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Influence Costs and Capital Structure

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ABSTRACT

This paper analyzes the role of capital structure in the presence of intrafirm influence activities. The hierarchical structure of large organizations inevitably generates attempts by members to influence the distributive consequences of organizational decisions. In corporations, for example, top management can reallocate or eliminate quasi rents earned by their employees, while at the same time, they must rely on these employees to provide them with information vital to their decision making. This creates the opportunity for lower level managers to influence top management's discretionary decisions. As a result, divisional managers may attempt to inflate the corporate perception of their relative contributions to the firm, or to take actions that make the elimination of their rents more costly for the firm. This incentive to influence is especially acute when managers fear losing their jobs, for example in the event of a divestiture.

Since the firm's capital structure can affect future divestiture decisions, it can be chosen to reduce or increase the divisional managers' incentives to influence top management's decisions. The control of influence activities arises at the expense of restrictions on future divestiture decisions. Hence, there emerges an optimal capital structure that trades off the costs of influence activities against the costs of making poor divestiture decisions. The findings suggest that capital structure can also be chosen to control influence activities that arise under less extreme motivations.

We identify several key factors that determine the optimal capital structure: the top management's prior assessment of the likelihood that it will be optimal to divest a specific division; the costs of influence activities to the firm and to the divisional managers; and the difference in the valuation of the division's assets in the current firm and under alternative uses.

THE HIERARCHICAL STRUCTURE OF large organizations inevitably generates attempts by members to influence the distributive consequences of organizational decisions. In corporations, for example, top management can reallocate or eliminate quasi rents earned by their employees, while at the same time, they must rely on these employees to provide them with information vital to their decision making. This creates the opportunity for lower level managers to influence top management's discretionary decisions. As a result, divisional managers may choose to incur substantive influence costs, as introduced in Milgrom (1988) and Milgrom and Roberts (1990), to attempt to inflate the

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corporate perception of their relative contributions to the firm, or to take actions that make the elimination of their rents more costly for the firm. Since such behavior not only affects corporate resources directly but may also affect the optimality of corporate decisions, the top management may seek to manage influence activities.

This paper analyzes the role of capital structure in the presence of intrafirm influence activities. It examines the particular influence activities surrounding a firm's decision whether to divest a division. Divestiture creates an especially acute incentive to influence top management, since if the division is sold, then workers and managers of the division may lose all or part of the quasi rents that they earn while being part of the firm. The paper demonstrates that, by affecting the firm's future divestiture decisions, the capital structure can be chosen optimally to reduce or increase the divisional managers' incentives to influence top management's decisions. This may lead, ex ante, to a more efficient outcome. However, the commitment inherent in debt also forces top management to sometimes sell divisions that would, ex post, be optimal to keep or to keep divisions that would, ex post, be optimal to divest. Hence, there emerges an optimal capital structure that trades off the costs of influence activities against the costs of making poor divestiture decisions.

We model two distinct examples of influence activities. In the first specification, the top manager receives perfect information about the ongoing value of the division before the divestiture decision is made. If the division is discovered not to be productive within the existing firm, then it is advantageous to sell it if a good divestiture opportunity arises. The divisional managers can attempt to influence the divestiture decision by affecting the probability that a good divestiture opportunity arises. In particular, this is accomplished by lowering the arrival probability of a high-synergy bidder. This specification captures the intuition that, as in Shleifer and Vishny (1989) or Edlin and Stiglitz (1992), divisional managers may make themselves "irreplaceable" through investing in assets with returns dependent on the managers' own information and attributes.

In the second specification of influence activities, the top manager receives only imperfect information concerning the ongoing value of the division, by observing a cash flow that the division generates. If a higher divisional cash flow is observed, it is more likely that the division is more profitable within the firm than when acquired by another firm. The divisional managers may therefore attempt to influence the top manager's divestiture decision by shifting future cash flows to the present, by "borrowing from the future." Such myopic behavior may be optimal from the divisional managers' point of view since it reduces the probability of a divestiture. As in Stein (1989), this is inefficient for the firm since, to improve cash flows in the short run, the division must forsake good long-term investments. While this inefficiency itself is clearly detrimental to the firm, influence activities may actually be either advantageous or disadvantageous to the firm, since they also affect the quality of the information that is conveyed to the top management by

observed divisional cash flows. Thus, in some cases, influence activities may in fact be advantageous to the firm because they improve the management's ability to distinguish between unprofitable and profitable divisions.

The firm can affect its future divestiture decisions by its capital structure choice. For example, the presence of risky short-term debt may effectively commit top management to sell divisions in certain states of the world, since when cash flow realizations are low the firm might be forced to sell off assets or divisions to repay its debt. This commitment to divestiture can either increase or reduce the incentives to engage in influence activities. If an equity-financed firm would never or only seldom divest the division, because there is a low prior probability that divestiture of the division will be optimal, then issuing some risky debt might create motives for divisional managers to influence the top management's divestiture decision. This may be advantageous for the firm if these influence activities allow top management to assess more conclusively the profitability of a division from its cash flow realization. This motive to issue debt is more likely to be important if the costs to the firm of influence activities are low.

Alternatively, if without risky debt there is a significant probability that a future divestiture will be optimal, then issuing a large amount of short-term debt commits the firm to divest the division with even higher probability. Since in most states the divestiture decision is no longer under the top management's discretion, influence activities might actually be reduced by debt. This may be advantageous for the firm if there is a high prior probability that divestiture of the division will be optimal, if the costs to the firm of influence activities are high, and if the costs to the firm of forced divestitures during financial distress are low.

In contrast, the presence of risky long-term debt may effectively commit top management not to sell divisions. Firms with long-term debt with covenants that preclude the firm from asset sales, possibly using divisional assets as collateral, will find it more costly to sell the division before the debt matures.[1] Thus, influence incentives may be reduced or eliminated. This may be advantageous for the firm when the resulting improvement of the investment decisions made by the divisional managers more than offsets the costs associated with foregone divestiture opportunities.

A number of empirical observations are consistent with the predictions emerging from the analysis in this paper. For example, the future profitability of firms seems to be inversely related to the firms' current leverage levels.[2] Since periods of low profitability are frequently also periods of downsizing, spinoffs, and restructuring, this observation accords well with our result that short-term debt may be used to manage influence costs during periods when future divestitures are likely. Also consistent with this result are the facts that corporations have generally increased their debt levels

[1]As an example, the long-term bondholders of Marriott Corporation are currently challenging the firm's intended spinoff of its real estate division.

[2]See, for example, Blair and Litan (1990).

significantly before the start of the recession in 1991,[3] and that major restructurings are frequently implemented after mergers or leveraged buyouts, events usually associated with large increases in the firms' leverage levels, especially debt of very short maturity such as bridge loans.

Standard analysis suggests that a firm chooses its capital structure for its financial gains such as minimizing taxes or bankruptcy costs, for its potency as a signal to financial markets, or to trade off the agency costs of top management. Recently, however, some of the nation's largest corporations, in possession of complex hierarchical structures which engender divisional influence activities, have designed securities apparently motivated primarily by the need to manage divisional incentives. When General Motors acquired Electronic Data Systems in 1984, it continued the listing of EDS stock as GM Class E stock, "without any doubt," according to EDS Chief Financial Officer Thomas Walter, "to continue to foster an entrepreneurial spirit among EDS employees" (*Dun's Business Month*, February 1986).[4] In February 1993, International Business Machines executed its first employee layoffs in seventy-nine years, while redefining its hierarchical structure into a dozen increasingly autonomous units. Top management at IBM were said to be favoring the incentives inherent in keeping full ownership of its units while offering special stocks pegged to their individual results (*Wall Street Journal*, February 8, 1993). While such recent capital structure choices might be difficult to reconcile with traditional theories, they seem to be more consistent with models in which the desire to affect lower level employee incentives motivates capital structure choices.

This paper is organized as follows. Section I presents the general model of influence costs and capital structure. In Section II we model the role of capital structure when influence activities reduce the likelihood of a profitable divestiture opportunity. In Section III we model the role of capital structure when influence activities alter the timing of cash flows generated by the divisions. Section IV concludes.

I. A General Model of Influence Costs and Capital Structure

This section provides a general exposition of the model. We examine a firm with n divisions. Each division employs a number of divisional managers and workers. To focus on the relationship between top management and divisions, we abstract from conflicts of interest within a division, assuming that divisional managers and employees within one division act collectively. The top manager monitors and decides whether to divest a division. To keep the analysis simple we shall focus on the nth division, and we assume that it is

[3]For a survey of the changes in capital structure and restructuring in the 1980s, see the articles in *Debt, Taxes and Corporate Restructuring*, edited by J. B. Shoven and J. Waldfogel.

[4]A similar class of stock, GM Class H stock, was then created after the acquisition of Hughes Aircraft Company in 1985.

never optimal to divest the remaining $n - 1$ divisions, which collectively generate a riskless cash flow of F_r per period.

When a division is divested, the synergies realized by the acquiring firm may be due in part to a reduction in the number of managers required to run the division, or due to the fact that divisional assets are put to a different use requiring different managerial talent to manage them. Thus, workers and managers of the division may lose all or part of the quasi rents that they earn while being part of the firm. This provides incentives for the divisional manager to influence the top management's divestiture decisions.

To allow for the existence of a variety of potential influence activities, we model explicitly two distinct examples of influence activities. First, divisional managers can reduce the probability of a profitable divestiture by diminishing the relative value of the nth division under alternative management. In our model this is captured by a reduced probability of the arrival of a high-synergy bidder for the division. Second, divisional managers can forsake good investments to boost current earnings, shifting the timing of cash flows towards the present, in an attempt to improve their perceived value to the firm.

The basic sequence of events is as follows. In the first period, at time 0, the top manager chooses the firm's capital structure. She decides on both the amount and the maturity structure of debt to be issued. At time 1, the divisional managers may act to influence the divestiture decision that will later be made by the top manager. At time 2, there is a cash flow realization. The top manager decides whether or not to divest the division immediately after observing the cash flow. Finally, if no divestiture occurs at time 2, then the division realizes a second cash flow at time 3, at which point all investors are paid off and the firm ceases to exist. These decisions are now analyzed recursively.

A. The Divestiture Decision at Time 2

The decision whether or not to divest the nth division is made after the time 2 cash flow has been observed. The division's cash flows can be thought of as being generated by both a short-term and a long-term investment project. Depending on the division's type, t, and the divisional managers' influence activities, which for simplification are represented by a scalar, i, the short-term project generates a cash flow at time 2 with probability $\lambda_{t,i,2}$. Similarly, the long-term project generates a cash flow at time 3 with probability $\lambda_{t,i,3}$. For a known division type and influence level, the division's expected payoff, $E[F(t,i)]$, is then given by

$$E[F(t,i)] = \lambda_{t,i,2} \int_0^\infty F_2 \pi_2(F_2)\, dF_2 + \lambda_{t,i,3} \int_0^\infty F_3 \pi_3(F_3)\, dF_3 \qquad (1)$$

where $\pi_\tau(F_\tau)$ is the probability density of the cash flow realization F_τ at time τ, $\tau \in \{2,3\}$, given that the project generates a time τ cash flow.

The division's type is determined by the success probabilities of its projects, $\lambda_{t,i,2}$ and $\lambda_{t,i,3}$. We rank types such that, for a given i, all investment

projects of a higher type division have a higher probability of being successful. Furthermore, we define the support of t to be $t \in [t_l, t_h]$. As an example, when there are only two types such that $t_h = h$ and $t_l = l$, we say that h is the higher type if and only if $\lambda_{h,i,\tau} > \lambda_{l,i,\tau}$ for all i and τ.

Depending on the division's type and on the types of its potential acquirers, the division's assets may be employable more or less productively by other firms. The efficiency gains or losses realized by a type T firm's acquisition of a type t division are denoted $G(T,t)$, where $T \in [T_L, T_H]$ and $G(T_J,t) > G(T_K,t)$ for all $J > K$. That is, for a given division type, the synergy realized by a bidder of a higher type exceeds the synergy realized by a bidder of a lower type. Define $\Pi_T(i)$ as the probability of a type T bidder arriving at time 2 if influence activities are of level i. We assume that the division can always be sold to the lowest-type bidder, that is, $\Pi_{T_L}(i) = 1$ for all i.

To keep the analysis simple, we assume that the bidder type is observable and, abstracting from bargaining issues, that the division could be sold to the highest-type bidder that has arrived, T_M, with the selling firm capturing the full synergy gain $G(T_M,t)$, at the price

$$P(T_M|F_2, D_S, D_L) = E[\lambda_{t,i,3}|F_2, D_S, D_L]\int_0^\infty F_3\pi_3(F_3)\,dF_3 + \int_{t_l}^{t_h} G(T_M,t)\Theta(t|F_2, D_S, D_L)\,dt, \tag{2}$$

where D_S and D_L denote, respectively, the face value of short-term debt to be paid back at time 2, and of long-term debt to be paid back at time 3, and where $\Theta(t|F_2, D_S, D_L)$ is the probability of the division being of type t given the cash flow realization and the debt levels. The bidders condition on D_S and D_L because their conjecture about the divisional managers' influence level generally depends on the debt levels.[5]

For concreteness, we assume that $G(T,t)$ is negative for division types above some critical $t^*(T)$ and positive below $t^*(T)$. Thus, under perfect information about a division's type, the firm would keep the division whenever its type is at least $t^*(T_M)$ and sell it otherwise.

If the division is not sold, its expected value to the firm, $V(F_2, D_S, D_L)$, is simply

$$V(F_2, D_S, D_L) = E[\lambda_{t,i,3}|F_2, D_S, D_L]\int_0^\infty F_3\pi_3(F_3)\,dF_3. \tag{3}$$

A value-maximizing manager divests the division if and only if $P(T_M|F_2, D_S, D_L) > V(F_2, D_S, D_L)$, which is the case when

$$\int_{t_l}^{t_h} G(T_M,t)\Theta(t|F_2, D_S, D_L)\,dt > 0.$$

[5]If the distribution of types is discrete rather than continuous, then, obviously, the second integral in equation (2) is replaced by a summation.

B. The Divisional Managers' Influence Decision at Time 1

We assume that the divisional managers receive a fixed wage, W, and always prefer to continue the operation of the division within the existing firm. If the division is divested, then its managers lose quasi rents that they earn while being part of the firm. For example, they may lose their jobs with higher probability due to a divestiture, with relocation being costly to them. Alternatively, they may have invested in firm-specific human capital that is lost when they are employed by another company. As in Meyer, Milgrom, and Roberts (1992), we denote these costs by K. These costs create incentives for divisional managers to influence the divestiture decision of the top management.

There are several plausible reasons why the conflict of interest between divisional managers and the firm cannot be completely resolved with incentive contracts.[6] First, in a more general model wherein the divisional managers must be motivated to expand effort, it may be suboptimal to pay the managers an additional K dollars whenever the time 2 cash flow is low and the division is sold. Second, the costs associated with divestiture may be due in part to reputational effects. When the firm concludes that divestiture is optimal, the top management will update its beliefs about the divisional managers' ability. Divestiture could therefore not only reduce the firm's perceptions of the managers' productivity at the divisional level but could also diminish career opportunities both within and outside the firm. Writing a contract that compensates for such a loss of reputational capital seems difficult and costly.[7]

The chosen level of influence activities i may affect both the probability distribution of bidder types and the timing of the division's cash flows. We now describe how these two effects are modeled. In the first specification of influence activities, the choice of divisional influence i changes the probability of the arrival of higher-type bidders. In particular we assume that

$$\frac{\partial \Pi_T(i)}{\partial i} < 0 \ \forall \ T > T_L. \tag{4}$$

According to equation (4), influence activities reduce the probability of the arrival of a type T bidder, except for the probability of the arrival of the lowest-type bidder, which is assumed to be constant and equal to 1.

In the second specification of influence activities, the success probabilities of the two investment projects, $\lambda_{t,i,2}$ and $\lambda_{t,i,3}$, can be influenced by the divisional managers, in an attempt to alter the stream of future cash flows. In particular, the nth division's managers are able to allocate more resources to the short-term project at the expense of the long-term project. This myopic behavior increases the probability that the short-term project will generate a

[6]For other models that rely on incomplete contracts, see, for example, Aghion and Bolton (1992) or Hart and Moore (1989).

[7]Boot (1992) captures such reputational effects.

cash flow, while lowering the probability that the long-term project will generate a cash flow. In the model, this alteration of the timing of the cash flows is captured by the choice of i, where

$$\frac{\partial \lambda_{t,i,2}}{\partial i} > 0, \qquad \frac{\partial \lambda_{t,i,3}}{\partial i} < 0, \tag{5}$$

and

$$\frac{\partial \lambda_{t,i,2}}{\partial i} \int_0^\infty F_2 \pi_2(F_2)\, dF_2 < -\frac{\partial \lambda_{t,i,3}}{\partial i} \int_0^\infty F_3 \pi_3(F_3)\, dF_3. \tag{6}$$

Given inequalities (5), exerting positive levels of influence is tantamount to transferring the likelihood of a cash flow from the future towards the present. Assuming that the riskless rate of interest is zero and that all agents are risk neutral, inequality (6) guarantees that such a transfer is inefficient. Since the lost expected cash flow in the future exceeds the increase in the earlier expected cash flow, the efficient allocation of funds across projects is at a zero influence level, denoted $i = 0$.

We assume that exerting influence is also personally costly for a divisional manager. We denote these costs $C(i)$, where $C(i)' > 0$ and $C(i)'' \geq 0$. This captures the intuition that it takes increasingly more effort either to alter the composition of the divisional assets to lower the probability that higher type bidders will arrive, or to alter the "natural" timing of cash flows by shifting cash flows from time 3 to time 2.

Thus, the divisional manager maximizes

$$E[U(t,i)] = W - K\phi(t,i,D_S,D_L) - C(i), \tag{7}$$

where $\phi(t,i,D_S,D_L)$ is the probability of a division of type t being divested when the influence level is i. The optimal influence level then satisfies the first-order condition, such that

$$-\frac{\partial \phi(t,i,D_S,D_L)}{\partial i} K = \frac{\partial C(i)}{\partial i}. \tag{8}$$

C. The Capital Structure Decision at Time 0

At time 0 the top manager selects the firm's capital structure. By choosing a particular financial structure, the firm implicitly also chooses its divestiture strategy. A firm without risky debt securities will be able to make unconstrained divestiture decisions. Firms that issue long-term collateralized debt using divisional assets as collateral, or firms that issue long-term debt with covenants restricting asset sales, will constrain their future ability to divest. Finally, firms with risky short-term debt will find that, in some states, divestiture is the cheapest way to avoid costly financial distress.[8] This could result if the firm was unable to issue new securities, perhaps because of the

[8] In the conclusion, we argue how the primary insights of the model can survive the relaxation of the assumption that financial distress necessitates divestiture.

debt overhang problem analyzed by Myers (1977) or Hart and Moore (1989), or because of adverse selection problems analyzed by Myers and Majluf (1984). Consistent with this notion, Asquith, Gertner, and Scharfstein (1992) find that the financially distressed firms in their sample sell 12 percent of their assets on average.[9]

If the only effect of debt were to restrict the firm's future divestiture decisions, then issuing debt would always be costly and firms would be entirely equity financed. However, by altering future divestiture decisions, the firm's capital structure also changes the influence incentives faced by divisional managers. Short-term debt may reduce or encourage influence activities. They are discouraged when short-term debt forces divestitures often enough so that influence activities are ineffective. They are encouraged when short-term debt generates concerns about divestitures that otherwise would not exist. By contrast, issuing long-term debt can eliminate incentives to influence by allowing management a credible commitment not to sell major firm assets or entire divisions in the short run.[10]

Since influence activities lower the arrival probability of a high-type bidder or cause an inefficient distortion of the cash flow stream, it is desirable, all else equal, to limit their occurrence. However, influence activities also affect, and may actually enhance, the informativeness of particular cash flow realizations. Hence, the optimal capital structure choice trades off the desirability of incurring influence to provide information valuable in the divestiture decision against the associated efficiency and divestiture losses.

The top manager chooses the face values of short- and long-term debt, D_S and D_L, to maximize the initial firm value, V_0. Define $F_2^D(T_M, D_S, D_L)$ as the set of time 2 cash flows conditional on which the division is divested. The maximization can then be written as

$$\begin{aligned}\max_{D_S, D_L} V_0 = {} & 2F_r + E[\lambda_{t,i,2}|D_S, D_L]\bar{F}_2 \\ & + \phi(D_S, D_L)E\left[P(T_M|D_S, D_L, F_2 \in F_2^D(T_M, D_S, D_L))\right] \\ & + (1-\phi(D_S, D_L))E\left[\lambda_{t,i,3}|D_S, D_L, F_2 \notin F_2^D(T_M, D_S, D_L)\right]\bar{F}_3 \quad (9)\end{aligned}$$

where $\bar{F}_\tau = \int_0^\infty F_\tau \pi_\tau(F_\tau)\, dF_\tau$, $\tau = \{2, 3\}$. According to equation (9), the firm value consists of the cash flow of the $n-1$ divisions at times 2 and 3 ($2F_r$), the nth division's expected cash flow at time 2 ($E[\lambda_{t,i,2}|D_S, D_L]\bar{F}_2$), the expected

[9] They also find that financially distressed firms that sell assets are considerably less likely to go bankrupt than those that do not sell assets. A recent example of a firm considering asset sales to reduce its financial distress is the Irish aircraft-leasing firm GPA Group PLC. GPA and its banks have been trying to sell airplanes and their accompanying leases to several U.S. rival companies to "stay afloat until the recession-wracked airline industry recovers." (*Wall Street Journal*, November 12, 1992).

[10] Rather than using long-term debt to commit to a policy of not divesting and laying off workers, several firms have simply signed agreements that limit or eliminate their future ability to lay off their workers in order to improve productivity, as in the case of National Steel (*Wall Street Journal*, May 1992).

revenue from divesting the division (the third term), plus the expected time 3 cash flow when the division is not sold (the last term).

It is implicit in equation (9) that capital structure affects firm value in several ways. First, due to a possible effect on the influence level, the division's expected probabilities of generating cash flows, $E[\lambda_{t,i,2}|D_S, D_L]$ and $E[\lambda_{t,i,3}|D_S, D_L]$, depend on the firm's capital structure. Second, a change in the debt level can affect the probability of a divestiture, $\phi(\cdot)$. Finally, through its effect on influence activities, the price at which the division is expected to be sold, $P(\cdot)$, changes with the firm's capital structure.

II. Using Capital Structure to Control Divisional Attractiveness under Alternative Uses

Section I developed a general model to analyze the use of capital structure to control divisional managements' influence activities. In this section we formalize the first specification of influence activities, by which divisional managers reduce the attractiveness of the division under alternative uses. This is captured by the reduced probability of the arrival of a high-type bidder. To determine the role of capital structure, we derive a closed form solution to the model, making the following assumptions about the functional forms of the parameters.

ASSUMPTION 1: *Uniform Cash Flow Distributions. The cash flows of the nth division's successful investment projects are independently uniformly distributed,* $F_\tau \sim U[0, M]$ *for* $\tau \in \{2, 3\}$.

ASSUMPTION 2: *Linear Influence Costs. The corresponding costs of the influence activity borne by the divisional manager,* $C(i)$*, are given by*

$$C(i) = zi \tag{10}$$

where $z > 0$*. To create a possible motive for influence activities, we assume that* $z < K$*, such that the marginal cost of influence activities is less than the expected loss of quasi rents as the result of divestiture.*

ASSUMPTION 3: *Two Types of Divisions. There are two types of divisions, h and l, for which* $\lambda_{h,i,\tau} = \lambda_h > \lambda_{l,i,\tau} = \lambda_l$*, for all i and* τ*. The unconditional probabilities of the division being of type h and l are, respectively,* θ *and* $1 - \theta$.

ASSUMPTION 4: *Perfect Information. The division's type becomes publicly known between times* 1 *and* 2.

ASSUMPTION 5: *Efficiency Gains Due to Divestiture. There are two types of acquiring firms, L and H, thus* $T \in \{L, H\}$*. A type H bidder realizes synergy gains that exceed those to a bidder of type L. The actual synergies are summarized by Table I.*[11]

[11] The particular values of the synergies are not important for the following analysis. It is only important that a positive synergy is realized when a type l division is sold to a type H bidder and that a negative synergy is realized when a type h division is sold to a type L bidder.

Table I
Synergy Gains Due to Divestiture, $G(T, t)$

	Bidder Type H	Bidder Type L
Division type h	0	−G
Division type l	G	0

We assume that the division can always be sold to a low-synergy bidder, $\Pi_L(i) = 1$ *for all* i*, but that a high-synergy bidder only arrives with a probability* $\Pi_H(i)$ *less than one.*

ASSUMPTION 6: *Discrete Influence Levels. The divisional managers' influence levels are restricted to be only zero or a positive level* I*, thus* $i \in \{0, I\}$*. Influence activities alter the probability of the arrival of a high-synergy bidder,* $\Pi_H(i)$*. In particular we define* $\Pi_H(i) = \Pi_H - i$*, which requires that* $I \leq \Pi_H$*.*

To examine the role of capital structure in the presence of influence activities, we derive the value of the firm under three alternative capital structures: equity, risky short-term debt to be paid back at time 2, and collateralized risky long-term debt to be paid back at time 3.

A. The Value of an Equity-Financed Firm

We first examine the divisional managers' influence activity at time 1 in an equity-financed firm. The expected utility of a divisional manager of type t in an all-equity firm is given by

$$E[U(t, i)] = W - K\phi(t, i, 0, 0) - zi. \tag{11}$$

Given the synergy gains from divestiture specified in Assumption 5, it is never optimal for an equity-financed firm to divest a type h division. Therefore, the divisional manager of type h never finds it optimal to influence and sets $i = 0$.

The probability of a type l division being divested when the influence level is i is $\Pi_H - i$, implying that

$$E[U(l, i)] = W - K(\Pi_H - i) - zi. \tag{12}$$

Since $z < K$, the divisional manager of type l will optimally exert influence of level $i = I$.

Thus, the time zero value of the all-equity firm is

$$V_E = \bar{\lambda}M + G[(1 - \theta)(\Pi_H - I)] + 2F_r, \tag{13}$$

where $\bar{\lambda} = \lambda_l(1 - \theta) + \lambda_h\theta$. It is implicit that the firm divests the division only if it is of type l and if a high bidder arrives, which occurs with probability $(1 - \theta)(\Pi_H - I)$.[12]

B. The Value of a Firm with Risky Short-Term Debt

Short-term debt is modeled to be debt that must be paid back after the time 2 cash flow realization. It is risky whenever the riskless time 2 cash flows from the other $n - 1$ divisions, F_r, are not sufficient to cover the face value of the debt. As paying back this debt sometimes necessitates the divestiture of the division, risky short-term debt can affect the divisional managers' influence incentives.

Risky short-term debt has no effect on the incentives of the type h manager. Since divestiture occurs automatically if the firm is in financial distress, while the division would not be divested regardless of influence activities if the firm is not in financial distress, the divisional manager of type h never finds it optimal to influence and therefore sets $i = 0$.

Risky short-term debt does affect the incentives of the type l manager. To analyze his influence decision, we note that the probability of the divestiture of a type l division in a firm with risky short-term debt of face value D_S is given by

$$\phi(l, i, D_S, 0) = 1 - \lambda_l + \lambda_l\left[\Pi_H - i + \frac{D_S - F_r}{M}(1 - \Pi_H + i)\right].$$

The division must be divested when no time 2 cash flow is realized, which occurs with probability $1 - \lambda_l$. With probability λ_l a positive cash flow occurs at time 2. If so, then the division is divested whenever a type H bidder arrives, which occurs with probability $\Pi_H - i$. Moreover, with probabililty $(D_S - F_r)/M$, the positive cash flow is insufficient to cover the debt liability. This forces the firm to divest even though no type H bidder arrives, which occurs with probability $(1 - \Pi_H + i)$.

Simplifying this expression, the expected utility of the divisional manager of type l is

$$E[U(l, i)] = W - K\left[1 - \lambda_l\left(1 - \frac{D_S - F_r}{M}\right)(1 - \Pi_H + i)\right] - zi. \quad (14)$$

Differentiating equation (14) with respect to i reveals that the divisional manager of type l prefers to set $i = I$ if $D_S < F_r + M\left(1 - \frac{z}{\lambda_l K}\right)$. If D_S is equal to this amount, then the manager is indifferent and is assumed not to

[12] Recall that the divestiture price as defined in equation (2) compensates the firm for both the synergy gain and the expected time 3 cash flows that the firm foregoes when it sells the division. Hence, the first term in equation (13) is $\bar{\lambda}M$.

influence. The optimal face value of risky short-term debt is therefore given by

$$D_S^* = \max\left[F_r + M\left(1 - \frac{z}{\lambda_l K}\right), F_r\right]. \tag{15}$$

The firm optimally either issues no risky short-term debt and the divisional managers influence, or it issues the amount D_S^* and no influence activities take place. The optimality of D_S^* follows from the observation that any short-term debt level below D_S^* induces positive influence activities but restricts the firm's divestiture decisions in some states. Such debt levels are therefore dominated by all equity (or riskless debt), which induces the same influence activities while allowing the firm to make unconstrained divestiture decisions. Alternatively, an increase of debt beyond the amount D_S^* has no incremental effect on influence activities but further restricts future divestiture decisions. Similar arguments imply that, if the minimum face value of risky short-term debt, F_r, already exceeds $F_r + M\left(1 - \frac{z}{\lambda_l K}\right)$, then the firm optimally sets the face value equal to F_r.[13]

The time 0 value of a firm with risky short-term debt with face value D_S^*, wherein the divisional manager chooses not to influence, is

$$V_S = \bar{\lambda}M + G\left[(1-\theta)\Pi_H - \theta\left(1 - \lambda_h\left(1 - \frac{D_S^* - F_r}{M}\right)\right)(1 - \Pi_H)\right] + 2F_r. \tag{16}$$

The first and last terms in equation (16) are the expected cash flows if the division is never sold. The second term captures the effects of divesting. This includes the expected gains from electing to sell a type l division to a type H bidder, and the expected loss resulting from selling a type h division to a type L bidder when cash flows are insufficient. Substituting for D_S^* yields

$$V_S = \begin{cases} \bar{\lambda}M + G\left[\Pi_H - \theta\left(1 - \dfrac{\lambda_h z}{\lambda_l K}(1 - \Pi_H)\right)\right] + 2F_r \\ \qquad\qquad \text{if } D_S^* = F_r + M\left(1 - \dfrac{z}{\lambda_l K}\right) \\ \bar{\lambda}M + G[\Pi_H - \theta(1 - \lambda_h(1 - \Pi_H))] + 2F_r \\ \qquad\qquad \text{if } D_S^* = F_r. \end{cases} \tag{17}$$

C. The Value of a Firm with Collateralized Long-Term Debt

Long-term debt must be paid back after the time 3 cash flow realization, with no obligation at time 2. It is risky whenever the sum of the time 2 and

[13] To avoid unnecessary notation, we assume that a face value of F_r is sufficient to make short-term debt risky. More precisely, the set of admissible face values for which short-term debt is risky is the open interval $(F_r, F_r + M]$.

time 3 cash flows from the other $n - 1$ divisions, $2F_r$, are not sufficient to cover the face value of the debt. In the context of this model, collateralized long-term debt can be issued to allow management a credible commitment not to sell major firm assets or entire divisions.[14]

For long-term debtholders to care about the firm's divestiture decisions, and thus for bond covenants to be relevant, their claims must be risky. We assume in what follows that the covenants on long-term risky debt preclude divestiture of the nth division and, thus, eliminate the incentives of divisional managers to influence.[15] Moreover, once long-term debt is risky, increasing the level of long-term debt further has no additional effect on the divestiture decision and therefore on influence decisions. In the following analysis, we assume that the face value of long-term debt, if issued, is $2F_r$, though greater levels would produce similar results.[16]

Since for any level of risky collateralized long-term debt the probability of divestiture is zero, divisional managers optimally incur zero influence costs such that $i = 0$. Thus, the value of the firm with risky long-term debt is given by

$$V_L = \bar{\lambda}M + 2F_r. \tag{18}$$

As can be seen by comparing equations (13) and (18), long-term debt is dominated by equity under this specification of influence activities. This arises because equity allows for some profitable divestitures to be undertaken, while firms with long-term debt are precluded from taking advantage of any potentially attractive divestitures.

D. Equilibrium Capital Structure

To determine the optimal capital structure chosen by the firm, we need to compare the value of a firm which issues risky short-term debt of face value D_S^* wherein the divisional managers choose not to influence, to the value of an all-equity firm wherein the managers choose influence level $i = I$.[17] Com-

[14] In fact, risky long-term debt issues are only feasible if bondholders are protected by bond covenants that restrict the firm's ability to sell off assets or pay out large dividends, since in the absence of such constraints, equityholders would face incentives to redistribute firm value by altering the firm's investment and dividend policy. For empirical evidence on bond covenants, see Smith and Warner (1979).

[15] The existence of a free-rider problem makes renegotiation of these covenants costly, enhancing their credibility.

[16] Unnecessary notation is again avoided by assuming that a face value of $2F_r$ is sufficient to make long-term debt risky. More precisely, the set of admissible face values for which long-term debt is risky is an open interval with its infimum equal to $2F_r$.

[17] Clearly, the simultaneous issuance of risky short- and long-term debt is suboptimal. Recall that a firm with risky short-term debt but no long-term debt finds it optimal in some states to sell assets in order to avoid costly bankruptcy. Long-term debt with the covenants discussed above prohibits such divestitures and forces the firm into bankruptcy.

paring equations (13) and (17) yields

$$V_S - V_E \equiv \Delta_{S-E} = \begin{cases} G\left[I(1-\theta) - \theta\left(1 - \dfrac{\lambda_h z}{\lambda_l K}\right)(1-\Pi_H)\right] \\ \qquad \text{if } D_S^* = F_r + M\left(1 - \dfrac{z}{\lambda_l K}\right) \\ G[I(1-\theta) - \theta(1-\lambda_h)(1-\Pi_H)] \\ \qquad \text{if } D_S^* = F_r. \end{cases} \tag{19}$$

Proposition 1 formally characterizes the two perfect Bayesian equilibria that exist, depending on the sign of Δ_{S-E} defined in equation (19).

PROPOSITION 1: *Given Assumptions* 1 *to* 6, *the following perfect Bayesian equilibria exist. If* $\Delta_{S-E} \leq 0$, *then the top manager issues no debt, the divisional managers choose to influence if and only if the division is of type l, and the firm divests the division if and only if the division is of type l and the bidder is of type H.*

If $\Delta_{S-E} > 0$, *then the top manager issues risky short-term debt with face value* D_S^*, *the divisional managers choose not to influence, and the division is divested if and only if either the cash flow at time* 2 *is less than the face value of short-term debt or the division is of type l and the bidder is of type H.*

Proof: The proposition follows directly from the analysis in subsections II.*A* to II.*D*. Q.E.D.

Equation (19) reveals that under the first specification of influence activities, the capital structure choice is determined by two factors. The first determinant of the optimality of debt financing is the magnitude of the effect of influence activities on the probability of positive synergy divestitures. This is captured by the first term, $GI(1-\theta)$. The larger the values of G and I and the smaller the value of θ, the greater is the value-reducing effect of influence activities on firm value and hence the more advantageous risky short-term debt becomes.

The second factor that affects the optimality of debt financing is the cost of committing to negative synergy divestitures. This cost in turn depends on the size of the negative synergies when a high type division is sold, on the likelihood that only a negative synergy bidder will arrive, on the likelihood that the division is of high type, and on the likelihood that cash flows are insufficient. This decomposition facilitates the interpretation of the comparative statics summarized as Proposition 2.

PROPOSITION 2: *Short-term debt financing becomes (weakly) more advantageous when (i) the probability of a high-type bidder arriving,* Π_H, *increases, (ii) the effect of influence activities on firm value, I, increases, (iii) the prior probability that the division is of high type,* θ, *decreases, (iv) the manager's personal cost of influence relative to the cost of being divested,* z/K, *increases,*

and (*v*) *the probability of high-type* (*low-type*) *divisions generating cash flows,* λ_h (λ_l) *increases* (*decreases*).

Proof: The results in the proposition follow from partially differentiating equation (19) with respect to Π_H, I, θ, z/K, λ_h, and λ_l. Q.E.D.

III. Using Capital Structure to Control the Timing of Divisional Cash Flows

Section II analyzed the use of capital structure to control the divisional management's incentives to alter the likelihood of a profitable divestiture, with the type of the division known at the time of the divestiture decision. In this section we formalize the second specification of influence activities by which divisional managers attempt to affect the top management's perception of the division's unknown type.

The intuition that capital structure decisions change the influence incentives faced by divisional managers, and thereby alter the decisions made by top management, is robust to this alternative specification of influence activities. In contrast to the preceding section, however, we find that sometimes firms issue risky short-term debt to induce influence activities rather than exclusively to eliminate them. Furthermore, we find that, under this specification of influence activities, firms may find it optimal to issue collateralized long-term debt to commit not to divest.

We maintain the basic sequence of events developed in Section I, and maintain Assumptions 1 and 2 pertaining to the uniformity of the cash flow distributions and the linearity of influence costs. We alter the remaining assumptions about the functional forms of the parameters.

We replace Assumption 3 with:

ASSUMPTION 3′: *Two Types of Divisions. There are two types of divisions,* $t \in \{h, l\}$. *The unconditional probabilities of the division being of type h and l continue to be, respectively,* θ *and* $1 - \theta$.

We now assume that the top manager does not learn the division's type:

ASSUMPTION 4′: *Imperfect Information. The division's type does not become publicly known between times* 1 *and* 2.

We now assume the presence of only one bidder type:

ASSUMPTION 5′: *Efficiency Gains Due to Divestiture. There is one type of acquiring firm,* $T_L = T_H = T$. *Depending on the type of the division, the synergies are defined by* $G(T, l) = G$ *and* $G(T, h) = -G$. *The bidder arrives with probability one such that* $\Pi_T(i) = 1\ \forall i$.

We also redefine the influence activity specification:

ASSUMPTION 6′: *Discrete Influence Levels. The divisional manager's influence levels are restricted to be only zero or a positive level I, i.e.* $i \in \{0, I\}$. *The corresponding effect of influence activity on the probability of obtaining a*

positive cash flow is given by

$$\lambda_{t,i,2} = \lambda_t + i \tag{20}$$

and

$$\lambda_{t,i,3} = \lambda_t - ki \tag{21}$$

where $k > 1$ *reflects the inefficiency of altering the stream of cash flows. Assume that* $\lambda_h > \lambda_l$, *requiring that* $\lambda_h + I \leq 1$ *and* $\lambda_l - kI \geq 0$.

To facilitate the discussion of comparative statics below, we define the informativeness of a cash flow observation as the difference between the probability of observing a positive cash flow at time 2 generated by a division of type h minus the probability of observing a positive cash flow at time 2 generated by a division of type l, $\lambda_h\theta - \lambda_l(1 - \theta)$. As is apparent from equations (22) and (23) below, this expression is proportional to the difference between the posterior probabilities of a type h and a type l division, respectively, conditional on having observed a cash flow at time 2 and on conjecturing an influence level of zero.

Let $\theta(\hat{i}, F_2 > 0)$ and $\theta(\hat{i}, F_2 = 0)$ denote the posterior probabilities of the division being type h, upon observation of the time 2 cash flow F_2 and given conjectured influence level $\hat{i}$:

$$\theta\left(\hat{i}, F_2 > 0\right) = \frac{\theta\left(\lambda_h + \hat{i}\right)}{\bar{\lambda} + \hat{i}} \tag{22}$$

and

$$\theta\left(\hat{i}, F_2 = 0\right) = \frac{\theta\left(1 - \lambda_h - \hat{i}\right)}{1 - \bar{\lambda} - \hat{i}}, \tag{23}$$

recalling that $\bar{\lambda} = \lambda_l(1 - \theta) + \lambda_h\theta$.

Since it can be shown that $\theta(\hat{i} = I,\ F_2 = 0) \leq \theta(\hat{i} = 0,\ F_2 = 0) \leq \theta(\hat{i} = I,\ F_2 > 0) \leq \theta(\hat{i} = 0,\ F_2 > 0)$, five combinations of posterior probabilities of a division being of high type are possible. These are given in Table II.

Table II

All Possible Combinations of Posterior Probabilities of a Division Being a High Type

Posterior Probability of Type h	Case I	Case II	Case III	Case IV	Case V
$\theta(\hat{i} = I, F_2 = 0)$	< 0.5	< 0.5	< 0.5	< 0.5	≥ 0.5
$\theta(\hat{i} = 0, F_2 = 0)$	< 0.5	< 0.5	< 0.5	≥ 0.5	≥ 0.5
$\theta(\hat{i} = I, F_2 > 0)$	< 0.5	< 0.5	≥ 0.5	≥ 0.5	≥ 0.5
$\theta(\hat{i} = 0, F_2 > 0)$	< 0.5	≥ 0.5	≥ 0.5	≥ 0.5	≥ 0.5

Given Assumptions 3′ and 5′, the price that a bidder would pay for the division, as defined by equation (2), can be rewritten as

$$P(T_M|F_2, D_S, D_L) = E[\lambda_{t,i,3}|F_2, D_S, D_L]\int_0^\infty F_3\pi_3(F_3)\,dF_3 + G\left[1 - 2\theta\left(\hat{i}, F_2\right)\right].$$

Thus, it is optimal to divest if the posterior probability of the division being of type h, $\theta(\hat{i}, F_2)$, is less than 0.5.

Figure 1 contains a graphical representation of the five possible cases defined in Table II. In case I, it is always optimal to divest the division, since the posterior probability of the division being of high type is below 0.5 regardless of the observed cash flow or the conjectured influence level. In case II, posteriors are such that it is optimal to divest the division unless influence is conjectured to be zero and a positive cash flow has been observed. In case III, posteriors are such that it is optimal to divest the division upon observing that the time 2 cash flow is zero, while it is optimal to keep the division if a positive time 2 cash flow is observed. In case IV, if no influence activity is

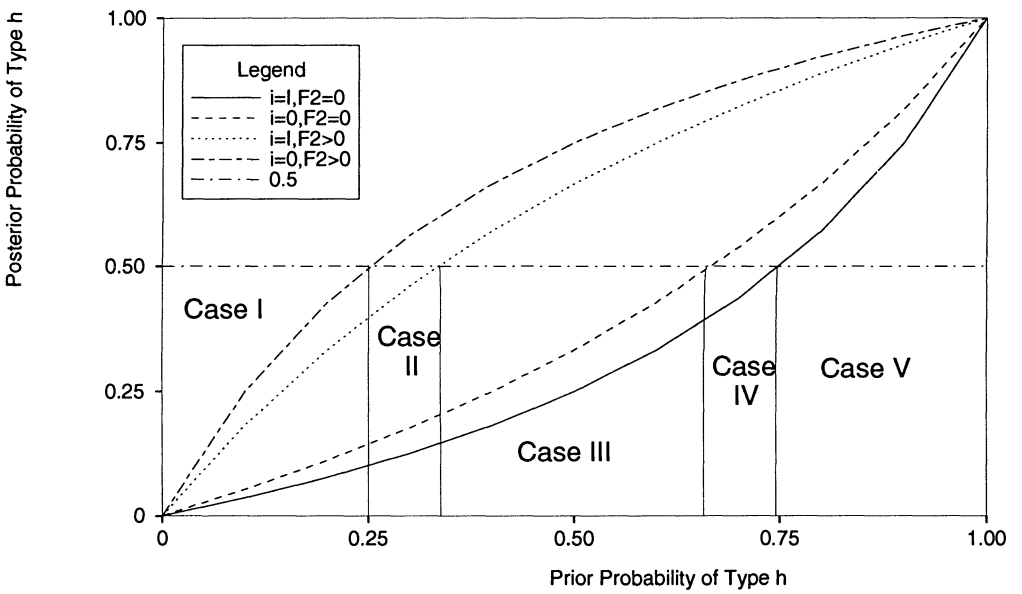

Figure 1. The posterior probability of a division being of high type, given conjectured influence level i, and observed cash flow F_2. Figure 1 represents the five possible cases for the model specification of Section III when $I = 0.2$, $\lambda_h = 0.6$, and $\lambda_l = 0.2$. Recall that it is optimal to divest a division when the posterior probability of a type h division is less than 0.5. In case I the prior probability of a division being of type h is sufficiently low so that it is always optimal to divest the division. In case II it is optimal to keep the division if and only if a positive cash flow is observed and a zero influence level is conjectured. In case III it is optimal to keep the division if a positive cash flow has been observed but it is optimal to divest the division after observing a zero cash flow. In case IV it is optimal to divest the division if and only if a zero cash flow is observed and a positive influence level has been conjectured. In case V it is never optimal to divest the division.

conjectured, then it is optimal to always keep the division, while if influence activities are conjectured, it is optimal to divest the division when no cash flow is observed at time 2. In case V, it is never optimal to divest the division, since the posterior probability of the division being of high type exceeds 0.5 regardless of the observed cash flow or conjectured influence level.

The following three comparative statics arise. First, note that the cases in Table II are ordered as an increasing function of θ, the prior probability of a type h division. As the prior probability of a type h division increases, it becomes increasingly likely that, for a given conjectured influence level and observed cash flow, the posterior probability of a type h division is more likely to exceed 0.5. This can be seen by comparing values of the posterior across any given row of the table.

Second, as the level of conjectured influence increases from zero to I for a given prior on θ and for an observed cash flow, the posterior probability of a type h is less likely to exceed 0.5.[18] This can be seen by comparing values of the posterior in case II when the observed cash flow is positive, or in case IV when the observed cash flow is zero.

Third, as the level of observed cash flow increases from zero to a positive level for a given prior, θ, and a conjectured influence level, the posterior probability of a type h is more likely to exceed 0.5. This can be seen by comparing values of the posterior in cases II or III when the conjectured influence level is zero, or in cases III or IV when the conjectured influence level is I.

There are three cases where the conjectured influence levels and observed cash flows may alter the divestiture decision, cases II, III, and IV. These cases identify the two main roles that debt can serve within this framework where divisional managers may influence the cash flow timing: debt can be used to reduce influence activities to diminish inefficiencies, or debt can be used to induce influence activities in order to generate information that top management will have available at time 2 to improve the divestiture decisions. Since cases II and III both demonstrate that debt can be used to reduce influence activities to diminish inefficiencies, we relegate the analysis of case II to the appendix, solving case III in subsection III.*A*. In subsection III.*B*, case IV demonstrates that debt can be used to induce influence activities in order to generate information. Furthermore, since cases I and V are straightforward, they are only discussed in the summary of all five cases, which is provided in subsection III.*C*.

[18] For example, note that the probability of being a type h division conditional on a zero time 2 cash flow is given by

$$\theta(\hat{i}, F_2 = 0) = \frac{\theta(1 - \lambda_h - \hat{i})}{\theta(1 - \lambda_h - \hat{i}) + (1 - \theta)(1 - \lambda_l - \hat{i})}.$$

Then it is easy to verify that $\dfrac{\partial \theta(\hat{i}, F_2 = 0)}{\partial i} < 0$, i.e., the higher the conjectured influence level, the lower is the probability that the division is of type h conditional on a zero time 2 cash flow.

A. Case III: The Use of Risky Short- and Long-Term Debt to Reduce Influence Activities

The conditions underlying case III can be rewritten as follows:

$$\theta\left(\hat{i}, F_2 > 0\right) \geq 0.5 \; \forall \hat{i} \tag{III.a}$$

and

$$\theta\left(\hat{i}, F_2 = 0\right) < 0.5 \; \forall \hat{i} \tag{III.b}$$

In case III, θ may be either less than, equal to, or greater than 0.5, implying that $(2\theta - 1)$ is of ambiguous sign. Condition (III.a) guarantees that the expression defined as the informativeness of a cash flow observation, $\lambda_h\theta - \lambda_l(1 - \theta)$, is always nonnegative.

To examine the role of capital structure in the presence of influence activities, we derive the value of the firm under the three alternative capital structures.

A.1. The Value of an Equity-Financed Firm

We first examine the value of a firm with no risky debt outstanding. Given conditions (III.a) and (III.b), an equity-financed firm divests the division if and only if a zero cash flow has been observed. The divisional manager's expected utility is then given by

$$E[U(t, i)] = W - K[1 - \lambda_t - i] - zi. \tag{24}$$

It follows from equation (24) that the divisional manager will optimally exert influence of level $i = I$, since $z < K$. The probabilities of a positive cash flow realization at times 2 and 3 are therefore given as $\lambda_{t,i,2} = \lambda_t + I$ and $\lambda_{t,i,3} = \lambda_t - kI$.

The time 0 value of the all-equity firm is given by

$$V_E = \left(\bar{\lambda} - \frac{I(k-1)}{2}\right)M + (1 - \bar{\lambda} - I)G\left[1 - 2\theta\left(\hat{i} = I, F_2 = 0\right)\right] + 2F_r.$$

Substitution and simplification yields

$$V_E = \left(\bar{\lambda} - \frac{I(k-1)}{2}\right)M + G[(1 - 2\theta)(1 - I) + (\lambda_h\theta - \lambda_l(1 - \theta))] + 2F_r. \tag{25}$$

A.2. The Value of a Firm with Risky Short-Term Debt

We next consider the choice of issuing risky short-term debt of face value D_S. The probability of divestiture can then be decomposed into the probability that the nth division realizes a zero cash flow plus the probability that even though the nth division realizes a positive cash flow, the cash flows generated by the n divisions collectively are insufficient to pay the face value of the

debt. The divisional manager's expected utility is therefore given by

$$E[U(t,i)] = W - K\left[1 - (\lambda_t + i)\left(1 - \frac{D_S - F_r}{M}\right)\right] - zi. \tag{26}$$

Differentiating equation (26) with respect to i reveals that the divisional manager prefers to set $i = I$ if $D_S < D_S^{**}$, given by

$$D_S^{**} = F_r + M\left(1 - \frac{z}{K}\right). \tag{27}$$

If $D_S = D_S^{**}$ then the manager is indifferent and assumed not to influence. As in the previous analysis, an increase of debt beyond the critical level has no incremental effect on influence activities. Moreover, any amount of debt below D_S^{**} leads to the positive level of influence. Clearly, therefore, the firm either issues no risky debt and the divisional manager chooses to influence, or it issues the amount D_S^{**} and no influence activities take place.

Recall that under the specifications of this example the price a bidder would pay at time 2 for a type l division, $P_l(T, |F_2, D_S, 0)$, is

$$P_l(T|F_2, D_S, 0) = E[\lambda_{l,i,3}|F_2, D_S, 0]\frac{M}{2} + G, \tag{28}$$

while the price a bidder would pay for a type h division, $P_h(T|F_2, D_S, 0)$, is

$$P_h(T|F_2, D_S, 0) = E[\lambda_{h,i,3}|F_2, D_S, 0]\frac{M}{2} - G. \tag{29}$$

The time 0 value of a firm with risky short-term debt of face value D_S^{**}, conditional on the divisional manager not influencing, is

$$\begin{aligned} V_S = {} & \bar{\lambda}M + (1 - \bar{\lambda})G\left[1 - 2\theta\left(\hat{i} = 0, F_2 = 0\right)\right] \\ & + \bar{\lambda}G\frac{K - z}{K}\left[1 - 2\theta\left(\hat{i} = 0, F_2 > 0\right)\right] + 2F_r. \end{aligned} \tag{30}$$

Substituting for $\theta(\cdot)$ and simplifying yields

$$V_S = \bar{\lambda}M + G\left[1 - 2\theta + \frac{z}{K}(\lambda_h\theta - \lambda_l(1 - \theta))\right] + 2F_r. \tag{31}$$

A.3. The Value of a Firm with Collateralized Long-Term Debt

Finally, we consider the choice of collateralized long-term debt. Since for any risky level of long-term debt the probability of divestiture is zero, divisional managers optimally incur zero influence costs such that $i = 0$. Thus, the value of the firm with risky long-term debt is given by

$$V_L = \bar{\lambda}M + 2F_r. \tag{32}$$

A.4. Equilibrium Capital Structure in Case III

To determine the optimal capital structure chosen by the firm, we need to compare the value of a firm that issues long-term debt wherein the divisional managers choose not to influence, to the value of a firm that issues risky short-term debt of face value D_S^{**} wherein the divisional managers choose not to influence, and to the value of an all-equity firm wherein the divisional managers choose to influence. From equations (25), (31), and (32) it follows that

$$V_S - V_L \equiv \Delta_{S-L} = G\left[1 - 2\theta + \frac{z}{K}(\lambda_h\theta - \lambda_l(1-\theta))\right], \tag{33}$$

$$V_S - V_E \equiv \Delta_{S-E} = \frac{I(k-1)M}{2} + G\left[(1-2\theta)I - \left(1 - \frac{z}{K}\right)(\lambda_h\theta - \lambda_l(1-\theta))\right], \tag{34}$$

and

$$V_L - V_E \equiv \Delta_{L-E} = \frac{I(k-1)M}{2} + G[(1-2\theta)(I-1) - (\lambda_h\theta - \lambda_l(1-\theta))]. \tag{35}$$

Proposition 3 formally characterizes the three perfect Bayesian equilibria that exist, depending on the signs of Δ_{S-L}, Δ_{S-E}, and Δ_{L-E} defined in equations (33), (34), and (35).

PROPOSITION 3: *Given Assumptions* 1, 2, *and* 3′ *to* 6′, *and conditions* (*III.a*) *and* (*III.b*), *the following perfect Bayesian equilibria exist. If* $\Delta_{S-E} \leq 0$ *and* $\Delta_{L-E} \leq 0$, *then the top manager issues no debt, the divisional managers choose to influence, and the division is divested if and only if the time* 2 *cash flow is zero.*

If $\Delta_{S-L} \geq 0$ *and* $\Delta_{S-E} \geq 0$, *then the manager issues risky short-term debt with face value* D_S^{**}, *the divisional managers choose not to influence, and the division is divested if and only if the cash flow at time* 2 *is less than the face value of short-term debt.*

If $\Delta_{S-L} \leq 0$ *and* $\Delta_{L-E} \geq 0$, *then the manager issues risky long-term debt, the divisional managers choose not to influence, and the division is never divested.*

Proof: The proposition follows directly from the analysis in subsection III.*A*. Q.E.D.

Equations (34) and (35) reveal that the optimality of debt financing is determined by two factors. The first determinant is the magnitude of the effect of influence costs on firm value. This is captured by the first term in both equations, $(I(k-1)M)/2$. The larger the values of k, I and M, the

larger is the value-reducing effect of influence activities on firm value and the more advantageous debt becomes.

The second factor that affects the optimality of debt financing is the cost of committing to divestiture decisions. This cost depends on the difference in the valuation of the division's assets by the firm and the bidder, given the division's type, and on the informativeness of a cash flow observation, defined above as the difference between the probabilities of observing a cash flow generated by a division of type h and type l respectively.

To understand the firm's choice between risky short- and long-term debt we focus on equation (33). Since influence levels in both cases are zero, the difference between the firm values with risky short- and long-term debt is only due to different divestiture decisions. In the case of long-term debt, divestiture never occurs, whereas in the case of risky short-term debt, the division is divested if and only if the time 2 cash flow is less than D_S^{**}. Equation (33) therefore reduces to the expected gain or loss due to divestitures of a firm with short-term debt. This gain or loss can be decomposed into two parts. The first term, $G(1 - 2\theta)$, represents the expected gain or loss realized when the division is divested with certainty. Since the firm with risky short-term debt keeps the division in the solvency states, the second term, $G(z/K)(\lambda_h\theta - \lambda_l(1 - \theta))$, represents the adjustment for keeping the division in these states. The larger the value of z and the smaller the value of K, the lower the required face value of risky debt, and the more significant this adjustment becomes. Intuitively, if a small amount of short-term debt is sufficient to drive influence costs to zero, the firm can keep the division in most states with positive cash flows, making short-term debt more advantageous. This decomposition facilitates the interpretation of the comparative statics summarized as Proposition 4.

PROPOSITION 4: *Equity financing becomes more advantageous relative to debt financing (both short- and long-term) when (i) the effect of influence activities on firm value, $(I(k - 1)M)/2$, decreases, and (ii) the informativeness of a cash flow observation, $\lambda_h\theta - \lambda_l(1 - \theta)$, increases. Short-term debt financing becomes more advantageous relative to long-term debt financing when (i) the prior probability of the division being of type h, θ, decreases, (ii) the ratio of the manager's personal cost of influence activities to the cost of being laid off, z/K, increases, and (iii) the informativeness of a cash flow observation, $\lambda_h\theta - \lambda_l(1 - \theta)$, increases.*

Proof: The results follow from partially differentiating equations (33), (34), and (35) with respect to $(I(k - 1)M)/2$, G, θ, z/K, and $\lambda_h\theta - \lambda_l(1 - \theta)$. Q.E.D.

B. Case IV: The Use of Risky Short-Term Debt to Generate Information

The conditions underlying case IV can be rewritten as follows:

$$\theta\left(\hat{i} = 0, F_2 > 0\right) \geq 0.5 \qquad \text{(IV.a)}$$

and

$$\theta(\hat{i}, F_2 = 0) = \begin{cases} \geq 0.5 & \text{if } \hat{i} = 0 \\ < 0.5 & \text{if } \hat{i} = I \end{cases} \quad \text{(IV.b)}$$

In case IV, θ always exceeds 0.5, ensuring both that $(2\theta - 1)$ is always positive, and that the expression of the informativeness of a cash flow observation, $\lambda_h\theta - \lambda_l(1 - \theta)$, is always positive.

To examine the role of capital structure, we again derive the value of the firm under the three alternative capital structures.

B.1. The Value of an Equity-Financed Firm

We first examine the value of a firm when it has no risky debt outstanding. Given the parameter values in case IV, managers of an equity-financed firm choose not to influence, since they correctly anticipate that the division will never be divested. Thus, the value of an equity-financed firm is given by

$$V_E = \bar{\lambda}M + 2F_r. \quad (36)$$

B.2. The Value of a Firm with Risky Short-Term Debt

If the firm issues risky short-term debt, the divisional manager's expected utility is defined by equation (26). It can be verified that if the face value of debt is in the range $F_r + M\left(1 - \frac{z}{K}\right) > D_S \geq F_r$, then equation (26) implies that the divisional manager optimally exerts influence of level $i = I$. Note that, if influence activities are chosen so that $i = I$, then, since $\theta(\hat{i} = I, F_2 = 0) < 0.5$, it is ex post optimal to sell the division conditional on observing a zero cash flow.

In contrast to the effects in previous sections, short-term debt here induces, rather than diminishes, the influence incentives of the divisional manager. The prior probability of a high-type division in this case is sufficiently high that, without influence activities, the division would never be divested. However, a zero cash flow becomes especially informative of a low-type division when positive levels of influencing are chosen. Hence, it may be desirable for the top manager to create incentives for influencing, despite accompanying inefficiencies, to improve the information available at the time of the divestiture decision.

The value of a firm with risky short-term debt of face value D_S is

$$V_S = \left(\bar{\lambda} - \frac{I(k-1)}{2}\right)M + (1 - \bar{\lambda} - I)G\left[1 - 2\theta\left(\hat{i} = I, F_2 = 0\right)\right] + (\bar{\lambda} + I)\frac{D_S - F_r}{M}G\left[1 - 2\theta\left(\hat{i} = I, F_2 > 0\right)\right] + 2F_r. \quad (37)$$

Equation (37) decomposes the firm value into the expected cash flows generated by the remaining $n - 1$ divisions (the last term) plus the expected cash flows generated by the nth division (all the remaining terms), consisting of the expected cash flows if the division is kept (the first term) plus the

expected gains from divestiture (the second and third terms). The second term reflects the expected gain from selling the division after a zero cash flow has been observed at time 2. This event occurs with probability $(1 - \bar{\lambda} - I)$. With probability $\bar{\lambda} + I$, a positive cash flow is observed at time 2. Given the parameterization of case IV, the division is then only sold if financial distress forces the firm to do so. This occurs with probability $(D_S - F_r)/M$. Since the gain from selling the division after observing a positive time 2 cash flow is negative, the optimal amount of risky short-term debt is either zero or equal to the lowest amount that makes debt risky, which is F_r.[19] In this case the second to last term in equation (37) reduces to zero. Substitution and simplification yields

$$V_S = \left(\bar{\lambda} - \frac{I(k-1)}{2}\right)M + G[(1 - \lambda_l - I)(1 - \theta) - (1 - \lambda_h - I)\theta]. \quad (38)$$

Note that the term premultiplied by G is the difference between the probability of a division being of type l and not generating a positive cash flow and the probability of the division being of type h and not generating a positive cash flow. Thus, analogously to the expression $\lambda_h\theta - \lambda_l(1 - \theta)$, which was defined as the informativeness of a nonzero cash flow observation, we refer to this expression as the informativeness of a zero cash flow.[20] It is easy to see that condition (IV.b) implies that this expression is positive.

B.3. The Value of a Firm with Collateralized Long-Term Debt

Given the parameterization of this subsection, it cannot be optimal for a firm to issue risky long-term debt. Recall that the motive for issuing long-term debt is to commit the firm not to divest. In this case a firm without risky debt never divests anyway, making long-term debt redundant.

B.4. Equilibrium Capital Structure in Case IV

To determine the optimal capital structure chosen by the firm, we need to compare the value of a firm that issues risky short-term debt of face value F_r wherein the divisional managers choose to influence, to the value of an all-equity firm wherein the divisional managers choose not to influence. From equations (36) and (38) it follows that

$$\Delta_{S-E} = V_S - V_E = -\frac{I(k-1)M}{2} + G[(1 - \lambda_l - I)(1 - \theta) - (1 - \lambda_h - I)\theta]. \quad (39)$$

Proposition 5 formally characterizes the two perfect Bayesian equilibria that exist, depending on the sign of Δ_{S-E} defined in equation (39).

[19] Unnecessary notation is again avoided by assuming that a face value of F_r is sufficient to make short-term debt risky. More precisely, the set of admissible face values for which short-term debt is risky is an open interval with its infimum equal to F_r.

[20] Note that the difference between the two expressions equals $(1 - 2\theta)(1 - I)$.

PROPOSITION 5: *Given Assumptions* 1, 2, *and* 3′ *to* 6′, *and conditions* (*IV.a*) *and* (*IV.b*), *the following perfect Bayesian equilibria exist. If* $\Delta_{S-E} > 0$, *then the firm issues risky short-term debt with face value* F_r, *the divisional managers choose to influence, and the firm divests the division if and only if the time* 2 *cash flow is less than or equal to the face value of short-term debt.*

If $\Delta_{S-E} \leq 0$, *then the firm does not issue risky debt, the divisional managers choose not to influence, and the firm never divests.*

Proof: The proposition follows directly from the analysis in subsections III.*B*.1 to III.*B*.4. Q.E.D.

Equation (39) reveals that the optimal capital structure is again determined by the two factors discussed in subsection III.*A*, namely the magnitude of the effect of influence costs on firm value and the cost of committing to divestiture decisions. However, the effect of these factors on the desirability of debt is now reversed. Previously, the larger the value reduction due to influence activities, the more advantageous was debt. By contrast, in case IV a larger value reduction due to influence activities makes debt less advantageous. This is because issuing risky short-term debt creates rather than mitigates influence incentives.

Furthermore, in case III, committing to divestitures was costly since it forced the firm to make suboptimal divestitures in some states. By contrast, in case IV the forced divestitures after a zero cash flow realization are optimal ex post. Debt commits the firm to divest when a zero cash flow occurs, inducing influence activities which in turn make the divestiture optimal. Thus, if the difference between the valuation of the division's assets by the firm and the bidder, G, increases, debt becomes more advantageous. Similarly, if the division's type can be assessed more accurately after a zero cash flow has been observed, if $(1 - \lambda_l - I)(1 - \theta) - (1 - \lambda_h - I)\theta$ increases, debt becomes more advantageous. While being able to assess the division's type more accurately after the cash flow observation increased the cost of forced divestitures and therefore made debt less advantageous in case III, in case IV being better able to assess the division type increases the benefit from divesting after a zero cash flow and thus makes debt more advantageous. This decomposition facilitates the interpretation of the comparative statics summarized as Proposition 6.

PROPOSITION 6: *Equity financing becomes more advantageous relative to short-term debt financing when* (*i*) *the effect of influence activities on firm value,* $(I(k - 1)M)/2$, *increases,* (*ii*) *the difference in the valuation of the division's assets when used within or outside the firm,* G, *decreases and* (*iii*) *the informativeness of a zero cash flow observation,* $(1 - \lambda_l - I)(1 - \theta) - (1 - \lambda_h - I)\theta$, *decreases.*

Proof: The results follow from partially differentiating equation (39) with respect to $(I(k - 1)M)/2$, G, and $(1 - \lambda_l - I)(1 - \theta) - (1 - \lambda_h - I)\theta$. Q.E.D.

C. Summary of Results: Using Capital Structure to Control the Timing of Divisional Cash Flows

We can now summarize the results of Section III. We find that the firm's capital structure choice depends crucially on the top management's prior assessment of the type of the division under consideration. If the top management expects that it will become optimal to always sell the division at time 2, as is true in case I, then the firm would be indifferent between equity- and short-term debt financing. Influence costs are not incurred, since the divisional managers recognize that any attempt to change future divestiture decisions is futile. For such a firm it is suboptimal, however, to restrict the firm's future ability to divest by issuing collateralized long-term debt restricting asset sales.

If the top manager expects that it will become optimal to sell the division at time 2 with a probability that is significant but less than one, then the optimal capital structure can consist of equity, risky short- or long-term debt. This characterizes cases II, III, and IV. In cases II and III, both risky short- and long-term debt can be used to eliminate the incentives to influence. This is optimal if influence activities result in large reductions in the value of the firm, if the possible gains from selling a division of known type are low, and if the top management is ex post unable to distinguish well between a division that should be sold and one that is optimal to keep.

The decision between short- and long-term debt depends on the top manager's prior probability that the division is of a type that is optimal to sell, on the effectiveness of short-term debt in discouraging influence activities, and on the expected synergies. The higher the prior probability that divestiture is optimal, the less advantageous long-term debt becomes, since it commits the firm not to divest. Furthermore, if the divisional managers' personal costs of influencing are low and the personal costs of divestiture are high, then a high level of short-term debt is required to eliminate the incentives to influence, making short-term debt relatively less attractive. Finally, if the expected gain from selling the division after a low cash flow realization is low, then the cost of long-term debt due to committing the firm not to divest is low, making long-term debt relatively more advantageous.

If the top manager's prior probability of the division being of a type that should be sold is sufficiently low, then a firm without risky debt would never divest and, consequently, divisional managers would never influence. Issuing a moderate amount of risky short-term debt makes credible that, with some probability, the division will be divested and thus creates influence incentives. As shown in case IV, this may be optimal despite the less efficient investment behavior it generates, since influence activities change the information content of cash flow realizations. Specifically, for a higher level of influence activities, a zero cash flow becomes more indicative of a division that should optimally be divested. Thus, influence activities can improve the firm's divestiture decisions. If the influence costs are low and if influence activities make low cash flows significantly more indicative of a low type

division, then the firm optimally issues risky short-term debt. Compared to cases II and III, however, the optimal amount of risky debt is lower.

Finally, if the top manager expects that it will never be optimal to sell the division, as is true in case V, then the firm is indifferent between equity and long-term debt. However, it would be suboptimal to issue risky short-term debt since this would create influence incentives and force the firm to sometimes make suboptimal divestiture decisions.

IV. Conclusions

This paper examines how a firm's capital structure can be used to control influence costs in the presence of intrafirm influence activities. As emphasized in Milgrom (1988) and Milgrom and Roberts (1990), influence activities undertaken by agents seeking to secure quasi rents may be costly both directly and in their obstruction of hierarchical decision making. This model focuses on a situation in which the incentives to influence may be especially acute: top management must decide whether or not to divest a division, in which case divisional managers and employees expect to lose quasi rents that they currently earn. It demonstrates that the term structure of debt can alter the benefits of influence activities by affecting the firm's divestiture decisions: risky short-term debt by committing the firm to liquidate divisions in the event of low cash flow realizations, and collateralized long-term debt by making it more expensive for the firm to liquidate divisional assets. By its impact on the level of influence activities chosen, the choice of a particular debt structure may therefore lead, ex ante, to a more efficient outcome. However, the commitments inherent in debt also force top management to sometimes either sell divisions that would, ex post, be optimal to keep or to keep divisions that would, ex post, be optimal to divest. Hence, there emerges an optimal capital structure that trades off the costs of influence activities against the costs of making poor divestiture decisions.

We find that equity or long-term debt financing is optimal for growing firms for which the probability of divestiture is essentially zero. For these firms influence activities are not significant. Firms with a positive probability that a divestiture might become optimal may issue equity, risky short- or collateralized long-term debt. Risky short-term debt may be issued for two opposite reasons. First, firms for which the inefficiencies due to divisional influence activities are relatively low but the information generated by influence activities is especially valuable may issue moderate amounts of risky short-term debt to induce influence activities.

Alternatively, firms for which there is a significant probability of a divestiture even without debt might want to issue a high amount of risky short-term debt to reduce the top manager's discretion over future divestiture decisions. This may be advantageous for the firm if there is a high prior probability that divestiture of the division will be optimal, if the costs to the firm of influence activities are high, and if the costs to the firm of forced divestiture during financial distress are low.

Firms for which there is an intermediate or low probability that divestiture of a division will become optimal may issue long-term debt with a covenant preventing the sale of corporate assets. In this case long-term debt decreases or eliminates the firm's incentives to divest, thereby mitigating potential influence activities. This may be advantageous for the firm when the resulting improvement of the investment decisions made by the divisional managers more than offsets the costs associated with foregone divestiture opportunities. Finally, equity or short-term debt financing is optimal for firms for which the probability of divestiture approaches one.

In this paper, the role of capital structure in managing intrafirm influence activities arises because capital structure restricts future divestiture decisions. Consider, for example, the role of short-term debt. Since firms in financial distress cannot obtain new financing at low cost, assets are optimally divested that would be kept by a firm not in financial distress. This assumption seems to confirm well with empirical evidence in Asquith, Gertner, and Scharfstein (1992). However, the main intuition of our analysis could also be obtained from a model in which capital structure can be renegotiated at time 2. This can be seen as follows. Suppose that once in financial distress, control of the firm shifts to bondholders. For simplicity assume that divisional managers and employees have no bargaining power in the default renegotiations with bondholders. In such a situation, bondholders could approach the divisional managers and seek concessions to prevent the divestiture of the division's assets whenever it is ex post optimal to keep the division. Bondholders could then obtain concessions from divisional managers equal to the rents that they would have earned otherwise. In this case, there would be no inefficient divestitures, but the effects of short-term debt on managerial influence activities would be identical to those presented in this model.

Furthermore, while the context of a divestiture decision illustrates one motivation for influence activities, the intuition underlying the results of this paper carries over to other situations in which capital structure can also be chosen to control influence activities that arise under less extreme motivations to influence. Generally, we would expect that capital structure can be used more efficiently in managing a divisional manager's influence incentives if the division is financially more independent. This may be one motive underlying the issuance of securities linked only to divisional performance, such as those envisioned by GM and IBM.

The simple model presented in this paper could easily be extended in several other directions. First, the cash flows generated by the remaining divisions could be made stochastic. Second, the model could allow for more than one division that could be divested, possibly creating even more incentives to influence top management's decisions. Third, the current analysis focuses on a simplified capital structure, namely short- and long-term debt and equity. Presumably, more complex financial structures could be implemented to fine tune the effects of capital structure on influence incentives and divestiture decisions. Finally, the analysis assumes that the top manage-

ment's objective is to maximize the total value of the firm. More generally, the compensation schedule of the top management could be used to further mitigate the total cost of influence activities and suboptimal divestiture decisions. While these questions are interesting and may result in more precise predictions, we expect that our main conclusions are robust to these extensions.

Appendix: Case II: The Use of Risky Short- and Long-Term Debt to Reduce Influence Activities

The conditions underlying case II can be rewritten as follows:

$$\theta\left(\hat{i}, F_2 > 0\right) = \begin{cases} \geq 0.5 & \text{if } \hat{i} = 0 \\ < 0.5 & \text{if } \hat{i} = I \end{cases} \tag{II.a}$$

and

$$\theta\left(\hat{i}, F_2 = 0\right) < 0.5 \; \forall \hat{i} \tag{II.b}$$

In case II, θ is always less than 0.5, ensuring that $(2\theta - 1)$ is always negative. Condition (II.a) guarantees that the expression of the informativeness of a cash flow observation, $\lambda_h\theta - \lambda_l(1 - \theta)$, is always nonnegative.

To examine the role of capital structure, we again derive the value of the firm under the three alternative capital structures.

A. *The Value of an Equity-Financed Firm*

We first examine the value of a firm when it has no risky debt outstanding. First, we show that there is no pure strategy equilibrium. To see this, suppose that the top manager conjectures that the zero influence level is chosen by the divisional manager. Then the division is not divested after a positive cash flow realization and the divisional manager's expected utility is

$$E[U(t,i)] = W - K[1 - \lambda_t - i] - zi. \tag{40}$$

Since $z < K$, the divisional manager would optimally choose to influence, $i = I$, contradicting the top manager's conjecture.

Suppose alternatively that the top manager conjectures that the positive influence level is chosen by the divisional manager. Then it is optimal to always divest the division and the divisional manager's expected utility is

$$E[U(t,i)] = W - K - zi. \tag{41}$$

The divisional manager therefore chooses not to influence, $i = 0$, contradicting the top manager's conjecture.

We now derive mixed strategies for both the top and divisional managers, considering in turn the divestiture and influence decisions. Observe that in case II it is always optimal to divest, regardless of conjectured influence levels, when the observed cash flow level is zero. By contrast, after observing a positive cash flow the optimal divestiture decision depends on the conjec-

tured influence. We define Π_D as the probability with which the division is divested when a positive cash flow is observed. The total probability of divestiture is then given by $1 - \lambda_t - i + (\lambda_t + i)\Pi_D$. This allows us to rewrite the divisional manager's expected utility as

$$E[U(t,i)] = W - K[1 - \lambda_t - i + (\lambda_t + i)\Pi_D] - zi. \tag{42}$$

The equilibrium requires that the divisional manager be indifferent between influencing and not, so that $E[U(t,0)] = E[U(t,I)]$. Using equation (42), this condition defines the equilibrium probability of divestiture, Π_D^*, to be

$$\Pi_D^* = 1 - \frac{z}{K}. \tag{43}$$

The time 0 value of the all-equity firm is given by

$$V_E = \bar{\lambda}M - \frac{I\pi_i(k-1)M}{2} + (1 - \bar{\lambda} - I\pi_i)G\left[1 - 2\theta\left(\hat{i} = I, F_2 = 0\right)\right] + \Pi_D(\bar{\lambda} + I\pi_i)G\left[1 - 2\theta\left(\hat{i} = I, F_2 > 0\right)\right] + 2F_r, \tag{44}$$

where π_i is defined to be the probability that the divisional manager chooses to influence.

For the top manager to be indifferent as to whether to divest after a positive cash flow realization requires $G[1 - 2\hat{\theta}(\hat{i} = I,\ F_2 > 0)] = 0$. This defines π_i^*, the equilibrium probability that the divisional manager chooses to influence, to be

$$\pi_i^* = -\frac{\lambda_h\theta - \lambda_l(1-\theta)}{(2\theta - 1)I}. \tag{45}$$

Substituting for π_i^* in equation (44) and simplifying yields

$$V_E = \left(\bar{\lambda} + \frac{(k-1)(\lambda_h\theta - \lambda_l(1-\theta))}{2(2\theta - 1)}\right)M - G[2\theta - 1] + 2F_r. \tag{46}$$

B. The Value of a Firm with Risky Short-Term Debt

We next consider the choice of issuing short-term risky debt of face value $D_S < D_S^{**}$ where, as before, $D_S^{**} = F_r + M(1 - \frac{z}{K})$. We demonstrate that, for these face values, we obtain a mixed strategy equilibrium and the resulting firm value is identical to that under equity financing. We continue to define π_i and Π_D, respectively, as the probability of choosing a positive influence level and the probability of divesting when a positive cash flow is observed, though the equilibrium value of Π_D will differ from the one in subsection A. For the divisional manager to be indifferent between influencing and not influencing requires $E[U(t,0)] = E[U(t,I)]$. Using equation (42), the man-

ager's expected utility is given by

$$E[U(t,i)] = W - K\left[1 - \lambda_t - i + (\lambda_t + i)\left(\Pi_D + (1 - \Pi_D)\frac{D_S - F_r}{M}\right)\right] - zi, \tag{47}$$

which implies an equilibrium value for Π_D^{**} equal to

$$\Pi_D^{**} = 1 - \frac{Mz}{K(M - D_S + F_r)}. \tag{48}$$

Note that if the face value of debt is F_r, this reduces to the value of Π_D^*, given in the all-equity case.

The time 0 value of the firm with risky short-term debt of face value D_S is given by

$$\begin{aligned} V_S = \bar{\lambda}M + \frac{I\pi_i^*(1-k)M}{2} + \left(1 - \bar{\lambda} - I\pi_i^*\right)G\left[1 - 2\theta\left(\hat{i} = I, F_2 = 0\right)\right] \\ + \left(\Pi_D^{**} + (1-\Pi_D^{**})\frac{D_S - F_r}{M}\right)\left(\bar{\lambda} + I\pi_i^*\right)G\left[1 - 2\theta\left(\hat{i} = I, F_2 > 0\right)\right] \\ + 2F_r, \end{aligned} \tag{49}$$

where π_i^* will again in equilibrium be defined by equation (45).

Substituting for π_i^* and simplifying yields V_S identical to V_E given in equation (46). That the value of the firm is independent of the chosen level of risky short-term debt as long as $D_S < D_S^{**}$ can be understood as follows. First, recall that the equilibrium influence probability π_i^* is independent of the face value of short-term debt. Second, in equilibrium the top manager is indifferent between divesting and not divesting after observing a positive cash flow. Thus, influence activities do not change with a change in the level of short-term debt, and a change in the divestiture decisions after a positive cash flow has no affect on firm value. Clearly, therefore, a change in the face value of debt is irrelevant to firm value.

We now derive the firm value for face values of short-term debt $D_S \geq D_S^{**}$. Note that equation (47) implies that $E[U(t,0)] \geq E[U(t,I)]$ for all $\Pi_D \geq 0$ so that the divisional manager optimally chooses not to influence. Thus, for $D_S \geq D_S^{**}$ a mixed strategy equilibrium is no longer feasible. Given the zero influence level, the top manager keeps the division if the cash flow is high enough to repay the debt. Since any increase in the debt level above D_S^{**} does not change the influence level but restricts the firm's future divestiture decisions, it is optimal to either issue no risky short-term debt or to issue risky short-term debt with face value D_S^{**}. In the latter case the value of the firm is given by

$$V_S = \bar{\lambda}M - G\left[2\theta - 1 - \frac{z}{K}(\lambda_h\theta - \lambda_l(1-\theta))\right] + 2F_r. \tag{50}$$

C. The Value of a Firm with Collateralized Long-Term Debt

We next consider the choice of collateralized long-term debt. Since for any risky level of long-term debt the probability of divestitures is zero, divisional managers optimally incur zero influence costs such that $i = 0$. Thus, the value of the firm with risky long-term debt is given by

$$V_L = \bar{\lambda}M + 2F_r. \tag{51}$$

D. Equilibrium Capital Structure in Case II

To determine the optimal capital structure chosen by the firm, we need to compare the value of a firm with risky long-term debt wherein the divisional managers choose not to influence, to the value of an all-equity firm, and to the value of a firm that issues risky short-term debt with face value D_S^{**} (recall that for any risky debt level $D_S < D_S^{**}$ we have $V_E = V_S$). From equations (46), (50) and (51) it follows that

$$V_S - V_L \equiv \Delta_{S-L} = -G\left[2\theta - 1 - \frac{z}{K}(\lambda_h\theta - \lambda_l(1-\theta))\right], \tag{52}$$

$$V_S - V_E \equiv \Delta_{S-E} = -\frac{(k-1)(\lambda_h\theta - \lambda_l(1-\theta))}{2(2\theta - 1)} + G\left[\frac{z}{K}(\lambda_h\theta - \lambda_l(1-\theta))\right] \tag{53}$$

and

$$V_L - V_E \equiv \Delta_{L-E} = -\frac{(k-1)(\lambda_h\theta - \lambda_l(1-\theta))}{2(2\theta - 1)} + G[2\theta - 1]. \tag{54}$$

Proposition 7 formally characterizes the three perfect Bayesian equilibria that exist, depending on the signs of Δ_{S-L}, Δ_{S-E}, and Δ_{L-E} in equations (52), (53), and (54).

PROPOSITION 7: *Given Assumptions* 1, 2, *and* 3′ *to* 6′, *and conditions* (*II.a*) *and* (*II.b*), *the following perfect Bayesian equilibria exist. If* $\Delta_{S-E} < 0$ *and* $\Delta_{L-E} \leq 0$, *then the firm issues no debt, the divisional managers choose to influence, and the division is divested if and only if the time* 2 *cash flow is zero.*

If $\Delta_{S-E} = 0$ *and* $\Delta_{L-E} \leq 0$, *then the firm is either equity financed or it issues debt with face value less than* D_S^{**}, *the divisional managers choose to influence with positive probability and the division is sold if the cash flow at time* 2 *is less than the face value of short-term debt and with positive probability if the cash flow at time* 2 *is greater or equal to the face value of short-term debt.*

If $\Delta_{S-L} \geq 0$ *and* $\Delta_{S-E} \geq 0$, *then the manager issues risky short-term debt with face value* D_S^{**}, *the divisional managers choose not to influence, and the*

division is divested if and only if the cash flow at time 2 is less than the face value of short-term debt.

If $\Delta_{S-L} \leq 0$ *and* $\Delta_{L-E} \geq 0$, *then the manager issues risky long-term debt, the divisional manager chooses not to influence, and the division is never divested.*

Proof: The proposition follows directly from the analysis in the Appendix. Q.E.D.

The interpretations of this proposition and its corresponding comparative statics are similar to case III in subsection III.*A* and are therefore omitted.

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