Pay Me Later: Inside Debt and Its Role in Managerial Compensation*

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Abstract

Many companies pay their executives using inside debt, such as pensions and deferred compensation. Though these instruments are widely used, their valuation and incentive effects for managers have been almost entirely overlooked by prior research. CEO compensation in most firms exhibits a balance between debt- and equity-based incentives, and the balance systematically shifts away from equity and toward debt as CEOs grow older. CEOs with high debt-based incentives manage their firms conservatively to reduce default risk. Pension plan compensation strongly influences patterns of CEO turnover and CEO cash compensation.

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1 Introduction

In the nearly-three decades since the publication of Jensen and Meckling (1976), a vast academic literature has emerged on executive compensation. A predominant focus of this literature has been equity-based compensation, paid in the form of restricted stock, stock options, and other instruments whose value is tied to future equity returns. Empirically, the growing role of equity-based compensation has been widely documented as part of research examining pay-versus-performance for corporate executives. On the theoretical front, the literature has sought both a justification for linking managerial pay to equity and the potential consequences of such a link for managerial incentives and other issues. Implicit in virtually all of this research is that managerial compensation consists of only two components: cash and equity-linked instruments. For example, Dewatripont and Tirole (1994) ask

> Why are managers' monetary incentives . . . traditionally correlated with the value of equity rather than the value of debt? That is, why does compensation meant to maximize firm value have managers paid in stocks rather than as a function of firm value?

Overlooked almost entirely is the widespread practice of paying top managers with debt. It is common for executives in the U.S. to work in exchange for promises from their firms to pay them fixed sums of cash in the future. The most common form of these intra-company IOUs ("inside debt" in the language of Jensen and Meckling, 1976) are defined-benefit pensions and deferred compensation. As we document in this paper, the amounts involved are significant.

The implications of substantial inside debt holdings by executives are numerous. By affecting both the overall level of compensation and its composition, inside debt alters managerial incentives in many directions. It should, for example, have an impact on the size of the firm's payouts, the composition of these payouts (dividends versus share repurchases), the firm's cost of debt and its capital structure, the choice of new securities to be issued (debt versus equity), project choice, capital expenditure, and the incentive to pursue diversifying mergers, among many other things. From a theoretical standpoint, it also raises the question of when and whether such debt-holding could be part of an optimal compensation package.

This paper takes a first, largely empirical, step in exploring the nature and implications of debt-based compensation for CEOs of large U.S. companies. Because disclosure for deferred compensation plans is limited, out of necessity most of our analysis focuses on CEO pension plans. (Even on pensions, information is not readily available as we explain later in the paper.) We begin with an example that illustrates and motivates the material to come.

A Case Study: Jack Welch of General Electric

Table I presents data about the annual evolution of the pension and deferred compensation of perhaps the most famous CEO in American business, John F. Welch Jr. of General Electric Co. Data appears annually for the last nine years of Welch's career, along with information about his direct compensation and equity ownership.

Welch's debt-based compensation was a significant part of his overall pay. Incremental yearly increases in his pension entitlement, when valued using standard actuarial methods, ranged as high as $24.8 million during the period shown, exceeding his cash salary and bonus compensation in each of his last five working years. By the time Welch retired, General Electric owed him $170 million between the present value of his pension and his deferred compensation.

The growth of Welch's pension value accelerated in his final years of office. This pattern is directly linked to the service-based formula underlying most CEO pensions. It provides clear incentives for CEOs to remain working until the minimum age for pension payout and also to manage the firm in their latter years in a way that preserves the value of the pension. In particular, one might expect CEOs to reduce firm risk as they accumulate seniority and their pension values grow.

Welch's cash compensation also grew substantially after he turned 60 in 1995, and he received a very large equity award as well in that year. General Electric permits retirement at age 60 with full pension benefits. To provide incentives to managers to keep working beyond that age, one would expect the company to increase compensation in order to make them whole for the pension benefits they sacrificed by not retiring. This appears to have happened with Welch.

Welch's "debt-equity ratio"—the ratio of his inside debt holding to his equity (stock and option) holding—ranged between 0.07 and 0.27 during the period shown, which was well below the company's overall debt/equity ratio during the same period. Having the CEO invested in both debt and equity claims against the company provides a mechanism for mitigating the agency costs of debt (Jensen and Meckling, 1976), but very large CEO holdings of inside debt may lead to an overly conservative management style. It is possible that the large equity awards Welch received in his final years in office were partly intended to counteract the incentives for conservative management that would otherwise have arisen from his pension.

Welch's pension structure and holdings of inside debt are not exceptional.[1] This paper inves-

[1]The *level* of Welch's compensation is not typical of most CEOs—his pension is by far the highest in our sample—but the balance between his inside debt and equity holdings and their evolution over time are quite typical among CEOs. Probably the most valuable pensions among active CEOs today are held by Lee R. Raymond of Exxon Mobil Corp. and Edward E. Whitacre Jr. of SBC communications Inc., each of whose pension has a fair actuarial present value betwen $50 and $60 million. Raymond also holds about $350 million worth of shares and options in his company, while Whitacre's equity holdings are considerably lower, not too far from parity with his pension value.

tigates CEO pensions in the U.S. and finds that these patterns of are present more generally in the data. The rest of this section elaborates.

This Paper's Contribution

Our sample involves CEO compensation for 237 Fortune 500 companies over a seven-year period between 1996 and 2002. Following a discussion of the related literature in Section 2, Section 3 describes our data set and the common rules used to determine CEO pensions.

Our analysis opens in Section 4 by highlighting of the importance of pensions in CEOs' compensation structure. Of the many features described here, two bear particular emphasis. First, we show that increases in the fair value of pensions constitute a significant component of overall compensation for many CEOs. For example, for the CEOs in the age group 61-65 in our sample, the pension component of overall compensation is on average 30% larger than the base salary and is 21% of the size of equity compensation. Second, the importance of the pension component of compensation increases monotonically with age. As a consequence, the balance between debt and equity incentives for CEOs shifts in a clear pattern away from equity and toward debt as they grow older. For instance, only 7% of the CEOs in our sample who are aged between 51 and 55 have debt-equity ratios exceeding their company's debt-equity ratios, but for CEOs in the age group 61-65, this rises to 22%.

In light of the importance of the pension component of executive compensation, we find it a bit surprising that companies in the U.S. (unlike their U.K. counterparts) are not required to report pension values explicitly and in greater detail. We comment further on this issue in Section 4.

Section 5 looks to identify important variables that determine or correlate with (a) the pension component of compensation, and (b) the CEO's ratio of debt-to-equity holdings. We consider a large set of variables suggested by contracting theory and intuition, including the firm's leverage, its growth opportunities, tax status, liquidity position, and several others. We find that the firm's leverage is positively related to the ratio of debt-to-equity compensation as expected. The CEO's years of tenure with the firm also exhibits a positive association with both the pension value and ratio of debt to equity pay. Surprisingly, few other company variables appear to influence the CEO's debt-equity ratio.

Section 6 turns to a topic that has received considerable coverage in the compensation literature: CEO turnover (e.g., Warner, Watts, and Wruck (1988) and Huson, Malatesta, and Parrino (2004)). We examine the role of the payout schedule for pensions in this context and find that it acts as a critical determinant of turnover: Holding constant age and other variables, we find that CEOs become much more likely to retire once their pensions become fully payable, with the effects operating most strongly for CEOs at age 60 and at ages 65 and above. Moreover,

for CEOs who do not retire when pensions become payable, we find that they collect additional cash compensation, equal to approximately 50 cents for each dollar of foregone pension income. These results have special significance since the role of pensions has not thus far been highlighted in the literature on turnovers.

In Section 7, we study the agency costs of debt stemming from the "asset-substitution" or "risk-shifting" incentives of equity-holding CEOs. These incentives are dampened and agency costs mitigated when the CEO holds debt in the company, so, ceteris paribus, debt-based compensation should reduce the riskiness of the firm's external debt. We test for this implication. As our metric of risk, we use the firm's "distance-to-default," which is, loosely speaking, the number of standard deviation moves in the firm's value required to put the firm in default. (A higher distance-to-default indicates a lower likelihood of default.) The notion of distance-to-default as capturing default risk was popularized in the Moody's KMV implementation of Merton's (1974) model and is now widely accepted as a good ordinal proxy for default risk. We find the data backs the theory. As CEO pension values increase relative to their equity values, risk-taking as measured by distance-to-default declines. A firm's distance-to-default is 0.3 to 0.4 standard deviations higher when the CEO's personal debt-equity ratio exceeds his company's debt-equity ratio.

The overall picture suggested by both theory and data is that pension plans induce a change in management style in the direction of conservatism. Two other checks we perform (debt-rating changes plotted against pension values, and capital-expenditures plotted against pension values) back this implication, at least with respect to the top tail of the distribution of pension values.

Finally, in Section 8, we look at the effects of pension holdings on payout policies. In general, higher equity holdings by a CEO should create an incentive for higher payouts, but the holdings of stock options (which are protected against stock repurchases but not against dividends) and inside debt may create incentives in the opposite direction. We are able to develop only limited empirical evidence along these lines.

We believe our paper is the first to highlight the importance of debt-based compensation as an element of top management contracts, and also the first to call attention to the underlying incentive and governance implications of these schemes. Our concluding remarks in Section 9 point to several open questions, both theoretical and empirical, beyond those addressed in this paper.

2 Literature Review

The large theoretical literature that has developed around managerial compensation and agency problems has seen a number of models justify the use of equity in a manager's compensation

package. However, the possibility of using debt instruments for management compensation has received little attention.

In general, the impact of debt and equity holdings on the manager's incentives depends on the capital structure of the firm itself. Begining with Jensen and Meckling (1976), several papers have examined the design of the "ownership structure" of a firm, defined as the combination of the firm's capital structure and the composition of its managerial compensation. The canonical model involves an "owner-manager" who seeks to raise outside financing (outside debt and/or equity) to fund a project. The objective is to choose these components optimally to minimize deadweight losses from agency. We discuss some of these papers in this section.

Jensen and Meckling (1976) consider an owner-manager who retains an equity interest in the firm which forms his sole compensation. They note that outside equity finance creates moral hazard concerns: The manager bears the full cost of effort expended in generating returns but receives only a part of the rewards, so he does not have adequate incentives to expend optimal effort. Outside debt, on the other hand, creates risk-shifting problems: The manager, as the holder of a convex residual claim on the firm, has an incentive to suboptimally increase the riskiness of the firm's cash flows. Deadweight costs result in either case that preclude first-best outcomes.

Jensen and Meckling do not, for the most part, consider including debt in the manager's compensation, except for a brief section in which they note that having the manager hold debt and equity in the same ratio as they appear in the firm's capital structure eliminates the risk-shifting problems associated with outside debt.[2]

Jensen and Meckling consider the problems of outside debt and outside equity separately (their framework does not encompass effort-avoidance and risk-shifting possibilities simultaneously) so they do not discuss the optimality of debt compensation in general or its impact on the moral hazard problem. Hellwig (1994) studies a generalization of the Jensen-Meckling framework that simultaneously admits both shirking and risk-shifting.

Matters are much more complex in Hellwig's model; for example, the manager can hide a low effort choice behind a high risk choice. Hellwig finds that under certain conditions, the optimal contract involves the issue of outside debt and outside equity; the manager holds the residual equity but still does not hold debt. Other more complex (and less reasonable) outcomes are possible in Hellwig's model, but none are discussed which involve the manager holding debt.

The Jensen-Meckling and Hellwig frameworks focus on the different patterns of income streams generated by different securities (and their consequent incentive effects) but do not

[2]Controlling the problems of risk-shifting leads to an empirical prediction that the amount of equity pay for a manager should vary inversely with firm leverage. See the model of John and John (1993) and empirical evidence in numerous papers such as Bryan, Hwang, and Lilien (2000) and Ortiz-Molina (2004).

pay much attention to the control rights conferred by these securities. In practice, a specific correlation is observed: equityholders, the holders of junior convex claims, control the firm in good states of the world, while debtholders, the holders of senior concave claims, control the firm in bad states. Motivated by this, Dewatripont and Tirole (1994) describe a model in which multiple outside investors hold diverse securities (outside debt and outside equity), and there is control by debtholders in bad states and by equityholders in good states.[3] In the optimal contract in the Dewatripont-Tirole model, managerial compensation is tied to equity value, rather than to firm value; debt is once again not a part of the compensation package. Loosely put, under the optimal incentive scheme, managers need to be punished when they take low effort levels, so control should pass to debtholders who have an incentive to choose actions that hurt the equity-holding manager.

It is possible that the literature's focus on rationalizing a congruence of interests between the manager and equityholders stems from the widely-held belief that compensation schemes in practice exhibit such alignment. However, the empirical evidence we present in this paper indicates that senior managers' interests are more closely tied to debt holders than is commonly acknowledged, and that at least in some firms, managers hold more inside debt than inside equity. This suggests that a reappraisal of the literature may be in order. It also points to the need to develop new theoretical frameworks that can address the possible optimality of debt—in particular, pension—compensation. Our objective in this paper is to the lay the foundation for thinking about these issues. We do not look to provide an alternative theoretical framework here, nor do we assert that the use of debt in the compensation structure is optimal in any sense. Rather, we derive incentive implications of debt compensation drawn from a simple setting, and test for these implications in the data.

Virtually no previous empirical scholarship has studied the role of pensions in top management compensation. When CEOs' pensions are mentioned in academic journals, the discussion occasionally includes references to the annual amount due to a CEO upon retirement, but almost never to the actuarially fair present value of the lifetime entitlement. A recent exception is a law school working paper by Bebchuk and Jackson (2005), who tabulate the pension values for 51 current or recently retired CEOs of S&P 500 companies and conclude that pensions represent a significant component of those CEOs' compensation.[4]

[3]Other relevant papers in this context include Zender (1991) and Aghion and Bolton (1992) who also address the point that income streams and control rights have a specific relationship, but who do not have multiple outside investors; and Bolton and Scharfstein (1990) who have multiple claimholders but no outside equity.

[4]It is not clear to us that the pension values in that paper have been calculated correctly, as the authors rely upon life annuity price quotes from a commercial website affiliated with "Annuity Shopper" magazine. Rather than using the cost of debt for each CEO's employer, the authors appear to be using the discount rate implicit in an average annuity price quote from 16 insurance companies associated with the magazine and its website. This methodology is equivalent to assuming that all CEOs' pensions are fully funded, which is not the case. For CEOs below retirement age, Bebchuk and Jackson use a standard discount rate of 5 percent, which appears too low.

Two other branches of research are related to our work. An earlier line of compensation research studied the"horizon problem" of CEOs approaching retirement and made certain empirical predictions that resemble some of ours. The horizon problem concerns CEOs who reduce investment and R&D spending in their final years in order to maximize accounting earnings and reap larger annual cash bonuses. See Dechow and Sloan (1991). We also predict that CEOs behave more conservatively as they grow old, but the motivation in our paper involves not the maximization of annual bonus income, but instead the safeguarding of the value of their pensions and deferred compensation. The means by which CEOs do so may involve some mix of reducing investment spending, selecting less risky projects, unlevering the firm's capital structure, or lengthening the maturity of the firm's debt.

A separate, rich literature has considered the role of defined benefit pension plans as an aspect of corporate finance generally. Pension plans have important effects upon corporate taxation, funds available for investment, mergers and acquisitions, and especially in recent years, earnings management. A notable recent example of this research is Rauh (2004). However, this literature has not considered the importance of pensions in the compensation of individual managers, which is our focus.

3 Data Description

Data for our study comes from 237 firms drawn from the 2002 Fortune 500 ranking of the largest U.S. companies. From the initial list of 500 companies, we drop all private firms as well as those public companies that do not have a history on the ExecuComp compensation database extending at least ten years back to 1993. This results in a subset of 237 firms, and we retain observations for the seven-year period 1996-2002, for a final sample of 1,659 firm-year observations. An historical sample selection rule is necessary for this research, because pension values are calculated based upon as many as five years lagged data for past compensation, and we reserve data for the years 1993-95 to use in these computations. In some cases, we must retrieve company proxy statements back to 1991 from Internet sources in order to collect the necessary compensation history for certain executives. Because of the sample design, the data set includes some over-representation of larger firms with longer operating histories.

The "inside debt" compensation owed by firms to their CEOs can take the form of either pension obligations or deferred compensation. Because disclosure is extremely limited for deferred compensation,[5] we must restrict the analysis in this paper to pensions only. In the minority of

The discount rates used for our pension calculations below range from 4.92 percent to 15.25 percent, depending on the date and the credit rating of each CEO's employer. The pension values in Bebchuk and Jackson's paper therefore appear to be over-stated.

[5]Nearly every company has a deferred compensation plan for its executives, but disclosure is only required

cases in which deferred compensation values can be inferred (less than 15 percent of the sample), this form of inside debt is usually far less than the value of pensions, so the omission of deferred compensation from our analysis may not be serious.

CEO Pensions

Pensions for CEOs are usually called supplemental executive retirement plans, or SERPs, since their payouts far exceed the maximum federally-insured amounts available to most workers under ordinary tax-qualified pension plans. SERP pension liabilities represent unsecured, unfunded debt held by executives against the firm, and should the firm become insolvent, SERP pension beneficiaries would stand in line with other creditors.[6] A firm generally does not receive a tax deduction until pension payments are made to a retired executive, and the executive does not face an income tax liability until payments are received. For at least some firms, pensions therefore offer the possibility for net tax savings between the company and an executive by shifting compensation from the present to the future, when one party or the other might expect to have lower marginal tax rates compared to the present.

We calculate the actuarially fair present value of each CEO's pension as of the end of each fiscal year. The large majority of CEO pensions are defined benefit plans that pay a fixed amount per year upon retirement. Typically the pension is payable as a life annuity, although some companies disclose pension values based upon different annuity types.[7] All companies specify a

of "above-market interest" earned on the deferred compensation account balance. Above-market interest occurs only if the company credits the executive with a fixed rate of interest and this fixed rate exceeds 110 percent of the Internal Revenue Service "applicable federal rate" which was in effect at the time of establishment of the plan. Using this information, one can convert the amount of above-market interest paid during a year to an executive into an average annual balance in their deferred compensation account. Most firms do not pay a fixed rate of interest but instead permit deferred compensation balances to be invested in diversified index funds, bond funds, or synthetic shares of company stock, and in these cases no disclosure of executive earnings is required.

[6] About 15% of the sample companies fund executives' pensions with so-called "rabbi" trust funds or similar devices such as insurance policies. Rabbi trusts are irrevocable, meaning that the firm cannot withdraw contributions once they are made, but in the event of bankruptcy these trusts can be reached by the firm's creditors. A separate and much rarer device, a "secular" trust fund, can be used to secure an executive's pension in a bankruptcy-proof form, but these trusts have adverse income tax consequences and are extremely controversial with creditors and other employees. The CEOs of both Delta Air Lines Inc. and AMR Corp. (the parent of American Airlines) lost their jobs in 2003-4 after disclosing that they had created such trusts for the benefit of themselves and other top managers. See Bachelder (1995 and 2003) as well as `www.401kpsp.com/rabbitrust.htm`.

[7] Two popular alternatives are a life annuity with a guaranteed minimum term, and a joint life annuity payable for the longer of the life of the CEO and his or her spouse. Calculations for the values of other annuities require only straightforward modifications to equation (1). In cases of joint spousal annuities, we assume that the CEO is married with a spouse of the same age. Many firms give executives the option of choosing among several payout schemes, with the annual amount adjusted in an actuarially fair way so that the overall value of the pension does not change.

minimum retirement age, which is the earliest age that an executive can leave the company and obtain 100 percent of the earned pension benefit (most companies will pay a reduced amount in the event of early retirement). If the CEO chooses to work beyond the minimum retirement age, he forfeits the right to pension benefits that he would otherwise have collected by retiring. The formula for the fair actuarial value of a CEO's pension is, in most cases:

$$\sum_{n=\max(0,R-A)}^{K-A} \frac{p(n)\,X}{(1+d)^n} \tag{1}$$

where X is the annual pension amount, R is the minimum retirement age, A is the CEO's current age, $p(n)$ is the probability that the CEO is alive n years in the future, d is the firm's cost of long-term debt, and K is the terminal year of the pension. The mortality probabilities by age, $p(n)$, are obtained separately for male and female CEOs using actuarial tables published by the U.S. Social Security Administration. In theory K can increase without limit, but for simplicity we set $K = 120$ and assume that all CEOs die with certainty by age 120, so that $p(120 - A) = 0$. The CEO's current age and the company's minimum pension retirement age are disclosed in company proxy statements. The company's cost of debt is based upon historical bond ratings for most firms supplied by Moody's or Standard & Poor's, and historical corporate yield curves for different rating classes supplied by Salomon Smith Barney; we use the seven-year U.S. Treasury bond yield plus an appropriate markup for each rating class, because seven years approximates the duration of cash flows that most CEOs expect from their pension entitlements. When no bond rating is available, we estimate a company's debt rating based upon comparable companies; a majority of the observations without bond ratings are for firms with little or no long-term debt outstanding, and we classify them as Aaa credits. Within the range of different rating classes of investment grade debt, small changes in assumptions about discount rates do not lead to material changes in estimated pension values.

The most difficult part of the calculation arises in estimating X, the annual pension amount that each CEO is entitled to receive upon retirement. In some cases companies disclose this value directly, but more often it must be inferred from other information published in the proxy statement, a process that requires time-consuming research for each company. In practice, the annual pension entitlement is usually calculated according to the following formula:

$$\sum_{k=1}^{P} \frac{C_{t-k}}{P} \times M \times S, \tag{2}$$

where C_t is the cash salary and bonus compensation for year t, P is a number of past years (usually either three or five) whose compensation is averaged together as part of the formula, M is a multiplier factor that usually lies in a neighborhood between 0.015 and 0.020, and S is

the executive's number of years of service. Often the formula is modified so that the product MS is capped at a value of perhaps 0.50 or 0.60. Therefore, for many long-serving executives the pension payment will equal 60 percent of the average pay received in their final three years in office.[8] The structure of the formula effectively serves as a multiplier on the value of current cash compensation, since a CEO who receives a pay increase will see that increase feed into the pension formula and increase his retirement pay as well. This effect intensifies as the CEO gets older, since the present value of future pension income grows larger as he nears retirement. Under a reasonable set of assumptions,[9] an extra dollar of cash compensation received in one year adds about 48 cents to the actuarial present value of a pension when a CEO is 55 years old, and about $1.10 when he is 65. Since this override effect exerted by pension plans upon salary and bonus income tends to strengthen as CEOs near retirement, it resembles the optimal life-cycle compensation scheme derived by Gibbons and Murphy (1992), who argue that executives near retirement require the strongest pay-performance incentives.

Companies are required by the Securities and Exchange Commission to disclose annual pension payments in a matrix format, in which years of service S are tabulated on one axis, and final average compensation C is tabulated on the other. The pension formula itself is not directly disclosed, but it can be inferred for any single executive by locating his position on the matrix and interpolating between cells. Many companies reduce the pension payout by the amount of an executive's Social Security entitlement, but because this sum is trivial for most CEOs (perhaps 1 to 3 percent of their pensions), we do not take account of this adjustment.

4 Descriptive Statistics

Tables II–IV and Figure 1 present information concerning CEO pensions and other aspects of their compensation. Table II shows that for most CEOs, equity value is far higher than pension value, and the median ratio between these two quantities is 0.07. However, as shown below, this ratio increases markedly as CEOs grow older.

The first step is to measure the annual increment to CEO pensions. This is the present (i.e., actuarially fair) value of the amount by which the CEO's annual pension entitlement increases

[8] Equation (2) is written so that the pension payout is based on compensation received in the most recent P years in office. Some firms instead use the highest P-year average achieved in any P consecutive years in office, while still others use the highest any P individual years, whether consecutive or not. In practice, because cash compensation tends to increase almost monotonically over an executive's career, all of these formulas yield the same value for most executives. To keep the data collection and calculations tractable for this paper, we use the formula in equation (2) as the default for all observations unless better information is readily available.

[9] Assume that the number of years averaged P=5, the multiplier M=0.016, years service S=20 at age 55 and S=30 at age 65, and the real discount rate d=0.03. If we instead assume P=3, the totals would be 80 cents and $1.84, respectively.

when time moves forward by a year, i.e., when equation (2) is recalculated after (a) including the most recent compensation C_{t-1} and omitting $C_{t-(P+1)}$, and (b) changing S to $S+1$. Conceptually, one could think of the corporation issuing a new bond to the CEO each year, representing a lifetime annuity with a face value equal to this difference which is:

$$\frac{M}{P}\left(\left[C_{t-1}-C_{t-(P+1)}\right]S+\sum_{k=1}^{P}C_{t-k}\right).$$

The present value of this mean annual increment across our sample equals $1.0 million. This value, as well as the mean values for subgroups of CEOs reported in Table III, are somewhat understated, because our calculations essentially rely on first differences in compensation and force us to discard the observation for each CEO's first year in the dataset if he has a non-zero pension; this process causes a disproportionately large number of zero-valued observations to enter the calculations.

A second number of interest is the annual change in the present value of total pension entitlement. This change could be negative if the annual pension increment is negative, which could happen, for example, if $C_{t-1} < C_{t-(P+1)}$. More generally, it could also be negative if the company changes its pension formula, if its cost of debt rises, if the CEO takes a cut in his cash compensation, of if the CEO works past the normal retirement age and fails to draw down his pension when it becomes available. CEOs may also perceive their pensions as having lower values if poor health, high stress, or lifestyle choices shorten their life expectancies, a possibility that we do not consider.

Pension values decline on an objective actuarial basis for about 6 percent of the CEO-year observations in the sample, and a significant number of these observations occur due to market-wide increases in interest rates that reduce the value of all pensions across-the-board. However, in the vast majority of cases, CEO pension values rise each year. Even if there is no change in basic comepnsation, the CEO's years of service (the variable S in equation (2)) will increase each year, his life expectancy will increase, and the discounted value of future pension entitlements will increase as well. As shown in Table II, the mean overall change in a CEO's pension value is also about $1.0 million each year.

CEO pension values are highly sensitive to age. Figure 1 illustrates mean and median actuarially fair pension values for all CEOs in the sample between ages 51 and 65. As shown on the graph, the mean lifetime pension entitlement has a present value of just $1.5 million for 51-year-old CEOs, but this rises to more than $10 million at age 65; the median values increase from $0.9 million to $6.4 million over the same range. The convex shape of the top graph shows that the rate of pension growth accelerates as CEOs age. Data on the graph are likely subject to some self-selection bias, as those CEOs with the most valuable pensions may be inclined to retire earlier and drop out of the sample.

Table III shows mean values for all sources of CEO compensation, including the annual increment to pension value, for the entire sample and for subsamples of CEOs arranged according to age. The sum of total compensation from all categories is almost invariant to age, averaging right around $10 million per CEO per year, but the importance of pension value as part of overall compensation change increases monotonically up to age 65. For CEOs in the age 46-50 group, the annual pension increment averages $400,000, representing about 4 percent of total compensation. In the age 61-65 group, in contrast, the average pension increase is $1.6 million annually, representing about 15 percent of total compensation. Beyond age 65, pensions begin to lose their importance; all members of this group are sacrificing the right to draw down their pensions by continuing to work, which makes the net change in pension value lower than for those younger than 65. One can also assume that many CEOs with the most lucrative pensions retire by age 65 and exit the sample.

Data near the bottom of Table III shows the ratio between pension value and equity value for CEOs in different age groups. The data indicate that this ratio also increases monotonically, rising from about 0.05 for CEOs in the 46-50 year-old age bracket to 0.27 for CEOs aged 61-65, until it too falls off for CEOs aged 66 and above. In other words, pension values tend to rise more rapidly than the value of equity owned as CEOs grow older, giving managers increasing incentives to run the firm more in the interests of debtholders and less in the interests of equityholders. The last line of the table shows the fraction of CEOs for whom the personal debt/equity ratio (pension value divided by share plus option value) exceeds the firm's overall debt/equity ratio (short- and long-term debt divided by the market value of equity). This group of CEOs will have clear incentives to pursue policies that favor debt more than equity. Thirteen percent of all CEOs fall into this group, with the fraction again rising monotonically by age.

Table IV presents detail about the form and structure of CEO pensions within the sample. Pensions are held by CEOs in all but 23% of the firm-year observations, and the vast majority of these pensions are awarded based on the age/service formula used in equation (2) above. A minority of CEOs negotiate their pensions directly as part of their employment contracts,[10] or participate in cash balance pension plans which are generally quite modest in value. For about three-fourths of all CEOs, the retirement age at which full pension benefits become available is 65, though a minority of firms pay full pensions at earlier ages, some as young as age 55. Most CEO pensions are based upon final average compensation which always includes salary and also

[10]The table indicates that 6 percent of CEOs negotiate fixed pension amounts in their employment contracts. However, a larger number negotiate modifications to the pay/service formula to make it more generous for themselves than the formula used for regular company employees. For example, while serving as the CEO of CSX Corp., John W. Snow had an employment contract calling for his pension to be calculated including the value of restricted stock grants as part of his annual income, an enhancement of the company's ordinary formula that took account of only salary and bonus; while serving as the CEO of Alcoa Inc., Paul H. O'Neill had an employment contract that awarded him two years of service time for pension purposes for every one year worked.

includes bonuses 94 percent of the time. A small minority of firms take into account other forms of compensation, such as restricted stock awards or long-term incentive plans, when making these calculations. Final average compensation is nearly always based upon either three years pay (39 percent of all observations), or five years pay (54 percent). We find that a significant amount of variation exists both between firms and within firms in the design of pension plans. Sixty seven firms, or 28 perecent of those in the sample, change either the form of their pension plan or the underlying formula at some point during the seven-year sample period, not counting several dozen firms that negotiate one-time pension enhancements with CEOs in their final year of service (see Yermack, 2005).

These data indicate unambiguously that pensions are a large part of overall CEO compensation. Nonetheless, current SEC regulations require only complex and somewhat opaque disclosures about pensions, and financial acumen is required to convert the reported data into estimates of the fair value of any executive's pension. Disclosure practices in certain other countries such as the U.K. provide far more illuminating reports of pension values and their annual changes. Moreover, disclosure requirements are non-existent in the U.S. for most aspects of deferred compensation, as well as post-retirement transactions involving pension rights such as "SERP swaps" that are understood to be available to many top executives but never disclosed.

5 Cross-Sectional Determinants of CEO Debt vs Equity Holdings

We analyze the distribution of CEOs' inside debt and equity ownership within our sample of 237 firms. We measure inside debt value as the fair actuarial present value of CEO pension holdings and equity value as the market value of stock and stock options, with option portfolios valued according to standard Black-Scholes assumptions.[11] As discussed above, the absence of deferred compensation from our analysis will lead to estimates of CEO debt values somewhat below the true level. Since we are assessing the relative strength of debt and equity ownership for our sample CEOs, the dependent variable in our regression analysis equals the ratio of pension (or debt) value divided by stock plus option (or equity) value. We refer to this quantity as the "CEO's

[11]We obtain information about the number of options held and their average exercise prices from ExecuComp. We then estimate option portfolio values by applying a "representative option" approach that has become widely used in the compensation literature. Core and Guay (2002) provide empirical validation of this approach. We assume all outstanding options have six-year lives and use the prevailing firm volatilities, dividend rates, and risk free rates to value them on a Black-Scholes basis. If all of the outstanding options are out-of-the-money, we cannot calculate an average exercise price for the representative option. In these cases we read older proxy statements until we can obtain enough information about the options' exercise prices in order to use the representative option method.

debt/equity ratio."

We test several well-known theories of compensation that appear in the literature on equity incentives (Yermack, 1995), in tandem with theories of debt-based compensation that are discussed above. These include:

- *Leverage:* Because debt-based compensation reduces the agency costs of debt, we should observe a positive association between the CEO's debt/equity ratio and the firm's leverage. We measure leverage as long-term debt over the sum of long-term debt and stockholders' equity, as reported by Compustat. We use the book value instead of the market value of equity to avoid a mechanical negative association between the leverage variable and the market value of CEOs' equity holdings.

- *Liquidity:* Equity compensation provides a means for firms to pay executives without the use of cash. We therefore expect a negative association between measures of liquidity and CEOs' debt/equity ratios. We measure liquidity constraints with an indicator variable that equals 1 if the firm pays zero dividends (Fazzari, Hubbard, and Petersen, 1988).

- *Growth opportunities:* Equity pay is expected to be used when a firm has many valuable investment opportunities that are best understood by managers instead of outside shareholders or directors. We therefore expect a negative association between measures of growth opportunities and the CEO's debt/equity ratio. We use the ratio of research and development expense over sales as a proxy for growth opportunities. We avoid other measures that rely on the company's stock price, such as the market-to-book ratio or Tobin's Q, because these will exhibit mechanical positive correlations with the value of the CEO's equity holdings.

- *Tax status:* Taxation plays a role in both stock option and pension compensation. Each provides opportunities for income deferral to future years, which could result in a net tax savings for the firm and executive depending on the marginal tax rates of each. Stock options have additional favorable tax treatment under certain conditions, although CEO stock option awards are generally too large to qualify for these benefits. We include as a regression control an indicator variable for whether the firm has net operating loss carryforwards on its balance sheet as a proxy for its tax status. However, we cannot make an unambiguous prediction about the sign of the estimate for this variable, since compensation in both the numerator and denominator of the CEO's debt/equity ratio delivers certain types of tax benefits.

We estimate our regressions in standard panel data models to control for firm-specific and CEO-specific fixed effects (these intercepts unique to each company or each CEO negate the

need for industry controls). All regressions include control variables for the firm size (the log of total assets), dummy variables for individual years, and a range of governance variables including the log of board size, the percent of outside directors on the board, the CEO's years tenure in office, and the percentage ownership by institutional investors as reported by Thomson/CDA. Most importantly, we control for CEO years of service, because the formula for the accumulation of pension value will mechanically increase a CEO's debt incentives based upon his years with the firm, as discussed above.

Table V presents the regression estimates. In the left two columns, estimates are based upon the value of the CEO's pension alone; these estimates are shown so that the reader can assess whether the results for the CEO's debt/equity ratio, shown in the right two columns, are influenced by its numerator or denominator. Some of the control variables are untabulated in order to save space.

The firm's leverage ratio, the key explanatory variable in the model, has a positive and significant association with the CEO's debt/equity ratio, as shown by estimates in the right columns. This result is consistent with firms using larger pensions and smaller equity awards in order to mitigate the agency costs of debt. In the left columns, the firm's leverage ratio exhibits a somewhat unexpected negative association with the pension value, though the result has no significance in one model and only borderline significance in the other. Because the variable has a positive association with the CEO's debt/equity ratio, we infer that it is even more negatively related to equity than to debt-based compensation.

The CEO's years employed by the firm exhibits a positive association as expected with both the CEO's pension value and the ratio of pension value to equity value. However, the result is significant only when firm dummy variables are used in the model, and not when dummy variables are included for individual CEOs. CEOs hired from outside the firm appear to have larger pensions than CEOs promoted internally, but they apparently have larger equity pay as well, since the ratio of pension value to equity value has no significant association with the dummy variable for outside-hire CEOs.

Perhaps the most surprising indication in Table V is the absence of evidence that either tax status or growth opportunities affect the structure of CEO ownership. Liquidity constrained firms do appear to place greater emphasis on equity compensation and less on debt compensation, as expected, but this inference is extremely weak as this variable has a significant estimate in only one of the four models in Table V. While the results fail to validate strongly many predictions of mainstream contracting theory, this pattern accords with prior empirical research about the structure of CEO compensation (Yermack, 1995) that shows little or no attention by firms to the agency costs of debt, tax issues or growth opportunities when awarding CEO pay.

6 Pensions and CEO turnover

A substantial literature has examined the determinants of executive turnover, but none with reference to pension payout patterns. Inside debt compensation such as pensions offers incentives to the CEO to leave his position once the debt becomes payable, since ordinarily the debt is collectible only after the CEO retires. We therefore study the interaction between pension compensation and patterns of CEO turnover, using logistic regressions presented in Table VI.

The dependent variable in Table VI equals 1 if the CEO leaves his position in the last half of the current fiscal year or in the first half of the subsequent fiscal year. We separate the cases of CEO turnover into forced and planned, based upon searches of news stories and disclosures in company proxy statements; about one-quarter of the turnover events are involuntary according to our research. We omit several dozen observations in which the CEO cedes the CEO title to someone else but does not retire or begin to transition out of top management, remaining as the full-time, permanent Chairman of the Board with compensation equal to or exceeding the CEO (Bill Gates of Microsoft would be a representative example).

The three columns of Table VI present logit estimates with the dependent variable equal to 1 for all turnover, forced turnover only, and planned turnover only, from left to right. For our purposes, the key explanatory variable in Table VI is an indicator for whether the CEO's pension is currently payable. This variable equals 1 if the CEO has the right to draw down 100% of his earned pension benefits, and it equals zero if this right has not yet vested or if the CEO has no pension. Other explanatory variables in the regressions include the range of controls found in many studies of CEO turnover: company performance, measured as net-of-market stock return for the current and prior years; CEO variables, including age, percent ownership, tenure in office, and membership in the company's founding family; leverage; market-to-book ratio; and governance variables including the log of board size, the percent of outside directors on the board, and the percentage ownership by institutional investors. All regression estimates include standard errors robust to serial correlation and heteroskedasticity.

Estimates in Table VI show that the existence of an immediately payable pension significantly increases the incidence of CEO turnover, after holding constant CEO age and other factors. The pension indicator variable has a significant estimate in the models for all turnover and for voluntary turnover, but not for forced turnover. This pattern of estimates makes sense, since the CEO controls his departure decision only in voluntary turnover cases. The economic significance of the estimate is substantial; the logit marginal effect for the pension payable indicator indicates that when this variable equals 1, CEO turnover rises by 4.3%, a very large magnitude compared to the unconditional voluntary turnover rate of 7.7%.

Further analysis of the pension indicator variable, based upon untabulated regressions, shows that pension availability influences CEO turnover especially strongly at two points: for CEOs aged

60, and for CEOs over age 65. Though age 60 lies below the customary U.S. retirement age of 65, data in Table IV indicate that it represents a focal point in the careers of some CEOs because a because a significant number of firms (about 11% of the sample) provide for full pension benefits at that age (very few firms have pensions payable before age 60). At ages between 61 and 65 CEO turnover tends to increase year by year, but pension availability has little effect. Beyond age 65, availability of full pension benefits again acts as a significant motivation for CEOs to retire.

Annual turnover frequencies plotted in Figure 2 reinforce the economic significance of Table VI's regression estimates. The figure shows voluntary turnover frequencies by age for CEOs who are at or beyond the age at which their pensions are 100% payable, compared to turnover frequencies for CEOs who are younger than the full pension age. The graph excludes CEOs who do not have pensions and also omits cases of forced CEO turnover. No CEOs younger than 60 are shown in the top graph, and none older than 64 in the bottom graph, since only a tiny handful fall into these categories. A large disparity exists in turnover rates for CEOs of the same age, according to whether or not their pensions have become fully payable; for example, for 63-year-old CEOs, the voluntary turnover rate is 8 percent in companies whose pensions are not yet payable in full, while the rate increases to 27 percent in firms where the pension payable age is at or below the CEO's age. The graph is no doubt influenced by mandatory retirement policies which are likely to be synchronized with pension payability ages at many firms.

Other estimates in Table VI also provide illuminating results about CEO turnover. Company stock performance exhibits significant negative associations with forced turnover but not voluntary. Indicators of CEO entrenchment such as high stock ownership and founding family membership are also negatively associated with turnover, but somewhat surprisingly, they appear to impact voluntary turnover only. These results suggest that CEOs with high personal stakes in the company, either for ownership or family reasons, choose to serve longer tenures but are not immune to removal for disciplinary reasons.

In Table VII we analyze the annual cash compensation of CEOs, with the key explanatory variable equal to the pension payments that certain CEOs forego when they continue in office past the age at which full pension benefits would be available for payout. This variable, which appears in the last row of the table, equals zero for all CEOs who are below the pension payout age or who work for companies with no pensions. Other variables in the compensation regression include the excess stock return for the current and prior year, firm size, and CEO characteristics including age, percentage ownership, years tenure in office, and founding family membership. The table includes fixed effect panel data estimates for models with intercepts unique to each firm and to each CEO.

Regression estimates in Table VII show that firms pay higher cash compensation when they have larger size and when they are successful, as evidenced by positive excess stock returns. Cash compensation also appears strongly affected when pension benefits are sacrificed by CEOs who

serve past the full pension age. Coefficient estimates for the foregone pension variable in the two columns are 0.46 and 0.49 respectively, both strongly significant. The estimates imply that CEOs receive close to 50 cents on the dollar in immediate compensation for foregone pension benefits. In addition, this incremental compensation will feed into the calculation of the CEO's pension benefits when he ultimately retires. According to the multiplier estimates discussed in Section 3 above, the net increase in the CEO's wealth should more than compensate him for the opportunity cost of not drawing his pension immediately.

7 Inside Debt and Risk Reduction

When top executives receive part of their compensation in debt and part in equity, we would expect them to manage the firm in a way that considers the interests of both debt and equity investors. Classic agency cost of debt problems related to risk-shifting and excessive payouts should diminish in importance when managers hold large pensions or deferred compensation.

We use the simple framework of Merton (1974) to clarify our hypotheses in this context. Consider a firm with two securities outstanding: zero-coupon debt with face value F and maturity T, and equity. If the value V_T of the firm's assets on date T exceeds F, the debt is paid off and the balance goes to the firm's equity holders. If $V_T < F$, the firm is liquidated. Assume liquidation is costless and absolute priority holds. Then the payoffs to debt and equity holders on date T are, respectively:

$$\min(F, V) \text{ and } \max(V_T - F, 0). \tag{3}$$

Now suppose the firm's manager holds a fraction α of the firm's equity and a fraction β of its debt. The time T payoffs to the manager are:

$$\alpha \max(V_T - F, 0) + \beta \min(V_T, F). \tag{4}$$

The value of the manager's portfolio and its sensitivity to various parameters can now be determined using standard option pricing theory. If $C(F)$ is the current value of a call option on the firm with strike price F, the current value of the manager's portfolio is:

$$\alpha C(F) + \beta (V - C(F)) = \beta V + (\alpha - \beta) C(F). \tag{5}$$

The most obvious parameter of interest is risk, which enters the option pricing formulae in the form of volatility. In the oft-analyzed case in which a manager holds equity, he has an incentive to increase the firm's risk beyond the level desired by debtholders. In our setting, since the manager

holds both debt and equity, this incentive for risk-shifting is lessened; with enough inside debt compensation, the manager may even have an incentive to reduce volatility. From (5), the impact of a change in volatility on the value of the manager's portfolio is just:

$$(\alpha - \beta) \times \text{ Vega}(C(F)) \tag{6}$$

This is positive if $\alpha > \beta$, zero if $\alpha = \beta$, and negative if $\alpha < \beta$. In other words, if the debt-equity ratio of the manager's holdings is less than the firm's debt-equity ratio, the manager has an incentive to increase risk, and vice versa.

To test whether managers' inside debt holdings in the form of pensions have an impact upon the firm's riskiness, we utilize the concept of the "distance to default" statistic popularized by Moody's KMV and now widely-accepted as a qualitatively reliable indicator of default likelihood. The distance-to-default (henceforth, DtD) is the number of standard deviations of decline in a firm's asset value that would push it into default. KMV's operationalization of this notion requires converting a firm's debt structure into an "equivalent" zero-coupon form. Following their approach (see Crouhy, Mark, and Galai (2001) or Sundaram (2001)), we define the default point DPT to be equal to the sum of the face value of short-term debt (less than one year) plus half the face value of long-term debt (greater than one year) and to have a maturity of one year. This simple approximation has been found to work well in practice. With this, the distance to default statistic is

$$\text{DtD } = \frac{V - DPT}{\sigma V} \tag{7}$$

Here, V is the firm's asset market value, as above, and σ is the firm's asset value volatility. To estimate this, we must obtain values for the unobserved variables V and σ. The KMV model does this as follows. Under the default point DPT, equity holders have a call option to buy the firm for DPT in one year's time. The value of this call—which depends on V and σ—is the value of equity which is observable. Since we have two unknowns, we need a second equation. For this, we use equity volatility σ_E which too is observed. Standard stochastic calculus arguments show that equity volatility and firm value and volatility are related via

$$\sigma_E \ = \ \sigma \frac{V}{E} \Delta_E \tag{8}$$

where E is the market value of equity and Δ_E is the derivative $\partial E / \partial V$ of the option value function with respect to firm value (i.e., it is the delta of the call option that equityholders own).

Using these two equations and information regarding the risk-free rate, we can now solve for V and σ for each firm-year observation and substitute those values into (7) to obtain the estimated

distance to default. We do these DtD calculations using an iterative spreadsheet algorithm. We discard observations for which $DPT/V < 0.01$, assuming that firms with a trivial amount of debt would never default. This exclusion removes 81 firm-years, or about 5% of the sample. Descriptive statistics for the distance to default statistic appear in Table II. The mean and median distance to default are about three standard deviations of annual performance.

Table VIII presents our regression analysis of the distance to default, again using fixed effects panel data models. In addition to variables related to CEO incentives, we control for several firm variables that should have obvious relations to the likelihood of default: firm size (the log of total assets), leverage (in a book value form), and diversification (the number of segments for which the firm reports line-of-business data). We also include a variety of other governance and financial controls listed in the table. Our key explanatory variables are (i) the ratio of the CEO's pension value divided by the value of his stock plus options equity holdings, and (ii) an indicator that takes the value of 1 if the CEO's personal debt/equity ratio exceeds the firm's debt/equity ratio, calculated based upon the market value of equity. Under this condition the CEO will have incentives to manage the firm in ways that increase debt value relative to equity value.

Coefficient estimates in Table VIII are positive and significant for both specifications of the CEO's debt/equity ratio. A unit increase in this ratio implies an increase in distance to default close to 0.14, according to estimates in the left columns. Similarly, the right columns' estimates indicate that distance to default is approximately 0.3 to 0.4 standard deviations higher when the CEO's debt/equity ratio exceeds the company's overall ratio, which occurs for about 13 percent of the observations in the data according to summary statistics in Table III. The regression estimate therefore implies that these CEOs take actions, such as accepting fewer risky investments, that reduce the likelihood of default and the risks to their own pension values.

We find that firm size exhibits a positive association with distance to default and leverage has a negative association, both as expected, which the variable measuring diversification has estimates close to zero.

We carry out two mode tests to check the relationship between pension holdings and aspects of risk-reduction, in order to gain greater insight into the results shown in Table VIII. Figure 3 presents a plot of debt ratings changes against pension values. As the figure shows, the relation is roughly monotone with increased pension holdings leading to a greater frequency of net ratings upgrades, especially at the top range of the distribution of pension values. Figure 4 displays capital investments (capital expenditure + R&D) plotted against pension holdings. Again, the result is roughly monotone with capital investments declining as pension values increase. This pattern is consistent with CEOs reducing investment spending and leaving assets in more liquid form as their pension values increase, a behavior that would generally reduce firm risk. Each figure indicates that the greatest incremental impact of pensions upon either ratings changes or investment levels occurs at the top of the distribution, among CEOs holding the very most

valuable pensions. We estimate regressions of the relationships in Figures 3 and 4 but are not able to obtain significant results, apparently because the relation between pension values and the two dependent variables is narrowly driven by the relatively small group of high-valued pension observations.

8 Inside Debt and Payouts to Equity

Options and stock holdings of managers offer different incentives to provide payouts to equityholders, with options skewing managerial preferences towards repurchases and away from dividends. At least two reasons have been offered in the literature for why this might be the case. The first, suggested in Jolls (1998) and Fenn and Liang (2000), is that repurchases do not affect the share price of the firm while dividends reduce the price, so dividends make options less valuable.[12] The second, offered by Weisbenner (2000), is that stock repurchases undo partially the effect of dilution in earnings-per-share resulting from the grant of employee stock options. Empirical evidence in favor of the first hypothesis is reported by all three studies.

The literature has not considered the impact upon company payouts of inside debt holdings by managers. For a simple illustration of the importance of inside debt as an influence upon payouts, consider the model introduced above, and suppose that the manager's holdings are only in the form of debt and equity (no options). As earlier, suppose that the manager owns a fraction α of the firm's equity and a fraction β of its debt. Then, for each dollar of payouts to equity, whether in the form of dividends or share repurchases, a fraction α of the benefits accrues to the manager. However, the fall in the firm's assets leads to a fall in the value of the manager's claims held on the firm. From equation (5), we can see that the manager loses value in the amount:

$$\beta + (\alpha - \beta)\,\Delta_E, \tag{9}$$

where Δ_E measures the change in equity value for a dollar change in V (i.e., it is the delta of the call option that represents equity value). Thus, the overall impact of the payout on the manager is:

$$\alpha - [\beta + (\alpha - \beta)\,\Delta_E] \;=\; (\alpha - \beta)(1 - \Delta_E). \tag{10}$$

Since $0 < \Delta_E < 1$ always, equation (9) will be positive if $\alpha > \beta$, zero if $\alpha = \beta$, and negative if $\alpha < \beta$. More generally, this suggests a negative association between payouts and the difference between the CEO debt-equity ratio and the firm's.

[12] The statement that repurchases do not affect share prices is, strictly speaking, incorrect, since—even in the absence of signalling or other considerations—removing cash from the firm may alter its future prospects and so affect both debt and equity values. But for debt of low-risk, this effect will be small.

How do options affect this? Options in general are not protected against dividends, so they skew the incentives of a CEO away from dividends. Taking this into account, an approximate idea of the impact of dividends can be obtained as follows. For every \$1 change in stock price on account of dividends, let Δ_o denote the change in stock option value. Then, the impact on option value of a change Δ_E in the stock price is $\Delta_o \times \Delta_E$. If the CEO holds options on a fraction γ of the firm, the total change in the value of his portfolio is

$$(\alpha - \beta)(1 - \Delta_E) - \gamma(\Delta_o \times \Delta_E).$$

Of course, this expression is only approximate because it does not take potential dilution into account from the manager's exercise of stock options. But it does indicate that the manager's equity holding has to be substantially greater than his debt holding (relative to the firm's debt-equity ratio) for there to be a positive incentive to pay dividends.

To summarize, like options, holdings of inside debt reduce the manager's incentives to pay dividends, but unlike options, inside debt also reduces the incentives for repurchases. This raises at least two questions of interest. The first is whether payouts to equityholders are generally lower in the presence of larger inside debt holdings by the CEO. The second concerns the empirical findings of earlier papers (e.g., Weisbenner, 2000) that option-holding CEOs generally tend not to favor dividends. Since these papers do not also control for inside debt holdings of the CEO, the question is to what extent are the anti-dividends results driven by options and not by debt?

We find only limited evidence about the influence of CEO pension holdings upon firms' payout policies. We study both dividend payments and share repurchases. We find few significant results for repurchases, so in Table IX we tabulate regression results for dividend payouts only. Table IX shows estimates from panel Tobit models in which the dependent variable is the dividend payout rate, measured as total common dividends divided by market capitalization. The top half of the table presents estimates with firm effects, while the bottom half presents estimates with CEO effects. All models include a range of financial and governance control variables which are listed at the bottom of the table; to save space, we do not tabulate coefficient estimates for these variables.

In the firm effects specification, we find a negative association between CEO pension value and dividend payouts as expected. However, this estimate loses about half its magnitude as well as its statistical significance once the model is expanded to include values of the CEO's stock and options. In the CEO effects specification, the estimates for CEO pension value are close to zero and never significant. In all models, the CEO's option holdings exert a negative and significant effect upon the dividend payout rate. We conclude that CEOs' options appear to influence firms' payout strategies more clearly than stock or pensions.

9 Conclusions

Top managers receive a significant amount of compensation from "inside debt," or intra-corporate IOUs such as pensions and deferred compensation. These compensation instruments have received very little attention in prior theoretical or empirical research into executive compensation. Debt-based compensation provides managers with interesting incentives to reduce the agency costs of debt. Managers holding large pensions, for example, should be expected to pursue strategies that reduce overall firm risk. These may include choosing fewer risky investment projects, unlevering the capital structure, reducing payouts to equity holders, or lengthening the average maturity of outstanding debt.

We find that CEOs hold a portfolio of incentives arising from both inside debt and inside equity compensation, and this portfolio tends to shift in favor of the inside debt instruments as CEOs grow older. When a CEO's personal debt/equity ratio exceeds the firm's external debt/equity ratio, regression evidence indicates that CEOs manage more conservatively, taking a variety of actions that reduce the probability of a debt default.

Inside debt in the form of pensions also exerts strong influence on patterns of CEO turnover and other types of compensation. We find that, at any given age, the probability of a CEO retiring voluntarily is far higher if the CEO's pension has vested and is payable immediately. For CEOs who continue to work beyond the minimum retirement age, cash compensation is markedly higher, apparently to compensate them for foregone pension income.

We believe that the study of debt-based incentives for top managers can become a fruitful area for further research. A top priority would appear to be the development of theory that illustrates conditions under which debt-based compensation would represent the solution to an optimal contracting problem. On the empirical side, further research should be possible into how debt-based pay affects the selection of investment projects and capital structure, as well as related areas such as security issuance decisions, mergers and acquisitions, recapitalizations, or the timing of bankruptcy filings. Do managers with large pensions prefer to issue equity rather than debt? If they do borrow, is it more likely to be from a bank or the public markets? What sort of maturity structure do they favor? Do managers with large amounts of inside debt seek out diversifying mergers that reduce firm risk? Are they more or less likely to accept outside acquisition proposals, and does this decision depend on the capital structure of the bidding firm? If the CEO has earned a large pension, is a workout to avoid bankruptcy more likely to succeed if the firm becomes distressed? How will equity holders fare in such as transaction? Opportunities also exist to study the structure of individual companies' pension and deferred compensation arrangements. Why do some firms have more generous pension formulas than others? Why do some use three instead of five years of compensation in the calculation the pension payout? Why do minimum retirement ages vary between 55 and 65 for different firms? How much pay do

firms allow their executives to defer, and how do executives respond to these opportunities? How do they choose to invest their deferred sums? Historical research into executive compensation should also profit from greater attention to the role of inside debt. Investigators such as Jensen and Murphy (1990) have argued that weak pay-performance incentives through much of the 20th century gave managers little reason to maximize equity value. Such arguments would become stronger if augmented with data showing that managers in the 1980s, 1970s, and earlier typically had much more invested in inside debt via pension rights than in equity via stock or options, which we believe may well be the case.

We also believe our research highlights the potential importance of improved public disclosure of both pension and deferred compensation schemes. Current SEC regulations require only complex and somewhat opaque disclosures about pensions, and financial acumen is required to convert the reported data into estimates of the fair value of any executive's pension. Disclosure practices in certain other countries such as the U.K. provide far more illuminating reports of pension values and their annual changes. In addition, disclosure requirements are non-existent in the U.S. for most aspects of deferred compensation, as well as post-retirement transactions involving pension rights such as "SERP swaps" that are understood to be available to many top executives but never disclosed.

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Table I
John F. Welch's compensation as CEO of General Electric

Variables related to the compensation of John F. Welch Jr., CEO of General Electric Co., between 1993 and 2002. Equity awards represents the sum of the fair value of stock option and restricted stock awards, as reported by the ExecuComp database. The total value of Welch's pension is based upon a formula for the annual pension value disclosed in the company's proxy statement, which is assumed to be paid in a life annuity whose actuarial value is calculated based upon Welch's age and the company's cost of debt. The pension increment is the present value of the change in Welch's annual pension amount. The total pension value can change each year by more or less than the value of the pension increment, due to changes in market interest rates, the life expectancy of the CEO, or the underlying pension formula. The value of deferred compensation is inferred from above-market interest income to Welch that is reported in the proxy statement. Total inside debt equals the value of Welch's pension plus deferred compensation. Total inside equity equals the market value of stock owned plus the Black-Scholes estimated value of options held. The debt/equity ratio for the CEO equals the value of inside debt divided by inside equity. The company's debt/equity ratio equals the book value of short- and long-term debt divided by the market capitalization of common stock. All values are reported in millions of dollars as of December 31 of each year. Welch retired in September of 2001 and his compensation that year is not for a full 12 months.

Year	Age	Cash Salary + Bonus	Equity Awards	Pension Increment	Total Value of Pension	Value of Deferred Comp.	Total Inside Debt	Total Inside Equity	CEO's Debt/Equity Ratio	Company's Debt/Equity Ratio
1993	58	$4.0	$4.5	$3.9	$15.3	$0.8	$16.1	$120.0	0.13	1.81
1994	59	$4.4	$4.9	$4.3	$15.5	$1.2	$16.7	$129.9	0.13	1.09
1995	60	$5.3	$15.8	$3.2	$23.3	$3.7	$27.0	$223.1	0.12	0.96
1996	61	$6.3	$6.6	$4.8	$32.5	$5.6	$38.1	$331.2	0.12	0.80
1997	62	$8.0	$7.3	$8.4	$45.0	$8.6	$53.6	$632.6	0.08	0.60
1998	63	$10.0	$37.1	$12.0	$61.6	$10.2	$71.8	$850.2	0.08	0.52
1999	64	$13.3	$24.7	$18.0	$80.1	$12.7	$92.8	$1,263.1	0.07	0.40
2000	65	$16.7	$106.1	$24.8	$114.1	$18.9	$133.0	$1,155.0	0.12	0.42
2001	66	$16.0	$0.0	$19.1	$145.6	$24.8	$170.4	$639.4	0.27	0.59

Table II
Descriptive statistics

Descriptive statistics for variables related to CEO and firm characteristics for a sample of 1,659 observations from 237 Fortune 500 companies in the 1996-2002 period. Pension actuarial values are calculated based upon assumptions given in the text. Equity value equals the value of common stock plus stock options, calculated according to Black-Scholes methodology. Cash compensation is the value of annual salary and bonus. Leverage equals total debt, both short- and long-term, divided by total debt plus either the book value or market value of equity. Distance to default is the number of standard deviations decrease in firm value that would be required for a firm to default on its debt, according to assumptions given in the text. Distance to default is not calculated for firms with market leverage below 1%.

CEO variables	**Mean**	**Std. Dev.**	**25th %^{ile}**	**Median**	**75th %^{ile}**
Age	57.2	6.9	53	58	62
Pension indicator	0.77				
Pension actuarial fair value (mm.)	$4.5	$7.7	$0.3	$2.7	$5.7
Equity ownership value (mm.)	$416.3	$3,192.9	$16.0	$38.2	$104.8
Pension value / equity value	0.18	0.35	0.01	0.07	0.20
Annual cash compensation (mm.)	$2.3	$2.2	$1.2	$1.8	$2.7
Annual pension increment (mm.)	$1.0	$2.0	$0.0	$0.5	$1.0
Annual change in pension (mm.)	$1.0	$2.3	$0.0	$0.4	$1.3
CEO's years as CEO	6.61	7.07	2	4	9
CEO's years employed with firm	22.16	12.10	13	23	32
CEO outside hire indicator	0.18				
CEO in founding family indicator	0.14				
CEO percent ownership	1.19%	4.27%	0.05%	0.11%	0.31%
Firm variables					
Total assets (bn.)	$36.5	$88.9	$4.8	$12.0	$29.3
Net sales (bn.)	$12.4	$14.2	$4.3	$7.5	$14.5
Return on assets (EBITDA)	16.1%	10.6%	9.0%	15.1%	22.1%
Equity market capitalization (bn.)	$24.8	$46.5	$4.8	$9.5	$22.8
Equity volatility	0.372	0.147	0.277	0.346	0.435
Leverage (market value of equity)	0.267	0.212	0.092	0.211	0.421
Leverage (book value of equity)	0.565	0.278	0.361	0.566	0.790
Research & development / sales	0.023	0.047	0	0	0.025
Distance to default	3.15	1.10	2.39	2.97	3.72
Tax loss carry-forward indicator	0.211				
Zero-dividend indicator	0.144				
Years since date of founding	91.95	45.33	61	94	120
Number of industry segments	2.54	1.97	1	2	3
Board size	12.10	3.46	10	12	14
Percent of outside directors	79.2%	11.0%	73.3%	81.8%	87.5%
Institutional investor ownership	61.1%	14.9%	51.0%	62.6%	72.1%

Table III
Mean values of elements of CEO compensation, by age

Descriptive statistics for variables related to CEO compensation and pensions for a sample of 1,659 observations from 237 Fortune 500 companies in the 1996-2002 period. Increments to pension actuarial values are calculated based upon assumptions given in the text. Stock options awards are valued according to Black-Scholes methodology as reported by ExecuComp. All dollar values are in millions**.** In each column the annual pension increment is calculated based upon fewer observations than the other variables, since it requires the use of year-over-year differences in certain variables.

	All CEOs	Age 46-50	Age 51-55	Age 56-60	Age 61-65	Age 66+
Observations	1,656	175	385	509	423	104
Salary	$0.9	$0.8	$0.9	$1.0	$1.0	$1.0
Bonus	$1.4	$1.2	$1.3	$1.5	$1.6	$1.8
Stock option awards	$5.8	$6.1	$6.0	$4.9	$5.1	$7.0
Restricted stock awards	$0.9	$1.0	$0.7	$0.9	$0.9	$1.2
Long-term incentive payouts	$0.5	$0.5	$0.4	$0.5	$0.8	$0.3
Annual increment to pension value	$1.0	$0.4	$0.7	$1.1	$1.6	$0.8
Total compensation	$10.6	$9.9	$10.0	$10.5	$10.9	$12.0
Change in pension / total comp.	0.10	0.04	0.08	0.11	0.15	0.04
Pension value / equity value	0.18	0.05	0.14	0.23	0.27	0.05
Fraction of CEOs for whom (pension value / equity value) > firm's (debt value / equity value)	0.13	0.05	0.07	0.17	0.22	0.03

Table IV
Form and structure of CEO pensions

Incidence and structure of CEO pension plans in a sample of 1,659 observations from 237 Fortune 500 companies in the 1996-2002 time period. The second section of the table is based upon the 1,307 observations for firms whose CEOs have accrued non-zero pensions. The lower three sections of the table are calculated based upon 1,089 observations for which pensions are calculated according to the widely used pay/service formula, which is the product of average compensation times years employed times a multiplier factor. The final section of the table reports the payout currently earned by each CEO, not the payout that a CEO might expect to receive if he worked until normal retirement age.

Type of CEO pension	
Pay/service formula	64%
Cash balance	7%
Negotiated in employment contract	6%
Pension frozen with terms from defunct plan	1%
No pension	23%
Minimum retirement age for full pension benefits	
55	3%
60	11%
62	9%
65	76%
Other	1%
Items included in calculation of average compensation	
Salary	100%
Bonus	94%
Restricted stock awards (when vested)	4%
Long-term incentive plan (when paid out)	4%
Years compensation averaged to calculate annual payout	
1	5%
3	39%
4	3%
5	54%
Fraction of final average compensation in annual payout	
Less than 20.1%	9%
20.1% - 30.0%	9%
30.1% - 40.0%	12%
40.1% - 50.0%	23%
50.1% - 60.0%	31%
60.1% - 70.0%	14%
More than 70.0%	2%

Table V
Panel data Tobit estimates of ratio of CEO's inside debt vs. inside equity holdings

Tobit regression estimates of the fair actuarial value of a CEO's pension, and the ratio of pension value over stock and option equity value. Pension values are estimated using actuarial assumptions given in the text. Stock option values are based upon Black-Scholes calculations. Leverage equals total debt over total debt plus stockholders' equity. The dummy variable for liquidity constrained firms equals 1 if the firm pays zero dividends. The dummy variable for tax status equals 1 if the firm has an operating loss carry-forward. All between estimates are based upon within-firm averages for 237 *Fortune 500* firms in the 1996-2002 period. Fixed effects estimates are based upon 1,655 annual observations for these firms. T-statistics appear in parentheses below each estimate.

Dependent variable:	CEO's pension present value				CEO pension present value ÷ value of (stock + options)			
	Firm fixed effects		CEO fixed effects		Firm fixed effects		CEO fixed effects	
CEO's years employed by firm	0.297	***	0.205		0.008	***	0.000	
	(13.34)		(0.45)		(6.38)		(0.00)	
CEO hired from outside firm (dummy)	4.968	***			0.022			
	(6.85)				(0.52)			
Firm size (log of total assets)	1.620	***	0.553		-0.044		-0.100	**
	(3.08)		(1.11)		(1.49)		(3.37)	
Leverage (book value)	-1.043		-1.723	*	0.180	**	0.225	***
	(0.98)		(1.69)		(2.97)		(3.73)	
Liquidity constrained (zero-dividend dummy)	-0.207		-1.521	*	0.003		0.010	
	(0.20)		(1.71)		(0.05)		(0.19)	
Growth opportunities (R&D / sales)	-20.88		-2.639		0.380		0.094	
	(1.50)		(0.20)		(0.47)		(0.12)	
Tax status (carry-forward dummy)	-0.710		-0.503		0.026		-0.007	
	(0.99)		(0.58)		(0.73)		(0.20)	
Years since founding of firm	0.436	***	1.224	***	-0.001		0.020	
	(4.92)		(2.59)		(0.28)		(0.71)	

Other regression controls: institutional ownership (%), log of board size, percent of outside directors, CEO membership in founding family.
Significant at 1% (***), 5% (**), and 10% (*) levels.

Table VI
Logit estimates for CEO turnover as a function of pension compensation

Logistic regression estimates of the probability of CEO turnover. The sample includes observations for a panel of 237 Fortune 500 companies during the 1996-2002 period. The dependent variable equals 1 if the CEO leaves his position during the last half of the fiscal year or the first half of the subsequent fiscal year. The indicator for pension payable equals 1 if the CEO has the right to immediate payout of his full pension, if any. Excess stock return equals the difference between the raw stock return and the CRSP value-weighted index, compounded continuously. T-statistics robust to serial correlation and heteroskedasticity appear below each estimate in parentheses.

	All turnover		Forced turnover		Planned turnover	
CEO Age	0.138	***	0.001		0.216	***
	(6.04)		(0.03)		(6.59)	
Pension payable indicator	0.675	**	-0.665		0.610	**
	(2.43)		(0.75)		(2.04)	
Excess stock return	-0.836	***	-1.812	***	0.321	
	(2.52)		(3.81)		(0.76)	
Excess stock return, prior year	-0.894	***	-1.575	***	-0.192	
	(2.70)		(2.89)		(0.54)	
Member of founding family	-1.194	**	-0.549		-1.923	**
	(2.34)		(0.79)		(2.54)	
CEO percentage ownership	-6.004	*	0.589		-7.691	*
	(1.86)		(0.13)		(1.85)	
Years tenure as CEO	0.012		0.010		0.011	
	(0.77)		(0.29)		(0.59)	
Observations	1,616		1,616		1,616	
Year dummy variables	Yes		Yes		Yes	
Mean of dependent variable	0.106		0.029		0.077	
% classified correctly	89.3%		97.0%		92.0%	

Other regression controls: institutional ownership (%), log of board size, percent of outside directors, leverage (book value), market-to-book ratio.

Significant at 1% (***), 5% (**), and 10% (*) level.

Table VII
Adjustments to cash compensation when CEO foregoes pension

Panel data regression estimates of CEOs' cash salary and bonus compensation. The sample consists of observations for 237 *Fortune 500* firms in the 1996-2002 period. Excess stock return equals the difference between the raw stock return and the CRSP value-weighted index, compounded continuously. The forgone pension variable equals the annual pension that the CEO would have received had he chosen to retire prior to the current fiscal year; for CEOs who are younger than the age at which full pension benefits are paid, this variable equals zero. T-statistics appear in parentheses below each coefficient estimate.

	Dependent variable: Cash salary+bonus compensation			
	Firm fixed effects		CEO fixed effects	
Firm size (log of total assets)	542.92 (3.73)	***	498.21 (2.75)	***
Excess stock return, current year	1056.47 (7.66)	***	1155.07 (7.34)	***
Excess stock return, prior year	395.37 (2.74)	***	440.76 (2.77)	***
CEO age	18.83 (1.42)		-10.03 (0.01)	
CEO percentage ownership	-742.05 (0.36)		6670.25 (1.17)	
Member of founding family	532.57 (1.64)	*		
Foregone pension	0.46 (3.69)	***	0.49 (3.22)	***
Firms	237		237	
Observations	1,655		1,655	
Year dummy variables	Yes		Yes	
R^2	0.593		0.641	

Other regression controls: log of board size, institutional ownership (%), percent of outside directors, years tenure as CEO, age of firm.

Significant at 1% (***), 5% (**), and 10% (*) levels.

Table VIII
Estimates of default risk as a function of CEOs' inside debt and equity holdings

Fixed effects estimates of firms' default risk. Default risk is measured as the distance to default, which equals the number of standard deviations of reduction in the market value of the firm that would place it below the default barrier (a more complete definition appears in the text). The key explanatory variables utilize the CEO's personal debt/equity ratio, which has the actuarial fair pension present value in the numerator, and the market value of shares and options in the denominator. For the firm, the debt/equity ratio equals the book value of total debt over the market value of common stock. CEO pension fair value is calculated using assumptions given in the text. The number of industry segments, a measure of diversification, equals the number of business units for which the company reports disaggregated line-of-business data in its annual report. The sample includes 1,659 observations for 237 Fortune 500 firms between 1996-2002, and the regression omits firms with minimal amounts of debt outstanding. T-statistics appear below each estimate in parentheses.

Dependent variable: distance to default	Firm fixed effects		CEO fixed effects		Firm fixed effects		CEO fixed effects	
Firm size (log of total assets)	0.024		0.122	*	0.007		0.124	*
	(0.39)		(1.85)		(0.12)		(1.90)	
Leverage (book value)	-0.459	***	-0.400	***	-0.282	**	-0.203	
	(3.62)		(2.73)		(2.19)		(1.39)	
Number of industry segments in firm	-0.003		0.011		-0.005		0.007	
	(0.21)		(0.74)		(0.39)		(0.45)	
CEO's pension value / CEO's stock and option value	0.139	**	0.141	**				
	(2.38)		(1.97)					
Indicator for CEO's pension/equity>firm's debt/equity					0.312	***	0.436	***
					(5.45)		(6.23)	
Firms	233		233		233		233	
Observations	1,570		1,570		1,570		1,570	
Year dummy variables	Yes		Yes		Yes		Yes	
R^2	0.776		0.820		0.780		0.826	

Other regression controls: institutional ownership (%), log of board size, percent of outside directors, market-to-book ratio.

Significant at 1% (***), 5% (**), and 10% (*) levels.

Table IX
Dividend payout rate as a function of CEOs' inside debt and equity holdings

Panel Tobit regression estimates of the dividend payout rate. The key explanatory variable in each model is the value of the CEO's pension, option, or stock ownership. Each model also includes a range of control variables listed at the bottom of the table. The top half of the table presents estimates with firm-specific intercept terms, while the bottom half presents estimates with CEO-specific intercepts. The dependent variable in all models has been multiplied by 10^3, and all pension, option, and stock ownership is measured in millions of dollars. Each estimation uses 1,659 observations from 237 firms between 1996 and 2002.

Dependent variable: Dividends / market capitalization									
	Firm fixed effects								
Value of CEO's pension	-0.119	**					-0.069		
	(2.19)						(1.26)		
Value of CEO's options			-0.028	***			-0.026	***	
			(5.05)				(4.73)		
Value of CEO's stock					0.0002		0.0002		
					(1.31)		(1.33)		
	CEO fixed effects								
Value of CEO's pension	0.024						0.044		
	(0.41)						(0.75)		
Value of CEO's options			-0.017	***			-0.018	***	
			(3.28)				(3.33)		
Value of CEO's stock					0.0001		0.0001		
					(0.63)		(0.68)		

Other regression controls: return on assets (current year and one lag), firm size (log of assets), growth opportunities (r&d / sales), institutional ownership (%), log of board size, percent of outside directors, age of firm in years

Significant at 1% (***), 5% (**), and 10% (*) levels.

Figure 1
Mean and median actuarial fair pension values for CEOs by age

Mean and median actuarial present values for pensions held by CEOs in a sample of 237 Fortune 500 companies in the 1996-2002 period, including zero-valued observations which comprise 23 percent of the 1,659 CEO-year observations. Pension values are calculated based upon assumptions given in the text, using information disclosed in company proxy statements.

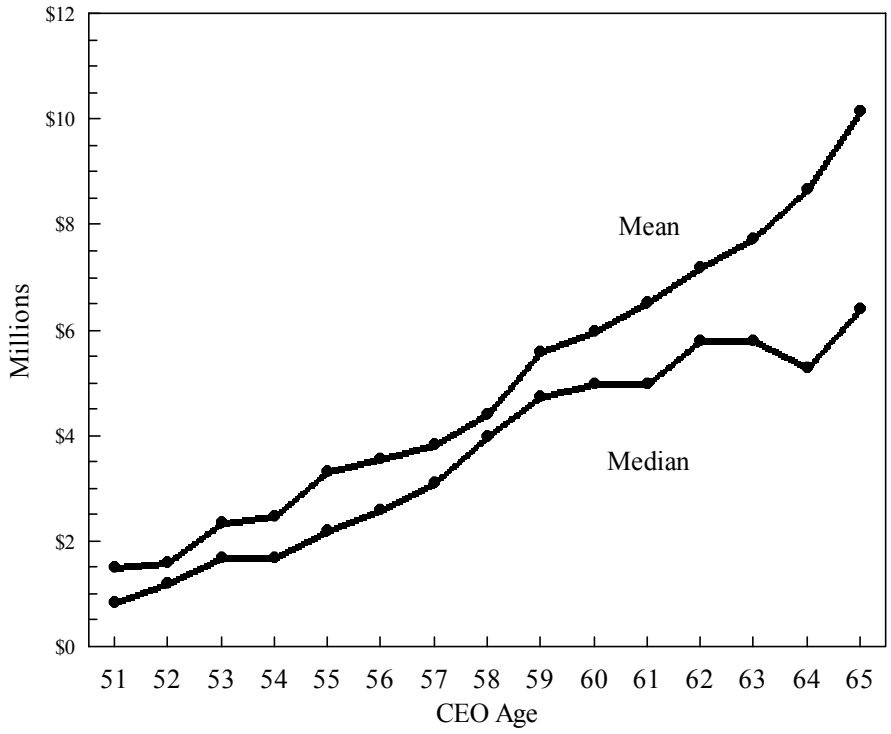

Figure 2
Annual CEO turnover rates by age, as a function of pension availability

Annual frequencies of voluntary CEO turnover at different ages within a sample of 237 Fortune 500 companies between 1996 and 2002. The entire sample includes 1,659 annual observations, but the chart is drawn from a subsample of 1,296 observations, excluding those CEO-years for which no pension plan was in effect and also excluding cases of involuntary turnover. The top line shows turnover rates for CEOs who have reached or surpassed the age at which their pensions become fully payable, comprising a total of 186 observations. The lower line shows turnover rates for CEOs who are younger than the pension payable age, a total of 1,100 observations.

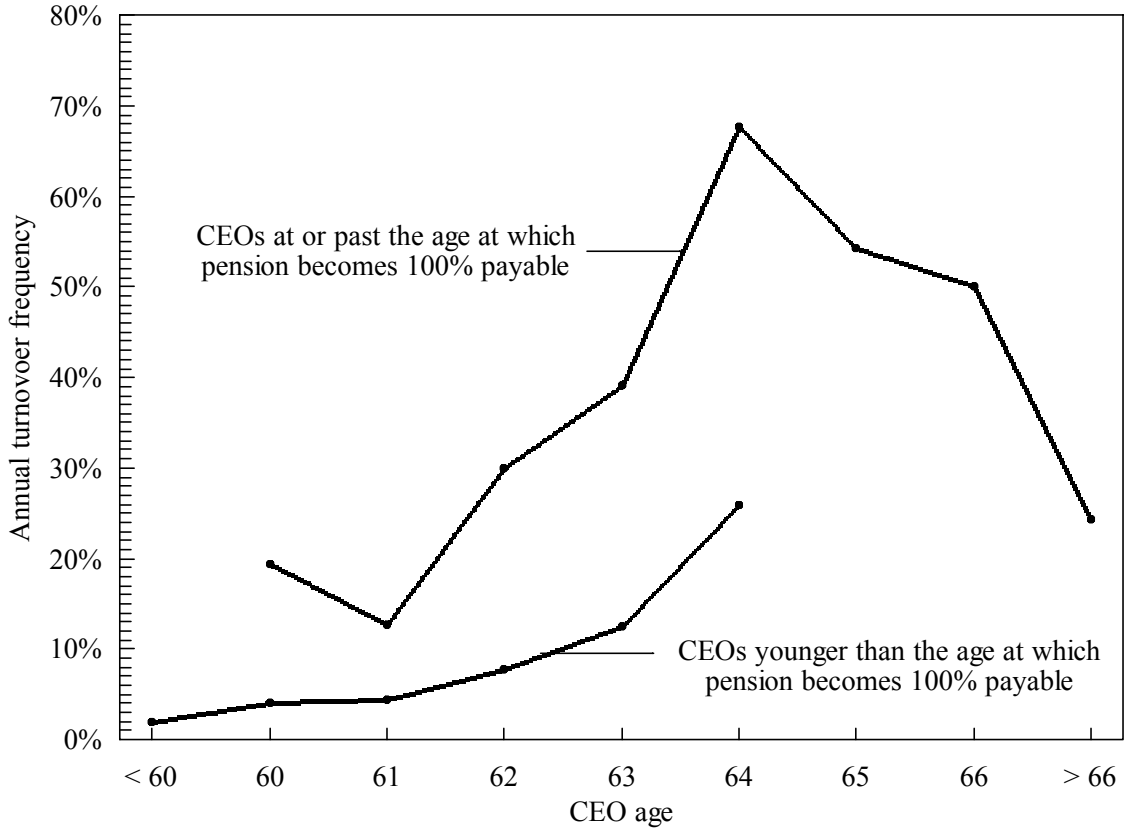

Figure 3
Debt rating upgrades and downgrades vs. CEO pension values

Annual frequencies of corporate debt rating upgrades and downgrades, plotted against the values of CEOs' pensions. Within a sample of 237 Fortune 500 companies between 1996 and 2002. Although the entire sample consists of 1,659 company-year observations, the graph is based on the subset of 909 observations for which CEOs have nonzero pensions and debt rating information is available from either Standard & Poor's or Moody's. CEO pension values represent year-end fair actuarial present values of lifetime pension benefits earned by the CEO, calculated according to assumptions given in the text.

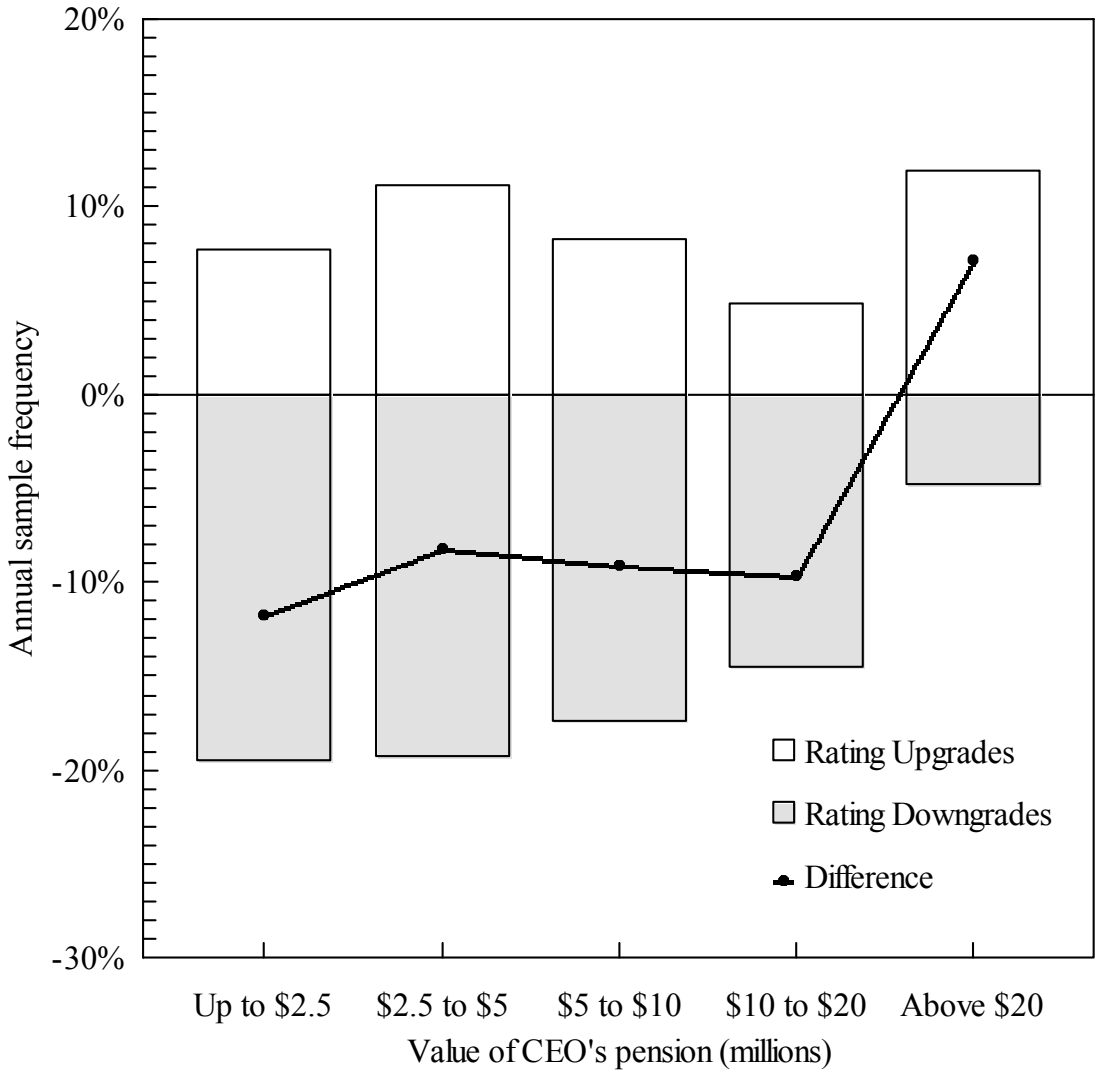

Figure 4
Capital investment vs. CEO pension values

Annual totals of corporate capital investment, plotted against the value of CEOs' pensions within a sample of 237 Fortune 500 companies between 1996 and 2002. Although the entire sample consists of 1,659 company-year observations, the graph is based on the subset of 1,307 observations for which CEOs have nonzero pensions. CEO pension values represent year-end fair actuarial present values of lifetime pension benefits earned by the CEO, calculated according to assumptions given in the text. Capital investment equals the sum of capital expenditures plus research & development expense (if any), as reported by Compustat.