Manager Characteristics and Capital Structure: Theory and Evidence

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Abstract

We investigate the effects of manager characteristics on capital structure in a structural model. We implement the manager's optimal contracts through financial securities that leads to a dynamic capital structure, which reflects the effects of taxes, bankruptcy costs and manager-shareholder agency conflicts. Long-term debt declines with the manager's ability, inside equity stake and the firm's long-term risk, but increases with its short-term risk. Short-term debt declines with the manager's ability, increases with her equity ownership, and declines with short-term risk. We show support for these implications in our empirical analysis.

JEL Classification Codes: G32, D92, D86

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I Introduction

We theoretically and empirically analyze the effects of managerial incentives and manager-specific characteristics on capital structure. We develop a dynamic structural model that incorporates the effects of taxes, bankruptcy costs, as well as agency conflicts between an undiversified manager and well-diversified outside investors. The manager has discretion in financing and effort, and receives dynamic incentives through explicit contracts with shareholders. We implement the manager's contracts through financial securities, which leads to a dynamic capital structure for the firm consisting of inside equity, outside equity, long-term debt, and short-term debt (or a cash reserve).

We derive novel, testable predictions that link manager and firm characteristics to long-term debt. Long-term debt declines with the manager's ability, her inside equity stake, and the firm's long-term risk, but increases with its short-term risk. Our implementation of the manager's contracts also generates additional predictions for the effects of manager and firm characteristics on short-term debt and total debt. Short-term and total debt decline with the manager's ability, increase with her inside equity stake, decline with the firm's short-term risk, but vary non-monotonically with its long-term risk. With the exception of the predicted relation between short-term debt and inside equity, we show significant support for all the above implications in our empirical analysis.

In our infinite horizon, continuous-time framework, the manager of a privately held firm obtains financing for a positive NPV project from public debt and equity markets. The manager has an initial ownership stake and receives a proportion of the net payoff from external financing (the total proceeds from financing net of the required capital investment). The firm's capital structure initially consists of equity, infinite maturity and non-callable long-term debt, and non-discretionary short-term debt that is associated with the firm's working capital requirements such as the financing of inventories, accounts receivable, and employee wages. In our subsequent implementation of the manager's contracts, the manager holds an inside equity stake and her cash compensation is implemented through a cash reserve that offsets the firm's short-term debt. In our implementation, therefore, the firm's capital structure consists of inside and outside equity, long-term debt, and short-term debt associated with working capital *and* the manager's cash compensation.

The total earnings (before interest, taxes, and the manager's compensation) evolve as a log-normal process and consist of two components: a component that increases with the manager's ability and effort, and a component that represents the earnings from existing assets that are unaffected by the manager's human capital. The firm's earnings are affected by two sources of uncertainty. First, the earnings generated by the manager in each period are risky; their standard deviation is the firm's *short-term risk*. Second, the firm's assets evolve stochastically; their standard deviation is the firm's *long-term risk*.

Outside investors are risk-neutral and *competitive* as in Chapters 3 and 4 of Tirole (2006), while the undiversified manager has quadratic (mean-variance) preferences. We consider an incomplete contracting environment in which the manager receives dynamic incentives through a sequence of explicit contracts contingent on the firm's earnings. The contracts must guarantee that the expected payout flow to the firm net of the manager's compensation is at least as great as the payout flow from existing assets.

As in Leland (1998), debt is serviced entirely as long as the firm is solvent by the additional issuance of equity if necessary. Bankruptcy occurs endogenously when the equity value falls to zero. The firm is subsequently controlled by debt-holders as an all-equity firm. The firm's future earnings after bankruptcy are lowered by bankruptcy costs that are external to the manager-firm relationship. The manager continues to operate the firm, and contracts with debt-holders, who are the firm's new shareholders. The manager also incurs personal bankruptcy costs because her compensation is tied to the firm's earnings.

We characterize the equilibrium in which the firm's capital structure and the manager's contracts are endogenously determined. Because the manager has an initial ownership stake, she receives a portion of the net payoff—the total proceeds net of the required capital investment—from external financing. The manager chooses the firm's capital structure to maximize the total expected utility she derives from her initial payoff from leveraging the firm and her stream of future contractual compensation payments.

The manager's compensation in each period is affine in the firm's earnings. We implement the risky component of the manager's compensation through an inside equity stake in the firm, and the performance-invariant or "cash" component through a cash reserve that modifies the firm's short-term debt. (Cash is effectively *negative* short-term debt; see DeMarzo and Fishman (2007).) The different components of the firm's capital structure play complementary roles. The firm's long-term debt primarily reflects the tradeoff between debt tax shields and bankruptcy costs. The manager's inside equity stake and the cash reserve provide optimal incentives to the risk-averse manager.

We first derive a number of results linking manager and firm characteristics to long-term debt that *do not depend* on our implementation of the manager's compensation contracts. The manager's long-term debt choice at date zero reflects its effects on her initial payoff from leveraging the firm, and the expected utility from her future contractual compensation payments—hereafter, her *continuation value*. The manager's initial payoff from leveraging the firm is proportional to the total proceeds from external financing net of the initial required investment. Under rational expectations, the proceeds from external financing equal the market value of the firm's total after-tax earnings *net of the manager's stake*.

The long-term debt choice trades off the positive and negative effects of long-term debt on the manager's total expected utility. On the positive side, because debt interest payments are shielded from corporate taxes, the manager can potentially increase the proceeds from external financing at date zero (therefore, her initial payoff) by choosing greater long-term debt. Choosing greater long-term debt, however, increases the expected bankruptcy costs for the firm and personal bankruptcy costs for the manager, which negatively affect her continuation value.

We show that long-term debt declines with the manager's ability, increases with the manager's risk aversion, and increases with her disutility of effort. To understand the intuition for these results, we first note that, because capital markets are competitive, the manager appropriates the surplus she generates due to her human capital (see Aghion and Bolton (1992), Chapter 3 of Tirole (2006)). Consequently, the manager's ability and effort affect her continuation value, but do not affect the proceeds from external financing at date zero and, therefore, the manager's initial payoff.

An increase in the manager's ability increases the output the manager generates and her expected contractual compensation in each period. *At the margin*, the manager consequently gives relatively more weight to her continuation value than her initial payoff in choosing the firm's long-term debt. Because long-term debt lowers the manager's continuation value through the likelihood of bankruptcy, the manager chooses lower long-term debt to lower the probability of bankruptcy.

An increase in the manager's risk aversion or disutility of effort increases the costs of providing incentives to the risk-averse manager so that she exerts lower effort in equilibrium. The output she generates in each period and her expected compensation decline. The manager therefore attaches relatively more weight to her initial payoff from leveraging the firm than her continuation value. She chooses greater long-term debt to exploit the positive effects of *ex post* debt tax shields on the surplus she generates from external financing and, therefore, her initial payoff.

The negative effect of manager ability, and the positive effect of risk aversion, on long-term debt are surprising predictions of our theory. Casual intuition would seem to suggest that manager ability should positively affect long-term debt because it increases the firm's earnings in each period, while risk aversion should negatively affect long-term debt because earnings decline (due to costs of risk-sharing) and the adverse impact of the possibility of bankruptcy on the manager's expected utility increases. As discussed above, our results and the intuition underlying them show that this casual intuition is incorrect.

The firm's short-term and long-term risks have differing effects on long-term debt. Long-term debt declines with long-term risk, but increases with short-term risk. Long-term and short-term risk have differing effects on long-term debt because the short-term risk affects the manager's incentive compensation in each period, while the long-term risk has long-term effects by influencing the manager's valuation of her future payoffs. The presence of managerial discretion plays a central role in generating the differing effects of long-term and short-term risks on debt structure.[a]

[a]In a different framework, Gorbenko and Strebulaev (2010) also show that permanent and temporary components of a firm's risk have differing effects on financial policies.

Next, we conduct a quantitative investigation of the effects of manager and firm characteristics on capital structure. To obtain a reasonable set of baseline parameter values, we calibrate the model to the data we use for our subsequent empirical analysis. In particular, we indirectly infer the manager-specific parameters—ability, risk aversion, discount rate, and disutility of effort—by matching the predicted values of key relevant statistics to their average values in the data.

Consistent with our analytical results, long-term debt declines with the manager's ability, increases with her risk aversion, increases with her disutility of effort, declines with the firm's long-term risk, and increases with its short-term risk. Our numerical analysis shows that the firm's short-term debt declines with the manager's ability, risk aversion and disutility of effort as well as with the firm's short-term risk. Because the manager's ability represents her non-discretionary contribution to output in each period, an increase in the manager's ability increases the performance-invariant or "cash" component of the manager's compensation in each period. The value of the firm's cash reserve (short-term debt), therefore, increases (decreases).[b]

An increase in the manager's risk aversion, disutility of effort, or the firm's short-term risk increases the cost of providing incentives to the risk-averse manager. In equilibrium, the manager's inside equity stake declines, and she receives a greater portion of her compensation in "cash" rather than risky "equity". Consequently, the value of the firm's cash reserve (short-term debt) again increases (decreases). Recall that the firm's short-term debt is determined by its working capital requirements and the manager's cash compensation. Manager-specific characteristics affect the firm's short-term debt through their effects on the manager's cash compensation.

Our main testable implications are robust to an extension of the model that accommodates the scenario in which the manager continues to service debt even after the equity value falls to zero (the firm effectively becomes privately held). The manager declares bankruptcy when it is no longer optimal for her to continue servicing debt. We also explore the robustness of our implications to another extension of the model that allows for variations in the

[b]Recall that cash is *negative* risk-free short-term debt.

allocation of bargaining power between insiders and outsiders. The main predictions of the theory hold as long as shareholders' bargaining power vis-a-vis the manager is below a (high) threshold.

We empirically investigate the testable implications of the theory that link manager and firm characteristics to long-term and short-term debt. For robustness, we use five empirical proxies for managerial ability. The first three proxies—CEO cash compensation, the ratio of CEO cash compensation to assets, and the industry-adjusted return on assets of the firm—are directly derived from the theory. The last two proxies—CEO tenure and the ratio of CEO tenure to age—are indirect proxies of CEO ability. We show that long-term and short-term debt decline with all our ability proxies as predicted by the theory.

The theory predicts that long-term debt increases with the manager's risk aversion and disutility of effort, while short-term debt declines. As discussed earlier, the manager's inside equity stake declines with her risk aversion and disutility of effort, which reflects the greater costs of providing incentives to the risk-averse manager. The theory, therefore, predicts a negative relation between long-term debt and the manager's inside equity ownership, and a positive relation between short-term debt and inside equity ownership. Consistent with the theory, long-term debt declines with the manager's inside equity ownership. The relation between short-term debt and inside equity ownership is, however, negative and marginally significant.

We also empirically examine the predicted effects of long-term and short-term risk on debt structure. Consistent with the theory, our primary proxies for a firm's long-term and short-term risk are the asset volatility and the standard deviation of the return on assets, respectively. As predicted by the theory, we show that long-term debt decreases with long-term risk and increases with short-term risk, while short-term debt decreases with short-term risk.

We carry out an instrumental variables analysis to correct for potential econometric issues created by the endogenous determination of manager ownership and debt structure. With the exception of the relation between short-term debt and manager ownership, our results continue to show significant support for the testable implications of the theory even after controlling for endogeneity. To partially address Strebulaev's (2007) critique that traditional leverage regressions could be misspecified in a dynamic context, we show support for our hypotheses in additional tests that examine the *incremental* financing decisions of firms.

II Related Literature

The tradeoff theory of capital structure argues that capital structure is determined by the tradeoff between the benefits of debt tax shields and the costs of financial distress. A number of studies examine the quantitative effects of the tradeoff between taxes and financial distress costs in dynamic, structural models in which managers are assumed to behave in the interests of shareholders (for example, Fischer et al (1989), Leland and Toft (1996), Goldstein et al. (2001), Hennessy and Whited (2005), Strebulaev (2007)).

Because they do not incorporate managerial discretion, manager characteristics have no effect on capital structure in these models. We contribute to this literature by analyzing the effects of managerial discretion in a dynamic model that also incorporates taxes and bankruptcy costs. Apart from reconciling growing evidence on the effects of manager characteristics on financing decisions (Berger et al. (1997), this study), our analysis also sheds light on the relative importance of taxes, bankruptcy costs, and manager-shareholder agency conflicts in the determination of capital structure.

The agency theory of capital structure is based on the premise that agency conflicts between managers and outside investors are a key determinant of capital structure (see Myers (2001) for a survey). DeMarzo and Sannikov (2006) and DeMarzo and Fishman (2007) investigate the effects of agency conflicts on capital structure in dynamic frameworks with risk-neutral agents and complete contracting.[c] We complement these studies in several key respects. First, we incorporate taxes in our framework, which have a first order effect on capital structure as shown by recent studies (for example, Hennessy and Whited (2005), Stre-

[c]In these studies, the current shareholders of the levered firm are committed to a contract signed with the shareholders of the original un-levered firm. They also consider the impact of *ex post* Pareto-improving renegotiations with respect to the contract signed with the original shareholders.

bulaev (2007)). Our study, therefore, integrates the perspectives of "tradeoff" and "agency" models that capital structure reflects the effects of *external* imperfections such as taxes and bankruptcy costs as well as *internal* agency conflicts among firms' stake-holders. Second, we derive novel implications for the effects of manager-specific characteristics such as ability and risk aversion on capital structure. Third, we examine the effects of managerial discretion in an environment in which contracts are incomplete.

Berk et al. (2006) analyze the effects of managerial risk aversion on capital structure in a framework with one-sided commitment. We complement their study by developing a framework with moral hazard (effort provision), *incentive* compensation, and *risky* long-term debt. We implement the manager's contract through financial securities, which leads to a dynamic capital structure and implications for the effects of manager and firm characteristics on long-term debt and short-term debt. Subramanian (2008) develops a continuous-time agency model to show how a risk-averse manager's discretion in dynamic financing, effort and project choices affects capital structure. He (2011) studies the effects of manager-shareholder agency conflicts on capital structure and finds that the effects of debt overhang on managerial incentives lowers the optimal leverage.

III The Model

The manager of an all-equity firm obtains financing for a capital investment $I > 0$ in a positive NPV project from public debt and equity markets. (The "manager" should be viewed as a proxy for the firm's "insiders.") The manager has an ownership stake $g_{initial} \in (0, 1)$ in the initial all-equity firm. The total earnings *before interest, taxes and the manager's compensation* (EBITM) are distributed among all the firm's claimants: the manager, shareholders, debt-holders, and the government (through taxes). We ignore personal taxes for simplicity, and assume that the corporate tax rate is a constant $\tau \in (0, 1)$. Security issuance costs are negligible and the risk-free interest rate, r, is constant and the same for all market participants. All agents are fully rational.

A The Firm's Total EBITM Flow

The model is set in continuous time with a time horizon $[0, \infty)$. For expositional convenience, we refer to the interval $[t, t + dt]$ as a "period," which represents a time period such as one quarter in the real world. In any period $[t, t + dt]$; $t \in [0, \infty)$, the firm's existing assets generate a total EBITM flow $P(t)dt$ without any actions by the manager. The manager affects the total EBITM flow over time through her ability and unobservable effort. In any period $[t, t + dt]$, if the manager exerts effort $e(t) > 0$, the EBITM flow is

$$dQ(t) = \overbrace{P(t)dt}^{\text{EBITM flow from existing assets}} + \overbrace{\overbrace{P(t)\Big[\big(\ell + e(t)\big)dt + sdW(t)\Big]}^{\text{Earnings generated by manager's human capital}} - \overbrace{\lambda P(t)dt}^{\text{Short-term debt payments}}}^{\text{Incremental EBITM flow generated by manager}} \tag{1}$$

where W is a standard Brownian motion. In the second term in equation (1), $\ell > 0$ is the manager's ability, which is constant through time and is observable. The parameter s determines the risk of the firm's earnings in each period, which we hereafter refer to as the firm's *short-term risk*. In equation (1), it is understood that earnings depend on the manager's effort. We avoid explicitly indicating the dependence to simplify the notation. The term $\lambda P(t)dt$ represents *non-discretionary*, short-term (single-period) debt payments associated with the firm's working capital requirements such as the financing of inventories, accounts receivable, employee wages, etc. The role of this term is to facilitate the calibration of the model; it does not affect any of our qualitative results.

The process $P(\cdot)$, which determines the *level* of the firm's EBITM flow in each period by equation (1), is the key state variable in the model. The process evolves as

$$dP(t) = P(t)[\mu dt + \sigma dB(t)], \tag{2}$$

where B is a Brownian motion that could be correlated with W. We refer to σ as the firm's *long-term risk* to because it affects the evolution of the firm's assets or "earnings-generating capacity" over time. The project parameters s, μ, σ, which determine the earnings flows over time, are common knowledge. The information generated by the EBITM process and the process $P(\cdot)$ is $\{\mathcal{F}_t\}$.

B The Debt Structure

All long-term debt issued at date zero has infinite maturity, is non-callable, and is completely amortized so that long-term debt-holders are entitled to a coupon payment θ per unit time (hereafter, the *coupon*). The coupon, θ, which determines the firm's long-term debt structure, is later determined endogenously. For now, the firm's capital structure consists of equity, long-term debt and the short-term debt financing of the firm's working capital requirements. In Section V, we implement the manager's optimal contract through an inside equity stake and a cash reserve that offsets the firm's short-term debt. While we could have incorporated the term $\lambda P(t)dt$ in equation (1) into the earnings generated by the manager's human capital, we indicate it separately to clarify the roles of the different components of short-term debt in the implemented model. We hereafter refer to the firm's long-term debt-holders as, simply, its *debt-holders*.

C The Objectives of Outside Investors and the Manager

Outside investors are risk-neutral, while the manager is risk-averse. If the manager's payoff in period $[t, t + dt]$ is $dc(t)$ and her effort level is $e(t)$, her total expected utility is

$$\Phi(c, e) = E\left[\int_0^\infty \exp(-\beta t)\left(U(dc(t)) - \frac{1}{2}\kappa e(t)^2 dt\right)\right]. \tag{3}$$

In the above, $\beta > 0$ is the manager's subjective discount rate (or "degree of myopia") and $\frac{1}{2}\kappa e(t)^2 dt$ ($\kappa > 0$ is a constant) is the manager's disutility of effort in period $[t, t + dt]$. All our analytical results hold if $\beta = r$. We allow for β to differ from the risk-free rate r for greater generality and to facilitate the calibration of the model. Our calibration exercise in Section VIA leads to a calibrated value of the manager's discount rate β that differs from the risk-free rate. This observation, and the significant level of risk aversion of the manager reflect the fact that the average manager is significantly undiversified. For tractability, we assume that the manager has quadratic (mean-variance) preferences, that is, the manager's utility function $U(.)$ is

$$U(x) = x - \frac{1}{2}\gamma x^2, \tag{4}$$

where γ is the manager's constant risk aversion.

D Contracting

The manager receives dynamic incentives through contracts that could be explicitly contingent on the EBITM flow process, $dQ(.)$. We consider an *incomplete contracting* environment in which only single-period contracts are enforceable. As in Chapter 3 of Tirole (2006), the manager offers a contract to the firm's *competitive* shareholders in each period. In our subsequent implementation of the manager's contracts in Section V, this is equivalent to the manager dynamically issuing (or buying back) financial securities in competitive capital markets. In our implementation, the manager also holds an inside equity stake in the firm. Anticipating this implementation, we assume that the manager receives her contractually specified payoff from the total earnings net of corporate taxes. The remaining earnings are distributed among long-term debt-holders (hereafter referred to as debt-holders) and shareholders.[d]

As in Leland (1998), debt payments are serviced entirely as long as the firm is solvent. In financial distress, debt payments are serviced through the additional issuance of equity. Bankruptcy occurs endogenously when the equity value falls to zero. The absolute priority of debt is enforced at bankruptcy and the firm is subsequently controlled by debt-holders as an all-equity firm.[e] Note that, because the manager's contracts determine the payout flows to outside equity, they also effectively determine the bankruptcy time. In Appendix B, we extend the model to allow for the manager to continue servicing debt from the firm's total earnings after the equity value falls to zero, which is effectively equivalent to the scenario in which the firm becomes privately held. The manager declares bankruptcy when it is no longer optimal for her to service debt. The implications of the extended model do not differ from those of the simpler model presented here in which bankruptcy occurs when the equity value falls to zero.

For simplicity and concreteness, we assume that the manager continues to operate the firm after bankruptcy and contracts with the new shareholders of the firm; the debt-holders.[f]

[d]This reflects the perspective that the manager is a shareholder so that her compensation is paid out after corporate taxes. We can easily modify the model to assume that executive compensation is deductible in the computation of corporate taxes without altering any of our implications. In reality, the tax treatment of CEO compensation is rather complex. According to Section 162(m) of the Internal Revenue Code, executive compensation is tax deductible, but only up to a limit of $1 million. Certain types of incentive compensation such as bonus compensation and qualified stock options are tax deductible, but stock grants, option grants below market value, and downside protection for an executive in the event of a decline in the stock price are not. Moreover, the assessed taxes also vary depending on underlying vesting periods. The situation is complicated further by the fact that personal taxes also depend on the underlying compensation instruments, exercise times, etc. The differential tax treatment of various components of managerial compensation would greatly complicate the framework and exposition, but is unlikely to alter the main insights of our study.

[e]We can extend the model to allow for the firm to be re-levered after bankruptcy. This complicates the analysis and notation without altering our main implications.

[f]As we discuss later, the manager also effectively incurs personal costs due to bankruptcy. The manager's expected future payoffs after bankruptcy in our model could also be re-interpreted as the manager's expected payoffs from her "outside options" in a modified model in which the manager leaves the firm after bankruptcy. As our results only require that the manager incur personal bankruptcy costs, they are

The firm bears deadweight costs as a result of bankruptcy that are reflected in a reduction in future earnings. More precisely, if T_b is the bankruptcy (stopping) time, the state variable $P(\cdot)$, which determines the level of earnings in each period by equation (1) falls by a proportion $\varsigma \in (0,1)$ at bankruptcy so that

$$(5) \qquad P(T_b) = (1-\varsigma)P(T_b-).$$

The post-bankruptcy period is otherwise identical to the period during which the firm is solvent. The effects of the manager's actions on total earnings are as described in equation (1) and equation (2). The bankruptcy costs modeled above comprise of direct costs as well as indirect costs that arise from imperfections in the firm's product market such as its relationships with customers and suppliers, which directly affect its asset base or output-generating capacity. In particular, these costs are due to sources *external* to the manager-firm relationship.

We simultaneously describe the contracting before and after bankruptcy because, in equilibrium, post-bankruptcy actions and earnings, which are rationally anticipated by all agents, affect pre-bankruptcy actions and earnings. To simplify the notation, we view the sequence of single-period contracts between the manager and shareholders before bankruptcy as a single long-term contract that is implemented by this sequence. Similarly, the sequence of single-period contracts between the manager and debt-holders after bankruptcy are viewed as a single long-term contract. We further simplify the notation by *concatenating* the pre and post-bankruptcy contracts and directly referring to the single combined contract for the manager. The pre-bankruptcy portion of the contract is between the manager and shareholders and the post-bankruptcy portion is between the manager and debt-holders.

As in traditional principal-agent models with moral hazard (see Laffont and Martimort (2002)), it is convenient to augment the definition of the manager's contract to also include the manager's effort. We then require that the manager's contract be *incentive compatible* or *implementable* with respect to her effort. Formally, a contract $\Gamma \equiv [dc_m(\cdot), e(\cdot)]$ is a

qualitatively unaltered.

stochastic process describing the manager's compensation payments $dc_m(\cdot)$ and effort choices $e(\cdot)$, before and after bankruptcy. The processes $dc_m(\cdot)$ and $e(.)$ are $\mathcal{F}_t$-adapted. The bankruptcy time is an $\mathcal{F}_t$-stopping time T_b (recall that the bankruptcy time is determined by the contract).

E Payoffs to Shareholders and Debtholders

In our implementation of the manager's contract in Section V, the manager also holds an inside equity stake in the firm. Anticipating this implementation, we assume that the manager receives her contractually specified payoff from the total earnings net of corporate taxes. For simplicity, we assume that there is no loss of tax shields on debt interest payments in financial distress, and taxation is symmetric. For a contract $\Gamma \equiv [dc_m(\cdot), e(\cdot)]$ and bankruptcy time T_b, it follows from equation (1) that the total after-tax earnings in any period $[t, t+dt]$ are

$$
\begin{aligned}
dc_f(t) &= (1-\tau)dQ(t) + \tau\theta dt, \; t < T_b \\
dc_f(t) &= (1-\tau)dQ(t) \;\; t \geq T_b
\end{aligned}
\tag{6}
$$

The above reflects the fact that corporate taxes are incurred on earnings net of interest payments on long-term debt.[g] The payoff to debt-holders during the period is

$$
\begin{aligned}
dc_d(t) &= \theta dt, \; t < T_b \\
dc_d(t) &= dc_f(t) - dc_m(t) \;\; t \geq T_b
\end{aligned}
\tag{7}
$$

As described by the second equation in equation equation (8), debt-holders receive the residual payout flow after payments to the manager in the post-bankruptcy period. From equation (7) and equation (8), the payoff to shareholders, which is the total after-tax earnings

[g] The interest portion of the short-term debt payments $\lambda P(t)dt$ described in equation (1) are $o(dt)$ so that the corresponding tax shield vanishes in the continuous-time limit.

net of payments to the manager as well as long-term and short-term debt payments is

$$(8) \qquad \begin{aligned} dc_s(t) &= [dc_f(t) - dc_m(t) - dc_d(t)],\ t < T_b \\ dc_s(t) &= 0,\ \ t \geq T_b \end{aligned}$$

We now describe the incentive compatibility and participation constraints that must be satisfied by the contract. Note that $P(t)dt$ represents the EBITM flow from existing assets in period $[t, t+dt]$ without any actions by the manager. The manager's contract is *feasible* if and only if it guarantees that the expected payout flow to shareholders is at least as great as the expected payout flow if total earnings were only equal to the EBITM flow from existing assets, that is, the total earnings in the absence of the manager's human capital inputs. More precisely, the manager's contract must satisfy the following dynamic constraints:

$$(9) \qquad E_t[dc_s(t)] = (1-\tau)(P(t) - 1_{t<T_b}\theta)dt,$$

where the indicator function $1_{t<T_b}$ reflects the assumption that the firm is all-equity after bankruptcy. In Section VI, we show that the main testable implications of the theory are robust to differing allocations of bargaining power between the manager (more generally, insiders) and outsiders.

A contract $\Gamma \equiv (dc_m(\cdot), e(\cdot))$ is *incentive compatible* if and only if it is optimal for the manager to exert effort $e(\cdot)$ specified by the contract given the compensation stream $dc_m(\cdot)$, that is,

$$(10) \qquad e(.) = \arg\max_{e'(\cdot)} E_{e'}\left[\left(\int_{t=0}^{\infty} \exp(-\beta t)\left[U\left(dc_m(t)\right) - \frac{1}{2}\kappa e'(t)^2 dt\right]\right)\right],$$

F The Manager's Financing and Contract Choices

The manager chooses the firm's long-term debt structure at date zero and her subsequent contract to maximize the expected utility she derives due to her payoff at date zero from financing the firm's investment and her future payoffs from operating the firm. The manager's contract choice is subject to the constraints equation (9) and equation (10). In a rational expectations equilibrium, the proceeds from debt and equity issuance at date zero are equal to their respective *market values*. For a given long-term debt coupon θ and contract $\Gamma \equiv (dc_m(.), e(.))$, let $dc_d(\cdot), dc_s(\cdot)$ be the corresponding payout flows to debt and equity as described in equation (8) and equation (9). The market values of long-term debt, $\mathbf{D}(0)$ and equity, $\mathbf{S}(0)$, are given by

$$\mathbf{D}(0) = E\Big[\int_{t=0}^{\infty} \exp(-rt)dc_d(t)\Big], \tag{11}$$

$$\mathbf{S}(0) = E\Big[\int_{t=0}^{T_b} \exp(-rt)dc_s(t)\Big]. \tag{12}$$

Note that the long-term debt and equity values depend on the long-term debt structure and the manager's contract; we avoid explicitly indicating this dependence for simplicity. The net payoff generated from external financing at date zero is $[\mathbf{D}(0) + \mathbf{S}(0) - I]$. Because the manager holds a stake, $g_{initial}$, in the initial all-equity firm, her utility payoff at date zero is $U\left[g_{initial}(\mathbf{D}(0) + \mathbf{S}(0) - I)\right]$.[h]

The manager's valuation of her future total payoffs or *continuation value* is

$$\mathbf{M}(0) = E\left(\int_{t=0}^{\infty} \exp(-\beta t)\left[U\left(dc_m(t)\right) - \frac{1}{2}\kappa e(t)^2 dt\right]\right)$$

[h]We can show that it is optimal for the manager to sell her initial equity stake $g_{initial}$ at date zero. To avoid complicating the analysis, we assume this result in the subsequent discussion (the proof is available upon request). The intuition for the result hinges on the fact that the only potential benefit from retaining an equity stake is the provision of appropriate effort incentives for the manager. However, these incentives are already provided by her ex post contract with shareholders. More precisely, if the manager were to retain any equity stake after date zero, her ex post contract with shareholders would rationally "adjust" for her existing exposure to firm-specific risk through her equity stake so that her "total incentives", which determine her effort in each period, would be unaltered. Further, as we show in Section V, the manager's compensation contract can be implemented by requiring the manager to hold an inside equity stake that provides her with the appropriate incentives. In reality, at the IPO stage, it could be optimal for the manager to commit to a "lock in" period where she cannot sell her initial stake. This scenario is especially plausible in a framework with long-term commitment and/or adverse selection. In our framework with short-term commitment and no adverse selection, however, imposing a lock-in period is sub-optimal.

The optimal long-term debt coupon θ^{opt} and the manager's optimal contract Γ^{opt}, therefore, solve the following optimization problem:

$$(13) \qquad (\theta^{opt}, \Gamma^{opt}) = \arg\max_{(\theta,\Gamma)} \overbrace{U\left(g_{initial}(\mathbf{D}(0) + \mathbf{S}(0) - I)\right)}^{\text{Date Zero Payoff}} + \overbrace{\mathbf{M}(0).}^{\text{Continuation Value}} \qquad .$$

IV The Equilibrium

We analyze the manager's optimization problem equation (13) in two steps. In step one, we derive the manager's optimal contract for a *given* long-term debt structure θ. In step two, we characterize the manager's optimal choice of long-term debt. To ensure that the discounted expected payoffs of all agents are finite, we assume that

$$(14) \qquad r > \mu; \quad \beta > \mu; \;\; \beta > 2\mu + \sigma^2,$$

We can prove that (we omit the proof for brevity) it suffices to consider compensation structures that have the form

$$(15) \qquad \begin{aligned} dc_m(t) &= \overbrace{a(t)dt}^{\text{performance-invariant compensation}} + \overbrace{b(t)(1-\tau)(dQ(t) - \theta dt)}^{\text{performance-dependent compensation}} \;\; , t < T_b \\ dc_m(t) &= a(t)dt + b(t)(1-\tau)dQ(t), t > T_b \end{aligned}$$

where the contractual parameters $a(.)$ and $b(.)$ are $\mathcal{F}_t-$adapted processes. In equation (15), we express the manager's compensation when the firm is solvent in terms of the earnings net of interest payments and taxes, $(1-\tau)(dQ(t) - \theta dt)$, because it facilitates our subsequent implementation of the manager's contract through financial securities. The parameter $b(t)$ is the *pay-performance sensitivity* because it determines the sensitivity of the manager's compensation to earnings. The parameter $a(t)$ determines the manager's *performance-invariant* compensation in period $[t, t + dt]$.

Theorem 1 (The Manager's Contract) *For a given long-term debt coupon θ, the contract $\Gamma \equiv (dc_m(\cdot), e(\cdot))$ is optimal for the manager only if the following hold at each date* *t:*

(a) The manager's contractual compensation parameters in period $[t, t+dt]$ *and her effort are*

$$\begin{aligned} b(t) &\equiv b = \frac{1}{1+\kappa\gamma s^2}; \\ e(t) &= \frac{(1-\tau)P(t)}{\kappa(1+\kappa\gamma s^2)}, \\ a(t) &= P(t)(1-\tau)\left[(1-b)\left(\ell-\lambda+e(t)\right)-b\right]+1_{t<T_b}b(1-\tau)\theta. \end{aligned} \tag{16}$$

(b) The manager's conditional expected utility from her total payoff in period $[t, t+dt]$ *is*

$$E\left[\exp(-\beta dt)\left[U\left(dc_m(t)\right)-\frac{1}{2}\kappa(e(t))^2 dt\right]|\mathcal{F}_t\right]=(\ell-\lambda)(1-\tau)P(t)dt+gP(t)^2dt, \text{ where} \tag{17}$$

$$g=\frac{(1-\tau)^2}{2\kappa(1+\kappa\gamma s^2)} \tag{18}$$

(c) The manager's optimal continuation value $\mathbf{M}_\theta(0)$ *for a given long-term debt structure* θ *(the subscript indicates the dependence of the continuation value on the debt structure) is*

$$\mathbf{M}_\theta(0)=E\left[\int_0^\infty \exp(-\beta t)\left((\ell-\lambda)(1-\tau)P(t)+gP(t)^2\right)dt\right], \tag{19}$$

where the state variable $P(.)$ *falls as in equation (5) at the bankruptcy time,* T_b*.*

Proof. All proofs are in Appendix A.

By equation (16), the manager's pay-performance sensitivity and her effort decline with her risk aversion γ, her disutility of effort, κ, and the short-term risk, s. An increase in any of these parameters increases the costs of risk-sharing between shareholders and the manager. The "degree of alignment" (as measured by the pay-performance sensitivity) of the manager's incentives with those of shareholders is, therefore, lowered. Consequently, as shown by equation (17) and equation (18), the output the manager generates also declines with these parameters. The manager's ability determines her *non-discretionary* contribution to output (see equation 1). As a result, the manager's ability only affects the performance-invariant component of her compensation.

In equation (19), the manager's continuation value is affected by the long-term debt structure through its effect on the bankruptcy time T_b. Since the manager's expected payoff in each period depends on the state variable $P(.)$ as shown by equation (17), she incurs personal costs after bankruptcy because the state variable $P(.)$ falls as in equation (5) at the bankruptcy time, T_b.

In the extended model presented in Appendix B, where the manager continues to service debt after the equity value falls to zero, the manager's contractual parameters when the firm becomes privately held differ from the contractual parameters described in Theorem 1. In particular, her effort as a proportion of the state variable $P(t)$ and her pay-performance sensitivity are higher (see Proposition 1 in Appendix B).

We now determine the market values of long-term debt, equity and the bankruptcy time. As in Leland (1998), bankruptcy occurs when the state variable $P(.)$ falls to an endogenous trigger $p_b(\theta)$.

Theorem 2 (Long-Term Debt Value, Equity Value, and Endogenous Bankruptcy Level) *For a given long-term debt structure θ, the market values of long-term debt, $\mathbf{D}_\theta(p)$, and equity, $\mathbf{S}_\theta(p)$, when the value of the state variable $P(.)$ is p; and the endogenous bankruptcy level $p_b(\theta)$ are given by the following system of equations:*

$$
\begin{aligned}
(20)\qquad \mathbf{D}_\theta(p) &= \left(\frac{(1-\varsigma)(1-\tau)p_b(\theta)}{r-\mu} - \frac{\theta}{r}\right)\left(\frac{p}{p_b(\theta)}\right)^{\zeta^-} + \frac{\theta}{r};\ p > p_b(\theta),\\
\mathbf{D}_\theta(p_b(\theta)) &= \frac{(1-\varsigma)(1-\tau)p_b(\theta)}{r-\mu},
\end{aligned}
$$

$$
\begin{aligned}
(21)\qquad \mathbf{S}_\theta(p) &= (1-\tau)\left(\frac{\theta}{r} - \frac{p_b(\theta)}{r-\mu}\right)\left(\frac{p}{p_b(\theta)}\right)^{\zeta^-} + (1-\tau)\Big(\frac{p}{r-\mu} - \frac{\theta}{r}\Big); p > p_b(\theta),\\
(22)\qquad \mathbf{S}_\theta(p_b(\theta)) &= \mathbf{S}'_\theta(p_b(\theta)) = 0,
\end{aligned}
$$

$$p_b(\theta) = -\left(\frac{\zeta^-}{1-\zeta^-}\right)\left(\frac{r-\mu}{r}\right)\theta. \tag{23}$$

In the above, ζ^- *is the negative root of the quadratic equation*

$$\frac{1}{2}\sigma^2 x^2 + (\mu - \frac{1}{2}\sigma^2)x - r = 0. \tag{24}$$

By equation (20), equation (21), and equation (23), the long-term debt value, equity value, and bankruptcy trigger do not depend on the manager characteristics—her ability, risk aversion, or disutility of effort. Because capital markets are competitive, the manager appropriates the surplus she generates from her human capital as in Aghion and Bolton (1992) (see also Chapters 3 and 4 of Tirole (2006)). Hence, the long-term debt and equity values are not affected by manager characteristics.

As mentioned earlier, we extend the model in Section VI to allow for more general allocations of bargaining power between shareholders and the manager. In the extended model, shareholders obtain a portion of the surplus the manager generates in each period so that the equity value at date zero is affected by the manager's human capital.

In the following theorem, we analytically characterize the manager's optimal continuation value for a given long-term debt structure θ.

Theorem 3 (The Manager's Continuation Value) *Given a long-term debt structure* θ*, the manager's optimal value function* $\mathbf{M}_\theta(.)$ *at any date prior to bankruptcy when the current value of the state variable* $P(.)$ *is* p *is given by*

$$\mathbf{M}_\theta(p) = Ap^{\chi^-} + g\frac{p^2}{\beta - 2\mu - \sigma^2} + \frac{(\ell-\lambda)(1-\tau)}{\beta-\mu}p;\ p > p_b(\theta), \tag{25}$$

$$\mathbf{M}_\theta(p_b(\theta)) = g\frac{(1-\varsigma)^2(p_b(\theta))^2}{\beta - 2\mu - \sigma^2} + \frac{(\ell-\lambda)(1-\tau)}{\beta-\mu}(1-\varsigma)p_b(\theta). \tag{26}$$

The constant A in equation (25) *is determined by the boundary condition* equation (26). *The exponent* χ^- in equation (25) *is the negative root of the quadratic equation*

$$\frac{1}{2}\sigma^2 x^2 + (\mu - \frac{1}{2}\sigma^2)x - \beta = 0. \tag{27}$$

The manager's value function at the bankruptcy threshold p_b, which is given by equation (26), is the expected utility she derives from her post-bankruptcy payoff stream. The expression for the manager's value function at the bankruptcy threshold reflects the fact that the state variable $P(.)$ falls by the proportion ς when bankruptcy occurs (see equation (5)). The manager's post-bankruptcy payoffs are, therefore, correspondingly lowered so that she effectively incurs personal costs due to bankruptcy.

By equation (13), the manager's optimal choice of coupon (hence, the long-term debt structure) solves

$$\theta^{opt} \equiv \arg\max_\theta \Big[U\left(g_{initial}(\mathbf{D}(0) + \mathbf{S}(0) - I)\right) + \mathbf{M}_\theta(0) \Big], \tag{28}$$

where the values of debt, $\mathbf{D}_\theta(0)$, and equity, $\mathbf{S}_\theta(0)$, for a given coupon θ are given by equation (20) and equation (21). The manager's continuation value function $\mathbf{M}_\theta(0)$ is given by equation (25).

V Dynamic Capital Structure

We now implement the manager's contracts through financial securities as in DeMarzo and Fishman (2007) and DeMarzo and Sannikov (2006). Define

$$dc_{tot}(t) = (1-\tau)\left(P(t)dt + P(t)\left[(\ell + e(t))dt + sdW(t)\right]\right) + \tau\theta dt. \tag{29}$$

By equation (1), the above represents the firm's total after-tax payout flow in each period *gross* of short-term debt payments associated with the financing of inventories, accounts receivable, employee wages, etcetera that are represented by the term $\lambda P(t)dt$ in equation (1). By equation (7), equation (8), equation (16), and equation (29), we can rewrite the manager's payoff (15) in period $[t, t+dt]$ as

$$dc_m(t) = b[dc_{tot}(t) - dc_d(t) - (1-\tau)\lambda P(t)dt + \overline{a}(t)dt], \text{ where} \tag{30}$$

$$\overline{a}(t) = \frac{a(t)}{b} \tag{31}$$

By equation (30), the manager's optimal compensation can be implemented through an inside equity stake b and additional payments

$$dc_{sd}(t) = (1-\tau)\lambda P(t)dt - \overline{a}(t)dt \tag{32}$$

incurred by *all* equity holders—inside and outside—in each period. Depending on whether they are positive or negative, the cash flows $dc_{sd}(t)$ could be viewed as short-term debt payments or cash inflows (or, alternately, by a credit line or a cash reserve as in DeMarzo and Fishman (2007)).

The market values of long-term debt, total short-term debt and outside equity at any date t are[i]

$$\begin{aligned} \text{Long-Term Debt} &= E_t \int_t^{\infty} \exp(-r(s-t))dc_d(s), \\ \text{Short-Term Debt} &= E_t \int_t^{\infty} \exp(-r(s-t))dc_{sd}(s), \\ \text{Outside Equity} &= E_t \int_t^{\infty} \exp(-r(s-t))(1-b)[dc_{tot}(s) - dc_d(s) - dc_{sd}(s)]. \end{aligned} \tag{33}$$

As indicated by equation (33), the firm's capital structure consists of inside equity, outside equity, long-term debt, and short-term debt that combines the financing of the firm's working capital requirements *and* the manager's cash compensation.[j]

As in DeMarzo and Fishman (2007) and DeMarzo and Sannikov (2006), our implementation of the manager's contracts is not unique. Similar to the above studies, we believe that the implementation of the manager's cash compensation through a credit line (or a cash reserve) is intuitive and generates interesting predictions for the effects of manager and

[i]As in the case of the long-term debt and equity values derived in Theorem 2, we can analytically characterize the market value of the firm's short-term debt. We omit the expressions here for brevity.

[j]It is worth mentioning here that capital structure is not fully dynamic because the long-term debt level is fixed at the outset, that is, we do not allow for long-term debt restructuring (for example, see Strebulaev (2007)).

firm characteristics on short-term debt. It is worth emphasizing, however, that the testable predictions of the model for the effects of manager and firm characteristics on *long-term debt* do not depend on our implementation of the manager's contracts.

VI The Effects of Manager Characteristics

In this section, we investigate the effects of manager characteristics—ability, risk aversion, and disutility of effort— on the firm's capital structure. The following theorem analytically describes the effects of manager characteristics on the firm's long-term debt.

Theorem 4 (Manager Characteristics, Short-Term Risk, and Long-Term Debt) *The long-term debt value declines with the manager's ability, increases with her risk aversion, disutility of effort, and the firm's short-term risk.*

By equation (28), the long-term debt structure is chosen to maximize the sum of the manager's initial utility payoff and her continuation value. For a given long-term debt coupon θ, the manager's initial utility payoff is $U\left[g_{initial}(\mathbf{D}_\theta(0)+\mathbf{S}_\theta(0)-I)\right]$. As discussed after Theorem 2, the sum of the market values of long-term debt and equity at date zero, $\mathbf{D}_\theta(0)+\mathbf{S}_\theta(0)$ does not depend on the manager's ability or effort (see equations (20) and (21)).

The manager's optimal choice of long-term debt trades off the beneficial effects of *ex post* debt tax shields on her initial payoff from leveraging the firm against the detrimental effects of debt on the likelihood of bankruptcy and her continuation value. Because the manager's risk aversion, disutility of effort, and the firm's short-term risk only affect her effort (see 16), it follows from the above discussion that the manager-specific characteristics—ability, risk aversion, and disutility of effort— and the firm's short-term risk only affect her continuation value and not her initial payoff.

As the manager's ability increases (keeping the debt coupon fixed), the surplus she generates in each period increases, which increases her continuation value without affecting her initial payoff. *At the margin*, she, therefore, cares more about her continuation value relative to her initial payoff. She chooses lower long-term debt, which lowers the likelihood of bankruptcy and increases her continuation value.

An increase in the manager's risk aversion, disutility of effort, or the firm's short-term risk increases the costs of providing incentives to the manager. She exerts lower effort in equilibrium, which lowers the surplus she generates in each period. The manager's continuation value is *lowered* relative to her initial payoff. The manager now chooses *greater* long-term debt, which increases her initial payoff from leveraging the firm through the exploitation of *ex post* debt tax shields. Similarly, an increase in the manager's discount rate also lowers her continuation value relative to her initial payoff so that she chooses greater long-term debt.

Casual intuition would suggest that more risk-averse managers would prefer less long-term debt because the adverse impact of bankruptcy would be greater. The result of the theorem and the intuition underlying it suggests that this casual intuition is incorrect in our framework. As discussed above, the manager's long-term debt choice reflects the tradeoff between the initial payoff from leveraging the firm and her continuation value. Because capital markets are competitive so that the manager captures the surplus she generates from her human capital in each period, the manager's initial payoff is unaffected by her risk aversion, while her continuation value is lowered. Consequently, it is optimal for a more risk-averse manager to increase rather than decrease long-term debt.

As mentioned earlier, the results of Theorem 4 *do not depend* on our implementation of the manager's contracts through financial securities described in Section V. The testable implications of our theory for the effects of manager and firm characteristics on long-term debt are, therefore, independent of the choice of implementation of the manager's contracts.

The effects of manager characteristics on short-term debt are ambiguous for general parameter values. By equation (16), equation (30), equation (32) and equation (33), short-term debt decreases with the long-term debt coupon and with the ratio $a(t)/b$ of the parameters that determine the "cash" and "risky" components of the manager's compensation (see 15). By equation (16) and equation (30), an increase in the manager's ability does not affect her inside equity stake but increases the cash component of the manager's compensation, which has a negative effect on the firm's short-term debt by equation (32) and equation

(33). Recall that the long-term debt coupon also decreases with the manager's ability, which has a positive effect on the firm's short-term debt by equation (16), equation (30), equation (32) and equation (33). For general parameter values, therefore, the effect of managerial ability on the firm's short-term debt is ambiguous. By similar arguments, the effects of the risk aversion, γ, and disutility of effort, κ, on short-term debt are also ambiguous. In the next sub-section, we numerically explore the effects of manager characteristics on short-term debt.[k]

A Numerical Analysis

In this section, we conduct a quantitative investigation of the effects of manager and firm characteristics on capital structure. To examine the robustness of our implications, we have numerically investigated the basic model of Section III as well as the extended model described in Appendix B in which the manager continues servicing debt even after the equity value falls to zero. Because our key testable implications are unchanged, we present the results of our analysis of the basic model.

Model Calibration

To obtain a reasonable set of baseline parameter values, we calibrate the parameters of the model to the data we use for our subsequent empirical analysis.

Risk-Free Rate, Tax Rate, Bankruptcy Costs: We set the risk-free rate r to 6.0% and the effective corporate tax rate τ to 0.15, which is consistent with the estimates of Goldstein et al. (2001).[l] We set the proportional bankruptcy cost parameter ς to 0.15, which is the

[k]It is important to emphasize here that the results of Theorem 4 rely on the assumption that managerial ability does not have long-term effects on earnings. As suggested by the intuition above, if ability were to have long-term effects on earnings by (for example) affecting the drift of the state variable $P(.)$, the implications of the theorem could change. However, the fact that we find strong empirical support for the implications of the theorem suggests that the effects of managerial ability on earnings is short-term.

[l]Recall that we assume that taxation is symmetric for simplicity. The effective corporate tax rate also incorporates the effects of personal taxes. An effective corporate tax rate of 0.15 is consistent with the estimates of the tax advantage of debt using corporate tax rates as well as personal tax rates on interest and

midpoint of the range $[0.10, 0.20]$ of proportional financial distress costs reported in Andrade and Kaplan (1998).

Short-Term Risk, Long-Term Risk, Drift, Initial EBITM Rate, and Investment: Our proxy for the *asset value* is the value of the un-levered firm *net* of the manager's contractual compensation. It follows from equation (1), equation (2) and Theorem 1 that the asset value $A(t)$ at any date t is the present value of the stream of after-tax earnings from existing assets,

$$A(t) = E_t \left[\int_t^{\infty} \exp\left(-r(u-t)\right)(1-\tau)P(u)du \right] = \frac{(1-\tau)P(t)}{r-\mu}. \tag{34}$$

We set the initial investment outlay I equal to the asset value at date zero. We normalize the initial EBITM rate $P(0)$ so that the asset value or *book value* is 100.

The average after-tax annual return on assets is the ratio of average annual after-tax earnings net of the manager's contractual compensation to asset value. By equation (1) and equation (34), this is equal to $\frac{(1-\tau)P(t)}{A(t)} = r - \mu$. Since $r = 0.06$, we set $\mu = -0.02$ to approximately match the median annual after-tax earnings to asset value ratio in our sample. Note that, as discussed in Leland (1998) and Chapter 12 of Duffie (2001), the assumption that investors are risk-neutral implicitly means that we are carrying out our analysis under the risk-neutral probability. Therefore, the parameter μ is, in fact, the *risk-neutral drift* of the state variable $P(.)$. Since the risk-neutral drift equals the actual drift (the drift under the physical or "real world" probability) less the risk premium, it could be negative.

From equation (1) and equation (34), the standard deviation of the after-tax return on assets is $(r-\mu) * s$. The median of the standard deviations of the after-tax return on assets in our sample is approximately 0.015. Accordingly, we set $s = \frac{0.015}{r-\mu} \approx 0.19$. We set the long-term risk, σ, to its median value in our sample, 0.29.

Manager Variables: The median CEO percentage ownership (including options adjusted by their respective deltas) in the sample we use for our empirical analysis is approximately 0.035 (see Table 5). Accordingly, we set the manager's initial equity ownership $g_{initial}$ to

dividend income.

0.035. We calibrate the baseline values of the manager's ability ℓ, risk aversion γ, discount rate β, disutility of effort κ, and the parameter λ associated with the short-term debt financing of the firm's working capital requirements (see 1) by matching key, relevant statistics predicted by the model to their median values in the data. Specifically, we indirectly determine the parameters so that (i) the manager's inside equity stake; (ii) the ratio of the manager's cash compensation to asset value; (iii) the ratio of the firm's net short-term debt (short-term debt net of cash) to asset value; (iv) the ratio of long-term debt to asset value; and (v) the ratio of firm value to asset value match the median CEO equity stake, the median ratio of CEO cash compensation to asset value, the median net short-term debt ratio, the median long-term debt ratio, and the median ratio of firm value to asset value, respectively, in the data.

We calculate a firm's *net* short-term debt as "debt in current liabilities", which includes lines of credit (Compustat item #34) *minus* "debt due in one year" (Compustat item #44) *minus* cash (Compustat item #1). We subtract item #44 from item #34 to correspond as closely as possible to the short-term debt measure in the theoretical model because both items include current portions of long-term debt, while item #34 includes lines of credit.[m] From Table 5, the median ratio of net short-term debt to asset value for the firms in our sample is 8.2% and the median ratio of long-term debt (Compustat item #9) to asset value is 15.5%. The median ratio of firm value to asset value in our sample is 1.16. The median ratio of the annual cash compensation of CEOs to asset value for firms in our sample is 0.075%. (Note that the ratio of the *present value* of the stream of future CEO cash compensation payments to asset value is an order of magnitude higher.)

Baseline Parameter Values: Table 2 lists the baseline values of all the parameters in the model. Table 3 shows the baseline firm value, long-term debt ratio and net short-term debt ratio. Note that the firm value is the market value of the firm's stream of *total* after-tax earnings and, therefore, *includes* the manager's stake. We normalize the initial value $P(0)$ of the state variable so that the asset value (the un-levered firm value net of the manager's stake) defined in equation (34) is 100.

[m]Our results are not altered if we do not subtract item #44 in the calculation of net short-term debt.

The Effects of Manager Characteristics

The Effects of the Manager's Ability

Figure 1 displays the variation of the long-term, short-term and total debt ratios with the manager's ability ℓ. Consistent with Theorem 4, long-term debt declines with the manager's ability. For the baseline values of the other model parameters, the figure shows that the negative effects of an increase in ability on short-term debt dominate the positive effects so that short-term debt declines with ability (recall the discussion following Theorem 4). As the manager's ability increases, the firm moves from holding positive short-term debt to holding cash. The total debt ratio also declines with manager ability because the long-term and short-term debt ratios decline.

PLACE FIGURE 1 ABOUT HERE

The Effects of the Manager's Risk Aversion

Figure 2 shows the effects of the manager's risk aversion γ. Consistent with Theorem 4, long-term debt increases with the manager's risk aversion. The table shows that short-term debt decreases with the manager's risk aversion in the calibrated model. As the risk aversion increases, it is costlier to provide incentives to the manager. Hence, the "power of incentives" represented by the manager's inside equity stake declines (see equations (16) and (30)). Consequently, the manager receives a greater portion of her compensation in cash so that the firm's short-term debt decreases (see equation (32)). The decline in short-term debt with risk aversion dominates the increase in long-term debt so that the total debt ratio also decreases.

PLACE FIGURE 2 ABOUT HERE

Because the manager's inside equity stake declines with her risk aversion, the results imply that the long-term debt ratio declines with the manager's inside equity stake, while the short-term debt ratio increases. The In unreported results, the effects of the manager's disutility of effort are similar to those of the manager's risk aversion. The effects of the two variables are qualitatively similar because an increase in either κ or γ increases the costs of providing incentives to the manager.

We remind the reader here that short-term debt in the model is determined by the firm's working capital requirements and the manager's (more generally, insiders') cash compensation. As discussed above, manager-specific characteristics affect short-term debt through their effects on the manager's cash compensation.

The Effects of Short-Term Risk

Figure 3 shows the effects of the short-term risk s. Short-term risk has differing effects on the firm's long-term and short-term debt. Consistent with Theorem 4, long-term debt increases with short-term risk. Short-term debt, however, decreases. By Theorem 1 and equation (16), an increase in the short-term risk lowers the power of incentives to the manager, and increases the "cash" portion of her compensation. By equation (32) and equation (33), this has a negative effect on the firm's short-term debt. The decline in short-term debt with short-term risk dominates the increase in long-term debt so that the total debt ratio also decreases.

PLACE FIGURE 3 ABOUT HERE

The Effects of Long-Term Risk

Figure 4 shows the effects of the firm's long-term risk, σ. The firm's long-term risk also has differing effects on long-term and short-term debt. By the discussion in Section A, the manager's choice of long-term debt reflects its effects on her initial payoff and her continuation value by equation (28). By equation (16), the long-term risk σ has no effect on the manager's compensation structure and, therefore, on the output she generates in each period. The manager's continuation value, however, declines with the long-term risk because it increases the likelihood of bankruptcy and the associated personal costs for the manager. Long-term debt therefore declines with long-term risk.

PLACE FIGURE 4 ABOUT HERE

The decline in the long-term debt coupon with long-term risk has a positive effect on the firm's short-term debt (see equations (16), (30), and (32)). The increased likelihood of bankruptcy, however, has a negative effect on the value of the firm's short-term debt. The interplay between these two effects causes short-term debt to vary non-monotonically with long-term risk.

Comparing Figures 3 and 4, we conclude that distinct components of the firm's risk have differing effects on its capital structure. The differing effects arise due to the fact that short-term risk directly affects the manager's incentive compensation in each period. The long-term risk, on the other hand, has longer-term effects by influencing the manager's valuation of her stream of future payoffs and the likelihood of bankruptcy.

The incorporation of managerial discretion and risk aversion in our model plays a central role in generating the differing effects of long-term risk and short-term risk on the firm's debt structure. In addition to the predicted effects of manager characteristics on capital structure, these results distinguish our theory from theories that do not incorporate managerial discretion or risk aversion.

Effects of Manager's Initial Stake

Figure 5 shows the effects of varying the manager's initial stake $g_{initial}$. Long-term debt increases with the manager's initial stake, short-term debt declines, and total debt increases. By equation (13), an increase in the manager's initial stake increases her payoff from external financing at date zero, but does not affect her continuation value by equation (25) and equation (26). Consequently, she chooses greater long-term debt. By equation (16), equation (31) and equation (32), an increase in the long-term debt coupon lowers short-term debt. In the calibrated model, the increase in long-term debt more than offsets the decline in short-term debt so that total debt increases.

The Effects of Bargaining Power

In the analysis thus far, we assumed that capital markets are competitive so that the manager appropriates the surplus she generates from her human capital. We now explore the robustness of our results to the scenario in which shareholders enjoy nonzero bargaining power vis-a-vis the manager. In this scenario, the dynamic participation constraints equation (9) are replaced by the following:

$$E_t\left[dc_s(t)\right] = (1-\tau)(P(t)dt + \omega\left(\ell - \lambda + e^*(t)\right)P(t)dt - 1_{t<T_b}\theta dt), \tag{35}$$

where $\omega \in [0,1)$ represents the shareholders' bargaining power and $e^*(t)$ is the manager's *equilibrium* effort in period $[t, t+dt]$ that is rationally anticipated by all agents. The above constraints capture the fact that the expected payout flow to the firm must equal the payout flow from existing assets *plus* a proportion of the expected surplus generated by the manager. The rest of the model is as described earlier. The following theorem generalizes Theorem 1 to this setting.

Theorem 5 (The Manager's Contract) *For a given long-term debt coupon θ, the manager's contractual parameters in period $[t, t+dt]$ are*

$$\begin{aligned} b^*(t) &\equiv b = \frac{1}{1+\kappa\gamma s^2}; \\ e^*(t) &= \frac{(1-\tau)P(t)}{\kappa(1+\kappa\gamma s^2)}, \\ a^*(t) &= P(t)(1-\tau)\left[(1-b^*(t))\left(\ell-\lambda+e^*(t)\right) - b^*(t)\right] + 1_{t<T_b}b^*(t)(1-\tau)\theta \\ &\quad -P(t)(1-\tau)\omega\left(\ell-\lambda+e^*(t)\right)dt. \end{aligned} \tag{36}$$

The manager's conditional expected utility from her total payoff in period $[t, t+dt]$ is

$$E_t\left[\exp(-\beta dt)\left[U\left(dc_m(t)\right) - \frac{1}{2}\kappa(e(t))^2dt\right]\right] = (1-\omega)(\ell-\lambda)(1-\tau)P(t)dt + hP(t)^2dt, \tag{37}$$

where

$$h = \frac{(1-\tau)^2(1-\omega)}{2\kappa(1+\kappa\gamma s^2)} \tag{38}$$

The conditional expected payout flow to shareholders in period $[t, t+dt]$ *is*

$$E_t\left[dc_s(t)\right] = (1-\tau)\left[P(t)\left(1+\omega\left(\ell-\lambda+e^*(t)\right)\right) - 1_{t<T_b}\theta\right]dt \tag{39}$$

Comparing equation (37) with equation (16), we see that the manager's pay-performance sensitivity and effort are unaltered (this is a consequence of the allocation of payoffs does not affect the Pareto optimal levels of effort and incentives), but the manager's cash compensation is lowered by the additional term $P(t)(1-\tau)\omega\left(\ell-\lambda+e(t)\right)dt$. Note further from equation (39) that the expected payout flow to equity in each period depends on the earnings generated by the manager's human capital.

We can follow the analysis in Section IV to solve the rest of the model and derive the analogues of Theorems 2 and 3. The key difference is that the value of equity now depends on the manager's human capital, that is, her ability and effort. As in the basic model, the manager's choice of capital structure solves equation (28). We implement the manager's contract through equity and short-term debt (or cash) as in Section V.

We numerically analyze the effects of differing allocations of bargaining power using the baseline parameter values in Table 2. Figures 5 and 6 show the variations of long-term debt and short-term debt with manager ability for various values of the bargaining power parameter ω. Both long-term and short-term debt increase with ω. An increase in shareholders' bargaining power decreases (increases) the surplus to the manager (shareholders) in each period. Consequently, the manager's continuation value declines relative to her initial payoff from leveraging the firm. Since the marginal effect of the manager's initial payoff becomes more important as ω increases, long-term debt, increases with ω. An increase in ω lowers the manager's cash compensation relative to her equity compensation (see 37). Because the manager's cash compensation offsets the firm's short-term debt in our implementation of the manager's contracts, the firm's short-term debt increases with the shareholders' bargaining power.

PLACE FIGURES 6 AND 7 ABOUT HERE

Figures 6 and 7 show that our earlier implications for the variations of long-term debt and short-term debt with manager ability are generally robust to variations of the bargaining power of shareholders vis-a-vis the manager. Short-term debt always declines with manager ability. Long-term debt also declines as long as ω is not too high. When ω is above a threshold, long-term debt declines with ability below a threshold and then increases. The underlying intuition is the following. As discussed above, an increase in ω increases the relative effects of the manager's initial payoff on her long-term debt choice. These effects are further accentuated when the manager's ability is above a threshold. For high values of ω and when the manager's ability is above a threshold, therefore, long-term debt could increase with manager ability. Overall, our results, therefore, suggest that long-term debt declines with manager ability unless shareholders' bargaining power vis-a-vis the manager and the manager's ability are *both* high.

The implications of the basic model for the variations of debt structure with manager risk aversion, long-term risk, and short-term risk are also robust to variations in the shareholders' bargaining power ω. We do not display these results for brevity.

VII Empirical Analysis

A Testable Hypotheses

The results of Section VI lead to the seven empirically testable hypotheses shown in Table 1. In reality, capital structure is potentially affected by several variables that are not present in our stylized model. In our empirical analysis, therefore, we test our hypotheses controlling for the effects of the various other determinants of capital structure identified by previous empirical studies.

PLACE TABLE 1 ABOUT HERE

B Data

Our sample includes firms with available data, as detailed below, from Compustat, Execucomp, IRRC, and CRSP over the period 1993-2007. All variables are described in Table 4.

Leverage Variables: A firm's long-term debt ratio is its long-term debt (Compustat item #9) scaled by total assets (Compustat item #5). A firm's short-term debt ratio is short-term debt *minus* cash (the *net* short-term debt) scaled by total assets. We calculate a firm's net short-term debt as its "debt in current liabilities" (Compustat item #34) - "debt due in one year" (item #44) - "cash" (item #1). We subtract item #44 because both items #34 and #44 include current portions of long-term debt, while item #34 includes lines of credit that are not included in item #44. By subtracting item #44 from item #34, we exclude portions of the firm's long-term debt from the short-term debt measure, which is consistent with the model. We have also run our tests without subtracting item #44 and obtain very similar results. We mention here that our proxy for short-term debt is not working capital.

CEO Ability: We construct five proxies of CEO ability for robustness. The first three proxies are directly derived from the theory, while the last two are indirect proxies.

a) *CEO Cash Compensation*: By equation (16) and equation (31), the manager's cash compensation increases with her ability. Our first proxy for CEO ability is therefore the cash compensation of the CEO. The use of cash compensation as a proxy for ability is also consistent with neo-classical models in which agents are paid their marginal products.

b) *CEO Cash Compensation to Assets Ratio:* To control for possible "size" effects on compensation, we also use the ratio of CEO cash compensation to assets as a proxy for CEO ability.

c) *Industry adjusted accounting performance*: To the extent that a CEO of superior ability delivers superior corporate performance, CEO ability and industry adjusted accounting performance are likely to be significantly positively correlated. Consistent with this intuition, the manager's ability positively affects earnings in our model (see 1). Our third proxy of CEO ability is the *industry-adjusted return on assets* of the firm, that is, the excess return on assets of the firm relative to other firms in the same 4-digit SIC industry. We consider accounting, rather than stock market, measures of performance since an efficient stock market would anticipate the impact of CEO ability on the firm and impound it into the share price.

d) *CEO tenure*: In our model, a CEO of superior ability delivers superior corporate performance. Also, a significant body of literature in finance and accounting has documented disciplinary CEO turnover subsequent to poor performance (e.g. see Farrell and Whidbee, 2003). Hence, CEO ability is likely positively correlated with CEO tenure.

e) *CEO tenure divided by CEO age.* Consider two CEOs, A and B, who have both served as CEOs for five years. A is 55 years old, and B is 65. It is plausible that, *ceteris paribus*, A has greater ability than B, since she has accomplished/survived a five year tenure at an earlier age. Accordingly, we use CEO tenure/CEO age as our third proxy for CEO ability.[n]

CEO Ownership: We calculate a CEO's equity ownership in the firm using the number of shares of common stock and the number of options held by the CEO. Specifically, the CEO's percentage ownership at any date is equal to the number of shares of company stock she holds plus the number of options weighted by their respective deltas. We have also run our tests using CEO dollar ownership measures and obtained very similar results.

Long-Term Risk and Short-Term Risk: Consistent with the model, we measure short-term risk as the standard deviation of the quarterly return on assets over the past three years (see 1). Consistent with equation (2), we measure long-term risk as the standard deviation of the logarithm of firm value over the past three years. For robustness, we also run our tests using the 3-year standard deviation of the quarterly earnings per share (EPS) as the proxy for short-term risk, and the 3-year standard deviation of monthly stock returns as the proxy for long-term risk. Our results remain robust to these alternate proxies.[o] Table 5 presents

[n]As robustness checks, we have also run our tests with the following alternate measures of CEO ability: (i) CEO Tenure and CEO Tenure/CEO Age with minimum cutoffs for tenure of 2, 3, and 4 years; (ii) unadjusted ROA; (iii) CEO Tenure and CEO Tenure/CEO Age for cumulative tenure as a CEO, not just as a CEO of the sample firm; and (iv) average annual adjusted ROA during the current CEO's tenure. Our results are qualitatively unaltered.

[o]As additional robustness checks, we have also run our tests with long-term risk measured as the standard

the descriptive statistics for the variables.

PLACE Table 5 ABOUT HERE

C Manager Ability and Debt Structure

Table 6 shows the empirical relationship between debt structure and our proxies for managerial ability. We report ordinary least squares regression results with firm fixed effects. Standard errors of coefficient estimates are corrected for clustering at the firm level.

PLACE Table 6 ABOUT HERE

Consider Table 6, Panel A. Regressions 1-3 include only the control variables motivated by the extensive capital structure literature. Consistent with the extant literature we find that asset tangibility and firm size positively affect leverage. Growth opportunities and firm profitability are negatively related to leverage. Regression 3 includes the past three years' stock returns; past stock returns are negatively correlated with leverage. Tangibility of assets, growth opportunities, and firm profitability are significantly correlated within an industry group. Hence, when we include industry leverage as a control in Regression 2, the above three control variables' coefficients diminish in magnitude.

Given the above findings, we include firm size, industry leverage, and past stock returns as the control variables in the remaining regression models. Regression 4, 5 and 6 in Table 6, Panel A, document the significant negative relations between the long-term debt ratio and the direct proxies of CEO ability; CEO cash compensation, the ratio of CEO cash compensation to assets, and the industry adjusted return on assets. Regressions 7 and 8 show the significant negative relations between the long-term debt ratio and the indirect proxies of CEO ability: CEO tenure and the ratio of CEO tenure to age. Consistent with Hypothesis 1 in Table 1, therefore, the long term debt ratio declines with managerial ability.

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deviation of monthly returns over the past 5 years; and short-term risk measured as the standard deviation of 3-5 year return on assets as well as 3-5 year standard deviation of the P-E ratio. Our results are unaltered.

Consistent with Hypothesis 2 in Table 1, regressions 4-8 in Table 6, Panel B, document a negative relation between short-term debt and our proxies for managerial ability. The negative relation between short-term debt and CEO cash compensation also provides empirical support for our implementation of the manager's contracts in which an increase in the CEO's cash compensation has a negative effect on short-term debt (see 32).

The effects of CEO ability on debt structure are also economically significant. Using cash compensation as the measure of manager ability, a 1% increase in managerial ability is associated with a 0.11% decline in long-term debt and a 0.38% decline in short-term debt.[p] As a point of comparison, the elasticity of past stock returns to the long-term debt ratio is -0.03%; that is, a 1% increase in past stock returns is associated with a 0.03% decrease in the long-term debt ratio.

D Manager Ownership and Debt Structure

As mentioned in Section B, the manager's ownership stake includes stock and option compensation. The results in Table 7, Panel A, regressions 1 and 2 are consistent with Hypothesis 3 in Table 1. The long-term debt ratio decreases with the CEO's ownership stake.

Regressions 3-7 in Table 7, Panel A include our five proxies of manager ability as controls. Consistent with the results of Table 6, long term debt is negatively related to each of the five proxies of managerial ability. After including manager ability as a control, we continue to find a negative and statistically significant relation between the long-term debt ratio and the manager's inside equity stake. These results are also economically significant. For example, a 1% increase in the manager's equity stake is associated with a 0.04% decline in long-term debt.

PLACE Table 7 ABOUT HERE

The results in Table 7, Panel B, regressions 1-7 indicate a statistically insignificant or marginally significant negative relation between the manager's equity stake and the short-

[p] Using other variables for managerial ability, the economic significance of the effect of ability on debt structure is of comparable magnitude.

term debt ratio. We, therefore, do not find empirical support for Hypothesis 4 in Table 1.

E Long-Term Risk, Short-Term Risk, and Debt Structure

We find a statistically significant negative relation between the long-term debt ratio and long-term risk in Table 6, Panel A, and Table 7, Panel A. We also document a statistically significant and positive relation between the long-term debt ratio and short-term risk in Table 6, Panel A, and Table 7, Panel A. These results are consistent with Hypothesis 5 and Hypothesis 6 in Table 1.

Consistent with Hypothesis 7, Table 6, Panel B and Table 7, Panel B show that the relation between short-term debt and short-term risk is negative. Our empirical results also show that the relation between short-term debt and long-term risk is negative.

F Endogeneity

Manager ownership and capital structure are simultaneously and endogenously determined in the model, which could potentially lead to biased and inconsistent OLS coefficients in Table 7. To address these issues, we use instrumental variables and two-stage least squares regression analysis (2SLS). The primary instrumental variable that we use for manager ownership is the average ownership of CEOs in the same four-digit SIC code. We also include the vector of control variables from the second stage leverage regression as additional instruments in the first stage. Specifically, the first stage regression that we run is the following:

$$\begin{aligned}(40)\qquad \text{CEO ownership}_{i,t} = \text{f}(&\text{Average industry CEO ownership}_{i,t}, \text{LnAssets}_{i,t},\\ &\text{Advertising and R\&D expenses}_{i,t},\ \text{Past stock returns}_{i,t},\\ &\text{Market-to-Book}_{i,t}, \text{Long-term risk}_{i,t},\ \text{Short-term risk}_{i,t})\end{aligned}$$

We use this equation to obtain a predicted value for CEO Ownership. We use this predicted value in our second stage leverage regression along with the other control variables in the regressions in Table 7. We test the appropriateness of our first stage instruments using a battery of specification tests. First, we use the Stock and Yogo (2005) test for weak instruments. This is a test of the strength of the instruments included in the first stage regression, but not included in the second stage regression to determine how much information is added to the predicted value by the instruments (see also Cragg and Donald, 1993). In our regression model, these instruments include Average Industry CEO Ownership, Advertising and R& D expenses, and Market-to-Book ratio. Second, we use the Hahn and Hausman (2002) test for instrument validity to verify that the instruments are not correlated with capital structure.[q] In unreported results, we find that these instruments are indeed valid, suggesting that the model is not affected by any correlation between our instruments and capital structure. While these two diagnostic tests suggest that our choice of instruments is appropriate for this model, for completeness we also perform the Anderson-Rubin test and the Hansen-Sargan test.[r] Both of these tests show that our system of equation is properly identified, suggesting that our instruments are appropriate.[s]More specifically, the Hansen-Sargan test results fail to reject the null hypothesis that there is no correlation between the exogenous instruments and the error term from the capital structure equations.[t]The results of these tests show that our choice of instruments is indeed appropriate. Finally, we test

[q]The Spearman rank correlation between average industry CEO ownership and long term debt is 0.10; the Spearman rank correlation between average industry CEO ownership and short term debt is 0.07.

[r]The Hansen-Sargan test is a test for overidentifying restrictions, testing the joint significance of the set of endogenous variables in the system of equations. It has a Chi-square distribution (with degrees of freedom equal to the number of instruments minus the number of parameters), and the null hypothesis is that the instruments are valid. Large p-values suggest that the instruments are valid. The Anderson-Rubin (1949, 1950) test is a test of the joint significance of a set of endogenous variables in a system of equations. It tests for the joint significance of the excluded instruments by substituting the first-stage reduced-form equations into the second-stage structural equations. The test statistic has a Chi-square distribution; large test statistics and small p-values suggest instrument validity and joint significance of the system.

[s]We establish a system of equations only to perform these two identification tests. We are not concerned about the effect that capital structure has on manager ownership, and so we do not analyze or discuss that relationship.

[t]The p-values for the Hansen-Sargan tests are all greater than 0.28 and the p-values for the Anderson-Rubin test are all less than 0.06.

whether or not endogeneity is an issue in our system using the Hausman (1978) specification test. The results from this test suggest that our system is weakly affected by endogeneity (p-values around 0.10).

Table 8 presents the results from the second-stage leverage regressions. The results are consistent with those in Table 7 and show that, with the exception of the predicted relation between short-term debt and manager ownership, the testable hypotheses hold even after adjusting for endogeneity.

PLACE TABLE 8 ABOUT HERE

G Manager Characteristics and Incremental Debt Financing

Strebulaev (2007) argues that leverage panel regressions similar to the ones above could be misspecified in a dynamic context because firms rebalance their debt only infrequently in the presence of adjustment costs. Consequently, firms could be at different points in their refinancing cycles even though they are otherwise identical, which complicates the inferences from such regressions. He argues for a structural approach to the empirical analysis of firms' capital structure decisions. While a fully structural approach is beyond the scope of this paper, we take some steps towards addressing his critique by analyzing the *incremental* financing decisions of firms.

We collect *external* financing data: the net issuance of long-term debt (Compustat item # 111 - item # 114); the net issuance of short-term debt (the change in current liabilities, Compustat item #5, adjusted for long-term debt in current liabilities, Compustat item #34); and the net issuance of common stocks and preferred stocks (Compustat item # 108 - item # 115). A negative value for the net issuance of debt and equity during a particular fiscal year implies that the firm effectively buys back outstanding securities during that year. To focus on the financing of new investments, we restrict consideration to firm-year samples where the net issuance of equity and debt are both nonnegative. The sample for these tests, therefore, includes firm-year observations with external financing and excludes those corresponding to securities buy-backs.

The dependent variable in the tests is the proportion of incremental long-term debt financing or the proportion of incremental short-term debt financing to total external financing for each firm-year observation. The independent variables in our tests are the same as those in Tables 6 and 7, respectively. Table 9 displays the results. From Panels A and B, we see that, consistent with our hypotheses, manager ability and ownership negatively affect the proportion of incremental long-term debt financing. From Panels C and D, measures of managerial ability negatively affect the proportion of incremental short-term debt financing.

PLACE TABLE 9 ABOUT HERE

VIII Conclusions

We theoretically and empirically investigate the effects of manager characteristics on capital structure. We develop a dynamic principal-agent model that incorporates taxes, bankruptcy costs, and managerial discretion in financing and effort. We derive the manager's dynamic contract and implement it through financial securities, which leads to a dynamic capital structure for the firm.

We derive novel implications that link manager and firm characteristics to capital structure: (i) Long-term debt declines with manager ability, and with her inside equity ownership. (ii) Short-term debt declines with manager ability, and increases with her equity ownership. (iii) Long-term debt declines with long-term risk, and increases with short-term risk. (iv) Short-term debt declines with short-term risk. With the exception of the relation between short-term debt and manager ownership, we show empirical support for the above implications. Our results show that manager characteristics are important determinants of firms' financial policies.

In this study, we consider a framework with limited commitment in which only single period contracts are enforceable. The generalization to the scenario in which long-term contracts are feasible is significantly more complex. In fact, in the current setup where the manager is risk-averse, earnings have unbounded support, the manager's effort can take a continuum of values, and the relationship can be endogenously terminated, it is unclear whether a framework with long-term contracting is analytically or computationally tractable. This is because, as shown by the dynamic contracting literature, the manager's continuation value is an additional state variable that can take a continuum of values. Further, the risk aversion of the manager makes the optimal contracting problem non-concave unless one allows for public randomization. An additional major complication is that there are external frictions due to taxes and bankruptcy costs. Recent studies that allow for long-term contracting such as DeMarzo and Sannikov (2006) and DeMarzo and Fishman (2007) obtain tractability with simplifying assumptions such as zero taxes, universal risk-neutrality, a linear disutility of effort so that a "bang bang" solution for the manager's effort choice problem is optimal, and the assumption that is always optimal to implement maximal effort by the manager. The analysis of a fairly general long-term contracting model with managerial risk aversion, taxes and bankruptcy costs is a major challenge for future research.

Appendix A

Proof of Theorem 1

a) Because only single-period contracts are enforceable, the contract Γ must be *sequentially optimal*, that is, it must be optimal in every continuation game corresponding to all dates and histories. Suppose that there is nonzero slack in the constraint (9) at some date t for a $\mathcal{F}_t$-measurable set A. We can construct a new contract Γ' that modifies Γ by increasing the manager's payoff in period $[t, t+dt]$ by $\epsilon > 0$ conditional on the prior history at date t lying in the set A. For a sufficiently small ϵ, the participation constraints are satisfied at date t. They are clearly satisfied at all subsequent dates because Γ' is identical to Γ at these dates. Therefore, the manager's valuation of her future payoff stream under Γ' is strictly greater than the valuation under Γ at date t so that Γ is not sequentially optimal. Because the date t and the set A are arbitrary, the dynamic constraints equation (9) must be satisfied with equality at each date and state.

Suppose the manager's contractual parameters (defined in 15) in period $[t, t+dt]$ when the firm is solvent are (a, b) and the manager exerts effort e. It immediately follows from equation (9) that the following period by period "after tax" constraints must be satisfied:

$$
\text{(A-1)} \qquad \begin{aligned} E_e\Big[dc_s(t)|\mathcal{F}_t\Big] &= \big((1-\tau)(P(t)-\theta)dt\big),\ t < T_b, \\ E_e\Big[dc_s(t)|\mathcal{F}_t\Big] &= \big((1-\tau)P(t)dt\big),\ t \geq T_b. \end{aligned}
$$

The manager's payoff in the period $[t, t+dt]$ is

$$
dc_m(t) = adt + b(1-\tau)[dQ(t) - 1_{t<T_b}\theta dt].
$$

By equation (1), equation (3), and equation (4), the manager's conditional expected utility from her payoff over the period $[t, t+dt]$ is

(A-2)

$$
m_{(a,b,e)}(t) = adt - b(1-\tau)1_{t<T_b}\theta dt + b(1-\tau)P(t)(1+\ell-\lambda+e)dt - \frac{1}{2}\kappa e^2 dt - \frac{1}{2}\gamma(1-\tau)^2 b^2 s^2 P(t)^2 dt,
$$

where the subscripts indicate the dependence of the manager's conditional expected utility on the contractual parameters (a, b, e). Using standard dynamic programming arguments, the manager's optimal value function at at date t must satisfy the following formal dynamic programming equation:

$$
\text{(A-3)} \qquad \mathbf{M}(t) = \sup_{(a,b,e)} m_{(a,B,e)}(t) + E_t e^{-rdt}\mathbf{M}(t+dt),
$$

where the optimization is subject to the constraint equation (A-2). Since the manager's effort only affects her payoffs in the current period, and her contract must be sequentially optimal, the manager's optimal continuation value $\mathbf{M}(t+dt)$ does not depend on the contractual parameters (a, b, e). Hence, the manager chooses these parameters to maximize $m_{(a,b,e)}(t)$ subject to the constraint equation (A-2).

We first determine the manager's optimal effort given the compensation parameters (a, b). It follows directly from equation (A-2) that the manager's incentive compatible effort is

$$
\text{(A-4)} \qquad e^*(b) = \frac{(1-\tau)bP(t)}{\kappa},
$$

By equation (9), the expected payout flow to shareholders over the period $[t, t+dt]$ when the manager exerts effort $e^*(b)$ is

$$\begin{aligned}
\text{(A-5)}\quad E_t[dc_s(t)] &= (1-\tau)((1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt) - adt \\
&\quad -b(1-\tau)\left[(1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt\right] \\
&= -adt + (1-\tau)(1-b)\left[(1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt\right]
\end{aligned}$$

By equation (A-2), the manager chooses the contractual parameter a to satisfy

$$-adt+(1-b)(1-\tau)\left[(1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt\right] = (1-\tau)(P(t)-1_{t<T_b}\theta)dt.$$

Hence,

$$\begin{aligned}
\text{(A-6)}\qquad a(b) &= -(1-\tau)(P(t)-1_{t<T_b}\theta) + \\
&\quad (1-\tau)(1-b)\left[(1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt\right],
\end{aligned}$$

where the argument indicates the dependence of a on b.

Substituting equation (A-4) and equation (A-6) in equation (A-2), we see that (after some algebra) the manager's conditional expected utility over period $[t, t+dt]$ is

$$\text{(A-7)}\quad P(t)(1-\tau)(1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})dt - \frac{b^2(1-\tau)^2P(t)^2}{2\kappa} - \frac{1}{2}\gamma b^2(1-\tau)^2s^2P(t)^2dt$$

The manager's pay-performance sensitivity b maximizes her conditional expected utility equation (A-7). By the first order conditions for a maximum, we have

$$\text{(A-8)}\qquad b^* = \frac{1}{1+\kappa\gamma s^2}.$$

By equation (A-6), the performance-invariant compensation parameter a is given by the second equation in equation (16). Setting $b = b^* = \frac{1}{1+\kappa\gamma s^2}$ in equation (A-4), the manager's optimal effort is given by the third equation in equation (16).

c) The manager's conditional expected utility for the period is obtained by setting $b = b^* = \frac{1}{1+\kappa\gamma s^2}$ in equation (A-7).

d) The manager's optimal value function is simply the expected utility she derives from her stream of future payoffs and is, therefore, given by equation (19).

Proof of Theorem 2

The market value of long-term debt $\mathbf{D}(t)$ at any date t is

$$\mathbf{D}(t) = E_t\Big[\int_t^{\infty} \exp(-r(u-t))dc_d(u)\Big].$$

By equation (8), the fact that the participation constraints equation (9) are satisfied with equality, and Ito's lemma, the value of long-term debt must satisfy the following ODE for $t > T_b$:

$$\frac{1}{2}\sigma^2 p^2 \mathbf{D}_{pp} + \mu p \mathbf{D}_p - r\mathbf{D} + (1-\tau)p = 0, \tag{A-9}$$

$$\lim_{p\to 0} \mathbf{D}(p) = 0 \; ; \lim_{p\to\infty} \mathbf{D}(p)/p < \infty. \tag{A-10}$$

We have directly represented the value of debt as a function of the current value p of the state variable P. The solution of the above ODE is given by $\mathbf{D}(p) = \frac{(1-\tau)p}{r-\mu}$. For $t < T_b$, it follows from equation (8) that the debt value satisfies

$$\mathbf{D}(p) = E_t\Big[\theta dt + \exp(-rdt)\mathbf{D}(P(t+dt))\Big], \tag{A-11}$$

where $P(t+dt)$ is the end-of-period value of the state variable. Applying Ito's lemma to the above, we can show that the value of debt satisfies

$$\frac{1}{2}\sigma^2 p^2 \mathbf{D}_{pp} + \mu p \mathbf{D}_p - r\mathbf{D} + \theta = 0, \tag{A-12}$$

with the boundary conditions

$$\text{(A-13)} \qquad \lim_{p\to\infty} \mathbf{D}(p) < \infty,$$

and is continuous at the bankruptcy level. The solution of the system equation (A-12) and equation (A-13) is equation (20).

The market value of equity is zero at bankruptcy. By equation (32), equation (9), and the fact that the participation constraints equation (9) are satisfied with equality, the value of equity $\mathbf{S}(p)$ at any date t prior to bankruptcy must satisfy

$$\text{(A-14)} \qquad \mathbf{S}(p) = E_t\Big[(1-\tau)(p-\theta)dt + \exp(-rdt)\mathbf{S}(P(t+dt))\Big].$$

By equation (8) and equation (9), the first term inside the expectation above is the expected after-tax payout flow to equity over the period $[t, t+dt]$. It follows from equation (A-14), Ito's lemma, and the fact that shareholders optimally choose the bankruptcy level $p_b^*(\theta)$ that the value of equity satisfies the following system:

$$\text{(A-15)} \qquad \frac{1}{2}\sigma^2 p^2 \mathbf{S}_{pp} + \mu p \mathbf{S}_p - r\mathbf{S} + (1-\tau)(p-\theta) = 0,$$

$$\text{(A-16)} \qquad \lim_{p\to\infty} \mathbf{S}(p)/p < \infty; \mathbf{S}(p_b^*(\theta)) = \mathbf{S}'(p_b^*(\theta)) = 0,$$

where the second set of conditions are the value matching and smooth pasting conditions for the equity value at the bankruptcy level. The solution to the system equation (A-15) and equation (A-16) is given by equation (21). The endogenous bankruptcy level is given by equation (23). Q.E.D.

Proof of Theorem 3

It follows directly from equation (2), equation (16), and equation (17) that the manager's value function at any date t depends on time only through the current value of the state variable $P(t)$. If $P(t) = p$, the manager's value function at any date t satisfies

$$\text{(A-17)} \qquad \mathbf{M}(p) = (1-\tau)(\ell-\lambda)p\,dt + gp^2dt + E_t\left[\exp(-\beta dt)\mathbf{M}(P(t+dt)\right] = m(p) + E_t\left[\exp(-\beta dt)\mathbf{M}(P(t+dt)\right].$$

Using Ito's lemma and equation (2), the manager's value function $M(p)$ satisfies the following ODE:

$$\text{(A-18)} \qquad \frac{1}{2}\sigma^2p^2\mathbf{M}_{pp} + \mu p\mathbf{M}_p - \beta\mathbf{M} + m(p) = 0$$

The above ODE has the general solution

$$\text{(A-19)} \qquad \mathbf{M}(p) = Ap^{\chi^-} + Bp^{\chi^+} + g\frac{p^2}{\beta-2\mu-\sigma^2} + \frac{(1-\tau)(\ell-\lambda)}{\beta-\mu}p,$$

where χ^- and χ^+ are the negative and positive roots, respectively, of equation (27). As $p \longrightarrow \infty$, the manager's value function must asymptotically tend to $g\frac{p^2}{\beta-2\mu-\sigma^2} + \frac{(1-\tau)(\ell-\lambda)}{\beta-\mu}p$. Hence, the coefficient B in equation (A-19) must be zero.

Since the firm is all-equity after bankruptcy, the manager's value function at bankruptcy must be finite as $p \longrightarrow 0$. Hence, the manager's value function at bankruptcy is

$$\text{(A-20)} \qquad \mathbf{M}(p_b(\theta)) = g\frac{(1-\varsigma)^2p^2}{\beta-2\mu-\sigma^2} + \frac{(1-\tau)(\ell-\lambda)(1-\varsigma)p}{\beta-\mu}$$

Since the manager's value function must be continuous at the bankruptcy trigger p_b, it follows that the manager's value function prior to bankruptcy must be given by equation (25) and satisfies equation (26).

Proof of Theorem 4

The manager's optimal choice of long-term debt coupon solves

$$\text{(A-21)} \qquad \theta^{opt} \equiv \arg\max_\theta\Big[g_{initial}[\mathbf{F}_\theta(0) - I] + \mathbf{M}_\theta(0)\Big] = \arg\max_\theta \mathbf{G}(\theta,\ell,\kappa),$$

where $\mathbf{F}_\theta(0) = \mathbf{S}_\theta(0) + \mathbf{D}_\theta(0)$ is the sum of the values of long-term debt and equity. We explicitly indicate the dependence of $\mathbf{G}$ on θ, ℓ and κ for clarity.

Because the manager captures the surplus she generates in each period, $\mathbf{F}_\theta(0)$ does not depend on the manager's ability, risk aversion, or disutility of effort (see 20 and 21 in Theorem 2). If $\pi \in \{\ell, \gamma, \kappa, s\}$, by the implicit function theorem,

$$\frac{\partial \theta^{opt}}{\partial \pi} = -\frac{\partial^2 \mathbf{G}/\partial\theta\partial\pi}{\partial^2 \mathbf{G}/\partial\theta^2}\Big|_{\theta=\theta^{opt}}. \tag{A-22}$$

$\partial^2\mathbf{G}/\partial\theta^2|_{\theta=\theta^{opt}} < 0$ by the second order condition for a maximum. By equation (A-21),

$$\partial^2\mathbf{G}/\partial\theta\partial\pi = \frac{\partial^2 \mathbf{M}_\theta(0)}{\partial\theta\partial\pi}. \tag{A-23}$$

By equation (25) and equation (26),

$$\mathbf{M}_\theta(P(0)) = [m_{\text{bankrupt}}(p_b(\theta)) - m(p_b(\theta))]\left(\frac{P(0)}{p_b(\theta)}\right)^{\chi^-} + m(P(0)), \text{ where} \tag{A-24}$$

$$m(p) = g\frac{p^2}{\beta - 2\mu - \sigma^2} + \frac{(1-\tau)(\ell-\lambda)}{\beta-\mu}p, \tag{A-25}$$

$$m_{\text{bankrupt}}(p) = g\frac{(1-\varsigma)^2p^2}{\beta - 2\mu - \sigma^2} + \frac{(1-\varsigma)(1-\tau)(\ell-\lambda)}{\beta-\mu}p \tag{A-26}$$

By equation (A-24), equation (A-25), and equation (A-26),

$$\partial^2\mathbf{M}_\theta/\partial\theta\partial\ell = \frac{\chi^-(1-\varsigma)(1-\tau)}{\beta-\mu}P(0)^{\chi^-}\,(p_b(\theta))^{-\chi^- - 1}\,\frac{dp_b(\theta)}{d\theta}. \tag{A-27}$$

Since $\chi^- < 0$, and $\frac{dp_b(\theta)}{d\theta} > 0$ by equation (23), it follows from equation (A-27) that $\partial^2\mathbf{M}_\theta/\partial\theta\partial\ell < 0$. Therefore, by equation (A-22), $\frac{\partial\theta^{opt}(\ell)}{\partial\ell} < 0$. Hence, long-term debt declines with the manager's ability.

By equation (A-24), equation (A-25), and equation (A-26), for $\tau \in \{\gamma, \kappa, s\}$

$$\text{(A-28)} \qquad \partial^2 \mathbf{M}_\theta / \partial\theta\partial\tau = \frac{\partial g}{\partial \tau} \frac{[(1-\varsigma)^2 - 1]p^2}{\beta - 2\mu - \sigma^2} \chi^- P(0)^{\chi^-} (p_b(\theta))^{-\chi^- - 1} \frac{dp_b(\theta)}{d\theta}.$$

By equation (18), $\frac{\partial g}{\partial \tau} < 0$ for $\tau \in \{\gamma, \kappa, s\}$. Since $(1-\varsigma)^2 < 1$, and $\frac{dp_b(\theta)}{d\theta} > 0$ by equation (23), it follows from equation (A-28) that $\partial^2 \mathbf{M}_\theta / \partial\theta\partial\beta > 0$ for $\beta \in \{\gamma, \kappa, s\}$. Therefore, by equation (A-22), $\frac{\partial \theta^{opt}(\beta)}{\partial \beta} > 0$ for $\tau \in \{\gamma, \kappa, s\}$. Hence, long-term debt increases with risk aversion, disutility of effort, and short-term risk.

Proof of Theorem 5

The first part of the proof follows along the lines of the proof of Theorem 1. By equation (35), the period by period after-tax participation constraints for shareholders are now given by

$$\text{(A-29)} \qquad \begin{aligned} E_e\Big[dc_s(t)|\mathcal{F}_t\Big] &= \big((1-\tau)(P(t)\left[1+\omega(\ell-\lambda+e^*(t))\right]-\theta)dt\big),\ t < T_b, \\ E_e\Big[dc_s(t)|\mathcal{F}_t\Big] &= \big((1-\tau)P(t)\left[1+\omega(\ell-\lambda+e^*(t))\right]dt\big),\ t \geq T_b, \end{aligned}$$

where $e^*(t)$ is the manager's *optimal* effort in period $[t, t+dt]$ that is rationally anticipated by all agents.

Following the analysis in the proof of Theorem 1, we can show that the manager's incentive compatible effort level given her contractual compensation parameters (a, b) is again given by equation (A-4). The corresponding expected payout flow to shareholders is given by equation (A-6).

By equation (A-30), the manager chooses the contractual parameter a to

$$\begin{aligned} & -adt + (1-b)(1-\tau)\left[(1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt\right] \\ = \;& (1-\tau)(P(t)\left[1+\omega(\ell-\lambda+e^*(t))\right] - 1_{t<T_b}\theta)dt. \end{aligned}$$

Hence,

$$\text{(A-30)} \qquad a(b) = (1-b)(1-\tau)\left[(1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt\right]$$
$$-(1-\tau)(P(t)\left[1+\omega(\ell-\lambda+e^*(t))\right] - 1_{t<T_b}\theta)dt.$$

From equation (A-4) and equation (A-30), we can show that the manager's optimal pay-performance sensitivity again maximizes equation (A-7) and is, therefore, given by equation (A-8). The manager's optimal effort and her cash compensation are then given by equation (37). The conditional expected utility payoff to the manager is then derived as in the proof of Theorem 1. The conditional expected payout flow to shareholders is given by equation (A-30).

Appendix B: A Modified Model

In this Appendix, we describe a modified model that allows for the manager to delay bankruptcy by servicing debt from the firm's total earnings even after the firm's equity value falls to zero. (This is effectively equivalent to the scenario in which the firm goes private.) The manager declares bankruptcy when it is no longer optimal for her to continue servicing debt. As in Section F, the manager's contract with shareholders must satisfy the dynamic constraints given by equation (9). where T_b is the stopping time at which the equity value falls to zero. However, the manager's incentive compatibility constraints are now

$$\text{(B-1)} \qquad e(.) = \arg\max_{e'(\cdot)} E_{e'} \left[\begin{array}{c} \left(\int_{t=0}^{T_b'} \exp\left(-rt\right)\left[U\left(dc_m(t)\right) - \frac{1}{2}\kappa e'(t)^2 dt\right]\right) + \\ \left(\int_{t=T_b}^{T_b'} \exp\left(-rt\right)\left[U\left(dc_m(t)\right) - \frac{1}{2}\kappa e'(t)^2 dt\right]\right) + \\ \left(\int_{t=T_b'}^{\infty} \exp\left(-rt\right)\left[U\left(dc_m(t)\right) - \frac{1}{2}\kappa e'(t)^2 dt\right]\right) \end{array} \right],$$

where T_b' is the stopping time at which the manager declares bankruptcy. The manager continues to service debt for $t \in (T_b, T_b')$. In the period (T_b, T_b'), the manager receives the firm's total earnings net of long-term and short-term debt payments. The manager's optimization problem is

$$\text{(B-2)} \qquad \left(\theta^{opt}, \Gamma^{opt}\right) = \arg\max_{(\theta,\Gamma)} E\left[\left(\int_{t=0}^{\infty} \exp\left(-rt\right)\left[U\left(dc_s^{manager}(t)\right) - \frac{1}{2}\kappa e'(t)^2 dt\right]\right)\right].$$

The following proposition describes the manager's optimal contract (proofs are omitted for brevity).

Proposition 1 (The Manager's Optimal Contract) *a) For $t < T_b$, the manager's optimal contract is as described in Theorem 1. b) For $T_b < t < T_b^{'}$, the manager's payoff is*

$$\text{(B-3)} \qquad dc_m(t) = (1-\tau)\left[\left(P(t)\left(1+\ell-\lambda+e'(t)\right)dt + sP(t)dW(t)\right) - \theta dt\right],$$

where the manager's effort $e'(t)$ is

$$\text{(B-4)} \qquad e'(t) = \frac{(1-\tau)P(t)}{\kappa}.$$

The manager's conditional expected utility from her payoff in period $[t, t+dt]; t \in (T_b, T_b^{'})$ is

$$\text{(B-5)} \qquad \begin{aligned} E\left[U(dc_m(t)) - \frac{1}{2}\kappa(e(t))^2 dt|\mathcal{F}_t\right] &= (1-\tau)\left((\ell-\lambda)P(t)-\theta\right)dt + g'P(t)^2 dt, \\ g' &= (1-\tau)^2\left(\frac{1}{\kappa} - \frac{1}{2}\gamma s^2\right) \end{aligned}$$

c) The manager's optimal value function $M_\theta(0)$ for a given long-term debt structure θ is

$$\text{(B-6)} \qquad \mathbf{M}_\theta(0) = E\left[\begin{array}{c} \left(\int_0^{T_b} \exp(-rt)\left((\ell-\lambda)(1-\tau)P(t) + gP(t)^2\right)dt\right) + \\ \left(\int_{T_b}^{T_b^{'}} \exp(-rt)\left((\ell-\lambda)(1-\tau)P(t) + g'P(t)^2 - (1-\tau)\theta\right)dt\right) + \\ \left(\int_{T_b^{'}}^{\infty} \exp(-rt)\left((\ell-\lambda)(1-\tau)P(t) + gP(t)^2\right)dt\right) \end{array}\right],$$

where the state variable $P(.)$ falls by the proportion ς at $T_b^{'}$.

The following proposition describes the debt value, the equity value and the manager value for a given long-term debt coupon θ.

Proposition 2 (Debt, Equity and Manager Values) *a) The equity value is given by equation (21) and (22). The trigger* $p_b(\theta)$ *at which the equity value falls to zero is given by equation (23). b) The debt value is given by*

$$\text{(B-7)} \qquad \begin{aligned} \mathbf{D}_\theta(p) &= \left(\frac{(1-\tau)(1-\varsigma)p_b^{'}(\theta)}{r-\mu} - \frac{\theta}{r}\right)\left(\frac{p}{p_b^{'}(\theta)}\right)^{\chi^-} + \frac{\theta}{r};\ p > p_b^{'}(\theta), \\ \mathbf{D}_\theta(p_b^{'}(\theta)) &= \frac{(1-\tau)(1-\varsigma)p_b^{'}(\theta)}{r-\mu}, \end{aligned}$$

where $p_b^{'}(\theta) < p_b(\theta)$ *is the endogenous trigger at which the manager optimally declares bankruptcy. c) The manager's value and the endogenous trigger* $p_b^{'}(\theta)$ *are determined by the following system of equations:*

$$\text{(B-8)} \qquad \begin{aligned} \mathbf{M}_\theta(p) &= Ap^{\chi^-} + g\frac{p^2}{r-2\mu-\sigma^2} + \frac{(1-\tau)(\ell-\lambda)}{r-\mu}p;\ p > p_b(\theta), \\ &= Bp^{\chi^+} + Cp^{\chi^-} + g'\frac{p^2}{r-2\mu-\sigma^2} + \frac{(1-\tau)(\ell-\lambda)}{r-\mu}p - \frac{(1-\tau)\theta}{r};\ p_b^{'}(\theta) < p < p_b(\theta) \\ \mathbf{M}_\theta(p_b^{'}(\theta)) &= g\frac{(1-\varsigma)^2(p_b^{'}(\theta))^2}{r-2\mu-\sigma^2} + \frac{(1-\tau)(1-\varsigma)(\ell-\lambda)p_b^{'}(\theta)}{r-\mu}. \end{aligned}$$

The coefficients A, B, and C and the trigger $p_b^{'}(\theta)$ *are determined by the conditions that the manager's value function is differentiable for* $p \geq p_b^{'}(\theta)$. *In* equation (B-8), χ^+ and χ^- *are the positive and negative roots of the quadratic equation equation (24).*

As we show in Section A, our testable implications for the effects of manager and firm characteristics on capital structure are robust to this modified model.

References

Aghion, P., and P. Bolton. "An Incomplete Contracts Approach to Financial Contracting." *Review of Economic Studies*, 59 (1992), 473–494.

Anderson, T.W., and H. Rubin. "Estimation of the Parameters of a Single Equation in a Complete System of Stochastic Equations." *Annals of Mathematical Statistics*, 20 (1949), 46–63.

Andrade, G., and S. Kaplan. "How Costly is Financial (Not Economic) Distress? Evidence from Highly Leveraged Transactions that Became Distressed." *Journal of Finance*, 53 (1998), 1443–1493.

Berk, J.; R. Stanton; and J. Zechner. "Human Capital, Bankruptcy, and Capital Structure," *Journal of Finance*, 65 (2010), 891–926.

Berger, P.; E. Ofek; and D. Yermack. "Managerial Entrenchment and Capital Structure Decisions," *Journal of Finance*, 52 (1997), 1411–1438.

Cragg, J.G., and S.G. Donald. "Testing Identifiability and Specification in Instrumental Variable Models." *Econometric Theory*, 9 (1993), 222–240.

DeMarzo, P., and M. Fishman. "Optimal Long-Term Financial Contracting." *Review of Financial Studies*, 20 (2007), 2079–2128.

DeMarzo, P., and Y. Sannikov. "Optimal Security Design and Dynamic Capital Structure in a Continuous-Time Agency Model." *Journal of Finance*, 61 (2006), 2681–2724.

Duffie, D. *Dynamic Asset Pricing Theory.* Princeton University Press (2001).

Farrell, K., and D. Whidbee. "The Impact of Firm Performance Expectations on CEO turnover and Replacement Decisions." *Journal of Accounting and Economics*, 36 (2003), 165–196.

Fischer, E.; R. Heinkel; and J. Zechner. "Dynamic Capital Structure Choice: Theory and Tests." *Journal of Finance*, 44 (1989), 19–40.

Goldstein, R.; N. Ju; and H. Leland. "An EBIT Based Model of Dynamic Capital Structure." *Journal of Business*, 74 (2001), 483–512.

Gorbenko, A., and I. Strebulaev. "Temporary Versus Permanent Shocks: Explaining Corporate Financial Policies.*Review of Financial Studies*, 23 (2010), 2591–2647.

Hahn, J., and J. Hausman. "A New Specification Test for the Validity of Instrumental Variables." *Econometrica*, 70 (2002), 163–189.

Hausman, J. “Specification Tests in Econometrics,” *Econometrica*, 46 (1978), 1251–1271.

He, Z.“A Model of Dynamic Compensation and Capital Structure,” *Journal of Financial Economics*, 100 (2011), 351–366.

Hennessy, C. and T. Whited. “Debt Dynamics.” *Journal of Finance*, 60 (2002), 1129–1165.

Leland, H. “Agency Costs, Risk Management, and Capital Structure.” *Journal of Finance*, 53 (1998), 1213–1243.

Leland, H., and K. Toft. “Optimal Capital Structure, Endogenous Bankruptcy and the Term Structure of Credit Spreads.” *Journal of Finance*, 51 (1996), 987–1019.

Myers, S. “Capital Structure.” *Journal of Economic Perspectives*, 15 (2001), 81–102.

Stock, J. and M. Yogo. “Testing for weak instruments in linear IV regression.” In *Identification and Inference for Econometric Models: A Festschrift in Honor of Thomas Rothenberg*, J.H. Stock and D.W.K. Andrews, eds. Cambridge, England: Cambridge University Press (2005).

Strebulaev, I. “Do Tests of Capital Structure Theory Mean What they Say?” *Journal of Finance.* 62 (2007), 1747–1787.

Subramanian, A. “Managerial Flexibility, Agency Costs, and Optimal Capital Structure,” *Unpublished working paper*, Georgia State University (2008).

Tirole, J. *The Theory of Corporate Finance*. Princeton University Press (2006).

Table 1: **Testable Hypotheses**

Hypothesis 1:	Long-term debt declines with the manager's ability
Hypothesis 2:	Short-term debt declines with the manager's ability
Hypothesis 3:	Long-term debt declines with the manager's inside equity stake
Hypothesis 4:	Short-term debt increases with the manager's inside equity stake
Hypothesis 5:	Long-term debt increases with short-term risk
Hypothesis 6:	Long-term debt declines with long-term risk
Hypothesis 7:	Short-term debt declines with short-term risk

Table 2: **Baseline Parameter Values**

Economy Parameters			Firm Parameters					Manager Parameters				
r	τ	ς	μ	σ	s	I	λ	$g_{initial}$	ℓ	κ	γ	β
0.06	0.15	0.15	-0.02	0.29	0.19	100	0.09	0.035	0.22	265	0.19	0.08

Table 3: **Baseline Outputs**

Variable	**Definition**	**Baseline Value**
Firm Value	Value of After-Tax Cash Flows to Firm	115.51
Long-Term Debt Ratio	Value of Long-Term Debt/Asset Value	15.64%
Short-Term Debt Ratio	Value of Short-Term Debt/Asset Value	8.24%
CEO Cash Compensation Ratio	CEO Cash Compensation/Asset Value	0.07%

Table 4: **Description of Variables**

The table describes all the variables in our empirical analysis.

Leverage variables:	
Long term debt to assets	Long term debt over total assets
Long term debt to firm value	Long term debt over firm value.
Short term debt to assets	Debt in current liabilities minus current portion of debt minus cash over total assets
Short term debt to firm value	Net short term debt over firm value.
Total debt to assets	Long term debt plus short term debt minus cash, over total assets
Total debt to firm value	Total debt over firm value.
Incremental Financing	Net issuance of long-term debt / (Net issuance of long-term debt + common and preferred stock)
Industry leverage	The respective leverage ratio for the sample firm's four-digit SIC code
CEO Characteristic variables	
CEO Cash Compensation	The natural log of the salary, bonus, and other cash compensation of the CEO
CEO Cash Compensation to Assets Ratio	The ratio of CEO cash compensation (salary, bonus and other) to total firm assets
Industry adjusted ROA	Return on assets minus the average return on assets for all firms in the same four digit SIC code
CEO tenure	The number of years that the current CEO has held that position
CEO tenure to CEO age	CEO tenure divided by CEO age
CEO ownership, percent	The percentage of equity owned by the CEO (including stock and options).
Control and risk variables:	
Assets, log	Natural logarithm of total firm assets
Firm value	Market value of equity plus book value total debt minus cash
Tangibility	Net plant, property and equipment divided by total assets
Growth opportunities	Advertising expenses plus research and development expenses, divided by total assets
Return on Assets	Operating income before depreciation divided by total assets
Past 3 years stock return	Average compound annual stock return for the prior 36 months
Short Term Risk: SD of ROA	Standard deviation of Return On Assets for the prior 12 quarters
Long Term Risk: Firm Value Volatility	Standard deviation of the change in log firm value for the prior 12 quarters

Table 5: **Summary Statistics**

The table provides the summary statistics for all the variables in our empirical analysis. The variables are described in Table 4.

	No. of Obs	Mean	Median	Standard Deviation
Long term debt to assets	16,573	0.187	0.155	0.196
Long term debt to value	16,573	0.149	0.098	0.165
Short term debt to assets	16,573	0.039	0.082	0.220
Short term debt to value	16,573	0.027	0.056	1.204
Incremental financing	3,582	0.549	0.621	0.380
CEO Cash Compensation (log, 1000s)	9,423	6.790	6.786	0.753
CEO Cash Compensation-to-Assets (x 100)	9,423	0.133	0.075	0.348
Industry adjusted ROA	16,523	-0.003	0.006	0.151
CEO tenure	9,865	7.989	5.590	7.698
CEO tenure to CEO age	9,666	0.140	0.101	0.124
CEO ownership, percent	15,142	1.966	0.000	5.946
CEO ownership with options, percent	10,252	6.863	3.480	8.552
Assets, log	16,573	6.766	6.653	1.686
Firm value, log	16,573	9.138	7.661	9.857
Tangibility	16,545	0.309	0.247	0.226
Growth opportunities	16,573	0.054	0.018	0.097
Return on Assets	16,525	0.131	0.137	0.148
Past 3 years stock return, average	14,065	0.139	0.109	0.317
Short Term Risk	16,529	0.034	0.018	0.071
Long Term Risk	12,493	4.926	0.288	3.869

Table 6: **OLS Analysis of the Effects of Manager Ability on Capital Structure**
Table 6 presents the results of regression analysis of the effects of manager ability on capital structure. In Panel A, long-term debt to assets is the dependent variable. In Panel B, short-term debt to assets is the dependent variable. Tangibility is the ratio of fixed assets to assets. Growth Opportunities is the ratio of advertising and R&D expenses to assets. Industry leverage is the average long-term or short-term leverage ratio for the sample firm's four-digit SIC code. Past stock returns is the compound stock return for the last three years. Short-term risk is the standard deviation of Return on Assets over the prior twelve quarters for the sample firm. Long-term risk is the volatility of Firm Value over the prior twelve quarters for the sample firm. CEO Cash is the natural log of all cash compensation received in the year by the CEO. CEO Cash/Assets is the ratio of CEO cash compensation to total firm assets. Industry adjusted ROA is the firm's operating income divided by assets less the average operating income divided by assets for all other firms in the same four-digit SIC code. CEO tenure is the number of years the CEO has been in that position. CEO tenure to CEO age is the ratio of CEO tenure to CEO age. The sample includes firms with available information from Execucomp, IRRC CRSP and Compustat from 1993-2007. Standard errors are corrected for clustering at the firm level. Intercepts and year-dummy variables are not presented. Regression coefficients are presented with p-values below in parentheses.

Panel A: Long Term Debt to Assets								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tangibility	0.1952	0.1949						
	(0.00)	(0.00)						
Growth Opportunities	-0.1808	-0.1799						
	(0.01)	(0.01)						
LnAssets	0.0231	0.0231	0.0269	0.0268	0.0274	0.0318	0.0374	0.0248
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Return on assets	-0.2969	-0.2965						
	(0.00)	(0.00)						
Industry leverage		0.5960	0.6264	0.6255	0.6262	0.6292	0.6279	0.6280
		(0.00)	(0.00)	(0.04)	(0.04)	(0.02)	(0.04)	(0.04)
Past stock returns			-0.0624	-0.0725	-0.0739	-0.0433	-0.0654	-0.0701
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CEO Cash				-0.0238				
				(0.00)				
CEO Cash/Assets					-0.0080			
					(0.09)			
Industry adjusted ROA						-0.2228		
						(0.00)		
CEO tenure to CEO age							-0.0667	
							(0.03)	
CEO tenure								-0.0009
								(0.06)
Short Term Risk				0.1872	0.1806	0.2194	0.2091	0.2790
				(0.04)	(0.04)	(0.02)	(0.03)	(0.02)
Long Term Risk				-0.0032	-0.0034	-0.0029	-0.0041	-0.0038
				(0.00)	(0.00)	(0.00)	0.00	(0.00)
R^2	0.15	0.20	0.21	0.22	0.22	0.22	0.21	0.20
Number of observations	16,512	16,497	14,055	6,320	6,408	11,235	7,676	7,632

Panel B: Short Term Debt to Assets								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tangibility	0.0948	0.0939						
	(0.00)	(0.00)						
Growth Opportunities	-0.4779	-0.4654						
	(0.00)	(0.00)						
LnAssets	0.0238	0.0237	0.0345	0.0210	0.0217	0.0270	0.0136	0.0212
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Return on assets	0.0963	0.0968						
	(0.06)	(0.06)						
Industry leverage		0.7267	0.7345	0.0300	0.0306	0.0293	0.0309	0.0320
		(0.00)	(0.00)	(0.03)	(0.03)	(0.13)	(0.03)	(0.03)
Past stock returns			-0.0034	-0.0640	-0.0662	-0.0729	-0.0781	-0.0663
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CEO Cash				-0.0332				
				(0.00)				
CEO Cash/Assets					-0.0034			
					(0.04)			
Industry adjusted ROA						-0.2180		
						(0.01)		
CEO tenure to CEO age							-0.1675	
							(0.00)	
CEO tenure								-0.0022
								(0.00)
Short Term Risk				-0.1236	-0.1232	-0.4223	-0.1184	-0.1164
				(0.00)	(0.00)	(0.03)	(0.00)	(0.00)
Long Term Risk				-0.0047	-0.0051	-0.0083	-0.0053	-0.0054
				(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
R^2	0.15	0.16	0.29	0.24	0.24	0.23	0.24	0.23
Number of observations	16,512	16,494	14,053	6,346	6,434	11,310	6,817	6,777

Table 7: **OLS Analysis of the Effects of Manager Ownership on Capital Structure** The table presents the results of regression analysis of the effects of manager ownership on capital structure. In Panel A, long-term debt to assets is the dependent variable. In Panel B, short-term debt to assets is the dependent variable. The size measure is the natural log of assets. Industry leverage is the average long-term or short-term leverage ratio for the sample firm's four-digit SIC code. Past stock returns is the compound stock return for the last three years. CEO ownership is measured as the percentage equity ownership of the CEO, including option compensation adjusted for the delta of option value. Short-term risk is the standard deviation of Return on Assets over the prior twelve quarters for the sample firm. Long-term risk is the volatility of Firm Value over the prior twelve quarters for the sample firm. In specifications (3)-(7), five different measures of CEO ability are considered. CEO Cash is the natural log of all cash compensation received in the year by the CEO. CEO Cash/Assets is the ratio of CEO cash compensation to total firm assets. Industry adjusted ROA is the firm's operating income divided by assets less the average operating income divided by assets for all other firms in the same four-digit SIC code. CEO tenure is the number of years the CEO has been in that position. CEO tenure to CEO age is the ratio of CEO tenure to CEO age. The sample includes firms with available information from Execucomp, IRRC CRSP and Compustat from 1993-2007. Ordinary least squares regressions are used. Standard errors are corrected for clustering at the firm level. Intercepts and year-dummy variables are not presented. Regression coefficients are presented with p-values below in parentheses.

Panel A: Long Term Debt to Assets							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAssets	0.3481	0.0403	0.0397	0.0392	0.0397	0.0439	0.0384
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Industry leverage	0.6219	0.6214	0.6010	0.6010	0.6281	0.6117	0.6117
	(0.00)	(0.04)	(0.06)	(0.06)	(0.03)	(0.05)	(0.05)
Past stock returns	-0.0537	-0.0552	-0.0599	-0.0590	-0.0327	-0.0570	-0.0599
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
CEO ownership, percentage	-0.0011	-0.0009	-0.0005	-0.0005	-0.0007	-0.0014	-0.0014
	(0.02)	(0.13)	(0.06)	(0.07)	(0.04)	(0.08)	(0.08)
CEO Cash			-0.0122				
			(0.12)				
CEO Cash/Assets				-0.0021			
				(0.07)			
Industry adjusted ROA					-0.2683		
					(0.03)		
CEO tenure						-0.0015	
						(0.03)	
CEO tenure to CEO age							-0.1153
							(0.01)
Short Term Risk		0.4483	0.3983	0.4002	0.4570	0.4046	0.4305
		(0.07)	(0.16)	(0.16)	(0.09)	(0.14)	(0.10)
Long Term Risk		-0.0055	-0.0036	-0.0032	-0.0041	-0.0041	-0.0040
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R^2	0.17	0.19	0.19	0.19	0.22	0.20	0.20
Number of observations	5,605	4,602	3,194	3,143	4,602	3,473	3,443

Panel B: Short Term Debt to Assets							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAssets	0.0407	0.0297	0.0287	0.0288	0.0301	0.0193	0.0288
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Industry leverage	0.5407	0.5519	0.5316	0.5309	0.5449	0.5302	0.5361
	(0.00)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Past stock returns	-0.0346	-0.0545	-0.0717	-0.0699	-0.0684	-0.0835	-0.0723
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CEO ownership, percentage	-0.0004	-0.0008	-0.0012	-0.0009	-0.0008	-0.0010	-0.0013
	(0.59)	(0.13)	(0.12)	(0.14)	(0.09)	(0.09)	(0.09)
CEO Cash			-0.0369				
			(0.01)				
CEO Cash/Assets				-0.0105			
				(0.05)			
Industry adjusted ROA					-0.1658		
					(0.08)		
CEO tenure						-0.0019	
						(0.02)	
CEO tenure to CEO age							-0.1544
							(0.00)
Short Term Risk		-0.0852	-0.1186	-0.1189	-0.0610	-0.1130	-0.1161
		(0.00)	(0.00)	(0.00)	(0.01)	(0.02)	(0.02)
Long Term Risk		-0.0069	-0.0050	-0.0046	-0.0078	-0.0054	-0.0054
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
R^2	0.16	0.18	0.22	0.22	0.19	0.23	0.21
Number of observations	5,604	4,601	3,193	3,142	4,601	3,472	3,442

Table 8: **Manager Ownership and Capital Structure: Instrumental Variables Analysis**

The table presents the results of instrumental variables regression analysis of the effects of manager ownership on capital structure. The specification for the first stage is described in Section F; the presented results are from the second stage structural equation. In Panel A, long-term debt to assets is the dependent variable. In Panel B, short-term debt to assets is the dependent variable. Industry leverage is the average long-term or short-term leverage ratio for the sample firm's four-digit SIC code. Past stock returns is the compound stock return for the last three years. CEO ownership is the percentage equity ownership of the CEO, including option compensation. Short-term risk is the standard deviation of Return on Assets over the prior twelve quarters for the sample firm. Long-term risk is the volatility of Firm Value over the prior twelve quarters for the sample firm. CEO Cash is the natural log of all cash compensation received in the year by the CEO. CEO Cash/Assets is the ratio of CEO cash compensation to total firm assets. Industry adjusted ROA is the firm's operating income divided by assets less the average operating income divided by assets for all other firms in the same four-digit SIC code. CEO tenure is the number of years the CEO has been in that position. CEO tenure to CEO age is the ratio of CEO tenure to CEO age. The sample includes firms with available information from Execucomp, IRRC CRSP and Compustat from 1993-2007. Standard errors are corrected for clustering at the firm level. Intercepts and year-dummy variables are not presented. Coefficients are presented with p-values in parentheses.

Panel A: Long Term Debt to Assets							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAssets	0.0205	0.0185	0.0191	0.0190	0.0186	0.0223	0.0256
	(0.04)	(0.01)	(0.03)	(0.03)	(0.01)	(0.04)	(0.01)
Industry leverage	0.6162	0.4488	0.6323	0.6269	0.4568	0.6156	0.6387
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Past stock returns	-0.0663	-0.0626	-0.0607	-0.0606	-0.0437	-0.0602	-0.0616
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
CEO ownership, percentage	-0.0165	-0.0152	-0.0133	-0.0128	-0.0148	-0.0145	-0.0151
	(0.02)	(0.00)	(0.01)	(0.02)	(0.00)	(0.00)	(0.00)
CEO Cash			-0.0113				
			(0.05)				
CEO Cash/Assets				-0.0082			
				(0.15)			
Industry adjusted ROA					-0.2699		
					(0.06)		
CEO tenure						-0.0020	
						(0.02)	
CEO tenure to CEO age							-0.1331
							(0.02)
Short Term Risk		0.5102	0.7241	0.7299	0.6030	0.6977	0.5762
		(0.16)	(0.08)	(0.08)	(0.08)	(0.08)	(0.10)
Long Term Risk		-0.7221	-0.8355	-0.8878	-0.6215	-0.8887	-0.7041
		(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)
R^2	0.30	0.21	0.27	0.26	0.23	0.25	0.26
Number of observations	4,592	3,494	3,051	3,033	3,494	3,134	3,125

Panel B: Short Term Debt to Assets							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAssets	0.0351	0.0182	0.0197	0.0184	0.0182	0.0118	0.0233
	(0.00)	(0.08)	(0.11)	(0.13)	(0.07)	(0.03)	(0.05)
Industry leverage	0.6205	0.6748	0.6624	0.6529	0.6585	0.6509	0.6685
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Past stock returns	-0.0660	-0.0492	-0.0436	-0.0457	-0.0630	-0.0510	-0.0427
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CEO ownership, percentage	-0.0070	-0.0047	-0.0053	-0.0051	-0.0050	-0.0033	-0.0049
	(0.01)	(0.04)	(0.05)	(0.05)	(0.04)	(0.06)	(0.05)
CEO Cash			-0.0389				
			(0.00)				
CEO Cash/Assets				-0.0025			
				(0.07)			
Industry adjusted ROA					-0.1971		
					(0.03)		
CEO tenure						-0.0015	
						(0.12)	
CEO tenure to CEO age							-0.1109
							(0.17)
Short Term Risk		-0.7240	-0.8769	-0.8998	-0.4360	-0.7846	-0.8655
		(0.00)	(0.00)	(0.00)	(0.11)	(0.00)	(0.01)
Long Term Risk		-0.2240	-0.2270	-0.2221	-0.2170	-0.2492	-0.2314
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.05)
R^2	0.27	0.28	0.29	0.29	0.29	0.30	0.29
Number of observations	4,591	3,494	3,051	3,033	3,494	3,134	3,125

Table 9: **Incremental Financing Choices**

The table presents the results of regression analysis of the effects of manager characteristics on incremental external financing. Panels A and B examine the effects of manager ability and ownership on incremental long-term debt financing without and with instrumental variables, respectively. Panels C and D examine the effects of manager ability and ownership on incremental short-term debt financing without and with instrumental variables, respectively. Industry leverage is the average long-term or short-term leverage ratio for the sample firm's four-digit SIC code. Return on Assets is the ratio of operating income to assets. Past stock returns is the compound stock return for the last three years. CEO ownership is the percentage equity ownership of the CEO, including option compensation. Short-term risk is the standard deviation of Return on Assets over the prior twelve quarters for the sample firm. Long-term risk is the volatility of Firm Value over the prior twelve quarters for the sample firm. CEO Cash is the natural log of all cash compensation received in the year by the CEO. CEO Cash/Assets is the ratio of CEO cash compensation to total firm assets. Industry adjusted ROA is the firm's operating income divided by assets less the average operating income divided by assets for all other firms in the same four-digit SIC code. CEO tenure is the number of years the CEO has been in that position. CEO tenure to CEO age is the ratio of CEO tenure to CEO age. The sample includes firms with available information from Execucomp, IRRC CRSP and Compustat from 1993-2007. Standard errors are corrected for clustering at the firm level; intercepts and year dummies are not presented. P-values appear in parentheses.

Panel A: Manager Ability and New Long-Term Debt Financing								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tangibility	0.2494	0.2545						
	(0.00)	(0.00)						
Growth Opportunities	-0.8848	-1.0354						
	(0.00)	(0.00)						
LnAssets	0.0581	0.0632	0.0939	0.1728	0.1580	0.1338	0.1978	0.2106
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.05)
Return on assets	-0.2625	-0.2158						
	(0.00)	(0.03)						
Industry leverage		-0.0004	-0.0004	0.0981	0.0782	0.0219	0.0570	0.0522
		(0.82)	(0.94)	(0.98)	(0.96)	(0.97)	(0.99)	(1.00)
Past stock returns			0.0182	0.0808	0.1128	0.0589	0.0728	0.0605
			(0.75)	(0.82)	(0.85)	(0.83)	(0.80)	(0.83)
CEO Cash				-0.2254				
				(0.04)				
CEO Cash/Assets					-0.2870			
					(0.06)			
Industry adjusted ROA						-0.1896		
						(0.64)		
CEO tenure to CEO age							-0.3698	
							(0.04)	
CEO tenure								-0.0743
								(0.04)
Short Term Risk				0.0191	0.0213	0.0256	0.0655	0.0607
				(0.56)	(0.57)	(0.25)	(0.46)	(0.46)
Long Term Risk				-0.1050	-0.0431	-0.0771	-0.1048	-0.0412
				(0.01)	(0.07)	(0.05)	(0.01)	(0.08)
R^2	0.14	0.16	0.11	0.09	0.11	0.10	0.14	0.09
Number of observations	3,345	3,345	2,579	1,685	1,710	2,385	2,086	2,071

Panel B: Manager Ability and New Long-Term Debt Financing: IV Analysis							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAssets	0.0834	0.2312	0.2419	0.2254	0.2941	0.3014	0.3511
	(0.00)	(0.02)	(0.04)	(0.10)	(0.03)	(0.09)	(0.10)
Industry leverage	0.3812	0.7475	0.7146	0.7297	0.8922	1.0136	1.0527
	(0.04)	(0.00)	(0.00)	(0.02)	(0.09)	(0.01)	(0.05)
Past stock returns	-0.0118	0.1487	0.1202	0.1691	0.2022	0.1605	0.2628
	(0.91)	(0.06)	(0.05)	(0.05)	(0.03)	(0.04)	(0.05)
CEO ownership, percentage	-0.0220	-0.0321	-0.1816	-0.1180	-0.1767	-0.2226	-0.2264
	(0.02)	(0.04)	(0.08)	(0.04)	(0.09)	(0.00)	(0.05)
CEO Cash			-0.0500				
			(0.01)				
CEO Cash/Assets				-0.1030			
				(0.01)			
Industry adjusted ROA					-0.0207		
					(0.09)		
CEO tenure						-0.1063	
						(0.09)	
CEO tenure to CEO age							-0.0719
							(0.01)
Short Term Risk		0.0989	0.0905	0.1180	0.1367	0.1656	0.2291
		(0.01)	(0.08)	(0.03)	(0.08)	(0.08)	(0.10)
Long Term Risk		-0.1526	-0.0554	-0.1239	-0.2082	-0.0436	-0.0734
		(0.16)	(0.06)	(0.01)	(0.16)	(0.12)	(0.01)
R^2	0.14	0.13	0.13	0.10	0.13	0.16	0.16
Number of observations	2,501	1,169	1,101	1,087	1,168	1,189	1,166

Panel C: Manager Ability and New Short-Term Debt Financing								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tangibility	0.1003	0.0755						
	(0.00)	(0.00)						
Growth Opportunities	-0.4367	-0.0864						
	(0.00)	(0.36)						
LnAssets	0.0181	0.0142	0.0194	0.0954	0.0703	0.0753	0.0967	0.0846
	(0.00)	(0.00)	(0.00)	(0.03)	(0.05)	(0.07)	(0.03)	(0.05)
Return on assets	0.0415	0.0323						
	(0.86)	(0.87)						
Industry leverage		0.9561	1.0027	0.5938	0.5935	0.5885	0.5760	0.5495
		(0.00)	(0.00)	(0.06)	(0.05)	(0.02)	(0.08)	(0.06)
Past stock returns			-0.0075	0.0359	-0.0097	0.0312	0.0269	0.0652
			(0.61)	(0.18)	(0.17)	(0.17)	(0.18)	(0.14)
CEO Cash				-0.0642				
				(0.01)				
CEO Cash/Assets					0.0563			
					(0.08)			
Industry adjusted ROA						-0.0439		
						(0.00)		
CEO tenure to CEO age							-0.1550	
							(0.01)	
CEO tenure								-0.0359
								(0.07)
Short Term Risk				-0.0349	-0.0672	-0.0176	-0.0175	-0.1021
				(0.07)	(0.06)	(0.06)	(0.12)	(0.03)
Long Term Risk				-0.0826	-0.0499	-0.0542	-0.0936	-0.0436
				(0.12)	(0.11)	(0.05)	(0.12)	(0.04)
R^2	0.12	0.30	0.29	0.28	0.31	0.32	0.30	0.29
Number of observations	4,306	4,286	2,896	2,077	2,186	2,854	2,666	2,650

Panel D: Manager Ownership and New Short-Term Debt Financing: IV Analysis							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnAssets	0.0264	0.0459	0.1150	0.1399	0.0604	0.1345	0.1977
	(0.00)	(0.03)	(0.05)	(0.06)	(0.08)	(0.04)	(0.10)
Industry leverage	0.4732	0.9482	0.9482	1.0445	1.1734	1.2290	1.3658
	(0.00)	(0.02)	(0.10)	(0.08)	(0.00)	(0.04)	(0.07)
Past stock returns	0.0017	0.0162	0.0035	0.0416	0.0349	0.0569	0.0597
	(0.96)	(0.10)	(0.05)	(0.06)	(0.01)	(0.06)	(0.07)
CEO ownership, percentage	-0.0007	-0.1748	-0.1344	-0.0412	-0.1698	-0.1713	-0.2838
	(0.41)	(0.05)	(0.08)	(0.09)	(0.05)	(0.01)	(0.09)
CEO Cash			-0.0645				
			(0.01)				
CEO Cash/Assets				-0.1102			
				(0.01)			
Industry adjusted ROA					-0.0458		
					(0.06)		
CEO tenure						-0.0805	
						(0.07)	
CEO tenure to CEO age							-0.0885
							(0.03)
Short Term Risk		-0.0241	-0.0141	-0.0212	-0.0223	-0.0208	-0.0228
		(0.06)	(0.02)	(0.07)	(0.03)	(0.05)	(0.09)
Long Term Risk		-0.0717	-0.0219	-0.0561	-0.0229	-0.0941	-0.0395
		(0.16)	(0.11)	(0.08)	(0.09)	(0.09)	(0.01)
R^2	0.10	0.06	0.07	0.10	0.12	0.09	0.12
Number of observations	4,687	4,469	3,185	3,163	4,399	4,011	3,995

Figure 1. Variation of Debt Ratios with Manager Ability

The following figure shows the variation of the long-term, short-term and total debt ratios with the manager's ability.

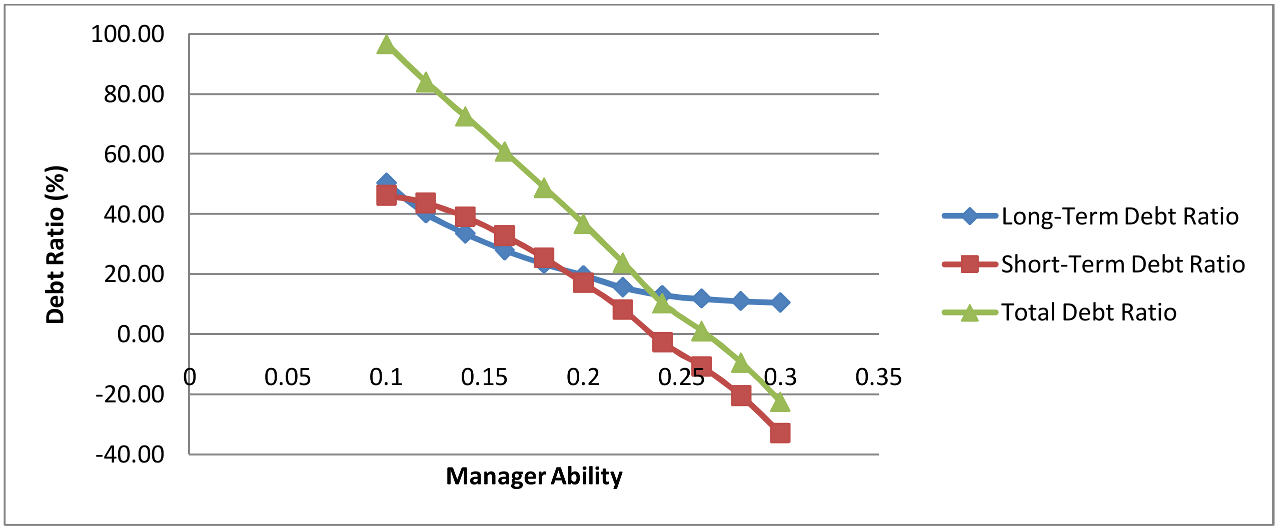

Figure 2. Variation of Debt Ratios with Manager Risk Aversion

The following figure shows the variation of the long-term, short-term and total debt ratios with the manager's ability.

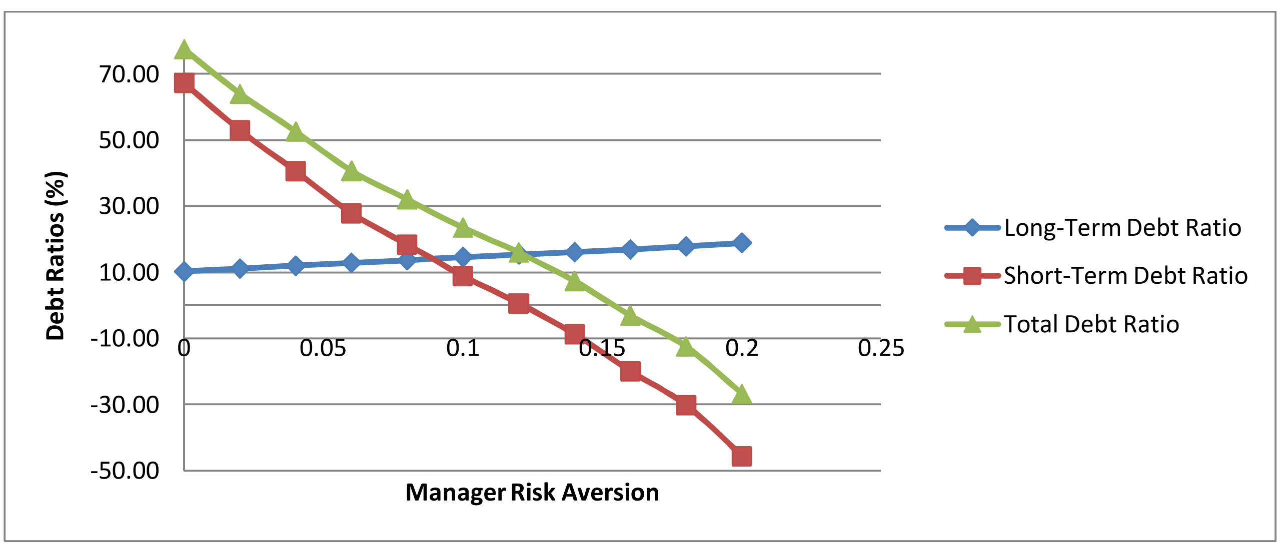

Figure 3. Variation of Debt Ratios with Short-Term Risk

The following figure shows the variation of the long-term, short-term and total debt ratios with the firm's short-term risk.

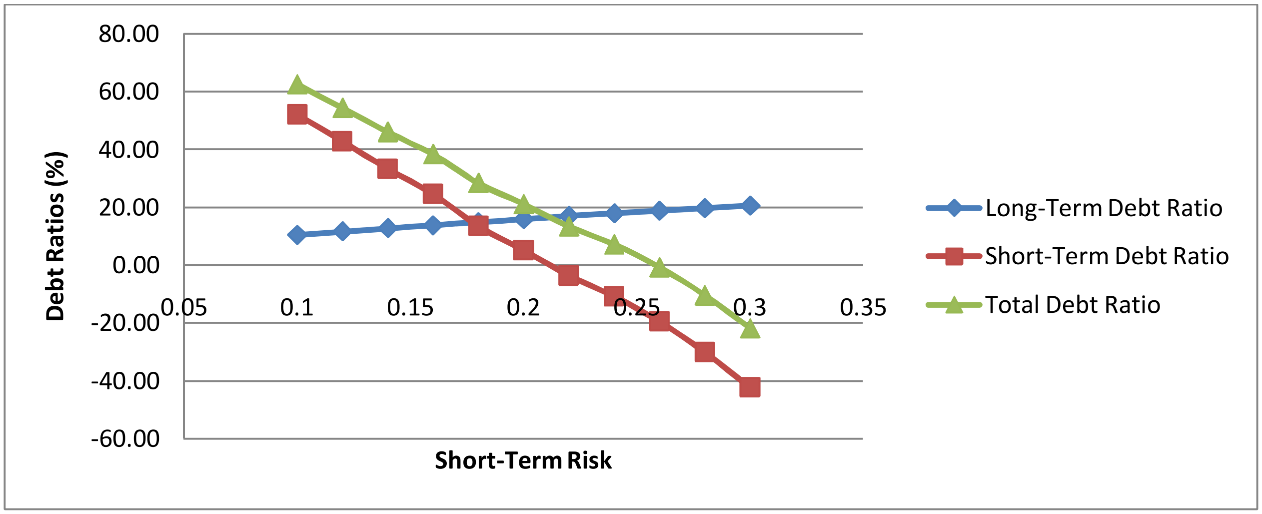

Figure 4. Variation of Debt Ratios with Long-Term Risk

The following figure shows the variation of the long-term, short-term and total debt ratios with the firm's long-term risk.

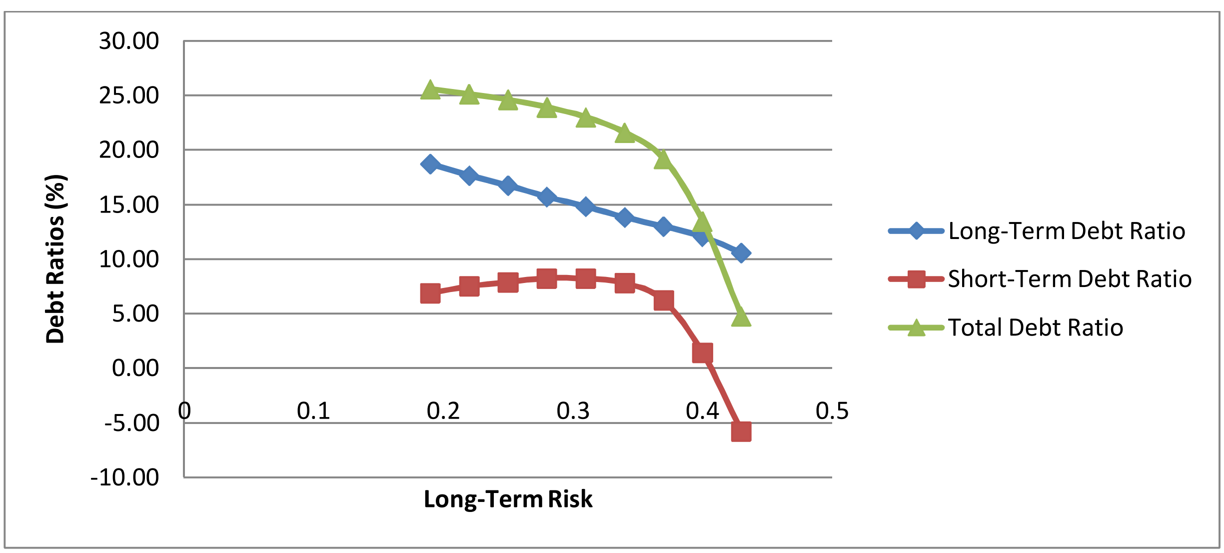

Figure 5. Variation of Debt Ratios with Manager's Initial Stake

The following figure shows the variation of the long-term, short-term and total debt ratios with the manager's initial ownership stake.

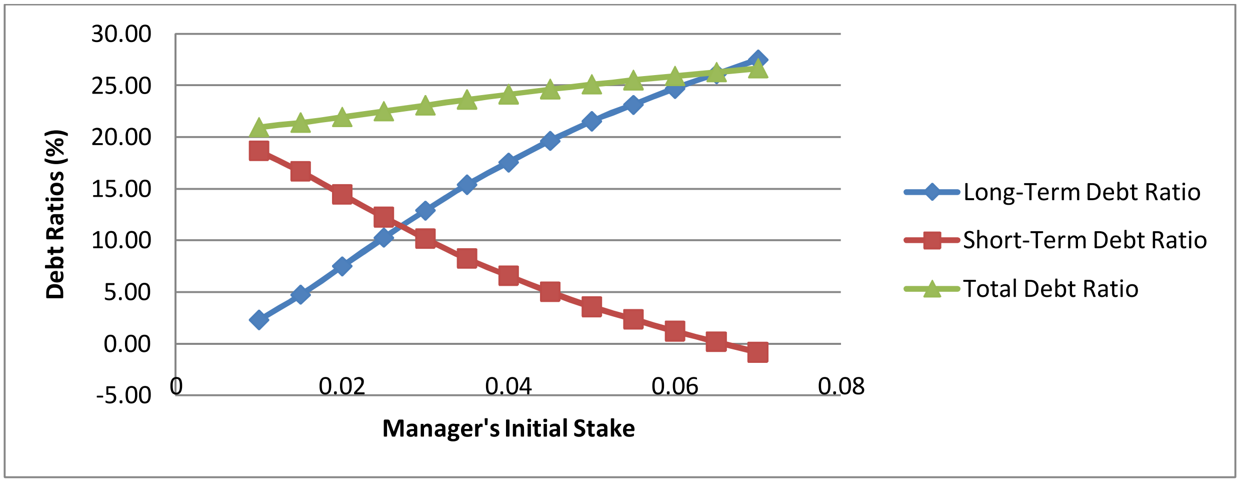

Figure 6. Effects of Manager's Bargaining Power on Long-Term Debt

The following figure shows the effects of the manager's bargaining power on the variation of the long-term debt ratio with the manager's ability.

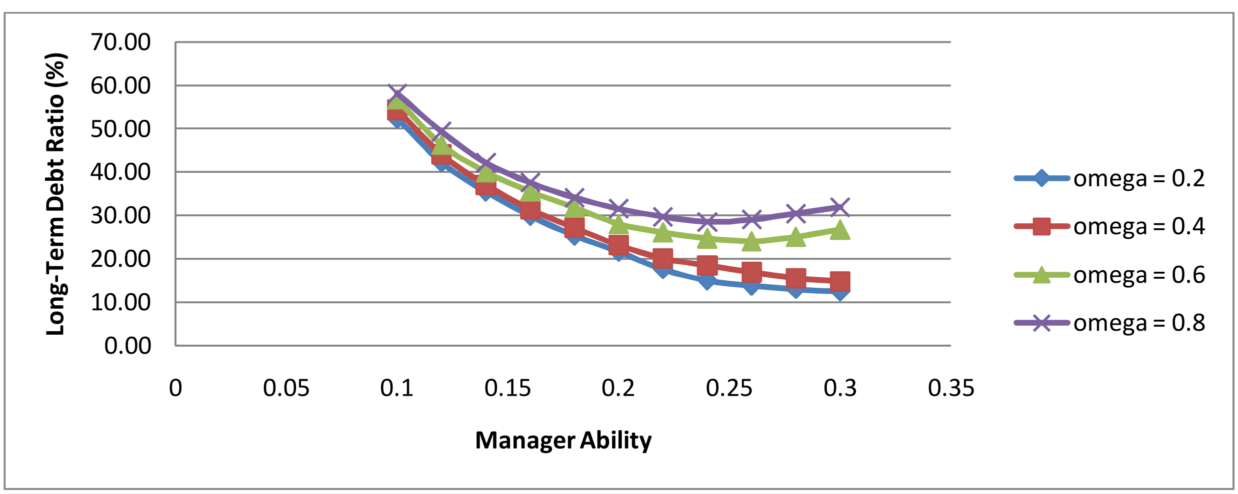

Figure 7. Effects of Manager's Bargaining Power on Short-Term Debt

The following figure shows the effects of the manager's bargaining power on the variation of the short-term debt ratio with the manager's ability.