

Short-Term Termination Without Deterring Long-Term Investment: A Theory of Debt (Not Dividends)*

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Abstract

The option to terminate a manager early minimizes investor losses if he is unskilled. However, it also deters a skilled manager from undertaking long-term projects that risk low earnings. This paper introduces a novel role of debt that allows it to overcome this tension. Leverage concentrates equityholders' stakes, creating incentives for them to learn the cause of low earnings. If they result from investment (poor management), the firm is continued (liquidated). Therefore, unskilled managers are terminated and skilled managers can invest without fear of termination. Unlike models of managerial discipline based on total payout, here dividends are not a substitute for debt: they only achieve termination upon non-payment, and do not lead to concentration, monitoring and thus investment. Debt is dynamically consistent as the manager benefits from monitoring by a concentrated investor. In traditional theories, monitoring constrains the manager; here it frees him to take long-term projects.

KEYWORDS: Termination, liquidation, managerial myopia, long-term investment, ownership concentration, monitoring, corporate governance, leverage, private equity

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1 Introduction

This paper studies the tension between two first-order problems faced by the modern firm: how to terminate unskilled managers, and how to ensure long-run growth. The recent financial crisis demonstrates the substantial losses that can occur if misguided decisions, such as overexpansion, are left unchecked. One key challenge for shareholders is to detect and halt such mistakes early. A quite separate challenge for investors is how to incentivize managers to invest for the long-term. Nowadays, competitive success increasingly hinges upon intangible assets such as human capital and organizational knowledge (Zingales (2000)). Unlike the tangible assets that were central to the traditional firm, intangibles are invisible to outsiders in the short-term. Thus, managers concerned with interim performance may underinvest (Stein (1988).)

These two challenges fundamentally conflict. Investors can mitigate the effect of misguided decisions by forcing the manager to reveal short-term earnings, thus giving themselves the option to terminate him if profits are low. However, the same termination threat may deter a manager from undertaking efficient long-term projects that risk low short-term earnings.

This paper demonstrates how risky debt can alleviate this tension, by playing two distinct roles which address the two separate challenges. The *disciplinary effect* of debt forces the manager to make an interim cash payment. The failure to do so reveals that earnings are weak and thus termination might be desirable. However, investors do not automatically fire a non-paying manager, owing to the second effect of debt. Leverage allows a given dollar investment to translate into a greater proportion of the total equity: the *concentration effect*. An investor's concentrated stake gives her an incentive to gather costly information on the underlying cause of weak earnings. If the cause is low managerial skill, the firm is liquidated; if the cause is long-term investment, it is continued. Therefore, a skilled manager can invest without fear of termination, while an unskilled manager is efficiently terminated.

We commence by analyzing a model with a single manager and a single large investor. The large investor has limited wealth and so forms a syndicate with atomistic small investors. The manager may turn out to be inspired or uninspired. An uninspired manager reduces firm value in the short-run and even further in the long-run; short-run value is unobservable to outside investors. A inspired manager chooses between two projects. The safe project improves firm value in the short-run and even more in the long-run. The risky project maximizes both long-run value and the manager's private benefits. However, it risks yielding short-term losses and leading to the manager being viewed as uninspired. The firm is only profitable if it both achieves short-run termination of uninspired managers and induces inspired managers to choose the risky project. We consider alternative financing structures to analyze whether they can achieve the two goals and thus allow the firm to be viable.

One financing structure involves equity financing from all investors. Inspired managers are free to choose the risky project without fear of termination. The disadvantage is that investors cannot observe short-term earnings and so cannot tell if the manager is uninspired; they are thus unable to terminate such a manager. While the large investor has the option to learn the

firm's long-run value and thus whether liquidation would be efficient, her share of the firm's equity is too low to motivate paying the cost.

One option is to require the manager to pay an interim dividend. This costlessly reveals the firm's short-run earnings to outsiders, since an uninspired manager cannot pay the dividend. Thus, shareholders can identify and terminate him without costly monitoring. However, the dividend requirement deters inspired managers from taking the efficient project, as they risk being unable to pay the dividend. Upon non-payment, the large investor has the option to gather information to learn the cause of this failure, but since her stake is again insufficient to induce monitoring, the manager is instead automatically terminated.

This is where the superiority of debt lies. Like dividends, debt imposes discipline on the manager by requiring an interim payment. Moreover, debt has a second effect which critically distinguishes it from dividends: the concentration effect. Debt concentrates the large shareholder's equity stake, incentivizing her to learn the cause of non-payment; if it results from investment, the firm is continued. The importance of the concentration effect distinguishes this paper from prior theories centered around the disciplinary role of debt: it has different implications for the substitutability of dividends for debt, the effect of debt on investment, and the optimal level of debt. In Jensen (1986), Stulz (1990) and Zwiebel (1996), debt also disciplines the manager by forcing him to pay out cash rather than overinvesting. In these models, dividends would have the same disciplinary effect and thus are a perfect substitute for debt: they are theories of total payout (debt plus dividends) rather than debt in particular. Here, debt is critically different from dividends because it is not only the disciplinary effect that is relevant. In addition to allowing termination (imposing discipline), the financing structure must also induce investment. The latter requires the concentration effect, which only debt has.

Turning to the effect of debt, in Jensen (1986) and Stulz (1990), debt impacts investment by altering the amount of free cash available. It affects the *level* of investment: too little debt allows inefficient investment, and too much debt prevents efficient projects. Here, debt impacts investment by inducing ex post monitoring via the concentration effect. Since informed investors base their liquidation decisions on long-run value, the *type* of investment changes to efficient projects that maximize long-run value.

Moving to the optimal level of debt, in a number of disciplinary models, the efficient amount of debt is borderline risky. Since the only role of debt is to impose discipline, it should be just high enough that a bad type cannot pay it. In Gümbel and White (2007), strictly risky debt is suboptimal because it leads to debt overhang. In Lambrecht and Myers (2008), strictly risky debt induces the manager to disinvest suboptimally quickly. In this paper, strictly risky debt is efficient as it leads to greater concentration.

We next extend the model to multiple large investors and heterogeneous managers, where good managers have a higher probability of becoming inspired than bad types. A separating equilibrium is sustainable where good managers run levered firms and are financed by both large and atomistic investors, and bad managers run unlevered firms financed exclusively by small shareholders. This approximates a situation in which high-quality managers seek private equity

financing, and concentrated private equity investors earn superior returns than shareholders in public firms (as found by Ljungqvist and Richardson (2003)).

The two roles of debt identified above, which lead to the optimality of leverage in a single-manager setting, also achieve the sustainability of the separating equilibrium in a multi-manager setting. The disciplinary effect of debt renders it a *credible* signal of managerial quality: bad managers are unwilling to take on leverage as they know they are likely to default. However, if only credibility of the signal mattered, borderline risky debt would be optimal – debt should be just high enough that a bad type would default; additional debt would merely augment signaling costs. In addition, dividends would be equally effective as they also have a disciplinary effect: indeed, Bhattacharya (1979) shows that the Ross (1977) idea of signaling value with debt can also be achieved with dividends.

However, credibility of the signal is not the only issue. The signal must be a *desirable* one that good managers are willing to emit. In standard models, it is automatic that a good manager wishes to reveal his quality, as his compensation is exogenously assumed to depend on short-run value (Ross (1977), Bhattacharya (1979)) or signaling quality is necessary for the firm to raise financing (Myers and Majluf (1984), Fulghieri and Lukin (2001).) Here, the manager's pay is not tied to short-run value, and even bad managers can raise financing. Therefore, the traditional motives to signal do not exist. This is where the concentration effect comes in: it provides a motive to signal. This motive is not to obtain a greater *level* of funds, but to attract a different *type* of funds. By signaling their quality, they attract large investors. A large investor provides no more funds than several small investors, but is critically different as she has the incentive to monitor, thus allowing an inspired manager to take the risky project. Since good managers have a greater probability of becoming inspired, this advantage is more important to them and separation is achieved.

The different motives for signaling lead to different results on the dynamic consistency of debt, and the effect of signaling on aggregate firm value. In this and other models, debt hurts the manager owing to the disciplinary effect, but he willingly bears these costs to signal quality. If the goal of signaling is to raise more initial funds (or improve initial market value), it is already achieved in the first period. Hence, once funds have been raised, the manager has incentives to issue new equity to buy back the debt, thus freeing himself from discipline. This concern applies not only to signaling theories, but single-type models in which investors impose debt on the manager to solve agency problems. For example, in Jensen (1986) and Stulz (1990), shareholders initially finance the firm with leverage to force the manager to pay out free cash. However, as noted by Zwiebel (1996), it is the manager who controls leverage and he may subsequently reduce it to give himself the freedom to empire-build.

Here, debt is dynamically consistent since its advantages are not confined to the first period, and so the manager has an incentive to retain it. Debt benefits the manager by inducing monitoring: this requires not only attracting a large investor through initially signaling quality, but also persuading this investor to monitor in the future by maintaining leverage: the concentration effect. In short, the disciplinary effect of debt renders debt a credible signal in

the first period. The concentration effect renders it a desirable signal that the firm wishes to maintain in future periods. This persistence of leverage is consistent with the empirical findings of Lemmon, Roberts and Zender (2008).

The manager's desire for monitoring in turn results from this model's analysis of a different agency problem to prior debt theories. In Jensen (1986), Stulz (1990) and Zwiebel (1996), there is a traditional effort conflict¹ where firm value maximization requires the manager to either exert costly effort or forgo private benefits. The manager's and investors' objective functions are inherently misaligned, and so investors' role is to be an "adversary" of the manager, preventing him from shirking or taking private benefits. Monitoring hurts the manager, and so he wishes to delever to reduce investors' incentives to do so. In this paper, there is no traditional effort conflict. The risky project maximizes both firm value and private benefits; agency problems instead arise because of the risk of being mistaken for an uninspired manager in the short-run. A monitor's role is to be an "ally" of the manager, allowing him to take the action that he wishes to anyway in the absence of termination concerns. Since the monitor helps the manager, the latter has an incentive to retain the former through maintaining leverage.

Turning to welfare effects, signaling reduces fundamental value in traditional models. In Ross (1977), signaling leads to bankruptcy risk; in Stein (1989) and Miller and Rock (1985) it reduces investment. There are no offsetting positive real effects as separation merely changes outsiders' *perceptions* of short-run value. In Myers and Majluf (1984) and Fulghieri and Lukin (2001), signaling does have real benefits, because it allows a firm to raise financing and thus invest. Here, signaling also has real benefits, but through a quite different mechanism. Signaling has no effect on the *level* of funds raised: firms receive the same as in a pooling equilibrium. Instead, the benefit comes in the different *type* of funds. Signaling allocates scarce large investors to good managers, who benefit most from monitoring as they are most likely to become inspired. In turn, monitoring improves fundamental value as it leads to efficient investment.

The model has a number of empirical implications. Most broadly, it can explain the widespread prevalence of debt. While standard theories suggest that managers wish to reduce leverage as it disciplines them (e.g. Jensen (1986), Stulz (1990)), here the monitoring induced by leverage is beneficial to the manager. Zwiebel (1996) also achieves dynamic consistency, through the different mechanism of an ever-present raider. In addition, the model highlights how the level of debt depends on the magnitude of a firm's agency problems. While standard empirical studies analyze the determinants of overall leverage (e.g. Rajan and Zingales (1995)), this paper emphasizes that leverage is the product of two factors: the level of total payout (debt plus dividends) and the composition of a fixed level of total payout between debt and dividends. The importance of short-term termination determines total payout. If termination is unlikely to be optimal (e.g. the firm is a start-up with low liquidation value), total payout should be low; indeed, such firms are typically unlevered and pay no dividends. The importance of long-

¹Throughout this paper, the effort conflict is broadly defined to include any action that has opposing effects on firm value and the manager's utility. Examples include shirking, pursuit of private benefits, and managerial rent extraction.

term growth determines the composition of total payout. If intangible investment is important, any payout used to allow termination should be in the form of debt, rather than dividends. Indeed, as the importance of intangibles have grown over time (Zingales (2000)), dividends have fallen (Fama and French (2001).) Along the cross section, while Rajan and Zingales (1995) find that leverage is negatively correlated with growth opportunities, the model predicts a positive correlation once total payout is controlled for. While a levered firm may have fewer growth opportunities than an all-equity peer, the model predicts it invests more than a firm making a similar payout in the form of dividends.

The concentration effect in this paper echoes Jensen and Meckling (1976) and Innes (1990), where debt magnifies a manager's equity holding, *directly* providing incentives to exert effort. Here, leverage incentivizes effort by investors rather than the manager – indeed, there is no managerial effort conflict. External monitoring *indirectly* incentivizes the manager to choose the efficient project. The model contains two layers of agency problems: investor monitoring and managerial investment; solving the former addresses the latter.²

The effect of debt on outsiders' incentives to gather information is shared with a number of other papers. In Boot and Thakor (1993), as in this paper, shareholders have limited dollar wealth and leverage translates it into a greater percentage equity stake, inducing monitoring. In their model, monitoring affects the cost of funds; here, it has real effects through both achieving liquidation and improving investment choice.³ In Harris and Raviv (1990), debt leads to information acquisition but not through changing monitoring incentives. They exogenously assume that bankruptcy automatically leads to an audit and that such an audit cannot occur outside of bankruptcy. In reality, investigations can occur at all times; our model endogenizes the monitoring decision.⁴ Like the present paper, von Thadden (1995) considers short-term and long-term projects, and shows how debt can exert discipline; dividends would have the same effect. He shows how myopia can be alleviated by monitoring, which he assumes to be verifiable and thus contractible. This paper demonstrates how debt can induce non-verifiable monitoring through the concentration effect.

In Gumbel and White (2007), debt also affects managerial decisions by inducing external monitoring, but through a different mechanism. In their paper, debt works by shifting control to a "tough" agent (creditor) with a concave claim and thus bias towards shut-down. Since the equityholder has a convex claim, she has incentives to gather information to allow the firm to continue. Here, debt has no control shift effect compared to dividends: equityholders in a

²Direct application of the Jensen and Meckling (1976) result would suggest that the shareholder should be levered, since the effort conflict is at the shareholder level. However, in this paper, the conflict is addressed by introducing leverage at the firm level.

³In Boot and Thakor and the present paper, debt is valuable as it makes equity informationally sensitive and induces shareholders to monitor. By contrast, in Gorton and Pennacchi (1990), the desirability of debt arises because it is informationally insensitive and its owners have low incentives to monitor. Thus, uninformed investors wish to trade debt.

⁴Debt has a second informational role in Harris and Raviv: non-payment of debt reveals to investors that cash flows are low. This role is also featured in the present paper and is not unique to debt – we show that non-payment of dividends has the same effect.

firm that has missed its dividend are already tough and wish to liquidate the firm – the essence of the myopia issue. Monitoring is instead induced by the concentration effect, which is not featured in Gumbel and White. Another distinction is that the manager in Gumbel and White makes an effort decision and the monitor is an adversary; here he makes an investment decision and the monitor is an ally, thus providing a dynamic reason for why the manager may wish to retain her. While there is a tension between termination and investment, there would be no tension between termination and effort since termination threat induces greater effort.

Edmans (2009) also considers the effect of concentrated ownership on ex post monitoring and ex ante investment decisions. He assumes the blockholder’s investment can always be increased if required.⁵ Here, the large shareholder’s funds are limited and monitoring is instead induced by debt; this paper is a theory of capital structure rather than ownership structure. This method of increasing concentration has an important advantage over Edmans: while the number of dollars invested is chosen by the blockholder, leverage is chosen by the manager and thus under his control. Another difference is that Edmans (2009) exogenously assumes that the manager is concerned with the firm’s short-term value. Here, such concerns are endogenous. Investors can choose to demand no interim payment, but we show that it is optimal for them to liquidate a firm upon interim losses, endogenously causing the manager to be concerned about temporary earnings. There is no liquidation decision in Edmans.

The modeling setup of this paper is similar to Stein (2005), who also analyzes the tension between liquidation and long-term decisions, within the context of arbitrageurs contemplating long-run convergence trades. A closed-end fund prevents interim withdrawals and thus alleviates the Shleifer and Vishny (1997) “limits to arbitrage” issue, but prevents desirable liquidation if the manager turns out to be unskilled. This paper builds on Stein by adding leverage and a monitoring technology, and demonstrates the superiority of debt over other forms of discipline as it induces investors to use this monitoring technology.

This paper proceeds as follows. Section 2 considers a single firm and single large investor, and illustrates the concentration and disciplinary effects of debt that allow it to induce both termination and investment. Section 3 considers heterogeneous managers and multiple large investors, and demonstrates the sustainability of a separating equilibrium. Section 4 discusses potential applications of the model and Section 5 concludes.

2 The Model

A single penniless manager (M) seeks financing of I dollars for a project. There exists a single large investor (L) who has funds of x , and a pool of atomistic investors who can invest one dollar each, where $1 < x < I$. In reality, the large investor corresponds to an institutional investor such as a private equity fund or mutual fund, and the atomistic investors represent households. There are four periods, summarized in Figure 1. At $t = 0$, L forms a syndicate

⁵In Burkart, Gromb and Panunzi (1997), Maug (1998), Kahn and Winton (1998) and Bolton and von Thadden (1998), monitoring is also induced by the blockholder investing a sufficiently large amount.

with atomistic investors to offer I of financing to M . L has full bargaining power over both M and atomistic investors, i.e. can make a “take-it-or-leave-it” offer that extracts all the surplus.⁶ In the syndicate, L commits x in the form of either debt or equity, and raises the remaining $I - x$ from atomistic investors in either debt or equity. D denotes the total amount of debt raised; it has face value of F and matures at $t = 2$. In addition, shareholders can ask M to pay a dividend at $t = 2$. For simplicity, we normalize the interest rate to zero and assume all agents are risk-neutral.

The modeling of investment opportunities is similar to Stein (2005). At $t = 1$, with probability π the manager is “inspired”, i.e. obtains a good investment idea. An inspired manager can choose to invest in either a Risky (R) or Safe (S) investment project. (We will sometimes refer to choosing R rather than S as “investing”.) An uninspired manager invests in unprofitable projects that lose money over time. At $t = 2$ the firm has an interim value. We assume that this value is unobservable, but the model extends naturally to the case in which the value is observable, as discussed at the end of Section 2.1. Investors may choose to liquidate the firm at $t = 2$; the basis for the liquidation decision will be discussed shortly. The manager is assumed to be essential for the firm’s continuation, so termination of the manager is equivalent to liquidation of the firm. At $t = 3$, the firm’s final value becomes publicly known.

M ’s objective function consists of private benefits, which are increasing in both firm value and his tenure. One natural interpretation is the manager’s reputation. As in Stein and in other models where debt addresses agency problems (e.g. Stulz (1990), Zwiebel (1996)), we use this formulation rather than incentive pay, since L has full bargaining power and can reduce the manager’s cash pay to zero; competition for funds in a multi-manager model (e.g. Section 3) will have the same effect. Private benefits are inalienable and so not competed away.⁷

The payoffs are given in the table below (cash V , private benefits B), depending on whether the firm is liquidated at $t = 2$ or allowed to continue until $t = 3$.⁸ Throughout this paper, subscripts will refer to the time period: for example, V_2 refers to firm value at $t = 3$. We sometimes refer to V_2 as “earnings” and V_3 as “fundamental value.”

Table 1: Payoffs to Investment Strategies

	Uninspired	Inspired, S	Inspired, R
Continue until $t = 3$	K, Tz	R^S, Tz	$R^R, Tz(1 + \alpha)$
Liquidate at $t = 2$	J, z	G, z	r, z . $r = J$ with probability γ , G w.p. $1 - \gamma$

⁶This assumption has no effect on the results, since we are concerned with total investor returns. However, it simplifies the analysis since we need not calculate the returns to atomistic investors (who always break even); it means that L ’s return equals total investor returns.

⁷Our results continue to hold if private benefits are replaced by performance-related pay that weights short-term as well as long-term performance, as in Miller and Rock (1985), Stein (1988), Edmans (2009). We take myopic concerns as given and consider how to solve them via financing.

⁸Note that the payoffs are total, not incremental: a firm run by an uninspired manager is worth K at $t = 3$, not $K + J$.

The parameters in Table 1 satisfy the following conditions:

$$K < J < 1 \tag{1}$$

$$R^R > R^S > G > 1 \tag{2}$$

$$T > 1 \tag{3}$$

$$\alpha > 0. \tag{4}$$

(1) means that an uninspired manager loses money over time and so firm value is maximized by terminating him at $t = 2$. (2) demonstrates that R leads to a higher V_3 than S . However, it has a probability γ of leading to the same low earnings as an uninspired manager at $t = 2$. We will sometimes refer to a firm in which R has been implemented but delivers $V_2 = J$ as “unlucky,” or suffering “interim turbulence” or “interim losses.” (3) denotes that the manager prefers not to be terminated. (4) means that M ’s incentives are aligned with investors if the firm is allowed to continue until $t = 3$: the same project that maximizes firm value (R) also maximizes M ’s private benefits. This distinguishes the paper from models of the effort conflict, where actions that benefit investors are costly to managers, in the form of an effort expenditure or a reduction in private benefits.

At $t = 2$, the investor in control may decide to liquidate the firm if this action maximizes their payoff. Creditors have control if the firm is bankrupt ($V_2 < F$); shareholders have control if the firm is solvent ($V_2 > F$). Even if shareholders desire shut-down, it is less likely that closure will occur than if the firm has is bankrupt. In a bankruptcy, the “default” decision (in the absence of further information) is liquidation; in solvency, the “default” decision is continuation and it requires an active decision by shareholders to close the firm. For example, Zwiebel (1996) assumes that managers are replaced in bankruptcy with certainty if termination is efficient, but shareholders face a cost of firing a manager in solvency due to entrenchment. Similarly, Myers (2000) assumes that shareholders face costs of collective action in liquidating a solvent firm. Here, we model such costs by specifying that, if liquidation is optimal for shareholders, it occurs only with probability $\lambda \leq 1$. To keep the expressions simple, we will consider $\lambda = 1$ for now; as will be made clear later, the model’s results will be stronger if $\lambda < 1$.

To guide the liquidation decision, an investor may choose to engage in monitoring at $t = 2$. Monitoring costs the investor c and has a probability ϕ of success; since $\phi < 1$, monitoring is a non-contractible activity.⁹ If monitoring succeeds, it generates a publicly observable, but unverifiable signal of V_3 . This is similar to the costly state verification models of Townsend (1979) and Gale and Hellwig (1985) where the underlying state (V_3 , in this case) can be made publicly visible at a cost. Given the signal, all investors will agree on the optimal decision – both shareholders and creditors maximize their payoff if the firm is liquidated upon $V_3 = K$ and continued upon $V_3 = R^R$ or R^S . Thus, even if the signal is not publicly observable, and the

⁹We assume that the cost is a non-pecuniary cost (e.g. effort expenditure or the opportunity cost of foregoing other revenue-generating activities). The model can easily be extended to allow c to be a financial cost, as in Boot and Thakor (1993) and Fulghieri and Lukin (2001).

monitor is different from the party who takes the liquidation decision, the monitor can credibly communicate the signal to the party in control.¹⁰

To make the financing problem interesting, we need to impose parametric restrictions to ensure that both the termination and investment problems exist in the first place (e.g. a manager threatened with shut-down will myopically choose S), and that these problems are sufficiently severe that, if unsolved, the firm is unviable. It is clearer to introduce the first category of assumptions later during the actual analysis, as the reader can more easily see their effect. The second category of assumptions is as follows:

$$\pi R^S + (1 - \pi)J < I \tag{5}$$

$$\pi R^R + (1 - \pi)K < I. \tag{6}$$

Condition (5) states that, if the manager always chooses S if inspired, the firm will not be profitable. Condition (6) states that, if an uninspired manager is never terminated, the firm will not be profitable. These two conditions mean that, for L to be willing to finance the project, she must be able to ensure that the manager will both (at least sometimes) choose R if inspired and be terminated if uninspired. The requirement to achieve both objectives simultaneously, for the firm to be viable, constitutes the tension between termination and investment. We examine the effect of relaxing assumptions (5) and (6) in Section 2.3.

We now consider the different modes of financing in turn, to analyze investors' monitoring decisions, M 's project choice, and thus whether investor returns are sufficiently high to allow the firm to be financed in the first place.

2.1 Unlevered Firm

The firm is financed with x of equity from L , and $I - x$ of equity from atomistic shareholders. Shareholders can choose whether to demand a dividend from the manager at $t = 2$.

2.1.1 No Dividend

We first analyze the case of no dividend. Since the manager need not make a payout at $t = 2$, he need not worry about V_2 and can simply choose R if inspired, which maximizes both private benefits and firm value. If

$$\pi R^R + (1 - \pi)K > J, \tag{7}$$

all shareholders will wish the firm to continue at $t = 2$ in the absence of information. We assume that (7) holds, else it is immediate that the firm will not be viable, from (6) and $J < I$. We

¹⁰For the same reason, even if the monitor has the option to destroy the signal and instead to pretend that monitoring is unsuccessful, she will not wish to do so. Since all investors agree on the optimal liquidation decision given a particular signal, the monitor will always wish the party in control to make the decision according to her signal. Note that we are assuming no bankruptcy costs in a reorganization. If bankruptcy costs exist, they reduce the desirability of debt. Since the negative effect of bankruptcy costs on optimal leverage has been well explored in the literature, we exclude them here.

now consider whether any shareholder will monitor at $t = 2$. The incentive to do so is that, if a monitor finds that the manager is uninspired (i.e. V_3 will be K), she knows that liquidation is optimal, in which case shareholders recover J rather than K . Since the manager is uninspired with probability $(1 - \pi)$, L will not monitor if:

$$\phi(1 - \pi)(J - K)\frac{x}{I} < c. \quad (8)$$

L 's monitoring incentives depend on the cost of gathering information c , its effectiveness ϕ , and her stake in the firm $\frac{x}{I}$. If her stake is sufficiently small, she shares in too little of the gains from efficient liquidation ($J - K$) and will thus not monitor.¹¹ For the remainder of the paper, we assume that (7) and (8) hold, otherwise there is no termination problem to begin with. Since an atomistic shareholder's stake is $\frac{1}{I}$, no household will monitor either. (Since L has the largest incentive to monitor, any monitoring will be done by her rather than households; thus, the remainder of the paper only considers L 's monitoring decision.) Therefore, the firm is never liquidated early, and so it is worth R^R if the manager is inspired and K otherwise.

Lemma 1 *Assume that the firm is all-equity financed and no dividend is required at $t = 2$. The unique Nash equilibrium is the following:*

(i) *The manager chooses R if inspired.*

(ii) *At $t = 2$, no monitoring occurs and the firm is never liquidated.*

The expected gross returns to L and M are given by

$$\pi R^R + (1 - \pi)K, \quad (9)$$

and

$$\pi Tz(1 + \alpha) + (1 - \pi)Tz. \quad (10)$$

L makes a loss, and therefore will not finance the firm to begin with.

From (6), (9) $< I$. Therefore, L will not finance the firm in the first place.

2.1.2 Dividend

The key problem with the no-dividend structure is that an uninspired manager is never terminated early, since he is not forced to reveal his low earnings at $t = 2$. A possible solution to this problem is to force the manager to pay a dividend of (slightly in excess of) J at $t = 2$. Any dividend below J will have no effect because all firms will be able to meet the requirement. Dividends strictly in excess of J and below G will be equally effective; without loss of generality,

¹¹We have assumed that L cannot coordinate to share the monitoring costs with other investors. This assumption is standard in any model with multiple shareholders (see also, e.g., Burkart, Gromb and Panunzi (1997), Maug (1998), Kahn and Winton (1998), Bolton and von Thadden (1998), Edmans (2009)) – if perfect coordination is possible, shareholder structure is irrelevant. The model's results continue to hold if shareholders can coordinate but at a cost.

we consider a dividend of exactly J and assume that the manager cannot pay it if $V_2 = J$. This is to avoid having to write “plus epsilon” throughout the paper.

Since an uninspired manager is unable to make such a payment, his low quality is immediately revealed even in the absence of costly monitoring, thus allowing efficient liquidation. Dividends thus play a similar disciplinary role to Myers (2000), where shareholders also liquidate the firm if the dividend payment is not met. However, the disadvantage is that the dividend requirement may deter an inspired manager from choosing R since it risks yielding $V_2 = J$, in which case the manager is unable to pay the dividend and may be viewed as uninspired. This leads to the following Lemma.

Lemma 2 *Assume that the firm is all-equity financed, that shareholders demand a dividend of J at $t = 2$, and that the following three conditions hold:*

$$\frac{1 - \pi}{1 - \pi + \pi\gamma}K + \frac{\pi\gamma}{1 - \pi + \pi\gamma}R^R < J, \quad (11)$$

$$\phi \frac{\pi\gamma}{1 - \pi + \pi\gamma} \frac{x}{I} (R^R - J) < c, \quad (12)$$

$$(1 - \gamma)Tz(1 + \alpha) + \gamma z < Tz. \quad (13)$$

The unique Nash equilibrium is the following:

(i) *The manager chooses S if inspired.*

(ii) *At $t = 2$, no monitoring occurs. If the dividend payment is met, the firm is continued, otherwise it is liquidated.*

The expected gross returns to L and M are given by

$$\pi R^S + (1 - \pi)J, \quad (14)$$

and

$$\pi Tz + (1 - \pi)z. \quad (15)$$

L makes a loss, and therefore will not finance the firm to begin with.

The intuition is as follows. The maximum posterior probability that a non-paying manager is inspired is $\frac{\pi\gamma}{1 - \pi + \pi\gamma}$. This probability is reached if an inspired manager always chooses R , otherwise the posterior is lower. Equation (11) means that, in the absence of information, shareholders prefer to liquidate a manager who cannot pay the dividend: even if the posterior probability that the manager is inspired is the highest possible, it is still insufficient to outweigh the gains from early liquidation if M is uninspired.¹² (12) shows that L will not acquire information upon poor performance: her stake in the firm, $\frac{x}{I}$, is too small to outweigh the monitoring cost. Together, (11) and (12) imply that any manager who fails to pay the dividend

¹²Note that the same condition means that the manager is unable to continue by raising external funds – since the firm is now negative-NPV, no investor will finance it.

will be fired. Equation (13) shows that an inspired manager myopically chooses S to avoid the risk of non-payment. For the remainder of the paper, we assume that (11) – (13) hold, else there is no myopia problem to begin with: an inspired manager nonchalantly chooses R .

By (5), the firm is never viable if an inspired manager never chooses R . Therefore, L will not finance the firm in the first place. The problem with the above financing structure is that, while it achieves efficient termination of an uninspired manager, this is at the cost of deterring inspired managers from choosing R . Therefore, shareholders only earn R^S if M is inspired.

In sum, the firm cannot be financed if it is unlevered. If no dividend is required, an inspired manager chooses R but an uninspired manager is never terminated. If a dividend is required, an uninspired manager is terminated but inspired managers choose S . This is the tension between termination and investment: in the absence of leverage, it is impossible to achieve both objectives simultaneously. From (5) and (6), both are necessary for the firm to be viable.

Note that the model has a close parallel in the case in which V_2 is publicly observable. In such a case, dividend policy is not needed to reveal V_2 . Instead, the dividend case of Section 2.1.2 corresponds to a scenario in which the manager is given a short-term contract which allows him to be fired at $t = 2$. This allows shareholders to fire an uninspired manager, but also will deter an inspired manager from choosing R . The no-dividend case of Section 2.1.1 corresponds to giving the manager a long-term contract which guarantees his employment until $t = 3$. The long-term contract solves the myopia issue, as an inspired manager can now choose R without risk of interim dismissal, but prevents termination if $V_2 = J$. The tension between termination and investment remains. Similarly, the model has a parallel in which V_2 is initially unobservable but can be made verifiable through disclosure. The dividend case corresponds to a scenario in which investors require the manager to disclose earnings at $t = 2$ (detering R , since it may lead to low disclosed earnings) and the no dividend case represents a situation of no disclosure (preventing termination). Note that V_3 is never verifiable at $t = 2$ since it is a future value.

Regardless of the interpretation, the essence of managerial myopia is information asymmetry: investors can only base their termination decisions on observable variables, and they can only observe short-term earnings V_2 (either directly via disclosure or indirectly via observing the dividend payment) rather than fundamental value V_3 . This asymmetry is not resolved through monitoring, since no investor has the incentive to undertake it.

2.2 Levered Firm

The levered firm is partially financed by short-term debt with face value F and current value D , and equity of $I - D$. L can choose to provide either debt or equity in this structure; we will show that she will provide equity as this maximizes her monitoring incentives. It will become clear that there is no role for dividends, since debt can be used to force cash payouts.

2.2.1 Riskless Debt

We first consider the case of $F < J$, i.e. riskless debt. All firms can meet the required debt payment at $t = 2$. The scenario is thus similar to the unlevered firm with no dividends (Section 2.1.1): an inspired manager chooses R as he does not fear interim dismissal, and the firm is continued in the absence of information from (7). However, the important difference is that, even though riskless debt plays no role in revealing V_2 , because all managers can repay the debt, it does impact L 's incentives to gather information. If L is a debtholder, she has no incentives to monitor – since debt is riskless, she will always be repaid. Therefore, we consider the case where L is an equityholder. She will gather information if:

$$\phi(1 - \pi)(J - K) \frac{x}{I - D} > c. \quad (16)$$

The left-hand side of (16) contains the term $\frac{x}{I - D}$, which exceeds the $\frac{x}{I}$ in equation (8). We denote the positive effect of F on $\frac{x}{I - D}$ and thus monitoring incentives as the “concentration effect.” Even if L would not gather information in an unlevered firm which pays no dividend, she may do so in a levered firm with riskless debt. The highest possible level of riskless debt, where F is just less than J , is weakly preferred to any lower debt level as this maximizes the concentration effect.

If L finds that the manager is uninspired, she will liquidate the firm. Hence, riskless debt achieves both (occasional) liquidation and investment. This gives rise to Lemma 3.

Lemma 3 *Assume that the firm is partially financed by riskless debt, that L holds equity, and that (16) holds. The unique Nash equilibrium is the following:*

(i) *The manager chooses R if inspired.*

(ii) *At $t = 2$, L monitors. If she learns that $V_3 = R^R$, the firm is continued, otherwise it is liquidated.*

The expected gross returns to L and M are given by

$$\pi R^R + (1 - \pi)(\phi J + (1 - \phi)K) - c \quad (17)$$

and

$$\pi Tz(1 + \alpha) + (1 - \pi)(\phi z + (1 - \phi)Tz). \quad (18)$$

It is possible that (17) exceeds I , i.e. the firm can be financed under riskless debt. However, it may not be possible to satisfy (16) with riskless debt ($F < J$). In particular, if

$$\phi(1 - \pi)(J - K) \frac{x}{I - J} < c, \quad (19)$$

then L will not monitor under riskless debt. In this case, her return is the same as in the unlevered firm with no dividends (as given by (9)) and thus less than I . (19) will hold if the gains from efficient termination of an uninspired manager, $(J - K)$, are small.

2.2.2 Risky Debt

We now analyze the case of $F \geq J$. Creditors now have control if $V_2 = J$, since the firm is in default. In the absence of further information, they will liquidate the firm if

$$\frac{1 - \pi}{1 - \pi + \pi\gamma}K + \frac{\pi\gamma}{1 - \pi + \pi\gamma}F < J. \quad (20)$$

This holds as a direct consequence of (11). Note that (11) also means that liquidation is efficient, so there is no scope for renegotiation.

We now consider whether L will gather information. The Appendix proves that L will not monitor if she is a creditor. The intuition is that her monitoring incentives are maximized when F is the highest possible, as creditors receive F upon continuation of an inspired manager. In turn, F is maximized when creditors own (virtually) the entire firm. A debtholder's incentive when the firm is entirely owned by debtholders is the same as a shareholder's incentive in an all-equity firm, and the latter is insufficient from (12).

By contrast, L will monitor as an equityholder¹³ if

$$\phi \frac{\pi\gamma}{1 - \pi + \pi\gamma} \frac{x}{I - D} (R^R - F) > c. \quad (21)$$

(We will later derive conditions on F to ensure that (21) is satisfied). Thus, to induce information acquisition, the levered firm must feature L owning x of equity; atomistic shareholders provide $I - D - x$ of equity and D of debt.

If an inspired manager knows that an investor will become informed, he will choose R if

$$(1 - \gamma(1 - \phi))Tz(1 + \alpha) + \gamma(1 - \phi)z > Tz. \quad (22)$$

The manager is only terminated if R suffers interim turbulence (w.p. γ) and monitoring fails (w.p. $(1 - \phi)$). For the remainder of the paper, we assume (22) is satisfied, otherwise monitoring becomes irrelevant as it cannot cure myopia. Condition (22) is fully consistent with (13), i.e. the manager of a risky levered firm may choose R even if the manager of an unlevered firm chooses S . The key to this result is that debt affects ex ante investment decisions through changing ex post monitoring incentives. The manager in a risky levered firm knows that investors will monitor and make the liquidation decision according to fundamental value rather than earnings. Therefore he will choose the project which maximizes fundamental value rather than earnings, i.e. R . Thus, risky debt can allow short-term termination without deterring long-term investment. This result gives rise to the following Lemma.

Lemma 4 *Assume that the firm is partially financed by risky debt, that L holds equity, and that conditions (21) holds. The unique Nash equilibrium is the following:*

(i) *The manager chooses R if inspired.*

¹³It is easy to show that the large investor holding both equity and debt is weakly dominated by her holding equity only, since the incentives to monitor are weakly lower.

(ii) If the firm is bankrupt at $t = 2$, L monitors. If she finds that $V_3 = R$, the firm is continued, otherwise it is liquidated.

The expected gross returns to L and M are given by

$$(\pi - \pi\gamma(1 - \phi))R^R + (1 - \pi + \pi\gamma(1 - \phi))J - (1 - \pi + \pi\gamma)c \quad (23)$$

and

$$(\pi - \pi\gamma(1 - \phi))Tz(1 + \alpha) + (1 - \pi + \pi\gamma(1 - \phi))z. \quad (24)$$

The market value of debt is given by

$$D = (\pi - \pi\gamma(1 - \phi))F + (1 - \pi + \pi\gamma(1 - \phi))J. \quad (25)$$

If (23) $> I$, the firm can be financed under risky debt.

The lower bound to F is the minimum debt level that allows (21) to be satisfied. Substituting (25) into (21) defines the lower bound as:

$$\underline{F} = \frac{c(1 - \pi + \pi\gamma)(I - (1 - \pi + \pi\gamma(1 - \phi))J) - \phi\pi\gamma x R^R}{c(1 - \pi + \pi\gamma)(\pi - \pi\gamma(1 - \phi)) - \phi\pi\gamma x}.$$

The upper bound to F is given by substituting (25) into $D = I - x$, i.e.

$$\overline{F} = \frac{I - x - (1 - \pi + \pi\gamma(1 - \phi))J}{\pi - \pi\gamma(1 - \phi)}.$$

Therefore, if

$$\phi \frac{\pi\gamma}{1 - \pi + \pi\gamma} (R^R - \overline{F}) > c, \quad (26)$$

then monitoring can be induced under risky debt. If (26) is violated, the monitoring technology is sufficiently ineffective that, even if debt is at its maximum level which allows L to hold the firm's entire equity, she still does not monitor.

Using the results of Lemmas 1, 2, 3 and 4 leads to Proposition 1.

Proposition 1 *Assume that (19) and (26) hold and (23) $> I$. The firm cannot be financed with pure equity or riskless debt, but can be financed by risky debt.*

Proof See Lemmas 1, 2, 3 and 4. ■

The monitoring technology is key to inducing an inspired manager to select R . The challenge is for L to be able to commit to using the monitoring technology. If the firm is unlevered, L has insufficient incentives to monitor if $V_2 = R$; knowing this, M will choose S . The key role of leverage is that it creates a commitment device to force L to monitor.

The power of risky debt comes from two effects. The first is the “disciplinary effect.” Debt forces the firm to pay out cash. Since uninspired managers cannot meet the payout requirement, they are efficiently terminated; riskless debt does not have this effect since all managers can

make the payment. However, risky debt has the potential disadvantage of deterring inspired managers from choosing R .

This is where the second role of debt comes in: the concentration effect. This effect is similar to Section 2.2.1: as the firm becomes more levered, L 's investment becomes a greater proportion of the total outstanding equity, thus augmenting her incentives to gather information. Mathematically, a rise in F augments D (from (25)) and thus $\frac{x}{I-D}$ in equation (21). This contrasts with equation (12), which is (21) with $D = 0$: incentives to monitor are insufficient.

Note that there is a countervailing effect on L 's incentives to gather information as F rises. An increase in F reduces shareholders' benefits from efficient continuation of an unlucky manager, which are $R^R - F$. This is because creditors gain $F - J$ from efficient continuation, and therefore capture more of the benefits. This is an example of the Myers (1977) "debt overhang" effect. Combining the two effects, a rise in F reduces the total gains to all shareholders from efficient continuation, but allows L to capture a greater proportion of these gains since she now has a higher fraction of total shareholder equity. The overall effect of increasing F on L 's incentives to gather information is given by differentiating the left-hand side of (21) to yield:

$$\phi \frac{\pi\gamma}{1 - \pi + \pi\gamma} \frac{(R^R - F)(\pi - \pi\gamma(1 - \phi)) - (I - D)}{(I - D)^2}. \quad (27)$$

The Appendix proves that this is positive, i.e. the concentration effect outweighs the debt overhang effect. For brevity, we use the term "concentration effect" to denote the concentration effect net of the debt overhang effect, since the former always outweighs the latter.

Both effects of risky debt are necessary for the firm to be viable. We first compare the case of risky debt to the unlevered firm with dividends. Dividends also achieve the disciplinary effect, because they force the firm to pay out cash and thus (partially) reveal an uninspired manager at $t = 2$. Indeed, in a number of theories of debt (e.g. Jensen (1986), Stulz (1990), Zwiebel (1996)), the only objective of debt is to force payout of cash and prevent overinvestment, analogous to preventing inefficient continuation of an uninspired manager in this paper. Since only the disciplinary effect is important, dividends are a substitute for debt in such models. Similarly, in the dividend model of Myers (2000), the manager must pay out cash in the form of dividends to prevent him from diverting it and is terminated if he misses a payment; debt would have the same effect.

However, in this model, allowing liquidation is not the only objective. Dividends are not a satisfactory substitute for debt because they do not achieve the concentration effect, and thus do not solve the second problem of short-termism. Thus, while the disciplinary effect of dividends allows liquidation of an uninspired manager, it has the side-effect of deterring an inspired manager from taking risky projects. Only debt leads to the concentration effect, and thus allows termination without distorting investment incentives.

Note that the above analysis has assumed that $\lambda = 1$, in which case the disciplinary effect of dividends and debt are the same, but debt has a concentration effect. If $\lambda < 1$, the advantage of risky debt is even greater because it also has a stronger disciplinary effect. Failure to meet a

debt obligation bankrupts the firm and changes the default decision to liquidation. By contrast, a firm that fails to meet a dividend expectation remains solvent and requires an active decision from shareholders to be shut down; owing to costs of collective action, liquidation occurs only with probability $\lambda < 1$. Hence, allowing for $\lambda < 1$ strengthens the model's result that debt is preferred to dividends.¹⁴

We next compare risky to riskless debt. Riskless debt also achieves the concentration effect: regardless of whether debt is riskless or risky, an increase in leverage concentrates L 's equity stake. However, it does not achieve the disciplinary effect and thus has two main drawbacks. First, even if riskless debt is able to induce monitoring (i.e. condition (19) does not hold), L must monitor excessively. Monitoring is only worthwhile if $V_2 = J$, because if $V_2 = G$, L automatically knows that the manager is inspired. Since all firms are able to repay riskless debt, L is unable to learn V_2 and must therefore monitor in all states, i.e. with probability 1. This cost may reduce L 's net return, (17), below I . The disciplinary effect of risky debt reveals V_2 to L without cost: if the firm meets its debt repayment, L knows that $V_2 = G$ and therefore does not have to monitor. L only needs to bear the cost of monitoring if $V_2 = J$, i.e. with probability $1 - \pi - \pi\gamma$. Second, it may be that (19) holds, so that riskless debt is unable to induce monitoring. Under riskless debt, the default decision is to continue the firm, and so the gains from monitoring are the savings from efficient liquidation, $J - K$. By contrast, the disciplinary effect of debt changes the default decision to liquidation. Therefore, the incentive to monitor depends on the gains from continuation, $R^R - F$. This may be significantly larger than $J - K$, particularly in growth firms where R^R is large. Hence, (21) may be satisfied even if (19) holds: the concentration effect alone is insufficient to induce monitoring. The disciplinary effect is needed to change the default decision from continuation to liquidation, and thus further increases the incentive to monitor.

Gümbel and White (2007) were the first to note that debt increases shareholders' incentives to monitor because it shifts control to creditors and thus changes the default decision to liquidation. In their setting, there is no concentration effect because a shareholder has unlimited funds, and only the disciplinary effect matters. Therefore, the optimal level of debt is borderline risky to avoid debt overhang: F is just above J , i.e. just sufficient to shift control to creditors. Similarly, in many other settings in which debt exerts discipline, borderline risky debt is also optimal: for example, in Lambrecht and Myers (2008), strictly risky debt would induce the manager to disinvest suboptimally quickly. In our setting, the concentration effect is important as well as the disciplinary effect, and so the optimal debt level is strictly risky.

For completeness, we compare risky debt to the unlevered firm with no dividends. The latter has neither the concentration nor disciplinary effect. Therefore, an uninspired manager is not terminated: there is no disciplinary effect to reveal an uninspired manager through payout, nor

¹⁴Dewatripont and Tirole (1994) identify a similar reason why debt imposes greater discipline than dividends. Under certain parameter values, equityholders will not fire the manager if he fails to pay dividends as they have a convex claim; therefore, it is necessary to shift control to the creditor. In this paper, as in Myers (2000), equityholders do wish to fire the manager upon poor performance, which is the essence of the myopia issue.

a concentration effect to encourage L to monitor. Therefore, the firm is unviable from (6).

To summarize, debt overcomes the tension between termination and investment via the combination of the concentration and disciplinary effects. The concentration effect distinguishes debt from dividends, and differentiates the model from prior theories in which only total payout matters. It also means that the optimal level of debt is strictly risky, contrasting the model from theories in which debt's only role is to shift control to creditors and thus borderline risky debt is optimal. The disciplinary effect means that risky debt dominates riskless debt, as the latter does not impose discipline.

2.3 Comparison of Financing Structures

Thus far, we have assumed that both the termination and investment problems need to be simultaneously solved for the firm to be viable (assumptions (5) and (6)). Combined with (19), the only feasible financing structure was the levered firm. However, more generally, one of the agency problems may be relatively unimportant, and so it may be possible to finance the firm even if it is not solved. In such a case, other financing structures become feasible and may dominate the levered firm. This subsection relaxes assumptions (5) and (6), and compares L 's returns under the four structures to analyze which she will choose.¹⁵

From equations (9), (14), (17) and (23), L 's returns under each structure are given by:

$$\text{Unlevered, No Dividend (NODIV)} : \pi R^R + (1 - \pi) K \quad (28)$$

$$\text{Unlevered, Dividend (DIV)} : \pi R^S + (1 - \pi) J \quad (29)$$

$$\text{Riskless Debt (RISKLESS)} : \pi R^R + (1 - \pi) (\phi J + (1 - \phi) K) - c \quad (30)$$

$$\begin{aligned} \text{Risky Debt (RISKY)} : & (\pi - \pi\gamma(1 - \phi)) R^R + (1 - \pi + \pi\gamma(1 - \phi)) J \\ & - (1 - \pi + \pi\gamma) c. \end{aligned} \quad (31) \quad (32)$$

The relative returns of the four structures depend on a number of terms. $(J - K)$ reflects the magnitude of the termination issue: if it is high, there are significant savings by terminating an uninspired manager early. $(R^R - R^S)$ reflects the magnitude of the investment issue: if it is high, there is significant value creation from inducing an inspired manager to take the risky project. π reflects the manager's quality. If it is low, the manager is likely to be uninspired and so efficient termination becomes important. ϕ and c reflect the effectiveness of monitoring: if ϕ is high and c is low, then monitoring is effective. Note that monitoring effectiveness impacts not only the relative magnitude of L 's returns under the four financing structures, but also whether certain financing structures are feasible in the first place. If (19) is satisfied, then L does not monitor under riskless debt, and so this structure leads to the same outcome as the

¹⁵We analyze the structure that maximizes investor returns, rather than total surplus (investor returns plus private benefits) because it is L that chooses the financing structure. Her payoff is independent of private benefits, because they are inalienable and M is penniless – therefore, L cannot ask M to pay her cash equal to the private benefits that he is receiving under the financing structure.

unlevered, non-dividend-paying firm. If (26) is satisfied, then L does not monitor under risky debt. Therefore, this structure leads to the same outcome as the unlevered, dividend-paying firm.

As previously established, if both termination and investment are important, *RISKY* maximizes L 's returns and may indeed be the only viable financing structure. This is likely to be the case in middle-aged firms. Such firms have growth opportunities and so significant value can be created by pursuing the risky project, but also have significant tangible assets that could be destroyed under inefficient continuation.

Investment, but not termination, is an important issue in two main types of firm. First, a start-up has high growth opportunities and thus a large potential payoff from taking the efficient project: $(R^R - R^S)$ is high. On the other hand, the savings from efficient termination $(J - K)$ are low for two reasons: it has few tangible assets and so little is recovered in a liquidation, even if it comes early (both J and K are low), and it has low free cash so an uninspired manager that is allowed to continue will not reduce firm value significantly. Second, if the manager is highly talented (π is high), it is unlikely that investors will want to terminate him; instead, it is more important to encourage him to take the risky project. From (28) – (31), *NODIV* and *RISKLESS* lead to the greatest investor returns. When investment is important, it is critical to achieve R^R with the highest probability. These structures achieve this because they never terminate an inspired manager that pursues R , even if he becomes unlucky. In a dividend-paying firm, the manager never chooses R ; in the risky firm, the inspired manager always chooses R but is terminated if he is unlucky and monitoring fails. The disadvantage of *NODIV* and *RISKLESS* is that they do not liquidate an uninspired manager with certainty, but this is unimportant if the termination issue is small.

We now compare *NODIV* and *RISKLESS*. Riskless debt dominates no dividends if (30) > (28), i.e.

$$c < (1 - \pi) \phi (J - K). \quad (33)$$

For the levered structure with riskless debt to be feasible, we must have (16) so that L has an incentive to monitor. Since $\frac{x}{I-D} < 1$, (16) implies (33). Therefore, if the monitoring technology is sufficiently effective for riskless debt to be feasible, it is also strictly optimal. By contrast, if (16) is violated, there is no monitoring under riskless debt, so it leads to the same outcome as the unlevered firm with no dividends. Indeed, *NODIV* is a special case of *RISKLESS* where leverage is zero.

The final case is where termination is important, but investment is not. This is likely the case in a mature firm with few growth opportunities and significant free cash flow that could be wasted by an uninspired manager, or if managerial quality is low. In such a firm, *DIV* and *RISKY* achieve the highest investor payoffs, because they terminate an uninspired manager with certainty. Comparing these two structures, dividends dominate debt if (29) > (31), i.e.

$$(1 - \pi + \pi\gamma)c > \pi(R^R - R^S) - \pi\gamma(1 - \phi)(R^R - J). \quad (34)$$

For the risky structure to be feasible, we must have (21) so that L has an incentive to monitor. This condition is indeed consistent with (34). Previously we showed that, if the *RISKLESS* is feasible (i.e. (16) is satisfied), it is always preferred to *NOIV*. However, even if *RISKY* is feasible (i.e. (21) is satisfied), it may be inferior to *DIV* under certain parameter values. The intuition is as follows. If γ is sufficiently high, L would like to dissuade M from pursuing R if inspired, because the risky project runs the risk of interim losses and leading to inefficient termination if monitoring is unsuccessful. Since R^R is low (investment is unimportant), this disadvantage is not outweighed by the upside of the risky project. L would be able to dissuade M from pursuing R if she could commit to not monitoring if earnings are low. However, the decision to monitor only takes place once low earnings have been realized, and so does not depend on γ (see (21)): γ only affects the possibility that low earnings are realized in the first place. Thus, even if γ is high (so that L wishes an inspired manager to choose S), she may still monitor the manager once losses have occurred. Since M expects to be monitored, he selects R , even if it is inefficient. By forcing the disciplinary payout at $t = 2$ to be through dividends rather than debt, L avoids the concentration effect and is thus able to commit not to monitor. Note that dividends only dominate debt if γ is high and R^R is low. As soon as the investment problem becomes important (i.e. R^R increases), the levered structure with risky debt becomes optimal.

The different financing structures can be compared upon two dimensions: the level of total payout at $t = 2$, and the proportion of total payout which is in the form of debt rather than dividends. If termination is unimportant, it is optimal to have either no dividends or riskless debt. In both cases, total payout is sufficiently low that the manager can always meet the requirement. If termination is important, it is optimal to have either dividends or risky debt. In both cases, total payout is sufficiently high that a loss-making manager cannot meet the requirement. If investment is unimportant, this payout is entirely in the form of dividends; if investment is important (together with termination), this payout is entirely in the form of debt.

3 Heterogeneous Managers

This section extends the model to a setting of heterogeneous managers and multiple large investors, and demonstrates the sustainability of a separating equilibrium. In such an equilibrium, good managers establish levered firms where the equity is partially held by a large investor, and bad managers run unlevered firms financed by dispersed investors.

There now exists two types of managers. There are n good managers (type G) who have a probability p_G of becoming inspired, and a continuum of bad managers (type B) who have a probability p_B of becoming inspired, where $p_B < \pi < p_G$. The manager's type is private

information. In addition, there are n large investors.¹⁶ As before, the manager has no bargaining power so that he does not obtain any share of firm value, only private benefits. We will talk about the manager establishing the financing structure and signaling, but all of the results equally apply to investors establishing the financing structure and screening.

We revert to the general case where $\lambda < 1$, so that the disciplinary effect of dividends is weaker than that of debt: failure to meet a debt obligation bankrupts the firm and changes the default decision to liquidation, but shareholders must take an active decision to shut down a firm that has not met dividend expectations. All of the model's results continue to hold with $\lambda = 1$ if we instead assume that M suffers an additional reputational loss of y from his firm being bankrupt: being fired because a firm is bankrupt damages M 's reputation more than being fired from a firm that is still solvent. We only require that M personally wishes to avoid bankruptcy – either because firing is more common in bankruptcy ($\lambda < 1$) or firing in bankruptcy is more painful to him ($y > 0$).

We continue to relax (5) and (6) and instead make the following assumptions:

$$p_B R^S + (1 - p_B)(\lambda J + (1 - \lambda)K) = I \quad (35)$$

$$p_B R^R + (1 - p_B)K < I \quad (36)$$

$$p_B R^R + (1 - p_B)(\phi(\lambda J + (1 - \lambda)K) + (1 - \phi)K) - c < I \quad (37)$$

$$\frac{1 - p_G}{1 - p_G + p_G \gamma} K + \frac{p_G \gamma}{1 - p_G + p_G \gamma} F < J. \quad (38)$$

Assumption (35) states that a firm run by a bad manager just breaks even if M pursues S if inspired and is fired with probability λ if uninspired. This assumption means that an unlevered firm which requires dividends of J at $t = 2$ is borderline viable. Assumption (36) means that the firm is never viable if an uninspired manager is never terminated, and so an unlevered firm with no dividend requirement is unviable. By (37), a firm with riskless debt is unviable because the firm is not shut down with sufficient frequency. The three assumptions are mutually consistent. A bad manager is likely to be uninspired and thus there are significant gains from liquidating him early. The unlevered firm with dividends maximizes the probability of such a liquidation: an uninspired manager is revealed with certainty and thus fired with probability λ . In an unlevered firm with no dividends, he is never fired; in a firm with riskless debt, he is revealed with probability ϕ and thus fired with probability $\phi\lambda$.

Assumption (38) is somewhat different from the previous three. It means that, if creditors have control because the firm has defaulted, they wish to liquidate even if they know that the manager is good. In other words, even if a good manager can signal his quality, and all inspired managers choose R , creditors prefer to close down a good manager who delivers $V_2 = J$ as there

¹⁶This assumption simplifies the analysis as it means that each G can be financed by one L , but it is not critical. If the number of large investors is $n_L < n_G$, some good managers can only obtain financing from atomistic investors, which leads to a very similar separating equilibrium as what follows but with n_G effectively being n_L . If $n_G > n_L$, some managers will be held by multiple large investors, which has no effect as a single large investor will monitor them anyway (given $p_G > \pi$ and (21)). The analysis is thus the same as if $n_G = n_L$.

is a sufficiently high probability that he is uninspired. If (38) does not hold, the problem is uninteresting as signaling high quality automatically solves the myopia issue: a good manager is not fired upon delivering $V_2 = J$, and so he can choose R if he becomes inspired.

Proposition 2 demonstrates the conditions under which a separating equilibrium is the only sustainable equilibrium.

Proposition 2 *Assume that the following conditions hold:*

$$\begin{aligned} & (p_G - p_G\gamma(1 - \phi))Tz(1 + \alpha) + (1 - p_G + p_G\gamma(1 - \phi))z \\ > & p_GTz + (1 - p_G)(\lambda z + (1 - \lambda)Tz), \end{aligned} \quad (39)$$

$$\begin{aligned} & (p_B - p_B\gamma(1 - \phi))Tz(1 + \alpha) + (1 - p_B + p_B\gamma(1 - \phi))z \\ < & p_BTz + (1 - p_B)(\lambda z + (1 - \lambda)Tz), \end{aligned} \quad (40)$$

and

$$\phi \frac{p_B\gamma}{1 - p_B + p_B\gamma I} \frac{1}{I} (R^R - J) < c. \quad (41)$$

A separating equilibrium is sustainable in which:

(i) *Good managers are financed with D of risky debt, x of equity from a large investor, and $I - D - x$ of equity from atomistic investors. If the firm is bankrupt at $t = 2$, L monitors. If she finds that $V_3 = R$, the firm is continued, otherwise it is liquidated. The gross returns to L and M are given by*

$$(p_G - p_G\gamma(1 - \phi))R^R + (1 - p_G + p_G\gamma(1 - \phi))J - (1 - p_G + p_G\gamma)c \quad (42)$$

and

$$(p_G - p_G\gamma(1 - \phi))Tz(1 + \alpha) + (1 - p_G + p_G\gamma(1 - \phi))z. \quad (43)$$

(ii) *Bad managers are financed with equity from atomistic investors and promise a dividend of $V_2 = J$. At $t = 2$, no monitoring occurs. If the dividend payment is met, the firm is continued, otherwise it is liquidated with probability λ . The net returns to each atomistic investor are zero and the private benefits to M are given by*

$$p_BTz + (1 - p_B)(\lambda z + (1 - \lambda)Tz). \quad (44)$$

(iii) *Investors have the off-equilibrium path belief that a manager who establishes any other structure is bad.*

Since $p_G > p_B$, conditions (39) and (40) can simultaneously be satisfied. The first (second) condition ensures that G (B) does not deviate. L will monitor at $t = 2$ if

$$\phi \frac{p_G\gamma}{1 - p_G + p_G\gamma I - D} \frac{x}{I - D} (R^R - F) > c.$$

From $p_G > \pi$ and (21), this is satisfied. L has no incentive to deviate to finance an unlevered firm as she earns a strictly positive net return: since (23) $> I$ and $p_G > \pi$, we have (42) $> I$. The atomistic investors have no incentive to monitor from (41), nor deviate to a levered firm as they earn a zero net return in all cases.

In the analysis of Section 2, the disciplinary and concentration effects allowed the firm to be financed under risky debt, even if it is unviable under riskless or zero debt. Here, the same two effects of debt support a separating equilibrium: the disciplinary effect means that debt is a *credible* signal of managerial quality, and the concentration effect renders it a *desirable* signal which good managers are willing to emit.

First, $\lambda < 1$ means that an uninspired manager in an unlevered firm is only occasionally fired, whereas an uninspired manager in a levered firm is definitely shut down. Debt therefore imposes stronger discipline than dividends. As in Ross (1977), this renders it particularly costly to bad managers, as they are more likely to be uninspired, and so taking on leverage can credibly signal managerial quality.

Second, good managers desire to give the signal as they benefit from revealing their quality – but the gains from signaling are quite different from standard signaling theories. In traditional models, the manager immediately benefits from revealing his quality: in Ross (1977) and Bhattacharya (1979) the benefit manifests in the form of a higher market valuation of the firm, to which his compensation is tied; in Myers and Majluf (1984) and Fulghieri and Lukin (2001), signaling high quality is necessary to raise funds in the initial period. Here, managers are not paid according to the firm’s market value and do not benefit from receiving a greater *level* of funds, since all managers are financed and receive I . Even if a manager is revealed to be bad, he can still raise funds as the pricing of funds adjusts to reflect his low quality; such pricing does not affect his payoff as he receives only private benefits. Instead, the benefit of signaling manifests solely in the *type* of funds. By revealing his quality, a good manager attracts scarce large investors who are able to monitor. Monitoring is beneficial because it allows inspired managers to pursue risky projects; this benefit is particularly large for good managers, since they are most likely to become inspired. In sum, the benefits of leverage are highest for type G , and the costs are highest for type B , and so separation is achieved.

The difference in the incentives to signal further leads to dynamic consistency of leverage in this paper. Zwiebel (1996) notes that some theories of debt are “setup models”, where high debt is only possible when the firm is initially set up. The manager dislikes the disciplinary effect of debt, since it forces him to pay out cash that he would rather invest in pet projects. Therefore, in Jensen (1986) and Stulz (1990), managers do not adopt debt voluntarily but investors must force it upon the manager in the initial period. However, such leverage is unsustainable since it is the manager who controls the debt level going forward, and he may choose to issue equity to buy back debt, thus freeing him from discipline.

Even in models in which the manager voluntarily chooses high leverage to signal in the

initial period, he may have incentives to reverse his decision later.¹⁷ In such models, even though the manager dislikes the disciplinary effect of debt, he chooses high leverage either to be able to raise funds (since debt either commits not to overinvest or signals high quality) or deter hostile takeovers that aim to correct managerial agency (since debt prevents the manager from wasting free cash). Once funds have been raised, the manager has incentives to delever¹⁸; similarly, if the raider is only present in the initial period and subsequently disappears, leverage is no longer needed going forward.

Dynamic consistency issues occur in such papers because debt's only role is to act as either a signal (which is only valuable in the first period) or disciplining device (which is imposed by shareholders who only control leverage in the first period). Zwiebel solves this issue by introducing a raider who is present in every period, and so it is individually rational for the manager to commit with debt in every period.¹⁹ In this paper, dynamic consistency is achieved because debt has two roles. The disciplinary effect credibly signals high quality, but this signal is only relevant at $t = 0$, when funds are raised. If signaling was the only effect, debt would be dynamically inconsistent. Immediately after funds are raised at $t = 0$, the manager would have the incentive to undo the signal. Even if such a reversal reveals the manager to be bad, he will not be fired since the firm remains viable (from (35)) and so threat of firing which leads to dynamic consistency in Zwiebel's model does not apply here.

Instead, it is the concentration effect that gives the manager an ongoing incentive to maintain high leverage. Critically, unlike in traditional models where the benefits of signaling are obtained only at $t = 0$, when the signal is issued and funds are raised, here the benefits are earned at $t = 2$ in the form of monitoring. Delevering would reduce L 's incentives to acquire information, thus preventing M from taking R if he becomes inspired. Dynamic consistency can be shown by giving the manager of a levered firm the option to issue equity to repurchase debt and promise a dividend just after $t = 0$, once funds have already been raised.²⁰ From (39), the manager will not choose to do so, because he will lose the monitoring effect of debt. This disadvantage outweighs the fact that delevering will reduce the risk of termination if he turns out to be uninspired. This persistence of leverage is consistent with the empirical findings of Lemmon, Roberts and Zender (2008).

¹⁷Similarly, in the model of Allen, Bernardo and Welch (2000) good managers signal their quality by using dividends to attract institutions. They assume that managers can commit to a dividend policy. If they cannot commit, they will have incentives to announce a high dividend policy to attract institutions, and then renege on this policy after the initial period.

¹⁸If outsiders expect such deleveraging, debt will be unable to signal quality in the first place.

¹⁹The key ingenuity in Zwiebel's model is that, even though the raider is always present, his presence is not sufficient to deter over-investment, because investment is sunk and cannot be overturned by the raider. Thus, debt is needed to deter over-investment.

²⁰A repurchase of debt at $t = 0$ must be accompanied by a dividend promise, because any structure that does not involve risky debt reveals the manager as bad. From (35), (36) and (37), investors will immediately terminate a bad manager at $t = 0$ unless he promises a dividend. Similarly, the only "reasonable" (in the Cho and Kreps (1987) sense) off-equilibrium path belief is that that any manager who repurchases debt at $t = 1$ is uninspired. This is because an uninspired manager earns Tz if the firm is unlevered and z if it is levered; by contrast, an inspired manager gains from leverage by (22). Hence, any repurchase at $t = 1$ reveals a manager as uninspired and leads to instant termination, and so no such repurchase will occur.

Dynamic consistency in this model stems from the fact that L plays a different role vis-a-vis the manager than in most existing literature. In effort models where there is a conflict between firm value and the manager's private benefits (e.g. Gümbel and White (2007)), the manager dislikes monitors since they are an "adversary" of the manager and force him to exert effort or forgo private benefits. Therefore, the manager has incentives to deter L from monitoring by reducing leverage. In this model, there is no fundamental conflict between firm value and private benefits, because the same project (R) maximizes both. Here, the monitor is an "ally" of the manager, allowing him to continue operating if he is unlucky. This provides a dynamically consistent reason for the manager to retain the monitor through leverage.

As in Section 2, the importance of the concentration effect means that strictly risky debt is optimal. If credibility was the only requirement for signaling, only the disciplinary effect of debt is important (since a bad manager wishes to avoid discipline) and so borderline risky debt is optimal to minimize signaling costs. However, for signaling to be desirable for good managers, debt must also lead to concentration, and so strictly risky debt is optimal. Also as in Section 2, the importance of the concentration effect means that dividends are not a substitute for debt. This contrasts with the Ross (1977) signaling model where debt can signal high quality since bad firms are unable to meet the debt repayments: Bhattacharya (1979) shows that dividends can have the same effect.

A final difference with other signaling models is that signaling can increase aggregate fundamental firm value. In a pooling equilibrium where all firms are unlevered and financed with dividends, a firm run by a good manager delivers investor returns of

$$p_G R^S + (1 - p_G) (\lambda J + (1 - \lambda) K)$$

compared to (42) in a separating equilibrium. If $(R^R - R^S)$ and $(J - K)$ are sufficiently high, i.e. the termination and investment issues are sufficiently important, the returns generated by a good manager are higher in a separating equilibrium. This is because the separating equilibrium allows good managers to be monitored, which encourages them to take the risky project and also leads to them being terminated with certainty (rather than probability λ) if they become uninspired. The bad manager yields the same returns in both a pooling and separating equilibrium.

This result contrasts with a number of classical signaling models (e.g. Ross (1977), Bhattacharya (1979), Miller and Rock (1985), Stein (1989)) where signaling only increases outsiders' *perceptions* of firm value in the short-term; actual fundamental value is reduced because signaling is costly. (Moreover, since the increased perceived value of good firms is accompanied by a reduced perceived value of bad firms, even the short-run effect is a redistribution rather than an aggregate increase.) In Myers and Majluf (1984) and Fulghieri and Lukin (2001), signaling can increase real value by allowing a firm to raise funds and thus undertake investment. In the present paper, signaling has no effect on the *level* of funds raised, since all managers raise I in both equilibria. Instead, the real benefits of signaling arise because it affects the *type* of funds:

scarce large investors are allocated to good managers, who benefit most from their monitoring.

4 Applications and Implications

This section discusses empirical implications of the core model, as well as applications of the separating equilibrium analyzed in Section 3.

The broadest implication of the model is that managers should willingly seek and retain leverage. In standard disciplinary theories (e.g. Jensen (1986), Stulz (1990)), leverage is imposed on the manager by investors in the initial period. Since it is the manager who controls the debt level going forward, and he is hurt by the restrictive effects of debt, leverage should disappear over time. Here, the manager wishes to retain debt as it leads to monitoring by an ally. Zwiebel (1996) was the first to present a dynamically consistent model of debt; in his model, the manager wishes to retain leverage owing to the existence of an ever-present raider. Here, the manager retains debt even in the absence of an external threat – he does so because of the desire to pursue internal growth opportunities.

This dynamic consistency of debt has both cross-sectional and time-series implications. First, the model is consistent with the widespread prevalence of debt in reality: if leverage were not dynamically consistent, only firms that have just raised funds would be levered, and so the vast majority of firms at a given time would have no debt. Second, in a given firm, leverage should be persistent over time, as found by Lemmon, Roberts and Zender (2008).

In addition to implications on the general existence and persistence of debt, the model also analyzes the specific determinants of a firm's debt level. Most existing research focuses on the factors affecting total debt. This paper suggests that total debt should be decomposed into two constituent components: the level of total payout (debt plus dividends) and the composition of a fixed level of total payout between debt and dividends, i.e.

$$Debt = Total\ Payout \times \frac{Debt}{Total\ Payout}$$

where $Total\ Payout = Debt + Dividends$.

In turn, the two components of debt depend on the two agency problems. The severity of the termination issue determines the optimal level of total payout. For firms in which early termination is unlikely to be optimal (e.g. start-up firms with low liquidation value and little free cash to waste by inefficient continuation), there is no need to require an interim payment in the first place – such a requirement would merely induce myopia. Therefore, total payout should be low; indeed, such firms are typically unlevered and pay few dividends.

The severity of the investment issue determines the optimal composition of a given level of total payout between debt and dividends. If the termination issue is important and an interim payout is required, it should be in the form of debt rather than dividends if long-run growth is especially critical. Again, this has both cross-sectional and time-series implications. With

regards to the cross-section, it suggests that firms with more long-term growth opportunities should feature debt rather than dividends. The positive association between growth opportunities and debt appears to contradict existing theory (Myers (1977)) and evidence (Rajan and Zingales (1995)). Those papers argue that debt is detrimental to growth, and so a growing firm would prefer to be unlevered rather than levered. However, if the termination issue is important, then being unlevered is not an option. The appropriate comparison is debt versus other forms of payout that would achieve termination; debt is less detrimental to growth than these other solutions. Rajan and Zingales study debt in isolation rather than in conjunction with dividends: while they show that growth firms use less debt, the model predicts that this relationship is overturned once total payout is controlled for. Similarly, the likelihood of a firm being levered, conditional upon paying dividends, should be greater than the likelihood of a firm paying dividends, conditional upon being levered. This is consistent with casual empiricism, but we are unaware of any systematic analysis.

The model also makes time series predictions for an individual firm over its life cycle, and firms in aggregate over time. For a nascent individual firm, inefficient continuation is a minor issue and so total payout should be zero. As it matures, payout is necessary to address the termination issue; the model predicts that firms should start raising debt before they commence paying dividends. Turning to the aggregate, intangible investment has become increasingly important in recent years (Zingales (2000)), which implies that dividends should decrease and ownership concentration should rise. Indeed, Fama and French (2001) document a sharp fall in dividends over time. Gompers and Metrick (2001) demonstrate a rise in institutional ownership. Since institutional ownership is strongly correlated with ownership concentration, this provides suggestive but indirect evidence that ownership concentration has increased.

In addition to the determinants of debt, the model also makes predictions on its effects. Existing models suggest that, compared to the counterfactual of being unlevered, debt changes the *level* of investment: it lowers it through reducing free cash flow (Jensen (1986), Stulz (1990), Zwiebel (1996)) or creating debt overhang (Myers (1977).) Here, debt impacts investment by inducing monitoring and thus changes the *type* of investment. This involves augmenting investment where it is efficient (inducing long-term rather than short-term projects) and deterring investment where it is not (achieving liquidation rather than inefficient continuation). Compared to the counterfactual of paying out the equivalent amount of dividends, debt increases the level of investment, by changing it from short-term to long-term projects.

We now turn to applications of the separating equilibrium analyzed in Section 3. In the separating equilibrium, good managers taken on risky debt and bad managers are unlevered. One real-world interpretation is that the former corresponds to private equity and the latter to a public corporation with little risk of bankruptcy. Unlike in some signaling theories, here the motive for high-quality managers to signal is not to obtain more funds. This is consistent with the fact that private firms are typically smaller than public firms.

The separating equilibrium can thus explain the high leverage in private equity: in particular, it justifies the use of strictly risky debt to achieve concentration, whereas some existing

theories (e.g. Lambrecht and Myers (2008)) advocate borderline risky debt to avoid debt overhang.²¹ In our model, concentrated private equity investors play an active monitoring role, as documented empirically by Cotter and Peck (2001). The theory also suggests that levered firms should have a concentrated investor, since if ownership is dispersed, there is no monitoring and so the requirement to make debt repayments will induce myopia. (The prediction of concentrated ownership is also shared with Gumbel and White (2007), although for reasons unrelated to myopia). Indeed, Cotter and Peck (2001) find that LBOs perform more strongly if ownership is concentrated. Cotter and Peck’s results cannot be explained by other theories for high leverage in LBOs, such as taxes or the negative effect of debt on free cash flow (i.e. a pure discipline theory), where no monitoring occurs and concentration is irrelevant. In addition, the model implies that levered firms should outperform because they attract high-quality managers and allow them to invest optimally: L earns a strictly positive net return. Ljungqvist and Richardson (2003) find that private equity generates excess returns of 5-8% per year relative to public equity.

Second, with few changes, the model can be extended to analyzing the capital structure of investment companies, the focus of Stein (2005). The two fund types analyzed by Stein have natural analogs in this model. The closed-end fund is very similar to the unlevered firm with no dividends, which allows long-term investment but not liquidation. The open-end mutual fund is analogous to the unlevered firm with dividends: open-ending allows liquidation upon poor performance (through permitting investor withdrawals), but at the expense of deterring long-term arbitrage trades, thus leading to the “limits of arbitrage” documented by Shleifer and Vishny (1997). The levered structure in this paper is not considered by Stein (2005). The analogy in the investment world is hedge funds: leverage allows hedge funds to undertake risky arbitrage trades, while at the same time deterring bad managers from establishing such funds as they will likely be terminated. Indeed, Ackermann et al. (1999) find that the average hedge fund consistently outperforms mutual funds, even after risk and fees are taken into account.

5 Conclusion

This paper addresses a fundamental dilemma in corporate governance: how can investors ensure that bad managers are terminated, without inducing good managers to take myopic actions to avoid termination? Equity financing without dividends allows investment but prevents optimal shut-down; forcing dividends or disclosure achieves termination at the expense of myopia.

The model introduces a novel benefit of debt that can alleviate this tension: the concentration of equityholders’ stakes and the consequent elicitation of information gathering. Monitoring

²¹The model complements existing justifications for the debt-financing of buyouts. One oft-cited reason is that debt forces the manager to work hard to avoid bankruptcy (Jensen (1989)). However, as argued previously, this disciplinary effect may also be achieved by equity-financing acquisitions and forcing the manager to pay high interim dividends. Axelson, Stromberg and Weisbach (2009) provide an alternative story for why buyouts are levered based on agency problems between fund managers and fund investors, rather than between fund managers and operating company managers.

is desirable even in the absence of an effort conflict as it allows long-term project choice. As a result, debt has significant advantages over disciplinary mechanisms to achieve termination, such as dividends, as it does not suffer the side-effect of inducing myopia. In addition, strictly risky debt is optimal because it increases concentration.

The monitoring induced by leverage allows a separating equilibrium to be sustainable: good managers are willing to signal quality by assuming debt. Even though signaling does not lead to more initial funds, and the manager is not aligned to the firm's market value, a good manager has an incentive to signal as it attracts a different type of funds: active monitors, who allow him to undertake long-term projects. Once the signal has been given and financing has been raised, the manager has continued incentives to maintain leverage and thus a concentrated monitor.

While existing empirical studies investigate the determinants of total leverage, this paper suggests new avenues for future empirical work: breaking down leverage into total payout, and the proportion of payout in debt as opposed to dividends. Where the termination issue is unimportant (such as early stage firms), total payout should be low and the firm should feature neither debt nor dividends. Where both termination and investment are important, total payout should be high and in the form of debt rather than dividends. The conventional wisdom that debt is detrimental to growth may be overturned when levered companies are compared not to unlevered peers, but peers that pay out the same amount of cash in the form of dividends to overcome a termination problem.

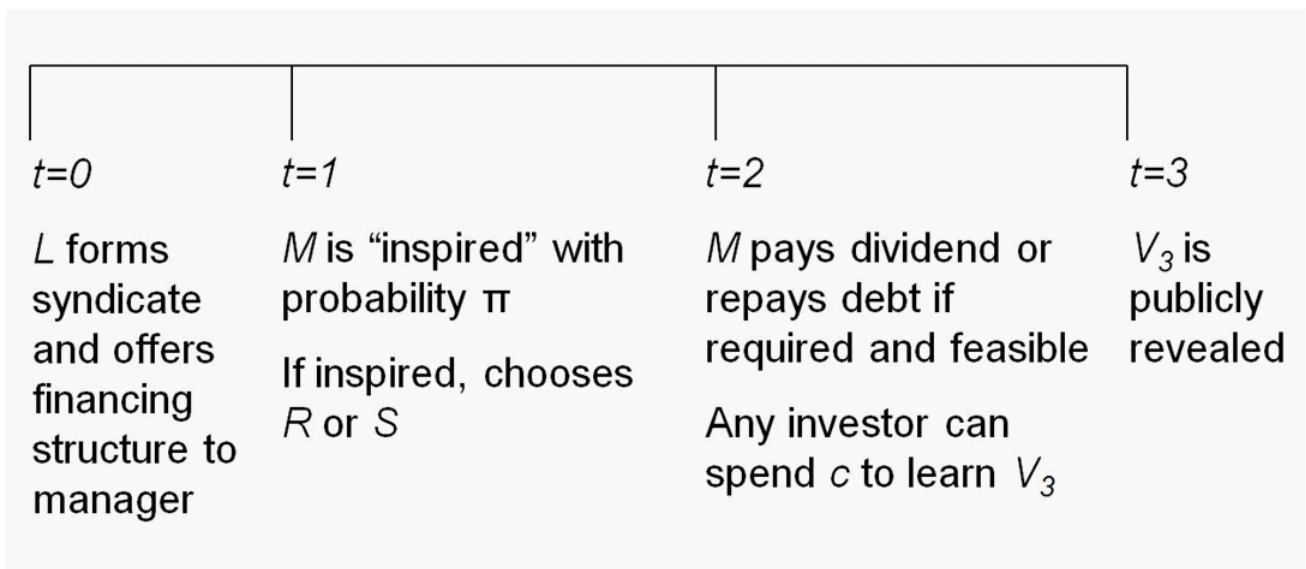


Figure 1. Timeline of the model

A Proofs

Proof that L does not monitor if she is a creditor

If L is a creditor in a levered firm, she will monitor if

$$\phi \frac{\pi\gamma}{1 - \pi + \pi\gamma} x \frac{F - J}{D} < c \quad (45)$$

Only the $\frac{F-J}{D}$ term depends on F . Substituting for F using (25) gives

$$\frac{D - J}{D(\pi - \pi\gamma(1 - \phi))}.$$

In turn, this is maximized when D is at its highest possible value. This occurs when $F = R^R$, in which case creditors own the entire firm. Then, creditors are effectively the equityholders and L 's incentives are as in an unlevered firm, as analyzed in Section 2.1.2. From equation (12), L has insufficient incentives to monitor.

Proof that (27) > 0

Equation (27) is positive if

$$(R^R - F)(\pi - \pi\gamma(1 - \phi)) - (I - D) > 0.$$

Substituting for D using equation (25) and rearranging, this is positive if

$$(\pi - \pi\gamma(1 - \phi))R^R + (1 - \pi + \pi\gamma(1 - \phi))J - I > 0, \quad (46)$$

which holds because (23) $> I$.

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