Myopic Shareholders

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Abstract

There is a heated debate over concerns that the presence of investors with short-term investment horizons can be expected to exacerbate the short-termism problem of public companies (corporate myopia), and over proposals to discourage short-term investors or limits their power and influence. We develop a model to study the widely expressed concern that short-term shareholders have an interest to push for or encourage governance structures, pay schemes, and director choices that would increase the focus of public companies on the short-term. We extend the canonical Stein Model (Stein 1988 and Stein 1989) by allowing for governance structures, pay schemes, and director selection– all choices that affect the level of corporate myopia and are taken as exogenous in the Stein Model – to be determined endogenously and influenced by shareholder preferences. Building on the standard framework for analyzing short-termism, we show that short-term investors have the same preferences with respect to governance structures, pay schemes, and director selections as long-term shareholders and, contrary to widely expressed concerns, short-term investors would not prefer choices making long-term shareholders worse off. Our analysis indicates that short-term investors cannot be expected to have an adverse effect through key channels on which policy debates and policymakers have focused. (*JEL* D74, D82, D83, G34, K22)

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1 Introduction

This paper develops a model to examine the effect that the presence of investors with short-term horizons ("myopic shareholders") has on problems of short-termism ("corporate myopia") and, in turn, on the performance and value of public companies. In particular, we study whether myopic shareholders can be expected to seek and support governance structures, pay arrangements, and board changes that would increase focus on short-term results, and thus exacerbate corporate myopia problems, at the expense of long-term value and long-term shareholders.

Our model seeks to contribute to two key debates – on short-termism and myopic shareholders. Prominent public officials and business leaders have expressed grave concerns about the adverse effects of myopic shareholders, and have advocated substantial policy measures to address them.[1] To begin, short-termism is widely viewed as a major problem for the performance of public companies and the economy. For example, corporate short-termism has been gravely described as "one of the greatest threats to America's enduring prosperity" by Vice-President Biden (Biden 2016), as "holding America back from reaching its full potential" by a bill sponsored by Senators Baldwin and Merkley (Baldwin and Merkley 2016), and as having "eroded faith in corporations continuing to be the foundation of the American free enterprise system, which has been, in turn, the foundation of our economy" by an Aspen Institute Task Force (Aspen Institute 2009).

Those concerned about short-termism have long viewed the presence and influence of short-term shareholders as a key contributor to myopic behavior by managers of public companies (see, e.g., Barton 2011). Delaware Chief Justice Strine explains the rationale for this position as follows: "[I]n corporate polities, unlike nation-states, the citizenry can easily depart and not 'eat their cooking.' As a result, there is a danger that activist shareholders will make proposals motivated by interests other than maximizing [long-term value]" (Strine 2010). Similarly, the Aspen Institute Task Force argued that "fund managers with a primary focus on short-term trading gains have little reason to care about long-term corporate performance or externalities, and so are unlikely to exercise a positive role in promoting corporate policies, including appropriate proxy voting and corporate governance policies, that are beneficial and sustainable in the long-term" (Aspen Institute 2009).

Importantly, concerns about the impact of myopic shareholders have motivated an array of

[1] For surveys of these debates, see Bebchuk (2013) and Roe (2018).

policy proposals that seem to have gained substantial traction in policy debates. In particular, public officials and business leaders have called for measures to encourage a long-term horizon for institutional investors. For example, to combat corporate myopia, Hillary Clinton's presidential campaign, BlackRock's CEO Larry Fink, and economist Joseph Stiglitz advocated tax incentives to encourage long-term retention of stock (Clinton 2015, Fink 2017, Stiglitz 2015); others have called for reforming the compensation of portfolio managers to eliminate incentives for short-term focus (e.g., Strine 2016); and various researchers, organizations, and practitioners have advocated corporate arrangements that would encourage long-term investors by providing additional "loyalty" dividends to such investors at the expense of other investors (e.g., Bolton and Samama 2013).

In addition, concerns that short-term shareholders exacerbate the myopia problems of public companies have motivated an array of proposals to limit the power, rights and influence of short-term shareholders relative to those of long-term shareholders. Indeed, to combat corporate myopia, various writers have advocated adopting tenure voting arrangements that would reduce the relative voting power of short-term investors (see, e.g., Fox and Lorsch 2012, Mayer 2013); others have proposed limits on the power of short-term investors to propose corporate changes (see, e.g., Strine 2010), with the SEC following such an approach when adopting a proxy access rule in 2010 (SEC, 2010); and Senators have put forward legislative proposed to curb the activities of hedge fund activists (Baldwin and Merkley 2016).

We seek to study the impact of myopic shareholders on the problem of short-termism. To do so, we build on the well-known analytical framework for examining short-termism established by Jeremy Stein (Stein 1988 and Stein 1989, collectively "the Stein Model").[2] The Stein Model has shown how short-termism can arise in market equilibrium and has been key reference in financial economics. In this model, short-termism arises because of asymmetric information between corporate directors and managers ("the manager"). The manager may take some unobservable actions (such as making an unobservable investment that has payoff only in the long-term). The Stein Model shows that, whenever the managers care about the share value not only in the long-term but also in the short-term, the manager may take some inefficient unobservable actions that would improve short term results at the expense of the long term. This inefficiency, which is anticipated in equilibrium, adversely affects firm value. Furthermore,

[2]The Stein Model continues the work of Narayanan (1985) who showed that managerial myopia arises in equilibrium where prices reflect public information due to information asymmetry between insiders and market participants.

the larger the weight attached to short-term prices, the more sever the short-termism problem.

To contribute to the key policy debates on myopic shareholders, we extend the Stein Model to facilitate an examination of whether myopic shareholders would have an interest in pushing for governance structures, pay schemes, and leadership choices (e.g., appointing an activist hedge fund to the board) that would disfavor long-term shareholders by exacerbating the short-termism problem. To this end, we introduce into the Stein Model shareholders with different horizons and examine the effects of shareholder horizons on various choices. Specifically, we allow for the governance structures, pay schemes, and leadership choices to be endogenously determined and influenced by the preferences of shareholders.[3]

We would like to clarify that our focus is not on analyzing the desirable level of influence shareholders of public companies ought to have. Rather, our focus is on the question whether, for any given level of influence that shareholders have with respect to governance, pay structure, and leadership choices, the presence of short-term shareholders would adversely affect these choices. In the course of our analysis, we do examine the long-term costs and benefits of governance arrangements that expand shareholder power to replaced directors. However, our focus is on examining whether short-term and long-term shareholders would have different preferences on such matters.

Our analysis is organized as follows. In Section 2 we present our framework of analysis. Similar to the Stein Model, we have a company that operates in two periods and that can take unobservable actions that would inefficiently improve results in the first period at the expense of the results in the second period. We add a time prior to the first period in which governance structures, pay schemes, and the identity of the manager – choices that will affect the subsequent level of short-termism in the first period – are determined. We allow for these choices to be influenced by shareholders, and we introduce two types of shareholders; myopic shareholders, which plan to sell their shares after the results of the first period are known, and long-term shareholders, which plan to hold their shares through the second period. Our

[3]The Stein Model, which has attracted more than 3500 citations on Google Scholar, has provided a basis for may theoretical papers (including by us). Papers extending this model in various ways include (e.g., Aghion and Stein 2008; Benmelech, Kandel, and Veronesi 2010; Bizjak, Brickley, and Coles 1993; Edmans et al. 2012; Goldman and Slezak 2006; Kumar and Langberg 2009; Marinovic and Varas 2018; Von Thadden 1995; Zhu 2018). To the best of our knowledge, however, this body of work has not provided our key insights.

Unlike the Stein Model and the papers that builds on its framework, there is another line of work that studies managerial myopia in settings in which market prices deviate from fundamental values for prolonged periods of time due to limits to arbitrage, investor overconfidence, and other reasons (e.g., Bolton et al. 2006; Shleifer and Vishny 1990).

primary question is whether myopic shareholders would prefer and seek different arrangements than those that would be desirable for long-term shareholders.

In Section 3 we analyze how the governance structure choice is expected to affect the level of myopia. For concreteness we examine the governance arrangements that affect how easy/difficult it would be to replace the manager after the results of the first period with a new manager that will run the firm in the second period. The results of the first period might provide shareholders with information about the ability of the manager, and this information might indicate that replacing the manager with a new manager will be value-increasing (on an expected value basis). As long as the probability of replacement decreases with improvement in first-period results, any change in governance structure that makes it easier (harder) to replace the manager after the first period results are known increases (decreases) the manager's incentive to take unobservable myopic actions that inefficiently improve short-term results.

In Section 4, we identify the governance structure that would best serve the interests of long-term shareholders. The optimal choices for such investors will trade off two effects of enabling manager replacement – the expected benefit of enabling efficient replacement and the expected cost from incentivizing myopic behavior. Thus, even from the perspective of long-term investors a governance structure that fully insulates the manager from replacement to eliminate any incentives to engage in short-termism arising from the fear of replacement might not be optimal.

Section 4 then identifies the choice of governance structure that would be optimal for short-term investors. Our main result demonstrates that, although these investors expect to sell their shares at the end of the first period, they would not favor a governance structure that would induce more short-termism than the long-term investors. The reason is that, while the myopic actions taken by managers are assumed to be unobservable in the Stein model, the choice of governance structure is clearly observable. Thus, the inefficiency costs of choosing a governance structure that would inefficiently exacerbate the problem of myopic actions would be expected to be reflected in the market prices that would be received by short-term investors.

Thus, even assuming that short-term shareholders would be interested in the manager's taking unobservable myopic actions, the short-term shareholders would not be able to benefit from using the observable instrument of an inefficient governance structure to obtain such actions. Recall Chief Justice Strine's concern about short-term shareholders push for changes without having "to eat their own cooking." The intuition behind our result is that, because governance

structure changes are observable, short-term investors that push for inefficient changes that can be expected to have an adverse effect on the myopia problem, they will have to eat their cooking when they sell their shares after making such changes.

Section 5 extends the analysis to the choice of executive pay schemes. Pay schemes that induce managers to increase the weight they attach to short-term prices, such as by allowing short-term unloading of shares, can be expected to increase incentives to take unobservable myopic corporate actions. Again, however, we show that short-term investors would not have an interest in pushing for or encouraging myopic pay schemes disfavored by long-term investors. Doing so would decrease, not increase, the short-term prices that they would be able to obtain when they sell their shares.

Section 6 considers the case in which short-term investors seek to take over leadership of the firm before the first period in which myopic actions may be taken. This case is important to analyze because over the past decade, activist hedge funds have been increasingly able to get individuals associated with them elected to boards of directors (Bebchuk et al. 2017). In the setting that we analyze, if an investor with short-horizon takes on leadership of the firm in the first period, such a leader will have increased incentives to take unobservable myopic actions that exacerbate the costs of short-termism. However, because the introduction of a leadership with a short-term focus would be observable and reflected in subsequent market prices, such a leadership change would be interest of short-term investors only when it would serve the interests of long-term investors – that is, when the expected benefits from superior leadership ability (if any) would exceed the expected costs from enhanced short-termism.

Section 7 extends the analysis to consider the possibility that insiders have superior information about the effects of governance structures on firm value. We show that our main result extends to this case, and highlight that the key issue is not whether outside shareholders are as informed as insiders, but rather whether all shareholders have access to the same information.

Section 8 further extends the analysis in two final ways. First, we highlight the key and valuable role played by disclosure requirements. We explain that corporate myopia levels could be adversely affected by the presence of activist hedge funds (or other short-term investors) if corporate managers could have a secret channel with hedge fund activists that (i) enabled the managers to provide such hedge fund managers with short-term horizons with information about myopic actions not observable to other, and (ii) enabled the managers to agree to do so. By preventing such secret channels, securities laws play a beneficial role. Second, we discuss

how our main result could be extended to cases with substantial heterogeneity in the investment horizon of different investors.

Section 9 makes concluding remarks. Our analysis has substantial implications for the ongoing heated debates on corporate myopia problem and the contribution of short-term investors to this problem. We show that certain key channels – the influence of short-term investors on governance arrangements, pay schemes, and board composition – cannot be expected to have the adverse effect on corporate myopia that is often suggested in policy debates. To be sure, our analysis does not preclude short-term investors from having adverse effect through some other channel, and future work could investigate whether such channels exist. In the meantime, however, policy discussions regarding investor horizons and corporate myopia should be informed by our analytical results, and our framework of analysis can provide a solid foundation for such discussions.

2 Framework of Analysis

We consider a public firm which is run by a manager and owned by shareholders. We follow the Stein Model with two periods, where the first period represents the short-term and the second and final period represents the long-term. We have the following sequence of events, which is summarized in Figure 1 below.

- $t = 1$, short term period:

  a : choice of governance structure

  b : choice of myopic actions level

  c : realization and disclosure of first period profits

  d : market trading

- $t = 2$, long term period:

  a : vote whether to replace the manager

  b : second period operations

  c : realization of second period profits and terminal value

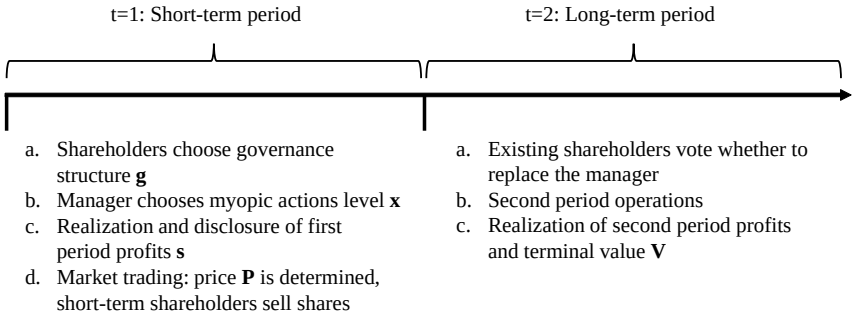


Figure 1 - Timeline of the model

The manager. The company is run by a team of directors and executives. Following the Stein Model, we view them for convenience as a unitary agent and we refer to that agent as the manager. We denote by $a_I \sim N(\mu, \sigma_a^2)$ the ability of the incumbent manager (i.e., skills, expertise, and talent). The manager's ability affects the terminal value of the firm, which we denote by V. We assume that shareholders and the incumbent manager are symmetrically uninformed about a_I, but they share the same prior. The manager receives a monetary compensation that is proportional to the terminal value of the firm, if he is still running the firm at that time. We denote by $\omega \in [0, 1)$ the manager's compensation.[4]

Shareholders. We consider two types of shareholders. The first type of shareholders have long investment horizon; they hold onto their shares until the terminal period. The utility of these shareholders is the terminal value of the firm net of compensation to the manager,

$$u_{LT} = (1 - \omega) V. \tag{1}$$

The second type of shareholders have a short investment horizon; they must sell their shares before the terminal value is realized (later on we discuss cases with more than two types of shareholders in terms of investment horizon). We denote the interim share price that short-term shareholders receive when they sell their shares by P. Therefore, the utility of these shareholders is

$$u_{ST} = (1 - \omega) P. \tag{2}$$

Both types of shareholders are diversified and are not exposed to the idiosyncratic risk of the firm.[5]

[4] Adding a fixed salary to the manager's compensation does not change the main results.

[5] Both types of shareholders are effectively assumed to be risk neutral.

Governance structure choice. At the outset, shareholders vote on a governance policy of the firm $g \in [0, \overline{g}]$, where $\overline{g} > 0$. A change to the governance policy of the firm requires the approval of the majority of the shareholders in a vote. We interpret g as the level of insulation of corporate insiders from the market, where higher g implies higher insulation. More specifically, g is interpreted as the cost that shareholders must face to replace a manager due to coordination problems such as free-riding, takeover defenses, legal challenges, and search costs. We assume these costs are drawn from the resources of the firm. Therefore, a larger g is also a larger commitment not to fire the manager even if it is efficient to do so ex-post. We assume that the choice of g is public, and it cannot be modified afterwards.[6] In practice, the governance structure of public companies is observable. The focus of the paper is on the optimal level of g that is set at the initial voting stage by shareholders. As we discuss below, the assumption that g is observable will play a key role in our analysis.

Choice of myopic actions level. After the governance of the firm is determined by shareholders, the manager decides on $x \in [0, \overline{x}]$, which affects the profitability of the firm. It will become clear below that this decision can be interpreted as the allocation of resources between short-term and long-term projects, or simply earning management. The decision x is *unobserved* by the market. We assume the expected increase in the profitability of the firm at the first period is given by x, whereas the expected decrease in the profitability of the firm at the second period is given by $K(x)$, where $K(0) = 0$, $K'(0) = 1$, and $K''(\cdot) > 0$ for all $x \in [0, \overline{x}]$. Intuitively, the short-term investment is inefficient with this inefficiency increasing in the amount of short-termism.

First period profits. While the choice x is unobserved by the market, the profitability of the firm at the first period becomes public immediately after the manager makes his decision. The first period profit depends on the incumbent manager's ability a_I, the level of myopic actions x, and luck $\varepsilon \sim N(0, \sigma_\varepsilon^2)$ which is independent of a_I. Specifically, the first period profit is given by

$$s = a_I + x + \varepsilon. \tag{3}$$

Therefore, good performances in the short-term can be attributed to luck (ε), high ability of the incumbent manager (a_I), or high level of myopic actions (x). Action x is myopic in the

[6] The important assumption is that g cannot be modified without any cost. Empirically, corporate governance is very persistent over time.

sense that it inflates the current performances of the firm at the cost of its future.

First period trading. After the first period profits are realized and disclosed, there will be trading of the firm's share. At this point the short-term investors unload their shares and sell. The share price of the firm is determined by the expectations of the market about the terminal value of the firm. The market does not directly observe the level of myopic actions chosen by the manager, although it will have the correct expectations in equilibrium. Instead, the market bases its expectations on the available public information which includes the first period profits s and the initial decision of shareholders about g. To reflect this dependence, we denote the interim share price as $P(g, s)$.[7]

Vote whether to replace the manager. Given the realization and disclosure of the first period profits, existing shareholders may choose to replace the incumbent manager ($e = fire$) or retain him ($e = retain$).[8] How difficult it is to replace the manager, and therefore, how likely it is to happen, will depend on the governance structure chosen at time 1.a. In order to fire the manager, shareholders must incur a cost of g. If the incumbent manager is removed, then a new manager with ability $a_R \sim N(\mu, \sigma_a^2)$ is hired, where a_R is independent of a_I.[9] We assume that the new manager is compensated by the same amount ω as the incumbent, so shareholders' decision to replace the manager is not motivated by their desire to reduce managerial compensation. Moreover, the new manager enjoys the same private benefits from his job as the incumbent manager (which we specify below), so the social welfare is not directly affected by the decision to replace the incumbent.

Second period profits and terminal value. At this stage, the second period profits are realized. If the ability of the manager who is running the firm at that point is a_{LT}, and the level of myopic actions is x, then the second period profits are given by $\lambda a_{LT} - K(x)$, where $\lambda > 0$ captures the importance of the manager's ability to firm value at the long-term relative to the

[7] The same result holds if instead the share price is determined after shareholders decide whether to fire the manager.

[8] In practice, shareholders do not vote directly on the replacement of CEO; it is the responsibility of the board of directors. Instead, shareholders elect directors. Therefore, a higher g implies that it is harder to remove incumbent directors from office.

[9] Simialr results holds if the expected ability of the incumbent manager differs from that of the replacement manager.

short-term. Therefore, the value of the firm, gross of the cost of replacing the manager, is

$$\Pi\left(a_{LT},x\right)=\underbrace{a_I+x+\varepsilon}_{\text{short-term}}+\underbrace{\lambda a_{LT}-K\left(x\right)}_{\text{long-term}}. \tag{4}$$

Finally, the terminal value of the firm is realized according to the initial level of x and the talent of the manager in office, net of the cost of firing the manager, if the incumbent manager was fired. The terminal value of the firm is[10]

$$V\left(g,x,e,a_I,a_R\right)=\begin{cases}\Pi\left(a_I,x\right) & if\ e=retain\\ \Pi\left(a_R,x\right)-g & if\ e=fire.\end{cases} \tag{5}$$

Management compensation and private benefits. The total payoff of the incumbent manager is

$$u_M=\mathbf{1}_{e=retain}\cdot\left[\omega V\left(g,x,retain,a_I,a_R\right)+b\right]. \tag{6}$$

Notice that the manager's compensation is not tied directly to the interim share price. We relax this assumption in Section 5, where we consider the affect of short-term compensation. Also note that, in addition to his monetary compensation, the manager has non-pecuniary private benefit $b>0$ from keeping his job until the terminal period (e.g., the publicity and prestige that comes with the status of being a CEO of a public firm). If the manager is fired, then he loses his monetary compensation and private benefits, but he receives his outside option which we normalize to zero. We also assume

$$b/\omega+\overline{x}-K\left(\overline{x}\right)+\left(1+\lambda\right)\left(\mu-\overline{g}/\lambda-\overline{x}\right)\geq 0, \tag{7}$$

which simplifies the analysis by ruling out the possibility that the shareholders would like to retain the incubment manager, but the manager will prefer to voluntarily resign his job. For simplicity, the manager is assumed to be risk neutral.

[10]Notice that the cost g is deducted from the resources of the firm. Similar results hold if the cost is privately incurred by shareholders.

3 Myopia and The Governance Structure

As in the Stein model, the threat of replacement can induce the manager to choose myopic actions. In this section we analyze how the equilibrium level of myopic action, which we denote by x^*, depends on the chosen governance structure g. We solve the model backwards.[11] In Subsection 3.1 we examine how the decision of shareholders to replace the manager is affected by the level of myopic actions and the initial governance structure. In Subsection 3.2 we analyze the manager's expected payoff for any given level of myopic action and governance structure. Last, in Subsection 3.3, we characterize the level of myopic action chosen by the manager for any given initial governance structure. All proofs not in the main text are given in the Appendix.

3.1 The choice to replace the manger after the first period

Consider the decision of shareholders to fire the manager given the first period profits s. At this stage, the governance structure is fixed at g and the level of myopic action x is no longer reversible. Therefore, the decision of shareholders to retain the incumbent manager depends only on their inference about his ability relative to a potential replacement.[12] We establish the following result.

Lemma 1 *Given governance structure g, realized first period profit s, and an expected level of myopic action x^*, shareholders retain the incumbent manager if and only if*

$$\hat{\mu}\left(s, x^*\right) > \mu - g/\lambda. \tag{8}$$

where

$$\hat{\mu}\left(s, x^*\right) \equiv \frac{\sigma_\varepsilon^2}{\sigma_\varepsilon^2 + \sigma_a^2}\mu + \frac{\sigma_a^2}{\sigma_\varepsilon^2 + \sigma_a^2}\left(s - x^*\right). \tag{9}$$

To understand Lemma 1, note that, in equilibrium, shareholders expect the level of myopic action to be x^*, and the first period profit to satisfy $s = a_I + x^* + \varepsilon$. Given the normality assumptions for a_I and ε, it follows from a standard normal learning model that shareholders' posterior inference for the ability of the incumbent manager is normally distributed with mean $\hat{\mu}\left(s, x^*\right)$ and variance $(\frac{1}{\sigma_\varepsilon^2} + \frac{1}{\sigma_a^2})^{-1}$, where the former is given by Expression (9) in Lemma 1.

[11] The solution concept is Perfect Bayesian Equilibria.

[12] Notice that only the long-term shareholders make the decision to replace the manager.

Intuitively, shareholders' posterior beliefs about the manager's ability are the weighted average of their prior μ and what their best estimate of ability would be if they only observed s and had a diffuse prior. A higher realization of first period profits implies that the manager has a higher ability, and shareholders update their beliefs accordingly. Notice that shareholders believe that the first period profits s are inflated by x^*, and account for that. The weights that are put on the prior versus the new estimate depend on the signal to noise ratio—that is, if the prior is very noisy (high σ_a^2), more weight is put on the new information, while if the new information is very noisy (high σ_ε^2), more weight is put on the prior. This explains Expression (9).

Since the sensitivity of firm value to the ability of the manager in the long-term is λ, and since firing the manager cost shareholders g, shareholders retain the incumbent if and only if $\lambda\hat{\mu}(s, x^*) > \lambda\mu - g$, which is exactly Condition (8). This proves Lemma 1.

3.2 The manager's payoff given the myopia level

Before analyzing the choice of the manager on the level of myopic action, we derive the manager's expected payoff in closed form. For this purpose, let ϕ and Φ represent the density function and the cdf of the standard normal distribution, respectively. We derive the following result.

Lemma 2 *Suppose shareholders expect the level of myopic action to be x^* but the manager decides on x. The manager's expected payoff is*

$$U_M(x, x^*; g) = (b + \omega\Pi(\mu, x))(1 - \Phi(\tau(x - x^*))) + \omega(1 + \lambda)\Sigma\phi(\tau(x - x^*)) \tag{10}$$

where $\Sigma \equiv \sqrt{\frac{\sigma_a^4}{\sigma_\varepsilon^2 + \sigma_a^2}}$ *and*

$$\tau(x - x^*) \equiv \frac{1}{\Sigma}\left(-g/\lambda - \frac{\sigma_a^2}{\sigma_\varepsilon^2 + \sigma_a^2}(x - x^*)\right). \tag{11}$$

The closed form of $U_M(x, x^*; g)$ has an intuitive interpretation. The first term in Expression (10), $b + \omega\Pi(\mu, x)$, is the payoff of the manager if he is retained by shareholders. The payoff of the manager is composed of his private benefits b and the equity share in the firm's terminal value, $\omega\Pi(\mu, x)$. Notice that the manager is initially uninformed about his ability, and therefore, the terminal firm value is evaluated at the expected ability μ.

The second term in Expression (10), $1-\Phi\left(\tau\left(x-x^{*}\right)\right)$, is the probability the manager ascribes to the event that shareholders retain him if in equilibrium he is expected to choose x^{*} but in fact he was choosing x. That is, $1-\Phi\left(\tau\left(x-x^{*}\right)\right)$ is the probability of $\hat{\mu}\left(s,x^{*}\right)\geq\mu-g/\lambda$ given $s=a_{I}+x+\varepsilon$.[13] Notice that $1-\Phi\left(\tau\left(x-x^{*}\right)\right)$ is increasing in g and $x-x^{*}$. The effect of g is obvious; a higher cost of replacing the manager implies a lower probability of being fired. To understand the effect of $x-x^{*}$, notice that if the manager chooses a higher level of myopic action than what is anticipated (i.e., $x-x^{*}>0$ is large), shareholders will attribute high realizations of the first period profits to a high managerial ability (and in part to a bad draw of luck, ε) rather than myopic actions, and as a consequence, they are more likely to retain the manager. This observation also implies that the manager will have incentives to inflate the first period profits of the firm by choosing a larger x.

The third term in Expression (10) is a bit more subtle. Shareholders retain the manager if and only if his inferred ability is sufficiently high, that is, $\hat{\mu}\left(s,x^{*}\right)\geq\mu-g/\lambda$. Therefore, conditional on being retained, the manager believes that his ability is higher, and as a consequence, his equity compensation is also higher in those cases. This informational effect is captured by the term $\omega\left(1+\lambda\right)\Sigma\phi\left(\tau\left(x-x^{*}\right)\right)$.

3.3 The equilibrium myopia level

Given g and x^{*}, the manager chooses x that maximizes his expected payoff $U\left(x,x^{*};g\right)$. In equilibrium, shareholders correctly anticipate the decision of the manager, even though they do not observe it directly. That is, $x=x^{*}$. Therefore, $x^{*}\left(g\right)$ must solve

$$\frac{\partial U_{M}\left(x,x^{*};g\right)}{\partial x}|_{x=x^{*}}=0. \tag{12}$$

The next result characterizes the equilibrium level of myopic actions.

[13] Notice that we invoked the assumption that the manager does not resign voluntarily when shareholders choose to retain him. If the manager resigns voluntarily, he obtains his outside option, which is zero. However, if shareholders retain the manager and the manager does not resign, conditional on realization of s, the manager gets $\omega\Pi\left(x,\hat{\mu}\left(s,x\right)\right)+b$. Notice that the similar shareholders, the manager also learns about his ability from s. However, unlike shareholder, the manager does not need to form expectations about the level of x; he directly observes it. In principle, the manager may choose a different x than what is anticipated by shareholders (i.e., $x\neq x^{*}$ is possible off the equilibrium path). Therefore, from the manager's perspective, his expected ability conditional on choosing x and the realization of s is $\hat{\mu}\left(s,x\right)$. The manager resigns voluntarily if and only if $\omega\Pi\left(x,\hat{\mu}\left(s,x\right)\right)+b<0$. Assumption (7) guarantees that Condition (8) implies $\omega\Pi\left(x,\hat{\mu}\left(s,x\right)\right)+b\geq0$.

Proposition 1 *For any governance structure g, the equilibrium level of myopic actions $x^*(g)$ is strictly positive and decreasing in g and ω. Moreover, if $x^*(g) < \overline{x}$ then $x^*(g)$ is given by the unique solution of*

$$\omega\left(K'\left(x^*\right)-1\right)\left(1-\Phi(\tau\left(0\right))\right)=\left(b+\omega\Pi\left(\mu-g/\lambda,x^*\right)\right)\phi(\tau\left(0\right))\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}}. \tag{13}$$

Proposition 1 implies that level of myopic actions in equilibrium is decreasing with the level of market insulation (i.e., the weakness of the governance structure) and the managerial skin in the game. The intuition is the following. The only reason the manager chooses inefficient myopic actions is to reduce the probability that shareholders replace him after the profits of the first period are realized. As g increases, the likelihood that shareholders find it optimal to replace the manager decreases. Therefore, the benefit from inefficiently inflating the first period profits decreases as well. In general, because $\omega > 0$, the manager at least partially internalizes the negative effect of myopic actions on the terminal value of the firm. Therefore, a larger ω implies that the manager will make fewer inefficient investments.

More specifically, Equation (13) has the following intuitive meaning. The left hand side is the marginal cost of choosing myopic actions from the perspective of the manager, while the right hand side is the marginal benefit. To understand these expressions, consider first the left hand side. If shareholders retain the manager, which happens with probability $1-\Phi(\tau\left(0\right))$, then the manager will receive as compensation his share of the terminal value. Since $K' > 1$, myopic actions reduces the terminal value of the firm, which the manager at least partly internalizes as long as $\omega > 0$. Therefore, the left hand side of Equation (13) is the negative effect of myopic actions on the manager's payoff.

Consider the right hand side of Equation (13). The only benefit of the manager from myopic actions is the higher likelihood that shareholders will retain him. In equilibrium, however, the manager cannot fool the shareholders; they have the correct expectations about x. But since shareholders do not observe directly the actual level of myopic actions, the manager cannot avoid the temptation to nevertheless increase x. The marginal effect of an increase of x on the decision of shareholders is inducing them to retain the manager when their inference about his ability is exactly $\mu - g/\lambda$. The first term in the right hand side of Equation (13), $b+\omega\Pi\left(\mu-g/\lambda,x^*\right)$, is the payoff to the manager from inducing shareholders to retain him when his ability is exactly $\mu - g/\lambda$. The second term, $\phi(\tau\left(0\right))$, is the probability that the

shareholders will be exactly indifferent between firing and retaining the manager, which is the only event where a higher x could change their decision. The third term, $(\sigma_\varepsilon^2 + \sigma_a^2)^{-\frac{1}{2}}$, captures the sensitivity of the first period profits to the level of myopic actions. If σ_ε^2 or σ_a^2 are large, then shareholders ascribe variation in s to noise or to the ability of the manager, rather than to myopic actions. Therefore, the effect of x on shareholders' beliefs, and consequently on their decision to retain the manager, is smaller. Therefore, the marginal benefit from myopic actions is weaker when $\sigma_\varepsilon^2 + \sigma_a^2$ is larger. This explains Equation (13).

4 Governance Structure Preferred by Long-Term and Short-Term Shareholders

In this section we study the optimal choice of the governance structure g by shareholders, as a function of their investment horizon. We first consider the decision of long-term shareholders, those shareholders who maximize the expected terminal value of the firm, and then we consider the decision of short-term shareholders, those who maximize the value of the interim share price.

4.1 Long-term shareholders

Form the perspective of long-term investors, the optimal governance structure is the one that maximizes the terminal value of the firm. Based on the analysis in the previous section, the expected terminal value of the firm as a function of g is

$$E\left[V\left(g\right)\right] = x^*\left(g\right) - K\left(x^*\left(g\right)\right) + \mu + E\left[\max\left\{\lambda\hat{\mu}\left(s, x^*\left(g\right)\right), \lambda\mu - g\right\}\right]. \tag{14}$$

Equation (14) can be explained intuitively as follows. The first two terms embed the effect of myopic actions on firm value. The last two terms embed the effect of managerial ability on firm value. In particular, the last term is the option value from replacing the incumbent manager if it turns out that his ability is low. Notice that, in equilibrium, shareholders have correct expectations about the level of myopic actions, and therefore, $\hat{\mu}\left(s, x^*\left(g\right)\right) = \hat{\mu}\left(a_I + \varepsilon, 0\right)$. In other words, the option value of replacement is independent of $x^*\left(g\right)$, but it does decrease in g, which is effectively the strike price of this option.

Since $u_{LT} = (1-\omega) V$, long-term shareholders prefer the governance structure that maximizes Equation (14). Therefore, the optimal governance structure from the perspective of long-term investors is formally defined as[14]

$$g^*_{LT} \in \arg\max_{g \in [0,\overline{g}]} E\left[V\left(g\right)\right]. \tag{15}$$

The analysis indicates that the optimal governance structure from the perspective of long-term shareholders may still induce some level of managerial myopia, that is, $g^*_{LT} < \overline{g}$ is possible. To understand this observation, recall that according to Proposition 1, $x^*\left(g\right)$ is decreasing in g. Therefore, $x^*\left(g\right) - K\left(x^*\left(g\right)\right)$ is increasing in g. By providing the manager with insulation from market pressure (i.e., $g > 0$), long-term shareholders can reduce managerial myopia and thereby increase the terminal value of the firm. At the same time, a higher g also reduces the value of the option to replace the incumbent manager if shareholders learn he is unskilled. The optimal governance g^*_{LT} trades off these two opposing effects. Therefore, in general, even from the perspective of long-term shareholders, it may be optimal to induce some level of managerial myopia by ensuring that the option to replace the manager is in the money.[15]

4.2 Short-term shareholders

Form the perspective of short-term investors, who sell their shares after the first period profits are realized, the optimal governance structure is the one that maximizes the expected share price at that point of time. Since the governance structure g is observable, in general, the interim stock price will depend on the initial choice of g. Therefore, the optimal governance structure from the perspective of short-term investors is formally defined as

$$g^*_{ST} \in \arg\max_{g \in [0,\overline{g}]} E\left[P\left(s, g\right)\right]. \tag{16}$$

[14] Since $E\left[v\left(g\right)\right]$ is continuous on the closed interval $[0, \overline{g}]$, a maximum always exists.

[15] For example, if λ is sufficiently large, then the shareholder value is mostly driven by the ability of the manager at the second period; the impact of myopic actions is a second order. In those cases, the optimal governance structure will be a low g, reflecting the desire of shareholders to increase the value of the option to replace a low ability manager.

Notice that the market correctly believes that the equilibrium level of myopic actions is $x^*(g)$. Therefore, conditional on s,

$$\begin{aligned} P(s,g) &= x^*(g) - K(x^*(g)) + \hat{\mu}(s, x^*(g)) \\ &\quad + E\left[\max\left\{\lambda\hat{\mu}(s, x^*(g)), \lambda\mu - g\right\} | s = a_I + x^*(g) + \varepsilon\right]. \end{aligned} \tag{17}$$

The interpretation of Equation (17) is very similar to the interpretation of Equation (14). The key difference is that, in the former, the estimation of the terminal value is conditional on the realization of the first period profits, s. Indeed, at the time when the interim share price is determined, the first period profits are realized and disclosed to the market.

The next proposition is our main result.

Proposition 2 *The optimal governance structure from the perspective of long-term and short-term shareholders is the same, that is,*

$$g^*_{ST} = g^*_{LT}. \tag{18}$$

To prove Proposition 2, simply note $P(s,g) = E[V(g)|s]$, and therefore, by the law of iterated expectations,

$$E[P(s,g)] = E[V(g)], \tag{19}$$

where $E[V(g)]$ is given by Equation (14). That is, shareholders who sell their share at the interim period get the same expected value as shareholders who keep their shares until the terminal value is realized.[16] Since long-term and short-term shareholders solve the same optimization problem, they have identical preferences over the governance structure, as required.

Intuitively, since the governance structure on which shareholders vote is observed by the market, governance structures that are expected to harm the terminal value of the firm will be correctly priced by the market to reflect these lower valuations. Therefore, the policy the maximizes the expected interim share price also maximizes the expected terminal value of the firm, and short-term shareholders will prefer exactly the same governance structure that will be preferred by the long-term shareholders. As a result, if the investment horizon is the only source of heterogeneity in the shareholder base, shareholders will always reach a consensus on

[16] Notice that the expected terminal value of the firm, $E[v(g)]$, is a mean-preserving spread of the expected interim share price, $E[p(s,g)]$.

the optimal governance mechanism.

Our result that short-term shareholders would not prefer to push for governance structures that put more pressure on the short-term unless these structures have long-term benefits that make them also attractive for long-term shareholders has empirical implications. Consistent with this observation, we note that active funds like Fidelity, T.RowePrice, and American have been supportive of moves from staggered board to annual director elections (Bebchuk et al. 2013). Annual elections make all directors come for a vote each year and thereby could arguably increase short-term pressure on incubments. However, we note that the move to annual elections has been widely supported by investors with long investment horizon such as Vanguard, BlackRock and State Street (Bebchuk et al. 2013).

More generally, our analysis predicts that, all else equal,[17] voting decisions on governance arrangements that put short-term pressure on incumbents should not be associated with the investment horizon of the institutional investors. Governance arrangements that put short-term pressure on incumbents include shareholders proposals to lower threshold on calling for special shareholder meeting and introducing shareholder rights to act by written consent.

5 Compensation Structure

Thus far we treated the compensation structure of the manager as given and assumed that the choices of shareholders at time 1.a, when they can exert influence, are limited to the governance structure of the firm. However, the incentives of the manager might be influenced not just by the governance structure but also by the compensation arrangement, on which shareholders may also have influence. Indeed, in the United States shareholders in most companies vote annually on say-on-pay proposals and it is widely viewed that these votes as well as the positions that shareholders express have significant influence on compensation structures (e.g., see Ertimur et al. 2013).

Therefore, in this section we extend the model and consider the preferences of long-term and short-term shareholders over the compensation structure of the manager. However, we do not examine the full range of compensation arrangements, instead, we focus on the preferences of investors over long-term and short-term compensation structure. In the baseline model the

[17] There could be other factors that affect voting behavior, for example, the extent to which institutional investors derive revenues from managing 401K plans for public companies (e.g., Cvijanoviet et al. 2016). These factors should be controlled for in the empirical analysis.

compensation of the manager was long-term in the sense that it was tied to the terminal value of the firm. Here, we also consider cases where the compensation of the manager is tied to the short-term, that is, to the interim share price (or alternatively, the compensation contract allows the manager to sell a fraction of his shares at the short-run). Specifically, the manager's payoff is

$$u_M = \eta P(g,s) + \mathbf{1}_{e=retain} \cdot [(\omega - \eta) V(g, x, retain, a_I, a_R) + b], \tag{20}$$

where $\eta \in [0, \omega]$ measures the fraction of the compensation that is short-term. We assume the compensation structure of the manager is observable. Since the total amount of compensation that the manager receives is ω, the payoff of long-term and short-term shareholders is the same as in the baseline model. Notice that the baseline model is a special case where $\eta = 0$. If $\eta = \omega$ then all the compensation of the manager is short-term. This formulation abstracts from the optimal level of managerial compensation, as captured by parameter ω. Many factors outside of our model can affect this choice. Instead, our main focus is on the optimal allocation between short-term and long-term compensation, that is, the optimal η.

We denote by $x^*(\eta)$ the equilibrium level of myopic actions as a function of short-term managerial compensation. Similar to the analysis in Section 4 we can prove the following result.

Proposition 3

(*i*) *The equilibrium level of myopic actions, $x^*(\eta)$, is increasing in η where $x^*(\omega) = \overline{x}$.*

(*ii*) *The compensation structure that is most preferred by short-term shareholders is the same as the one that is most preferred by long-term shareholders, and it is given by*

$$\eta^*_{short_term} = \eta^*_{long_term} = 0. \tag{21}$$

Part (i) of Proposition 3 describes how the short-term compensation affects the manager's choice of myopic actions. It shows that with short-term compensation, the manager has stronger incentives to in crease x. Intuitively, with short-term compensation, a higher x not only reduces the likelihood that shareholders will fire the manager, but the interim share price is also likely to be higher, which increases the manager's payoff due to $\eta > 0$. Therefore, as expected, a larger η induces more managerial myopia. In the limit, when all the managerial compensation

is short-term (i.e., $\eta = \omega$), the manager only cares about influencing market expectations, he does not internalize the adverse effect of myopic actions on the terminal value of the firm. In equilibrium, the manager cannot avoid the temptation to inflate the first period profits as much as possible, and as a result, $x^* = \overline{x}$.

Part (ii) of Proposition 3 states that both long-term and short-term shareholders have the same preferences over the compensation structure of the manager. Moreover, it states that both types of shareholders prefer the manager's compensation to be as long-term as possible.

Long-term shareholders. To understand the perspective of long-term shareholders, notice that a higher η induces a higher level of myopic actions it has no benefit to shareholders (unlike a lower g which intensifies managerial myopia but also increases the option value of replacing an incompetent manager). Indeed, the expected long-term shareholder value, $E[V(g)]$, which is given by Expression (14), depends on η only indirectly, through its effect on x^*. All else equal, $E[V(g)]$ decreases with x^*, and therefore, long-term shareholders prefer is $\eta = 0$, as required.[18]

Short-term shareholders. To understand the perspective of short-term shareholders, notice that the same reasoning of Section 4 also applies here: since in equilibrium the market has the correct expectations about the level of myopic actions, for a given level of η, the expected interim share price is the same as the expected terminal value of the firm, that is, $E[P(s,\eta)] = E[V(\eta)]$. Moreover, since the compensation structure of the manager is observable to the market, and a larger η implies a higher and inefficient level of myopic actions, short-term shareholders also prefer $\eta = 0$, as required. Therefore, as long as the compensation structure of the manager is observed by the market, short-term shareholders have incentives to set a compensation that minimizes the effect of short-termism.[19]

The analysis of this section has empirical implications. For example, it suggests that, all else equal, the tendency to vote against compensation packages that provide short-term incentives in the company's say-on-pay vote should not depend on the of institutional investor's investment horizon. This is a testable prediction that we hope future empirical work will investigate.

[18] The goal of the analysis is not to explain the existence of short-term compensation arrangements in practice. Short-term compensation could be part of an optimal contract if one augments our model with a moral hazard problem or managerial liquidity needs. Instead, our goal is to emphasize that short-term shareholders will have the same preferences as long-term shareholders over the compensation arrangements.

[19] If the compensation that is offered to the manager is hidden, it will have no effect on the optimal choice of long-term shareholders, but it would affect the choice of short-term shareholders, as they would be tempted to use short-term managerial compensation to inflate the short-term price. For more details see Section 8.

6 Short-Term Shareholders Taking Over Corporate Leadership

Over the last decade there has been a large number of cases in which activist hedge funds, which are often viewed as having a short-term investment horizon, obtained seats on corporate boards by winning proxy fights or negotiating settlements (Bebchuk et al. 2017). This empirical evidence raises the question whether short-term shareholders have incentives to take over corporate boards and use its power to inflate the short-term performances of the firm.

Introducing the possibility of short-term leadership. To examine this channel of influence, we extend the model as follows. We assume that at time 1.a, before the level of myopic actions is determined by the manager, short-term shareholders have the power to put a hedge fund activist on the board. The activist joins the board together with other nominees and obtains enough influence such that the incumbent manager has effectively the same preferences as the activist. The activist always leaves the board after the first period profits are realized, and his objective is to maximize the interim share price P. We assume that by joining the board, the hedge fund activist may also bring new expertise. Specifically, the ability of the manager when the activist is present is effectively $a_A \sim N(\mu_A, \sigma_a^2)$. We allow for $\mu_A \neq \mu$ and assume that short-term and long-term shareholders are symmetrically uninformed about a_A. For simplicity we assume the governance structure g is given exogenously.

The effect of shareholder leadership on the myopia level. As we will see, the actions of the short-term activist might lead to more myopia than before. Indeed, under the activist's control the manager behaves as if $\eta = \omega$ and $b = 0$ (recall the activist always leaves the company at the interim period). A corollary of Proposition 3 implies that, in equilibrium, the manager will choose $x^* = \overline{x}$ under the influence of the short-term activist. That is, the activist will induce the manager to inflate the interim share price, and the market will have correct expectations about it. Since the activist leaves the board at the interim period, the ability of the manager at the second period is μ. Therefore, under the activist control, the expected interim share price in equilibrium, which we denote by P_A, is

$$P_A = \overline{x} - K(\overline{x}) + \mu_A + \lambda\mu. \tag{22}$$

This analysis raises the critical question whether shareholders would prefer appointing the

short-term hedge fund activist to the board, and if so, whether there is a wedge between the preferences of long-term and short-term investors. We obtain the following result.

Proposition 4 *There exists $\mu^* > \mu$ such that:*

(*i*) *If and only if $\mu_A > \mu^*$ then the expected terminal value of the firm under the control of the short-term hedge fund activist is higher than under the control of the incumbent manager.*

(*ii*) *The change of leadership will be preferred by short-term shareholders under exactly the same circumstances that it will be preferred by the long-term shareholders.*

To understand the logic of Proposition 4, notice that by following the same reasoning as in Section 4, we can conclude that P_A is equal to the expected terminal value of the firm. Therefore, the long-term shareholders will always agree with the short-term shareholders on whether to grant the hedge fund activist the control of the board. Both types of shareholders will benefit from doing so as long as P_A is larger than $E[V(g)]$, which is explicitly given by Expression(14).

Moreover, Proposition 4 states that short-term shareholders will not always seek to appoint the activist to the board, and when they do, long-term shareholders will benefit from that as well. To understand these observations, notice that short-term shareholders face the following trade-off: if they let the activist control the board, the activist will not be able to resist the temptation to inflate the first period profits, in attempt to boost the interim share price. Therefore, the activist will choose a high level of myopic actions, higher than what the manager would have chosen in the absence of the activist's intervention. Since the market observes the appointment of an activist to the board, in equilibrium, the market will anticipate the high level of myopic actions, and accordingly, will price the share at a low level. Therefore, appointing a short-term hedge fund activist to the board has a the cost of a fully anticipated high level of myopic actions, which is inefficient. Unless the hedge fund activist brings additional expertise to the board (i.e., if $\mu_A \leq \mu$), even the short-term shareholders will not support his appointment.

On the other hand, if μ_A is sufficiently larger than μ, then short-term shareholders can increase firm value by deploying the expertise of the activist to board of the company. Since the market observes the appointment of the activist and his expected expertise, it will be reflected in the interim share price. If this expertise is high enough to compensate for the

expected high level of myopic actions (i.e., $\mu_A > \mu^*$), both types of shareholders would benefit from appointing the hedge fund activist to the board, that is, $P_A > E[V(g)]$.

The analysis of this section has testable empirical implications. In particular, the analysis suggests that in companies where a majority of shareholders have short-term investment horizon and bring about a leadership change, the leadership change would not adversely affect the value of long-term shareholders.[20] Again, we hope that future empirical work will investigate this issue.

7 Uncertainty about the effects of governance structures

In the body of the paper we assumed that shareholders have the same information as insiders about the effects of governance structures on firm value. But in reality, insiders might have a better idea about the consequences of governance structures, for example, because they have better information about the investment technology and the extent to which myopic actions harm the long-term value of the firm.

Could the information asymmetry between insiders and outside shareholders change the main conclusions of our analysis? The answer is no. To illustrate this point, suppose that myopic actions reduce the terminal value of the firm by $K_1(x)$ with probability $q \in [0,1]$, and by $K_2(x)$ with probability $1-q$. We assume $K_1(x) \neq K_2(x)$, but these functions have the same generic properties as in the baseline model.[21] The manager knows whether it is $K_1(x)$ or $K_2(x)$, whereas both long-term and short-term shareholders, as well as the market, only know the prior probability of each form. We show that Proposition 2 holds in this setup as well.

Proposition 5 *The optimal governance structure from the perspective of long-term and short-term shareholders is the same, that is,*

$$g^*_{ST} = g^*_{LT}. \tag{23}$$

To prove Proposition 5, note that in this setup the manager's choice of x will in general depend on his private information. That is, given the governance structure g, the man-

[20] Some suggestive evidence in this regard is provided by Bebchuk et al. (2017). This study show that the introduction of directors favored by hedge fund activists into the boardroom, presumably because the issuer expects the hedge fund activist to have a good chance in wining a proxy fight, is not associated with adverse affect on long-term shareholder value down the road.

[21] Specifically, for $i = 1, 2$, we assume $K_i(0) = 0$, $K_i'(0) = 1$, and $K_i''(\cdot) > 0$ for all $x \in [0, \overline{x}]$.

ager will choose in equilibrium $x_1^*(g)$ if the form is $K_1(\cdot)$, and $x_2^*(g)$ if it is $K_2(\cdot)$. Since long-term and short-term shareholders have the same (imperfect) information about the true state of nature, from their perspective, the equilibrium effect of the myopic action on the profit in the first and the second period is $\hat{x}^*(g) \equiv qx_1^*(g) + (1-q)x_2^*(g)$ and $\hat{K}^*(g) \equiv qK_1(x_1^*(g)) + (1-q)K_2(x_2^*(g))$, respectively. Similarly, the expected value of the option to replace the manager at the interim period is $E[\max\{\lambda\hat{\mu}(s, x_1^*(g), x_2^*(g)), \lambda\mu - g\}]$, where $\hat{\mu}(s, x_1^*(g), x_2^*(g))$ is the inference about the ability of the manager given realization s of the first period profits.[22] Therefore, and for the same reason as in Section 4, the expected terminal value of the firm is the same as the expected interim share price as a function of g. Since the governance structure is observable, long-term shareholders and short-term shareholders will have the same preferences over the choice of g.

This result highlights that the key issue is not whether outside shareholders are perfectly informed, but rather whether all shareholders have access to the same information. As long as this is the case, our work shows that the suspected divergence of interest between long-term and short-term shareholders would not arise in the canonical Stein Model.

8 Extensions and Discussion

8.1 The key role of disclosure obligations

An implicit assumption of our analysis is that the manager and short-term shareholders do not have a "secret" channel through which managers can secretly communicate to short-term shareholders the level of myopic actions or agree to adopt compensation or governance arrangements that would be unknown to other shareholders or the market. In practice, Regulation Fair Disclosure (FD) prohibits managers from sharing private information with investors that is not provided to the market at large. Moreover, securities laws require disclosure of governance structures and compensation arrangements, as well as any material agreement between hedge fund activists and managers. For this reason, as long as hedge fund activists do not take over the leadership of the company through board seats, they do not have superior information about myopic unobservable actions relative to other investors that has to be disclosed.

In principle, if such disclosure obligations did not exist or were not tightly enforced, managers

[22] Notice that the inference about the manager's ability from the first period profit is more complex in this extension, since now shareholders have to account for the two different states of nature.

would be able to privately share with hedge fund activists information about the level of myopic actions, and one could imagine how this information might have been exploited by short-term investors outside the boardroom. For example, the activist and the manager could reach a secret agreement in which the manager increases the level of myopic actions in return for secret compensation benefits or in order to avoid the pressure from the activist (e.g., publication of adverse information about the manager if he does not comply with the activist's demand). The agreement can be enforced by the manager secretly showing the activist the level of the myopic actions. Therefore, in this world, the presence of short-term investors such as activist hedge funds who have secret channels to managers could lead to an increase in the level of myopic actions and the reduction of long-term firm value. Nowadays, however, this state of affairs is largely precluded by the existing and long-standing disclosure requirements. Our analysis therefore highlights the value and important role of disclosure obligations.

8.2 Different types of investment horizons

Our baseline analysis focuses on two types of shareholders; those who hold their shares until the value of the firm is realized, and those who sell everything they own in the interim period. In reality, there is substantial heterogeneity in the investment horizon of different investors. For example, some hedge fund activists such as Nelson Peltz of Trian, emphasize that their investment horizon is longer than the typical activist, and can be as long as 7-8 years. Our analysis can be extended to capture such heterogeneity. For example, one can assume that there is a continuum of types of shareholders who differ with respect to the investment horizon, which we parametrize by $\theta \in [0, 1]$. Parameter θ captures the likelihood the investor sells his shares immediately after the first period, or the fraction of shares sold at that point of time. Using the same reasons as in our baseline model, one can establish that the preferences of investors over the governance structure, compensation arrangement, and the potential of taking over the leadership of the company by short-term activists will not depend on the level of θ.

9 Concluding Remarks

This paper has sought to contribute to a key and long-standing policy debate regarding public companies and their shareholders. Leading policymakers and business leaders have expressed concerns that the presence of shareholders with short-term investors exacerbates managerial

myopia problems and thereby has adverse effects on long-term performance. These concerns have led to an array of proposals for encouraging long-term investors and for limiting the rights and influence of short-term investors.

We have studied this question within the standard Stein Model that financial economists have used to study managerial myopia. In this framework, myopia arises from informational asymmetry between corporate insiders and market participants, with the latter group being unable to observe some choices made by the former group. We have shown that, in this standard framework, the presence or share of short-term investors does not have adverse effects. To be sure, certain choices of governance arrangements, pay structures, and leadership changes could exacerbate managerial myopia and have adverse long-term effects. However, we show that short-term shareholders would not systematically prefer different choices from those favored by long-term investors and, in particular, would not push for choices that would involve a higher degree of myopia than the choices favored by long-term investors. A key insight is that when short-term investors influence choices that are observable – as governance arrangements, pay structures, and leadership changes are – they need to take into account that the expected effects of these observable choices will be taken into account also by others and reflected in short-term market prices. Thus, the securities laws that prevent outside short-term investors from having a secret channel to managers and getting privileged access to inside information about observables play an important role.

Of course, future work might examine whether it is possible to ground the expressed concerns about short-term investors in a model not developed within the standard framework. For example, short-term investors could have adverse effects if they were to have nonpublic information about the expected long-term effects of governance, pay, or leadership choices or if their information about these choices were public but still not expected to be reflected in market prices. Of course, if such models are developed, the question would arise whether their assumptions provide a plausible premise.[23] In any event, our analytical results within the standard framework should in the meantime inform the debate on short-term investors. We also hope that they will provide a useful starting point and benchmark for any subsequent work on myopic shareholders.

[23] For early models of myopia problems with public information that not fully reflected in market prices, which can be used as a starting point of such work, see Shleifer and Vishny (1990) and Bolton et al. (2006).

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Appendix

Proof of Lemma 2. We prove the result for a general managerial preferences as given by (20). The proof has several steps. First, we prove the following claim: If shareholders expect the level of short-termism to be x^*, but the manager decides on x, then from the manager's perspective, $\hat{\mu}(s, x^*)$ is normally distributed with variance Σ^2 and mean

$$m(x - x^*) \equiv \mu + \frac{\sigma_a^2}{\sigma_\varepsilon^2 + \sigma_a^2}(x - x^*). \tag{24}$$

Indeed, by substituting (3) into (9) we get

$$\hat{\mu}(s, x^*) = \frac{\sigma_\varepsilon^2}{\sigma_\varepsilon^2 + \sigma_a^2}\mu + \frac{\sigma_a^2}{\sigma_\varepsilon^2 + \sigma_a^2}(a_I + x + \varepsilon - x^*).$$

Since $a_I \sim N(\mu, \sigma_a^2)$ and $\varepsilon \sim N(0, \sigma_\varepsilon^2)$ are uncorrelated, we have

$$\hat{\mu}(s, x^*) = \mu + \frac{\sigma_a^2}{\sigma_\varepsilon^2 + \sigma_a^2}[x - x^* + \xi], \tag{25}$$

where ξ is a random variable distributed according to $N(0, \sigma_\varepsilon^2 + \sigma_a^2)$, which concludes the argument.

Second, let $F(y)$ be the cumulative distribution function of $\hat{\mu}(s, x^*)$. Then, $F(y) = \Phi(\frac{y - m(x - x^*)}{\Sigma})$ and $F'(y) \equiv f(y) = \frac{1}{\Sigma}\phi\left(\frac{y - m(x - x^*)}{\Sigma}\right)$. We argue

$$\int_{\mu - g/\lambda}^{\infty} y dF(y) = m(x - x^*)(1 - \Phi(\tau(x - x^*))) + \Sigma\phi(\tau(x - x^*)). \tag{26}$$

To see why, recall that for the normal distribution $\phi'(y) = -y\phi(y)$. Therefore, $f'(y) = -\frac{y - m(x - x^*)}{\Sigma^2} f(y)$, which implies by simple algebra

$$y f(y) = m(x - x^*) f(y) - \Sigma^2 f'(y).$$

Therefore,

$$\begin{aligned}\int yf(y)\,dy &= \int \left[m(x-x^*)f(y)-\Sigma^2 f'(y)\right]dy \\ &= m(x-x^*)\int f(y)\,dy-\Sigma^2\int f'(y)\,dy \\ &= m(x-x^*)F(y)-\Sigma^2 f(y) \\ &= m(x-x^*)\Phi\left(\frac{y-m(x-x^*)}{\Sigma}\right)-\Sigma\phi\left(\frac{y-m(x-x^*)}{\Sigma}\right),\end{aligned}$$

and

$$\begin{aligned}\int_{\mu-g/\lambda}^{\infty} yf(y)\,dy &= \left[m(x-x^*)\Phi\left(\frac{y-m(x-x^*)}{\Sigma}\right)-\Sigma\phi\left(\frac{y-m(x-x^*)}{\Sigma}\right)\right]_{y=\mu-g/\lambda}^{y=\infty} \\ &= m(x-x^*)\left(1-\Phi\left(\tau(x-x^*)\right)\right)+\Sigma\phi\left(\tau(x-x^*)\right).\end{aligned}$$

Third, let $P(x,x^*)\equiv E[P(g,s)]$ be the expected interim share price from the manager's perspective when shareholders' expected the equilibrium level of short-termism to be x^* but the manager chooses x. Recall

$$\begin{aligned}P(s,g) &= x^*(g)-K(x^*(g))+\hat{\mu}(s,x^*) \\ &\quad +\lambda E\left[\max\left\{\hat{\mu}(s,x^*(g)),\mu_R-g/\lambda\right\}|s=a_I+x^*(g)+\varepsilon\right]\end{aligned}$$

Therefore,

$$\begin{aligned}P(x,x^*) &= x^*-K(x^*)+m(x-x^*) \\ &\quad +\lambda\int_{-\infty}^{\mu-g/\lambda}(\mu-g/\lambda)\,dF(y)+\lambda\int_{\mu-g/\lambda}^{\infty} ydF(y) \\ &= x^*-K(x^*)+m(x-x^*)+(\lambda\mu-g)\Phi\left(\tau(x-x^*)\right)+\lambda\int_{\mu-g/\lambda}^{\infty} ydF(y). \\ &= x^*-K(x^*)+m(x-x^*)+(\lambda\mu-g)\Phi\left(\tau(x-x^*)\right) \\ &\quad +\lambda\left[m(x-x^*)\left(1-\Phi\left(\tau(x-x^*)\right)\right)+\Sigma\phi\left(\tau(x-x^*)\right)\right]\end{aligned}$$

which can be rewritten as

$$\begin{aligned} P(x-x^*) &= x^* - K(x^*) + m(x-x^*)(1+\lambda) \\ &\quad + (\lambda\mu - g - \lambda m(x-x^*))\,\Phi(\tau(x-x^*)) + \lambda\Sigma\phi(\tau(x-x^*)) \end{aligned} \tag{27}$$

Fourth, since $\hat{\mu}(s,x) = \hat{\mu}(s,x^*) + \mu - m(x-x^*)$, the manager's expected payoff is

$$\begin{aligned} U_M(x,x^*;g,\eta) &= \int_{\mu-g/\lambda}^{\infty} [b + (\omega-\eta)(x-K(x)) + (\omega-\eta)(1+\lambda)(y+\mu-m(x-x^*))]\,dF(y) \\ &\quad +\eta P(x,x^*) \\ &= (1-\Phi(\tau(x-x^*)))[b + (\omega-\eta)(x-K(x)) + (\omega-\eta)(1+\lambda)(\mu-m(x-x^*))] \\ &\quad + (\omega-\eta)(1+\lambda)\int_{\mu-g/\lambda}^{\infty} y dF(y) + \eta P(x,x^*) \\ &= (1-\Phi(\tau(x-x^*)))[b + (\omega-\eta)(x-K(x)) + (\omega-\eta)(1+\lambda)(\mu-m(x-x^*))] \\ &\quad + (\omega-\eta)(1+\lambda)[m(x-x^*)(1-\Phi(\tau(x-x^*))) + \Sigma\phi(\tau(x-x^*))] + \eta P(x,x^*) \\ &= (1-\Phi(\tau(x-x^*)))[b + (\omega-\eta)(x-K(x)) + (\omega-\eta)(1+\lambda)\mu] \\ &\quad + (\omega-\eta)(1+\lambda)\Sigma\phi(\tau(x-x^*)) + \eta P(x,x^*) \end{aligned}$$

Noting that $\Pi(\mu,x) = x - K(x) + (1+\lambda)\mu$ and letting $\eta = 0$ gives Expression (10). ■

Proof of Proposition 1. First note that

$$\begin{aligned} \frac{\partial P(x,x^*)}{\partial x} &= (1+\lambda)\frac{\sigma_a^2}{\sigma_\varepsilon^2+\sigma_a^2} \\ &\quad -\lambda\frac{\sigma_a^2}{\sigma_\varepsilon^2+\sigma_a^2}\Phi(\tau(x-x^*)) + (\lambda\mu_R - g - \lambda m(x,x^*))\,\phi(\tau(x-x^*))\,\frac{-\frac{\sigma_a^2}{\sigma_\varepsilon^2+\sigma_a^2}}{\Sigma} \\ &\quad -\lambda\Sigma\phi(\tau(x-x^*))\,\frac{-\frac{\sigma_a^2}{\sigma_\varepsilon^2+\sigma_a^2}}{\Sigma}\tau(x-x^*) \\ &= 1+\lambda-\lambda\Phi(\tau(x-x^*)) > 0. \end{aligned}$$

Differentiating $U_M(x,x^*;g,\eta)$ with respect to x, and rearranging terms (notice we use the

identity $\phi'(x) = -x\phi(x)$), yields

$$\begin{aligned}
\frac{\partial U(x,x^*;g,\eta)}{\partial x} &= (\omega-\eta)(1-K'(x))(1-\Phi(\tau(x-x^*))) \\
&\quad -(b+(\omega-\eta)\Pi(\mu_I,x))\phi(\tau(x-x^*))\frac{\partial\tau(x,x^*)}{\partial x} \\
&\quad -(\omega-\eta)(1+\lambda)\Sigma\tau(x-x^*)\phi(\tau(x-x^*))\frac{\partial\tau(x-x^*)}{\partial x}+\eta\frac{\partial P(x,x^*)}{\partial x} \\
&= (\omega-\eta)(1-K'(x))(1-\Phi(\tau(x-x^*))) \\
&\quad +\begin{pmatrix} b+(\omega-\eta)(x-K(x)) \\ +(\omega-\eta)(1+\lambda)\left(\mu-g/\lambda-\frac{\sigma_a^2}{\sigma_\varepsilon^2+\sigma_a^2}(x-x^*)\right)\end{pmatrix}\phi(\tau(x-x^*))\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}} \\
&\quad +\eta\left[1+\lambda-\lambda\Phi(\tau(x-x^*))\right]
\end{aligned}$$

and

$$\begin{aligned}
\frac{\partial^2 U(x,x^*;g,\eta)}{\partial^2 x} &= -(\omega-\eta)K''(x)(1-\Phi(\tau(x-x^*))) \\
&\quad +(\omega-\eta)(1-K'(x))\phi(\tau(x-x^*))\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}} \\
&\quad +(\omega-\eta)\left((1-K'(x))-(1+\lambda)\frac{\sigma_a^2}{\sigma_\varepsilon^2+\sigma_a^2}\right)\phi(\tau(x-x^*))\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}} \\
&\quad +\begin{pmatrix} b+(\omega-\eta)(x-K(x)) \\ +(\omega-\eta)(1+\lambda)\left(\mu-g/\lambda-\frac{\sigma_a^2}{\sigma_\varepsilon^2+\sigma_a^2}(x-x^*)\right)\end{pmatrix} \\
&\quad \times\phi(\tau(x-x^*))\tau(x-x^*)\left(\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}}\right)^2 \\
&\quad +\eta\lambda\phi(\tau(x-x^*))\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}}.
\end{aligned}$$

The first order condition requires $\frac{\partial U(x,x^*;g,\eta)}{\partial x}=0$. Plugging this condition into $\frac{\partial^2 U(x,x^*;g,\eta)}{\partial^2 x}$

yields

$$\begin{aligned}\frac{\partial^2 U(x,x^*;g,\eta)}{\partial^2 x} &= -(\omega-\eta)K''(x)(1-\Phi(\tau(x-x^*)))\\ &+(\omega-\eta)(1-K'(x))[\phi(\tau(x-x^*))-(1-\Phi(\tau(x-x^*)))\tau(x-x^*)]\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}}\\ &+(\omega-\eta)\left((1-K'(x))-(1+\lambda)\frac{\sigma_a^2}{\sigma_\varepsilon^2+\sigma_a^2}\right)\phi(\tau(x-x^*))\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}}\\ &-\eta[1+\lambda-\lambda\Phi(\tau(x-x^*))]\tau(x-x^*)\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}}\\ &-\eta\tau(x-x^*)\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}}\\ &+\eta\lambda(\phi(\tau(x-x^*))-(1-\Phi(\tau(x-x^*)))\tau(x-x^*))\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}}\end{aligned}$$

The first row is negative by $K''>0$, the third term is negative by $K'>1$. The fourth and fifth terms are also negative. The second and the sixth terms are negative if and only if

$$\Lambda(\tau(x-x^*))\geq\tau(x-x^*),$$

where $\Lambda(\cdot)=\frac{\phi(\cdot)}{1-\Phi(\cdot)}$ is the hazard rate of the normal distribution. Since the hazard rate of a normal distribution is an increasing function, then $\Lambda'\geq 0$. Note that $\Lambda'(y)=\Lambda(y)(\Lambda(y)-y)$, and hence, $\Lambda(y)-y\geq 0$ for all y. We conclude that any solution of the first order condition is a maximum point.

In equilibrium, $x=x^*$, and hence, $\tau(x^*-x)=\frac{-g/\lambda}{\Sigma}$. Therefore, x^* must solve $\frac{\partial U(x,x^*;g,\eta)}{\partial x}|_{x=x^*}=0$, which can be rewritten as $\Gamma(x^*)=0$ where

$$\begin{aligned}\Gamma(x^*) &= (\omega-\eta)(1-K'(x^*))\\ &+\left(\begin{array}{c}b+(\omega-\eta)(x^*-K(x^*))\\ +(\omega-\eta)(1+\lambda)(\mu-g/\lambda)\end{array}\right)\frac{\phi(\tau(0))}{1-\Phi(\tau(0))}\left(\sigma_\varepsilon^2+\sigma_a^2\right)^{-\frac{1}{2}}\\ &+\eta\left(\frac{1}{1-\Phi(\tau(0))}+\lambda\right).\end{aligned}$$

Notice that if $\eta=0$ then $\Gamma(x^*)=0$ is equivalent to Equation (13). Since $K''>0$ and $x-K(x)$ is a decreasing function (i.e., $K'>1$), $\Gamma(x^*)$ is a decreasing function of x^*, which implies that the solution is unique.

The assumption that the incumbent manager does not resign voluntarily (i.e., $b/\omega+\overline{x}-$

$K(\overline{x}) + (1+\lambda)(\mu - \overline{g}/\lambda - \overline{x}) \geq 0)$ implies

$$b + (\omega - \eta)(x^* - K(x^*)) + (\omega - \eta)(1+\lambda)(\mu - g/\lambda) \geq 0 \tag{28}$$

for all admissible values. Since $\tau(0) = \frac{-g/\lambda}{\Sigma}$ and the hazard rate of the normal distribution is an increasing function, $\Gamma(x^*)$ is decreasing in g, which implies that $x^*(g)$ is decreasing in g. Moreover, notice that $\Gamma(x^*)$ is increasing in η, which implies that $x^*(\eta)$ is decreasing in η. In fact, if $\eta = \omega$ then

$$\frac{\partial U(x, x^*; g, \eta)}{\partial x} = b\phi(\tau(x - x^*))\left(\sigma_\varepsilon^2 + \sigma_a^2\right)^{-\frac{1}{2}} + \omega(1 + \lambda - \lambda\Phi(\tau(x - x^*))) > 0,$$

that is, the manager has incentives to choose the largest x possible, and in equilibrium, it must be $x^* = \overline{x}$.

Finally, note that combined, (28) and $K'(0) = 1$ imply $\Gamma(0) > 0$, that is, $x^*(g) > 0$ for all $g \in [0, \overline{g}]$. ■

Proof of Proposition 3. The proof of Proposition 1 shows that $x^*(\eta)$ is decreasing in η and $\eta = \omega$ implies $x^* = \overline{x}$. ■

Proof of Proposition 4. The comparison between Expressions (22) and (14) implies $P_A > E[V(g)]$ if and only if

$$\begin{aligned} \overline{x} - K(\overline{x}) + \mu_A + \lambda\mu &> x^*(g) - K(x^*(g)) + \mu + \lambda E[\max\{\hat{\mu}(s, x^*(g)), \mu - g/\lambda\}] \Leftrightarrow \\ \mu_A &> \mu^* \end{aligned}$$

where

$$\begin{aligned} \mu^* \equiv\ & (x^*(g) - K(x^*(g))) - (\overline{x} - K(\overline{x})) \\ & + \mu(1 - \lambda) + \lambda E[\max\{\hat{\mu}(s, x^*(g)), \mu - g/\lambda\}] \end{aligned}$$

Notice that

$$E[\max\{\hat{\mu}(s, x^*(g)), \mu - g/\lambda\}] \geq E[\hat{\mu}(s, x^*(g))] = \mu.$$

Since $x - K(x)$ is decreasing in x and $x^*(g) \leq \overline{x}$, $\mu^* > \mu$ as required. ■