Capital and Ownership Structures, and the Market for Corporate Control

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I analyze optimal capital and ownership structures as resulting from anticipated future control contests. I focus on leverage as a device that enables the incumbent management to extract the maximum value from the rival. I show that firm value depends on both capital and ownership structures. The analysis leads to the following predictions: (i) more efficient managers use less debt, (ii) firms facing better rivals for control issue more debt, and (iii) firms with supermajorlty rules issue less debt. Several predictions are consistent with known empirical regularities.

In the 1980s there was a dramatic increase in both the degree of financial leverage used by U.S. corporations and the level of activity in the market for corporate control.[1] In the beginning of the 1990s, we

[1] dedicate this article to the memory of my teacher and dear friend, Daniel R. Siegel, from whom I learned a great deal about financial economics, research, and other important aspects of life. Dan's direct input and inspiration are well reflected in this article. I wish to thank Artur Raviv for his guidance and assistance in writing this article, and Laurie Bagwell. Elazar Berkovitch, David Brown, Harry DeAngelo, Mike Fishman, Jacob Glazer, Rick Green (the editor), David Hirshleifer, Morton Kamien, E. Han Kim, Marc Lars Lipson. Phil Meguire, Chester Spatt (the executive editor), Neal Stoughton (the referee), and participants in seminars at Columbia, Duke, Michigan, Minnesota, Northwestern, Ohio State, UC Irvine, UCLA, UNC, USC, Utah, Wisconsin, the 1989 WFA Meetings, and the 1989 AFA Meetings for their useful discussions and suggestions. Of course, I bear full responsibility for any errors contained in this article. Address correspondence to Ronen Israel, The University of Michigan, School of Business Administration, Ann Arbor, MI 481091234.

[1] For evidence regarding capital structure trends, see Taggart (1986) and Harris and Raviv (1991). For evidence regarding the activity in the market for corporate control, see Jarrell, Brickley, and Netter (1988).

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have observed both very little activity in the market for corporate control and a decrease in corporate debt levels. In this article, I investigate the relation between a firm's capital and ownership structures and the market for corporate control.

The basic idea is that managers select capital structure and ownership structure in order to gain advantages in future takeover battles. The premise is that managers value control per se and that the benefits of control are noncontractible. Capital structure and ownership structure are selected in order to extract the maximum amount of value from future bidders for control. In this model, an entrepreneur who initially determines the capital structure and the ownership structure of a firm extracts not only the expected appreciation in firm value due to a value-increasing change in control, but also the private noncontractible benefits of control accruing to the rival management.

The intuition behind these results is as follows. The ownership structure is established so that the current manager retains sufficient equity to determine the success of future control contests. The capital structure is established so that the bid required to induce the current manager to allow a change in control is high enough to extract all the rival's benefits of control. Specifically, when current managers deter a takeover, they retain their benefits of control but realize an opportunity loss on their equity holdings. This loss stems from the increase in equity value that would have been obtained had the rival gained control. The optimal bid by the rival just compensates current managers for the difference between these two effects. In order to extract a higher premium from the rival, the entrepreneur must lower the opportunity loss that accrues to current managers through their equity holdings. To do this, the entrepreneur issues risky debt. Since a portion of the valuation gain from a change in control accrues to the holders of risky debt, the appreciation in equity value decreases with leverage. The entrepreneur captures the premium to be paid by the rival when he establishes the firm and issues fairly priced debt and equity to atomistic investors.

This view of capital and ownership structures implies that firm value should be correlated with both capital structure and managerial equity ownership. It also leads to a number of new testable implications: First, managers with higher ability to operate the firm's assets are expected to use less leverage. This is consistent with the evidence in Titman and Wessels (1988) that debt levels and firms' profitability are negatively correlated. Second, firms facing rivals for control with higher ability are expected to issue less debt. Third, firms with supermajority rules are expected to use less debt than firms with simple majority rule.

Harris and Raviv (1988a) and Stulz (1988) have studied the relation between capital and ownership structures and the market for corporate control. In Harris and Raviv (1988a), the optimal capital structure results from a trade-off between increases in management's voting power and increases in the likelihood that the firm will go bankrupt, causing the incumbent management to lose its benefits of control. Stulz (1988) shows that a higher equity fraction held by management decreases the probability of a takeover but increases the premium offered if a bid is made. A special case is when managers issue debt to increase their equity holdings.

While both Harris and Raviv (1988a) and Stulz (1988) exogenously constrain the manager's ability to finance the firm with personal wealth to obtain links between ownership structure and capital structure, my model provides such a link even when the manager has, and is free to use, personal wealth to finance the firm's operations. Another difference is that both Harris and Raviv (1988a) and Stulz (1988) assume that small shareholders have heterogeneous valuations, while I assume that they share the same valuation.

Israel (1991) has studied the relation between capital structure and the market for corporate control. Optimal capital structure is obtained by trading off a decrease in the probability of a takeover against an increase in the premium paid by the raider. Israel (1991) does not consider how debt is used to extract the benefits of control from the rival and does not incorporate managerial equity ownership in the model.

The model is presented in the next section. The contest for control is analyzed in Section 2. The optimal capital and ownership structures are derived in Section 3. The implications of the model are presented and discussed in Section 4, and the conclusion is in Section 5.

1. The Model

The model consists of an entrepreneur, who later becomes the incumbent management *(I)*, a rival for control *(R)*, and a continuum of atomistic investors *(A)*. I assume that all agents are risk neutral and that the interest rate is zero.

Initially, the entrepreneur controls the firm and has the right to undertake a profitable project that costs C. The proceeds from the project depend on the identity of the controlling management. At the end of one period, the project returns a random cash flow $\tilde{y} \in [0, \hat{Y}_j]$, where $j \in \{I, R\}$ is the manager's identity. The distribution of cash flows, $G_j(y)$, is continuously differentiable on $(0, \hat{Y}_j)$. The expected value of y under management j is denoted by Y_j. I assume that the project has positive net present value-that is, $Y_j > C$, $j \in \{I, R\}$. I also assume that the distribution of cash flows under the rival dominates that under the incumbent in the first-order stochastic sense-that is, $G_I(y) \geq G_R(y)$, for all $y \in [0, \hat{Y}_R]$, and $G_I(y) > G_R(y)$, for some $y \in [0, \hat{Y}_R]$.

Capital markets are competitive but incomplete. Competition among investors drives prices of securities to their expected value given the available information. The market is incomplete in that there are noncontractible private benefits of control, $B_j > 0$, $j \in \{I, R\}$, that accrue only to the party in control. The private benefits may include monetary returns from the diversion of wealth from the firm to other firms controlled by management, from the ability to dilute minority rights, or from nonpecuniary perquisites of control.

The sequence of events is as follows. First, the entrepreneur establishes the firm and decides on the capital and ownership structures. Second, the rival arrives and considers making a tender offer. Third, if a tender offer is made, the atomistic investors and the incumbent simultaneously consider whether to tender their shares to the rival. Their tendering decisions determine the winner of the contest for control. If the rival does not bid, the incumbent maintains control. Fourth, production takes place, cash flows are distributed to the final holders of securities, and the firm liquidates.

The entrepreneur may contribute W_0 from his own resources to the project. The amount W_0 is chosen by the entrepreneur and it may be positive or negative. When W_0 is negative, the entrepreneur takes $-W_0$ as a dividend. Outside financing is obtained from voting equity or nonvoting debt.[2] The face value of debt is denoted by F, the market value of debt by $D(F)$, the value of debt conditional on the identity of the manager by $D_j(F)$, and the market value of equity sold to outsiders by $E_A(F)$. The entrepreneur issues debt and equity to atomistic investors in competitive capital markets. The amount raised from outsiders and the entrepreneur's own contribution finance the required investment:

$$E_A(F) + D(F) + W_0 = C. \tag{1}$$

I assume that initial financing does not involve the rival. Hence, the rival has no equity in the firm. The equity fraction held by the incumbent is denoted by $\alpha_I(F)$ and the equity fraction held by the atomistic investors is denoted by $\alpha_A(F)$. For given levels of debt, outside equity financing, and the entrepreneur's own contribution, the equity fractions $\alpha_I(F)$ and $\alpha_A(F)$ depend upon the expected outcome of the contest for control, since different controlling managements result in different valuations of the equity.

[2] In fact, in this model, debt represents any nonvoting securities such as preferred stocks and nonvoting equity.

The *expected cash to equityholders* is defined as the expected cash flows from the project less the expected cash flows to debtholders:

$$S_j(F) = Y_j(F) - D_j(F). \qquad (2)$$

Note that this is not the value of equity under management *j*, since equity value reflects expected premiums that may be paid by the rival to gain control.

Subsequent to the establishment of the firm, the rival considers submitting a nondiscriminating tender offer. The initiation of a control contest involves bidding costs, *T*. These costs are smaller than the rival's benefits of control (i.e., $B_R \geq T$).[3] To obtain control, the rival must acquire more than β percent of the equity (i.e., he must acquire β percent of the equity plus one share).[4] I consider bids which are both restricted and conditional. The rival offers to buy up to a fraction γ of the equity at a price *P*. If a fraction larger than γ is tendered, the rival prorates equally (as per SEC 13e-4) and acquires γ. If a fraction smaller than γ, but larger than β, is tendered, the rival acquires all shares that are tendered. If a fraction less than or equal to β is tendered, the rival acquires no shares.

Having observed the bid, the incumbent management and the atomistic investors simultaneously make their tendering decision. Atomistic shareholders take the outcome of the contest for control as given when deciding what fraction, $a \in [0, 1]$, of their equity to tender.[5] The incumbent considers his influence on the outcome of the contest for control when choosing what fraction, $x \in [0, 1]$, of his equity to tender.

These fractions, *a* and *x*, determine the identity of the winning management. This management obtains the private benefits of control, runs the firm, and distributes realized cash flows.

The information structure of the model is symmetric to all agents and the only source of uncertainty concerns the realization of cash flows.[6]

The notion of equilibrium that I use is subgame perfect Nash equilibrium. Thus, I begin by solving the contest for control assuming

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[3] Bidding costs eliminate the possibility that the rival bids even if he loses for sure. Alternatively, we could assume that the rival bids only if he earns some (arbitrarily small) positive profit. If $T > B_R$, the rival never bids in equilibrium.

[4] The majority rule β is assumed to be exogenously given. For analysis of optimal majority rules, see Grossman and Hart (1988) and Harris and Raviv (1988b). Also. if there are passive investors who are not part of the market for corporate control, then β represents the effective controlling ownership (taking into account the "sleeping investors"). For a discussion of effective votes, see DeAngelo and DeAngelo (1985).

[5] Grossman and Hart (1980) make the same assumption about atomistic investors. For further analysis of this subject, see Bagnoli and Lipman (1988) and Hirshleifer and Titman (1990).

[6] All relevant parameters and the structure of the model are common knowledge. In particular, $G_I(y)$, B_I, $G_R(y)$, B_R, β, C, T, the strategy space available to different agents. and the sequence of events are all common knowledge.

that capital and ownership structures decisions have already been made. I then solve for the capital and ownership structures. The text presents results and intuition, while proofs are deferred to the Appendix.

2. The Contest for Control

The contest for control includes a *bidding subgame,* in which the rival submits a tender offer, and a *tendering subgame,* in which the atomistic investors and the incumbent management simultaneously tender their shares. I restrict attention to bids where $\gamma > \beta$ and the rival is expected to win since losing bids cost the rival T but generate no capital gains (at the expense of other investors) or benefits of control.

2.1 The tendering subgame

In this subgame, the incumbent management and the atomistic investors simultaneously tender their shares. I start by analyzing the individual players' best response to different bids and then use the best response functions to characterize the equilibria of the tendering subgame.

Consider the best response of a typical atomistic investor to an outstanding bid (P, γ). If the investor believes the rival will win, he tenders his shares if doing so yields a capital gain [i.e., $a = 1$, if $P \geq S_R(F)$]. He does not tender otherwise [i.e., $a = 0$, if $S_R(F) > P$].[7]

The best response of the incumbent management is different from that of atomistic investors. The incumbent considers his influence on the outcome of the contest for control. Further, he is motivated not only by capital gains but also by the benefits of control.

As mentioned, I ignore the case in which the rival loses for sure (i.e., the case in which $\beta \geq a\alpha_A + \alpha_I$), and break the analysis of the incumbent's best response into two mutually exclusive cases: (i) the rival wins for sure (i.e., $\beta < a\alpha_A$) and (ii) the incumbent is *pivotal* in determining the winner of the contest for control (i.e., $a\alpha_A \leq \beta < a\alpha_A + \alpha_I$).

The incumbent's best response when the rival wins for sure is identical to that of a typical atomistic investor: he tenders if he expects a capital gain [i.e., $x = 1$, if $P \geq S_R(F)$], and he does not tender otherwise [i.e., $x = 0$, if $P < S_R(F)$].

In the second case, when the incumbent is pivotal, the rival wins

[7] The best response for the case in which investors believe that the rival will lose is irrelevant and therefore omitted.

if the incumbent tenders his shares and he loses otherwise. If the incumbent retains control, his payoff is

$$\alpha_I S_I(F) + B_I \tag{3}$$

and if he relinquishes control when faced with a bid (γ, P), his payoff is

$$\gamma\alpha_I P + (1 - \gamma)\alpha_I S_R(F). \tag{4}$$

It follows from (3) and (4) that a pivotal incumbent relinquishes control if and only if he is offered at least his reservation price, P_C, given by

$$P_c = S_R(F) + [B_I - \alpha_I \Delta S(F)]/(\gamma\alpha_I), \tag{5}$$

where $\Delta S(F) \equiv S_R(F) - S_I(F)$. The first term, the posttakeover equity value, represents the reservation value of a nonpivotal investor. The second term represents the premium a pivotal incumbent is able to extract from the rival..[8]

To give up control, the incumbent must be compensated for the benefits of control, net of the forgone capital gain on his equity, should he decide to block the bid. This amount, which is equal to $B_I - \alpha_I \Delta S(F)$, is paid to the incumbent via the nondiscriminatory tender offer. Since the rival acquires from the incumbent only a fraction $\gamma\alpha_I$ of the equity, he must offer a total premium of $[B_I - \alpha_I \Delta S(F)]/(\gamma\alpha_I)$.

Note that when the incumbent values his benefits of control by less than the forgone capital gain, this premium is negative. A negative premium implies that if the incumbent has more than β percent of the equity, the rival can gain control while paying less than the posttakeover equity value [i.e., $S_R(F) > P_C$]. In this case, the rival retains all his benefits of control and part of the valuation gain. However, the entrepreneur can always design the equity ownership structure to extract the entire valuation gain. To do so, he chooses an ownership structure with $\alpha_I \leq \beta$. In this way, no single investor can determine the success of the bid. Thus, the rival must bid the posttakeover equity value, $S_R(F)$. As a result, current equityholders capture the entire valuation gain. The rival is still willing to bid because he retains his benefits of control. Thus, for the rest of the analysis, only reservation prices larger than or equal to the posttakeover value of equity are considered.

When the pivotal incumbent is offered at least his reservation price,

[8] Notice that here premium refers to the amount the rival pays over and above the posttakeover value of securities. It is different from the amount the raider pays over and above the pretakeover market price, which is frequently called the takeover premium.

he tenders all his shares, and when offered less than his reservation price, he does not tender any share [i.e., $x = 1$, if $P \geq P_C$, and $x = 0$, otherwise].

Combining the atomistic investors' and the incumbent's best response, Proposition 1 characterizes all bids resulting in successful takeovers and the induced tendering subgame equilibria, a^* and x^*.

Proposition 1. *The winning bids and the induced tendering subgame equilibria are*

$$\text{(a)} \quad a^* = x^* = 1, \qquad \text{if } P \geq P_c \text{ and } \gamma \in (\beta, 1];$$

$$\text{(b)} \quad a^* = x^* = 1, \qquad \text{if } P_c > P \geq S_R(F),\ \gamma \in (\beta, 1],\ \alpha_A > \beta.$$

To understand (a) recall that $P_C \geq S_R(F)$. Consequently, when offered P_C or more, atomistic investors tender all their shares. In addition, bids with $P \geq P_C$ are high enough to induce a pivotal as well as a nonpivotal incumbent to tender. Clearly, for the bid to succeed, the rival must buy more than β percent of the shares.

When the rival offers less than the reservation price, P_C, but at least the posttakeover value, $S_R(F)$, atomistic investors tender their shares. In this case, the rival wins for sure if atomistic investors possess more than β of the equity. Moreover, given that the rival wins, a nonpivotal incumbent tenders his shares as well. However, facing such a bid, a pivotal incumbent holds on to his shares and the bid fails. Thus, bids in this range succeed if and only if $\alpha_A > \beta$.

A more intuitive reasoning for Proposition 1 is as follows. When $\alpha_A > \beta$, the rival takes advantage of the nonstrategic behavior of atomistic investors by paying only the posttakeover value, $S_R(F)$. Unlike the case studied by Grossman and Hart (1980)) the rival takes over because of his private benefits of control. When $\beta \geq \alpha_A$, the rival cannot take advantage of the nonstrategic behavior of atomistic investors and, therefore, is forced to pay a premium to gain control. Since the atomistic investors have less equity than is required for the rival to win, the rival has to acquire part of the incumbent's equity. This enables the incumbent to credibly threaten to block the takeover by not tendering his shares, thereby forcing the rival to pay a premium from the rival's benefits of control.

2.2 The bidding subgame

In this subgame, the rival chooses the maximum fraction of equity he is willing to accept, γ, and the price, P, he wishes to offer. He observes the capital and the ownership structures and he takes into account the equilibrium in the induced tendering subgame, $a^* = a^*(P, \gamma)$ and $x^* = x^*(P, g)$.

Recall that the rival bids only if he wins. Thus, his payoff, $\Pi_R(P, \gamma)$, consists of the capital gain (or loss) on shares purchased, and the benefits of control net of bidding costs:

$$\Pi_R(P, \gamma) = \gamma(S_R(F) - P) + B_R - T. \tag{6}$$

In the case where $\alpha_A > \beta$, the rival can win by paying the posttakeover value $S_R(F)$. In this case, his profit is B_R - T independent of γ, and any $\gamma \in (\beta, 1]$ is optimal.

When $\alpha_A \le \beta$, Proposition 1 implies that the rival must offer at least the reservation price, P_C. Thus, the rival's problem is

$$\operatorname*{Max}_{P,\gamma} \gamma(S_R(F) - P) + B_R - T, \tag{7}$$

s.t.

$$\gamma(P - S_R(F)) \ge [B_I - \alpha_I \Delta S(F)]/\alpha_I.$$

The constraint is obtained from algebraic manipulation of $P \ge P_C$, where P_C is given by (5). Note that maximizing (7) is equivalent to minimizing the left-hand side of the constraint. Thus, (7) is maximized when the constraint holds with equality. In this case, the rival offers the reservation price P_C. Substituting the constraint into the objective function results in a payoff of

$$\Pi_R = B_R - T + \Delta S(F) - B_I/\alpha_I. \tag{8}$$

Since Π_R is independent of γ, any $\gamma \in (\beta, 1]$ is optimal. Note that if Π_R is negative, the rival does not bid. Proposition 2 summarizes the rival's optimal bid.

Proposition 2. *(a) If $\alpha_A > \beta$, then $P^* = S_R(F)$ and $\gamma^* \in (\beta, 1]$.*

(b) If $\alpha_A \le \beta$, then $P^* = P_c$ and $\gamma^* \in (\beta, 1]$, if $B_R - T + \Delta S(F) - B_I/\alpha_I \ge 0$, and the rival does not bid if $B_R - T + \Delta S(F) - B_I/\alpha_I < 0$.

The capital and ownership structures that are fixed at the contest for control stage are determined by the entrepreneur when he establishes the firm. When the entrepreneur selects the ownership and capital structures, he anticipates the contest for control and its outcome characterized by Propositions 1 and 2.

3. Optimal Capital and Ownership Structures

Capital and ownership structures are used by the entrepreneur to determine the winner of the future control contest and to create an environment in which the largest possible premium is extracted from the rival if there is a change in control. Consider first the case where the entrepreneur lets the rival win the future contest for control. In this case, the rival will be forced to pay a premium from his benefits of control. Furthermore, since offers are nondiscriminating, the premium will be paid not only to the incumbent, but also to atomistic shareholders. The expected portion of the premium for atomistic investors is collected by the entrepreneur when equity is first issued and priced ex ante in competitive capital markets. As a result, the profit for the entrepreneur consists of the value of equity retained in his portfolio, net of his personal investment[9] W_0:

$$\Pi_I(F, W_0) = \alpha_I(F, W_0)[\gamma^* P^* + (1 - \gamma^*) S_R(F)] - W_0, \qquad (9)$$

where

$$\alpha_I(F, W_0) = 1 - \frac{C - W_0 - D_R(F)}{\gamma^* P^* + (1 - \gamma^*) S_R(F)}$$

$$= \frac{\gamma^*(P^* - S_R(F)) + Y_R - C + W_0}{\gamma^* P^* + (1 - \gamma^*) S_R(F)}. \qquad (10)$$

Equation (10) is obtained from (1), the fact that $\alpha_I(F) = 1 - \alpha_A(F)$, and from the fact that equity sold to atomistic shareholders is fairly priced. Substituting (10) into (9) yields

$$\Pi_I(F, W_0) = Y_R - C + \gamma^*(P^* - S_R(F)). \qquad (11)$$

The interpretation of (11) is that securities' prices reflect the NPV of the project under the rival, $Y_R - C$, and the equilibrium premium the rival pays to take over, $\gamma^*(P^* - S_R(F))$.

From Proposition 2 it follows that whenever the rival bids, he offers a nonnegative premium. Proposition 2(a) implies that if the firm is widely held,, $\alpha_A > \beta$, the premium is zero. However, when $\alpha_A \leq \beta$, it follows from Proposition 2(b) that the rival pays a positive premium and takes over as long as $\Pi_R \geq 0$, where Π_R is given by (8). In this case, the rival pays $P^* = P_C$. It follows from (5) that the premium is

$$\gamma^*(P^* - S_R(F)) = \gamma^*(P_c - S_R(F)) = B_I/\alpha_I - \Delta S(F). \qquad (12)$$

Substituting (12) into (11) results in the following maximization problem for the entrepreneur:

$$\operatorname*{Max}_{F, W_0} \{Y_R - C + B_I/\alpha_I(F, W_0) - \Delta S(F)\}, \qquad (13)$$

s.t.

[9] This objective function is equivalent to maximizing the profits from selling the debt and the equity in the capital markets net of the entrepreneur's own contribution. Note that since debt and outside equity are fairly priced, this is reduced to maximization of the entrepreneur's equity value.

$$1 \geq \alpha_I(F, W_0) \geq 1 - \beta, \tag{14}$$

$$B_R - T \geq B_I/\alpha_I(F, W_0) - \Delta S(F), \tag{15}$$

where $\alpha_I(F, W_0)$ is given by (10). Constraint (14) is a restatement of $\beta \geq \alpha_A$. Constraint (15) must hold for the rival to bid. Since (13) is increasing in $B_I/\alpha_I(F, W_0) - \Delta S(F)$ (15) holds with equality at the optimum. Substituting this equality into the objective function gives the following maximization problem for the entrepreneur:

$$\underset{F, W_0}{\text{Max}} \{Y_R - C + B_R - T\}, \tag{16}$$

s.t.

$$1 \geq \alpha_I(F, W_0) \geq 1 - \beta, \tag{17}$$

$$\alpha_I(F, W_0) = B_I/[B_R - T + \Delta S(F)], \tag{18}$$

where (18) is a rewriting of (15) when it holds with equality.

In addition to these two restrictions on the entrepreneur's equilibrium equity ownership, there is a restriction on the relation between the entrepreneur's equilibrium equity ownership and the firm's capital structure. This additional constraint is dictated by equilibrium valuation as described by Equations (10), (12), and (18). Combining these three equations yields

$$\alpha_I(F, W_0) = [Y_R - C + B_R - T + W_0]/[B_R - T + S_R(F)]. \tag{19}$$

Since the objective function described by Equation (16) is independent of F and W_0, the entrepreneur's problem is reduced to choosing F and W_0 that satisfy Equations (17)-(19) simultaneously.

Note that for any given debt level, F, the entrepreneur can contribute a (positive or negative) amount, W_0, that satisfies Equation (19). In this respect, the entrepreneur's personal wealth or personal liabilities and the firm's debt obligations are perfect substitutes. However, when the entrepreneur's own contribution, W_0, is held fixed, the optimal debt level solves Equation (19). A similar constraint enables Harris and Raviv (1988a) and Stulz (1988) to translate their theory of ownership structure into a theory of capital structure. Clearly, when the entrepreneur does not face wealth constraints or if he can borrow on personal account, this type of relation can no longer explain firms' choice of capital structure.

In the absence of wealth constraints on the entrepreneur, the firm's optimal capital structure is dictated only by Equations (17) and (18). Two important observations regarding the right-hand side of (18) are in order. First, for an all-equity firm it is less than 1, but it can be smaller or larger than 1 - β. Second, it increases with the debt level,

F. Intuitively, it increases with debt since the increment in equity value, $\Delta S(F)$, can be reduced arbitrarily close to zero as more debt is issued [see Lemma A(1) in the Appendix]. These two facts guarantee that there is a debt level satisfying constraints (17) and (18) simultaneously. This, combined with the additional degree of freedom the entrepreneur has from his ability to adjust his own contribution W_0 to satisfy Equation (19), enables him to extract all the rents from the rival.

Consider the case where the right-hand side of (18), evaluated at $F = 0$, is larger than or equal to $1 - \beta$. In this case, the entrepreneur does not have to issue debt to extract all the rents from the rival: he can do so by issuing only equity. This happens when the total value of cash flows and benefits of control under the entrepreneur and under the rival are not too far apart.

In the other case, where the right-hand side of (18), evaluated at $F = 0$, is smaller than $1 - \beta$, the entrepreneur must issue debt in order to extract all the rents from the rival. The reason is that when the entrepreneur maintains enough equity to be pivotal, his gain in wealth from a control change is too high. The capital gain is too high since it results in a low reservation price that leaves the rival with a positive profit. To see this, notice that for the entrepreneur to be pivotal he retains $\alpha_I(0, W_0) \geq 1 - \beta$. It follows from the assumption that the right-hand side of (18), evaluated at $F = 0$, is less than $1 - \beta$ that $\alpha_I(0, W_0)$ is larger than the right-hand side of (18) and, therefore, the rival gets a positive profit. In this case, there is a continuum of positive debt levels satisfying constraints (17) and (18). The lowest debt level satisfying the equations, F_l, is the solution to

$$1 - \beta = B_I/[B_R - T + \Delta S(F_l)]. \tag{20}$$

The highest debt level satisfying the equations, F_b, is the solution to

$$1 = B_I/[B_R - T + \Delta S(F_b)]. \tag{21}$$

Thus, any debt level $F^* \in [F_l, F_b]$ results in the highest possible value for the entrepreneur, $Y_R - C + B_R - T$. In addition to obtaining the NPV under the rival, the entrepreneur extracts the net benefits of control from the rival via the premium the rival pays. When the total value under the rival is considerably larger than that under the entrepreneur, the entrepreneur has to issue debt to extract all the rents from the rival. Here debt is used to simultaneously (i) make the entrepreneur pivotal in the contest for control, and (ii) credibly commit the entrepreneur to an opportunity cost that enables him to extract all the rents from the rival.

So far I have shown how the entrepreneur extracts all the rents from the rival when he chooses to allow a change in control. If the entrepreneur wishes to maintain control, his payoff is $Y_I - C + B_I$. Since giving up control yields the entrepreneur $Y_R - C + B_R - T$, he maintains control if and only if $Y_I + B_I > Y_R + B_R - T$. In this case, since the rival cannot afford to pay a premium, it is enough for the entrepreneur to be pivotal in the contest for control. Thus, the optimal ownership structure satisfies $1 \geq \alpha_I(F^*, W_0) \geq 1 - \beta$. The optimal capital structure, F^*, is determined by the equilibrium pricing and, therefore, it satisfies

$$\alpha_I(F^*, W_0) = [Y_I - C + W_0]/S_I(F^*). \tag{22}$$

Note the difference in the expressions for $\alpha_I(F, W_0)$ in (18) and (22). This is so because of the anticipation of a different outcome of the contest for control. Proposition 3 summarizes the optimal ownership and capital structures.

Proposition 3. *(a) Suppose $Y_I + B_I < Y_R + B_R - T$. The optimal ownership structure satisfies $1 \geq \alpha_I(F^*, W_0) \geq 1 - \beta$, and the optimal capital structure satisfies $F^* \in [F_l, F_b]$.*

(b) Suppose $Y_I + B_I > Y_R + B_R - T$. The optimal ownership structure satisfies $1 \geq \alpha_I(F^*, W_0) \geq 1 - \beta$, and the optimal capital structure satisfies Equation (22).

Proposition 3 will be used to obtain the comparative static results regarding capital structure and to discuss the optimality of one share-one vote and majority rules.

4. Implications of the Model

In analyzing the implications of the model, I focus on the situations in which the rival is socially better as described in Proposition 3(a). I also assume that the entrepreneur issues the smallest debt level among all debt levels that yield him the same payoff.[10]

4.1 Cross-sectional variation In leverage

In this section, I analyze cross-sectional differences in capital structure as a function of various parameters of the model. The optimal degree of leverage decreases with the ability of the entrepreneur, with his benefits of control, and with the firm's majority rule (defined as the equity fraction necessary for the rival to gain control). The reason for these results is that, for a given debt level, the entrepreneur has a lower than optimal opportunity cost from blocking the rival. Thus, he issues less debt to obtain the higher optimal opportunity

[10] This assumption may be justified by assuming that the entrepreneur is risk averse.

cost. The optimal degree of leverage increases with the ability of the rival and with the rival's benefits of control, because, under these conditions, there is more to extract from the rival. Proposition 4 summarizes this discussion.

Proposition 4. *Ceteris paribus, the optimal degree of leverage, F^*, (a) decreases with the ability of the entrepreneur, with the entrepreneur's private benefits of control, with the acquisition costs, and with the majority rule employed by the firm; and (b) increases with the ability of the rival, and with the rival's benefits of control.*

Note that Proposition 4 provides empirical implications regarding the book value of debt. Titman and Wessels (1988) examine the cross-sectional variation in the book value of debt and its relation to firms' profitability. Proposition 4(a) is consistent with their finding that leverage is negatively correlated with profitability.[11]

Another testable implication of Proposition 4(a) is that, ceteris paribus, firms with a simple majority rule are expected to have a higher degree of leverage than firms that employ a supermajority rule. It should be noted here that this implication is derived for an exogenously given voting rule.

4.2 Voting rights of common shares

Grossman and Hart (1988) and Harris and Raviv (1988b) analyze the optimality of one share-one vote. Grossman and Hart (1988) conclude that one share-one vote results in efficient allocation of control. Harris and Raviv (1988b) also arrive at this result. In addition, they conclude that private optimality (i.e., maximization of the value of securities) is obtained by issuing "the two extreme securities, namely, the one with cash flows but no votes and the one with votes but no cash flows" (p. 224). The implications of my model, as it appears from Proposition (3), are different. Under many circumstances, the optimal capital structure is a mix of voting common equity and non-voting risky debt.[12]

The payoff to the entrepreneur using the capital structure proposed in Proposition (3) dominates his payoffs from issuing the securities suggested by Grossman and Hart (1988) and by Harris and Raviv (1988b). The reason for this is that by issuing risky debt, the entrepreneur extracts the benefits of control from the rival. Thus, we should

[11] Titman and Wessels (1988) do not control for all variables relevant to this theory. Therefore. their result does not apply directly to this model and a more direct test would be desirable.

[12] A combination of voting equity and nonvoting risky debt is different from one share-one vote since not all the cash flows are aligned with the votes. This combination is also different from the two extreme securities since the security with the voting is entitled to the residual cash flows.

not expect to observe these dominated securities. In fact, most firms have risky debt and one class of common voting equity outstanding. The above discussion suggests that analysis of voting rights of common shares should not be isolated from other securities, such as debt.

In a more general setting, Harris and Raviv (1989) study the optimal allocation of cash flows and votes to securities. They consider a general set of securities, including, but not limited to, voting equity, nonvoting equity, riskless debt, and risky debt. They conclude that the optimal set of securities includes a risky security with the voting rights issued to outsiders, a nonvoting risky security held by the insider, and possibly a riskless nonvoting security held by outsiders. This set excludes issuing a risky nonvoting security, such as risky debt, to outsiders. In contrast, an implication of my analysis is that risky debt is issued to outsiders. The reason for the difference is that while Harris and Raviv exclude two-sided benefits of control and therefore ignore the extraction role of securities, I include two-sided benefits of control and thus consider the extraction role of securities, which is best served by issuing risky debt to outsiders.

5. Conclusions

This article shows how anticipated competition for control influences a firm's capital and ownership structures. The main insight is that the entrepreneur captures the benefits of control from the rival by (i) increasing his equity stake so that he is able to block a takeover attempt, and (ii) issuing risky debt, thereby committing to a higher reservation price and, as a result, increasing his "bargaining power."

The theory predicts that firm value should be correlated to both capital structure and managerial equity ownership, and has the following empirical implications: (i) better managers are expected to use less leverage; (ii) firms facing better rivals are expected to use more leverage; and (iii) firms using supermajority rules are expected to issue less debt than firms using simple majority rule.

I have assumed that the characteristics of the rival for control are known with certainty. An advantage of this assumption is that the theory and insight offered here were obtained from a relatively simple structure. Limitations of this assumption are that the theory cannot provide implications regarding price effects, and that the model predicts that all takeover attempts are successful. Thus, an important extension would be to add uncertainty regarding the characteristics of the rival. This would lead to empirical implications regarding the relations between capital structure and both the price effects of takeovers, and the likelihood of firms becoming acquisition targets. Analysis along these lines is pursued in Israel (1991), where it is shown that the analysis is robust to this uncertainty.

Another valuable extension would be to expand the strategy space available to the rival by allowing direct negotiation with the incumbent management. Hopefully, this would lead to predictions concerning the relation between capital structure and the form of the contest for control (i.e., mergers versus tender offers).[13]

Appendix

Lemma A(1)

$$\frac{\partial \Delta S(F)}{\partial F} \leq 0.$$

Proof of Lemma A(1)
I take the derivative of $S_j(F)$ with respect to F, and then apply it to $D\ S(F)$:

$$S_j(F) = \int_F^{\hat{Y}_j} (y - F)\ dG_j(y), \qquad j \in \{I, R\}.$$

Using Leibnitz's rule,

$$\frac{\partial S_j(F)}{\partial F} = G_j(F) - 1, \qquad j \in \{I, R\},$$

$$\frac{\partial \Delta S(F)}{\partial F} = \frac{\partial S_R(F)}{\partial F} - \frac{\partial S_I(F)}{\partial F} = G_R(F) - G_I(F) \leq 0,$$

where the inequality is obtained from the assumption that the distribution of cash flows under the rival dominates that under the incumbent in the first-order stochastic sense. Q.E.D

Proof of Proposition 1
Clearly γ is part of a winning bid if $1 \geq \gamma > \beta$.

(a) Suppose $P \geq P_C$. Since $P_C \geq S_R(F)$, atomistic investors tender their shares. By construction of P_C, a pivotal incumbent tenders his shares. Clearly, a nonpivotal incumbent tenders his shares as well. Thus, the unique equilibrium of the tendering subgame is $a^* = x^* = 1$.

(b) Suppose $P_C > P \geq S_R(F)$. Atomistic investors tender their shares, $a^* = 1$. When the incumbent is nonpivotal (i.e., when ($\alpha_A > \beta$), his best response is to tender, $x^* = 1$.

[13] See Berkovitch and Khanna (1991) for an analysis of the form of control contests: mergers versus tender offers.

To complete the proof, it remains to be shown that no other winning bids exist. When $P_C > P \geq S_R(F)$ and the incumbent is pivotal, $\beta \geq \alpha_A$, by construction of P_C, the incumbent holds to his shares and the bid fails. Clearly, all bids with $S_R(F) > P$ fail. Q.E.D.

Proof of Proposition 2

(a) Suppose $\alpha_A > \beta$. From Proposition l(b) it follows that any $P \geq S_R(F)$ is enough for the rival to win. Since Π_R (P, g), as given by (6), decreases with P, the rival offers the lowest price, $P^* = S_R(F)$. It follows from substitution of P^* into (6) that the rival's profit is B_R - T. Since this is independent of γ, $\gamma^* \in (\beta, 1]$.

(b) Follows directly from the discussion before the proposition. Q.E.D.

Proof of Proposition 3

Follows directly from the discussion before the proposition. Q.E.D.

Proof of Proposition 4

Suppose that $F^* = F_1$, where F_1 is the solution to Equation (20).

(a) As the ability of the entrepreneur increases, $S_I(F)$ increases, D $S(F)$ decreases, and the right-hand side of (20) increases. Lemma A(1) implies that in order to restore the equality of (20), $F^* = F_1$ must be lower. Similarly, as B_1 or T increase, the right-hand side of (20) increases, resulting in a lower F^*. As β increases, the left-hand side of (20) decreases, resulting in a lower F^*.

(b) As the ability of the rival increases, $S_R(F)$ increases, Δ $S(F)$ increases, and the right-hand side of (20) decreases. Lemma A(1) implies that in order to restore the equality of (20), $F^* = F_1$ must be higher. Similarly, as B_R increases, the right-hand side of (20) decreases, resulting in higher F^*. Q.E.D.

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