition*. In this model, the activist investor supports this transition by putting in private effort and designing an optimal contract that encourages management to contribute their 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.[1] The manager, or management more broadly, represents the firm's key personnel and executives who are able to influence firm outcomes. The activist's private effort captures its engagement with the firm, for instance, by appointing key personnel and board members, developing strategies and proposals, providing industry connections, or voting on proposals.

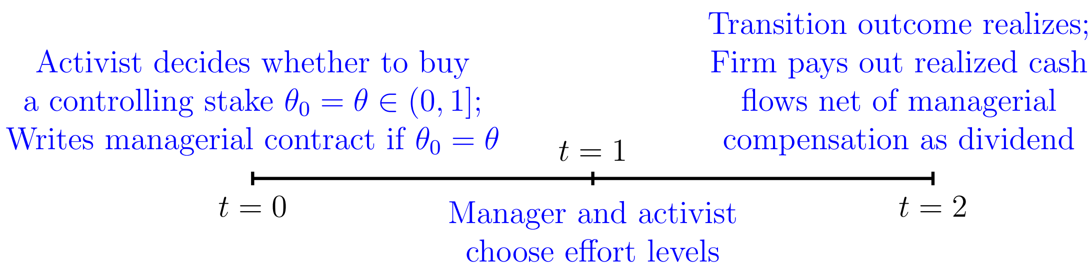


Figure 1: **Timeline of the model.**

Timing and Technology. 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 a manager. We consider a single firm run by the manager. The firm is all equity-financed with a number of outstanding shares normalized to one. It 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's production technology is initially dirty, but the firm can reduce its environmental damage (e.g., carbon emissions) by transitioning to a clean production technology.[2]

[1] Hedge funds and private equity funds often actively engage with their portfolio companies to influence outcomes (Brav, Jiang, Partnoy, and Thomas, 2008; Kaplan and Strömberg, 2009).

[2] Green investments can take the form of tangible green projects such as the adoption of new technologies

The outcome of this green transition is captured by a state $\omega \in \{G, B\}$ that is realized and publicly observed at $t = 2$. 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 manager's effort m, both of which are chosen at $t = 1$. With probability $a + m$, state $\omega = G$ realizes and the firm becomes clean. With probability $1 - a - m$, state $\omega = B$ realizes and the firm remains dirty. To ensure that the probability of transitioning is well-defined, we impose that a and m are bounded from above by $\overline{a}$ and $\overline{m}$ respectively and that parameters are such that optimal efforts are interior, in that $a \in (0, \overline{a})$ and $m \in (0, \overline{m})$. In our baseline, efforts affect the transition probability symmetrically and independently. Section 5.2 shows that our key findings remain qualitatively similar when allowing efforts to be complements.

The firm produces cash flows $X_\omega > 0$ at $t = 2$ and pays out all cash flows net of managerial compensation as dividends. A carbon taxation 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 (2022)). We define $\Delta := X_G - X_B + T$ as the total financial gain from transition, including the carbon tax. We assume that $\Delta \geq 0$.

When $\Delta = 0$, the green transition has a 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 the 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

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.

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.[3]

Preferences. In our baseline analysis, we assume that the activist derives a non-pecuniary benefit $\theta\pi \geq 0$ from owning the firm's stock after the firm successfully transitions toward a green technology. This specification is consistent with the activist deriving a non-pecuniary benefit from owning stocks in companies with a business model in line with its values. This positive payoff reflects sustainability preferences arising from warm-glow preferences (Andreoni, 1990; Pástor, Stambaugh, and Taylor, 2022; Landier and Lovo, 2024) or a green investment mandate making it desirable to hold green stocks (Hong, Wang, and Yang, 2023). Intuitively, the activist internalizes part of the positive externality of transitioning, giving rise to a non-pecuniary benefit associated with the green transition. As a consequence, the activist may push for a green transition, even when $\Delta = 0$ and the green transition has a negative financial payoff due to the cost of effort. Riedl and Smeets (2017), Bonnefon et al. (2024), and Heeb et al. (2023) provide empirical evidence on such preferences. In Section 5.1, we examine the consequences of assuming that activists account for the level of externalities relative to a counterfactual scenario in which they do not invest in the firm, as in, e.g., Gupta et al. (2024) and Oehmke and Opp (2024), and show that incorporating such consequentialist, i.e., impact, preferences has no bearing on our key findings. Our main objective in the paper is to determine if and when an activist with sustainability preferences can help firms transition towards cleaner technologies. For our analysis, only the difference between active and passive investors' sustainability-related preferences matters, so we do not explicitly model any sustainability preferences for passive investors.

Moral Hazard and Optimal Contracting. The activist (respectively the manager) chooses effort $a \geq 0$ (respectively effort $m \geq 0$) against quadratic costs $\frac{\phi_a a^2}{2}$ (respectively

[3] 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 (2023), 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.

$\frac{\phi_m m^2}{2}$), where $\phi_a, \phi_m > 0$ 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—either the activist (if $\theta_0 = \theta$) or the passive investor (if $\theta_0 = 0$)—writes at $t = 1$ (before efforts are chosen), a contract (C, R) to incentivize management. This contract stipulates a payment C to the manager 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 $\hat{a}$ (which equals zero if the activist has not invested and $\theta_0 = 0$), the manager maximizes

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

leading to the incentive constraint

$$m = \frac{R}{\phi_m}. \tag{2}$$

assuming that effort is interior. 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

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

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

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

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 activist's and manager's efforts (a, m), equals

$$P = \big(1 - (a + m)\big)\big(X_B - C - T\big) + (a + m)\big(X_G - C - R\big). \tag{5}$$

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.,

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

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 the activist acquires a stake in the firm, the activist cannot capture the gains from activism and hence cannot profitably invest. That is, activist entry is subject to a free-rider problem that reduces the incentives to invest in the first place (Grossman and Hart, 1980). The baseline model considers the 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 5.3 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 5.4 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

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

where we normalize the value of the activist's outside option to zero. Note that under optimal efforts (a, m), the payoff from entering equals simply the activist's expected non-pecuniary payoff from transitioning minus its cost of effort.

In our setting, activism can reduce passive investors' valuation of the firm, in that we can have $P < P_0$. 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.

2 Solution

2.1 First-best active and passive ownership benchmark

Before solving the full model, we study two benchmarks, i.e., passive ownership and first-best active ownership. We characterize efforts a and m and the rate of green transition, equal to total effort $a + m$, 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 between the activist and management. Then, efforts are chosen to maximize the total surplus generated from the green transition from the activist's perspective (who holds a fraction θ of the firm), so that

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

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 and $\theta_0 = 0$, in which case the firm is owned by passive investors. In this case, there is no activist effort and managerial effort solves $m^P = \arg\max_m \left\{ \Delta m - \frac{\phi_m m^2}{2} \right\}$. The following proposition characterizes the manager's effort and, thus, the rate of transition both under first-best active ownership and passive ownership.

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

$$a^{FB} = \frac{\theta(\Delta + \pi)}{\phi_a} \quad \textit{and} \quad m^{FB} = \frac{\Delta + \pi}{\phi_m}.$$

The manager's effort under passive ownership satisfies

$$m = m^P = \frac{\Delta}{\phi_m} < a^{FB} + m^{FB}.$$

First-best efforts a^{FB} and m^{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., $a^{FB} + m^{FB}$, exceeds the transition rate that would prevail under passive ownership, $m^P = \frac{\Delta}{\phi_m}$. Absent moral hazard, activist and manager efforts complement each other in the transition process so that activism unambiguously fosters the green transition.

Interestingly, the manager's effort under passive ownership equals m^P irrespective of whether there is moral hazard. The reason is that since the manager is 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. Obviously, when there are no financial benefits of transitioning, in that $\Delta = 0$, we have $m^P = 0$ and the transition cannot be achieved without the activist.

2.2 Optimal Effort and Double Moral Hazard

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 manager's effort m 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 financial (pecuniary) component Δ and a non-pecuniary component π, both of which increase engagement. Note that according to the activist's incentive condition (9), the activist's and manager's effort incentives arise as (endogenous) substitutes. Higher effort incentives provided to the manager 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 optimal contract (C, R) that maximizes the activist's payoff V in (4) subject to (2), (3), and (9). Using (3), we obtain $C = W - (a+m)R + \frac{\phi_m m^2}{2}$. Inserting C in (4), we can characterize the choice of the contract as follows

$$\max_R \left\{ -\left(\frac{\phi_a a^2 + \phi_m m^2}{2} \right) + \theta(a+m)(\Delta + \pi - R) \right\},$$

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

Proposition 2 (Investor activism and the green transition rate)**.** *Define the activist's relative cost of effort parameter per unit of ownership as*

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

Optimal efforts with activist entry satisfy:

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

with $a < a^{FB}$ and $m < m^{FB}$ 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 $\xi = \frac{\phi_a}{\theta \phi_m}$, inversely capturing the activist's ability to speed up transition via its own effort. Keeping ϕ_a constant, we have $\xi \to 0$ when $\phi_m \to +\infty$ and the firm cannot transform without the activist, implying that the activist is key for transition. On the other hand, the activist plays no role in the transition process when $\xi \to \infty$, e.g., when $\theta \to 0$ or $\phi_a \to \infty$ (while ϕ_m remains such that $a + m < 1$ is ensured).[4]

Importantly, activism introduces a double moral hazard problem that distorts incentives,

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

which is not present under passive ownership. Specifically, the incentives for both the activist and management to exert effort are intertwined through a two-sided (i.e., double) moral hazard problem. Because the activist's effort is unobservable, it cannot commit to a specific effort level and instead responds to incentives shaped by its equity stake and sustainability preferences. These incentives are tied to the sensitivity of equity to the transition outcome. However, this sensitivity is not independent of management's incentives, as equity is a residual claim. Part of the transition surplus is allocated to management through its incentive contract, with the remaining surplus accruing to equity. Consequently, the effort incentives provided to management diminish the activist's effort, so that an activist's incentives to exert effort are reduced relative to the first-best case (i.e., $a < a^{FB}$).

While activist and manager efforts complement each other in first best, in the sense that they both contribute to the transition, they endogenously arise as substitutes with moral hazard. Increasing m requires a higher compensation R, thus lowering a, and vice versa. Consequently, the optimal contract incentivizes managerial effort below the first-best level, in that $m < m^{FB}$. Put differently, due to the double moral hazard problem, the activist's and management's effort incentives are interconnected, so they generally cannot be set efficiently in that effort levels and the transition rate lie below their respective first-best levels. In essence, the double moral hazard problem reduces the transition rate, with the extent of this distortion depending on the relative significance of activist effort in the transition process.

2.3 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 can acquire a stake, the activist cannot capture the gains from activism and thus has no incentive to invest in the first place. As we show next, in its purest (i.e., most extreme) version, this free-rider problem implies that activism cannot drive a green transition if the activist does not derive non-pecuniary benefits from transitioning. Notably, using the closed-form expressions for the activist's value function and the firm's stock price (reported in Appendix A.2), we can characterize the activist's entry decision in terms of its skill ξ and the ratio of non-pecuniary and financial benefits to transitioning $\frac{\pi}{\Delta}$.

Proposition 3 (Sustainability preferences are necessary for impact)**.** *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 we set (with a slight abuse of notation) $\frac{\pi}{\Delta} := +\infty$ *if* $\Delta = 0$.

Entry condition (11) states that when the acquisition price of its equity stake 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. In particular, when activism generates financial returns, in that $\Delta > 0$, an activist will not invest to facilitate the green transition in the absence of sustainability preferences (i.e., for $\pi = 0$). Such preferences make the activist internalize the negative production externality 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 if the financial gains from engaging with the firm are negative or zero.

Another implication of Proposition 3 is that the absence of a financial gain associated with transition, i.e., $\Delta = 0$, is a sufficient condition for entry as there is no 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*

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

3 Can Investor Activism Foster the Green Transition?

3.1 Activist Skill 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., $\lambda(\theta_0) = a + m$. 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:

$$\frac{\text{Green transition rate with activism}}{\text{Green transition rate without activism}} = \frac{\lambda(\theta)}{\lambda(0)} = \frac{a+m}{m^P} = \frac{1+\xi^2}{\xi+\xi^2}\left(1+\frac{\pi}{\Delta}\right). \tag{12}$$

When $\frac{\lambda(\theta)}{\lambda(0)} > 1$, i.e., $\lambda(\theta) > \lambda(0)$, activism fosters the green transition, in that it leads to a higher transition rate than passive ownership. When $\frac{\lambda(\theta)}{\lambda(0)} < 1$, i.e., $\lambda(\theta) < \lambda(0)$, activism hinders the green transition and leads to a lower transition rate than passive ownership.

Equation (12) demonstrates that the intensive margin effect of activism in the green transition is fully characterized by (i) the activist's relative skill 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 (12) suggests that activism can reduce the transition rate, notably when the activists has low skills (and ξ is above one), due to double moral hazard. The following proposition formalizes this intuition.

Proposition 4 (Skills and the green transition rate)**.** *Activism hampers transition and leads to a lower transition rate than passive ownership, in that $\lambda(\theta) < \lambda(0)$, whenever $\xi \in (\xi_-, \xi_+)$, where*

$$\xi_\pm = \frac{\Delta \pm \sqrt{\Delta^2 - 4(\Delta+\pi)\pi}}{2\pi}, \tag{13}$$

with $\xi_- \geq 1$ and $\xi_+ > \xi_-$. Otherwise, activism fosters green transition, in that $\lambda(\theta) > \lambda(0)$. In the limit as $\pi \to 0$, we have $\xi_- \to 1$ and $\xi_+ \to \infty$. When Δ is sufficiently small, activism always fosters the transition and $\lambda(\theta) > \lambda(0)$ for any ξ. In the limit $\Delta \to \infty$, we have

$\xi_- \to 0$ *and* $\xi_+ \to \infty$.[5]

Proposition 4 shows that while activism fosters the green transition under first best, this is not always the case under moral hazard. In particular, the transition rate $\lambda(\theta_0)$ is larger under passive ownership than under active ownership for intermediate values of ξ, i.e., for $\xi \in (\xi_-, \xi_+)$. The underlying reason is that the activist's and management's efforts are unobserved, causing a double moral hazard problem. As such, activism introduces an additional moral hazard problem that is not present under passive ownership and that makes the activist's and management's efforts function as substitutes. Holding everything else equal, the moral hazard problem is most severe when ξ takes intermediate values, that is, when both the activist and manager are important for the transition process.

When ϕ_a and ξ are large, the activist's effort is unimportant relative to the manager's effort. In the limit $\phi_a \to \infty$, i.e., $\xi \to \infty$, the activist exerts no effort, double moral hazard vanishes, and optimal contracting is able to fully resolve the moral hazard. Then, the activist's and manager's efforts coincide with the respective first-best levels. Likewise, when ξ is low, managerial effort is unimportant relative to the activist's effort; in the limit $\xi \to 0$, (a, m) converge to first-best levels.

In sum, 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." However, for intermediate levels of $\xi \in (\xi_-, \xi_+)$, both the activist's and manager's efforts are important for the transition process. In such cases, the double moral hazard problem is severe, and activism reduces the transition rate, i.e., $\lambda(\theta) < \lambda(0)$, giving rise to "bad activism." Such bad activism arises, for instance, when the financial gains of transitioning Δ are large. Under these circumstances, passive owners already provide management with incentives to exert high effort, which limits the effects of activism on the transition rate.

Finally, when the activist's sustainability preferences are weak (i.e., $\pi \to 0$), then $\xi_- \to 1$ while $\xi_+ \to \infty$. Then, activism improves the green transition rate if and only if $\xi < 1$.

[5] While the limit $\Delta \to \infty$ in (13) is mathematically well-defined, this limit would make the expressions for efforts in (10) exceed one. However, since (13) does not depend on ϕ_m, one could always take the double limit $(\Delta, \phi_m) \to (+\infty, +\infty)$ in an appropriate manner to ensure that $a + m \in (0, 1)$ is satisfied in the limit.

Note that $\xi \le 1$ is equivalent to $\phi_a \le \frac{\phi_m}{\theta}$, where θ is the size of the activist's stake. Empirical estimates of activists' stakes suggest that these are generally below 20% (see, e.g., Brav et al. (2008), Greenwood and Schor (2009), and Collin-Dufresne, Fos, and Muravyev (2017)). Thus, for the activist to have a positive impact on the green transition, it must be that $\phi_a < \frac{\phi_m}{5}$, meaning the activist should be at least five times as efficient as management in fostering the transition. This back-of-the-envelope calculation shows that without strong sustainability preferences, activism is unlikely to foster the green transition.

3.2 Activist Skill 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 (Skills and entry incentives)**.** *An activist's incentives to enter increase as its relative skills worsen, i.e., as ξ increases. Provided that $\pi > 0$ and $\Delta \ge 0$, there exists unique ξ_E such that the activist enters if and only if $\xi \ge \xi_E$.*

Proposition 5 shows that an activist's incentives to enter increase as its relative skills worsen. The reason is that, holding everything else equal, higher ξ reduces the activist's effort and impact, thereby mitigating the free-rider problem associated with activist entry. Hence, relatively less skilled activists, characterized by high ξ and ϕ_a, are more likely to invest, but these activists exert low effort. According to Proposition 4, lower relative activist skill, i.e. higher ξ or ϕ_a, may reduce $\frac{\lambda(\theta)}{\lambda(0)}$ and lead to bad activism. That is, higher ξ boosts activism on the extensive margin while reducing it on the intensive margin.

The differential effects of ξ on the intensive and extensive margin of activism, therefore, highlight a tension that arises due to the combination of the moral hazard and the free-rider problems. Due to the free-rider problem, the most skilled activists, who would have a large and positive impact on the transition process, do not enter. Instead, only less skilled activists enter and engage with firms. However, due to moral hazard, these low-skill activists have limited or even negative impact on the transition process.

Additionally, the model predicts that activists tend to invest in "relatively green" firms characterized by low ϕ_m, which can transition on their own at low cost. When the activist invests in a low-ϕ_m firm, it exerts relatively low effort, as shown in Proposition 2, which mitigates the free-rider problem and facilitates entry. In other words, higher firm-level costs ϕ_m are linked to more activist effort and impact conditional on entry but also to a more severe free-rider problem at entry. Consequently, the free-rider problem prevents activists' investments in high-ϕ_m firms, effectively tilting their investments towards low-ϕ_m firms.

Finally, suppose that an activist with a given cost of effort ϕ_a can invest in firms with different levels of ϕ_m, say on some range $[\underline{\phi}_m, \overline{\phi}_m]$ (on which $a + m < 1$ is ensured). If the activist invests in a firm with high ϕ_m, which struggles to transition on its own, the activist's effort plays a key role in transition, and activism fosters transition. In contrast, in a firm characterized by low ϕ_m, which could easily transition on its own, the activist's role in the green transition is lower, and activism may, in fact, hamper the green transition (as ξ is high). The following corollary shows that the activist's payoff from investing $V - \theta P$ decreases in ϕ_m. As a consequence, the activist's payoff is maximized for the lowest possible value of ϕ_m.

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_m*.*

Corollary 2 shows that activists endogenously select firms that can transition independently and adopt a passive approach with low engagement. This suggests an *endogenous exclusion mechanism* whereby activists tilt their portfolio towards "greener" firms, i.e., firms that can transition on their own at a low cost. The economic force underlying the endogenous exclusion is the free-rider problem: Greener, low-ϕ_m firms require lower activist effort in the green transition and thus suffer from a less severe free-rider problem. Given the selection of relatively greener firms, the activist exerts relatively low effort, adopting a relatively passive investment approach. Further, low ϕ_m implies high ξ, potentially leading to $\lambda(\theta) < \lambda(0)$, so that the activist's endogenous investment choice hinders the green transition.

3.3 Sustainability Preferences, Carbon Taxes, and Impact

As shown in Proposition 3, sustainability preferences—that is, non-priced benefits of transitioning π—are necessary for activist entry. The following proposition shows that, as expected, sustainability preferences in fact favor activism both by increasing entry incentives (extensive margin) and by increasing activist engagement (intensive margin). By contrast, any increase in the financial benefits of transitioning, hampers activism by hindering entry and reducing effort incentives relative to passive investing.

Proposition 6 (The effects of financial 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* $\frac{\lambda(\theta)}{\lambda(0)} \gtrless 1$ *if and only if* $\frac{\pi}{\Delta} \gtrless \Gamma_G := \frac{\xi-1}{1+\xi^2}$*.*

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 with respect to the effects of activism on the green transition. 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 2 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) over and below which activism improves the green transition rate as functions of the ratio $\frac{\pi}{\Delta}$ of non-pecuniary to financial benefits of transitioning. A decrease in sustainability preferences or an increase in the financial benefits of transitioning hampers impact both by decreasing the quality of activists that invest (i.e., by increasing ξ_E) and by increasing the range $\xi_+ - \xi_-$ over

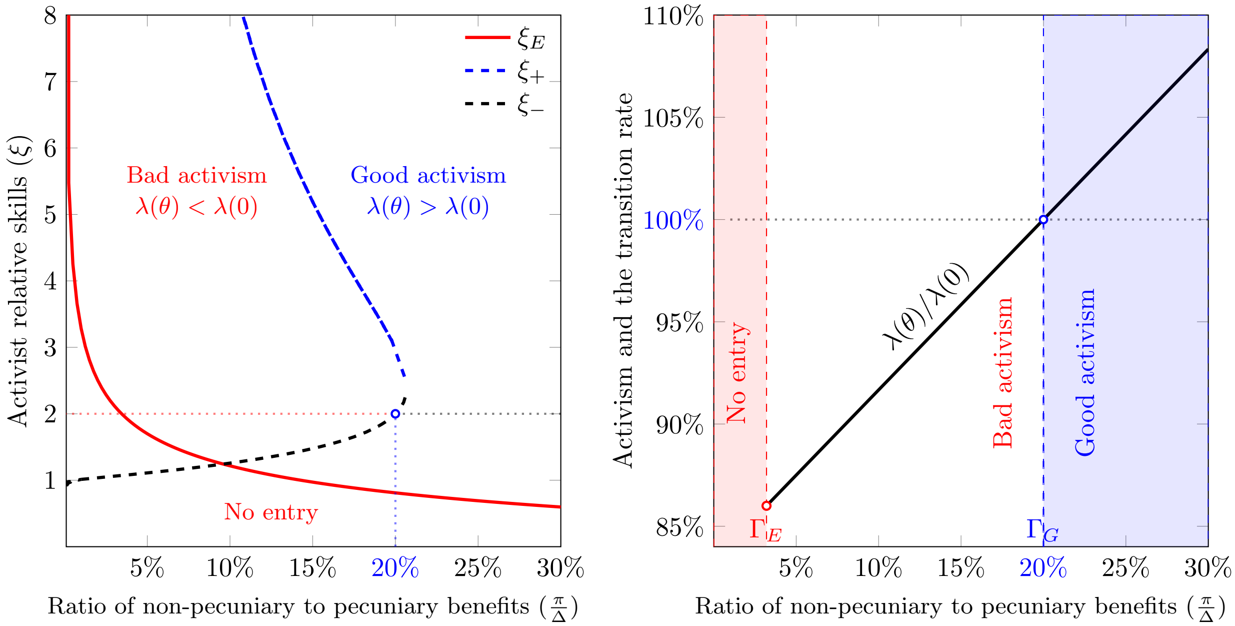


Figure 2: **Preferences, skills, and impact**: The left panel plots the entry threshold ξ_E and the skill levels ξ_+ and ξ_- over and below which activism improves the green transition rate as functions of the ratio of non-pecuniary to financial benefits of transitioning $\frac{\pi}{\Delta}$. The right 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 $\xi = 2$.

which activism hampers transition. For sufficiently low (high) $\frac{\pi}{\Delta}$, activism unambiguously 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 $\frac{\pi}{\Delta}$. When $\xi = 2$, there exist three regions: No activism, bad activism, and good activism.

Using the above results, we can examine in greater detail the effects of carbon taxes on activism. Proposition 6 suggests that higher carbon taxes, by increasing Δ and decreasing $\frac{\pi}{\Delta}$, may hinder activism. In other words, carbon taxes crowd out active sustainable financing, making carbon taxes and active sustainable finance substitutes. 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 increase efforts as well as the extent to which they are reflected in the stock price. Consequently, carbon taxes strengthen the free-rider problem and reduce entry incentives.[6] Accordingly, there exists a carbon tax level T_E above which there is no activist entry. This level T_E increases as the activist's relative skills ξ decrease and as the free-rider problem becomes less severe.

Next, Proposition 6 implies that an increase in Δ, for instance, due to carbon taxation, increases the cutoff ξ_E above which activists enter the firm. Hence, larger financial payoffs to transitioning prevent high-skill activists from entering, reducing the overall skill of those activists that invest. Specifically, carbon taxation induces investment by activists with low skills and a high cost of effort. Likewise, carbon taxation implies that activists only invest in firms characterized by a relatively low ϕ_m, i.e., ξ. Thus, by increasing the financial benefits of transitioning and exacerbating the free-rider problem at entry, carbon taxes tilt activists' investments towards "greener" firms that can transition independently at low cost.

Moreover, a carbon tax reduces the effects of activism on the intensive margin as captured by $\frac{\lambda(\theta)}{\lambda(0)}$. An increase in carbon taxes increases the financial benefits of transitioning and thus the transition rate, both with activism $\lambda(\theta)$ and without activism $\lambda(0)$, with the transition rate $\lambda(0)$ rising more strongly. Because carbon taxes enhance the transition rate for passively held firms, they naturally diminish the importance of impact activism in the transition process. When $\xi > 1$, there exists a cutoff level T_G for carbon taxes above which activism, if it arises, always reduces the green transition rate. As a consequence, carbon taxes also favor the emergence of bad activism, hampering the transition relative to passive ownership. These effects are illustrated in Figure 2, where the entry threshold ξ_E and the regions over which activism does not arise or hinders the transition increase as the financial benefits of transitioning Δ increase and $\frac{\pi}{\Delta}$ decreases. In particular, when $\frac{\pi}{\Delta}$ is sufficiently low, activism, if it emerges, is always detrimental to the transition rate, giving rise to bad activism.

[6] We note that other mechanisms, such as pro-social consumer preferences, which increase the financial benefits of a green transition, also hinder impact activism on both the extensive and intensive margins.

In sum, when carbon taxes are sufficiently low and $T \leq \min\{T_E, T_G\}$, the activist enters and fosters transition relative to passive ownership. For $T \in (T_G, T_E)$, the activist enters but hampers the transition process. Lastly, there is no activist entry for $T > T_E$. A direct consequence of our analysis is that an increase in carbon taxes can decrease the transition rate $\lambda(\theta_0)$. In particular, when $T_E < T_G$, raising the tax above T_E facilitates the emergence of bad activism, hampering the transition process. When $T_E \geq T_G$, activism, if it emerges, unambiguously fosters the transition. Then, an increase of the carbon tax above T_E precludes activist entry and good activism, thereby reducing the transition rate $\lambda(\theta_0)$. When the carbon tax does not affect activist entry, an increase in carbon taxation boosts the transition rate $\lambda(\theta_0)$ by increasing Δ, raising a and m in (10).

4 Green Investment Subsidies

Policymakers often subsidize green capital investment; for instance, a firm may receive direct subsidies or a tax advantage for investing in green transition. An illustrative instance of this is the Investment Tax Credit (ITC), which is offered under the Inflation Reduction Act to encourage green investments in the United States.[7] As utility is in financial terms and there are no capital constraints, we can, without loss in generality, interpret the managerial costs of effort as financial investment costs at the firm level, with effort representing investment. A firm-level subsidy s will be based on the anticipated (or contracted) effort $\hat{m}$, which may differ from actual effort m upon deviation. In optimum, we have $m = \hat{m}$ and a subsidy implies a transfer to the firm proportional to the cost of effort, in that the firm-level subsidy raises firm cash flows by $\frac{s\phi\hat{m}^2}{2}$. That is, a fraction $s \in [0, \overline{s}]$ of the investment costs are subsidized. To ensure optimal interior effort and to sharpen our analytical findings (which are obtained under the sufficient condition $s \leq \frac{1}{2}$), we stipulate $\overline{s} < \min\{\frac{1}{2}, \frac{\phi_m}{\phi_a}\}$.

Since the subsidy is based on anticipated effort $\hat{m}$, the activist and the manager take the subsidy as given when choosing actual efforts a and m. In particular, the manager's optimiza-

[7] Likewise, in the European Union and, notably Germany, firms may receive tax credits or subsidies for transforming their production toward sustainability, for instance, by reducing carbon emissions.

tion problem remains unchanged and follows (1) for a given contract (C, R). Consequently, for $\theta_0 = \theta$, the activist's value function and optimization reads

$$V = \max_{a \geq 0, (C,R)} \left\{ \theta \left(X_G - C + \frac{\phi_m \hat{m}^2 s}{2} \right) + (a+m)\theta\big(\Delta + \pi\big) - \frac{\phi_a a^2}{2} \right\}, \tag{14}$$

subject to the manager's incentive and participation constraints, i.e., (2) and (3). The activist takes the subsidy $\frac{\phi \hat{m} s^2}{2}$ (of which it receives fraction θ) as given, when choosing the contract (C, R) and its own effort. As such, the activist's incentive constraint (9) applies. Under active ownership, i.e., $\theta_0 = \theta$, the firm's stock price at time $t = 1$ is

$$P = \big(1 - (a+m)\big)\big(X_B - C - T\big) + (a+m)\big(X_G - C - B\big) + \frac{\phi \hat{m} s^2}{2}. \tag{15}$$

As in the baseline, the activist enters and $\theta_0 = \theta$ if and only if the entry condition (7) is satisfied. The following proposition characterizes the effects of investment subsidies.

Proposition 7 (Investment subsidies and the transition rate)**.** *We have that*

1. *Under active ownership, efforts satisfy*

$$a = \frac{\Delta + \pi}{\phi_m} \left(\frac{1 - \xi s}{\xi\left(\xi(1-s) + 1\right)} \right) \quad \text{and} \quad m = \frac{\Delta + \pi}{\phi_m} \left(\frac{\xi}{\xi(1-s) + 1} \right). \tag{16}$$

Under passive ownership, the manager's effort is $m = m^P = \frac{\Delta}{\phi_m(1-s)}$.

2. *The transition rate satisfies* $\frac{\partial \lambda(\theta)}{\partial s} \gtrless 0$ *if and only if* $\xi \gtrless 1$. *In addition,* $\frac{\lambda(\theta)}{\lambda(0)}$ *decreases in* s *and satisfies* $\frac{\lambda(\theta)}{\lambda(0)} \gtrless 1$ *if and only if* $\frac{\pi}{\Delta} \gtrless \Gamma_G^s$, *where* Γ_G^s *increases in* s *and*

$$\Gamma_G^s := \frac{\xi - 1 + s(1 + \xi(1-s))}{(1-s)(1 + \xi(\xi - s))}. \tag{17}$$

3. *The activist enters if and only if* $\frac{\pi}{\Delta} \geq \Gamma_E^s$, *where* Γ_E^s *decreases in* s *for sufficiently small* $s \geq 0$ *and*

$$\Gamma_E^s := \frac{(1 - \xi s)^2}{1 + 2\xi(1 + \xi + \xi^2)(1-s) + \xi^2 s^2} \tag{18}$$

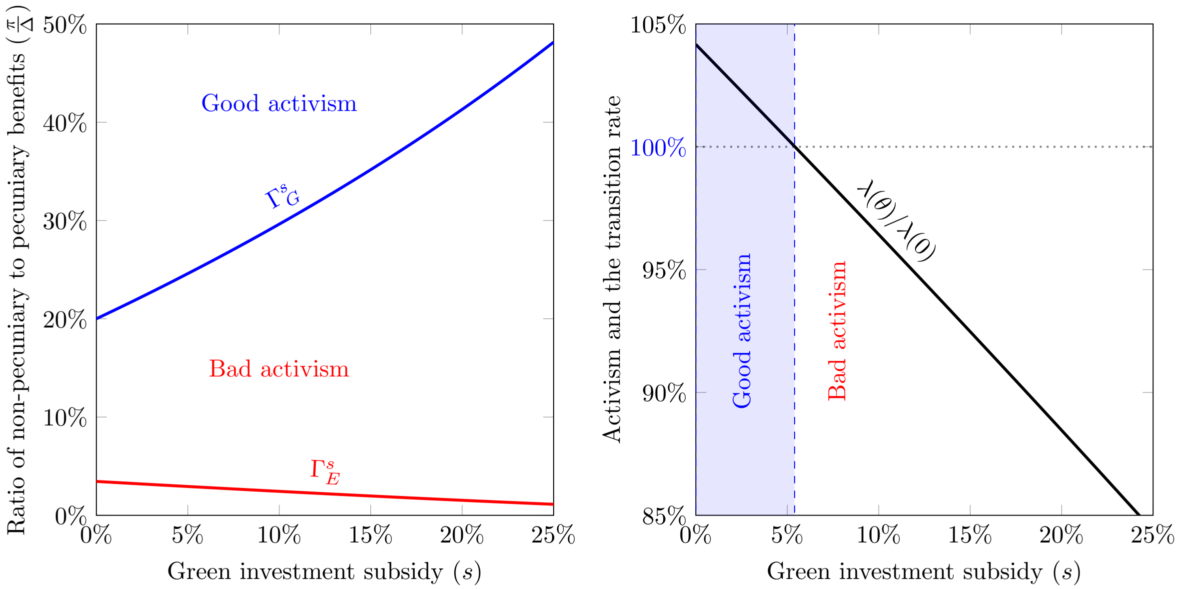


Figure 3: **Green investment subsidies**: The left panel plots the ratios of non-pecuniary to financial benefits Γ_E^s over which there is entry and Γ_G^s over which activism improves the green transition rate as functions of the green investment subsidies s. The right panel plots the ratio of transition rates with and without activism for $\xi = 2$ and $\frac{\pi}{\Delta} = 25\%$.

Proposition 7 shows that a firm-level investment subsidy crowds out activist effort and engagement. Conditional on activist entry $\theta_0 = \theta$, an increase in the investment subsidy s reduces activist effort a and its relative contribution to transition $\frac{a}{a+m} = \frac{1-\xi s}{1+\xi^2}$, while increasing the manager's effort m. Intuitively, a firm-level subsidy makes it optimal to increase the manager's effort m, which requires a higher payment R to incentivize the manager. This, in turn, decreases the activist's effort incentives, reflecting that activist and managerial efforts are substitutes in the presence of moral hazard.

Consequently, an investment subsidy reduces the intensive margin effect of activism on the green transition, relative to passive ownership, in that $\frac{\lambda(\theta)}{\lambda(0)}$ decreases with s. Intuitively, with investment subsidies, activism becomes more likely to hamper the transition process, giving rise to bad activism. For activism to increase the transition rate relative to passive ownership, sustainability preferences must be sufficiently strong or the financial payoff from transitioning must be sufficiently low, i.e., $\frac{\pi}{\Delta} \geq \Gamma_G^s$. As Γ_G^s increases in s, investment subsidies make good activism, fostering transition relative to passive ownership, less likely and bad activism, hampering transition, more likely.

Figure 3 graphically illustrates these effects. The left panel shows that Γ_G^s increases while Γ_E^s decreases in s, thereby expanding the bad activism region. The right panel shows that the intensive margin effect of activism (relative to passive ownership), captured $\frac{\lambda(\theta)}{\lambda(0)}$ decreases with s. Input parameter values are such that activism has a positive effect on the transition rate absent investment subsidies (good activism). However, the introduction of investment subsidies decreases engagement, eventually leading to bad activism.

Importantly, because investment subsidies diminish the role of activist effort in the transition process, they also mitigate the free-rider problem, thereby fostering activism on the extensive margin. Taken together, while subsidies crowd out activism on the intensive margin, they crowd in activism on the extensive margin. However, since subsidies give rise to bad activism, the crowding-in effect on the extensive margin hinders the transition process.

5 Robustness and Other Results

This section considers several variations from our baseline model, including assuming that activist investors have consequentialist preferences, that efforts are complements, that the stake size of the activist is endogenous, that the activist has bargaining power at entry, and that passive investors set managerial contracts.

5.1 Consequentialist Preferences

In our baseline analysis, activists have value-alignment preferences and care about the absolute level of externalities produced by their investments. Empirical evidence on such preferences for sustainable investing is provided by many studies; see, e.g., Riedl and Smeets (2017), Cole et al. (2023), Heeb et al. (2023), and Bonnefon et al. (2024). We now examine 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 as in, e.g., Oehmke and Opp (2024) and Gupta et al. (2024). Specifically, we modify our baseline specification of preferences by assuming that the activist gets a non-pecuniary payoff of

$\theta_0\pi^N + \pi^C$ 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 (that is, non-consequentialist) 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 $\theta\pi := \theta\pi^N + \pi^C$.[8] 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.

To solve the model with such preferences, note that conditional on entry, the solution remains identical, and the activist derives payoff $V - \theta P$ from entering. We assume that when the activist does not enter, it cannot exert any effort to contribute to the firm's transition. Thus, when $\theta_0 = \theta$, the firm transitions with probability m^P, generating payoff $\alpha\theta\pi$ to the activist. Thus, the entry condition changes to

$$V - \theta P - \alpha\theta\pi m^P = \theta\pi\big[(a+m) - \alpha m^P\big] - \frac{\phi_a a^2}{2}, \tag{19}$$

where $V - \theta P = \theta\pi(a+m) - \frac{\phi_a a^2}{2}$ in optimum.

Proposition 8. *With consequentialist preferences, efforts are characterized in (10) and do not depend on α. The activist enters if and only if*

$$E^B := \frac{\pi}{\Delta}\left[\frac{\pi}{\Delta}\left(1 + 2\xi\left(1 + \xi + \xi^2\right)\right) + 2\xi\left(1 + \xi + \xi^2 - \alpha(1+\xi)^2\right)\right] \geq 1. \tag{20}$$

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

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

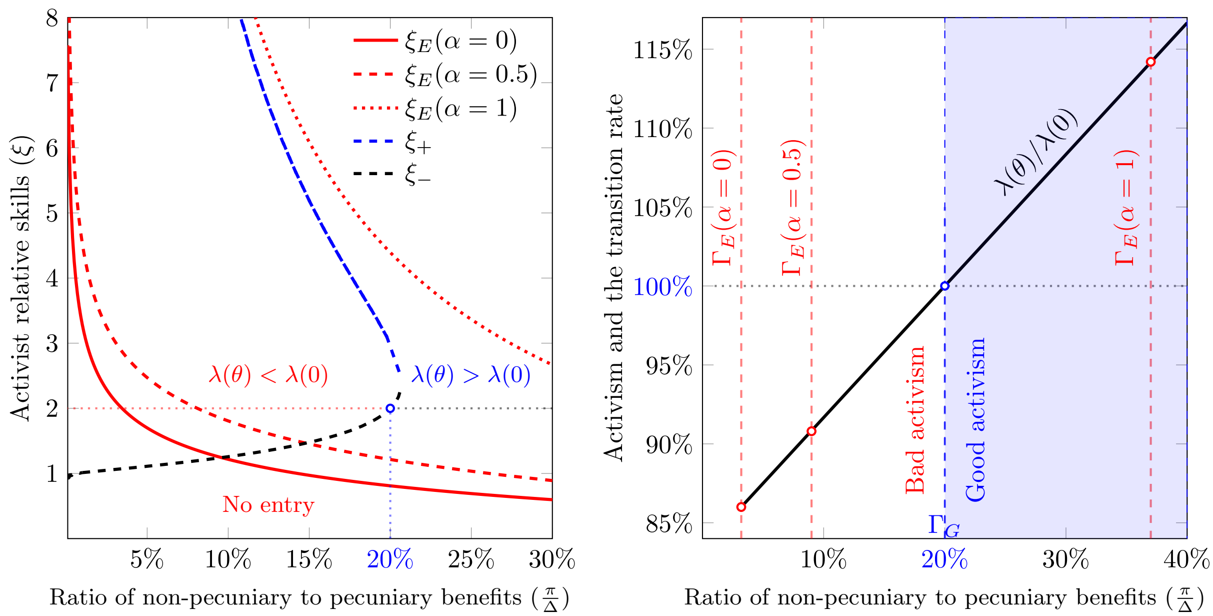


Figure 4: **Preferences, skills, and impact**: The left panel plots the entry thresholds $\xi_E(\alpha = 0)$, $\xi_E(\alpha = 0.5)$, and $\xi_E(\alpha = 1)$ and the skill levels ξ_+ and ξ_- over and below which activism improves the green transition rate. The right panel plots the ratio of transition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

$\alpha \leq \frac{1}{2}$ *implies* $\frac{\partial E^B}{\partial \xi} > 0$. *Entry incentives increase in* $\frac{\pi}{\Delta}$.

Proposition 8 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, while they decrease with the financial benefits of transitioning and carbon taxation in particular.[9] Moreover, as long as α is not too large or $\frac{\pi}{\Delta}$ is large, entry incentives increase with ξ. Under these circumstances, the free-rider problem hampers entry by relatively more skilled activists with lower ξ and tilts activists' investments toward firms that can transition at low cost (i.e., have low ϕ_m and ξ).

Second, holding the total 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 (i.e., higher α) may prevent

[9] To see how larger $\frac{\pi}{\Delta}$ unambiguously fosters entry, note that when the term in square brackets in (20) 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 (20) holds or equivalently that $\mathbb{I}\{E^B \geq 1\}$ increases in $\frac{\pi}{\Delta}$.

both good or bad activism. Specifically, sufficiently large values of α preclude bad activism. To see this note that by (19), a necessary condition for activist entry under $\alpha = 1$ is that $a + m > m^P$, i.e., activism increases the transition rate relative to passive investors owning the firm. That is, when activists' preferences are sufficiently consequentialist, 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 2 the entry thresholds when $\alpha > 0$ in addition to the baseline entry threshold.

5.2 Complementarity of Efforts in the Transition Process

In our baseline model, the activist's and management's efforts affect the transition probability $a+m$ symmetrically and independently. We now generalize our baseline by considering that efforts can inherently be substitutes or complements in fostering the green transition, in that the transition probability is given by $a + m + \omega am$ where $\omega \gtreqless 0$ captures the interactions of both efforts in the transition process; the baseline obtains for $\omega = 0$. Denote by $\hat{a}$ the anticipated level of activist effort which coincides with a in optimum. As we show in the Appendix A.12, management's incentive condition under a contract (W, R) becomes

$$m = \frac{R(1 + \omega\hat{a})}{\phi_m}, \tag{21}$$

Note that the manager's effort depends on the reward R, as well as on the activist's effort $\hat{a}$. The activist's effort satisfies the incentive condition

$$a = \frac{\theta(\Delta + \pi - R)(1 + \omega m)}{\phi_a}. \tag{22}$$

Higher effort incentives provided to management have an ambiguous effect. First, due to the exogenously assumed complementarity of efforts in the production technology, higher managerial effort incentivizes activist effort when $\omega > 0$. Second, as in the baseline, the manager is incentivized through a reward R upon successful transition. When the activist increases its effort, part of the benefits accrue to management through the incentive contrast, because the activist's effort is not contractible. Providing higher incentives to management 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 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 this, we solve the model numerically (with $\omega \neq 0$, no closed-form solution can be obtain). To this end, Figure 5 plots both the management's and activist's efforts 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 boosts the transition rate and makes activism more valuable and bad activism less likely. Yet, bad activism (i.e., $\lambda < m^P$) 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 free-rider problem at entry, 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 management's and activist's efforts are complements in the transition process, the activist, if it enters, has greater impact and is more likely to raise the transition rate. However, the complementarity also hampers activist entry, which may preclude both good and bad activism. By worsening the free-rider problem, the complementarity effectively also tilts activists' investments towards greener firms that can transition independently at relatively low cost. Likewise,

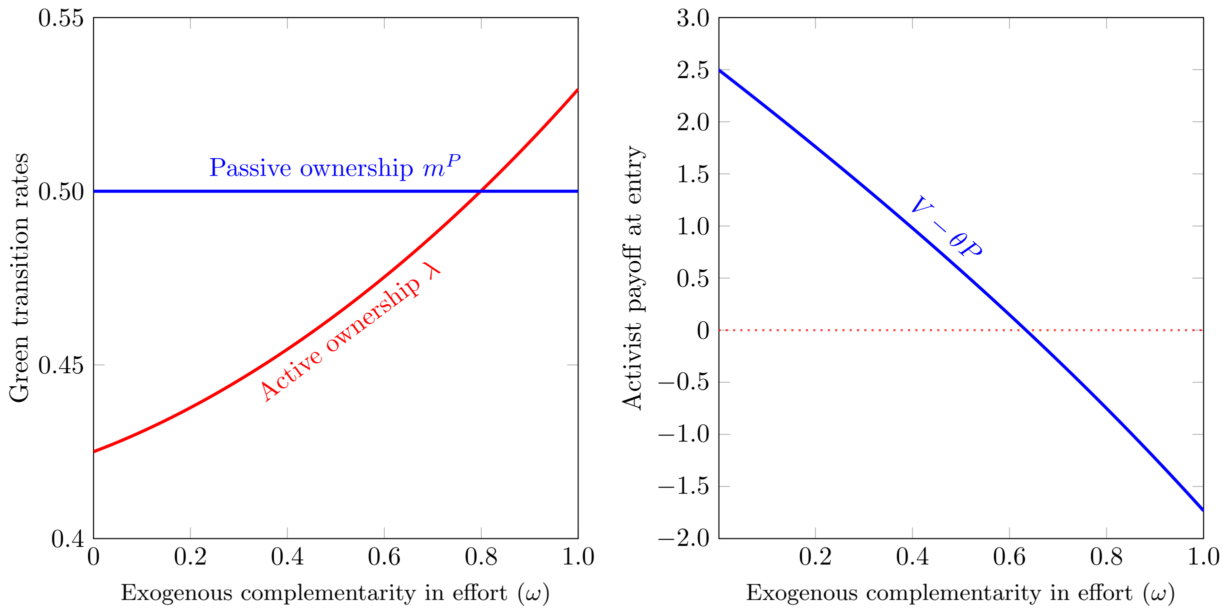


Figure 5: **Exogenous complementarity in efforts**: The left panel plots the transitions rates under active and passive ownership while the right panel plots the activist's payoff upon entry as functions of the exogenous level in complementarity ω. The numerical solution assumes $\phi_a = \phi_m = 1$,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

substitutability of efforts in the transition process (i.e., $\omega < 0$) would alleviate the free-rider problem, fostering entry, but hamper the activist's impact conditional on entry.

5.3 Entry Incentives, 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 considerable bargaining power when investing in private companies.[10] 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

[10] 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.

pays

$$K := \theta P_0 + \eta\theta(P - P_0) \tag{23}$$

to acquire ownership stake θ with $\eta = 1$ in the baseline. The activist enters if and only if

$$V - K \geq 0, \tag{24}$$

where, as in the baseline model, the activist has an outside option normalized to zero.

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 the manager are the same as in the baseline model so that Propositions 1, 2, 4, and 6 still obtain. That is, the double moral hazard problem leads to underinvestment by the activist and the manager and activism leads to a lower transition rate than passive ownership whenever $\xi \in (\xi_-, \xi_+)$. Equation (24) implies that the activist enters if and only if

$$V - \underbrace{\theta P_0}_{\substack{\text{Cost without} \\ \text{Price Impact}}} - \underbrace{\eta\theta(P - P_0)}_{\substack{\text{Rents of Passive} \\ \text{Investors}}} \geq 0. \tag{25}$$

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

Proposition 9 (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 its relative skills worsen 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 9 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 vis-a-vis passive owners, such as in private capital markets.

5.4 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 and solve 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 that $\theta^* > 0$, i.e., 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 that $\overline{\theta} \geq \theta^*$. Solving the activist optimization problem yields the following results when θ^* is interior, where a sufficient condition for interior θ^* is $\frac{\phi_a}{\phi_m} \leq \xi_E$.

Proposition 10 (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 10 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 $\lambda(\theta^*) < \lambda(0) < \lambda(\overline{\theta})$, so that the activist could, in principle, enter and foster transition if it bought a larger stake. 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 11. *Suppose that* θ^* *is interior, i.e.,* $\theta^* \in (0, 1)$. *Then,* θ^* *decreases in* ϕ_m, *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_m 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 $\phi_m \in [\underline{\phi}_m \overline{\phi}_m]$, maximizing $V - \theta P$. Notably, we have that:

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

Corollary 4 shows that the activist, as before, excludes investment in less green firms characterized by high ϕ_m. Instead, the activist invests in relatively green firms characterized by the lowest possible ϕ_m (i.e., $\phi_m = \underline{\phi}_m$). In light of Proposition 11, the activist selects a relatively large stake in such firms. In conclusion, we find that the activist tends to acquire large stakes in relatively green firms that can transition on their own at relatively low cost, while it excludes investment in less green firms where it could have more impact.

5.5 Managerial Contract Set by Passive Investors

So far, we have considered that activists contribute to a firm's green transition by exerting effort and contracting with management. Assume now that the contract of the manager is 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

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

The activist enters and $\theta_0 = \theta$ if and only if entry condition (7) is satisfied. We then have the following proposition.

Proposition 12 (Passive investors control)**.** *When passive investors set the contract of the manager, we have that:*

1. *Efforts satisfy* $a = \frac{1}{\phi_m}\frac{\Delta+\pi\xi}{\xi^2}$ *and* $m = \frac{\Delta}{\phi_m}\frac{\xi-1}{\xi}$ *when relative skills are such that* $\xi > 1$*; and* $a = \frac{\Delta+\pi}{\phi_m}\frac{1}{\xi}$ *and* $m = 0$ *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 managerial contracts are set by passive investors rather than activists:*

1. *The activist's effort* a *is higher and the manager's effort* m *is lower than in the baseline.*

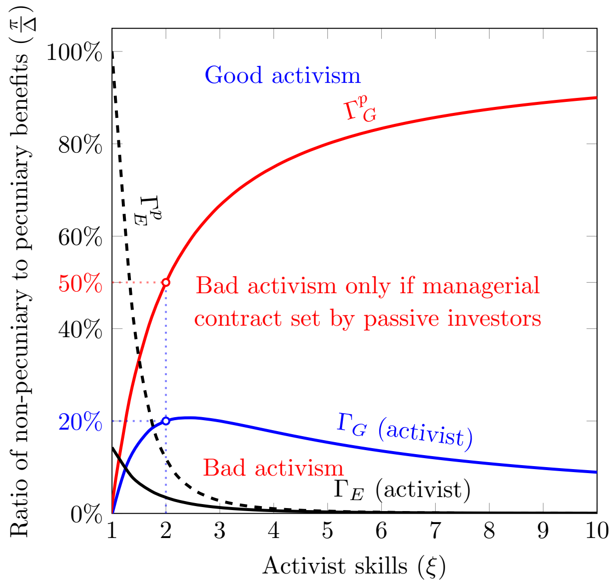
2. *Impact activism is negatively affected on the intensive margin for $\xi > 1$ in that the transition rate is lower than in the baseline and $\Gamma_G^p > \Gamma_G$. For $\xi \leq 1$, we have $\Gamma_G, \Gamma_G^p \leq 0$ and activism improves the transition rate in either scenario.*

3. *Impact activism is negatively affected on the extensive margin in that $\Gamma_E^p \geq \Gamma_E$.*

Corollary 5 shows that when passive investors set the managerial contract, the manager exerts lower effort and the activist exerts higher effort than in the baseline with the activist setting the contract. To understand this result, recall that due to the double moral hazard problem, and specifically incentive constraints (2) and (9), the activist's and the manager's efforts 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 management, when compared to the activist setting management's contract. 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 management's incentive contract, further reducing managerial effort.

Corollary 5 demonstrates that the impact of passive investors' control over the managerial contract on the transition rate $\lambda = a + m$ is influenced by the activist's relative skills. When $\xi > 1$ and the relative skill of the activist is low, higher a and lower m 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 the manager. Conversely, when $\xi \leq 1$, the activist is more efficient than the manager. 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 the managerial contract 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 manager's contract. However, Proposition 12 shows that in this case the activist



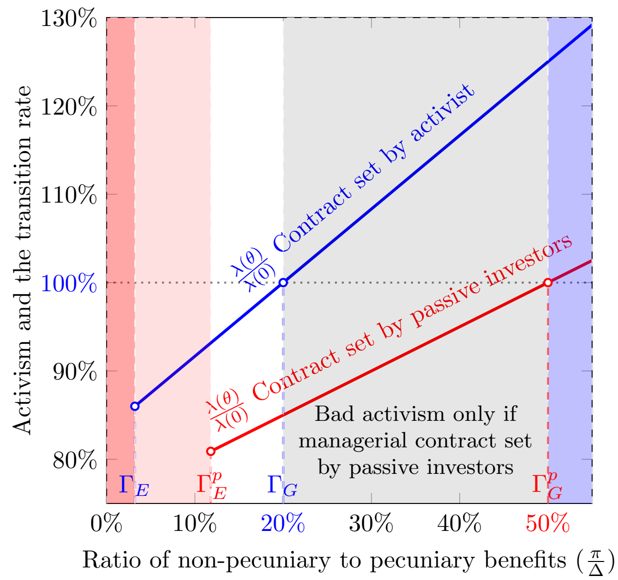


Figure 6: **Manager contract and activism**: The top panel plots the ratio of non-pecuniary to financial benefits over which activism improves the green transition rate when the manager contract is set by the activist (blue line) and by passive investors (red line) as functions of the activist's skills ξ. The figure also plots the entry thresholds Γ_E (solid black line) and Γ_E^p (dashed black line). The bottom 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 managerial contract is set by the activist (blue line) or by passive investors (red line).

only enters when the non-pecuniary benefits of activism exceed its financial benefits in that entry occurs if and only if $\frac{\pi}{\Delta} \geq 1$. Moreover, $\xi \leq 1$ is equivalent to $\phi_a \leq \frac{\phi_m}{\theta}$, where θ is the size of the activist' stake. Empirical estimates of activists' stakes suggest that these are generally below 20%, implying that the activist should be five times as efficient as management for activism to improve the green transition rate.

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 managerial compensation, especially by integrating sustainability objectives into it.

These results are graphically illustrated in Figure 6. The top panel plots the ratio of non-pecuniary to financial benefits 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 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 and that larger values of non-pecuniary benefits of transitioning are required to obtain good activism.

The bottom 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 managerial contract is 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 managerial 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 the contract is set by passive investors. In the blue region, the activist enters and facilitates the transition independently of who sets the managerial contract. The value of $\frac{\pi}{\Delta}$ triggering entry is larger when passive investors set the contract of the manager in that $\Gamma_E^p = 11.8\% > \Gamma_E = 3.2\%$. When passive investors set the managerial contract, the ratio of non-pecuniary to financial benefits of transitioning has to exceed $\Gamma_G^p = 50\%$ for activism to improve the green transition rate.

6 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 management. 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 management, which are costly, unobserved, and subject to moral hazard. Second, activist investors cannot fully capture the gains of activism due to a free-rider problem at entry.

Our analysis uncovers several new findings. First, in the presence of moral hazard, the efforts of the activist and management endogenously arise as substitutes and lie below first-best efforts. As a result, activism can either increase or decrease the green transition rate compared to passive investors owning the firm. Second, due to the free-rider problem, activism cannot aid the green transition unless the financial benefits of transitioning are small or activists have strong non-pecuniary sustainability preferences. When the green transition generates substantial financial gains or sustainability preferences are sufficiently weak, the free-rider problem leads to a counter-intuitive outcome: activists engage only if their impact is negligible, targeting firms that would transition under passive ownership and exerting minimal effort. In this scenario, activism reduces the green transition rate and it is more efficient to leave the green transition solely in the hands of management. Third, carbon taxes, by increasing the net financial benefits of transitioning, worsen the free-rider problem and reduce activist engagement, thereby hindering impact activism. In particular, carbon taxation prevents investment by highly skilled activists, and tilts activists' investments toward firms that can transition independently.

In summary, our analysis highlights that the combination of moral hazard and the free-rider problem may lead to ineffective or even counterproductive activism. Environmental policies such as carbon taxes and green investment subsidies fail to address these issues and may, in fact, exacerbate them. Thus, 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 do not suffer from the 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 moral hazard. 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 moral hazard problem. In other words, an important takeaway from our analysis is that the contracting space is a key determinant of the effectiveness of impact activism.

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Online Appendix

A Proofs

A.1 Proof of Proposition 1

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

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

$$\begin{aligned} P_0 &= \max_{(C,R)} \big\{ (1-m)(X_B - C - T) + m(X_G - C - R) \big\} \\ &= \max_{R} \left\{ X_B - W + mR - \frac{\phi_m m^2}{2} + m(\Delta - R) \right\} \\ &= \max_{m} \left\{ X_B - W - \frac{\phi_m m^2}{2} + m\Delta \right\}, \end{aligned}$$

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

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

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

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

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

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

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

The first-order condition with respect to m becomes

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

Thus,

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

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

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

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

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

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

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

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

A.3 Proof of Proposition 3

Under optimal efforts, one can express the stock price as

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

Analogously, the activist's value function becomes

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

Accordingly, the entry objective can be written as

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

Thus, as desired, the entry condition becomes

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

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

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

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, $\pi \to 0$, we get $\lim_{\pi\to 0} \xi_+ = \lim_{\pi\to 0} \frac{\Delta + \sqrt{\Delta^2 - 4(\Delta+\pi)\pi}}{2\pi} = +\infty$. In addition, by L'Hopital's rule:

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

Finally, note that when $\Delta^2 < 4(\Delta+\pi)\pi$, which holds for Δ close to zero or π sufficiently large (relative to Δ), the equation $\lambda(\theta) = \lambda(0)$ has no root in ξ. Then, $\lambda(\theta) < \lambda(0)$ for any $\xi \in (0, \infty)$. Next, we can take the limit $\Delta \to \infty$, leading to $\lim_{\Delta\to\infty} \xi_- = 0$ and $\lim_{\Delta\to\infty} \xi_+ = +\infty$.

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

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

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

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

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

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 (12) 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

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

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

A.9 Proof of Corollary 3

Recall that the activist enters if and only if

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

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 7

To solve for efforts, we solve the optimization problem in (14) subject to (2), (3), and (9). For this sake, we insert (3) into (4) to rewrite the activist's optimization as

$$\begin{aligned} V &= \max_R\left\{\theta\big[X_B - W + (a+m)R - \frac{\phi_m m^2(1-s)}{2} + (a+m)(\Delta+\pi-R)\big] - \frac{\phi_a a^2}{2}\right\} \\ &= \max_R\left\{\theta\big[X_B - W - \frac{\phi_m m^2(1-s)}{2} + (a+m)(\Delta+\pi)\big] - \frac{\phi_a a^2}{2}\right\}, \end{aligned}$$

subject to (2) and (9).

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

$$V=\max_m\left\{\theta\left[X_B-W-\frac{\phi_m m^2(1-s)}{2}+\left(\frac{\theta(\Delta+\pi-\phi_m m)}{\phi_a}+m\right)(\Delta+\pi)\right]-\frac{\theta^2(\Delta+\pi-\phi_m m)^2}{2\phi_a}\right\}.$$

The first-order condition with respect to m becomes

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

Thus,

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

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

$$m = \frac{\Delta + \pi}{\phi_m}\left(\frac{1}{1 - s + 1/\xi}\right) = \frac{\Delta + \pi}{\phi_m}\left(\frac{\xi}{1 + \xi(1 - s)}\right).$$

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

$$a = \frac{\Delta + \pi}{\phi_m}\left(\frac{1 - \xi s}{\xi\left(\xi(1 - s) + 1\right)}\right).$$

Finally, the effort level under passive ownership is obtained by taking the limit $\phi_a \to \infty, \pi \to 0$; $\phi \to \infty$ implies $\xi \to \infty$ so that in that $m^P = \lim_{\pi\to,\xi\to\infty} m = \frac{\Delta}{\phi_m(1-s)}$.

Next, calculate

$$\frac{\lambda(\theta)}{\lambda(0)} = \frac{a + m}{m^{FB}} = \frac{(1 + \xi^2 - \xi s)(1 - s)}{\xi\left(\xi(1 - s) + 1\right)}\left(1 + \frac{\pi}{\Delta}\right)$$

Clearly, $\frac{\lambda(\theta)}{\lambda(0)}$ increases in $\frac{\pi}{\Delta}$. We can solve $\frac{\lambda(\theta)}{\lambda(0)} = 1$ for $\frac{\pi}{\Delta}$ to obtain $\frac{\pi}{\Delta} = \Gamma_G^s$ with

$$\Gamma_G^s = \frac{\xi - 1 + s(1 + \xi(1 - s))}{(1 - s)(1 + \xi(\xi - s))}.$$

Thus, $\lambda(\theta) \gtreqless \lambda(0)$ if and only if $\frac{\pi}{\Delta} \gtreqless \Gamma_G^s$.

We can calculate

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

As $s \leq \frac{1}{2}$, we have $\frac{\partial\Gamma_G^s}{\partial s} > 0$. Furthermore, we can calculate

$$\frac{\partial\lambda(\theta)}{\partial s} = \frac{\Delta + \pi}{\phi_m}\left(\frac{\xi\ (\xi - 1)}{\left(\xi(1 - s) + 1\right)^2}\right),$$

Thus, $\frac{\partial\lambda(\theta)}{\partial s} \gtreqless 0$ if and only if $\xi \gtreqless 1$.

The closed-form expression for the activist's value function and the stock price become

$$P = \frac{(\Delta + \pi)\left\{\Delta\left[\xi\left(\xi^2(1 - s) + 2\xi((s - 1)s + 1) + 4s - 2\right) + 2\right] - \xi^3(1 - s)\pi\right\}}{2\xi\phi_m(\xi(1 - s) + 1)^2} + X_G - \Delta - W$$

and

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

Finally, we can solve the entry condition $V - \theta P \geq 0$ for $\frac{\pi}{\Delta}$ to obtain

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

We can calculate

$$\frac{\partial \Gamma_E^s}{\partial s} = -\frac{2\xi^2(\xi + \xi^2(s^2 - 2s + 2) + \xi^3(s-2)s - 2\xi s + 1)}{\xi^2(s^2 - 2s + 2) - 2\xi^3(s-1) - 2\xi(s-1) + 1)^2},$$

which has the *opposite* sign as

$$\gamma := \xi(1-2s) + \xi^2(s^2 + 2(1-s)) + \xi^3(s-2)s - 2\xi s + 1.$$

Note that when $s \geq 0$ is sufficiently small, then $\gamma > 0$ and, therefore, $\frac{\partial \Gamma_E^s}{\partial s} < 0$.

A.11 Proof of Proposition 8

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

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

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 $m^P\alpha\theta\pi = \frac{\Delta\pi\alpha\theta}{\phi_m}$ when not entering, where $m^P = \frac{\Delta}{\phi_m}$ is the probability of transition under passive ownership.

We obtain that the activist enters if and only if $V - \theta P \geq \frac{\Delta\pi\alpha\theta}{\phi_m}$, 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.12 Effort Complementarity — Solution Details

We now assume that the probability of transition is given by

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

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

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

leading to the incentive constraint (under optimal interior effort)

$$m = \frac{R(1 + \omega \hat{a})}{\phi_m},$$

which is (21) 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

$$W = C + (\hat{a} + m + \omega \hat{a} m)R - \frac{\phi_m m^2}{2}, \tag{A.4}$$

which we can solve for C.

The activist chooses (C, R) and to maximize

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

subject to (21) and (A.4). We now take the first-order condition with respect to a, yielding

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

which, upon solving for a, yields (22). When taking the first-order condition with respect to a, note that by (A.4) and (21), (C, R) and thus m depend on anticipated activist effort $\hat{a}$ but not on actual activist effort a (which is unobserved and not contractible).

Using (A.4), the activist's value function optimization can then be rewritten as

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

subject to (21) and (22) and $\lambda = a + m + \omega am$. Unless $\omega = 0$, the solution cannot be characterized analytically. We then solve for optimal efforts (a, m) numerically.

Analogously to the baseline, the entry condition then becomes

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

under the optimal efforts (a, m).

A.13 Proof of Proposition 9

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

$$\begin{aligned} V &= \frac{\theta\left(1 + \xi + \xi^2\right)(\Delta + \pi)^2}{2\xi(\xi + 1)\phi_m} + \theta(X_G - \Delta - W) \\ P &= \frac{(\Delta + \pi)\big[(2 + 2\xi + 2\xi^2 + \xi^3)\Delta - \xi^3\pi\big]}{2\xi(\xi + 1)^2\phi_m} + X_G - \Delta - W. \end{aligned}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

Finally, we calculate

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

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

A.14 Proof of Proposition 10

Under the optimal interior $\theta = \theta^*$, let $\xi = \frac{\phi_a}{\phi_m\theta} = \frac{\phi_a}{\phi_m\theta^*}$ and $\overline{\xi} = \frac{\phi_a}{\phi_m\overline{\theta}}$.. By definition, $\overline{\xi} = \xi_E$. If $\pi \geq \Delta$, then $\xi_E = 0$. Otherwise, $\overline{\xi} = \xi_E$ 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

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

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

$$\pi\big[1+\xi(1+\xi)(3+\xi^2)\big] = \Delta(1+2\xi) \quad \Longleftrightarrow \quad \frac{\pi}{\Delta} = \frac{1+2\xi}{1+\xi(1+\xi)(3+\xi^2)}. \tag{A.5}$$

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 $\frac{\partial\lambda(\theta)}{\partial\theta} \gtreqless 0$ if and only if $\xi \gtreqless 1+\sqrt{2}$. 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.15 Proof of Proposition 11

The objective function is

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

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

$$\frac{\pi}{\Delta} = \frac{1+2\xi}{1+\xi(1+\xi)(3+\xi^2)}. \tag{A.6}$$

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.6) must increase, which requires ξ to decrease under the optimal $\theta = \theta^*$. Due to $\xi = \frac{\phi_a}{\phi_m\theta}$, this requires $\theta = \theta^*$ to increase. Consequently, θ^* increases with π but decreases with Δ.

Moreover, a change in ϕ_a or ϕ_m leaves the left-hand side of the first-order condition (A.6) unchanged. Thus, the right-hand side must remain unchanged, too. Due to $\xi = \frac{\phi_a}{\phi_m\theta}$, it therefore must be that $\frac{d}{dx}\left(\frac{\phi_a}{\phi_m\theta}\right)$ remains constant under optimal $\theta = \theta^*$. Thus, θ^* increases in ϕ_a but decreases in ϕ_m.

A.16 Proof of Corollary 4

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

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

$$\begin{aligned} P &= \max_{C,R}\left\{\left(1-(a+m)\right)\left(X_B - C - T\right) + (a+m)\left(X_G - C - R\right)\right\} \\ &= \max_{m}\left\{X_B - W - \frac{\phi_m m^2}{2} + \left(\frac{\theta(\Delta+\pi-\phi_m m)}{\phi_a} + m\right)\Delta\right\}. \end{aligned}$$

The first-order condition with respect to m becomes

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

When $m > 0$ is interior, then

$$m = \frac{\Delta}{\phi_m}\frac{\xi - 1}{\xi}.$$

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

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

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

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

and, therefore,

$$a + m - m^P = \frac{1 - \xi}{\xi^2}\frac{\Delta}{\phi_m} + \frac{\pi}{\phi_m \xi}. \tag{A.7}$$

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

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

When $\xi \leq 1$, then

$$a + m = \frac{\Delta\pi}{\phi_m \xi},$$

and

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

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

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

if $\xi > 1$ and

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

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 $m = 0$ (when passive investors set the contract, and it is clear that the manager's effort is lower than in the baseline. Moreover, $a = \frac{\Delta+\pi}{\phi_m}\frac{1}{\xi}$ clearly exceeds $\frac{\Delta+\pi}{\phi_m}\frac{1}{\xi(1+\xi)}$, i.e., the activist's effort in the baseline. Second, consider $\xi > 1$, so $m = \frac{\Delta}{\phi_m}\frac{\xi-1}{\xi} \leq \frac{\Delta+\pi}{\phi_m}\frac{\xi-1}{\xi}$. 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 $a = \frac{\Delta+\pi\xi}{\phi_m}\frac{1}{\xi^2} > \frac{\Delta+\pi}{\phi_m}\frac{1}{\xi^2}$. 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 $\lambda(\theta) = a = \frac{\Delta+\pi}{\phi_m}\frac{1}{\xi}$. The transition rate from the baseline equals $\frac{\Delta+\pi}{\phi_m}\frac{1+\xi^2}{\xi(1+\xi)} < \frac{\Delta+\pi}{\phi_m}\frac{1+\xi}{\xi(1+\xi)} = \lambda$ where we used $\xi < 1$. For $\xi > 1$, the transition rate becomes $\lambda = \frac{1}{\phi_m}\frac{\Delta+\pi\xi+\Delta\xi(\xi-1)}{\xi^2} < \frac{\Delta+\pi}{\phi_m}\frac{1+\xi-1}{\xi} =< \frac{\Delta+\pi}{\phi_m}\frac{1+\xi}{\xi(1+\xi)}$. This is smaller, due to $\xi > 1$, than the transition rate from the baseline, i.e., $\frac{\Delta+\pi}{\phi_m}\frac{1+\xi^2}{\xi(1+\xi)}$.

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 $\Gamma_E^p = 1$ 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 $\xi > 1$.

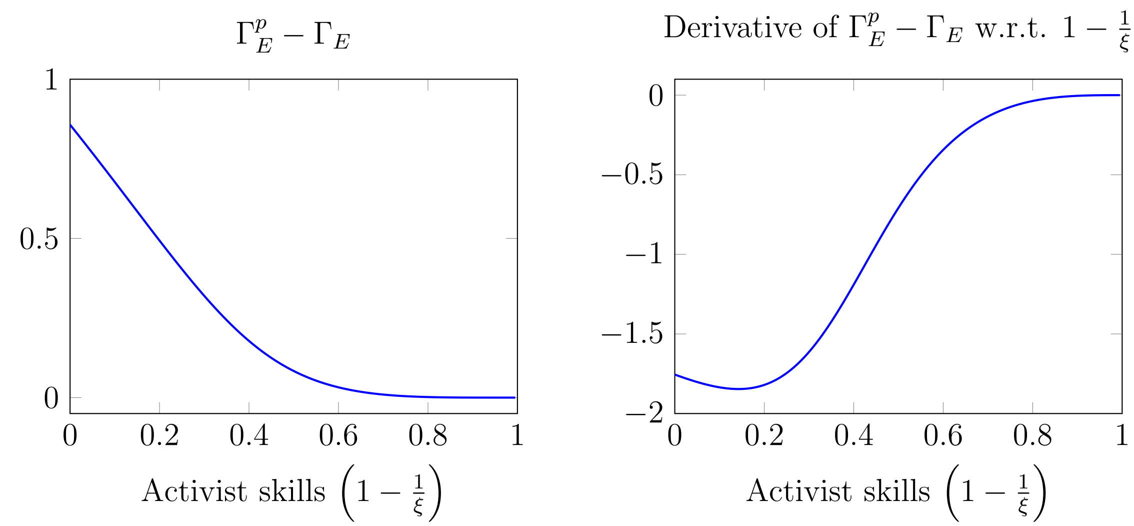

Figure A.1: $\Gamma_E^p - \Gamma_E$: The figure plots the difference $\Gamma_E^p - \Gamma_E$ between the entry threshold when the managerial contract is set by passive investors and the entry threshold when the managerial contract is set by activists in the case of $\xi > 1$. Both thresholds only depend 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 $1 - \frac{1}{\xi}$.