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"CAPITAL STRUCTURE CHOICE WHEN MANAGERS ARE IN CONTROL: ENTRENCHMENT VERSUS EFFICIENCY"

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Capital Structure Choice when Managers are in Control: Entrenchment versus Efficiency

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Recent capital structure theories have emphasized the role of debt in minimizing the agency costs that arise from the separation between ownership and control. In this paper we argue that *capital structure choices themselves* are affected by the same agency problem. We analyze when and how the optimal capital structure from the managers' perspective differ from the optimal capital structure from the shareholders' perspective. Our results help reconciling the optimal trade-off theory of capital structure with the observed financing decisions of U.S. corporations and explain the recent deleverage of Corporate America under the same tax system that supposedly generated the increase in leverage in the 1980s.

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Recent capital structure theories (e.g., Jensen (1986), Stulz (1990), and Hart and Moore (1994)) have emphasized the role played by debt in reducing the agency conflicts between managers and shareholders. Debt increases efficiency because it prevents managers from financing unprofitable projects. At the same time, debt may also block some profitable investment opportunities. The optimal capital structure, then, represents the ex ante efficient trade off between these costs and benefits.

These theories, though, leave unresolved the issue of who will choose such an optimal capital structure. They emphasize the role of debt in reducing agency problems between managers and shareholders, but they ignore that *the choice of debt itself* is subject to an agency problem. Short of claiming that the optimal capital structure is designed once and for all by the initial founders, these theories have to rely on self-interested managers to implement the optimal financing decisions. This fact raises two questions. First, how can we expect a manager to voluntarily increase the firm's leverage to decrease its own discretion? Second, even admitting that managers might be forced to use debt, why should we expect their choices to coincide with the ex ante optimal ones?

The first question has been addressed by Harris and Raviv (1988), Stulz (1988), and especially Zwiebel (1992). All these papers show how a takeover threat forces a manager to increase leverage. However, none of these studies analyze the possible divergence between a manager's choice under a takeover threat and the ex ante optimal capital structure. Hart and Moore (1994) conjecture that "the thrust of our analysis applies also to the case where management chooses financial structure to maximize its own welfare". The purpose of this paper is to verify the validity of this claim and to investigate what are the sources and the implications of a possible divergence between the two notions of optimality.

To achieve this objective we build a model in which the disciplinary role of debt and the pressure from the corporate control market are jointly considered. In this framework, we analyze and compare the optimal capital structure from a manager's and from shareholders' point of view. Our characterization of the optimal capital structure from shareholders' point of view is also of independent interest because the existing models that analyze the ex ante choice of debt as a discipline device do not consider explicitly the two alternative mechanisms at the same time.

As in Zwiebel (1992), our manager maximizes her job tenure, which is threatened by two possible events: bankruptcy and takeovers. The occurrence of these events, though, is affected by the capital structure in place. A unique feature of our model is that the manager realizes that debt and takeovers are alternative mechanisms of corporate control, and that the use of one mechanism may crowd out the effectiveness of the other. Therefore, the manager uses this crowding out effect in a way that maximizes her own entrenchment. This creates a distortion in the manager's capital structure choice.

We show that, in general, the shareholders and the manager's capital structure choices differ. Depending on the takeover pressure, the manager may underlever or overlever the company with respect to the ex ante optimal shareholders' choice. Moreover, the two choices differ in their sensitivity to the cost of financial distress and taxes. In other terms, we show that Hart and Moore's (1994) conjecture does not necessarily hold.

Our paper fully develops an alternative to the efficiency approach to capital structure decisions: the entrenchment approach. In the spirit of Shleifer and Vishny (1989) we analyze managers' capital structure choices as a way to increase their staying power. This approach can provide an explanation not only for the leverage decision, but also for the choice between private and public debt and the choice of which class of debt should be senior. More importantly, this new approach provides predictions – on the sensitivity of capital structure decisions to taxes, cost of financial distress, and pressure from the corporate control market – that differ from the implications derived in the efficiency approach. In other words, these implications provide a way to test the two approaches.

For example, we show that while the efficiency approach predicts a negative correlation between the use of debt and the cost of financial distress, the entrenchment approach predicts a positive one. Similarly, in the efficiency approach the level of debt is negatively related to the effectiveness of the pressure of the corporate control market. In other terms, debt and takeovers are alternative mechanisms of control, and there is a substitution between the two. By contrast, in the entrenchment approach the degree of leverage increases with the pressure from the market for corporate control.

Finally, while the efficiency approach has standard predictions on the effects of taxes, the entrenchment approach predicts an asymmetric and variable sensitivity of capital structure

choice to tax incentives. A manager's optimal leverage increases when debt is tax subsidized, but it does not decrease if equity is tax-subsidized. Moreover, the sensitivity of a manager's optimal leverage to tax subsidies is a function of the strength of the pressure from the corporate control market. This may explain the early 1990s deleverage of Corporate America under the same tax system that supposedly generated the increase in leverage in the late 1980s.

In sum, our analysis provides multiple ways to test the two alternative approaches and to assess the importance of the alleged distortions. Finding which of the two alternatives better characterizes the data is important because they also have different policy implications for the design of taxes and bankruptcy procedures. If capital structure is chosen by shareholders in an ex ante optimal way, then any tax differential treatment between debt and equity is distortionary. But if managers are the ones who choose it, then we argue that a tax-advantage to debt might be socially optimal. In that context we show that an improvement in the bankruptcy procedures that reduces the cost of financial distress is not necessarily welfare improving when managers underlever their firms

The remainder of the paper proceeds as follows. Section 1 describes the basic structure of the model. Section 2 derives the ex ante optimal capital structure. Section 3 derives the optimal capital structure from a manager's point of view and compares it with the ex ante optimal. Section 4 describes how the manager's choice responds to tax subsidies for debt and equity. Section 5 discusses other implications of the entrenchment approach to capital structure decisions. Section 6 presents some extensions of the model and, finally, section 7 discusses the empirical and normative implications of our model.

1 General Framework

Our interest is to compare the capital structure decisions made by self interested managers with those that shareholders would make. Therefore, we consider a firm run by a manager whose interests are not perfect aligned with shareholders. We model this conflict of interests by assuming that the manager wants to retain her control position, even when she is not the best person for the job.¹ Let $s \in \mathbb{R}^n$ be a vector of attributes summarizing the incumbent

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¹One might ask why an inefficient manager ended up in a top position to start with. This can be easily rationalized if we take the model back one period and we consider the shareholders' decision to hire the company's

manager's ability and s^* the optimal manager's type. Then we are interested in analyzing the cases where $s \neq s^*$.

We restrict our analysis to one production period. The value of the firm at the end of this period is made of two components. The first one, $y_1(\theta)$, captures the effects on the firm's value of the uncertainty during the period. θ represents a productivity shock uniformly distributed over the interval $[0, 1]$. To simplify our analysis we shall assume that the effect of the productivity shock is linear, that is, $y_1(\theta) = \theta$. The second component, $y_2(s)$, reflects the value of the firm as a function of the quality of the incumbent manager at the end of the period. Suppose that the firm is auctioned off with the incumbent manager. Then, $y_2(s)$ represents the "continuation value" of the firm if the s -type manager is still in place at the end of the period, while $y_2(s^*)$ is the firm's value when the optimal manager has been put in place.

By assuming risk neutrality and a zero discount rate, the value of a firm where the type- s manager retains control is given by

$$V(s) = E[y_1(\theta)] + y_2(s).$$

By contrast, if before the end of the period the type- s manager is dismissed and replaced with the optimal manager, the value of the firm is

$$V(s^*) = E[y_1(\theta)] + y_2(s^*).$$

The incumbent manager can be unseated in two ways: either the company enters bankruptcy and the manager is automatically dismissed, or shareholders coordinate to force the manager to step down. Regardless of how the incumbent manager is dismissed, we assume that the optimal type of manager is chosen to run the firm afterwards.

1.1 The working of the corporate control market

Shareholders are dispersed, therefore we assume that they can force the manager to step down only by paying a transaction cost c . The firing of the manager can be interpreted as a takeover,

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manager when there is uncertainty about the talents that will be needed in the future.

a proxy fight or some other form of shareholder's activism. For simplicity, in the rest of the paper we shall call a "takeover" any corporate control initiative, and a "raider" the leader of the control initiative. However, it is worth emphasizing that our framework is not restricted to the takeover case.

We assume that an inefficient manager is replaced only if it is profitable to do so, that is,

$$S^* - S \geq c, \quad (1)$$

where S^* is the company's equity value under the best possible manager and S is the company's equity value under the current management.

To decide whether to undertake a takeover, a raider must compare $S^* - S$ with c . We assume that c is exogenous and known by the raider, the manager, and shareholders. Therefore, we focus on the increase in a target's equity value.

Note that equation (1) corresponds to assuming that shareholders cannot free ride on the improvement implemented by the raider. Moreover, we also assume that the market for corporate control is perfectly competitive. As a result, takeovers will be provided "at cost" whenever they are profitable. In practice, the corporate control market is likely not to be perfectly competitive, and takeovers may not occur even if they create value because the raider cannot appropriate enough of the takeover gains (see Grossman and Hart, 1980). Therefore, our assumptions on the market for corporate control are not chosen for realism, but to emphasize that distortions in capital structure choices arise even in this idealized world. However, as we shall show in section 6, introducing more realistic features in the working of the corporate control market will only strengthen our results.

In a 100% equity financed company equation (1) corresponds to

$$S^* - S = y_2(s^*) - y_2(s). \quad (2)$$

Let's define $G(s) \equiv y_2(s^*) - y_2(s)$, then in a 100% equity firm the occurrence of a takeover will be determined by the relative size of the replacement gain, $G(s)$, and the takeover cost c . In other terms, a takeover will occur if and only if

$$G(s) \geq c. \quad (3)$$

1.2 The working of bankruptcy

If at the end of the period the value of the firm under the incumbent management falls below the face value of the debt, then the company defaults and creditors take control of the company. We assume that in bankruptcy creditors replace the inefficient manager with the optimal one.² Unfortunately, default is not a costless disentrenchment device. If the company goes into bankruptcy, then a fraction $\lambda \in (0, 1)$ of $y_1(\theta)$ is lost. This is consistent with interpreting $y_1(\theta)$ as the current cash flow and $y_2(s)$ as the continuation value. We also assume that $G(s) < \lambda$.³

1.3 The interaction between the two mechanisms

The effects of leverage on the likelihood of a takeover depends on how debt changes the post-takeover increase in the company's equity value ($S^* - S$). Let us define θ_D as the lowest realization of the productivity shock that the company does not default under the incumbent manager. Then if $D \in [y_1(0) + y_2(s), y_1(1) + y_2(s)]$, θ_D solves

$$y_1(\theta_D) + y_2(s) = D. \quad (4)$$

Otherwise, we set $\theta_D = 0$ if $D < y_1(0) + y_2(s)$ and $\theta_D = 1$ if $D > y_1(1) + y_2(s)$. Thus, the firm's equity value without a takeover is

$$S(D) = \int_0^{\theta_D} [\text{Max}\{y_1(\theta) - \lambda y_1(\theta) + y_2(s^*) - D, 0\}] d\theta + \int_{\theta_D}^1 [y_1(\theta) + y_2(s) - D] d\theta. \quad (5)$$

The first term captures the change in the firm's equity value when the incumbent cannot

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²This assumption is not as obvious as one might think. Creditors might be dispersed and they might face some of the same problems of shareholders. Nevertheless, the existing bankruptcy procedures are supposed to facilitate creditors' coordination. Furthermore, our assumption is without loss of generality because the value loss produced by a possible lack of creditors' coordination can be easily incorporated into the cost of financial distress.

³If $G(s) \geq \lambda$, then bankruptcy always increases the firm's value. We do not analyze this extreme case of inefficient entrenchment.

repay the debt. In these events, the company defaults and its value is reduced by the cost of financial distress $\lambda y_1(\theta)$. However, thanks to default, the incumbent is replaced and the “continuation” payoff is then $y_2(s^*)$.⁴ The second term shows the equity value when the company does not default and the manager stays in control.

Likewise, for the same debt level D we can define θ_D^* as the minimum value of θ such that default does not occur if the manager is replaced by a takeover. If $D \in [y_1(0) + y_2(s^*), y_1(1) + y_2(s^*)]$, then θ_D^* solves

$$y_1(\theta_D^*) + y_2(s^*) = D \quad (6)$$

Otherwise, we set $\theta_D^* = 0$ if $D < y_1(0) + y_2(s^*)$ and $\theta_D^* = 1$ if $D > y_1(1) + y_2(s^*)$.

The firm's equity value in the case of a takeover is then

$$S^*(D) = \int_0^{\theta_D^*} 0 d\theta + \int_{\theta_D^*}^1 [y_1(\theta) + y_2(s^*) - D] d\theta. \quad (7)$$

Subtracting (5) from (7) and noting that $\theta_D^* \leq \theta_D$ we can write the increase in equity value due to a takeover as

$$\int_{\theta_D}^1 [y_2(s^*) - y_2(s)] d\theta + \int_{\theta_D^*}^{\theta_D} [y_1(\theta) + y_2(s^*) - D - \text{Max}\{(1 - \lambda)y_1(\theta) + y_2(s^*) - D, 0\}] d\theta. \quad (8)$$

Let's define $\tilde{\theta}_D$ as the minimum realization of the productivity shock such that, in the absence of a takeover, shareholders receive some payments after bankruptcy. For $D \in [(1 - \lambda)y_1(0) + y_2(s^*), (1 - \lambda)y_1(1) + y_2(s^*)]$, creditors are fully paid for states of nature above some cut-off point. If this cut-off is smaller than θ_D , then it is also $\tilde{\theta}_D$. Otherwise, $\tilde{\theta}_D$ is equal to θ_D , meaning that the probability that the creditors will be fully paid conditioned on bankruptcy is 1. Formally, $\tilde{\theta}_D$ is the minimum between θ_D and the solution of the following equation:

$$(1 - \lambda)y_1(\tilde{\theta}_D) + y_2(s^*) = D. \quad (9)$$

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⁴Because of the gains produced by replacing the managers, it is possible that, after default, the company can pay debtholders in full. Consistent with the bankruptcy law, shareholders receive any surplus left after paying the creditors.

For D not belonging to $[(1 - \lambda)y_1(0) + y_2(s^*), (1 - \lambda)y_1(1) + y_2(s^*)]$, we set $\bar{\theta}_D = 0$ if $D < (1 - \lambda)y_1(0) + y_2(s^*)$ and $\bar{\theta}_D = \theta_D$ if $D > (1 - \lambda)y_1(1) + y_2(s^*)$.

Then, after using the fact that $G(s) \equiv y_2(s^*) - y_2(s)$, equation (8) can be rewritten as

$$\Delta S(D) = \int_{\theta_D}^1 G(s) d\theta + \int_{\theta_D}^{\bar{\theta}_D} [y_1(\theta) + y_2(s^*) - D] d\theta + \int_{\bar{\theta}_D}^{\theta_D} \lambda y_1(\theta) d\theta. \quad (10)$$

Equation (10) summarizes the three ways in which debt affects the profitability of a takeover. The first term shows that an increase in debt (and so an increase in θ_D) reduces the profitability of a takeover by delivering the replacement gains in the bankruptcy states. This is what we call the crowding out effect of debt. The second term illustrates what was pointed out by Israel (1991): the existence of risky debt transfers some of the takeover gains from the raider to the target debtholders.

Note that these two effects create a potential conflict of interests between the manager and shareholders in the choice of the optimal level of debt. Because the manager is interested in minimizing the probability of being replaced, she might inefficiently increase debt to use these two effects to decrease the profitability of a takeover.⁵

The third effect is the increase in equity value that comes with the lower probability of bankruptcy. By increasing efficiency, the raider reduces the probability of bankruptcy, and hence, saves part of the expected cost of financial distress. However, debtholders may bear some of the expected cost of financial distress. As a consequence, the last term of equation (10) is not the entire reduction in expected cost of financial distress, but only the reduction that would be borne by equityholders.

For future reference it is useful to establish the following result:

Lemma 1 *The equity gain from a takeover, $\Delta S(D)$, is monotonically decreasing in D , with strict monotonicity for debt levels that the raider can pay with positive probability.*

Proof: See Appendix. $\square$

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⁵Here we implicitly assumed that the existing debt cannot be renegotiated. Otherwise, the raider and the creditors should enter in an agreement to reduce the face value of the debt to an amount that allows the value enhancing takeover. However, the manager can make it difficult for a raider to renegotiate the company's debt by choosing public debt over private debt. Indeed, as we shall show in section 5.1, under a takeover pressure, the manager has the incentive to make any debt renegotiation more difficult.

Lemma 1 simply states that the equityholders stand to gain less and less from a takeover as the face value of debt increases. In other words, the first two (negative) effects of debt on the profitability of a takeover overcome the third one.

1.4 The timing of the events

Figure 1 summarizes the sequence of events and the payoffs in our model. At time 0 the capital structure is chosen either by the initial shareholders or by the incumbent manager. Whenever debt is issued, the proceeds are distributed to shareholders as dividends. If a takeover remains profitable after the change in the capital structure, then a raider takes over at time 1 and the manager is replaced. Otherwise, the manager remains in power at least until time 2. At this time, the industry-wide shock occurs, affecting the final payoff through $y_1(\theta)$. At time 3 the final payoffs are realized and the debt becomes due. If the company defaults, then the incumbent manager is replaced and the “continuation payoff” is $y_2(s^*)$. Otherwise, the original manager stays in control and the “continuation payoff” is $y_2(s)$.

Figure 1: Sequence of events within the production period

2 The Value Maximizing Level of Debt

In this section we compute the capital structure that initial shareholders would like to choose had they had the power and the ability to do so. In particular, we assume that they perfectly anticipate the type of the inefficient manager who will be running the company in the future. In this context, one can think of the shareholders' capital structure decision as a choice of the

least expensive way of replacing inefficient managers: bankruptcy, takeover or a combination of the two.

We start by assuming that bankruptcy is the only disentanglement device available, and we later move to the case in which both are present. Initial shareholders internalize all the costs and benefits of debt. Therefore, they choose the value of debt in order to maximize the firm's value:

$$\max_{\theta_D \in [0,1]} V(\theta_D) = \int_0^{\theta_D} [(1-\lambda)\theta + G(s) + y_2(s^*)]d\theta + \int_{\theta_D}^1 [\theta + y_2(s)]d\theta, \quad (11)$$

where we used the fact that $y_1(\theta) = \theta$. The first integral is the firm's expected value conditioned on default. Default triggers the replacement of the management with the consequent gain $G(s)$, but it also costs the firm some financial distress ($\lambda\theta$). The second integral is the value of the firm when there is no default.

The necessary condition (which in this case is also sufficient) for an interior maximum is

$$G(s) - \lambda\theta_D = 0.$$

It follows that the optimal level of debt should trigger bankruptcy in all the states where $G(s) > \lambda\theta$ (that is the marginal replacement gain is larger than the marginal cost of financial distress). Note that if $G(s) \geq \lambda$ then the optimal level of debt will induce bankruptcy with probability one. This is why we restricted our analysis to the more interesting case where $G(s) < \lambda$.

It then follows

Lemma 2 *The ex ante optimal debt level in the absence of takeovers is*

$$D^o = \frac{G(s)}{\lambda} + y_2(s). \quad (12)$$

Although our framework of analysis is somewhat different, D^o corresponds to the results obtained by Stulz (1990) and Hart and Moore (1994). Consistent with them, the optimal debt does not fully eliminate all agency costs. In fact, when $\theta \geq \frac{G(s)}{\lambda}$ the inefficient manager remains in charge and this implies that shareholders will not receive $G(s)$. Furthermore, even

when the manager is replaced, the company has to incur some cost of financial distress.

We summarize the expected cost of using debt as a disentrenchment strategy as

$$C_D = \lambda E[\theta | \theta < \theta_D] + (1 - \theta_D)G(s). \quad (13)$$

Note that C_D includes both the direct cost of financial distress (first term) and the opportunity cost of not replacing the manager in some states of nature (second term).

Let's now see how the optimal debt changes when we introduce the possibility of takeovers. If $G(s) < c$, then there is no change because takeovers are unprofitable, and so they are not a viable alternative. Consider $G(s) \geq c$. In this case takeovers are profitable in the absence of debt. Thus, initial shareholders have to decide whether they want to rely on takeovers, debt, or a combination of the two to disentrench the manager. In case shareholders opt for takeovers, there is not anymore a role for debt as a disentrenchment device. Therefore, we can think of the shareholders' problem as choice between using *only* debt or *only* takeovers to replace the manager. If they choose debt as the disentrenchment device, there is no reason for not using it in an optimal way (i.e., $D = D^\circ$). Hence, the solution of the shareholders' problem boils down to comparing C_{D° (i.e., C_D computed at the optimal debt level $D = D^\circ$) with the takeover cost c .

If $C_{D^\circ} \geq c$, then takeovers are more efficient than bankruptcy in replacing the manager. In fact, this inequality implies that the net gain from a takeover ($G(s) - c$) is larger than the net gain of using debt as a disentrenchment device ($G(s) - C_{D^\circ}$). In this case the initial shareholders would like to avoid interfering as much as possible in the working of the corporate control market. As a result, they choose any level of debt that does not block a takeover and which will never force the raider into bankruptcy.

If $C_{D^\circ} < c$, then debt is a less expensive disentrenchment device than takeovers (net advantage of debt $G(s) - C_{D^\circ}$ bigger than the net advantage of takeovers $G(s) - c$). In this case initial shareholders rely only on debt. This is achieved by setting the debt level equal to D° . Note that, with this level of debt, a takeover could increase the value of equity by at most C_{D° . Since $C_{D^\circ} < c$, takeovers are not profitable and bankruptcy is indeed the only disentrenchment device.

The following proposition summarizes the optimal debt choice from the shareholders' point

of view.

Proposition 1 *Let's define D^1 as the maximum level of debt that will never force the raider into bankruptcy (i.e., $D^1 = y_1(0) + y_2(s^*)$), D^2 as the maximum level of debt that does not block a takeover (i.e., $D^2 = \max\{D : \Delta S(D) \geq c\}$), and D^s as minimum between the two ($D^s = \min\{D^1, D^2\}$). Then, the debt level that maximizes shareholders' value is given by*

$$D^* = \begin{cases} [0, D^s) & \text{if } c < \min\{G, C_{D^0}\} \\ \frac{G(s)}{\lambda} + y_2(s) & \text{otherwise,} \end{cases}$$

where C_{D^0} is defined by equation (13), with $D = D^0 = \frac{G(s)}{\lambda} + y_2(s)$.

As the next corollary shows, the comparative static on the ex ante optimal leverage is quite standard:

Corollary 1 *The ex ante optimal debt level*

- a) *decreases with the cost of financial distress λ ,*
- b) *increases with the takeover cost c ,*
- c) *generically increases with the replacement gain $G(s)$.*

Proof: See Appendix. $\square$

As expected, the shareholders' optimal debt decreases with the cost of financial distress. This happens because the increase in the relative cost of an instrument (in this case debt) induces initial shareholders to use less of it. The same intuition applies to the comparative static with respect to c . An increase in the cost of takeovers induces a substitution towards debt as a disentrenchment device. The third result is only slightly less straightforward. The total cost of debt C_D is composed of a combination of the cost of financial distress and the opportunity cost of not replacing the manager. An increase in the replacement gain will push the optimal debt to a higher level to ensure that the higher replacement gain is lost in fewer states of nature.

3 The Manager's Capital Structure Choice

The manager's objective is to maximize her tenure. Thus, she minimizes the probability of being replaced either by a takeover or by creditors in default. This corresponds to minimizing the probability of bankruptcy conditioned on surviving the takeover threat.⁶

$$\begin{aligned} \min_{\{D\}} \text{Prob}\{y_1(\theta) + y_2(s) < D\} \\ \text{s.t. } \Delta S(D) < c, \end{aligned} \tag{14}$$

where $\Delta S(D)$ is the post-takeover increase in equity value as defined in equation (10).

The objective function is the probability of bankruptcy for debt level D . Equation (14) represents the main constraint on the manager's choice: a takeover must be unprofitable at the optimal debt level.

The manager's problem is very simple to solve when there is no real takeover pressure, that is, $G(s) < c$. In such case, an optimal debt level from the manager's point of view simply minimizes the probability of bankruptcy. Therefore, any debt that the company can pay it with probability 1 under the incumbent is optimal. Formally,

$$D^{**} = [0, y_2(s)). \tag{15}$$

Solving the manager's problem is not so easy when the manager is under a real takeover pressure. Here, blocking a takeover requires some risk of bankruptcy. In principle, one might conjecture that debt cannot block takeovers when the replacement gain is very high or the takeover cost is very low. However, Lemma 3 below shows that there is always a sufficiently large debt that blocks a takeover.

Lemma 3 *The managers can always block a takeover by choosing a debt level equal to*

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⁶In this context takeover will always be avoided. However, this is just a feature of the simplifying assumption on the nature of takeover costs. As we shall show in section 6, takeovers can occur in equilibrium once we introduce some uncertainty on the costs of the raider.

$$\bar{D} = 1 + y_2(s^*). \quad (16)$$

This level of debt guarantees that the value of equity will always be zero, even after a takeover. As a result, it guarantees that $\Delta S(\bar{D}) < c$. However, $\bar{D}$ also leads the incumbent to bankruptcy with probability one. Therefore, before opting to such an extremely high leverage the incumbent manager would be interested in checking if the takeover can be blocked by a debt level that she can pay in some state of nature.

Define D^r as the set of risky debt levels that the incumbent can pay in some state of nature. It is easy to see that D^r is the interval $(y_2(s), 1 + y_2(s)]$. If $\Delta S(D) < c$ for some D in D^r , then $1 + y_2(s^*)$ cannot be optimal because there is another debt that the incumbent can pay in some state of nature, which also blocks the takeover. In this case the optimal debt level is $D^m \equiv \theta^m + y_2(s)$, where D^m is the minimum debt in D^r that satisfies $\Delta S(D) < c$.⁷

Finally, if $\Delta S(D) \geq c$ for any $D \in D^r$, then the manager will have to accept bankruptcy with probability 1 to block the takeover. We do not gain any insight by characterizing the set of debt levels that block the takeover at the cost of bankruptcy with probability 1 for the incumbent. Hence, in this case we simply take $1 + y_2(s^*)$ as the optimal.

Proposition 2 below summarizes the optimal debt choice from the manager's point of view.

Proposition 2 *The optimal debt level for the manager equals*

$$D^{**} = \begin{cases} [0, y_2(s)) & \text{if } G(s) \leq c \\ \theta^m + y_2(s) & \text{if } G(s) > c \text{ and } \{D \in D^r : \Delta S(D) < c\} \neq \emptyset \\ 1 + y_2(s^*) & \text{otherwise,} \end{cases}$$

where $D^r = (y_2(s), 1 + y_2(s)]$, and $\theta^m + y_2(s) = \bar{D} + \epsilon$ with $\Delta S(\bar{D}) = c$ and $\epsilon > 0$ as small as necessary.

Having identified the manager's preferred solution, we can now derive the corresponding comparative statics.

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⁷Technically, the minimum debt level in D^r that satisfies $\Delta S(D) < c$ might not exist because the set $\{D \in D^r : \Delta S(D) < c\}$ is not closed in the lower bound. Therefore, the reader should interpret D^m as $\bar{D} + \epsilon$, where $\bar{D}$ solves $\Delta S(\bar{D}) = c$ and $\epsilon > 0$ is as small as needed.

Corollary 2 *The optimal debt level from the manager's point of view*

- a) *increases with the cost of financial distress λ ,*
- b) *decreases with the takeover cost c ,*
- c) *increases with the replacement gain $G(s)$.*

Proof: See Appendix. $\square$

The most surprising result is the first one. Contrary to any previous theory of capital structure, a theory based on entrenchment predicts an increase in leverage when the cost of financial distress increases. In fact, the cost of financial distress represents a subsidy to the raider who not only replaces the managers, but also saves some cost of financial distress. As a result, a higher cost of financial distress increases the profitability of a takeover. The manager, then, responds in the only way she has to block a takeover: increasing debt.

The second result provides a testable implication that sorts the efficiency and the entrenchment approaches. In the entrenchment approach, an increase in the takeover cost decreases the takeover pressure and, as a result, it reduces the manager's need for debt. Therefore, the entrenchment approach predicts that leverage and takeover cost move in opposite directions. In the efficiency approach, an increase in the cost of takeovers increases the optimality of using bankruptcy as a disentrenchment device. Therefore, the efficiency approach predicts that leverage increases with the takeover cost.

The third result coincides with the comparative static of Corollary 1. Both the efficient and the entrenchment solutions predict an increase in leverage when the replacement gain increases.

3.1 A comparison between the two solutions

The efficient and the entrenchment choices of debt differ not only in their sensitivity to certain parameters, but in their optimal levels as well. Let's use as a benchmark the shareholders' optimal solution (which happens to be also the socially efficient one):

Proposition 3 *The manager underlevers the company if $c > G(s)$ or $c \leq G(s)$ and $c > \Delta S(\frac{G(s)}{\lambda} + y_2(s))$. She overlevers if $c < \Delta S(\frac{G(s)}{\lambda} + y_2(s))$ or $c \leq G(s) < C_{D^0}$.*

Proof: It follows from a comparison of the results obtained in Propositions 1 and 2, and $\Delta S(D)$ decreasing with D . $\square$

Underleverage arises when the takeover pressure does not exist (i.e., $c > G(s)$), or it is not strong enough to induce the manager to the optimal leverage (i.e., $c > \Delta S(\frac{G(s)}{\lambda} + y_2(s))$). Overleverage occurs when the takeover pressure is so strong that it forces the manager to lever up beyond the efficient level (i.e., $c < \Delta S(\frac{G(s)}{\lambda} + y_2(s))$), or when takeovers are cheaper than debt as a disentrenchment device and the manager uses risky debt to block the takeover. The first reason for overleverage is similar to the rationale behind the use of a scorched earth strategy as an antitakeover device. The second one is more original and it is directly related to the agency problem in the choice of the appropriate disentrenchment instrument. The manager chooses debt even if this is a more inefficient disentrenchment device, because it allows her to stay in control in some states of nature.

4 Debt and Taxes

4.1 Tax subsidy for debt

Despite the magnitude of the tax advantage for debt in the U.S. tax code, there is very little empirical evidence on the importance of taxes to capital structure decisions.⁸ One possible explanation is that empirical researchers have failed to capture the effects of taxes because they vary across companies. Also, they have lacked a theoretical framework able to identify the causes of this differential sensitivity. The purpose of this section is to provide such a framework.

We model the tax subsidy for debt as a rebate equal to t times the total payments (and not just the interest payments) made to debtholders. This assumption captures in a one period model the features of the debt tax shield in an infinite horizon company. As a consequence we have that the present value of the debt tax shield, $DTS(D)$, is given by

$$DTS(D) = tB(D), \quad (17)$$

where $B(D)$ is the market value of a debt with a face value equal to D .

The initial shareholders take into account the tax benefits when they compute the optimal

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⁸Myers (1984) claims that he knows of no paper with strong evidence in favor of tax effects. Since then, Mackie-Mason (1991) has probably produced the most convincing piece in favor of a tax effect.

debt. Now, they maximize the value of the firm plus the value of the debt tax shield. As we show in the appendix, the solution of this program delivers standard results on the effects of taxes.

Corollary 3 *The optimal leverage from the initial shareholders' perspective increases whenever a tax subsidy for debt is introduced.*

Proof: See Appendix. $\square$

To derive the manager's optimal debt in a world with taxes we first have to show how the introduction of taxes changes the value of the company for the raiders. Then we proceed as before looking for the minimum debt that makes the takeover unprofitable.

4.1.1 The optimal trade-off between tax benefits and financial distress in the absence of agency costs

After the takeover, the best manager will be running the company and the raider sets the capital structure by weighting the tax benefit of debt and the cost of financial distress. In other words, when the agency problem has been resolved, our model collapses to the traditional trade-off theory of capital structure.

Lemma 4 *The debt level that optimally trades-off financial distress and tax savings is $\frac{\theta_{DT} + y_2(s^*)}{1-t}$, where $\theta_{DT} > 0$ equates the marginal tax benefit with the marginal cost of financial distress:*

$$\lambda\theta_{DT} = t(1 - \theta_{DT}).$$

Proof: See Appendix. $\square$

We are now ready to discuss the effects of a tax subsidy for debt on the manager's capital structure choice. We divide the analysis in two cases. First we consider a manager who, in the absence of the tax subsidy, is insulated from the market for corporate control. Then we look at a manager who is under a takeover pressure even without the tax subsidy.

4.1.2 The effects of a tax subsidy when the takeover pressure is low

Suppose that, in the absence of taxes, the manager is insulated from the market for corporate control (i.e. $G(s) < c$). We shall argue that, in this case, there exists a cut-off that determines

whether the tax subsidy will have any effect. For tax subsidies below this cut-off the manager stays with a riskless capital structure. On the other hand, the manager is forced to lever up to a risky level if the tax subsidy is above the cut-off.

To see this consider the maximum debt level that is safe for the incumbent under a tax subsidy t : $D = \frac{y_2(s)}{1-t}$.⁹ In the absence of a takeover, the firm's value under the maximum safe debt is given by

$$S = E[\theta] + y_2(s) + t\left(\frac{y_2(s)}{1-t}\right).$$

Once a raider buys out the company's equity and debt, she can set up the debt level, $\frac{\theta_{DT} + y_2(s^*)}{1-t}$, that optimally trades-off tax benefits and financial distress.¹⁰ Thus, the firm's value after a takeover is

$$S^* = \theta_{DT} \left[E[(1-\lambda)\theta | \theta < \theta_{DT}] + y_2(s^*) + t \left(\frac{E[(1-\lambda)\theta | \theta < \theta_{DT}] + y_2(s^*)}{1-t} \right) \right] + \\ (1 - \theta_{DT}) \left[E[\theta | \theta \geq \theta_{DT}] + y_2(s^*) + t \left(\frac{\theta_{DT} + y_2(s^*)}{1-t} \right) \right].$$

Subtracting S from S^* and evaluating the expectations, we obtain the increase in the firm's value due to a takeover

$$G(s) + \left\{ \frac{t}{1-t} \left[\int_0^{\theta_{DT}} (1-\lambda)\theta d\theta + (1-\theta_{DT})(\theta_{DT}) + G(s) \right] - \lambda \frac{\theta_{DT}^2}{2} \right\}. \quad (18)$$

The first term in equation (18), $G(s)$, is the usual gain from replacing the manager. The term in brackets is the gain from optimally leveraging up the company, which is formed by the increase in tax savings less the expected cost of financial distress. Let's call $R(t, \lambda, \theta, G(s))$ the expected gain from leveraging up the company to $\frac{\theta + y_2(s^*)}{1-t}$. Thus, the takeover is profitable

⁹The maximum safe debt can be obtained as follows. The face value of the debt, D , must be equal to the firm's cash-flow in the worst state of nature. We can divide this cash-flow in two components. The first one is the cash-flow in the absence of the tax subsidy: $\theta + y_2(s)$, which is equal to $y_2(s)$ in the worst state of nature ($\theta = 0$). The second component is the tax subsidy, which is equal to tD when the debt is safe. Therefore the maximum safe debt D solves $D = y_2(s) + tD \Rightarrow D = \frac{y_2(s)}{1-t}$.

¹⁰Note that a raider fully internalizes the company's debt value because she bears any cost of bankruptcy through the interest rate. Therefore, she has the correct incentives to choose the debt level that optimally trades-off tax benefits and bankruptcy costs.

if and only if

$$G(s) + R(t, \lambda, \theta_{DT}, G(s)) \geq c. \quad (19)$$

Note that $R(t, \lambda, 0, G(s)) = \frac{tG(s)}{1-t} > 0$. Hence, the expected gain from the optimal debt, $R(t, \lambda, \theta_{DT}, G(s))$, must be strictly positive. In fact, the following proposition proves that for each c , λ , and $G(s)$ there exists a level of tax subsidy, $\tilde{t}(c, \lambda, G(s))$, such that the manager can stay with a riskless debt level if and only if $t \leq \tilde{t}(c, \lambda, G(s))$.

Proposition 4 *Suppose that $G(s) < c$. For any takeover cost, replacement gain, and cost of financial distress there exists a tax subsidy for debt, $\tilde{t}(c, \lambda, G(s)) \in (0, 1 - \frac{G(s)}{c})$, such that a takeover is not profitable under a riskless debt level if and only if $t \leq \tilde{t}(c, \lambda, G(s))$. Moreover, $\tilde{t}(c, \lambda, G(s))$ increases with c and λ and decreases with $G(s)$.*

Proof: See Appendix □.

The comparative static of Proposition (4) is quite intuitive. The cut-off, $\tilde{t}(c, \lambda, G(s))$, increases with c because it is easier to block a costlier takeover. Likewise, an increase in λ reduces the profits from leveraging up the company. Since riskless debt does not allow the incumbent to default, the increased cost of financial distress hurts only the raider. Finally, an increase in the replacement gain, $G(s)$, increases the profitability of a takeover. Therefore, a lower tax benefit is needed to induce a takeover.

Proposition (4) sheds some light on the recent changes in the leverage of Corporate America. Financial innovations like junk bonds significantly decreased the costs of a hostile takeover in the 1980s. In our model, this would be equivalent to a decrease in c and $\tilde{t}(c, \lambda, G(s))$. Our conjecture is that the actual tax subsidy went beyond $\tilde{t}(c, \lambda, G(s))$ for many firms, forcing managers to increase leverage. On the other hand, anti-takeover legislation in the late 1980s increased c and $\tilde{t}(c, \lambda, G(s))$. Once more, the actual tax subsidy went below $\tilde{t}(c, \lambda, G(s))$, and Corporate America delevered under the same tax structure that generated the “overleverage” of the 1980s.

4.1.3 The effects of a tax subsidy when the takeover pressure is high

We now study the effects of a tax subsidy for debt in the case that a takeover is profitable in the absence of any risky debt (i.e., $G(s) \geq c$).

In this case the effect of the tax subsidy for debt is more ambiguous. In fact, the tax subsidy adds a new source of profits to takeovers only if the raider finds convenient to increase leverage beyond the level chosen by the manager.¹¹ If so, a tax subsidy for debt forces the manager to lever up.

By contrast, when the incumbent manager is more highly leveraged than what the raider would like to be, then the tax subsidy for debt decreases the takeover gains. Partially liberated from the takeover pressure, the incumbent manager can then afford to decrease the leverage. As a result, the introduction of a tax subsidy for debt will have the counterintuitive effect of decreasing the leverage of highly levered firms.

4.2 Tax subsidy for equity

In the previous subsection we showed that a sufficiently large subsidy for debt may force an otherwise entrenched manager to lever up. In this subsection we show that a tax subsidy for equity fails to induce the manager to decrease the leverage. Indeed, it can actually force her to *increase* leverage.

Consider a manager who would be fully entrenched in a tax neutral economy, that is $G(s) < c$. Now, introduce a subsidy that pays a percentage t on a firm's equity value. If the manager stays with an all equity capital structure, then the firm's value under her control becomes $(1 + t)(E[y_1(\theta)] + y_2(s))$.¹² On the other hand, if the raider takes over the firm the equity value is $(1 + t)(E[y_1(\theta)] + y_2(s^*))$. As usual, a takeover is profitable if and only if the increase in equity value is larger than the takeover cost, that is

$$(1 + t)G(s) \geq c.$$

If $(1 + t)G(s) < c$, then the manager is still insulated from the market for corporate control despite the tax subsidy for equity, and she stays with an all equity capital structure. If $(1 + t)G(s) \geq c$, then the tax subsidy for equity makes a takeover profitable under an all

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¹¹Note that level of leverage we are discussing uses the market value, not the face value of debt. This is so because the value of the debt tax shield is a function of the market value of debt.

¹²Note that there is no reason for the manager to choose a riskless debt level different from zero because the all equity capital structure maximizes firm's value under the incumbent's control and minimizes the probability of bankruptcy.

equity capital structure. The manager is forced to lever up.

Now consider that the manager is not entrenched in the absence of the subsidy, that is $G(s) > c$. Here, one could conjecture that the tax subsidy for equity might attenuate the overleverage. The following proposition proves that this conjecture is wrong:

Proposition 5 *The introduction of a tax subsidy for equity increases the manager's optimal level of leverage.*

Proof: See Appendix. $\square$.

The intuition is a straightforward. The manager under a takeover pressure chooses the minimum debt that blocks a takeover. The introduction of a tax subsidy for equity equal to t increases the potential gains from a takeover by $t\Delta S(D)$ (i.e., the increase in the equity value produced by a takeover times the magnitude of the subsidy). Thus, after the introduction of the subsidy the manager sets a debt level that obtains

$$(1 + t)\Delta S(D) < c.$$

In other terms, the effect of a tax subsidy for equity is to decrease the effective cost of a takeover from c to $\frac{c}{1+t}$. As we proved in Corollary 2 this has the effect of increasing debt.

5 Other aspects of capital structure choice

5.1 Private versus public debt

Thus far we have ignored the possibility of renegotiation. However, every time an excessive level of debt blocks a takeover, what prevents a raider from negotiating with the debtholders a concession sufficient to pay for the takeover cost? If renegotiation is always possible, then the manager will never be able to escape a takeover by increasing leverage. That is exactly the reason why incumbent managers who issue debt have a vested interest in preventing the possibility of renegotiations in the future. They can attempt to do that by distributing risky debt among dispersed investors.

Therefore, our model predicts that firms facing a takeover threat (i.e., firms issuing risky debt) should prefer to issue public rather than private debt. This implication suggests a

method to help identifying overlevered companies: these should be the ones with a lot of public debt or a wide dissemination of creditors. To this regard it is interesting to note that while corporate bonds represented just 25% of the debt financing of nonfinancial corporations in 1979, that share jumped to 50% in 1988 (Gertler and Hubbard, 1990). Therefore, the change in the composition of debt is consistent with the belief that Corporate America was overlevered in the late 1980s.

5.2 Senior versus junior debt

One of the existing puzzles in capital structure choice is why bank debt tends to be senior and public debt tends to be junior. Rajan and Winton (1994) provide an efficiency explanation for this composition based on the monitoring role of banks. The entrenchment approach may provide an alternative explanation, based on the manager's attempt to sandbag future renegotiations as much as possible. Bank debt tends to be more concentrated, while public debt is more widely diffused. Making the public debt junior (and so more risky) transforms the bondholders into the recipients of part of the takeover gains. This makes more difficult for a potential raider to renegotiate with creditors.

5.3 Other corporate decisions

In this paper we have focused on the capital structure choice as an entrenchment device. However, managers can entrench themselves in a variety of ways. They can invest in assets that are specific to them (Shleifer and Vishny, 1989), choose an organizational structure that make them indispensable (Novaes and Zingales, 1994), or more simply they can introduce poison pills and antitakeover devices. The availability of these instruments might reduce or even eliminate the need for using debt as an entrenchment device. In such case, the manager would choose riskless debt, and the deviations from the shareholders' optimal capital structure would only be in the direction of underleverage.

However, there are two reasons why capital structure decisions might be relevant even after these other entrenchment devices are considered. First, entrenchment devices are more powerful when their antitakeover effects are less obvious. Whenever the conflict of interest behind a manager's decision is transparent, entrenchment decisions are likely to be stricken

down by the court. By contrast, when the decision that entrenches the manager is a pure business decision (as financing is) the court does not interfere on the basis of the business judgment rule.

Furthermore, entrenchment in its various forms does not come without costs and without limits. If the choice of a manager-dependent organizational form introduces large inefficiencies, the overall effect on the likelihood of a takeover can be counterproductive. A similar argument can be made for the investment in some manager-specific assets. In sum, if no instrument alone can completely isolate the manager, multiple ways of entrenching can be complementary rather than substitutes in reaching the manager's final goal.

6 Extensions

6.1 The market for corporate control is not perfectly competitive

Thus far we have assumed that the corporate control market is perfectly competitive and that there is no free riding. Under these assumptions, the necessary and sufficient condition for takeovers to occur is $S^* - S \geq c$. In this section we relax these assumptions.

As an alternative we assume that the raider can capture only a fraction ϕ of the equity gains that a takeover generates. This formulation captures two possible deviations from the benchmark case. The first one is that existing shareholders can free ride, but the raider is allowed to dilute a fraction ϕ of the efficiency gains. Alternatively, ϕ represents the fraction of gains a raider can get in a bargaining with the incumbent management.

From the manager's perspective the required change is minor. Takeovers will occur whenever

$$\phi \Delta S(D) \geq c. \quad (20)$$

The manager's optimal solution picks the minimum level of debt such that $\phi \Delta S(D) < c$. However, this corresponds to the results obtained in Proposition 2, with a cost of takeover of $\frac{c}{\phi} > c$. In other words, the previous analysis carries through, and this renormalization has the effect of increasing the takeover costs.

By contrast, from the initial shareholders' perspective the assumption of a non-perfectly competitive market modifies the cost of using takeovers as a disentrenchment device. The cost

is no more c , but $\phi\Delta S(D)$. The interesting aspect is that the cost of a takeover depends on the company's leverage. Previously, the initial shareholders were only interested in finding the least costly disentrenchment device, but now they should also care about minimizing the surplus of a potential raider. In other terms, we have superimposed to the framework of section 2 a surplus extraction problem similar to the one described in Israel (1991).

This change has no consequences if $C_{D^0} \leq c$. In this case the initial shareholders would prefer debt as a disentrenchment device even if they could extract all the raider's surplus. Therefore, the solution will still be $D = \frac{G(s)}{\lambda} + y_2(s)$. However, the joint use of takeovers and debt may be the best alternative when $C_{D^0} > c$. In this case, the initial shareholders would like to introduce some risky debt to extract some of the takeover gains.

Note that if the initial shareholders were only interested in minimizing the raider's surplus, then their solution would be almost equal to the manager's solution. The initial shareholders would choose $\phi\Delta S(D) = c$, still leaving an incentive for the raider to take over, while the managers would choose a slightly larger debt ($\phi\Delta S(D) = c - \epsilon$) to make sure that the takeover would not happen. Actually, the initial shareholders do not care only to minimizing the raider's surplus. They also care about the cost of financial distress that their choice of debt induces. Therefore, shareholders' solution should favor less debt in the capital structure than the manager's solution.

In sum, the relaxation of the assumption that the market for corporate control is perfectly competitive has no substantial effects on the manager's solution and has the effect of pushing the initial shareholders' solution closer to the manager's one.

6.2 Stochastic takeover costs

In our model takeovers never happen in equilibrium because the manager always prefers default rather than being ousted by a takeover. However, this unrealistic feature is a mere consequence of the assumption that the cost of a takeover is perfectly known by the manager at the time of the leverage decision. By introducing some uncertainty on the takeover cost we obtain a trade-off between the probability of a takeover and the probability of bankruptcy. With this extension, takeovers and bankruptcies can both occur in equilibrium. In this subsection, we sketch this result.

In words, the manager can block the takeover with $\bar{D}$ for any realization of the takeover cost. However, she remains in control only if there is no bankruptcy. So, her expected utility with $D = \bar{D}$ is equal to the probability of staying out of bankruptcy. For debt $\underline{D}$, the manager survives a takeover only if $c = \bar{c}$, which happens with probability p . Still, the manager hopes that $\theta \geq \underline{\theta}$ to survive bankruptcy. The manager should choose the lower debt level if and only if $U(\underline{D}) > U(\bar{D})$. This happens when

$$p > \frac{1 - \bar{\theta}}{1 - \underline{\theta}}.$$

The above condition is more likely to be satisfied the higher the probability of a high takeover cost, and the higher the increase in the probability of bankruptcy when the manager sets $\bar{D}$ instead of $\underline{D}$. If so, the manager opts for a lower debt level and a takeover actually happens when a lower takeover cost realizes.

7 Implications

7.1 Empirical Implications

Our model incorporates as subcases most of the existing theories of capital structure and it is able to reconcile very different empirical findings.

Without an agency problem, our model collapses to the one described in section 4.1.1, that is, a company's capital structure arises from the traditional trade-off between taxes and cost of financial distress. However, a manager's capital structure choice may significantly differ from the shareholders' choice if the manager is the one in control. In fact, we showed that the manager's deviation from value maximization will depend (not monotonically) on the pressure from the corporate control market.

In the absence of a strong takeover pressure, the model delivers Myers' (1984) Pecking Order Theory. In this case, managers like to underlever their companies. However, they cannot do it easily with equity issues because these are subject to a shareholders' vote. Therefore, they do it little by little, accumulating retained earnings. This explains why the Pecking Order Theory provides such a good description of U.S. data, especially pre-1980s (see Shyam-Sunder and Myers, 1993), but it is not as good in describing the financing decisions of other

countries (Rajan and Zingales, 1995), where alternative mechanisms of control give more power to shareholders vis-a-vis management. This also explains why the evidence on the effects of the tax advantage of debt is so weak despite the magnitude of the subsidy for debt.

When the takeover pressure increases (as we think it happened in the 1980s), then capital structure choices are best described by “free-cash-flow type” of theories. The potential replacement gains are higher when the possibility of wasting corporate resources is higher. As a result, companies rich in cash flow increase their leverage. This explain why “free-cash-flow-type of theories” have been successful in explaining the capital structure decisions of some companies in the 1980s, but not at other times.

Unlike “free-cash-flow-type of theories”, our theory allows for the possibility of overleverage even in the absence of taxes. This implication substantiates the often heard claim that in the late 1980s Corporate America was overlleveraged. Our prediction is that overleverage is more likely in companies that issued large amounts of public debt.

Finally, we provide a way to discern which approach to capital structure choice is more appropriate in the U.S. economy: efficiency or entrenchment. Recall that when the takeover cost increases, the initial shareholders desire an increase in the level of debt, while entrenched managers desire a decrease in the level of debt. The deleveraging of Corporate America in the early 1990s suggests that the entrenchment approach may actually be the best approximation.

7.2 Corporate law

Our focus on the agency problem involved in the capital structure choice help us understanding some of the features of corporate law and corporate charters. For example, it appears surprising that while equity issues generally require shareholders' approval, the issue of debt and the choice of the dividend policy do not. This is particularly surprising for dividends, given that they can be considered a negative equity issue.

The entrenchment approach sheds some light on this puzzle. Provided that some degree of delegation is necessary in a modern corporation and that it would be too expensive to rely on a shareholders' vote for every decision, it is legitimate to expect that the requirement of a shareholders' vote should be limited to those decisions where the conflict of interests between managers and shareholders is most severe.

In our framework, managers are more likely to issue equity after the realization of a bad shock that increases the probability of going into bankruptcy. If the shock is such that $\Delta S(D) \ll c$, the managers can issue equity to reduce the personal risk of bankruptcy without incurring in the risk of a takeover. But issuing equity when the outstanding debt is very risky would imply a massive transfer of wealth to debtholders. It is clear, then, why it is wise to require shareholders' approval for equity issues. On the other hand, extraordinary dividend payments are like to happen at profitable states of nature, when a takeover pressure should help aligning the manager and shareholders' interest. In this case, a shareholders' vote might be redundant.

Finally, our model highlights that, as far as debt issues are concerned, there might be a conflict of interest in the use of publicly traded debt. Therefore, it might make sense to require a shareholders' vote to approve the issue of public debt. For instance, Italian Corporate Law requires shareholders' approval for the issues of public debt.¹⁴

7.3 Bankruptcy law

Financial distress has two major effects on a firm's value: on one hand it hurts shareholders by imposing a cost on the use of debt as a disentrenchment strategy. On the other hand, financial distress enhances the takeover pressure by adding a new source of profit for a potential raider. This latter effect explains why it is possible that a reduction in the cost of financial distress decreases welfare.

To analyze the welfare effects of a change in the cost of financial distress, we differentiate the firm's value (see equation (11)) with respect to λ :

$$\frac{dV(D)}{d\lambda} = \frac{d\theta_D}{d\lambda} [G - \lambda\theta_D] - \int_0^{\theta_D} \theta d\theta. \quad (21)$$

In case capital structure is set optimally ex ante, the envelope theorem implies $\frac{d\theta_D}{d\lambda} = 0$. It follows that the overall effect is negative. As expected, a reduction in the cost of financial distress increases a firm's value (and also welfare) in a world where decisions are made efficiently.

The result might be different if the capital structure is chosen by managers to entrench

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¹⁴We are indebted to Carlo Scarpa for this observation.

themselves. In this case, as we proved in Corollary 2, $\frac{d\theta_D}{d\lambda} > 0$. Therefore, the sign of the derivative depends on the relative size of the replacement gain, $G(s)$, and the cost of financial distress, $\lambda\theta_D$.

If $G(s) < \lambda\theta_D$ (i.e., the manager overlevers the company), then the derivative is negative. In other words, a reduction in the cost of financial distress has necessarily a positive impact on firm's value. By contrast, if $G(s) > \lambda\theta_D$ (i.e., the manager underlevers), then it is possible that the overall effect is positive.

It is interesting to use this analysis to understand the political pressure for bankruptcy reform. Before the mid 1980s when Corporate America was probably underlevered, there was not much political pressure for a bankruptcy reform. Only in the late 1980s bankruptcy reform became a hot issue both politically and academically. As we already mentioned, this is the period when it is likely that at least some companies were overlevered. Our analysis suggests that this is the time in which reducing financial distress is unequivocally good.

8 Conclusions

Recent capital structure theories have emphasized the role of debt in minimizing the agency problems between managers and shareholders. These theories seem to ignore that *capital structure choices themselves* are affected by the same agency problem. Building on this observation, we develop an alternative approach to capital structure choice: the entrenchment approach. Contrary to the efficiency approach, the entrenchment approach assumes that capital structure choices aim to maximize managerial discretion, rather than firm's value.

This paper derives a series of implications that make possible to discriminate between the two approaches. We also show that these two models have very different policy implications for the design of taxes and bankruptcy procedures. If capital structure is chosen by shareholders in an ex ante optimal way, then any tax differential treatment between debt and equity is distortionary and any reform that reduces the cost of financial distress is necessarily welfare improving. But if managers are the ones who choose it, then we argue that a tax-advantage to debt might be socially optimal. In the same context, we show that an improvement in the bankruptcy procedures that reduces the cost of financial distress is not necessarily welfare improving.

Appendix

Proof of Lemma 1:

We define θ_D , θ_D^* , and $\hat{\theta}_D$ as in the text (equations (6), (4), and (9)). However, to facilitate the exposition, we say that $\theta_D > 1$ when $D > 1 + y_2(s)$. By using the assumption that $y_1(\theta) = \theta$ we can write these cutoffs as a function of θ_D :

$$\theta_D^* = \begin{cases} 0 & \text{if } \theta_D < G(s), \\ \theta_D - G(s) & G(s) \leq \theta_D \leq 1, \\ \text{Min}\{1, D - y_2(s^*)\} & \text{otherwise.} \end{cases}$$

and

$$\hat{\theta}_D = \begin{cases} 0 & \text{if } \theta_D < G(s), \\ \frac{1}{1-\lambda}[\theta_D - G(s)] & G(s) \leq \theta_D \leq \frac{G(s)}{\lambda}, \\ \text{Min}\{1, \theta_D\} & \text{if } \theta_D > \frac{G(s)}{\lambda}. \end{cases}$$

We divide the analysis in four intervals as a function of the level of θ_D .

1. If $\theta_D \in [0, G(s)]$, then equation (10) becomes

$$\Delta S(D) = \int_{\theta_D}^1 G(s) d\theta + \int_0^{\theta_D} \lambda \theta d\theta. \quad (22)$$

Differentiating (22) with respect to θ_D yields

$$\frac{\partial \Delta S(D)}{\partial \theta_D} = -G(s) + \lambda \theta_D. \quad (23)$$

which is always negative for $\theta_D < G(s)$.

2. If $\theta_D \in (G(s), \frac{G(s)}{\lambda}]$, then equation (10) becomes

$$\Delta S(D) = \int_{\theta_D}^1 G(s) d\theta + \int_{\theta_D - G}^{\frac{1}{1-\lambda}[\theta_D - G]} [\theta + G(s) - \theta_D] d\theta + \int_{\frac{1}{1-\lambda}[\theta_D - G]}^{\theta_D} \lambda \theta d\theta. \quad (24)$$

Differentiating (24) with respect to θ_D yields

$$\frac{\partial \Delta S(D)}{\partial \theta_D} = -G(s) + \frac{1}{1-\lambda} \left[\frac{\theta_D}{1-\lambda} - \frac{G(s)}{1-\lambda} + G(s) - \theta_D \right] - \int_{\theta_D - G}^{\frac{1}{1-\lambda}[\theta_D - G]} d\theta + \lambda \theta_D - \frac{\lambda}{(1-\lambda)^2} [\theta_D - G]. \quad (25)$$

Simplifying, it becomes

$$= -G(s) + \lambda \theta_D - \frac{\lambda}{1-\lambda} [\theta_D - G(s)]. \quad (26)$$

This expression is negative if and only if

$$\theta_D > \frac{2\lambda - 1}{\lambda^2} G(s). \quad (27)$$

This is satisfied because $\theta_D > G(s)$ in this interval and $\frac{2\lambda - 1}{\lambda^2}$ is increasing in $\lambda \in [0, 1]$ and reaches a maximum equal to 1 at $\lambda = 1$.

3. If $\theta_D \in [\frac{G(s)}{\lambda}, 1]$, then equation (10) becomes

$$\Delta S(D) = \int_{\theta_D}^1 G(s) d\theta + \int_{\theta_D - G}^{\theta_D} [\theta + G(s) - \theta_D] d\theta \quad (28)$$

Differentiating (28) with respect to θ_D yields

$$\frac{\partial \Delta S(D)}{\partial \theta_D} = - \int_{\theta_D - G(s)}^1 d\theta < 0. \quad (29)$$

4. If $\theta_D > 1$ and $\theta^* = 1$, then equation (10) becomes $\Delta S(D) = 0$. If $\theta^* < 1$, then equation (10) becomes

$$\Delta S(D) = \int_{D-y_2(s^*)}^1 [\theta + y_2(s^*) - D] d\theta, \quad (30)$$

whose derivative with respect to D is $-\int_{D-y_2(s^*)}^1 d\theta < 0$. $\square$

Proof of Corollary 1:

- $\frac{\partial D}{\partial \lambda} \leq 0$. Consider first a change in λ that does not shift D^* from D^o to $[0, D^*)$ or vice versa. Of course, λ does not affect D^* when the optimal choice is safe debt ($[0, D^*)$). On the other hand, it is easy to see that $\frac{\partial D^o}{\partial \lambda} < 0$ when $D^* = D^o = \frac{G(s)}{\lambda} + y_2(s)$. Now consider changes in λ that shift D^* from D^o to $[0, D^*)$ or vice versa. An increase in λ increases C_D , therefore at most it shifts D^* from D^o to $[0, D^*)$. This implies a decrease in the optimal debt level. The same argument applies when λ decreases. At most, it shifts D^* from $[0, D^*)$ to D^o . This implies an increase in the optimal debt level.
- $\frac{\partial D}{\partial c} \geq 0$. If $D^* = [0, D^*)$ was optimal before and it remains optimal afterwards, then an increase in the takeover cost has no effect. The same is true if $D^* = D^o$ before and after. In such case, takeovers are not used as a disentrenchment device. Finally, an increase in c at most moves D^* from $[0, D^*)$ to D^o implying an increase in the optimal debt.
- $\frac{\partial D}{\partial G(s)} \geq 0$. If $c < C_{D^o}$ then the optimal debt level is a riskless one, and at most the interval of optimal debt levels may increase. If $c > C_{D^o}$, then $D^* = D^o$ and it is easy to see that $\frac{\partial D^o}{\partial G(s)} > 0$. Only if $c = C_{D^o}$, we have the possibility that an increase in $G(s)$ decreases the optimal debt by moving D^* from D^o to $[0, D^*)$. $\square$

Proof of Corollary 2:

The results follow from implicit differentiation of $\Delta S(D) = c$ in the four cases presented in Lemma 1. We present here the results for the second interval. The steps are the same in the other three. From Lemma 1 we know that $\frac{\partial \Delta S(D)}{\partial \theta_D} < 0$. Therefore it follows that $\text{sign}(\frac{d\theta_D}{dc}) = \text{sign}(\frac{d[\Delta S(D)-c]}{dG(s)})$. However, $\frac{d[\Delta S(D)-c]}{dG(s)} = \int_{\theta_D}^1 d\theta + \int_{\theta_D-G}^{\frac{1}{1-\lambda}[\theta_D-G(s)]} d\theta > 0$. Similarly, $\text{sign}(\frac{d\theta_D}{dc}) = \text{sign}(\frac{d[\Delta S(D)-c]}{dc})$. But $\frac{d[\Delta S(D)-c]}{dc} = -1 < 0$. Finally, $\text{sign}(\frac{d\theta_D}{d\lambda}) = \text{sign}(\frac{d[\Delta S(D)-c]}{d\lambda})$ which equals (after some simplifications) to $\int_{\theta_D-G}^{\frac{1}{1-\lambda}[\theta_D-G(s)]} \theta d\theta > 0$. $\square$

Proof of Corollary 3:

Initial shareholders solve

$$\max_{\theta_D \in [0,1]} V(\theta_D) + tB(\theta_D, t).$$

where $V(\theta_D)$ is the firm's value given by (11) and $tB(\theta_D, t)$ is the debt tax shield as given by the tax rate times the market value of the debt. The debt tax shield is equal to

$$\frac{t}{1-t} \int_0^{\theta_D} \min\{(1-\lambda)\theta + G(s) + y_2(s), \theta_D + y_2(s)\} d\theta + \int_{\theta_D}^1 \theta_D + y_2(s) d\theta.$$

Let's define

$$\hat{\theta} = \begin{cases} 0 & \text{if } (1-\lambda)\theta + y_2(s^*) > \theta_D + y_2(s) \\ 1 & \text{if } (1-\lambda)\theta + y_2(s^*) < \theta_D + y_2(s) \\ \text{solves } (1-\lambda)\theta + y_2(s^*) = \theta_D + y_2(s) & \text{otherwise.} \end{cases}$$

Then, the debt tax shield can be rewritten as

$$DTS(D) = \frac{t}{1-t} \int_0^{\hat{\theta}} [(1-\lambda)\theta + G(s) + y_2(s^*)] d\theta + \int_{\hat{\theta}}^1 [\theta_D + y_2(s)] d\theta.$$

$\frac{\partial DTS(D)}{\partial \theta_D}$ is always positive for any $\hat{\theta} < 1$. In particular, it will be positive for $\hat{\theta} = \theta_D = \frac{c}{\lambda}$, which is the initial

shareholders' optimum in a world without taxes. Therefore, the introduction of a tax subsidy for debt will have the effect of increasing debt. $\square$

Proof of Lemma 4: We look for the debt level that maximizes firm's value. Any $D < \frac{y_2(s^*)}{1-t}$ cannot be optimal because the latter gives the highest tax saving among the riskless debt levels. Moreover, any debt level that implies bankruptcy with probability 1 induces the same value for the firm because the tax saving depends on the market value of debt, not on the face value. Therefore, we can restrict our attention to the following program

$$\max_{\{\theta_D \in [0,1]\}} \theta_D [E[(1-\lambda)\theta | \theta < \theta_D] + y_2(s^*) + t \left(\frac{E[(1-\lambda)\theta | \theta < \theta_D] + y_2(s^*)}{1-t} \right)] + (1-\theta_D) [E[\theta | \theta \geq \theta_D] + y_2(s^*) + t \left(\frac{\theta_D + y_2(s^*)}{1-t} \right)]$$

Using $\theta_D E[\theta - \lambda\theta | \theta < \theta_D] = \int_0^{\theta_D} (\theta - \lambda\theta) d\theta$, and $(1-\theta_D) E[\theta | \theta \geq \theta_D] = \int_{\theta_D}^1 \theta d\theta$, we can rewrite our program as

$$\max_{\{\theta_D\}} E[\theta] + \frac{y_2(s^*)}{1-t} + \frac{t}{1-t} \int_0^{\theta_D} \theta d\theta - \frac{\lambda\theta_D^2}{2(1-t)} + (1-\theta_D) \frac{t\theta_D}{1-t}, \text{ s.t. } \theta_D \in [0,1].$$

Differentiating the objective function with respect to θ_D , we obtain the first order condition (FOC) for an interior maximum:

$$-\lambda\theta_{D\tau} + t(1-\theta_{D\tau}) = 0.$$

The FOC is also sufficient. To see that $\theta_{D\tau}$ increases with t , and decreases with λ , we use the implicit function theorem in the FOC

$$\frac{\partial \theta_{D\tau}}{\partial \lambda} = \frac{\theta_{D\tau}}{-(\lambda+t)} < 0.$$

$$\frac{\partial \theta_{D\tau}}{\partial t} = \frac{-1}{-(\lambda+t)} > 0.$$

$\square$

Proof of Proposition 4:

Define $\Psi(t, \lambda, c, G(s), \theta_{D\tau}) \equiv G(s) + R(t, \lambda, \theta_{D\tau}, G(s)) - c$ as the takeover profit. By the envelope theorem, we can take $\theta_{D\tau}$ as a constant when we differentiate $\Psi(t, \lambda, c, G(s), \theta_{D\tau})$. Therefore, we will simplify the notation by dropping $\theta_{D\tau}$ as an argument of Ψ and R . Now, consider the equation $G(s) + R(t, \lambda, G(s)) = c$. By the Implicit Function Theorem, the above equation defines a continuously differentiable function $\hat{i}(c, \lambda, G(s))$ if and only if $\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial t} \neq 0$. Indeed,

$$\frac{\partial \Psi(.)}{\partial t} = \frac{1}{(1-t)^2} \left[\int_0^{\theta_{D\tau}} (\theta - \lambda\theta) d\theta + (1-\theta_{D\tau})(\theta_{D\tau}) + G(s) \right] > 0.$$

Since $\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial t} > 0$ and $\Psi(\hat{i}(c, \lambda, G(s)), \lambda, c, G(s)) = 0$, a takeover is not profitable for any $t \leq \hat{i}(c, \lambda, G(s))$. Moreover, $\hat{i}(c, \lambda, G(s)) > 0$, for $\Psi(0, \lambda, c, G(s)) = G(s) > 0$. To prove that $\hat{i}(c, \lambda, G(s)) < 1$, note that $\Psi(1, \lambda, c, G(s), \theta_{D\tau}) > G(s) + R(1, \lambda, 0, G(s)) - c = G(s) + \frac{tG(s)}{1-t} - c$. Define, $\hat{i} = 1 - \frac{G(s)}{c} < 1$. Thus, $G(s) + R(\hat{i}, \lambda, 0, G(s)) - c = 0$. It then follows that a takeover must be strictly profitable for a subsidy t sufficiently close to $\hat{i}$ when we take into account the additional profit from optimally leveraging up the company. Hence, $\hat{i}(c, \lambda, G(s)) < \hat{i} < 1$. To do comparative statics on $\hat{i}(c, \lambda, G(s))$ we use the Implicit Function Theorem on $\Psi(t, \lambda, c, G(s))$.

- $\frac{\partial \hat{i}(c, \lambda, G(s))}{\partial c} = \frac{-\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial c}}{\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial t}} = \frac{1}{\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial t}} > 0.$
- $\frac{\partial \hat{i}(c, \lambda, G(s))}{\partial G(s)} = \frac{-\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial G(s)}}{\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial t}} = \frac{-\frac{1}{1-t}}{\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial t}} < 0.$
- $\frac{\partial \hat{i}(c, \lambda, G(s))}{\partial \lambda} = \frac{-\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial \lambda}}{\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial t}} = \frac{\frac{\theta_{D\tau}^2}{2(1-t)}}{\frac{\partial \Psi(t, \lambda, c, G(s))}{\partial t}} > 0. \square$

Proof of Proposition 5:

Let's first prove that, unlike in the case of the tax subsidy for debt, the tax subsidy for equity does not change the state of the world in which the company goes into bankruptcy. In a world without taxes, the cut-off state, θ_0 , for bankruptcy under a debt with face value D solves $D = \theta_0 + y_2(s)$. In a world with taxes the threshold for bankruptcy is defined by

$$D = \theta + y_2(s) + t[\theta + y_2(s) - D] \Rightarrow (1 - t)D = (1 - t)(\theta + y_2(s)) \Rightarrow \theta = \theta_0.$$

Now, call $\Delta S(D)$ the equity gain from a takeover when the face value of debt is D and there are no taxes. Then, if we introduce a tax subsidy to equity we can write (thanks to the first part of the proof) the equity gain from a takeover as $\Delta S(D) + t\Delta S(D)$. But before the introduction of the tax subsidy for equity the manager chose the level of debt so that $\Delta S(D) = c$. Therefore, after the introduction of the tax subsidy the raider's profit will be equal to $c + t\Delta S(D) > c$. As a result, the manager, will be forced to set $\tilde{D}$ so that $(1 + t)\Delta S(\tilde{D}) = c$. Given that $\Delta S(D)$ decreases with D , we have $\tilde{D} > D$. $\square$

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