

Short-Term Termination Without Deterring Long-Term Investment: A Theory of Debt and Buyouts*

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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 demonstrates how risky debt can 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 achieve termination upon non-payment, but not concentration, ex post monitoring and thus ex ante 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, contrasting the standard intuition that debt reduces investment. The model derives implications for how capital structure and dividend policy depend on the relative severity of different agency problems.

KEYWORDS: Termination, liquidation, managerial myopia, ownership concentration, monitoring, 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 early, and how to induce skilled managers to pursue 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 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)). Since intangibles are invisible to outsiders in the short-term, managers concerned with interim performance may underinvest (Stein (1988).)

These two challenges fundamentally conflict. Investors can mitigate the value destroyed by an unskilled manager by forcing him 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 skilled 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 addresses termination by forcing the manager to make an interim cash payment. The failure to do so reveals to investors that earnings are weak, that the manager is likely unskilled, and thus termination might be desirable. Indeed, Jensen (1989) argues that this disciplinary effect is a primary reason for why buyouts are typically levered: debt is “a mechanism to force managers to disgorge cash rather than spend it on empire-building projects.” However, such a justification for debt leaves many questions unanswered. First, dividends can also impose discipline: as Jensen also notes, “debt is a substitute for dividends.” Second, buyouts typically feature a concentrated shareholder – but, if the key feature is the disciplinary role of debt, then equityholders are irrelevant and dispersed ownership would be equally effective. Third, it is the manager who controls leverage going forward, and he has incentives to raise equity to repay the debt and free himself from its discipline. Fourth, the disciplinary effect may deter the manager from taking long-term investments.

This is where the second effect of debt comes in: the *concentration effect*, which addresses investment. Our core model contains a single firm, single large investor and a continuum of atomistic investors. If atomistic investors provide debt, the large investor’s limited funds translate into a greater proportion of the total equity. Thus, a non-paying manager is not automatically fired; instead, the large 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. Knowing that investors will make an informed liquidation decision ex post, the manager is free to pursue long-run growth ex ante. A skilled manager invests without fear of termination, while an unskilled manager is efficiently terminated.

The concentration effect distinguishes this paper from prior theories on the disciplinary

role of debt: it has different implications for the substitutability of dividends for debt, the effect of debt on investment, the optimal level of debt, and the concurrence of risky debt with concentrated equity. In Jensen (1986), Stulz (1990) and Zwiebel (1996), debt also forces the manager to pay out cash. Dividends would have the same disciplinary effect and thus are a perfect substitute: these models are theories of total payout (debt plus dividends) rather than debt in particular. Here, debt is critically different from dividends because the financing structure must not only allow termination (impose discipline), but 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 reduces investment by lowering the amount of free cash available. Here, debt can increase investment, since it induces investors to monitor and thus correctly value the investment. 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 Myers (1977) and Gumbel and White (2007), strictly risky debt is suboptimal because it leads to debt overhang; in Lambrecht and Myers (2008), it induces the manager to disinvest suboptimally quickly. Here, strictly risky debt is efficient as it increases concentration. Finally, if debt is predominantly motivated by disciplinary (or tax) reasons, shareholders play no role and so equity ownership structure is irrelevant. This model predicts that leverage should coincide with concentrated equity investors who actively monitor, as documented empirically by Cotter and Peck (2001).

The above predictions are primarily generated by the concentration effect. Moreover, by analyzing two distinct and conflicting agency problems (liquidation and investment), the model studies the interaction between the concentration and disciplinary effects together, which generates additional implications. These relate to the joint determinants of capital structure and dividend policy as a function of the relative severity 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 the need for the disciplinary effect and thus the level of 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-term growth determines the need for the concentration effect and thus the composition of total payout. If growth opportunities are relatively unproductive, investors wish to dissuade the manager from pursuing them. Thus, any payout used to achieve termination should be in the form of dividends, to avoid the concentration effect and thus credibly commit not to monitor. By contrast, if investment is desirable, any payout should be in the form of debt. 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. Rajan and Zingales's negative correlation would suggest that a growing firm prefers to be

unlevered – but if the termination issue is important, being unlevered is not an option. The appropriate comparison is debt versus other forms of payout that would achieve termination (i.e. to control for total payout); debt is less detrimental to growth than dividends.

The above single-firm model is analyzed in Section 2. Section 3 extends 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 bad managers run unlevered firms financed exclusively by small shareholders, and good managers run levered firms and are financed by both large and atomistic investors who earn abnormal returns. One interpretation of the latter is private equity; indeed, Ljungqvist and Richardson (2003) find that private equity investors enjoy superior returns.

The two roles of debt, which lead to firm viability in a single-manager setting, also achieve separation in a multi-manager setting. The disciplinary effect of debt renders it a *credible* signal of managerial quality: bad managers avoid 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 augment signaling costs. In addition, dividends would be equally credible 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 is not the only issue. The signal must be a *desirable* one that good managers wish to emit. In standard models, a good manager automatically wishes to reveal his quality, as his pay is exogenously assumed to depend on short-run value (Ross (1977), Bhattacharya (1979)) or signaling quality is necessary to raise financing (Myers and Majluf (1984), Fulghieri and Lukin (2001).) Here, pay is not tied to short-run value and even bad managers can raise financing, so 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. Signaling quality attracts 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 long-term 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 total surplus. 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 funds, it is already achieved in the first period. Hence, once funds have been raised, the manager has incentives to delever, thus freeing himself from discipline. This concern applies not only to signaling theories, but single-firm models in which investors initially impose debt on the manager to solve free cash flow problems (e.g. Jensen (1986) and Stulz (1990).) However, as noted by Zwiebel (1996), it is the manager who controls leverage going forward, and he may subsequently reduce it to increase free cash.

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. In short, the disciplinary effect 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. Along the cross-section, the model can explain the widespread prevalence of debt: if leverage were not dynamically consistent, only firms that have just raised funds would be levered, and so most firms at a given time would have no debt. Over the time series, the persistence of leverage in a given firm is consistent with the 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 fundamental effort conflict¹ where firm value maximization requires the manager to either exert 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 shirking or private benefits. Monitoring hurts the manager, and so he wishes to delever to reduce investors' incentives to do so. Here, there is no effort conflict with respect to project selection: the long-term project maximizes both firm value and private benefits. 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. Zwiebel (1996) also achieves dynamic consistency, through the different mechanism of an ever-present raider (an adversary).

Turning to welfare effects, signaling reduces fundamental value in traditional models. In Ross (1977), signaling leads to bankruptcy risk; in Stein (1988) 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, the real benefits arise 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 real investment. By contrast, disciplinary theories would predict that monitors should be allocated to bad managers to correct agency problems. In addition, while single-agent models predict that tolerance of failure (i.e. the absence of discipline) increases innovation (Manso (2009),) the model with heterogenous agents shows that intolerance of failure (via the disciplinary effect of debt) may ward off unskilled agents who are unable to innovate, thus increasing innovation overall.

Some features of this paper have been individually examined in prior models. By bringing together effects studied in previously disparate literatures, this theory analyzes important

¹We define the effort conflict broadly 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.

interactions between them (e.g. the conflict between termination and investment, and the concentration effect alleviating a side-effect of the disciplinary effect) and thus generates new insights unattainable from piecing together the individual results of prior research. In Boot and Thakor (1993), as in this paper, leverage concentrates shareholders' fixed dollar wealth into a greater percentage equity stake and induces monitoring.² In their model, monitoring has no real effects. While one could piece together their result with the literature on the effect of blockholders on real decisions (e.g. Burkart, Gromb and Panunzi (1997)) and conclude that the concentration effect can alleviate general agency problems, this paper explicitly models two specific and conflicting agency problems to deliver new results. For example, applying the standard result that the blockholder exerts discipline (e.g. Burkart et al.) suggests the manager will unlever; here the manager wishes to retain the blockholder. By analyzing the specific problems of termination and investment, the model considers the disciplinary and concentration effects together. This in turn allows us to break down debt into total payout and its composition between debt and dividends, generating implications for capital structure and dividend policy together – in particular that debt is supportive of investment (compared to other forms of payout) contrary to standard intuition. In a model of investment alone, growth could simply be induced by giving the manager a long-term contract and so there is no need for a concentration effect; a disciplinary decision is necessary to create endogenous short-term concerns for the manager. The concentration effect also echoes Jensen and Meckling (1976) and Innes (1990), where debt magnifies a manager's equity holding, *directly* inducing effort.³ Here, there is no fundamental effort conflict, yet debt is still effective. Leverage incentivizes effort by investors rather than the manager, which *indirectly* induces him to choose the efficient project. The model contains two layers of agency problems: investor monitoring and managerial investment; solving the former addresses the latter.⁴ With a single agency problem of managerial investment, debt would be ineffective.

Other papers contain a link between leverage and information acquisition that does not arise through concentration. In Townsend (1979), debt is optimal and verification only occurs in bankruptcy, as in this model; his is a pure exchange economy with no real effects. In Harris and Raviv (1990), debt leads to information acquisition because they exogenously assume that an audit occurs if and only if the firm is bankrupt. In reality, investigations can occur at all times; we endogenize the monitoring decision and study monitoring incentives.⁵ Von Thadden

²In 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. Mahrt-Smith (2004) studies how institutional factors jointly affect capital structure and ownership structure, rather than the how the former affects the latter.

³In Stulz (1988) and Harris and Raviv (1988), debt gives the manager a greater share of votes, enabling him to resist takeover attempts. They do not consider investment decisions.

⁴Direct 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. The large shareholder's wealth is the maximum that she can invest after taking on all feasible personal leverage.

⁵Debt has a second informational role in Harris and Raviv: non-payment of debt reveals to investors that

(1995) shows how debt can exert discipline; dividends would have the same effect. He also considers myopia and demonstrates that it can be alleviated by monitoring, which he assumes to be contractible. This paper demonstrates how debt can induce non-verifiable monitoring through the concentration effect. The manager in von Thadden has no incentive to encourage monitoring as it forces him to exert more effort. In Gumbel and White (2007), debt induces monitoring by shifting control to a “tough” investor, rather than by the concentration effect.⁶ In addition, the manager makes an effort decision and the monitor is an adversary; here she is an ally, thus giving the manager a reason to retain her. Edmans (2009) also links concentrated ownership to ex post monitoring and thus ex ante investment. He assumes the blockholder’s investment can always be increased if required.⁷ Here, her 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: while the number of dollars invested is chosen by the blockholder, leverage is chosen by the manager and thus under his control. In addition, Edmans exogenously assumes that the manager is concerned with the firm’s short-term value. Here, such concerns are endogenous – investors can choose not to demand an interim payment, but find it optimal to do so to allow termination.

The modeling setup of this paper draws from 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.

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, L corresponds to an institutional investor such as a private equity fund or mutual fund, and the atomistic investors represent households.⁸ There

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.

⁶Specifically, debt shifts control to the creditor, who is biased towards shut-down owing to his concave claim. 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 firm that has missed its dividend are already tough and wish to liquidate the firm – the essence of the myopia issue.

⁷In 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.

⁸ x is the maximum that L is able to invest after taking on as much personal leverage as she is able (or chooses) to. The assumption of limited funds, even in the presence of personal leverage, is standard in the literature (see, for example, Boot and Thakor (1993) and Fulghieri and Lukin (2001)) and necessary in models of ownership structure. If x was unlimited, a single investor would be able to own the entire firm, which would cure most agency problems.

are four periods, summarized in Figure 1. At $t = 0$, M raises x of funds from L and $I - x$ of funds from the atomistic investors. (It will become clear that any structure in which L invests less than x is weakly dominated, as her monitoring incentives are weaker.) M can choose to raise the funds in the form of equity or debt; as in an IPO, all equityholders pay the same price for their shares and all creditors pay the same price for their debt. D denotes the total amount of debt raised; it has face value of F and matures at $t = 2$. In addition, M can also promise to pay a dividend at $t = 2$.

At $t = 1$, with probability π the manager is “inspired”, i.e. obtains a good investment idea. An inspired manager can invest in either a Risky (R) or Safe (S) investment project; the project choice is noncontractible. (We will sometimes refer to choosing R rather than S as “investing”.) An uninspired manager has no good ideas and loses money over time. At $t = 2$ the firm generates some cash, C_2 , which is unobservable. At the end of Section 2.1 we discuss the extension to observable C_2 . Investors may choose to liquidate the firm at $t = 2$ and recoup the liquidation value $V_2 \geq C_2$. The manager is assumed to be essential for the firm’s continuation, so termination of the manager is equivalent to liquidation of the firm. A firm that has not been liquidated is worth V_3 at $t = 3$. (Cash and liquidation value are the same at $t = 3$ since the firm is wound up). Note that V_3 is the firm’s *total* value accrued over its life – it is not incremental to C_2 ; the incremental cash earned in period 3 is $V_3 - C_2$. We sometimes refer to C_2 as “earnings” and V_3 as “fundamental value.”

As in Stein (2005), equityholders capture the full surplus, so creditors break even and M ’s objective function consists of private benefits, such as reputational concerns or utility from incumbency, which are increasing in both firm value and his tenure. He earns B_2 if the firm is terminated, and B_3 in total if the firm is continued. The payoffs are given below:

Table 1: Payoffs to Investment Strategies

	Uninspired	Inspired, S	Inspired, R
C_2	K	G	K with probability γ , G w.p. $1 - \gamma$
V_2	J	G	J if $C_2 = K$, G if $C_2 = G$
V_3	K	R^S	R^R
B_2	z	z	z
B_3	Tz	Tz	$Tz(1 + \alpha)$

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 should be terminated 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 $C_2 = K$ as “unlucky” or suffering “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 intrinsically costly to managers.

At $t = 2$, the investor in control may decide to liquidate the firm. Creditors have control if the firm is bankrupt ($C_2 < F$); shareholders have control if the firm is solvent ($C_2 > F$). 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 $\phi < 1$ of success.⁹ If monitoring succeeds, it generates a publicly observable, but unverifiable signal of V_3 . 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 .¹⁰ We assume 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.

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 – even if investors are able to obtain the maximum possible liquidation value of J if the manager is uninspired. Condition (6) states that, if an uninspired manager is never

⁹We assume that the cost is non-pecuniary (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).

¹⁰The nonverifiability of the signal rules out contracts that directly reward L for producing a signal. The assumption that signals are observable but noncontractible is standard in the incomplete contracts literature (e.g. Aghion and Bolton (1992) and Dewatripont and Tirole (1994).) It is likely difficult to write into a contract what constitutes a good or bad signal, even though this will be evident ex post, since the number of possible such signals is likely to be very large. Once the signal is discovered, its nature (good or bad) is unambiguous – for example, monitoring could involve undertaking an independent analysis of a drug in progress or the quality of an existing product. Even if we allow the signal to be falsified, the monitor has no incentives to do so since, given the signal, all parties agree on the termination decision. The model can be extended to signals that are only privately observable to the monitor. To ensure the monitor does not shirk and simply claim to have found a positive signal, she could write credit protection to credibly communicate a positive signal, communicate it via trading shares (see, e.g., Edmans (2009)), or there could be a cost of communicating the signal so that she will only do so if the signal is truly positive. The analysis assumes observable signals since our focus is information acquisition incentives; the credible communication of acquired information has been studied elsewhere.

terminated, the firm will not be profitable – even if investors obtain the maximum possible terminal value of R^R if the manager is inspired. 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. Section 2.3 relaxes assumptions (5) and (6).

M 's objective function when choosing capital structure and dividend policy is to maximize his private benefits. Naturally, this requires investors to at least break even otherwise the firm will not be financed and his private benefits will be zero. 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. L thus owns an equity stake of $\frac{x}{I}$. Having chosen capital structure, the manager must now choose whether to promise a dividend 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 C_2 and can simply choose R if inspired. If

$$\pi R^R + (1 - \pi)K > \pi(\gamma J + (1 - \gamma)G) + (1 - \pi)J, \quad (7)$$

all shareholders will wish the firm to continue at $t = 2$ in the absence of information. From (5) and $R^S > J > G$, the right-hand side is less than I . Thus, we assume that (7) holds, else it is immediate that the firm will not be viable, from (6). We now consider whether any shareholder will monitor at $t = 2$. Since L has the largest incentive to monitor, any monitoring will be done by her rather than households; thus, we consider only L 's monitoring. The potential benefit from monitoring is that, if L finds that the manager is uninspired (i.e. V_3 will be K), she knows to liquidate the firm, 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 We assume that (8) holds, otherwise

¹¹We assume 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.

there is no termination problem to begin with. 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 investors and the manager are given by

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

and

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

From (6), investors make a loss, and therefore will not finance the firm to begin with.

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 is to force the manager to pay a dividend of (slightly in excess of) K at $t = 2$. Any dividend below K will have no effect because all firms has sufficient cash to meet the requirement. Dividends strictly in excess of K and below G will be equally effective; without loss of generality, we consider a dividend of exactly K and assume that the manager cannot pay it if $C_2 = K$. This is to avoid having to write “plus epsilon” throughout the paper.

Since an uninspired manager cannot make such a payment, his low quality is immediately revealed even in the absence of costly monitoring, allowing efficient liquidation. Dividends thus play a similar disciplinary role to Myers (2000), where shareholders also liquidate a non-paying firm. However, the disadvantage is that the dividend requirement may deter an inspired manager from choosing R since it risks yielding $C_2 = K$, 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 K 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 investors and M are given by

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

and

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

Investors make 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 non-paying manager 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, investors 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 .

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, which is the heart of the paper.

Note that the model has a close parallel in the case in which C_2 is publicly observable and so the disciplinary role of debt is not needed to reveal C_2 . This parallel isolates the role played by the concentration effect; relatedly, it is automatic that there is no role for dividends. The dividend case of Section 2.1.2 now 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 induces investment, but prevents termination if $C_2 = K$. The tension between termination and investment remains, and is solved

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.

by the concentration effect of debt. Similarly, the model has a parallel in which C_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) and the no-dividend case represents 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 C_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. Therefore, her equity stake is $\frac{x}{I-D}$. 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 $F < K$, i.e. riskless debt.¹³ 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). The key difference is that, even though riskless debt plays no role in revealing C_2 , it does impact L 's incentives to gather information. If L is a debtholder, she has no incentives to monitor since debt is riskless. 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.’’ The highest possible level of riskless debt, where F is just less than K , is weakly preferred to any lower debt level as this maximizes concentration.

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:*

¹³Note that debt of F , where $K \leq F < J$, is also riskless as creditors can liquidate the firm for J upon non-payment. However, we will show in Section 2.2.2 that $K \leq F < J$ is never optimal.

(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 investors and the manager 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 ($F < K$). In particular, if

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

then L will not monitor under riskless debt. In this case, investor returns are 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 $F \geq K$. Appendix A proves that it is never optimal to have $K \leq F < J$, so we consider the case of $F \geq J$. Creditors now have control if $C_2 = K$, 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. Appendix A 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 equityholder¹⁴ 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 infor-

¹⁴It 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.

mation 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 L will monitor, 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 losses (w.p. γ) and monitoring fails (w.p. $(1 - \phi)$). We assume (22) is satisfied, otherwise monitoring becomes irrelevant as it cannot cure myopia. 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.*

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

The expected gross returns to investors and the manager 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 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. 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. As the firm becomes more levered, L 's investment becomes a greater proportion of the total equity, thus augmenting her monitoring incentives. Mathematically, a rise in F augments D (from (25)) and thus $\frac{x}{I-D}$ in equation (21). Note that there is a countervailing effect: an increase in F reduces shareholders' benefits from efficient continuation of an unlucky manager, which are $R^R - F$. This is because creditors receive $F - J$ from efficient continuation, and therefore capture more of the gains. 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 gives L a greater proportion of these equity gains. The overall effect of increasing F on L 's incentives is given by differentiating the left-hand side of (21) to yield:

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

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 risky debt to dividends. Dividends also impose discipline: indeed, in a number of theories of debt (e.g. Jensen (1986), Stulz (1990), Zwiebel (1996)), the only purpose of debt is to force payout of cash and so dividends are a substitute. Similarly, in the dividend model of Myers (2000), the manager must pay out cash in the form of dividends to prevent diversion and is terminated if he misses a payment; debt would have the same effect. However, in our 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 have the side-effect of deterring investment.

We next compare risky to riskless debt. Riskless debt also concentrates equity, but has no disciplinary effect and thus suffers two main drawbacks. First, 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 risky 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 high. The disciplinary effect is needed to change the default decision from continuation to liquidation, and thus further increase the incentive to monitor. Second, even if riskless debt is able to induce monitoring (i.e. condition (19) does not hold), L monitors excessively. Monitoring is only worthwhile if $C_2 = K$, because if $C_2 = G$, L automatically knows that the manager is inspired. Since all firms can repay riskless debt, L is unable to learn C_2 and must therefore monitor in all states. This cost may reduce L 's payoff, (17), below I . The disciplinary effect of risky debt reveals C_2 to L without cost: if the firm meets its debt repayment, L knows that $C_2 = G$; she only needs to monitor if $C_2 = K$. This echoes Townsend (1979), where verification only occurs in bankruptcy.

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. Here, the concentration effect is also important, and so the optimal debt level is strictly risky.

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 risky 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 the investor returns under the four structures, to generate empirical predictions for how capital structure and dividend policy depend on the relative severity of the firm's agency problems. We examine investor returns, even though the manager is choosing capital structure, since the manager can only raise funds if investors at least break even; even if more than one structure allows this, competition for funds in a multi-manager model (e.g. Section 3) will force the manager to choose the structure that generates the highest returns. Moreover, all of the analysis is identical if the capital structure is instead chosen by shareholders, who directly care about equity returns.¹⁵

¹⁵We do not consider private benefits in the comparison as they are inalienable and M is penniless – therefore, M cannot pay his private benefits to investors.

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

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

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

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

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

While the previous section compared the mechanics of the four structures, here we compare the payoffs. 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 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 investor 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 *NODIV*. If (26) is satisfied, then L does not monitor under risky debt, and so this structure leads to the same outcome as *DIV*.

As previously established, if both termination and investment are important, *RISKY* maximizes investor 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. 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. 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.

$$c < (1 - \pi) \phi (J - K). \quad (32)$$

For *RISKLESS* to be feasible, we must have (16) so that L has an incentive to monitor. Since $\frac{x}{I-D} < 1$, (16) implies (32). 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 less so. 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.

$$(1 - \pi + \pi\gamma) c > \pi (R^R - R^S) - \pi\gamma (1 - \phi) (R^R - J). \quad (33)$$

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 (33). Previously we showed that, if *RISKLESS* is feasible (i.e. (16) is satisfied), it is always preferred to *NODIV*. 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, investors would like to dissuade M from pursuing R if inspired, because it 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 can dissuade M from pursuing R by committing not to monitor if earnings are low. 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 at $t = 1$), she may still monitor the manager once losses have occurred at $t = 2$. 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, the concentration effect is avoided and L is thus able to commit not to monitor.

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 for total payout to be sufficiently low that the manager can always meet the requirement. Thus, no dividends or riskless debt is efficient. If termination is important, it is optimal for total payout to be sufficiently high that a loss-making manager cannot meet the requirement. If investment is unimportant, this payout is in the form of dividends; if investment is important, it is in the form of risky debt.

2.4 Empirical Implications

While most existing research focuses on the factors affecting total debt, the above analysis suggests that total debt should be decomposed into two components: the level of total payout (debt plus dividends) and the composition of a fixed level of total payout between debt and dividends. We have:

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

where $Total\ Payout = Debt + Dividends$.

In turn, the two components of debt depend on the importance of the disciplinary and concentration effects, and thus the two agency problems. The severity of the termination issue determines the importance of the disciplinary effect, and thus the optimal level of total payout. For firms in which early termination is unlikely to be optimal (e.g. start-ups with low liquidation value and little free cash to waste by inefficient continuation), there is no need to discipline the manager by requiring 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 importance of the concentration effect, and thus the optimal composition of a given level of total payout. 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. This has both cross-sectional and time-series implications. With regards to the cross-section, 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 growing 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. 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. This contrasts the standard intuition that debt reduces investment – as explained above, if the termination issue is severe, debt should be compared to dividends rather than the case of no debt.

3 Heterogeneous Managers

3.1 Analysis

This section extends the model to a setting of heterogeneous managers and multiple large investors. There now exists two manager types. 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

We now allow bankruptcy to be personally costly to the manager. In the core model, a manager who is bankrupt is just as likely to be fired as a manager who misses a dividend. In reality, firing is likelier in a bankruptcy because 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. We model such costs by specifying that, if liquidation is optimal for shareholders, it occurs only with probability $\lambda < 1$. The core model assumed that $\lambda = 1$, i.e. the disciplinary effect if dividends and debt are the same; if we instead assume $\lambda < 1$, the results would be stronger – risky debt would be even more preferred because it has a greater disciplinary effect. Failure to meet a debt obligation bankrupts the firm and changes the default decision to liquidation. By contrast, a firm that misses a dividend remains solvent and requires an active decision from shareholders to be shut down; this occurs only with probability $\lambda < 1$.¹⁷ All of the results in this section continue to

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 $n_G = n_L$.

¹⁷Dewatripont 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),

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:

$$p_B R^S + (1 - p_B)(\lambda J + (1 - \lambda)K) = I \quad (34)$$

$$p_B R^R + (1 - p_B)K < I \quad (35)$$

$$\frac{1 - p_G}{1 - p_G + p_G \gamma} K + \frac{p_G \gamma}{1 - p_G + p_G \gamma} R^R < J. \quad (36)$$

Assumption (34) states that a firm run by a bad manager breaks even if M pursues S if inspired and is fired with probability λ if uninspired. Thus an unlevered firm which requires dividends of K at $t = 2$ is borderline viable. If the left-hand side was less than I , managers known to be bad would never be funded and so a separating equilibrium cannot exist. In reality, the pricing of physical capital will adjust so that bad managers will generate zero NPV – for example, if bad managers were unable to raise financing, demand for start-up capital would drop, causing its price I to fall. By contrast, if a bad manager runs an unlevered firm and is never fired (assumption (35)), the firm is unviable. Assumption (36) means that, even if a good manager can signal his quality, and all good managers who become inspired choose R , investors prefer to terminate a manager who yields interim losses (in the absence of information).¹⁸ If (36) does not hold, signaling high quality would automatically solve the myopia issue: a good manager is not fired upon delivering $C_2 = K$, 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:*

$$\begin{aligned} & (p_G - p_G \gamma(1 - \phi))Tz(1 + \alpha) + (1 - p_G + p_G \gamma(1 - \phi))z \\ > & p_G Tz + (1 - p_G)(\lambda z + (1 - \lambda)Tz), \end{aligned} \quad (37)$$

$$\begin{aligned} & (p_B - p_B \gamma(1 - \phi))Tz(1 + \alpha) + (1 - p_B + p_B \gamma(1 - \phi))z \\ < & p_B Tz + (1 - p_B)(\lambda z + (1 - \lambda)Tz), \end{aligned} \quad (38)$$

and

$$\phi \frac{p_B \gamma}{1 - p_B + p_B \gamma} \frac{1}{I} (R^R - J) < c. \quad (39)$$

equityholders do wish to fire the manager upon poor performance, which is the essence of the myopia issue.

¹⁸If creditors have control, they will terminate if $\frac{1 - p_G}{1 - p_G + p_G \gamma} K + \frac{p_G \gamma}{1 - p_G + p_G \gamma} F < J$, which holds from $F \leq R^R$ and (36).

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 manager becomes inspired, he chooses R . If the firm is bankrupt at $t = 2$, L monitors. If she finds that $V_3 = R^R$, the firm is continued, otherwise it is liquidated. The gross returns to investors and the manager are given by

$$(p_G - p_G\gamma(1 - \phi))R^R + (1 - p_G + p_G\gamma(1 - \phi))J - (1 - p_G + p_G\gamma)c \quad (40)$$

and

$$(p_G - p_G\gamma(1 - \phi))Tz(1 + \alpha) + (1 - p_G + p_G\gamma(1 - \phi))z. \quad (41)$$

(ii) Bad managers are financed with equity from atomistic investors and promise a dividend of $C_2 = K$. If the manager becomes inspired, he chooses S . 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

$$p_B Tz + (1 - p_B)(\lambda z + (1 - \lambda)Tz). \quad (42)$$

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

Since $p_G > p_B$, conditions (37) and (38) can simultaneously be satisfied. The first (second) condition ensures that G (B) does not deviate. L will monitor at $t = 2$ if

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

From $p_G > \pi$ and (21), this is satisfied.

In the analysis of Section 2, the disciplinary and concentration effects allowed the firm to be viable under risky debt. Here, the same two effects allow a separating equilibrium to be viable: 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. We deliberately assume a constant investment scale of I so that the traditional motives to signal do not apply. Despite this, good managers do have an incentive to signal due to the concentration effect. Here, the benefit of signaling manifests solely in the *type* of funds. By revealing his quality, a good manager attracts scarce large investors. One large investor provides no more funds than multiple small investors, but is critically different as she has the incentive 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. 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. 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 delever¹⁹; 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 was the first to present a dynamically consistent model of debt; he 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.²⁰ Dividends would be equally effective; the theory is a dynamically consistent model of total payout. This paper presents a dynamically consistent model of debt in particular, which arises from its two roles. The disciplinary effect credibly signals high quality, but this signal is only relevant at $t = 0$, when funds are raised. If raising funds was the only goal, debt would

¹⁹If outsiders expect such deleveraging, debt will be unable to signal quality in the first place.

²⁰The 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.

be dynamically inconsistent: immediately after funds are raised at $t = 0$, the manager would 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 (34)) and so the threat of firing which leads to dynamic consistency in Zwiebel does not apply here. 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.

Instead, it is the concentration effect that gives the manager an ongoing incentive to maintain leverage. Critically, unlike in traditional models where the benefits of signaling are obtained only in the initial period, 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.²¹ From (37), the manager will choose not to do so, because he will lose the concentration effect of debt and be unable to choose R if inspired. 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).

Dynamic consistency in this model arises 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. Burkart, Gromb and Panunzi (1997), Gumbel and White (2007)), the manager dislikes monitors since they are an "adversary" and force him to exert effort or forgo private benefits. Therefore, the manager has incentives to deter L from monitoring by reducing leverage. Here, there is no fundamental conflict between firm value and private benefits, because the same project (R) maximizes both. Here, the monitor is an "ally", allowing the manager to continue operating if he is unlucky. Thus, the manager wishes to retain her 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 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 cannot meet the debt repayments: Bhattacharya (1979) shows that dividends can have the same effect.

²¹A 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 (34) and (35), 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.

A final difference with standard 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 (40) 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 R 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. Here, 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. Moreover, the allocation of scarce large investors is different from that implied by traditional theories where large investors play a disciplinary role (e.g. Burkart, Gromb and Panunzi (1997), Maug (1998), Kahn and Winton (1998), Bolton and von Thadden (1998)) – these theories would predict that monitors should acquire stakes in bad firms to correct agency problems. In this paper, the monitor is an “ally” of good managers rather than an “adversary” of bad managers, and so should be allocated to the former.

3.2 Applications and Empirical Implications

While Section 2.4 considered implications of the single-firm model, this section discusses further implications generated by the extended model and applications of the separating equilibrium.

The extended model generates the broad implication 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, but it is the manager who controls the debt level going forward, and he has incentives to delever. Here, the manager wishes to retain debt as it leads to monitoring by an ally. This 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).

The core model predicts that debt is positively correlated with investment when total payout is controlled for, since it induces monitoring. The extended model provides another reason for this association – debt wards off unskilled managers who are unable to innovate. Holding managerial quality constant, Manso (2009) shows that tolerance of failure encourages innovation. This model shows an important counteracting effect in the presence of heterogeneous agents – intolerance of failure through disciplinary debt may screen out low-quality agents who are unable to innovate.

We now turn to real-life applications of the separating equilibrium. Good managers taken on risky debt and bad managers are unlevered; one interpretation is that the former corresponds to private equity and the latter to a public corporation with little risk of bankruptcy.²² 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. The theory also suggests that levered firms should have a concentrated investor who actively monitors, since if ownership is dispersed, there is no monitoring and so the requirement to make debt repayments will induce myopia.²³ Indeed, Cotter and Peck (2001) find that concentrated private equity investors play an active monitoring role, and LBOs perform more strongly if ownership is concentrated. Cotter and Peck's results cannot be explained by other justifications for leverage, such as taxes or forcing disciplinary payout, 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.²⁴

Second, the model can be applied to analyze the capital structure of investment companies, the focus of Stein (2005). The two fund types analyzed by Stein have natural analogs in

²²The 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.

²³The prediction of concentrated ownership is also generated by Gumbel and White (2007), although for reasons unrelated to myopia.

²⁴While buyouts usually do not retain their high leverage permanently, leverage typically remains significantly above the pre-buyout level (Kaplan (1991)). In addition, delevering is achieved through selling assets for cash and thus concentrated ownership is retained, rather than raising equity and diluting ownership. As assets are sold, the agency problem of inefficient continuation in non-core businesses is reduced; this reduces the optimal level of total payout and is consistent with the decline in debt.

this model. The closed-end fund is 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 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.

4 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 but at the expense of myopia.

We introduce a novel benefit of debt can alleviate this tension: the concentration of equity-holders’ stakes and the consequent elicitation of information gathering. Monitoring is desirable even absent an effort conflict as it allows investment. As a result, debt has significant advantages over other 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.

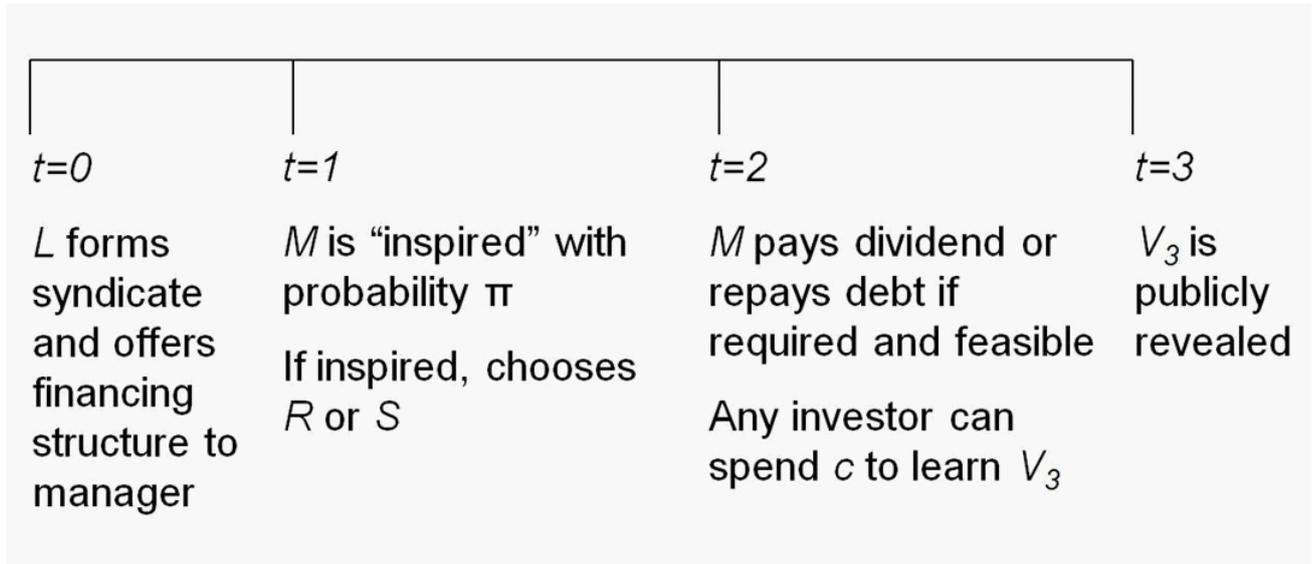


Figure 1. Timeline of the model

A Proofs

Proof that $K \leq F < J$ is suboptimal

Creditors have control if $C_2 = K$. Since (20) is satisfied, creditors will liquidate. Shareholders obtain $J - F$ in a liquidation, and $R^R - F$ under efficient continuation of an unlucky manager. Their incremental gain from incremental continuation is $R^R - J$, and so L 's incentive to monitor are:

$$\phi \frac{\pi\gamma}{1 - \pi + \pi\gamma} \frac{x}{I - D} (R^R - J).$$

Since creditors always recover F , we have $D = F$. The incentives to monitor are maximized when F is at its highest possible level. If $K \leq F < J$, this highest possible level is J , in which case monitoring incentives become

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

However, since (27) is positive, these incentives are stronger when increasing F above J . Hence, $F \geq K$ dominates $K \leq F < J$.

Proof that L does not monitor if she is a creditor

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

$$\phi \frac{\pi\gamma}{1 - \pi + \pi\gamma} x \frac{F - J}{D} > c. \quad (43)$$

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

$$(\pi - \pi\gamma(1 - \phi))R^R + (1 - \pi + \pi\gamma(1 - \phi))J - I > 0, \quad (44)$$

which holds because (23) $> I$.

References

- [1] Ackermann, Carl, Richard McEnally and David Ravenscraft (1999): “The Performance of Hedge Funds: Risk, Return and Incentives.” *Journal of Finance* 54, 833-874
- [2] Aghion, Philippe and Patrick Bolton (1992): “An Incomplete Contracts Approach to Financial Contracting.” *Review of Economic Studies* 59, 473-494
- [3] Axelson, Ulf, Per Stromberg and Michael Weisbach (2009): “Why Are Buyouts Levered? The Financial Structure of Private Equity Funds.” *Journal of Finance* 64, 1549-1582
- [4] Bhattacharya, Sudipto (1979): “Imperfect Information, Dividend Policy, and ‘The Bird in the Hand’ Fallacy.” *Bell Journal of Economics* 10, 259-70
- [5] Bolton, Patrick and Ernst-Ludwig von Thadden (1998): “Blocks, Liquidity, and Corporate Control.” *Journal of Finance* 53, 1-25
- [6] Boot, Arnoud and Anjan Thakor (1993): “Security Design.” *Journal of Finance* 48, 1349-1389
- [7] Burkart, Mike, Denis Gromb and Fausto Panunzi (1997): “Large Shareholders, Monitoring, and the Value of the Firm.” *Quarterly Journal of Economics* 112, 693-728
- [8] Cho, In-Koo and David Kreps (1987): “Signaling Games and Stable Equilibria.” *Quarterly Journal of Economics* 42, 179-221
- [9] Cotter, James and Sarah Peck (1999): “The Structure of Debt and Active Equity Investors: The Case of the Buyout Specialist.” *Journal of Financial Economics* 59, 101-147
- [10] Dewatripont, Mathias and Jean Tirole (1994): “A Theory of Debt and Equity: Diversity of Securities and Manager-Shareholder Congruence.” *Quarterly Journal of Economics* 109, 1027-1054
- [11] Edmans, Alex (2009): “Blockholder Trading, Market Efficiency and Managerial Myopia.” *Journal of Finance* 64, 2481-2513
- [12] Fama, Eugene and Kenneth French (2001): “Disappearing Dividends: Changing Firm Characteristics or Lower Propensity to Pay?” *Journal of Financial Economics* 60, 3-44
- [13] Fulghieri, Paolo and Dmitry Lukin (2001): “Information Production, Dilution Costs, and Optimal Security Design.” *Journal of Financial Economics* 61, 3-42
- [14] Gompers, Paul and Andrew Metrick (2001): “Institutional Investors and Equity Prices.” *Quarterly Journal of Economics* 116, 229-259
- [15] Gorton, Gary B. and George Pennacchi (1990): “Financial Intermediaries and Liquidity Creation.” *Journal of Finance* 45, 49-71

- [16] Gümbel, Alexander and Lucy White (2007): “Good Cop, Bad Cop: Complementarities Between Debt and Equity in Disciplining Management.” Working Paper, University of Oxford
- [17] Harris, Milton and Artur Raviv (1988): “Corporate Control Contests and Capital Structure.” *Journal of Financial Economics* 20, 55-86
- [18] Harris, Milton and Artur Raviv (1990): “Capital Structure and the Informational Role of Debt.” *Journal of Finance* 45, 321-349
- [19] Innes, Robert (1990): “Limited Liability and Incentive Contracting With Ex-Ante Action Choices.” *Journal of Economic Theory* 52, 45-67
- [20] Jensen, Michael and William Meckling (1976): “Theory of the Firm: Managerial Behavior, Agency Costs, and Capital Structure.” *Journal of Financial Economics* 3, 305-360
- [21] Jensen, Michael (1986): “The Agency Costs of Free Cash Flow: Corporate Finance and Takeovers.” *American Economic Review* 76, 323-329
- [22] Jensen, Michael (1989): “Eclipse of the Public Corporation”. *Harvard Business Review* 67, September-October, 61-74
- [23] Kahn, Charles and Andrew Winton (1998): “Ownership Structure, Speculation, and Shareholder Intervention.” *Journal of Finance* 53, 99-129
- [24] Kaplan, Steven N. (1991): “The Staying Power of Leveraged Buyouts.” *Journal of Financial Economics* 29, 287-313
- [25] Ljungqvist, Alexander and Matthew Richardson (2003): “The Cash Flow, Return and Risk Characteristics of Private Equity.” Working Paper, New York University
- [26] Lambrecht, Bart and Stewart C. Myers (2008): “Debt and Managerial Rents in a Real-Options Model of the Firm.” *Journal of Financial Economics* 89, 209–231
- [27] Lemmon, Michael L., Michael R. Roberts and Jaime F. Zender (2008): “Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure.” *Journal of Finance* 63, 1-37
- [28] Mahrt-Smith, Jan (2005): “The Interaction of Capital Structure and Ownership Structure.” *Journal of Business* 78, 787-816
- [29] Manso, Gustavo (2009): “Motivating Innovation.” Working paper, Massachusetts Institute of Technology
- [30] Maug, Ernst (1998): “Large Shareholders and Monitors: Is There a Trade-Off Between Liquidity and Control?” *Journal of Finance* 53, 65-98

- [31] Miller, Merton and Kevin Rock (1985): “Dividend Policy Under Asymmetric Information.” *Journal of Finance* 40, 1031-1051
- [32] Myers, Stewart C. (1977): “Determinants of Corporate Borrowing.” *Journal of Financial Economics* 13, 147-175
- [33] Myers, Stewart C. (2000): “Outside Equity.” *Journal of Finance* 55, 1005-1037
- [34] Myers, Stewart C. and Nicolas Majluf (1984): “Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have.” *Journal of Financial Economics* 13, 187-221
- [35] Rajan, Raghuram and Luigi Zingales (1995): “What Do We Know about Capital Structure? Some Evidence From International Data.” *Journal of Finance* 50, 1421-1460
- [36] Ross, Stephen A. (1977): “The Determinants of Financial Structure: The Incentive Signaling Approach.” *Bell Journal of Economics* 8, 1-32
- [37] Shleifer, Andrei and Robert Vishny (1997): “The Limits of Arbitrage.” *Journal of Finance* 52, 35-55
- [38] Stein, Jeremy (1988): “Takeover Threats and Managerial Myopia.” *Journal of Political Economy* 46, 61-80
- [39] Stein, Jeremy (2005): “Why Are Most Funds Open-End? Competition and the Limits to Arbitrage.” *Quarterly Journal of Economics* 120, 247-272
- [40] Stulz, René M. (1988): “Managerial Control of Voting Rights: Financing Policies and the Market for Corporate Control.” *Journal of Financial Economics* 20, 25-54
- [41] Stulz, René M. (1990): “Managerial Discretion and Optimal Financing Policies.” *Journal of Financial Economics* 26, 3-26
- [42] Townsend, Robert (1979): “Optimal Contracts and Competitive Markets with Costly State Verification.” *Journal of Economic Theory* 21, 265-293
- [43] Von Thadden, Ernst-Ludwig (1995): “Long-Term Contracts, Short-Term Investment and Monitoring.” *Review of Economic Studies* 62, 557-575
- [44] Zwiebel, Jeffrey (1996): “Dynamic Capital Structure Under Managerial Entrenchment.” *American Economic Review* 86, 1197-1215