Manager Characteristics and Capital Structure: Theory and Evidence*

Sanjai Bhagat
Department of Finance
Leeds School of Business
University of Colorado, Boulder
sanjai.bhagat@colorado.edu

Brian Bolton
Accounting and Finance Department
Whittemore School of Business and Economics
University of New Hampshire
brian.bolton@unh.edu

Ajay Subramanian
Department of Risk Management and Insurance
J. Mack Robinson College of Business
Georgia State University
insasu@langate.gsu.edu

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Abstract

We theoretically and empirically investigate the effects of manager-specific characteristics on capital structure. We develop a dynamic structural model in which a manager affects a firm's earnings through her ability and effort. The manager receives dynamic incentives through explicit contracts with shareholders. We derive the manager's contracts and implement them through financial securities. The firm's resulting capital structure is dynamic, and consists of long-term debt, short-term debt, inside equity, and outside equity. The different components of the firm's capital structure reflect the interactive effects of taxes, bankruptcy costs, as well as agency conflicts between the undiversified manager and well-diversified outside investors. The analysis of the model generates the following novel testable predictions: (i) Long-term debt declines with the manager's ability and with her inside equity ownership in the firm. (ii) Short-term debt declines with the manager's ability and increases with her equity ownership. (iii) Long-term debt increases with earnings risk and decreases with project risk. We show significant support for the above testable implications in our empirical analysis. Our theoretical and empirical results show that managerial discretion and manager-specific characteristics are important determinants of firms' financial policies.

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1 Introduction

We 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 derive the manager's contracts and implement them through financial securities, which leads to a dynamic capital structure for the firm. We derive new, empirically testable predictions that link manager and firm characteristics to different components of a firm's capital structure: long-term debt, short-term debt, inside equity, and outside equity. We show significant support for these implications in our empirical analysis.

In our infinite horizon, continuous-time framework, the manager of a privately held firm approaches the public debt and equity markets to obtain financing for a positive NPV project. The manager has an ownership stake in the initial privately held firm and receives a proportion of the surplus from external financing (the total proceeds from financing net of the required capital investment). The firm's capital structure consists of equity, long-term debt that has infinite maturity and is non-callable, and short-term debt that is associated with the firm's day to day operations such as the financing of inventories, accounts receivable, employee wages, etcetera.

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, which are unaffected by the manager's human capital. The after-tax earnings from existing assets represent the reservation payout flow to outside investors in each period.

Outside investors are risk-neutral and *competitive,* 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 shareholders their reservation value—the present value of future reservation payout flows to shareholders—at each date.

As in Leland (1998), debt is serviced entirely as long as the firm is solvent by the additional issuance of equity if necessary, and bankruptcy occurs endogenously when the value of equity 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. All structural model parameters are observable.

We characterize the equilibrium in which the firm's capital structure, the manager's dynamic compensation, and her effort choices are endogenously determined. Because the manager has an ownership stake in the initial privately held firm, she receives a proportion of the surplus generated 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 as well as her stream of future contractual compensation payments.

The manager's contractual 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 dynamic short-term borrowing or lending. In addition to the financing of inventories, accounts receivable, etcetera, the firm's short-term debt thereby includes an additional dynamic component associated with the manager's cash compensation. 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 additional component of the firm's short-term debt provide optimal incentives to the risk-averse manager.

The manager's choice of long-term debt financing 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 manager's choice of long-term debt financing trades off the positive and negative effects of long-term debt on her total expected utility. On the positive side, because debt interest payments are shielded from corporate taxes, the manager can potentially increase the surplus generated 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, Berk and Green, 2004, 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. At the margin, the manager now attaches 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.

We numerically analyze the effects of manager and firm characteristics on the firm's short-term debt. 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. We indirectly infer the manager-specific parameters—ability, risk aversion, and disutility of effort—by matching the predicted values of key relevant statistics to their average values in the data.

The firm's short-term debt declines with the manager's ability, risk aversion and disutility of effort. 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, therefore, increases or, equivalently, its short-term debt decreases.

An increase in the manager's risk aversion or disutility of effort 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) increases (decreases).

The firm's short-term risk (standard deviation of earnings in each period) and its long-term risk (asset volatility) have differing effects on the firm's long-term debt. Long-term debt declines with long-term risk, but increases with short-term risk. Long-term risk 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 project and earnings risks on debt structure.[1]

We empirically investigate the primary testable implications of the theory that link manager and firm characteristics to long-term debt. Using different empirical proxies for manager ability, we show that long-term debt declines with managerial ability 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. Consistent with the theory, long-term debt declines with the manager's inside equity ownership, increases with the firm's short-term risk, and decreases with the firm's long-term risk. We confirm our findings using different proxies for short-term risk and long-term risk.

[1] In a different framework, Gorbenko and Strebulaev (2008) also show that permanent and temporary components of a firm's risk have differing effects on financial policies.

As discussed earlier, our implementation of the manager's contracts through financial securities generates additional implications that link manager and firm characteristics to short-term debt. The theory predicts that short-term debt declines with the manager's ability, and increases with the manager's ownership stake. We find significant empirical support for the predicted negative relation between short-term debt and manager ability. The relation between short-term debt and inside equity ownership is, however, statistically insignificant in the data.

We also carry out an instrumental variables analysis to correct for potential econometric issues created by the simultaneous determination of managerial ownership and debt structure. With the exception of the predicted positive relation between short-term debt and manager ownership, our results show significant and consistent support for the testable implications of the theory. Finally, we also show support for our testable hypotheses in tests that examine the *incremental* financing decisions of firms (see Strebulaev, 2007).

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 (see Myers, 2001). 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, Hackbarth et al, 2007, 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, Graham and Harvey, 2001, Bertrand and Schoar, 2003, 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. A number of studies incorporate managerial discretion in two-period frameworks with adverse selection, moral hazard, or private control benefits (see Myers, 2001 for a survey). Zwiebel (1996) develops a dynamic model with risk-neutral agents in which contracts are not feasible. The manager chooses the firm's capital structure to balance the tradeoff between private benefits and the need to ensure sufficient efficiency to prevent control challenges. Morellec (2004) examines the effects of the interactions among private benefits, control challenges and taxes on leverage in a continuous-time framework.

We complement these studies by examining the effects of a *risk-averse* manager's discretion in effort and financing in a dynamic framework in which the manager's incentive structure is *endogenous*. Our study highlights the effects of agency conflicts between diversified investors and undiversified managers on capital structure.

Another important strand of the literature analyzes security design in dynamic frameworks in which all agents are risk-neutral and complete contracts are enforceable (for example, Biais et al, 2007, DeMarzo and Fishman, 2008).[2] Because these studies focus on security design, they abstract away from imperfections such as taxes. 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, Strebulaev, 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 analyze 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) develop a dynamic model to analyze the effects of managerial risk aversion on capital structure in a framework with one-sided commitment. Levy and Hennessy (2007) develop a general equilibrium framework with single-period debt and equity contracts to analyze the effects of agency conflicts arising from managers' private benefit extraction on financing over the business cycle. We complement these studies by developing a framework with moral hazard (effort provision), *incentive* compensation, and *risky* long-term debt. We implement the manager's contract through

[2] 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.

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.

Our study also contributes to the empirical literature that examines the effects of manager characteristics on capital structure. Berger, Ofek and Yermack (1997) show that entrenched CEOs seek to avoid debt. Graham and Harvey (2001) find that one of the most important concerns of CFOs is financial flexibility. Bertrand and Schoar (2003) show that a significant extent of the heterogeneity in financial practices of firms can be explained by manager "fixed effects". Our empirical analysis contributes to the literature by showing the effects of manager characteristics on long-term debt and short-term debt. Furthermore, we empirically show the effects of different components of firm risk—long-term risk and short-term risk—on debt structure.

2 The Model

The manager of an all-equity firm approaches the public debt and equity markets to obtain financing for a capital investment $I > 0$ in a positive NPV project. Throughout the paper, the "manager" should be viewed as a proxy for the firm's "insiders." Capital markets are competitive as in Chapter 3 of Tirole (2006). 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.

2.1 The Firm's Total EBITM Flow and Debt Structure

The model is 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 *EBITM rate* $P(\cdot)$ from existing assets is the key state variable in the model. 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 motions. In the second term in (1), $\ell > 0$ is the manager's ability, which is constant through time and is common knowledge.[3]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 (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 short-term (single-period) debt payments associated with the financing of inventories, accounts receivable, employee wages, etc. We explicitly indicate this term separately to clarify the interpretation of short-term debt in the subsequent calibration of the model.

The process $P(\cdot)$, which determines the *level* of the firm's EBITM flow in each period by (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 EBITM flows over time, are common knowledge. The information generated by the EBITM process and the process $P(\cdot)$ is $\{\mathcal{F}_t\}$.

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 (here-

[3] Alternately, we could allow for the manager's ability to be stochastic, but with a constant mean ℓ, by interpreting the expression $\ell + sdW(t)$ as the manager's ability (see also Berk et al, 2006).

after, 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 used to finance inventories, accounts receivable, etc. In Section 4, we implement the manager's optimal contract through financial securities. In this implementation, the firm's short-term debt includes an additional dynamic and discretionary component associated with the manager's compensation payments.

2.2 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

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

In the above, $\frac{1}{2}\kappa e(t)^2 dt$ ($\kappa > 0$ is a constant) is the manager's disutility of effort in period $[t, t+dt]$. 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.

2.3 Contracting

The manager receives dynamic incentives through contracts that could be explicitly contingent on the contractible EBITM flow process, $dQ(.)$. We consider an "incomplete contracting" environment in which only single-period contracts are enforceable (see Cooley et al, 2004, Levy and Hennessy, 2007).[4] As in Chapter 3 of Tirole (2006), the manager offers a contract to competitive shareholders in each period, which specifies the division of the firm's earnings (net of corporate taxes and

[4] As argued by studies in the incomplete contracting literature, long-term contracts could be impossible to enforce for several reasons including costs of writing and enforcing long-term agreements, managers' inalienable rights to withdraw their human capital, the fact that the firm's pool of shareholders changes over time, changes in the "outside options" of both parties and the possibility of hold up, etcetera.

interest payments) between the manager and shareholders. In our subsequent implementation of the manager's contracts in Section 4, 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 debt-holders and shareholders.

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. 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 describe an extension of the model that allows 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 analysis of the modified model does not alter the implications of the simpler model presented here.

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.[5] 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 (1) falls by a proportion $\varsigma \in (0, 1)$ at bankruptcy so that

$$P(T_b) = (1 - \varsigma)P(T_b-). \tag{5}$$

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 (1) and (2). The

[5] 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 qualitatively unaltered.

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. Without loss of generality, the sequence of single-period contracts between the manager and shareholders before bankruptcy could be viewed 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. Without loss of generality, 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 choices. 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 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).

2.4 Payoffs to Shareholders and Debtholders

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 (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.[6] The payoff to long-term debt-holders (hereafter referred to as debtholders) during the period is

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

After bankruptcy, as described by the second equation in (7), debt-holders receive the residual payout flow after short-term debt payments described by (31) and payments to the manager . From (6) and (7), the payoff to shareholders, which is the total after-tax earnings net of payments to the manager as well as long-term and short-term debt payments is

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

2.5 The Manager's Financing and Contract Choices

The manager chooses the firm's long-term debt structure and her contract to maximize her expected utility subject to incentive compatibility constraints with respect to her effort and dynamic participation constraints for the firm's competitive shareholders (e.g. see Chapter 3 of Tirole, 2006). We now describe these constraints. In the following, we use the generic term "shareholders" to also refer to the debt-holders after bankruptcy because they are the new shareholders of the all-equity firm post-bankruptcy. By (1), $P(t)dt$ represents the EBITM flow from existing assets in period

[6] We can show that the interest portion of short-term debt payments described in (**??**) are $o(dt)$ so that the corresponding tax shield vanishes in the continuous-time model.

$[t, t+dt]$ without any actions by the manager. Hence, the *reservation payout flow* to the firm over the period is $(1-\tau)P(t)dt + \tau\theta dt$ before bankruptcy and $(1-\tau)P(t)dt$ after bankruptcy. Hence, shareholders' *expected* reservation payout flow is

$$E_t\left[(1-\tau)P(t)dt + \tau\theta dt - dc_d(t)\right] = (1-\tau)(P(t)-\theta)dt \tag{9}$$

Similarly, shareholders can guarantee themselves a payoff $(1-\tau)P(t)dt$ after bankruptcy.

The firm's competitive shareholders accept a contract if and only if the market value of equity at *each* date under the contract is at least as great as the market value of equity if they receive their reservation payout flow $(1-\tau)(P(t)-\theta)dt$ in each subsequent period as long as the firm is solvent. A feasible contract Γ must, therefore, satisfy the following *dynamic* constraints:

$$\begin{aligned} E\Big[\int_{u=t}^{T_b} \exp(-r(u-t))dc_s(u)|\mathcal{F}_t\Big] &\geq E\Big[\int_{u=t}^{T_b} \exp(-r(u-t))\big((1-\tau)(P(u)-\theta)du\big)|\mathcal{F}_t\Big],\ t < T_b, \\ E\Big[\int_{u=t}^{\infty} \exp(-r(u-t))dc_d(u)|\mathcal{F}_t\Big] &\geq E\Big[\int_{u=t}^{\infty} \exp(-r(u-t))\big((1-\tau)P(u)du\big)|\mathcal{F}_t\Big],\ t \geq T_b \end{aligned} \tag{10}$$

A contract $\Gamma \equiv (dc_m(\cdot), e(\cdot))$ is *incentive compatible* or *implementable* 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,

$$e(.) = \arg\max_{e'(\cdot)} E_{e'}\left[\left(\int_{t=0}^{\infty} \exp(-rt)\big[U\left(dc_m(t)\right) - \frac{1}{2}\kappa e'(t)^2 dt\big]\right)\right], \tag{11}$$

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. 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 (7) and (8). The market values of long-term debt, $\mathbf{D}(0)$ and equity, $\mathbf{S}(0)$, are given by

$$\mathbf{D}(0) = E\Big[\int_{t=0}^{\infty} \exp(-rt) dc_d(t)\Big], \tag{12}$$

$$\mathbf{S}(0) = E\Big[\int_{t=0}^{T_b} \exp(-rt) dc_s(t)\Big]. \tag{13}$$

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 to simplify the notation. The surplus 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 $U\left[g_{initial}(\mathbf{D}(0) + \mathbf{S}(0) - I)\right]$.[7] The manager's valuation of her future total payoffs or *continuation value* is

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

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

$$(\theta^{opt}, \Gamma^{opt}) = \arg\max_{(\theta,\Gamma)} \overbrace{U\left(g_{initial}(\mathbf{D}(0) + \mathbf{S}(0) - I)\right)}^{\text{Date Zero Payoff}} + \overbrace{\mathbf{M}(0).}^{\text{Continuation Value}} \quad . \tag{14}$$

3 The Equilibrium

We analyze the manager's optimization problem (14) 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

[7] 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 4, 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.

all agents are finite, we assume that

$$r > max(\mu, 2\mu + \sigma^2), \tag{15}$$

We can prove that (we omit the proof for brevity) it suffices to consider compensation structures that are Ito processes, that is, the manager's compensation in period $[t, t + dt]$ has the form

$$\begin{aligned} dc_m(t) &= \overbrace{a(t)dt}^{\text{performance-invariant compensation}} + \overbrace{b(t)(1-\tau)(dQ(t) - \theta dt)}^{\text{performance-dependent compensation}} \quad, t < T_b \qquad (16) \\ dc_m(t) &= a(t)dt + b(t)(1-\tau)dQ(t), t > T_b \end{aligned}$$

where the contractual parameters $a(.)$ and $b(.)$ are $\mathcal{F}_t-$adapted processes. In (16), 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 constraints (10) are satisfied with equality.

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

$$\begin{aligned} b(t) &\equiv b = \frac{1}{1 + \kappa\gamma s^2}; \qquad (17) \\ e(t) &= \frac{(1-\tau)P(t)}{\kappa(1 + \kappa\gamma s^2)}, \\ a(t) &= P(t)(1-\tau)\left[(1-b)(\ell - \lambda + e(t)) - b\right] + 1_{t<T_b} b(1-\tau)\theta. \end{aligned}$$

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

$$E\left[\exp(-rdt)\left[U\left(dc_m(t)\right) - \frac{1}{2}\kappa(e(t))^2 dt\right] |\mathcal{F}_t\right] = (\ell - \lambda)(1-\tau)P(t)dt + gP(t)^2 dt, \text{ where} \tag{18}$$

$$g = \frac{(1-\tau)^2}{2\kappa 1 + \kappa\gamma s^2)} \tag{19}$$

(d) 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*

$$\mathbf{M}_\theta(0) = E\left[\int_0^\infty \exp(-rt)\left((\ell - \lambda)(1-\tau)P(t) + gP(t)^2\right)dt\right], \tag{20}$$

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

Proof. All proofs are in Appendix A.

By (17), 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 (18) and (19), the output the manager generates also declines with these parameters. The manager's ability determines her *non-discretionary* contribution to output (see 1). As a result, the manager's ability only affects the performance-invariant component of her compensation.

In (20), 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 (18), she incurs personal costs after bankruptcy because the state variable $P(.)$ falls as in (5) at the bankruptcy time, T_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:*

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

$$\begin{aligned}\mathbf{S}_\theta(p) &= (1-\tau)\left(\frac{\theta}{r}-\frac{p_b(\theta)}{r-\mu}\right)\left(\frac{p}{p_b(\theta)}\right)^{\zeta^-}+(1-\tau)\left(\frac{p}{r-\mu}-\frac{\theta}{r}\right);p>p_b(\theta), \qquad (22)\\ \mathbf{S}_\theta(p_b(\theta)) &= \mathbf{S}'_\theta(p_b(\theta))=0, \qquad (23)\end{aligned}$$

$$p_b(\theta)=-\left(\frac{\zeta^-}{1-\zeta^-}\right)\left(\frac{r-\mu}{r}\right)\theta. \qquad (24)$$

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

$$\frac{1}{2}\sigma^2x^2+(\mu-\frac{1}{2}\sigma^2)x-r=0. \qquad (25)$$

By (21), (22), and (24), 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 the participation constraints (10) are satisfied with equality under the optimal contract, the manager appropriates the surplus she generates from her human capital as in Aghion and Bolton (1992) and Berk and Green (2004) (see also Chapter 3 of Tirole, 2006). Hence, the long-term debt and equity values are not affected by manager characteristics.

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 only depends on the current* *value, p, of the state variable $P(.)$ and is given by*

$$\mathbf{M}_\theta(p) = Ap^{\chi^-} + g\frac{p^2}{r-2\mu-\sigma^2} + \frac{(\ell-\lambda)(1-\tau)}{r-\mu}p;\ p > p_b(\theta), \tag{26}$$

$$\mathbf{M}_\theta(p_b(\theta)) = g\frac{(1-\varsigma)^2(p_b(\theta))^2}{r-2\mu-\sigma^2} + \frac{(\ell-\lambda)(1-\tau)}{r-\mu}(1-\varsigma)p_b(\theta). \tag{27}$$

The constant A in (26) *is determined by the boundary condition* (27). *The exponent χ^-* in (26) *is the negative root of the quadratic equation (25).*

The manager's value function at the bankruptcy threshold p_b, which is given by (27), 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 5). The manager's post-bankruptcy payoffs are, therefore, correspondingly lowered so that she effectively incurs personal costs due to bankruptcy.

By (14), 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 (21) and (22). The manager's continuation value function $\mathbf{M}_\theta(0)$ is given by (26).

4 Dynamic Capital Structure

We now 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. 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 (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, etc. represented by the term $\lambda P(t)dt$ in (1).

By (6), (7), (17), and (29), we can rewrite the manager's payoff (16) in period $[t, t+dt]$ as

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

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

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

$$dc_{sd}(t) = (1-\tau)\lambda P(t)dt - \overline{a}(t)dt \tag{31}$$

incurred by all equity holders (inside and outside) in each period. Depending on their sign, the cash flows $dc_{sd}(t)$ could be viewed as short-term debt payments or cash inflows. Combining these payments with the short-term debt payments associated with the financing of inventories, accounts receivable, etc described in (31), we see that the market values of long-term debt, short-term debt and outside equity at any date t are[8]

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

5 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 and credit risk. The following theorem analytically describes the effects of manager characteristics on the firm's long-term debt.

Theorem 4 (Manager Characteristics, Earnings Risk, and Long-Term Debt) *The long-term debt value declines with the manager's ability, increases with her risk aversion, increases with*

[8] 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.

her disutility of effort, and increases with the firm's short-term risk.

By (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 21 and 22).

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 17), it follows from the above discussion that the manager-specific characteristics—ability, risk aversion, 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.

The effects of manager characteristics on short-term debt are ambiguous for general parameter values. By (17), (30) and (**??**), 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 16). By (17) and (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 (**??**). 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 (17), (30) and (**??**). 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 by calibrating the model to the data.

5.1 Numerical Analysis

5.1.1 Model Calibration

Risk-Free Rate, Tax Rate, Bankruptcy Costs: We set the risk-free rate r to 4.5%. We set the effective corporate tax rate τ to 0.15, which is consistent with the estimates of Graham (2000).[9] We set the proportional bankruptcy cost parameter ς to 0.15, which is the 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, Project Drift, Initial EBITM Rate, and Investment: We proxy the *asset value* as the value of the un-levered firm *net* of the manager's contractual compensation. It follows from (1), (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,

$$A(t) = E_t \left[\int_t^\infty \exp\left(-r(u-t)\right)(1-\tau)P(u)du \right] = \frac{(1-\tau)P(t)}{r-\mu}. \tag{32}$$

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. It follows from (1) and (32) that this is equal to $\frac{(1-\tau)P(t)}{A(t)} = r - \mu$. The median ratio of the annual after-tax earnings to asset value for the firms in the sample we use for our subsequent empirical analysis is approximately 0.12. Since

[9] Recall that we assume that taxation is symmetric for simplicity. The effective corporate tax rate also incorporates the effects of personal taxes in the model. An effective corporate tax rate of 0.15 is consistent with the estimates of the tax advantage of debt using Graham's (1996) data on corporate tax rates as well as personal tax rates on interest and dividend income.

$r = 0.045$, we set $\mu = -0.075$ to match the median annual after-tax earnings to asset value ratio. From (1) and (32), the standard deviation of the after-tax return on assets is $(r - \mu) * s$. The median standard deviation of the after-tax return on assets in our sample is approximately 0.055. Accordingly, we set $s = \frac{0.055}{r-\mu} = 0.46$. 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) 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 0.035. We calibrate the baseline values of the manager's ability ℓ, risk aversion γ, disutility of effort κ, and the parameter λ associated with the short-term debt financing of inventories, accounts receivables, employee wages, etc. (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 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.[10] 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 1.18. The median ratio of the annual cash compensation of CEOs to asset value for firms in our sample is 0.07%. Note that this is the ratio of *annual* CEO cash compensation to asset value and *not* the ratio of the present value of the stream of CEO cash compensation payments to

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

asset value.

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 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. In our simulations, we normalize the initial value $P(0)$ of the state variable so that the asset value (the value of the un-levered firm net of the manager's stake) defined in (32) is 100.

5.1.2 The Effects of Manager Characteristics

We now examine the effects of manager characteristics on the firm's value and capital structure.

The Effects of the Manager's Ability

Figure 1 displays the variation of the long-term and short-term 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 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 17 and 30). Consequently, the manager receives a greater portion of her compensation in cash so that the firm's short-term debt decreases (see 31). 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.

In results that we do not report for brevity, we also investigate the effects of the manager's disutility of effort. The effects of the manager's disutility of effort are similar to those of the 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.

5.1.3 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 (17), an increase in the short-term risk lowers the power of incentives to the manager, and increases the "cash" portion of her compensation. By (**??**) and (31), this has a negative effect on the firm's short-term debt.

5.1.4 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. The decline of long-term debt with long-term risk is consistent with considerable empirical evidence (for example, Rajan and Zingales, 1995). Similar to the discussion in Section 5.1.2, the manager's choice of long-term debt reflects its effects on her initial payoff and her continuation value by (28). By (17), 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 the manager's risk aversion lowers her valuation of her stream of future payoffs. Higher long-term risk also lowers the long-term debt value so that long-term debt declines with long-term risk.

The decline in the long-term debt coupon with average risk has a positive effect on the firm's short-term debt (see 30 and (31). 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.

6 Empirical Analysis

6.1 Testable Hypotheses

The results of Section 5 lead to the six 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 the above hypotheses controlling for the effects of the various other determinants of capital structure identified by previous empirical studies.

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 earnings risk
Hypothesis 6:	Long-term debt declines with project risk

6.2 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 *net* of its cash scaled by total assets. We calculate a firm's 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 obtained very similar results.

CEO Tenure and Ownership Variables: We obtain data on CEO tenure, age, and ownership from Execucomp. We calculate the dollar value of 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. We run our tests using dollar as well as percentage ownership measures and obtain very similar results. For brevity, we only report the results of tests using the percentage ownership measure.

CEO Ability: Because the identification and measurement of CEO ability is an imprecise process, we construct different measures of CEO ability for robustness.

a) *Industry adjusted accounting performance*: To the extent a CEO of superior ability delivers superior corporate performance, CEO ability and industry adjusted accounting performance are likely to be significantly positively correlated. Our first measure 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 (and that of the process that selects CEOs) on stock performance and impound it into the share price upon the announcement of the CEO's appointment or the first few major corporate decisions.

b) *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 (for example, see Farrell and Whidbee, 2003). Hence, CEO ability is likely positively correlated with CEO tenure.

c) *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.[11]

Long-Term Risk and Short-Term Risk: We measure long-term risk as the standard deviation of monthly stock returns over the past three years. Short-Term risk is represented by the standard deviation of the quarterly earnings-per-share over the past three years. Alternately, we also run our tests with short-term risk measured as the standard deviation of the return on assets over the past three years.[12]

Table 5 presents the descriptive statistics for the variables for all available years.

6.3 Manager Ability and Debt Structure

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

Consider Table 6, Panel A. Regressions 1-3 include only the control variables motivated by the extensive capital structure literature (for example, see Rajan and Zingales, 1995). 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 in light of the findings in Welch (2004) and Baker and Wurgler (2000); we confirm their findings that 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 in Table 6, Panel A, shows that the relation between the long-term debt ratio and CEO tenure-to-age is negative and significant. Regression 5 notes the significant relation between the long-term debt ratio and CEO tenure.

[11] 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.

[12] As robustness checks, we have also run our tests with project risk measured as the standard deviation of monthly returns over the past 5 years; and earnings 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 qualitatively unaltered.

Finally, regression 6 documents the significant negative relation between the long-term debt ratio and the industry adjusted return on assets. The long-term debt ratio is negatively related with each of our proxies for managerial ability. Consistent with Hypothesis 1 in Table 1, the long term debt ratio declines with managerial ability.

Consistent with Hypothesis 2 in Table 1, regressions 4, 5, and 6 in Table 6, Panel B, document a negative relation between short-term debt and managerial ability. The effects of CEO ability on debt structure are also economically significant. A 1% increase in managerial ability is associated with a .05% decline in long-term debt, a .32% decline in short-term debt, and a .12% decline in total-debt. As a point of comparison, the elasticity of past stock returns to total-debt ratio is -.03, that is, a 1% increase in past stock returns is associated with a .03% decrease in total-debt ratio.

6.4 Manager Ownership and Debt Structure

We measure the manager's ownership stake as the percentage of outstanding equity and includes options. 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, 4, and 5 (Table 7, Panel A) include our three measures of manager ability as controls. Long term debt is negatively related to each of the three measures of managerial ability. After including manager ability as a control measure, we continue to find a negative and statistically significant relation between the long-term debt ratio and the manager's inside equity stake. The results in Table 7, Panel A, regressions 3, 4 and 5 are consistent with Hypothesis 3. These results are also economically significant, for example, a 1% increase in the manager's equity stake is associated with a .03% decline in long-term debt.

The results in Table 7, Panel B, regressions 1, 2, 3, 4 and 5 indicate a statistically insignificant relation between the manager's equity stake and the short-term debt ratio. We, therefore, do not find empirical support for Hypothesis 4 in Table 1 in our data sample.

As robustness checks, we considered alternative specifications for the manager's equity stake by excluding options. We also ran tests in which the short-term debt is calculated as "debt in current liabilities" minus cash (Compustat item #34 - item #1). Our results are unaltered by these alternative specifications.

6.5 Long-Term Risk, Short-Term Risk, and Long-Term Debt

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 the predictions of the theory (see Sections 5.1.3 and 5.1.4), Table 6, Panel B and Table 7, Panel B show that the relations between short-term debt and long-term risk as well as short-term risk are ambiguous.

6.6 Endogeneity

Manager ownership and capital structure are simultaneously and endogenously determined in the model, which could distort the coefficients and standard errors in Table 7. We use instrumental variables to address this issue. In the first stage, we regress CEO Ownership on lagged leverage, R&D and advertising expenses, market to book ratio, average CEO ownership in the industry, industry leverage, lagged leverage, past 3 years' stock return, short-term risk and long-term risk. In the second stage, we regress the leverage measure (long-term debt ratio, short-term debt ratio) on the predicted value of CEO ownership from the first stage, the manager ability proxy, short-term risk, long-term risk, R&D and advertising expenses, market to book ratio, industry leverage, lagged leverage, past 3 years' stock return, average CEO ownership in the industry.

Table 8 shows the results from the second stage regression. The results are consistent with those in Table 7. Long-term and short-term debt decline with manager ability. Long-term debt declines with manager ownership, increases with short-term risk, and decreases with long-term risk.

We conduct the Hansen-Sargan test to ensure that our instruments are strong. We also perform the Cragg-Donald test for model identification. The Hansen-Sargan and Cragg-Donald tests indicate that our instruments are strong, and the system of equations is well-specified.

6.7 Manager Characteristics and Incremental Debt Financing

As an additional robustness check, we empirically analyze the incremental financing decisions of firms (see Strebulaev, 2007). 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, measures of managerial ability as well as manager 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. We do not find a significant relation between incremental short-term debt financing and manager ownership.

7 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, testable implications that link manager and project 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 varies non-monotonically with project and earnings risks.

With the exception of the predicted relation between short-term debt and manager ownership, we show empirical support for the above implications. Our theoretical and empirical results show that manager characteristics are important determinants of firms' financial policies.

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 (10) 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, shareholders' 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 (10) must be satisfied with equality at each date and state. It follows that the following period by period constraints must be satisfied by the optimal contract:

$$\begin{aligned} E_e\Big[dc_s(t)|\mathcal{F}_t\Big] &= \big((1-\tau)(P(t)-\theta)dt\big),\ t < T_b, \\ E_e\Big[dc_s(t)|\mathcal{F}_t\Big] &= \big((1-\tau)P(t)dt\big),\ t \geq T_b. \end{aligned} \tag{33}$$

b) Suppose the manager's contractual parameters (defined in 16) in period $[t, t+dt]$ when the firm is solvent are (a, b) and the manager exerts effort e. 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 (1), (3), and (4), the manager's conditional expected utility from her payoff over the period $[t, t+dt]$ is

$$m_{(a,b,e)}(t) = adt - b(1-\tau)1_{t<T_b}\theta dt + b(1-\tau)P(t)(1+\ell-\lambda+e)dt - \frac{1}{2}\kappa e^2 dt - \frac{1}{2}\gamma(1-\tau)^2 b^2 s^2 P(t)^2 dt, \tag{34}$$

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:

$$\mathbf{M}(t) = \sup_{(a,b,e)} m_{(a,B,e)}(t) + E_t e^{-rdt}\mathbf{M}(t+dt), \tag{35}$$

where the optimization is subject to the constraint (33). 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 (33).

We first determine the manager's optimal effort given the compensation parameters (a, b). It follows directly from (34) that the manager's incentive compatible effort is

$$e^*(b) = \frac{(1-\tau)bP(t)}{\kappa}, \tag{36}$$

By (8), the expected payout flow to shareholders over the period $[t, t+dt]$ when the manager exerts effort $e^*(b)$ is

$$\begin{aligned} E_t[dc_s(t)] &= (1-\tau)((1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt) - adt \\ &\quad -b(1-\tau)\left[(1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt\right] \\ &= -adt + (1-\tau)(1-b)\left[(1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt\right] \end{aligned} \tag{37}$$

By (33), 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,

$$\begin{aligned} a(b) &= (1-\tau)(P(t) - 1_{t<T_b}\theta) - \\ &\quad (1-\tau)(1-b)\left[(1+\ell-\lambda+\frac{b(1-\tau)P(t)}{\kappa})P(t)dt - 1_{t<T_b}\theta dt\right], \end{aligned} \tag{38}$$

where the argument indicates the dependence of a on b.

Substituting (36) and (38) in (34), we see that (after some algebra) the manager's conditional expected utility over period $[t, t+dt]$ is

$$P(t)(1-\tau)(1+\ell+\frac{b(1-\tau)P(t)}{\kappa})dt - \frac{b^2(1-\tau)^2P(t)^2}{2\kappa} - \frac{1}{2}\gamma b^2(1-\tau)^2 s^2 P(t)^2 dt \tag{39}$$

The manager's pay-performance sensitivity b maximizes her conditional expected utility (39). By the first order conditions for a maximum, we have

$$b^* = \frac{1}{1+\kappa\gamma s^2}. \tag{40}$$

By (38), the performance-invariant compensation parameter a is given by the second equation in (17). Setting $b = b^* = \frac{1}{1+\kappa\gamma s^2}$ in (36), the manager's optimal effort is given by the third equation in (17).

c) The manager's conditional expected utility for the period is obtained by setting $b = b^* = \frac{1}{1+\kappa\gamma s^2}$ in (39).

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 (20).

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 (7), the fact that the participation constraints (10) are satisfied with equality, and Ito's lemma, the value of long-term debt must satisfy the following ODE for $t > T_b$:

$$\frac{1}{2}\sigma^2 p^2 \mathbf{D}_{pp} + \mu p \mathbf{D}_p - r\mathbf{D} + (1-\tau)p = 0, \tag{41}$$

$$\lim_{p\to 0} \mathbf{D}(p) = 0 \; ; \lim_{p\to\infty} \mathbf{D}(p)/p < \infty. \tag{42}$$

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 (7) that the debt value satisfies

$$\mathbf{D}(p) = E_t\Big[\theta dt + \exp(-rdt)\mathbf{D}(P(t+dt))\Big], \tag{43}$$

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

$$\frac{1}{2}\sigma^2 p^2 \mathbf{D}_{pp} + \mu p \mathbf{D}_p - r\mathbf{D} + \theta = 0, \tag{44}$$

with the boundary conditions

$$\lim_{p\to\infty} \mathbf{D}(p) < \infty, \tag{45}$$

and is continuous at the bankruptcy level. The solution of the system (44) and (45) is (21).

The market value of equity is zero at bankruptcy. By (31), (8), and the fact that the participation constraints (10) are satisfied with equality, the value of equity $\mathbf{S}(p)$ at any date t prior to bankruptcy must satisfy

$$\mathbf{S}(p) = E_t\Big[(1-\tau)(p-\theta)dt + \exp(-rdt)\mathbf{S}(P(t+dt))\Big]. \tag{46}$$

By (7) and (8), 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 (46), 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:

$$\frac{1}{2}\sigma^2 p^2 \mathbf{S}_{pp} + \mu p \mathbf{S}_p - r\mathbf{S} + (1-\tau)(p-\theta) = 0, \tag{47}$$

$$\lim_{p\to\infty} \mathbf{S}(p)/p < \infty; \mathbf{S}(p_b^*(\theta)) = \mathbf{S}'(p_b^*(\theta)) = 0, \tag{48}$$

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 (47) and (48) is given by (22).

The endogenous bankruptcy level is (24). Q.E.D.

Proof of Theorem 3 It follows directly from (2), (17), and (18) 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

$$\begin{aligned}\mathbf{M}(p) &= (1-\tau)(\ell-\lambda)pdt + gp^2dt + E_t\left[\exp(-rdt)\mathbf{M}(P(t+dt)\right] \\ &= m(p) + E_t\left[\exp(-rdt)\mathbf{M}(P(t+dt)\right].\end{aligned} \tag{49}$$

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

$$\frac{1}{2}\sigma^2 p^2 \mathbf{M}_{pp} + \mu p \mathbf{M}_p - r\mathbf{M} + m(p) = 0 \tag{50}$$

The above ODE has the general solution

$$\mathbf{M}(p) = Ap^{\chi^-} + Bp^{\chi^+} + g\frac{p^2}{r-2\mu-\sigma^2} + \frac{(1-\tau)(\ell-\lambda)}{r-\mu}p, \tag{51}$$

where χ^- and χ^+ are the negative and positive roots, respectively, of (25). As $p \longrightarrow \infty$, the manager's value function must asymptotically tend to $g\frac{p^2}{r-2\mu-\sigma^2} + \frac{(1-\tau)(\ell-\lambda)}{r-\mu}p$. Hence, the coefficient B in (51) 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

$$\mathbf{M}(p_b(\theta)) = g\frac{(1-\varsigma)^2 p^2}{r-2\mu-\sigma^2} + \frac{(1-\tau)(\ell-\lambda)(1-\varsigma)p}{r-\mu} \tag{52}$$

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 (26) and satisfies (27).

Proof of Theorem 4

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

$$\theta^{opt} \equiv \arg\max_\theta \Big[g_{initial}[\mathbf{F}_\theta(0) - I] + \mathbf{M}_\theta(0)\Big] = \arg\max_\theta \mathbf{G}(\theta,\ell,\kappa), \tag{53}$$

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 21 and 22 in Theorem 2). If $\pi \in \{\ell, \gamma, \kappa, s\}$, by the implicit function theorem,

$$\frac{\partial\theta^{opt}}{\partial\pi} = -\frac{\partial^2\mathbf{G}/\partial\theta\partial\pi}{\partial^2\mathbf{G}/\partial\theta^2}|_{\theta=\theta^{opt}}. \tag{54}$$

$\partial^2\mathbf{G}/\partial\theta^2|_{\theta=\theta^{opt}} < 0$ by the second order condition for a maximum. By (53),

$$\partial^2\mathbf{G}/\partial\theta\partial\pi = \frac{\partial^2\mathbf{M}_\theta(0)}{\partial\theta\partial\pi}. \tag{55}$$

By (26) and (27),

$$\mathbf{M}_\theta(P(0)) = [m_{\text{bankrupt}}(p_b(\theta)) - m(p_b(\theta))] \left(\frac{P(0)}{p_b(\theta)}\right)^{\chi^-} + m(P(0)), \text{ where} \tag{56}$$

$$m(p) = g\frac{p^2}{r - 2\mu - \sigma^2} + \frac{(1-\tau)(\ell - \lambda)}{r-\mu}p, \tag{57}$$

$$m_{\text{bankrupt}}(p) = g\frac{(1-\varsigma)^2 p^2}{r - 2\mu - \sigma^2} + \frac{(1-\varsigma)(1-\tau)(\ell - \lambda)}{r-\mu}p \tag{58}$$

By (56), (57), and (58),

$$\partial^2 \mathbf{M}_\theta / \partial\theta\partial\ell = \frac{\chi^-(1-\varsigma)}{r-\mu} P(0)^{\chi^-} (p_b(\theta))^{-\chi^- - 1} \frac{dp_b(\theta)}{d\theta}. \tag{59}$$

Since $\chi^- < 0$, and $\frac{dp_b(\theta)}{d\theta} > 0$ by (24), it follows from (59) that $\partial^2 \mathbf{M}_\theta / \partial\theta\partial\ell < 0$. Therefore, by (54), $\frac{\partial\theta^{opt}(\ell)}{\partial\ell} < 0$. Hence, long-term debt declines with the manager's ability.

By (56), (57), and (58), for $\beta \in \{\gamma, \kappa, s\}$

$$\partial^2 \mathbf{M}_\theta / \partial\theta\partial\beta = \frac{\partial g}{\partial\beta} \frac{[(1-\varsigma)^2 - 1]p^2}{r - 2\mu - \sigma^2} \chi^- P(0)^{\chi^-} (p_b(\theta))^{-\chi^- - 1} \frac{dp_b(\theta)}{d\theta}. \tag{60}$$

By (19), $\frac{\partial g}{\partial\beta} < 0$ for $\beta \in \{\gamma, \kappa, s\}$. Since $(1-\varsigma)^2 < 1$, and $\frac{dp_b(\theta)}{d\theta} > 0$ by (24), it follows from (60) that $\partial^2 \mathbf{M}_\theta / \partial\theta\partial\beta > 0$ for $\beta \in \{\gamma, \kappa, s\}$. Therefore, by (54), $\frac{\partial\theta^{opt}(\beta)}{\partial\beta} > 0$ for $\beta \in \{\gamma, \kappa, s\}$. Hence, long-term debt increases with risk aversion, disutility of effort, and short-term risk.

Appendix B

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 2.5, the manager's contract with shareholders must satisfy the following dynamic constraints:

$$E\Big[\int_{u=t}^{T_b} \exp(-r(u-t)) dc_s(u) | \mathcal{F}_t\Big] \geq E\Big[\int_{u=t}^{T_b} \exp(-r(u-t)) \big((1-\tau)(P(u) - \theta) du\big) | \mathcal{F}_t\Big] \; \forall t, \tag{61}$$

where T_b is the stopping time at which the equity value falls to zero. However, the manager's incentive compatibility constraints are now

$$e(.) = \arg\max_{e'(\cdot)} E_{e'} \begin{bmatrix} \left(\int_{t=0}^{T_b'} \exp(-rt) \left[U(dc_m(t)) - \frac{1}{2}\kappa e'(t)^2 dt\right]\right) + \\ \left(\int_{t=T_b}^{T_b'} \exp(-rt) \left[U(dc_m(t)) - \frac{1}{2}\kappa e'(t)^2 dt\right]\right) + \\ \left(\int_{t=T_b'}^{\infty} \exp(-rt) \left[U(dc_m(t)) - \frac{1}{2}\kappa e'(t)^2 dt\right]\right) \end{bmatrix}, \tag{62}$$

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

$$\left(\theta^{opt}, \Gamma^{opt}\right) = \arg\max_{(\theta,\Gamma)} E\left[\left(\left(\int_{t=0}^{\infty} \exp\left(-rt\right)\left[U\left(dc_s^{manager}(t)\right) - \frac{1}{2}\kappa e'(t)^2 dt\right]\right)\right]. \tag{63}$$

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*

$$dc_m(t) = (1-\tau)\left[\left(P(t)\left(1+\ell+e'(t)-\lambda\right)dt + sP(t)dW(t) - \nu P(t)dZ(t)\right) - \theta dt\right], \tag{64}$$

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

$$e'(t) = \frac{(1-\tau)P(t)}{\kappa}. \tag{65}$$

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

$$\begin{aligned} E\left[U(dc_m(t)) - \frac{1}{2}\kappa(e(t))^2 dt|\mathcal{F}_t\right] &= (1-\tau)\left((\ell-\lambda)P(t)-\theta\right)dt + g'P(t)^2 dt, \\ g' &= (1-\tau)^2\left(\frac{1}{\kappa} - \frac{1}{2}\gamma(s^2+\nu^2)\right) \end{aligned} \tag{66}$$

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

$$\mathbf{M}_\theta(0) = E\left[\begin{array}{c} \left(\int_0^{T_b} \exp(-rt)\left((\ell-\lambda)(1-\tau)P(t) + gP(t)^2\right)dt\right) + \\ \left(\int_{T_b}^{T_b^{'}} \exp(-rt)\left((\ell-\lambda)(1-\tau)P(t) + g'P(t)^2 - (1-\tau)\theta\right)dt\right) + \\ \left(\int_{T_b^{'}}^{\infty} \exp(-rt)\left((\ell-\lambda)(1-\tau)P(t) + gP(t)^2\right)dt\right) \end{array}\right], \tag{67}$$

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 (22) and (23). The trigger $p_b(\theta)$ at which the equity value falls to zero is given by (24). b) The debt value is given by*

$$\begin{aligned} \mathbf{D}_\theta(p) &= \left(\frac{(1-\tau)(1-\varsigma)p_b^{'}(\theta)}{r-\mu} - \frac{\theta}{r}\right)\left(\frac{p}{p_b^{'}(\theta)}\right)^{\chi^-} + \frac{\theta}{r};\ p > p_b^{'}(\theta), \\ \mathbf{D}_\theta(p_b^{'}(\theta)) &= \frac{(1-\tau)(1-\varsigma)p_b^{'}(\theta)}{r-\mu}, \end{aligned} \tag{68}$$

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:

$$\begin{aligned} \mathbf{M}_\theta(p) &= Ap^{\chi^-} + g\frac{p^2}{r-2\mu-\sigma^2} + \frac{(1-\tau)(\ell-\lambda)}{r-\mu}p;\ p > p_b(\theta), \qquad (69)\\ &= Bp^{\chi^+} + Cp^{\chi^-} + g'\frac{p^2}{r-2\mu-\sigma^2} + \frac{(1-\tau)(\ell-\lambda)}{r-\mu}p - \frac{(1-\tau)\theta}{r};\ p_b^{'}(\theta) < p < p_b(\theta)\\ \mathbf{M}_\theta(p_b^{'}(\theta)) &= g\frac{(1-\varsigma)^2(p_b^{'}(\theta))^2}{r-2\mu-\sigma^2} + \frac{(1-\tau)(1-\varsigma)(\ell-\lambda)p_b^{'}(\theta)}{r-\mu}. \end{aligned}$$

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 (69), χ^+ and χ^- *are the positive and negative roots of the quadratic equation (25).*

The analysis of the above modified model does not alter the implications for the effects of manager and firm characteristics on capital structure derived using the simpler model in the main body of the paper.

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Table 2: **Baseline Parameter Values**

Economy Parameters			Firm Parameters					Manager Parameters			
r	τ	ς	μ	σ	s	I	λ	$g_{initial}$	ℓ	κ	γ
0.045	0.15	0.15	-0.075	0.29	0.46	100	0.1	0.035	0.245	252	0.11

Table 3: **Baseline Outputs**

Variable	**Definition**	**Baseline Value**
Firm Value	Market Value of Total After-Tax Cash Flows to the Firm	114.96
Long-Term Debt Ratio	Market Value of Long-Term Debt/Asset Value	15.40%
Short-Term Debt Ratio	Market Value of Short-Term Debt/Asset Value	8.24%
CEO Cash Compensation Ratio	CEO Cash Compensation/Asset Value	0.04%

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 divided by total assets
	Compustat #9 / Compustat #6
Short term debt to assets	Debt in current liabilities minus Debt due in one year minus cash, divided by total assets
	(Compustat #34 - Compustat #44 - Compustat #1) / Compustat #6
Total debt to assets	Long term debt plus short term debt minus cash, divided by total assets
	(Compustat #9 + Compustat #34 - Compustat #1) / Compustat #6
Industry leverage	Leverage ratio for four-digit SIC code
CEO Characteristic variables	
CEO tenure	Tenure of CEO, from Execucomp
CEO tenure to CEO age	CEO tenure divided by CEO age, from Execucomp
Industry adjusted ROA	Return on assets minus average return on assets for four digit SIC code
CEO ownership, dollar, log	Common stock owned by CEO times the price, from Execucomp, IRRC and Compustat.
	Calculated with and without stock options.
CEO ownership, percent	The percentage of common stock owned by CEO, from Execucomp and IRRC.
	Calculated with and without stock options.
Control and risk variables:	
Assets, log	Total firm assets (Compustat #6)
Firm value	Market value of equity plus book value total debt minus cash
Tangibility	Net plant, property and equipment divided by total assets
	(Compustat #8 / Compustat #6)
Growth opportunities	Advertising expenses plus research and development expenses, divided by total assets
	(Compustat #45 + Compustat #46) / Compustat #6
Return on assets	Operating income before depreciation divided by total assets
	(Compustat #13 / Compustat #6)
Past 3 years stock return	Average 3 year compound annual stock return
Earnings risk	3-year standard deviation of earnings per share
	3-year standard deviation of return on assets
Project risk	3-year standard deviation of stock returns

Table 5: **Summary Statistics**

The table provides the summary statistics and correlations for the leverage variables, CEO characteristics variables, and control variables. The leverage variables are long term debt to assets, short term debt to assets, total firm debt to assets. Return on assets (ROA) is operating income divided by assets. Industry leverage is the average relevant leverage ratio for the four-digit SIC code. Past stock returns is the compound stock return for the last three years. 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. CEO ownership is measured as dollar ownership and percentage ownership, with and without stock options included. 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. The size measures are the natural log of assets and the natural log of firm value. Tangibility is the ratio of fixed assets to assets. Growth opportunities is the ratio of advertising and research and development expenses to assets. Earnings risk is the standard deviation of the firm's earnings per share (EPS) over the last three years. Project risk is the standard deviation of monthly stock returns over the last three years. The sample includes firms with available information from Execucomp, IRRC, CRSP and Compustat from 1993-2007 although data are not available for all variables for all years.

	No. of Observations	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
Total debt to assets	16,573	0.226	0.279	0.323
Total debt to value	16,573	0.176	0.175	1.219
Incremental financing	3,582	0.549	0.621	0.380
CEO tenure	9,865	7.989	5.590	7.698
CEO tenure to CEO age	9,666	0.140	0.101	0.124
Industry adjusted ROA	16,523	-0.003	0.006	0.151
CEO ownership, dollar, log	9,423	15.183	15.564	3.494
CEO ownership, percent	15,142	1.966	0.000	5.946
CEO ownership with options, dollar, log	10,408	16.099	16.272	2.570
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
Earnings risk, EPS	14,945	0.808	0.304	30.028
Project risk, volatility of firm value	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 from regression analysis where the dependent variable equals the firm's long-term or short-term debt ratio. 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 research and development expenses to assets. The size measure is the natural log of assets. Return on assets (ROA) is operating income divided by assets. Industry leverage is the average relevant leverage ratio for the four-digit SIC code. Past stock returns is the compound stock return for the last three years. CEO tenure to CEO age is the ratio of CEO tenure to CEO age. CEO tenure is the number of years the CEO has been in that position. 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. Earnings risk is the standard deviation of the firm's earnings per share (EPS) over the last three years. Project risk is the standard deviation of monthly stock returns over the last three years. 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 dummies 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)
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	0.0247	0.0254	0.0289
	(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	0.6242	0.6249	0.6274
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Past stock returns			-0.0624	-0.0714	-0.0727	-0.0459
			(0.00)	(0.00)	(0.00)	(0.00)
CEO tenure to CEO age				-0.0731		
				(0.02)		
CEO tenure					-0.0010	
					(0.03)	
Industry adjusted ROA						-0.2335
						(0.00)
Earnings risk (EPS)				0.0146	0.0148	0.0094
				(0.00)	(0.00)	(0.05)
Project risk (firm volatility/100)				-0.0020	-0.0022	-0.0014
				(0.00)	(0.00)	(0.01)
R^2	0.15	0.20	0.21	0.22	0.22	0.22

Panel B: Short Term Debt to Assets						
	(1)	(2)	(3)	(4)	(5)	(6)
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	0.0291	0.0299	0.0293
	(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	0.7342	0.7348	0.7295
		(0.00)	(0.00)	(0.00)	(0.00)	(0.13)
Past stock returns			-0.0034	-0.0052	-0.0542	-0.0772
			(0.00)	(0.00)	(0.00)	(0.00)
CEO tenure to CEO age				-0.1571		
				(0.00)		
CEO tenure					-0.0020	
					(0.00)	
Industry adjusted ROA						-0.3293
						(0.00)
Earnings risk (EPS)				-0.0024	-0.0023	-0.0034
				(0.06)	(0.11)	(0.13)
Project risk (firm volatility/100)				-0.0076	-0.0079	-0.0100
				(0.00)	(0.00)	(0.00)
R^2	0.15	0.16	0.29	0.29	0.29	0.31

Table 7: **OLS Analysis of the Effects of Manager Ownership on Capital Structure**

The table presents the results from regression analysis where the dependent variable is the firm's long-term or short-term debt ratio. 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. 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. 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. 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. Earnings risk is the standard deviation of the firm's earnings per share (EPS) over the last three years. Project risk is the standard deviation of monthly stock returns over the last three years. 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 dummies 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)
LnAssets	0.3481	0.0301	0.0338	0.0333	0.0330
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Industry leverage	0.6219	0.6169	0.6083	0.6078	0.6026
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Past stock returns	-0.0537	-0.0579	-0.0594	-0.0584	-0.0335
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
CEO ownership, percentage	-0.0011	-0.0016	-0.0012	-0.0011	-0.0013
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
CEO tenure			-0.0014		
			(0.04)		
CEO tenure to CEO age				-0.1081	
				(0.01)	
Industry adjusted ROA					-0.2890
					(0.07)
Earnings risk (EPS)		0.0186	0.0162	0.0162	0.0168
		(0.00)	(0.00)	(0.00)	(0.00)
Project risk (firm volatility/100)		-0.0023	-0.0016	-0.0013	-0.0013
		(0.01)	(0.01)	(0.06)	(0.15)
R^2	0.17	0.18	0.20	0.20	0.22

Panel B: Short Term Debt to Assets					
	(1)	(2)	(3)	(4)	(5)
LnAssets	0.0407	0.0382	0.0401	0.0402	0.0351
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Industry leverage	0.5407	0.5590	0.5380	0.5373	0.5430
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Past stock returns	-0.0346	-0.0490	-0.0636	-0.0618	-0.0742
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CEO ownership, percentage	-0.0004	-0.0004	-0.0007	-0.0004	-0.0008
	(0.59)	(0.61)	(0.49)	(0.66)	(0.33)
CEO tenure			-0.0018		
			(0.03)		
CEO tenure to CEO age				-0.1507	
				(0.00)	
Industry adjusted ROA					-0.3003
					(0.00)
Earnings risk (EPS)		0.0013	0.0027	0.0028	0.0005
		(0.49)	(0.18)	(0.16)	(0.81)
Project risk (firm volatility/100)		-0.0091	-0.0081	-0.0077	-0.0101
		(0.16)	(0.00)	(0.00)	(0.00)
R^2	0.16	0.16	0.17	0.18	0.19

Table 8: **Manager Ownership and Capital Structure: Instrumental Variables Analysis**
The table presents the results from an instrumental variables analysis of the relation between managerial ownership and debt structure. The specifications for the two stages are as described in Section 6.6. 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. 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. 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. 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. Earnings risk is the standard deviation of the firm's earnings per share (EPS) over the last three years. Project risk is the standard deviation of monthly stock returns over the last three years. 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 dummies 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)
LnAssets	0.0205	0.0031	0.0039	0.0040	0.0047
	(0.04)	(0.02)	(0.02)	(0.02)	(0.00)
Industry leverage	0.6162	0.6130	-0.6049	-0.6004	-0.6205
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Past stock returns	-0.0663	-0.0631	-0.0635	-0.0628	-0.0442
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CEO ownership, percentage	-0.0165	-0.0342	-0.0309	-0.0308	-0.0315
	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)
CEO tenure			-0.0010		
			(0.06)		
CEO tenure to CEO age				-0.0680	
				(0.05)	
Industry adjusted ROA					-0.2229
					(0.12)
Earnings risk (EPS)		0.0534	0.0481	0.0480	0.0494
		(0.00)	(0.00)	(0.00)	(0.00)
Project risk (firm volatility/100)		-0.0116	-0.0111	-0.0112	-0.0113
		(0.00)	(0.00)	(0.00)	(0.00)
R^2	0.30	0.28	0.29	0.29	0.30

Panel B: Short Term Debt to Assets					
	(1)	(2)	(3)	(4)	(5)
LnAssets	0.0351	0.0321	0.0364	0.0370	0.0266
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Industry leverage	0.6205	0.6206	0.6130	0.6127	0.6183
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Past stock returns	-0.0660	-0.0653	-0.0783	-0.0766	-0.0923
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CEO ownership, percentage	-0.0070	-0.0109	-0.0093	-0.0087	-0.0141
	(0.01)	(0.01)	(0.05)	(0.07)	(0.00)
CEO tenure			-0.0021		
			(0.01)		
CEO tenure to CEO age				-0.1678	
				(0.00)	
Industry adjusted ROA					-0.3151
					(0.00)
Earnings risk (EPS)		0.0115	0.0080	0.0075	0.0164
		(0.03)	(0.16)	(0.19)	(0.00)
Project risk (firm volatility/100)		-0.0060	-0.0056	-0.0054	-0.0059
		(0.00)	(0.01)	(0.02)	(0.00)
R^2	0.27	0.27	0.29	0.29	0.31

Table 9: **Incremental Financing Choices**

The table presents the results of a regression analysis where the dependent variable is the proportion of incremental long-term or short-term debt financing as a proportion of total external financing. Panel A examines the effects of manager ability on incremental long-term debt financing; Panel B examines the effects of manager ownership on incremental long-term debt financing using instrumental variables; Panel C examines the effects of manager ability on incremental short-term debt financing; Panel D examines the effects of manager ownership on incremental short-term debt financing using instrumental variables. The size measure is the natural log of assets. 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. 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. 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. Earnings risk is the standard deviation of the firm's earnings per share (EPS) over the last three years. Project risk is the standard deviation of monthly stock returns over the last three years. 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 dummies are not presented. Regression coefficients are presented with p-values below in parentheses.

Panel A: Manager Ability and New Long-Term Debt Financing						
	(1)	(2)	(3)	(4)	(5)	(6)
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	0.0784	0.0721	0.1019
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Return on assets	-0.2625	-0.2158				
	(0.00)	(0.03)				
Industry leverage		-0.0004	-0.0004	0.0002	0.0003	0.0003
		(0.82)	(0.94)	(0.97)	(0.97)	(0.95)
Past stock returns			0.0182	-0.0074	-0.0069	0.0386
			(0.75)	(0.94)	(0.95)	(0.55)
CEO tenure to CEO age				-0.2959		
				(0.02)		
CEO tenure					-0.0047	
					(0.02)	
Industry adjusted ROA						-0.1251
						(0.02)
Earnings risk (EPS)				0.0191	0.0213	0.0256
				(0.56)	(0.57)	(0.25)
Project risk (firm volatility/100)				0.0376	0.0343	-0.0493
				(0.73)	(0.74)	(0.74)
R^2	0.14	0.16	0.11	0.12	0.12	0.14

Panel B: Manager Ability and New Long-Term Debt Financing: IV Analysis					
	(1)	(2)	(3)	(4)	(5)
LnAssets	0.0834	0.0793	0.0656	0.0652	0.0870
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)
Industry leverage	0.3812	0.3591	0.2678	0.2846	0.3825
	(0.04)	(0.04)	(0.08)	(0.07)	(0.03)
Past stock returns	-0.0118	0.0078	0.0006	-0.0009	0.0619
	(0.91)	(0.93)	(1.00)	(1.00)	(0.44)
CEO ownership, percentage	-0.0220	-0.0253	-0.0299	-0.0273	-0.0210
	(0.02)	(0.01)	(0.00)	(0.00)	(0.02)
CEO tenure			-0.0054		
			(0.07)		
CEO tenure to CEO age				-0.3008	
				(0.01)	
Industry adjusted ROA					-0.4900
					(0.01)
Earnings risk (EPS)		0.0421	0.0198	0.0254	0.0379
		(0.23)	(0.57)	(0.59)	(0.36)
Project risk (firm volatility/100)		-0.1777	0.0996	0.0856	-0.2268
		(0.42)	(0.78)	(0.76)	(0.37)
R^2	0.14	0.14	0.15	0.16	0.17

Panel C: Manager Ability and New Short-Term Debt Financing						
	(1)	(2)	(3)	(4)	(5)	(6)
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	0.0137	0.0138	0.0206
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Return on assets	0.0415	0.0323				
	(0.86)	(0.87)				
Industry leverage		0.9561	1.0027	0.8615	0.9105	0.7771
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Past stock returns			-0.0075	-0.0012	-0.0035	-0.0090
			(0.61)	(0.95)	(0.80)	(0.55)
CEO tenure to CEO age				-0.1553		
				(0.00)		
CEO tenure					-0.0021	
					(0.00)	
Industry adjusted ROA						-0.0053
						(0.89)
Earnings risk (EPS)				-0.0037	-0.0039	-0.0012
				(0.17)	(0.16)	(0.28)
Project risk (firm volatility/100)				-0.0002	-0.0002	-0.0002
				(0.15)	(0.15)	(0.13)
R^2	0.12	0.30	0.29	0.31	0.32	0.33

Panel D: Manager Ownership and New Short-Term Debt Financing: IV Analysis					
	(1)	(2)	(3)	(4)	(5)
LnAssets	0.0264	0.0252	0.0172	0.0182	0.0234
	(0.00)	(0.00)	(0.02)	(0.02)	(0.00)
Industry leverage	0.4732	0.4626	0.4708	0.4750	0.4761
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Past stock returns	0.0017	0.0036	0.0103	0.0154	-0.0431
	(0.96)	(0.87)	(0.65)	(0.52)	(0.02)
CEO ownership, percentage	-0.0007	-0.0009	-0.0013	-0.0011	-0.0012
	(0.41)	(0.31)	(0.23)	(0.31)	(0.18)
CEO tenure			-0.0028		
			(0.01)		
CEO tenure to CEO age				-0.2352	
				(0.00)	
Industry adjusted ROA					-0.4618
					(0.00)
Earnings risk (EPS)		0.0004	0.0002	0.0001	0.0015
		(0.82)	(0.95)	(0.95)	(0.27)
Project risk (firm volatility/100)		-0.0027	-0.0029	-0.0030	-0.0039
		(0.56)	(0.40)	(0.37)	(0.43)
R^2	0.10	0.09	0.11	0.10	0.13

Figure 1: Variation of Debt Ratios with Manager Ability

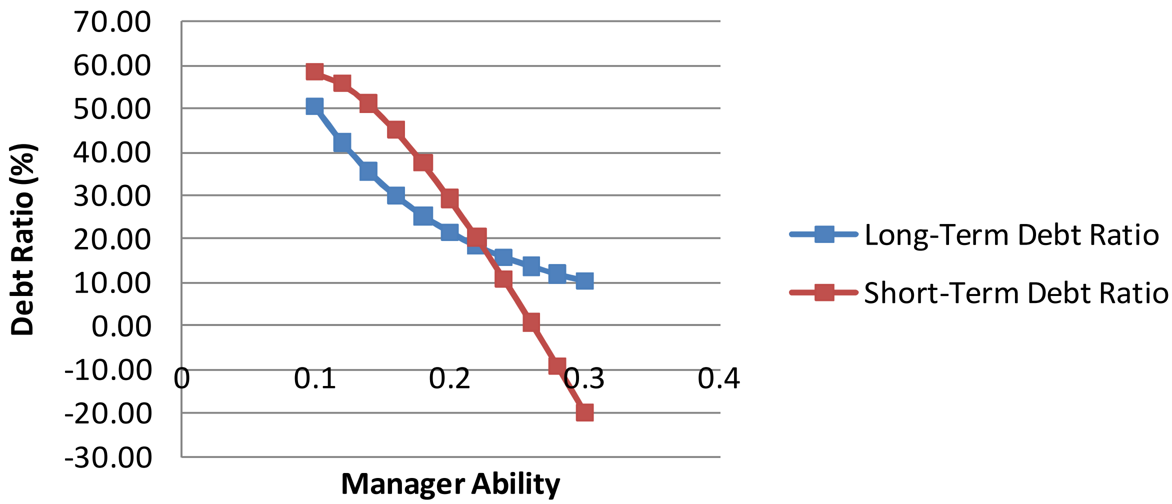

Figure 2: Variation of Debt Ratios with Manager Risk Aversion

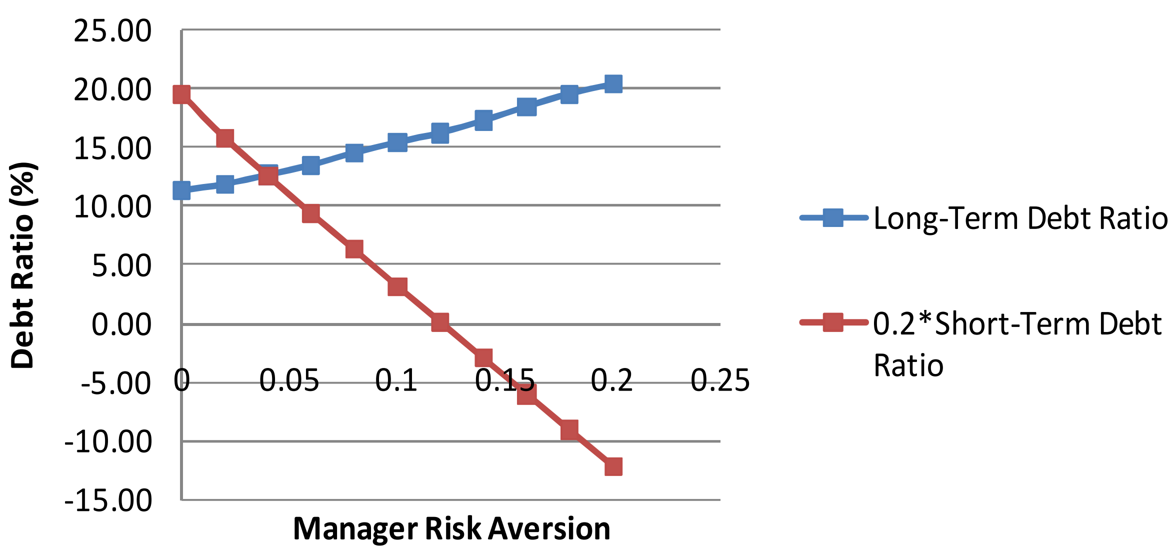

Figure 3: Variation of Debt Ratios with Short-Term Risk

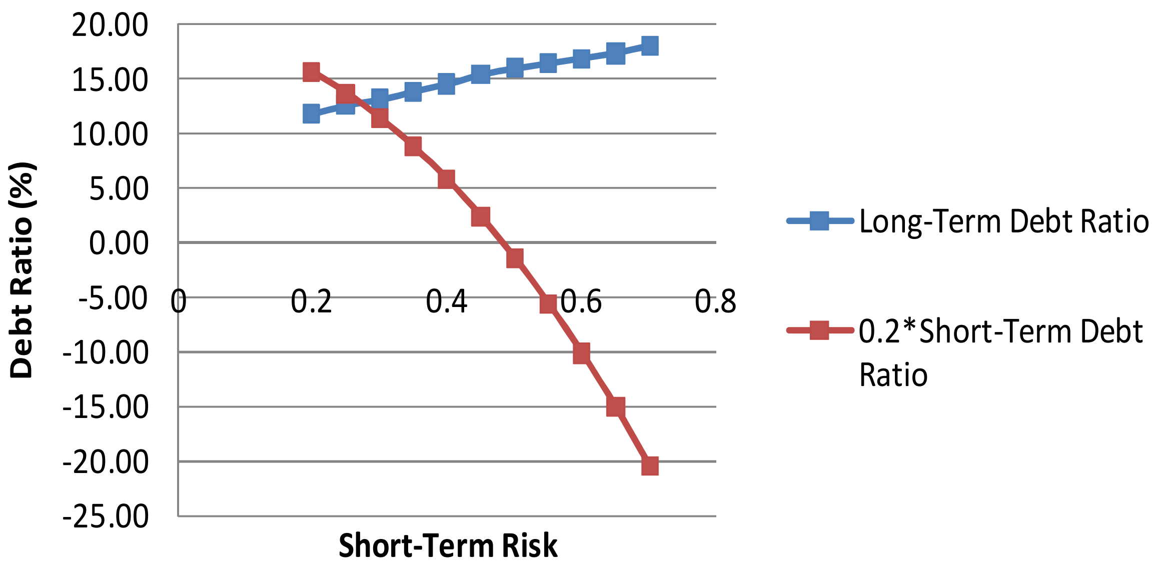

Figure 4: Variation of Debt Ratios with Long-Term Risk