A Theory of Efficient Short-termism*

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Abstract

This paper develops a theory of efficient short-termism—the shareholders prefer short-termism in project choice. Unlike previous theories, managers themselves prefer long-horizon projects, whereas short-termism maximizes firm value in the second-best case with optimal output-contingent wage contracts. Short-termism benefits the firm because it limits the managerial rent extraction that occurs with long-horizon projects and it leads to more efficient ability-based allocation of managers to projects. This result does not depend on stock mispricing or short-horizon investors.

Keywords: Short-termism, Myopia, Payback, Wage Contracting, Capital Budgeting, Project Choice

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1 Introduction

Short-termism, which is the practice of preferring lower-valued short-term projects over higher-valued long-term projects, is widely studied in corporate investment policy, and widely criticized. It has been linked to numerous ills—excessive risk taking, underinvestment in R&D, and even the 2007-09 financial crisis.\footnote{For empirical evidence on the effect of short-termism on R&D, see Budish, Roin, and Williams (2015) and Cremers, Pareek, and Sautner (2016). Bebchuk and Fried (2010) attribute excessive risk taking during the financial crisis to the short-term incentives induced by executive compensation. Rappaport and Bogle (2011) assert that short-termism may represent “a danger to capitalism”.
} Despite these criticisms of short-termism, its practice continues unabated (see Graham and Harvey (2001) and Lefley (1996)). Why?

The literature has offered three classes of explanations. One is that the stock market puts pressure on firms to deliver short-term earnings at the expense of long-term value (e.g. Bolton, Scheinkman, and Xiong (2006a,b) and Stein (1989)). A second explanation is that even though shareholders prefer (higher-valued) long-term projects, managers with career concerns prefer short-term projects because that choice privately benefits them (e.g. Narayanan (1985a,b)). The third explanation is that short-termism is practiced by managers in unsophisticated firms in which capital budgeting rules like payback are used.\footnote{Graham and Harvey (2001) found that 56.7% of the firms in their sample used payback and noted, “This is surprising given that financial textbooks have lamented the shortcomings of the payback criterion for years.”} While these explanations have taught us much, the empirical evidence suggests that they are incomplete. The evidence is that the use of short-termism exhibits little correlation with firm performance or negative outcomes (Kaplan (2017)), is used more in firms with stronger corporate governance (Gianetti and Yu (2016)), and is not used only by incompetent or unsophisticated managers (Graham and Harvey (2001)).\footnote{The idea that the quality of governance affects corporate investments is consistent with the evidence in Billett, Garfinkel, and Jiang (2011) that poor governance is associated with overinvestment.}

Why is short-termism ubiquitous even in well-managed firms, and why does it not always lead to poor outcomes? I develop a theoretical model to address this question, and show that there are plausible circumstances in which short-termism is economically efficient. The model is one in which there are two time periods, with learning about managerial ability
and moral hazard related to project search effort and project choice. In the first period, a manager must first choose whether to search for a long-horizon project or a short-horizon project, and then expend personally costly effort to find the project. Despite expending effort, he may fail to find a good project, in which case he has the choice of not asking for funding or requesting funding for a bad project that is always available. The shareholders (or their representative) cannot observe whether the project for which funding is requested is good or bad. If a short-horizon project is selected at the start of the first period, its outcome is revealed at the end of the first period. If a long-horizon project is selected, its outcome is not revealed at the end of the first period, but a noisy signal of the outcome is available. In the second period, the manager must search again for a good project, but this is necessarily a short-horizon project because there is only one period left. In both periods, the payoff distribution of the project depends on the manager’s a priori unknown ability.

In the first-best case, the higher-valued long-horizon project is always chosen in the first period. In the second best, when neither the manager’s choice of search effort nor project quality can be observed, the firm designs optimal contracts for each period to deal with two incentive problems—inducing the manager to expend search effort to find a good project and ensuring that the manager does not propose a bad project. The contracts also take into account the manager’s career concerns; the project outcome at the end of the first period affects not only the manager’s output-contingent first-period wage but also the firm’s perception of his ability and hence the second-period wage contract. The firm has the option to fire the manager after the first period and the manager has the option to quit.

With this model, I derive three main results. First, when second-best wage contracts are optimally designed, the manager earns higher rents over two period by opting for the long-horizon project than for the short-horizon project in the first period. Thus, the manager strictly prefers long-termism. Second, as long as the difference between the first-best values of the long-horizon and short-horizon projects is not too large, the firm’s owners strictly prefer the manager to search for short-horizon projects in both periods in the second-best case.
And third, the firm’s (second-best) value is maximized by imposing a constraint that it will only fund short-horizon projects in both periods, i.e., by “institutionalizing” short-termism.

The economic factor that is central to these results is that information about the success or failure of a short-horizon project is revealed quickly relative to that of a long-horizon project. Since incentives for managers to search for and propose funding for good projects must be provided through wages that are paid well before long-horizon project outcomes are unambiguously revealed, performance signals that matter for managerial incentives are inherently more noisy for long-term projects than for short-term projects. This requires the firm to provide steeper incentives for observed success versus failure for long-term projects in order to induce search effort. But this creates another incentive problem—the higher “performance wage” makes it more attractive for the manager to gamble by proposing a bad project when he does not find a good one. This requires the firm to pay a higher wage to the manager for not requesting funding, and this is a rent for the manager that is higher with a long-term project than with a short-term project. One benefit to the firm of adopting short-termism is to reduce this managerial rent extraction. A second benefit is that short-termism reveals information about managerial ability faster, leading to more efficient ability-based assignments of managers to projects.

Overall, the most robust result from this analysis is that informational frictions bias the investment horizons of firms without any discounting-related time horizon effects (such as those in Laibson (1997)), and that short-termism may be value-maximizing.\(^4\) It is thus related to the earlier literature on short-termism, but differs from this literature in three significant respects. First, the firm’s preference for short-termism is independent of any stock market inefficiencies or pressures, in sharp contrast to earlier research in which it emanates from investors’ short-term horizons (e.g. Bolton, Scheinkman, and Xiong (2006a,b)) or the risk that long-term projects may have their financing cut off (von Thadden (1995)). Second,

\(^4\)This is in line with Roe (2015), who states: “Critics need to acknowledge that short-term thinking often makes sense for U.S. businesses, the economy and long-term employment...it makes no sense for brick-and-mortar retailers, say, to invest in long-term in new stores if their sector is likely to have no future because it will soon become a channel for Internet selling.”
it is the managers with career concerns who dislike short-term projects, even when the firm’s owners prefer them. This is the opposite of papers like Narayanan (1985a,b) and Stein (1989), where managers like short-term projects.\(^5\) Third, in my model the firm is not raising external financing, so the preference for short-termism is not due to the desire to generate internal funds that have a lower cost than external funds, as in Thakor (1990) and Whited (1992).\(^6\)

This paper is also related to the literature on the effect of managerial career concerns on corporate investments, most notably Holmstrom and Ricart i Costa (1986). Unlike that paper, which focuses on capital rationing and related capital budgeting issues, this paper focuses on short-termism. Moreover, in Holmstrom and Ricart i Costa (1986), the manager’s wage in any period is paid up-front and is thus not contingent on the output in that period. In contrast, I consider optimal incentive contracts in which wages in each period depend on observables at the end of the period.

The rest of this paper is organized as follows. Section 2 develops the model. Section 3 contains the main results. Section 4 concludes. All proofs are in the Appendix.

2 Model

Preferences: Consider a world in which all agents are risk neutral and the riskless interest rate is zero. There are three dates: \(t = 0, 1, 2\). There are firms, all of which are unlevered, and have funds to invest in projects. There are two key agents in each firm: a Chief Executive Officer (CEO) and a manager. The CEO faithfully represents the interests of the firm’s owners (shareholders) and the manager maximizes expected utility over consumption at

\(^5\)Darrough (1987) shows that Narayanan’s (1985a,b) equilibrium disappears if the firm uses an appropriate incentive scheme. Jeon (1991) shows that Stein’s (1989) effect can at most be transient if stock prices reflect the manager’s strategic behavior.

\(^6\)Other related papers are Grenadier and Wang (2005) who use a real options framework to show that managers value the option-to-wait-to-invest more than owners, and Hackbarth, Rivera, and Wong (2017) who develop a model in which short-termism is ex post optimal for the shareholders in a levered firm due to a shareholder-bondholder conflict.
dates $t = 1$ and $t = 2$. The manager’s utility is:

$$V(c_1, c_2) = c_1 + c_2$$

(1)

**Investment Opportunity:** The three dates define two time periods, the first beginning at $t = 0$ and ending at $t = 1$, and the second beginning at $t = 1$ and ending at $t = 2$. In each period, the firm has the opportunity to invest in a project requiring a $1$ investment. At $t = 0$, the firm can choose between a short-horizon project, $S$, that pays off at $t = 1$, and a long-horizon project, $L$, that pays off at some distant future date $t > 2$ that lies beyond the planning horizon of the model. A noisy but informative signal, $\phi$, of the eventual payoff is available at $t = 1$. In the second period, the firm can invest only in a short-horizon project that pays off at $t = 2$.

The CEO’s responsibility is to approve (or deny) funding for the project in each period if the manager requests funding. In addition, the CEO can also decide whether to allow the manager to propose either $L$ or $S$ at $t = 0$ or to limit the manager to $S$ in each period. Limiting the manager’s choice to $S$ in each period is “short-termism”.

The manager’s responsibility at $t = 0$ is to first decide whether to opt for $L$ or $S$, and to then choose effort $e \in \{0, 1\}$ to search for a good ($G$) project. The private cost of effort for the manager is

$$\psi(e) = \begin{cases} \psi > 0 & \text{if } e = 1 \\ 0 & \text{if } e = 0 \end{cases}$$

(2)

Regardless of whether the manager opts for $L$ or $S$, a choice of $e = 1$ means that the manager finds a good project with probability $p \in (0, 1)$, and a choice of $e = 0$ means the probability of finding a good project is 0. If a good project is not found, the manager always has a bad

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7This can be interpreted as the project paying off at a time that is beyond the manager’s tenure at the firm. The Bureau of Labor Statistics reports that the median number of years that wage and salary workers had been in their present jobs was 4.6 years, a time period much shorter than the duration of the typical long-term project in many industries. For example R&D investments by drug companies have payoff horizons typically exceeding 10 years. Similarly, companies (like AT&T) that build telecommunication networks have payoff horizons exceeding 15 years.
at time $t = 1$, the manager must opt for $S$ and can again choose $e \in \{0, 1\}$. If $e = 1$ is chosen, he finds a good project with probability $p$ in the second period, and $e = 0$ means the probability of a good project is 0. In each period, the manager can decide whether to request funding for a project or to do nothing.

Managerial Ability and Project Payoff Distributions: The manager’s ability affects the payoff distributions of projects. Let $\tau$ represent the manager’s ability, with $\tau \in \{T, U\}$. If $\tau = T$, it means the manager is “talented”, and if $\tau = U$, it means the manager is “untalented”. The good $L$ project pays off $R_L > 1$ at $t = 2$ with probability $\tilde{q}(\tau)$ (that depends on the manager’s ability) and pays off 0 with probability $1 - \tilde{q}(\tau)$, with

$$
\tilde{q}(\tau) = \begin{cases} 
1 & \text{if } \tau = T \\
q \in (0, 1) & \text{if } \tau = U 
\end{cases} 
$$

The first-period good $S$ project pays off at $R_S > 1$ at $t = 1$ with probability $\tilde{q}(\tau)$ and 0 with probability $1 - \tilde{q}(\tau)$, and the second-period good $S$ project has the same payoff distribution at $t = 2$. The $\tilde{q}(\tau)$ for the $S$ project is also described by (3).

It is common knowledge that $\Pr(\tau = T$ at date $t) = \theta_t \in (0, 1)$. Define $\bar{q}_0 \equiv \theta_0 + [1 - \theta_0] q$. It is assumed that

$$
R_L > R_S 
$$

$$
\bar{q}_0 R_S - \bar{\psi} > 1 
$$

$$
q R_L < 1 
$$

These conditions mean that $L$ is higher-valued than $S$ ((4)), the expected net present value of $S$ at the prior beliefs about managerial ability is positive ((5)), and the expected net present value of even the $L$ project managed by the untalented manager is negative.

The bad $S$ project pays off $R_S$ with probability $b \in (0, q)$ and zero with probability $1 - b$, 


regardless of managerial ability. Similarly, the bad \( L \) project pays off \( R_L \) with probability \( b \) and 0 with probability \( 1 - b \).

**Informational Assumptions:** The manager’s ability unknown to all *a priori* and subsequent information revelation about it becomes symmetrically available to all agents at every date. Moreover, if the manager requests funding the CEO can see whether it is for an \( L \) or an \( S \) project. The manager’s search effort choices at \( t = 0 \) and \( t = 1 \) are privately known only to the manager, but the manager has to tell the CEO whether he is searching for an \( L \) or an \( S \) project. Moreover, the manager privately observes whether he found a good project or not, and he also privately observes whether the project for which funding is requested is good or bad.

The payoff on the first-period \( S \) project, \( y^1_S \in \{ R_S, 0 \} \) is observed by all at \( t = 1 \), and the payoff on the second-period \( S \) project, \( y^2_S \in \{ R_S, 0 \} \), is observed by all at \( t = 2 \). The payoff on \( L \), \( y_L \in \{ R_L, 0 \} \) is realized at some \( t > 2 \) and not observed at any \( t \in \{ 0, 1, 2 \} \), but a signal of this payoff is observed at \( t = 1 \) (with no further information at \( t = 2 \)). The distribution of this signal is:

\[
\Pr(\phi = \text{success} | y_L = R_L) = \Pr(\phi = \text{failure} | y_L = 0) = \beta \in (0.5, 1) \tag{7}
\]

This assumption is meant to capture the idea that a key difference between short and long horizon projects pertains to when accurate information about the success or failure of the project is available. With short-horizon projects—say a new consumer electronic product introduction—the firm knows within a couple of years whether the project is successful. With long-horizon projects—say a beer brewery with an estimated economic life of 20 years—the eventual success of failure of the project may be revealed only at a date long beyond the manager’s planning horizon; in the interim, only noisy signals of the final outcome are available.
Wage Contracts: The manager’s wage in each period can only be based on what is observable at the end of the period. Thus, for the $L$ project, the manager’s wage, paid at $t = 1$, is $W^x_L$, where the observable outcome $x \in \{n, \phi\}$, with $n$ representing the event that the manager is not requesting funding, and $\phi$ is the value of the signal observed at $t = 1$ if the $L$ project was funded at $t = 0$.

For the first-period $S$ project, the manager’s wage, paid at $t = 1$, is $W^x_{S1}$, where $x \in \{n, h, l\}$, with $x = h$ representing $y^1_S = R_S$ and $x = l$ representing $y^1_S = 0$. For the second-period $S$ project, the manager’s wage is $W^x_{S2}(z_1)$, paid at $t = 2$, where $x \in \{n, h, l\}$, with $x = h$ representing $y^2_S = R_S$ and $x = l$ representing $y^2_S = 0$. Note that $W^x_{S2}(z_1)$ is a function of the outcome $z_1$ on the first-period project that is observed at $t = 1$. Thus, $z_1 \in \{n, \phi, y^1_S\}$, depending on whether there was no investment at $t = 0$ ($n$), there was investment in $L$ at $t = 0$ and $\phi$ was observed at $t = 1$ ($\phi$), or there was investment in $S$ at $t = 0$ and $y^1_S$ is observed at $t = 1$ ($y^1_S$). All wages are constrained to be non-negative.

The CEO’s Choices at $t = 0$ and $t = 1$: At $t = 0$, the CEO:

1. either allows the manager unfettered choice of $L$ or $S$ or restricts the choice to $L$ or $S$; and

2. offers the manager a wage contract $W^x_L$ or $W^x_{S1}$, depending on whether the manager is searching for $L$ or $S$.

At $t = 1$, the CEO:

1. decides whether to retain the manager for the second period or fire him; and

2. if the manager is retained, the CEO offers a second-period contract $W^x_{S2}(z_1)$.

Manager’s Reservation Utility and Contract Acceptance Decision: The manager’s reservation utility in each period is 0. In each period, the CEO makes the manager a take-it-or-leave-it wage contract offer. The manager takes the contract if it satisfies his participation constraint.
Cost of Firing the Manager: If costs the firm $K > 0$ to fire and replace the manager. This is meant to reflect the transactions costs of searching for and hiring a new manager. To ensure that it makes sense for the firm to replace the manager with a new manager at $t = 1$, it will be assumed that

$$\bar{q}_0 R S - \bar{\psi} [A_1 + b] [A_1]^{-1} - K > 0$$

(8)

where

$$A_1 \equiv p [\bar{q}_0 - b]$$

(9)

We will see later that $\bar{\psi} [A_1 + b] [A_1]^{-1}$ is equal to the expected cost of compensating the manager under the optimal contract.

The Equilibrium: In the game between the CEO and the manager, I focus on subgame perfect equilibria. The CEO take the choice of $S$ in the first period and solves for optimal wage contract for the first and second periods that will be offered to the manager. Similarly, she takes the choice of $L$ in the first period and solves for the optimal wage contracts to offer the manager in both periods. In each case, she rationally anticipates the manager’s choices of search effort and decisions about when to request funding, as well as her own decision about when the manager will be replaced for the second period. She then compares the values of the firm (net of managerial wages) in the two cases and decides whether to impose a short-termism constraint.

3 Results

In this section, the model will be analyzed. I begin with some preliminaries.
First Best: In the first best case, the manager’s ability is known, his search effort is observable, and the quality of the project is observable to the CEO. Thus, she will instruct the manager to choose \( e = 1 \), pay him a fixed wage of \( \bar{\psi} \), and ask him to search for a good \( L \) project at \( t = 0 \). If the manager finds a good project, funding is provided; otherwise, no investment is made at \( t = 0 \). Then at \( t = 0 \), the manager is again paid a fixed wage of \( \bar{\psi} \), instructed to choose \( e = 1 \) and search for a good \( S \) project. Funding is provided only if the manager finds a good project.

Second Best Contracts when Manager Searches for a Good \( S \) Project at \( t = 0 \): The model is solved by backward induction. So first the optimal wage contract offered at \( t = 1 \) for the second period is solved for.

Second-period contract: At \( t = 1 \), the posterior belief that the manager is \( T \) is given by \( \theta_1 \). If there was no investment at \( t = 0 \), then clearly \( \theta_1 = \theta_0 \). If there was investment and the first-period \( S \) project failed, then the posterior belief is:

\[
\theta_1^l = \Pr (\tau = T | y_1^S = 0) = 0 \tag{10}
\]

Given (4) and (6), we see that (10) implies that the manager will be fired and replaced with a new manager if \( y_1^S = 0 \). If \( y_1^S = R_S \), then the posterior belief is

\[
\theta_1^h = \Pr (\tau = T | y_1^S = R_S) = \frac{\theta_0}{\theta_0 + [1 - \theta_0] q} \tag{11}
\]

Thus, the manager is retained and his wage contract is a triplet \( \{W_{S2}^n (R_S), W_{S2}^h (R_S), W_{S2}^l (R_S)\} \), where \( W_{S2}^n (R_S) \) is what the manager is paid if he does not request second-period funding, \( W_{S2}^h (R_S) \) is his wage if a project is invested in and it pays off \( R_S \) at \( t = 2 \), and \( W_{S2}^l (R_S) \) is his wage if the project pays off 0. This contract must satisfy two incentive compatibility (IC) constraints and a managerial participation constraint.
The first IC constraint is that the manager prefers to choose $e = 1$:

$$p \left\{ \bar{q}^h S_2^{h} (R_S) + [1 - \bar{q}^h] W_{s_2}^l (R_S) \right\} + [1 - p] W_{s_2}^n (R_S) - \bar{\psi} \geq W_{s_2}^n (R_S)$$  

(12)

where

$$\bar{q}^h = \theta^h_1 + [1 - \theta^h_1] q$$  

(13)

The second IC constraint is that if the manager does not find a good project, he will not request funding:

$$b W_{s_2}^h (R_S) + [1 - b] W_{s_2}^l (R_S) \leq W_{s_2}^n (R_S)$$  

(14)

The manager’s participation constraint is:

$$p \left\{ \bar{q}^h S_2^{h} (R_S) + [1 - \bar{q}^h] W_{s_2}^l (R_S) \right\} + [1 - p] W_{s_2}^n (R_S) - \bar{\psi} \geq 0$$  

(15)

The optimal wage contract in the second period is characterized below.

**Lemma 1:** If the manager searched for a short-horizon project in the first period that was funded and had $y^1_S = R_S$ at $t = 1$, then the optimal second-period wage contract is:

$$W_{s_2}^h (R_S) = \frac{\bar{\psi}}{p[\bar{q}^h_1 - b]}$$  

(16)

$$W_{s_2}^l (R_S) = 0$$  

(17)

$$W_{s_2}^n (R_S) = \frac{b\bar{\psi}}{p[\bar{q}^h_1 - b]}$$  

(18)

Two points are worth noting. First, it is clear that the higher $W_{s_2}^l (R_S)$ is, the more costly it is for the firm to ensure satisfaction of the IC constraint (12). So, given the zero lower bound constraint on wages, it is efficient to set $W_{s_2}^l (R_S) = 0$. Second, to ensure satisfaction of the IC constraint (14), the manager must be paid a wage even when he does not request project funding. Absent this wage, the manager will request funding even for a
bad project. We now have:

**Lemma 2:** Under the optimal contract in Lemma 1, the manager’s participation constraint (15) is slack and the manager earns a rent equal to $W_{S2}^n (R_S)$.

The reason why the manager earns a rent is that he has to be motivated to work hard to find a good project in a setting in which he must also be paid to do nothing, i.e., a wage for not requesting funding. Thus, the combination of the manager’s private information about his own effort choice and the quality of the project for which he is requesting funding generates an informational rent for him.

The next lemma characterizes the optimal second-period contract when the manager searched for $S$ in the first period but did not find a good project and thus did not request funding.

**Lemma 3:** If the manager searched for a short-horizon project at $t = 0$ but did not request funding for it, the optimal second-period wage contract is:

\[
W_{S2}^h (n) = \frac{\bar{\psi} - b}{p [\bar{q}_0 - b]} \quad (19)
\]

\[
W_{S2}^l (n) = 0 \quad (20)
\]

\[
W_{S2}^n (n) = \frac{b \bar{\psi}}{p [\bar{q}_0 - b]} \quad (21)
\]

The manager’s participation constraint is slack and he earns a rent of $W_{S2}^n (n)$.

The structure of contracts is the same as in Lemma 1, with $\bar{q}_1^h$ replaced by the prior belief $\bar{q}_0$, since a lack of investment in the first period leads to no revision of beliefs about managerial ability.

**First-period contract:** This is a triplet $\{W_{S1}^n (R_S), W_{S1}^h (R_S), W_{S1}^l (R_S)\}$. Using the logic used in proving Lemma 1, it can be shown that $W_{S1}^l = 0$. Thus, this contract is one that minimizes the firm’s expected wage bill subject to two IC constraints and one participation
constraint. The first IC constraint is that the manager chooses \( e = 1 \) at \( t = 0 \):

\[
pq_0 [W_{S1}^h + W_{S2}^n (R_S)] + [1 - p] [W_{S1}^n + W_{S2}^n (n)] - \psi \geq W_{S1}^n + W_{S2}^n (n) \tag{22}
\]

In writing this constraint, it is recognized that the manager is maximizing his expected utility over two periods in making his first-period choice and that he will get fired at \( t = 1 \) if \( y_{S}^1 = 0 \), so there is no second-period rent for him to extract in this case. The second IC constraint is that the manager will not request funding for a bad project:

\[
b [W_{S1}^h + W_{S2}^n (R_S)] \leq W_{S1}^n + W_{S2}^n (n) \tag{23}
\]

The manager’s participation constraint is that:

\[
pq_0 [W_{S1}^h + W_{S2}^n (R_S)] + [1 - p] [W_{S1}^n + W_{S2}^n (n)] - \psi \geq 0 \tag{24}
\]

This leads to the following result:

**Proposition 1:** The optimal first-period wage contract is as follows:

\[
W_{S1}^h (n) = \frac{\psi}{p[q_0 - b]} - W_{S2}^n (R_S) \tag{25}
\]

\[
W_{S1}^l = 0 \tag{26}
\]

\[
W_{S1}^n = \frac{b\psi}{p[q_0 - b]} - W_{S2}^n (n) \tag{27}
\]

With this wage contract, the manager chooses \( e = 1 \) to search for \( S \) in the first period, requests first-period funding only if he finds a good project, and is retained in the second period if he requested first-period funding for \( S \) and experienced \( y_{S}^1 = R_S \) or if he did not request first-period funding. If the manager is retained in the second period, the wage contract he receives is described in Lemmas 1 and 3.
Second-Best Contracts when Manager Searches for a Good \(L\) Project in the First Period: We again solve the model backward by solving first for the optimal second-period contract when it is known that the manager searched for \(L\) in the first period. At \(t = 1\), the CEO observes the signal \(\phi\) of the eventual payoff on \(L\). The second-period contract in this case is a triplet \(\{\hat{W}_{S2}^n(\phi), \hat{W}_{S2}^h(\phi), \hat{W}_{S2}^l(\phi)\}\). As before, we can show that \(\hat{W}_{S2}^l(\phi) = 0\) in the optimal contract. The following result can now be proved:

**Lemma 4:** \(\exists \beta^* \in (0.5, 1)\) such that the CEO does not fire the manager at \(t = 1\), regardless of the observed \(\phi\), as long as \(\beta \leq \beta^*\). The optimal second-period contract is:

\[
\hat{W}_{S2}^h(\phi) = \frac{\bar{\psi}}{p \left[\tilde{q}_1^\phi - b\right]} \quad (28)
\]

\[
\hat{W}_{S2}^l(\phi) = 0 \quad (29)
\]

\[
\hat{W}_{S2}^n(\phi) = \frac{b\bar{\psi}}{p \left[\tilde{q}_1^\phi - b\right]} \quad (30)
\]

where \(\phi \in \{h, l\}\), with \(h\) representing “success” and \(l\) representing “failure”:

\[
\tilde{q}_1^h = \frac{[1 - \beta]\theta_0}{[1 - \beta]\theta_0 + A_2 [1 - \theta_0]} + \frac{A_2 [1 - \theta_0] q}{[1 - \beta]\theta_0 + A_2 [1 - \theta_0]} \quad (31)
\]

\[
\tilde{q}_1^l = \frac{\beta\theta_0}{\beta\theta_0 + [1 - A_2] [1 - \theta_0]} + \frac{[1 - A_2] [1 - \theta_0] q}{\beta\theta_0 + [1 - A_2] [1 - \theta_0]} \quad (32)
\]

where \(A_2 \equiv q[1 - \beta] + [1 - q]\beta\). If the manager did not request first-period funding, the second-period contract is that stated in Lemma 3.

The intuition for why the manager is not fired at \(t = 1\) when he invests in \(L\) at \(t = 0\) and \(\phi = \text{failure at } t = 1\) is that the actual outcome on \(L\) is not observed at \(t = 1\). So if \(\phi\) is a sufficiently noisy signal, the adverse information it conveys about the manager’s ability is not compelling enough for the CEO to incur the cost \(K\) of firing the manager. However, since \(\phi\) is an informative signal, its realization does affect the manager’s second-period contract.
For the subsequent analysis, it will be assumed that $\beta \leq \beta^*$. 

Turning now to the first-period contract, it can be written as a triplet $\{W_L^n, W_L^h, W_L^l\}$. The CEO designs the contract to minimize its expected wage bill subject to the two IC constraints and participation constraint considered earlier. The first IC constraint is that the manager chooses $e = 1$:

$$p \left\{ q_0 \left[ \beta \left( W_L^h + \hat{W}_{S2}^n(h) \right) + \left[ 1 - \beta \right] \hat{W}_{S2}^n(l) \right] + \left[ 1 - q_0 \right] \left[ \beta \hat{W}_{S2}^n(l) + \left[ 1 - \beta \right] \left( W_L^h + \hat{W}_{S2}^n(h) \right) \right] \right\}$$

$$+ \left[ 1 - p \right] \left[ W_L^n + W_L^n(n) \right] - \bar{\psi} \geq W_L^n + W_L^n(n)$$

(33)

where $W_{S2}^n(n)$ is given in (21) and we set $W_L^l = 0$ as before. The second IC constraint is that the manager does not request funding for a bad project if he does not find a good project:

$$b \left\{ \beta \left( W_L^h + \hat{W}_{S2}^n(h) \right) + \left[ 1 - \beta \right] \hat{W}_{S2}^n(l) \right\}$$

$$+ \left[ 1 - b \right] \left\{ \beta \hat{W}_{S2}^n(l) + \left[ 1 - \beta \right] \left( W_L^h + \hat{W}_{S2}^n(h) \right) \right\} \leq W_L^n + W_L^n(n)$$

(34)

The manager’s participation constraint is:

$$p \left\{ q_0 \left[ \beta \left( W_L^h + \hat{W}_{S2}^n(h) \right) + \left[ 1 - \beta \right] \hat{W}_{S2}^n(l) \right] + \left[ 1 - q_0 \right] \left[ \beta \hat{W}_{S2}^n(l) + \left[ 1 - \beta \right] \left( W_L^h + \hat{W}_{S2}^n(h) \right) \right] \right\}$$

$$+ \left[ 1 - p \right] \left[ W_L^n + W_L^n(n) \right] - \bar{\psi} \geq 0$$

(35)
**Proposition 2:** The optimal first-period wage contract for $L$ is as follows:

$$W_L^h = \frac{\bar{\psi}}{p \left[ e_{\phi} - b \right] \left[ 2\beta - 1 \right]} + \hat{W}^n_{S2} (l) - \hat{W}^n_{S2} (h)$$

$$W'_L = 0$$

$$W_L^n = \frac{A_3 \bar{\psi}}{p \left[ e_{\phi} - b \right] \left[ 2\beta - 1 \right]} + \hat{W}^n_{S2} (l) - \hat{W}^n_{S2} (h)$$

where

$$A_3 \equiv b\beta + [1 - b][1 - \beta]$$

With this wage contract, the manager chooses $e = 1$ to search for $L$ in the first period, requests first-period funding only if he finds a good project, and is retained in the second period regardless of the signal $\phi$. The manager’s second-period wage contract is as described in Lemma 4.

The next result describes the manager’s preference for $L$ versus $S$ at $t = 0$.

**Proposition 3:** With the optimal wage contracts, the manager strictly prefers to search for $L$.

The intuition is that $L$ gives the manager rents that exceed the rents he can get by searching for $S$ at $t = 0$. The reason for this is that the signal of project performance at $t = 1$ is more noisy with $L$. Thus, a bad $L$ project is less likely to be detected at $t = 1$ than a bad $S$ project. Moreover, with $S$, the manager gets fired at $t = 1$ if the project fails, which denies him his second-period rent. This does not happen with $L$.

The manager’s incentive to work hard at $t = 0$ to find a good project is weaker with $L$ than with $S$, all else equal. So the CEO is forced to make the incentives in the wage schedule steeper with $L$ by paying the manager more for a good performance signal at $t = 1$. But this creates another incentive problem—it induces the manager to gamble and propose a bad project, so he can get the high performance bonus with a positive probability. To counter
this, the firm must increase the manager’s wage for doing nothing (no funding request), which gives the manager a rent.

This leads to the final result.

Proposition 4: As long as \( \Delta \equiv R_L - R_S \) is not too large, the firm strictly prefers that the manager search for \( S \) in the first period, so the CEO imposes a short-termism constraint to limit the manager’s first-period choice to \( S \).

The intuition is as follows. From Proposition 3 we know that the manager earns higher rents when he chooses \( L \) than when he chooses \( S \) at \( t = 0 \). Thus, the firm’s expected wage cost is higher with \( L \) than with \( S \). This is one benefit of limiting the manager to \( S \) at \( t = 0 \). The other benefit is that the firm learns more about managerial ability at \( t = 1 \) with \( S \) than with \( L \). This enables the firm to make a more efficient ability-based managerial assignment in the second period. Thus, the benefit of short-termism goes beyond just limiting a wealth transfer from the firm to the manager. The benefit of \( L \) is that it has a higher first-best value since \( R_L > R_S \). So when the difference \( \Delta \) is not too large, the firm will prefer short-termism.

4 Conclusion

This paper has developed a theory of short-termism in which optimal wage contracts generate informational rents for managers when they invest in intrinsically higher-valued long-horizon projects. To limit managerial rent extraction, the firm may choose to limit the manager’s choice to short-horizon projects. This not only reduces the firm’s expected wage cost, but it also permits a more efficient managerial assignment to project management in the second period. Thus, short-termism will be eschewed only when the long-horizon project is intrinsically much more highly valued than the short-term project, e.g., high-payoff R&D.
References


Appendix

Proof of Lemma 1: As argued in the text, it is optimal to set $W_{S_2}^l (R_S) = 0$. Next, note that (12) and (14) will be binding in equilibrium. Solving these simultaneously yield (16) and (18). With this solution, (15) is clearly satisfied.

Proof of Lemma 2: Since (12) holds and $W_{S_2}^n (R_S) > 0$, it follows that (15) is slack, which means the manager earns a rent equal to $W_{S_2}^n (R_S)$.

Proof of Lemma 3: Since not investing at $t = 0$ leads to beliefs about managerial ability remaining unchanged at $t = 1$, the contract in Lemma 3 is identical to that in Lemma 1 with $q^h_1$ replaced by $q_0$. This yields (19)–(21).

Proof of Proposition 1: $W_{S_1}^l = 0$ follows from earlier arguments. (25) and (27) are obtained by solving (22) and (23) as simultaneous equations because both constraints are binding at the optimum.

Proof of Lemma 4: Suppose the firm retains the manager for the second period when the signal at $t = 1$ is $\phi = l$. Then the (subgame perfect) optimal contract will mirror (16)–(18) with $q^h_1$ replaced by $q^\phi_1$ and $\phi \in \{l, h\}$. This yields (28)–(30).

Now suppose $\phi = l$. Then

$$\theta^l_1 = \Pr(\tau = T \mid \phi = l) = \frac{[1 - \beta] \theta_0}{[1 - \beta] \theta_0 + [1 - \theta_0] \{q[1 - \beta] + [1 - q] \beta\}}$$

(A.1)

and

$$\hat{q}^l_1 = \theta^l_1 + \left[1 - \theta^l_1\right] q$$

(A.2)

Similarly, with $\phi = h$:

$$\theta^h_1 = \Pr(\tau = T \mid \phi = h) = \frac{\beta \theta_0}{\beta \theta_0 + \{q \beta + [1 - q][1 - \beta]\} [1 - \theta_0]}$$

(A.3)
and

\[ \bar{q}_1^h = \theta_1^h + \left[1 - \theta_1^h\right] q \]  

(A.4)

Substituting \( A_2 \equiv q[1 - \beta] + [1 - q]\beta \), we see that (A.2) and (A.4) correspond to (31) and (32), respectively.

Then the firm’s expected second-period contracting cost with the original manager retained when \( \phi = l \) is

\[
\mathbb{E} \left[ \varphi_L \right] = p\bar{q}_1^l \left[ \frac{\bar{\psi}}{p \left[ \bar{q}_1^l - b \right]} \right] + [1 - p] \left[ \frac{b\bar{\psi}}{p \left[ \bar{q}_1^l - b \right]} \right] = \bar{\psi} \left\{ p\bar{q}_1^l + [1 - p]b \right\} \left( \frac{1}{p \left[ \bar{q}_1^l - b \right]} \right) 
\]

(A.5)

The firm’s value if it continues at \( t = 1 \) with the original manager is

\[
\bar{q}_1^l R_S - \mathbb{E} \left[ \varphi_L \right] 
\]

(A.6)

If the firm fires the manager and hires a new manager to replace him, the firm’s second-period value is

\[
\bar{q}_1^0 R_S - \bar{\psi} \left[ p\bar{q}_0 + [1 - p]b \right] b \frac{1}{p \left[ \bar{q}_0 - b \right]} - K
\]

(A.7)

Now, if \( \beta = 0.5 \), then (A.6) becomes

\[
\bar{q}_1^0 R_S - \bar{\psi} \left[ p\bar{q}_0 + [1 - p]b \right] b \frac{1}{p \left[ \bar{q}_0 - b \right]} 
\]

(A.8)

which clearly exceeds (A.7). Thus, by continuity, \( \exists \beta^* > 0.5 \) such that (A.6) equals (A.7). For all \( \beta < \beta^* \), the expression in (A.6) will strictly exceed that in (A.7).

Proof of Proposition 2: \( W^l_L = 0 \) is clear from earlier arguments. Moreover, since (33) and (34) are binding in equilibrium, we can treat (33) and (34) as simultaneous equations to obtain (36) and (38). Clearly, (35) holds with (36) and (38). The rest of the proof follows in a straightforward manner. ■
Proof of Proposition 3: The manager’s rent over two periods when he searches for $S$ at $t = 0$ is (using (22)): 

$$\pi_S \equiv W_{S1}^n + W_{S2}^n(n)$$ (A.9)

Substituting for $W_{S1}^n$ from (27) into (A.9) gives us:

$$\pi_S = \frac{b\tilde{\psi}}{p[\tilde{q}_0 - b]} - W_{S2}^n(n) + W_{S2}^n(n)$$

$$= \frac{b\tilde{\psi}}{p[\tilde{q}_0 - b]}$$ (A.10)

The manager’s rent over two periods when he searches for $L$ at $t = 0$ (using (33)) is:

$$\pi_L = W_L^n + W_{S2}^n(n)$$ (A.11)

Substituting for $W_L^n$ from (38) yields:

$$\pi_L = \frac{A_3\tilde{\psi}}{p[\tilde{q}_0 - b][2\beta - 1]} + \hat{W}_{S2}^n(l) - \hat{W}_{S2}^n(h) + W_{S2}^n(n)$$ (A.12)

Now

$$\frac{A_3\tilde{\psi}}{p[\tilde{q}_0 - b][2\beta - 1]} > \frac{b\tilde{\psi}}{p[\tilde{q}_0 - b]}$$ (A.13)

and (using (28) and (30))

$$\hat{W}_{S2}^n(l) = \frac{b\tilde{\psi}}{p[\hat{q}_1 - b]} > \frac{b\tilde{\psi}}{p[\hat{q}_1^h - b]} = \hat{W}_{S2}^n(h)$$ (A.14)

(because from (31) and (32) we know that $\hat{q}_1^l < \hat{q}_1^h$). Thus, it follows that $\pi_L > \pi_S$. ■

Proof of Proposition 4: From Proposition 3, we know that the manager’s rent is larger with $L$ than with $S$. This means that the firm’s expected wage cost over two periods is higher with $L$ than with $S$. So if firm value (excluding wage costs) is higher with $S$ being searched for at $t = 0$, then this is sufficient for short-termism to be optimal for the firm.
If $L$ is searched for at $t = 0$, then firm value over two periods (excluding wage costs) is:

$$V_L = p [\bar{q}_0 R_L - 1] + p [\bar{q}_0 R_S - 1] \quad \text{(A.15)}$$

And if $S$ is searched for at $t = 0$, then firm value over two periods (excluding wage costs) is:

$$V_S = p \left\{ [\bar{q}_0 R_S - 1] + p \left[ \hat{q}_L R_S - 1 \right] + [1 - \bar{q}_0] p [\bar{q}_0 R_S - 1] \right\}$$
$$+ [1 - p] p [\bar{q}_0 R_S - 1] \quad \text{(A.16)}$$

Thus, a sufficient condition for the CEO to impose a short-termism constraint is for (A.16) to exceed (A.15). Now suppose we set $R_L$ in (A.15) equal to $R_S$. Then, since $\hat{q}_L > \bar{q}_0$:

$$V_S > p [\bar{q}_0 R_S - 1] + p \left\{ p [\bar{q}_0 R_S - 1] \right\} + [1 - p] p [\bar{q}_0 R_S - 1]$$
$$= p [\bar{q}_0 R_S - 1] + p [\bar{q}_0 R_S - 1] [p + 1 - p]$$
$$= p [\bar{q}_0 R_S - 1] + p [\bar{q}_0 R_S - 1]$$
$$= V_L \text{ with } R_S = R_L \quad \text{(A.17)}$$

Thus, $V_S > V_L$ if $\Delta = R_L - R_S$ is not too large. ■