Pay Me Now (and Later): Pension Benefit Manipulation before Plan Freezes and Executive Retirement

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Abstract

Large U.S. companies modify the inputs of benefit formulas of top executives' defined benefit pension plans before plan-related events. We find an average boost of 17–33% in annual bonuses (a determinant of benefits) but no increases in equity awards (not a determinant of benefits) one year before pension freezes. Our results are stronger under propensity score matching. Moreover, firms lower plan discount rates by 13–35 basis points when top executives are ready to retire with a lump-sum benefit distribution. Interestingly, we find no pension-related bonus boosts or discount rate manipulation at firms with strong corporate governance.

JEL classification: G31; G32; G34; M40

Key Words: Defined benefit pension plans; Pension freezes; Executive retirement; Executive annual bonuses; Plan discount rates

1. Introduction

Executive compensation at large public companies in the United States has been at the center of policy debate in recent years.[1] Starting in January 2011, non-binding shareholders' votes on executive compensation have been mandated for all public U.S. companies. Shareholders are given *Say on Pay*. For such monitoring to work, it is crucial for shareholders to be fully informed about the dimensions of executive pay packages. Most of the literature on executive compensation has focused on the components of annual direct compensation, such as restricted stock and stock options (Jensen and Murphy, 1990; Yermack, 1995). Recently, however, scholars have begun to examine less visible components of executive pay packages, such as pensions (Sundaram and Yermack, 2007).[2]

Because pension benefit payouts start only upon retirement, executive pensions had been mostly hidden from investors before December 15, 2006, when the Securities and Exchange Commission (SEC) required public companies to disclose changes in the value of pension benefits for named executive officers (NEOs) in their proxy filings.[3] The new disclosures revealed that executive compensation in the form of accumulated pension benefits is comparable to base salary, and it is often substantially larger for long-tenured executives. Under a defined benefit (DB) pension plan, the sponsoring company promises to pay plan participants a fixed amount of annual

[1] For example, Murphy (2002); Murphy and Zabojnik (2004); Oyer (2004); Gabaix and Landier (2008); Edmans, Gabaix, and Landier (2009); Core and Guay (2010); Kaplan and Rauh (2010); Baranchuk, MacDonald, and Yang (2011); and Subramanian (2013) argue that the scarcity of managerial talent and increasing importance of managerial skills largely explain observed changes in the level and dispersion of chief executive officer (CEO) pay. On the other hand, Bertrand and Mullainathan (2001); Bebchuk and Fried (2004); and Morse, Nanda, and Seru (2011) argue that CEO entrenchment and ineffective board monitoring are the causes of increased CEO pay.

[2] See, for example, Rau and Xu (2013) and Goldman and Huang (2015) on severance agreements and Xu and Yang (2015) on signing bonuses for top executives.

[3] Sundaram and Yermack (2007) were the first to estimate the actuarial value of CEO pensions and show that pensions constituted a significant part of CEO compensation packages. The SEC final rules 33-8732a became effective on December 15, 2006, but as of 2013 the change in pension value was still not included in the calculation of total direct compensation (*TDC1*) in ExecuComp, even though it is listed as a component in the definition of *TDC1*.

pension benefit upon retirement. The amount of the annual benefit is calculated as the product of three factors: the number of service years, covered compensation (i.e., base salary and, almost always, annual bonuses, typically averaged over the final three years of the employee's tenure), and a benefit factor (typically between 1.5% and 2%) that may jump at critical service years.[4] Most plans allow participants to take the present value of pension benefits in a lump sum upon retirement. The lump-sum payout amount increases with the annual benefit and decreases with the assumed plan discount rate (and age-based mortality rates).

This paper investigates whether the management acts opportunistically when determining executive compensation and making plan assumptions before key pension-related events. It first examines the feedback effect of pension freezes and executive retirement on the awards of executive annual bonuses and shows that firms award larger executive annual bonuses before both events. Such awards not only increase annual compensation that year but also raise the value of the executives' pension benefits. The paper next examines whether firms lower plan discount rates in order to increase pensions before executive retirement, taking into account constraints on discount rate selections and potential costs of rate reductions: pressure exerted on the plan's funding status due to increases in its overall pension obligation. We show that the discount rates of DB plans are downward biased when top executives are ready to retire with the option to take lump-sum payouts, which further enhances executives' retirement packages.

As both the number of service years and covered compensation tend to increase with executive tenure, by construction, the growth of accumulated benefits often accelerates over time. In recent years, many sponsors froze their DB plans for long-term cost savings and reductions in

[4] Suppose, for example, the benefit factor is 2%. An executive with an accumulated 25 years of service and covered compensation of \$1 million has an annual pension benefit of \$0.5 million (= $0.02 \times 25 \times 1$), which is 50% of the covered compensation.

contribution volatility. When a pension freeze is implemented, both the number of service years and the level of covered compensation stop growing (the so-called *hard freeze*). As a result, earned pension benefits remain at the frozen level for the remaining tenure of the participants. Anticipating such a freeze, top executives may therefore have incentives to modify the determinants of their pension benefits in order to offset the loss of the expected benefit growth. Similarly, executives' annual benefits are also frozen at retirement because both accredited service years and covered compensation stop growing at that point. Thus, executives may have incentives to boost their pension benefits before retirement.

There are three ways to boost annual pension benefits at the executive level if firms do not change benefit formulas themselves (e.g., including 150% of bonuses): crediting multiple years of service, increasing base salary, and boosting annual bonuses. Leapfrogging the number of service years is easily detectable, and increasing base salary by more than inflation is difficult to justify if the firm does not grow substantially. Thus, boosting annual bonuses remains the least transparent way to increase the to-be-frozen annual benefits. For example, Goodyear Tire & Rubber Company awarded its CEO, Mr. Keegan, an annual bonus of $12.3 million (of which $3.5 million was discretionary bonuses) in 2007, the year before the company froze its DB plans.[5]

Determining whether surges in executive annual bonuses are intended to increase pension benefits before pension-related events is challenging. In our examination of annual bonuses before pension freezes (and executive retirement), we control for known economic determinants of annual bonuses such as firm performance, complexity, risk, and executive responsibility. We further

[5] Robert Keegan joined Goodyear in October 2000 and received a service credit of 2.5 years for pension purposes for each year he was employed. Mr. Keegan received annual bonuses of $10.44 million in 2006, $12.3 million in 2007, and $4.6 million in 2008. "Retirement benefits, including those provided through a SERP, are a critical component of an executive's overall compensation program and are essential to attracting, motivating and retaining talented executives with a history of leadership." Source: the proxy statement of Goodyear filed in 2007 at http://www.sec.gov/Archives/edgar/data/42582/000095015207001972/l23581adef14a.htm#126.

include industry-year fixed effects (two-digit SIC industry interactive with year) that take into account time-variant industry conditions (Gormley and Matsa, 2014) and, in alternative specifications, both year fixed effects and firm fixed effects that take into account the time trends as well as time-invariant and firm-specific characteristics that may affect bonus payouts (Graham, Li, and Qiu, 2012). We find that, on average, top executives received boosts of 17–26% in annual bonuses one year before a DB plan freeze.

We recognize, however, that including the above fixed effects may not be sufficient to address the concern of omitted variables that may affect both plan freeze and bonus award decisions if those variables are firm-specific and time-variant, and we address such concerns in three ways. First, because firms that freeze their pension plans tend to perform poorly, their executives are expected to receive smaller annual bonuses. Thus, omitted performance-related firm characteristics are biased against our finding of larger bonus awards right before pension freezes.

Second, we use the propensity score matching (PSM) approach to construct a matched sample based on the propensity of a pension freeze, estimated using firm financial and pension characteristics one year prior to the freeze.[6] Then, we match each freeze firm one year before its freeze to a firm in the same industry-year with the closest propensity score. We examine whether there is a difference in executive annual bonuses within matched pairs. Such a difference is more likely driven by the freeze decision than by other economic factors. Based on the matched sample analysis, we find an average boost of 33% in annual bonuses one year before pension freezes.

Third, we contrast equity awards with bonus payouts before a pension freeze. For 94% of DB plans, covered compensation of the annual benefit formula includes annual bonuses, while only 4% of plans consider restricted stock awards or long-term incentive pay relevant to the annual

[6] See, for example, Petersen (1994); Munnell and Soto (2007); Beaudoin, Chandar, and Werner (2014); and Choy, Lin, and Officer (2014); and Comprix and Muller (2011).

benefit calculation (Sundaram and Yermack, 2007). This institutional difference enables us to contrast the incentive to boost bonus awards with the lack of incentive to boost equity awards prior to a pension freeze. Even though firms may have other reasons to increase equity awards, because equity awards are typically much bigger than bonus awards (50–70% vs. 15–20% of total annual pay), we do not expect to, nor do we, find boosts in equity awards before pension freezes. The percentage of total compensation that is allocated to components that are used in the pension formula goes up, and there is no ex-ante reason why pay structure should change immediately prior to a plan freeze.

Boosts in annual bonuses before pension freezes help compensate top executives for their loss of future benefit accruals. Such compensation surges may be necessary to incentivize and retain top executives given labor market competition. However, when boosts in executive annual bonuses before pension freezes are accompanied by cuts in other employees' benefits, such developments could also indicate an agency problem. To this end, we examine how corporate governance affects the extent of executive bonus boosts before pension freezes. We construct an equal-weighted governance index based on seven indicators for board characteristics and ownership structure (Yermack, 1996; Core, Holthausen, and Larcker, 1999; Fich and Shivdasani, 2006; Coles, Daniel, and Naveen, 2008, 2015). We find no bonus boosts before pension freezes at firms with strong corporate governance, which is consistent with the agency problem hypothesis.

We further examine whether executive retirement, which is similar to plan freezes in capping pension benefits, also motivates firms to boost executive annual bonuses. We classify an executive as retired if the executive's age exceeds one of the three most popular retirement ages: 60, 62, and 65 (e.g., Weisbach, 1988; Parrino, 1997; and Kalyta, 2009). We find an increase of 46–62% in annual bonus payouts but no changes in equity awards for retiring executives right

before departure.[7] Provided that an executive retires during our sample period, the boosts in the executive's annual bonuses before the departure is, on average, 14 to 36%.

In addition to increasing annual pension benefits by boosting annual bonuses, firms also have the discretion to lower plan discount rates to increase the payout amount that retiring executives can cash out in a lump sum.[8] DB plans for top executives typically consist of two parts: (1) qualified plans that are tax deductible but can cover only annual benefits up to the limit imposed by the Internal Revenue Service (IRS) (e.g., $205,000 in 2013), and (2) supplemental executive retirement plans (SERPs), which cover the remaining pension benefits.[9] For top executives of large U.S. companies, pension benefits under SERPs are typically much larger than those under regular qualified plans. Discount rates for qualified plans and SERPs may differ. For example, when Mr. Keegan retired from Goodyear Tire & Rubber Company in 2010 and took out all pension benefits in a lump sum, the discount rate of SERP decreased by 75 bps from the 2009 level, while the average decrease in the discount rate from 2009 to 2010 for all SERP sponsors in our sample was only 47 bps.

The choice of the discount rates of DB plans is subject to several constraints. Legally, the discount rates for minimum lump-sum distribution of qualified plans were linked to the Treasury bond yield; starting on January 1, 2008, sponsors were required to link the discount rates to high-

[7] "One of Exxon Mobil's two supplemental pension plans for executives uses the three highest bonuses in the five years prior to retirement to calculate the executive's pension. As a result, a $US4m bonus to chief executive Rex Tillerson in 2008 helped push the total value of his pension to $US31m from $US23m." Source: Ellen E. Schultz and Tom McGinty, "Pensions for Executives on Rise." WSJ, November 3, 2009. Schultz (2011) includes more examples of managerial opportunistic behavior related to pensions.

[8] Under *Accounting Standards Codification 715*: *Compensation—Retirement Benefits* (FASB, 2009), employers have considerable discretion in determining the discount rates of DB plans for the purpose of measuring pension obligations. Comprix and Muller (2011) show that firms lowered plan discount rates by 18 basis points (bps) prior to the Sarbanes-Oxley Act to exaggerate the economic burden before DB plan freezes.

[9] Contributions made to SERPs are not tax deductible. As a result, SERPs are typically unfunded and, in most cases, do not need to comply with the requirements of the Employee Retirement Income Security Act (ERISA). Nevertheless, pension disbursements are deductible for the sponsor when these benefits are paid.

quality bond rates, with an annual transition rate of 20% over a five-year period. Moreover, discount rates for annuity payouts of DB plans are often linked to the rates implicit in annuity contracts at which the pension obligation can be effectively settled. These annuity rates are linked to high-quality bond rates (Naughton, 2015). Thus, there are natural benchmarks for the discount rates of DB plans. Practically, lowering the discount rate exerts pressure on the funding status of a firm's qualified plans because it increases the present value of total pension liabilities. Thus, the incentive to lower plan discount rates mainly exists when lump-sum distribution is available, and such an incentive is stronger when top executives are ready to retire and exercise the lump-sum distribution option.

Using manually collected data mainly from firms' proxy statements on plan discount rates, the lump-sum distribution option, and the retirement age specified in DB plans over the period of 2006 to 2013, we find that in years in which any top executive is qualified for retirement with a lump-sum distribution, the discount rate of the DB plan is, on average, lowered by 13 to 14 bps relative to benchmark rates. These results are obtained after controlling year fixed effects, and are not driven by managerial behavior in any particular year of our sample period. In addition, we obtain similar results if the benchmark rate is included as an independent variable in the regression of the plan discount rate. More importantly, we find that the incentive to lower the discount rate is much stronger for executives who benefit the most: The discount rate is lower than the benchmark rate by 31 to 35 bps, on average, when retiring executives have large expected pension benefits (in the top quintile). Interestingly, we do not find downward biased assumptions on plan discount rates at firms with strong corporate governance (in the top quintile).

Our paper is the first to provide empirical evidence that a significant number of firms give favorable treatment to top executives' pension benefits before pension freezes and executive

retirement. At the very least, boosting pension benefits prior to these pension-related events and lowering plan discount rates when executives are ready to retire with a lump-sum distribution hide the true compensation costs from investors. Thus, our study is linked to the literature on problematic compensation practices such as stock option backdating (Lie, 2005; Lie and Heron, 2007), large special cash payments to target CEOs in mergers and acquisitions (Hartzell, Ofek, and Yermack, 2004), large separation pay for departing CEOs (Yermack, 2006), and biased selection of compensation peer groups (Faulkender and Yang, 2010; Bizjak, Lemmon, and Ngyuen, 2011).

Our paper contributes to the executive compensation literature by documenting the relationship between executive pensions and annual bonuses, two compensation components that have largely been examined separately. While the literature on annual bonuses has been developing for 30 years,[10] Sundaram and Yermack (2007) were the first to point out the link between the cash component of compensation and pension value.[11] In contrast to Sundaram and Yermack, who focus on the effect of CEO pensions on risk-taking and retirement decisions, we examine the feedback effect of plan freezes and executive retirement on executive annual bonuses.

Our research also contributes to the literature examining opportunistic managerial behavior in making pension-related decisions. For example, firms are shown to use lower expected rates of return (ERRs) for DB plans to reduce income before CEO option grants, and higher ERRs to increase income before CEOs exercise stock options (Bergstresser, Desai, and Rauh, 2006) or sell shares in the open market (Comprix and Mueller, 2006). Begley, Chamberlain, Yang, and Zhang

[10] See, for example, Murphy (1985), Gaver and Gaver (1998), Jensen and Murphy (2011), and Kim and Yang (2012).
[11] While Cadman and Vincent (2015) show a positive correlation between DB pension benefits and excess annual compensation for CEOs, Gerakos (2010b) finds that an additional dollar of pension benefits is associated with a 48 cent decrease in pay. Gerakos (2010a) argues that the variation in pension levels is more likely due to optimal contracting than rent seeking. Kalyta (2009) shows income-increasing earnings management before CEO retirement if CEO pension is based on performance.

(2015) further show that greater CEO interest in employee DB plans leads to higher funding levels and a lower probability of plan freezes.[12]

The remainder of the paper is organized as follows. Section 2 presents the empirical strategy of our tests. Section 3 describes data and summary statistics, and presents empirical results on bonus boosts before pension freezes and executive retirement. Section 4 documents the manipulation of plan discount rates when executives are ready to retire with a lump-sum distribution option of pension benefits. Section 5 concludes.

2. Empirical Strategy

Our empirical analysis includes two sets of tests. First, we examine whether executive bonus payouts change in anticipation of pension freezes and executive retirement. Second, we examine whether plan discount rates are lowered when executives are ready to retire with a lump-sum distribution option of pension benefits.

We first examine whether firms increase executive annual bonuses before pension freezes. Pension freeze decisions are often negotiated with employees, retirees, and their unions over an extended period. As a result, when getting close to a resolution these events are fully anticipated by top executives, thus giving them the opportunity to implement changes in compensation that counterbalance foregone benefit accruals. In contrast, regular employees are not offered such offsets, as Rauh, Stefanescu, and Zeldes (2015) show that freezing the DB plan generates considerable savings for the firm—about 3.5% of total payroll per year—even after accounting for additional contributions to supplementary defined contribution plans.

[12] Our research also contributes to the literature examining the effect of DB plans on corporate decisions. For example, Bergstresser, Desai, and Rauh (2006) show that management manipulates pension assumptions before mergers and acquisitions and earnings announcements. DB plans are also shown to affect corporate investment decisions (Rauh, 2006), choices of financial leverage (Shivdasani and Stefanescu, 2010), and the costs of equity and debt (Wei and Yermack, 2011).

Our baseline specification focuses on executive annual bonuses before a pension freeze:

$$Bonus_{ijt} = \alpha + \beta_1 \times Pre\ Freeze_{it} + \gamma_1 \times Salary_{ijt} + \gamma_2 \times X_{i,t\ or\ t-1} + \eta_t + \mu_i + \varepsilon_{ijt}, \quad (1)$$

where subscript *i* refers to the firm, subscript *j* refers to the executive, and subscript *t* refers to the time in years. We use the (anticipated) freeze event occurring one year ahead, *Pre Freeze*, as our main test event.

Our specification includes various control variables that are commonly known to affect annual bonuses. For instance, we include *Salary*, because target bonuses are typically expressed as multiples of base salaries (Kim and Yang, 2012). Following the literature on executive compensation (Core, Holthausen, and Larcker, 1999), we control for firm size (lagged *Sales*) and performance (lagged and current *ROA* and stock *Return*), which are expected to be positively correlated with executive annual bonuses. We then add two dummy variables related to recent income levels: *Negative Income* and *Income Increase* (Gaver and Gaver, 1998; Jackson, Lopez, and Reitenga, 2008). Furthermore, we include stock *Return Volatility*, market-to-book ratio of equity (*M/B*), and *Leverage* as control variables. We also include an indicator for the CEO, because CEOs have greater responsibility and receive bigger bonuses than other NEOs in general.

In our regression analysis, we either include industry-year fixed effects to control for unobserved time-varying industry characteristics, or include year fixed effects and firm fixed effects to control for time trends and unobserved time-invariant firm characteristics that may affect executive bonuses. Standard errors are clustered at the firm level. We further conduct a similar analysis on whether annual bonuses are boosted before executive retirement, using an indicator, *Pre Depart*, for the year before executive departure and interacting it with proxies for retirement.

Our second set of tests examines DB plan discount rates relative to benchmark rates at executive retirement when lump-sum distribution is allowed. We examine qualified plans and

SERPs separately, because some firms use younger ages to define retirement for SERPs than for qualified plans and apply different discount rates to these two types of plans. Retirement is defined based on the retirement conditions specified in DB plans at which all of the executive's pension benefits can be paid out. Retirement is defined separately for qualified plans and SERPs. We classify a firm-year as a *Retirement* year if at least one NEO meets the retirement condition specified in the plan that year regardless of whether any executive actually leaves the firm.

To examine the effect of an executive's retirement with a lump-sum distribution on the pension plan discount rate, we use the following specification:

$$Discount\ rate_{it} - Benchmark\ rate_t = \alpha + \beta_1 \times Lump\ Sum_{it} + \beta_2 \times Retirement_{it} + \beta_3 \times Lump\ Sum_{it} \times Retirement_{it} + \eta_t + \varepsilon_{it}, \quad (2)$$

where *Lump Sum* takes the value of 1 if a lump-sum distribution of pension benefits is allowed at retirement and 0 otherwise. We cluster standard errors at the firm level.

We compare the discount rate of a DB plan with two pairs of benchmark rates. The Pension Protection Act (PPA 2006, 120 STAT. 920–921) mandated the use of a high-quality bond rate as the reference discount rate in calculating the minimum lump-sum distribution for qualified plans, replacing the previous reference to the 30-year Treasury bond yield.[13] The new rule applies to "plan years beginning after December 31, 2007," with an annual transition rate of 20% to the bond rate over a five-year phase-in period. We construct the weighted-average of the Treasury bond yield and two corporate bond rates—*the Moody's AA* corporate bond index and the IRS's Composite Corporate Bond Rate (*CCBR*)—based on the transition schedule governed by PPA 2006.[14] For example, for a firm with fiscal (plan) years that end in December, the weights used for

[13] Prior to enactment of the PPA 2006, sponsors were required to calculate lump-sum distribution using interest rates on 30-year Treasury bond yield.

[14] The CCBR data are available on the IRS website at https://www.irs.gov/Retirement-Plans/Composite-Corporate-Bond-Rate-Table. Using the Corporate Bond Weighted Average Interest Rate yields similar results.

the Treasury bond yield and bond rate are [100%, 0%] in 2006 and 2007, [80%, 20%] in 2008, [60%, 40%] in 2009, [40%, 60%] in 2010, [20%, 80%] in 2011, and [0%, 100%] in 2012 and 2013.

Next, we measure the deviation of the plan discount rate from each of the two constructed (weighted-average) benchmark rates, and examine whether the deviation becomes larger (more negative) at firms when their top executives are ready to retire and take out pension benefits in a lump sum. We further calculate the deviation of the plan discount rate from each of the *Moody's AA* corporate bond index and the *CCBR* because DB plans with annuity payouts link their discount rates to high-quality bond rates.

3. Bonus Boosts before Pension Freezes and Executive Retirement

3.1 Data and Summary Statistics

We start our sample construction with firms covered by the Standard & Poor's ExecuComp database; that is, all current and past S&P 1500 index component firms. The annual compensation table of ExecuComp includes detailed information on base salary, annual bonuses, restricted stock, stock options, and other incentive payments for the NEOs. For the period from 2000 to 2013, ExecuComp covers 2,807 unique firms, of which 1,624 offer DB plans to their employees based on the pension annual table of Compustat. We further require our sample firms to have at least one Form 5500 filing with matched *GVKEY* during our sample period, which reduces the sample to 1,095 firms. For these firms, we extract firm (executive) years with required information on the variables used in our regression analysis: positive pension liabilities as reported in 10-K (*PBPRO* in Compustat), and non-missing salary, annual bonuses, sales, return on assets (*ROA*), net income, net income increase, stock return, market-to-book ratio, leverage, return volatility, and a CEO indicator. Firm financial data are extracted from Compustat and stock return data from the Center for Research in Security Prices (CRSP). These requirements reduce our sample of firms with DB plans to 1,084 firms, corresponding to 13,850 executives and 61,831 executive-year observations.

We identify plan freezes from IRS Form 5500, which is filed by all sponsors at the plan level. The form includes detailed financial information about the plan and its funding status. In particular, the form identifies all plans that are frozen in any given year. *Hard freezes* entail a complete stop of pension accruals. In contrast, *soft* (i.e., *partial*) *freezes* typically involve a slowdown in the growth of plan level liabilities or the closure of the plan to new participants. The check box in the filing of Form 5500 refers to *hard freezes* and the disclosure became mandatory in 2002. We further check the freeze date in the plan description paragraph that is typically available in the attachments to Form 5500. During the period from 2000 to 2013, 207 of the 1,084 firms with DB plans froze 251 of their plans. Because Form 5500 is not publicly released for two years following the filing at the IRS, our sample of freezes for 2012 and 2013 is incomplete. Similarly, because the Form 5500 disclosure of pension freezes occurred prior to 2002 was not mandated, our sample of plan freezes in 2000 and 2001 is also incomplete. Figure 1A depicts the annual distribution of these freeze events and Figure 1B the industry distribution.

Table 1 reports the summary statistics on key variables. We compare firm characteristics of those firms that froze their pension plans one year before the freeze with those of other firm years, and find that these firms tend to have poorer performance: lower ROA, stock returns, and market-to-book ratio, negative net income and no income increases, and more volatile stock returns. Regarding pension characteristics, Table 1 reveals that 83.2% of the firms that froze their DB plans have overall underfunded plans in the year before the freeze, in contrast to 78.5% for the remaining firm years. We code the *Underfunded* dummy variable as 1 if the overall funding ratio of a firm's DB plans (*PPLAO*/*PBPRO* in Compustat) is below 1 and 0 otherwise. We also note that freeze firms have significantly larger pension plans and thus greater anticipated savings on average, with

the projected pension benefit obligation equal to 20.1% of the firm's total assets in the year before the freeze, compared with 15.6% for the remaining firm years.

These summary statistics suggest that firms that freeze their pension plans have difficulties in meeting their pension funding requirements. Given the observed poor performance, top executives at those firms are expected to receive low compensation. However, we find that both salary payments and bonus payouts are significantly higher in the year before a pension freeze. For example, executives receive an average of 15.3% (a median of 23.2%) more pay in annual bonuses before a pension freeze.[15] To tell whether those firms pay excessive annual bonuses in anticipation of a pension freeze, we need to control for firm characteristics (e.g., size), because firms that freeze their DB plans are typically larger and may pay their talented managers more.[16]

3.2 Executive Annual Bonuses before Pension Freezes

In this subsection, we investigate potential manipulation of annual bonuses before a pension freeze with multivariate regression analysis. Using the empirical specification of Equation (1), we run panel regressions with Ln (1 + *Bonus*) in thousands of dollars as the dependent variable. Our main variable of interest is the anticipated pension freeze, *Pre Freeze*. Essentially, we are testing whether the level of executive annual bonuses is abnormally high in the year prior to a pension freeze.

[15] ExecuComp modified the definition of annual bonuses. The more comparable terms are the sum of *BONUS* and *LTIP* before December 15, 2006 and the sum of *BONUS* and *NONEQ_INCENT* afterwards. Given that *LTIP* is not included in the pension benefit calculation for 96% of DB plans (Sundaram and Yermack, 2007), we use *BONUS* before December 15, 2006 in our bonus boost analysis. Table T2 in the Online Appendix (column 2) shows that including *LTIP* in bonuses introduces noise; it does not change our conclusion of bonus boosts before freezes.

[16] Table T1 in the Online Appendix includes the correlation matrix among key variables used in our regression analyses. *Pre Freeze* is positively correlated with executive annual bonuses, base salary, firm sales, total assets, negative net income, and (industry) cash flow volatility, and it is negatively correlated with ROA, lagged ROA, net income increase, stock returns, return volatility, M/B, and leverage. In addition, we find that the pension freeze dummy is positively correlated with the underfunded status of the pension plan and the relative size of pension obligations. Note that the correlation between the pension freeze dummy and equity awards is not statistically significant.

We report the results of the estimation in Table 2. Columns 1 and 2 include all ExecuComp firms offering DB plans, while columns 3 and 4 include only those that froze their DB plans over our sample period. Using the subsample of firms that froze their DB plans allows us to compare executive bonus levels around the freeze event conditional on the freeze decision. We further address potential endogeneity problems in Sections 3.2.1 and 3.2.2. Columns 1 and 3 include (two-digit SIC) industry-year fixed effects, and columns 2 and 4 include year fixed effects and firm fixed effects.

The coefficient estimate of *Pre Freeze* is positive and statistically significant in all regressions. The results are stronger for the subsample of firms that froze their pension plans between 2000 and 2013. For example, under model (4), which includes year fixed effects and firm fixed effects, we find that firms, on average, award their top executives 25.8% more in annual bonuses in the year prior to a pension freeze after controlling for other determinants of annual bonuses. The coefficient estimate is statistically significant at the 1% level.[17]

Control variables have the expected signs. For example, executive bonuses are highly and positively correlated with salaries because annual bonuses are often expressed as a percentage of base salary. Economically, for an increase of 1% in base salary, annual bonuses increase by 1.1%. Bonuses increase with current-year *ROA*, *Income Increase*, and current- and previous-year stock *Return*, and they decrease with *Negative Income*, *Return Volatility*, and *M/B*.[18]

[17] It is possible that greater bonus awards are not limited to the year prior to the pension freeze. If pension benefits are calculated based on the values of base salary and annual bonuses over the final three years, for example, top executives have incentives to boost their bonuses in years leading up to the pension freeze. However, the freeze decision is more uncertain well before the freeze year. We examine annual bonuses awarded from three years before to two years after the freeze. We find significant boosts in annual bonuses only one year before the freeze.

[18] In column 3, the CEO dummy is negative and statistically significant. This sign may appear counterintuitive. Note that salary is included as an independent variable in the regression and CEOs tend to receive greater salary payment than other NEOs. The loading of the CEO dummy is 0.725 and significant (at the 1% level) if we omit salary from the right hand side of the regression.

Using the median value of each measure for CEOs in our sample, we estimate that a boost of 0.258 in Ln (1+ *Bonus*) before pension freezes increases the total amount of compensation by $0.53 million, of which about half is due to the increase in the bonus payout and another half is the resulting increase in the present value of pension benefits. In addition, we estimate that boosts in annual bonuses allow executives to preserve 88% of the pension value that they would have received in the absence of the freeze (and in the absence of any manipulation).[19] Given that our calculation leaves out alternative pensions awarded to top executives after the freeze of DB plans (e.g., 401(k) plans), we likely underestimate the retained portion of top executives' pension benefits.

In robustness tests reported in Table T2 in the Online Appendix, we find no boosts in base salary before pension freezes (column 1). If we use the sum of *BONUS* and the long-term incentive payout (*LTIP*) to measure annual bonuses prior to December 15, 2006, which makes bonus measures more comparable before and after the change in the SEC's reporting requirement, we obtain a slightly weaker result (column 2). This is not surprising because only about 4% of DB plans consider *LTIP* as covered compensation in their benefit formula (Sundaram and Yermack, 2007). Thus, the *LTIP* portion adds noises to the test on bonus boosts for pension purposes.

[19] Suppose a benefit factor of 0.02, a nominal discount rate of 5.5%, three-year averaging of covered compensation, a retirement age of 65, current salary of $902,670, and bonus of $901,000 (sample medians). Further, suppose that one year before the freeze, a CEO is 56 years old, has 21 years of service, and Ln (1+ *Bonus*) of 6.805. An increase of 0.258 in Ln (1 + *Bonus*) corresponds to $265,493 ($= (e^{7.063} - e^{6.085}) \times 1000$), which in turn increases the annuity of pension benefits by $37,169 (= 0.02 × 21 × 265,493 / 3). Using a PV factor of 7.17 (which takes into account the official mortality rates, by age), this increases the present value of pensions in the year before the freeze by $267,663. Thus, the total amount of compensation increase is $532,156 (= 265,493 + 267,663) valued one year prior to the freeze. Assume that salary and bonus grow at 4% per year for the CEO (in the absence of any manipulation) and that the CEO leaves the firm three years after the pension freeze (sample median, four years between departure and the pre freeze year). We estimate that the freeze would have reduced the present value of benefits by 19% had the bonus boost not occurred. Bonus boosts and the resulting increases in pension value recover about 40% of the loss. The resulting ratio of the present value of pension benefits after freeze and bonus boost to that in the absence of the freeze is 88%.

We next examine how management boosts bonus payouts before pension freezes. It may be surprising to find that executives have the ability to alter their annual bonuses before pension freezes because bonus payouts are generally determined based on a performance metric specified in the annual incentive plans, which were determined at the beginning of the year. However, an important component of annual bonuses is discretionary and is therefore at the latitude of the board. ExecuComp has started to record discretionary bonuses in *BONUS* since December 15, 2006. We find that discretionary bonuses increase by 46% before pension freezes, much larger than the increases in annual incentive pay, suggesting a possible channel of boosting annual bonuses for pension-related purposes through discretionary bonus awards (columns 3 and 4).[20]

One potential concern is that pension freezes and bonus award decisions are endogenously determined; that is, firms that freeze their pension plans may differ systematically from those that do not, and these differences may lead to the observed difference in bonus awards. Note that models (3) and (4) include only firms that chose to freeze their pension plans. In addition, our results hold in specifications with year fixed effects and firm fixed effects (models (2) and (4)); thus time trends as well as time-invariant, firm-specific characteristics that may affect annual bonus awards have already been taken into account. Moreover, in untabulated tests using executive fixed effects to replace firm fixed effects in models (2) and (4), we find slightly stronger results: the coefficient of *Pre Freeze* becomes 0.234 and 0.268, respectively.

[20] The bonus boost results are similar if we keep only one pension freeze per firm, either the earliest freeze or the freeze of the largest DB plan. We further examine whether freezing SERPs (along with qualified plans) provides stronger incentives for management to boost annual bonuses. In our sample, 94 out 251 plan freezes are accompanied by SERP freezes. We add an indicator of *SERP Freeze* and *SERP Freeze* × *Pre Freeze* into Equation (1). Under specifications (2) and (4) of Table 2, the coefficient estimates of *Pre Freeze* are 0.24 and 0.26, and they are statistically significant at the 5% level. The coefficient estimates of *SERP Freeze* × *Pre Freeze* are -0.06 and -0.008, but not statistically different from zero (untabulated).

To further address endogeneity concerns, we use the PSM approach to identify control firms that had a similar propensity to freeze their DB plans that year but did not do so. We then examine the effect of pension freezes on bonus awards among freeze firms and their matching counterparts.

3.2.1 Propensity Score Matching Model

To predict the likelihood of a pension freeze, we include cash flow volatility in addition to size, accounting and stock performance, market-to-book ratio, and leverage as independent variables because Petersen (1994) shows that firms with more volatile cash flows are less likely to retain DB plans. Cash flow volatility is calculated using annual data over the past 10 years. We use the median level of firms in the same industry (two-digit SIC code) in the year prior to the freeze. As the previous literature shows that the underfunding level is an important determinant of the freeze decision, we further include the *Underfunded* indicator and the overall funding ratio of a firm's DB plans (Comprix and Muller, 2011). Lastly, we include *Relative Pension Size* as a predictor of the freeze because firms with large pension plans are more likely to see a bigger effect of a pension freeze on cash flows (Munnell and Soto, 2007). We include year fixed effects and industry fixed effects to control for potential freeze waves and industry characteristics omitted in the specification that may affect the freeze decision. Standard errors are clustered at the firm level.

Panel A in Table 3 reports the regression result of the first-stage probit model. The dependent variable is 1 if a firm will freeze its DB plan the following year and 0 otherwise. Cash flow volatility and the underfunded status have the expected positive sign, but their coefficient estimates are not statistically significant. The coefficient of the *Relative Pension Size* is positive and statistically significant at the 1% level. Moreover, we find that large firms and poorly

performing firms are more likely to freeze their DB plans, consistent with Munnell and Soto (2007) and Rauh, Stefanescu, and Zeldes (2015).

We match within year and two-digit SIC industry and do not allow replacement in the matching process. For each freeze event, we find a firm not freezing its DB plan that year and has the nearest propensity score, which is within a caliper of 0.25 times the standard deviation of the estimated propensity scores (approximately 0.6%). We are able to generate 214 matched pairs for the 251 freeze events, corresponding to 1,293 executive-years for the treated (freeze) group and 1,269 executive-years for the control group. Panels C and D show that treatment and control firms are comparable in all factors that affect pension freezes. The *t*-test and median test reported in Panel E show that executive bonuses at freeze firms prior to their plan freezes are larger than those at matched firms by 30.7% (*p*-value = 0.001) and 7.1% (*p*-value = 0.165), respectively. Using this matched sample, we run a multivariate regression of annual bonuses on the pension freeze indicator, *Pre Freeze*, and all control variables used in Table 2. As shown in Panel B of Table 3, the coefficient of *Pre Freeze* is 0.322 for the specification with year fixed effects and industry fixed effects and 0.333 for that with industry-year fixed effects; both are statistically significant at the 5% level.[21] These results confirm our findings under the OLS, or ordinary least squares, specifications that firms tend to boost executive bonuses prior to pension freezes.

An alternative explanation for our bonus boost finding is that perhaps executives always want to increase their own compensation, and that the observed boosts in annual bonuses prior to a pension freeze could be driven by some unobservable factors that are not captured by the fixed-effect models or the PSM model. If this is indeed the case, we should observe similar boosts in

[21] Given that the mean and median of the propensity to freeze a DB plan are 3.8% and 3.2%, we also use calipers of 0.1% and 1% and obtain coefficient estimates of 0.421 (143 matched pairs, *p*-value = 0.008) and 0.305 (225 matched pairs, *p*-value = 0.019) for *Pre Freeze*, respectively.

other compensation components such as stock and options. In the next subsection, we test whether the anticipation of a pension freeze is associated with more generous equity awards.

3.2.2 Equity Awards before Pension Freezes

Equity awards are rarely included in the covered compensation for the calculation of pension benefits (94% of DB plans include annual bonuses, while only 4% of DB plans include equity awards in the definition of covered earnings; see Sundaram and Yermack, 2007). Even though firms may have other reasons (e.g., agency problems) to increase equity awards, we do not expect to observe boosts in equity awards prior to a pension freeze, because such boosts do not help increase executive pension benefits.

Our research design on equity awards is the same as the one used for examining bonus awards prior to a pension freeze. The regression results are presented in Table 4. Columns 1 and 2 include the sample of all firms with DB plans at some point between 2000 and 2013, while columns 3 and 4 focus on firms that froze their DB plans during this period. In contrast to our findings of boosts in annual bonuses, we find no evidence of boosts in equity awards in the year before a pension freeze. This result lends further support to the findings that annual bonuses are boosted to enhance pension benefits before plan freezes.

3.2.3 Effect of Corporate Governance on Bonus Boosts

Boosts in annual bonuses before pension freezes could be driven by either labor market competition or managerial entrenchment. To distinguish these hypotheses, we next examine how the strength of corporate governance affects the extent of bonus boosts before pension freezes. We construct an equal-weighted governance index using seven indicators based on board characteristics and ownership structure relative to the sample median: board size (-), fraction of independent directors (+), fraction of busy directors (-), fraction of co-opted directors (-),

CEO/chairman duality (-), outside directors' ownership (+), and institutional ownership (+).[22] A firm is defined as having strong governance if its governance index is greater than 4 (in the top quintile). We find that when corporate governance is not strong, top executives receive bonus boosts before pension freezes. In contrast, top executives at firms with strong governance actually receive reduced annual bonuses before pension freezes than in other years (see Table 5).[23] This result is consistent with the managerial entrenchment view.

3.3 Annual Bonuses before Executive Retirement

In this subsection, we examine whether firms increase annual bonuses before executive retirement. An executive may, for instance, influence his annual bonuses prior to a planned retirement but not before a forced departure. We follow the literature on CEO turnovers (Weisbach, 1988; Parrino, 1997; Kalyta, 2009) and use 60, 62, and 65 as proxies for retirement ages, which are also the three most popular retirement ages based on DB plan specifications, as described in Section 4.1. Anticipating retirement in the near future, an executive has an incentive to increase annual bonuses to boost pension benefits. We test this hypothesis on a subsample from 2000 to 2008, given the availability of departure data in ExecuComp, and contrast bonus payouts with equity awards.[24] The results of our analysis are presented in Table 6. We find an increase of 46–62% in annual bonuses for executives who are ready to retire, as reflected in the positive and significant coefficient estimates of the interactions of *Pre Depart* with all three proxies for retirement. Provided that the retirement condition is met, executives receive, on average, a boost

[22] For example, a board with fewer directors tends to monitor more effectively, thus board size contributes negatively to the governance strength index (Yermack, 1996).

[23] In an untabulated test, we find neither boosts nor reductions in executive annual bonuses before pension freezes at firms with governance index greater than 3 (corresponding to firms in the top half of governance strength).

[24] ExecuComp stopped collecting executive departures dates (*LEFTCO* and *RELEFT*) after 2009 as a result of inconsistency in reporting because this information was not required to be disclosed. *LEFTOFC* indicates the date on which a CEO left the corner office. We rule out NEOs who stay at the firm after leaving the CEO position by checking whether NEOs receive annual compensation after the date indicated by *LEFTOFC*.

in annual bonuses by 14.1 to 36.1% (= 0.587 – 0.226). We find no increases in equity awards before retirement. These findings are consistent with managerial incentives to boost annual bonuses before their pension benefits get capped, even though there could be other drivers for the increases in annual bonuses before executive retirement (Yermack 2006).[25]

Having shown that firms tend to boost annual bonuses before pension freezes and executive retirement, we next examine whether firms modify plan discount rates in anticipation of pension-related events. Comprix and Muller (2011) show that firms lower ERRs and plan discount rates before freezing their DB plans to exaggerate the economic burden. We next examine whether firms lower plan discount rates when their top executives are ready to retire and exercise the option to take out pension benefits in a lump sum.

4. Discount Rate Manipulation at Executive Retirement

4.1 Data and Univariate Analysis

Information on plan discount rates, the lump-sum distribution option, and retirement conditions are extracted from the proxy statement (DEF-14A, in the section of *Retirement Benefits* or *Pension Benefits*) for most firms, and from 10-K(/A) filings for some small firms. The number of accredited service years and the present value of pension benefits are contained in the pension benefits table of ExecuComp. All of these data items are available starting on December 15, 2006, when the SEC enhanced disclosure requirements. Thus, our sample for the discount rate examination is constructed over the period from fiscal year 2006 to 2013.

[25] Boosts in annual bonuses before executive retirement could be driven by other factors such as severance pay. The severance pay data are available in ExecuComp starting only in December 2006, and our data on executive departures end in May 2009, which allows us to study bonus boosts in the presence of severance pay only during the period from December 2006 to May 2008. For this subsample, we find that bonus payouts before retirement are significantly greater when severance pay exists. In addition, we find that bonuses increase by 17% before retirement (defined based on a retirement age of 65) using a model with year fixed effects and firm fixed effects. However, such boosts are not statistically different from zero at a conventional level, regardless of whether the indicator of severance pay is included.

Out of the 5,563 firm-year observations (corresponding to 873 unique firms) that have information on retirement conditions and the lump-sum distribution option, 5,139 firm years have qualified plans and 4,988 have SERPs. In our sample, 2,820 firm years (corresponding to 480 unique firms) disclosed the discount rates of DB plans in the DEF-14A or 10-K(/A) filings. When discount rates of DB plans involving top executives are not disclosed (2,743 firm years, corresponding to 517 unique firms), we fill in the discount rate by the weighted-average discount rate over all DB plans of the firm listed in the 10-K filing (*PBARR* in Compustat). The discount rate for qualified plans has an average of 5.41% and a median of 5.6%, and the discount rate for SERPs has an average of 5.33% and a median of 5.5%.

Among the 873 unique firms in our sample, 64% allow for lump-sum distribution of pension benefits and 36% do not. For qualified plans, the discount rate for lump-sum distribution differs from that for annuity payments in 270 cases. As shown in Panel A of Table 7, the mean and median discount rates are 5.37% and 5.50% for lump-sum distribution and 5.48% and 5.75% for annuity payments. For SERPs, the discount rate for lump-sum distribution differs from that for annuity payments in 451 cases. The mean and median discount rates are 5.26% and 5.45% for lump-sum distribution and 5.45% and 5.70% for annuity payments. Plans allowing lump-sum distribution tend to have lower discount rates, and the average gap between the lump-sum and the annuity rates is larger for SERPs than for qualified plans.

Among firm years with DB plans, retirement at which all pension benefits can be paid out is defined based on a single age in 83% of the cases and based on a combination of age and service years in 13% of the cases. The remaining 4% of the observations have multiple retirement ages or age service year combinations applied to different plans or different executives. As shown in Panel B of Table 7, the most popular retirement ages are 65 (71.6% of observations), 62 (19.5%), and 60

(6.9%), with a minimum of 55, a maximum of 66, an average of 63.9, and a median of 65 years for qualified plans. For SERPs, the most popular retirement ages are 65 (62.1% of the sample), 62 (21.6%), and 60 (12.2%), with a minimum of 55, a maximum of 72, an average of 63.5, and a median of 65 years. Figure 2 shows the number of firms with any executive at or above the retirement age for pension purposes, by plan type and year.

We calculate the deviation of the discount rate of a DB plan from four benchmark rates: one pair of constructed rates and one pair of corporate bond rates (*Moody's AA Rate* and *CCBR*). The constructed rate is the weighted-average of the Treasury bond yield and one of the two corporate bond rates based on the transition schedule given in PPA 2006. We winsorize all continuous variables at the 1st and 99th percentiles and report the mean and median rate difference based on whether lump-sum distribution is allowed and whether any NEO meets the retirement condition of the DB plans during the year.

Panel C of Table 7 reports the results on plan discount rates in excess of each of the two constructed rates. The top panel shows discount rates deviations from the benchmark when *Retirement* = 1 and the bottom panel shows such deviation when *Retirement* = 0. When any top executive is ready to retire, the discount rates of qualified plans with a lump-sum distribution option are, on average, lower than those of plans without such an option by 19 to 20 bps. In contrast, when no executives satisfy the retirement condition, the discount rates of qualified plans allowing lump-sum distribution is lower than those not allowing it by 6 to 7 bps. The contrast is more prominent for SERPs. When any top executive is ready to retire, the discount rates when lump-sum distribution is allowed are lower than those when lump-sum distribution is not allowed by 28 to 29 bps. In contrast, when no executives satisfy the retirement condition, the discount rates for plans with a lump-sum distribution option are, on average, lower than those for plans without such

an option by 13 bps. Panel D of Table 7 reports the results on plan discount rates in excess of *Moody's AA Rate* and *CCBR*, respectively. We find that, again, plan discount rates are lower when at least one NEO is ready to retire with a lump-sum distribution option, and such a pattern is more prominent for SERPs.

Panel A of Figure 3 depicts the average discount rates for qualified plans and SERPs, two constructed benchmark rates, and the Treasury bond yield. The unusual pattern of the Treasury bond yield during the Great Recession due to a flight to safety affects the patterns of the two constructed rates. In contrast, as shown in Panel B of Figure 3, average discounts rates of DB plans generally lie between the CCBR and Moody's AA rates, with SERP rates located below qualified plan rates.

4.2 Regression Analysis

Using the regression model specified in Equation (2), we examine the discount rate of DB plans (qualified plans and SERPs) in excess of the benchmark rates based on whether there is executive retirement and whether lump-sum distribution is permitted. We expect to find lower discount rates of DB plans at firms with a lump-sum distribution when any NEO is ready to retire. We include year fixed effects and cluster standard errors at the firm level. Our regression results are presented in Table 8, of which Panel A uses constructed rates and Panel B uses corporate bond rates as the benchmarks. The coefficient estimate of the interaction term of *Lump Sum* and *Retirement* is negative and statistically significant in all eight specifications. Relative to cases in which lump-sum distribution is not permitted, firms with a lump-sum distribution option lower the discount rates of their qualified plans and SERPs by 13 to 14 bps on average when any NEO is ready to retire. Conditional on executive retirement, the discount rates of SERPs are, on average, lowered by 25 bps (= -0.109 – 0.14) when lump-sum distribution is permitted. In contrast, the

discount rates of qualified plans are lowered by 18 bps (= -0.037 – 0.141) when the lump-sum distribution option is available.

Our results are robust to various regression specifications. For example, we examine whether the lowering discount rates is concentrated in any particular year of our sample period and find no such evidence (see Table T3 in the Online Appendix). Moreover, if we use the benchmark rate as an independent variable in the plan discount rate regression, allowing its coefficient to differ from 1, we find a similar extent of discount rate manipulation when top executives are ready to retire with a lump-sum distribution (see Table T4 in the Online Appendix).[26] In the absence of year fixed effects, the coefficient estimates of the high-quality bond rates are very close to 1.

Having shown that the discount rates of DB plans are low relative to benchmark rates at firms with a lump-sum distribution option when executives are ready to retire, we next examine whether such incentive is stronger when the retiring executives have a larger pension value to take home in a lump sum. We measure pension value by the present value of total pension benefits (ExecuComp variable *PENSION_VALUE*) in the year prior to the executive retirement, and we scale it by the executive's base salary. If there are multiple retiring NEOs that year, we aggregate the pension values over all retiring executives. This measure takes into account the number of retiring executives and the size of their stakes.[27] We sort firms into three groups. The omitted group includes firms without retiring executives that year, which have the weakest incentive to lower the discount rates of their DB plans. Among firms with retiring executives, we divide them into the

[26] While the short time series of our discount rate data does not permit meaningful regressions with firm fixed effects, adding industry fixed effects does not change our conclusions (untabulated). Lastly, in a placebo test, we replace plan discount rates for top executives disclosed in DEF-14A by the weighted-average discount rate for all pension plans reported in 10-K (*PBARR* in Compustat), and we do not find manipulation of plan discount rates at executive retirement with a lump-sum distribution option (untabulated).

[27] Our results are robust if we simply use the maximum of the pension value among all retiring executives (untabulated).

top quintile (*Group 1*) and the remaining quintiles (*Group 2*) based on the amount of retiring executives' pension benefits.

Results presented in Table 9 show that the plan discount rate is on overage lower than the benchmark rate by 31 to 35 bps for firms with the strongest incentive to lower the discount rates (firm years in *Group 1*) and by 12 to 16 bps for firm years with some incentives to lower the discount rates (firm years in *Group 2*). Both are statistically different from the omitted group that has no executive retirement. The differences between groups 1 and 2 are statistically significant at the 10% level for SERPs.[28]

Economically, using the sample average of the present value of DB plans of top executives in the year prior to their retirement (about $7.7 million) and a retirement age of 65, lowering the discount rate by 35 bps from 5.5% to 5.15% corresponds to an increase in the value of the lump-sum distribution of pension benefits by $215,990 for male executives and $358,240 for female executives based on the mortality tables by gender. The lowered plan discount rate, compounded by bonus boosts before retirement, could make the lump-sum distribution to retiring executives substantially more valuable.

The above findings of downward biased plan discount rates in years in which top executives are ready to retire and cash out pension benefits could be driven by two factors. First, the management acts opportunistically to lower plan discount rates in order to award retiring executives more generous packages. Second, executives who meet plan retirement conditions

[28] There are 496 firm years in our sample that have only qualified plans, which makes the size of the pension benefits of their top executives small relative to that of cases with SERPs, given that our pension size measure is the aggregated value over all plans. However, incentives to reduce the discount rates of qualified plans when executives retire with a lump-sum distribution in these cases can be strong because the size of their qualified plans may be large relative to that of other executives' qualified plans. If we leave out these 496 observations, the manipulation of qualified plan discount rates in *Group 2* is much smaller than that in *Group 1*, and the difference between the two groups is statistically significant at the 10% (5%) level for the specifications using the constructed benchmark rates (corporate bond rates).

choose to retire in years in which plan discount rates are low. Note that if the executives time their retirement, they should pay attention to plan discount rates themselves (= deviation of plan discount rates from benchmark rates + benchmark rates) instead of the deviation of plan discount rates from the benchmarks. Moreover, *retirement* in our regression analysis is defined ex ante; that is, when at least one NEO meets the retirement condition specified in the DB plan, regardless of whether any executive actually leaves the firm that year.[29]

To further distinguish these two possibilities, we examine how corporate governance affects the extent of plan discount rate reductions when executives are ready to retire with a lump-sum distribution. If the agency problem hypothesis is true, we are less likely to observe such opportunistic behavior at firms with strong governance. In contrast, under the retirement timing hypothesis, we do not expect the extent of plan discount rate reductions to vary with the strength of corporate governance. Using the governance index described in Section 3.2.3, we find that firms ranked in the top quintile of governance strength (governance index > 4) do not lower plan discount rates when their top executives retire with lump-sum distribution option (Panels A and C of Table 10) but firms with weak corporate governance do (Panels B and D of Table 10). This evidence is consistent with the agency problem interpretation of our findings.

5. Conclusion

While pensions are an integral part of executive compensation contracts, until recently, they had received little attention. Sundaram and Yermack (2007) are among the very few to estimate the actuarial value of CEO pensions, and they showed that pensions constitute a

[29] In untabulated tests, we examine the effect of (ex-post) executive retirement on plan discount rates when a lump-sum distribution of benefits is permitted and reach the same conclusion. We find that the extent of discount rate manipulation for SERPs is noticeably greater than that for qualified plans. In addition, results on discount rate manipulation at ex-post retirement are slightly weaker than those reported in Tables 8 and stronger than those reported in Table 9.

significant component of overall compensation for many CEOs. This paper echoes their intuition and provides evidence that managers boost annual bonuses in anticipation of pension freezes and executive retirement, and lower plan discount rates when executives are ready to retire with a lump-sum distribution option. We believe that hiding true executive compensation costs from investors suggests an agency problem.

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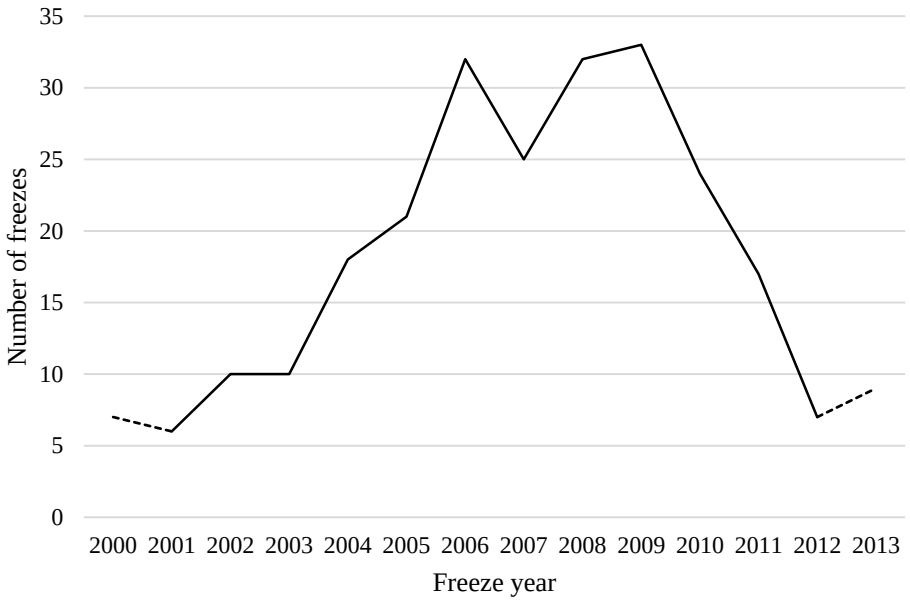
Figure 1: Distribution of Defined Benefit (DB) Plan Freezes

This figure in Panel A depicts the number of *hard freezes* of defined benefit plans over the period from 2000 to 2013. The dashed lines reflect potentially incomplete observations. Plan administrators are required to report plans that are *hard frozen* in Form 5500 filings after 2002. However, these disclosures often have a delay over two years. The distribution of hard freezes shown in the figure is extracted by reading plan descriptions from the attachments to Form 5500, as plan administrators often disclose the *hard freeze* with an additional delay. Panel B reports the distribution of firms that froze their DB plans by industry.

Panel A. Distribution of DB plan freezes by year



Panel B. Distribution of firms that froze DB plans by industry

Industry	No. of firms that hard froze DB plans	No. of firms in the sample	Percentage
Consumer Durables	12	41	29.27%
Other	27	94	28.72%
Shops	18	78	23.08%
Manufacturing	47	213	22.07%
Business Equipment	16	77	20.78%
Money	37	191	19.37%
Health	8	49	16.33%
Telecommunication	6	38	15.79%
Chemicals and Allied Products	9	60	15.00%
Energy	7	53	13.21%
Consumer Nondurables	13	103	12.62%
Utilities	7	87	8.05%

Figure 2: Distribution of Executive Retirement

This figure depicts the distribution of *Retirement* over the period from 2006 to 2013. *Retirement* is identified if any top executive of a firm meets the retirement condition at which 100% of pension benefits can be paid out in a fiscal year under the specification of qualified plans and SERPs, respectively.

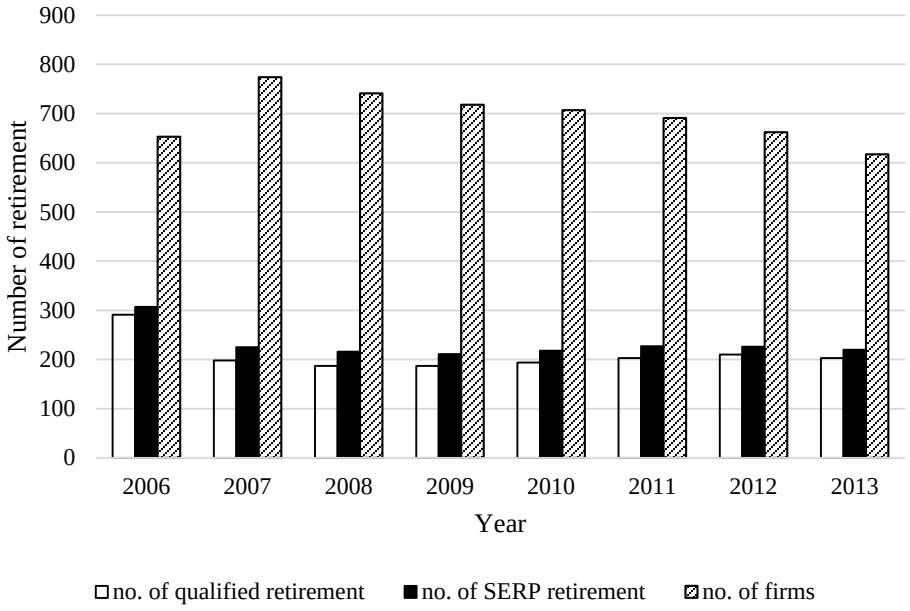
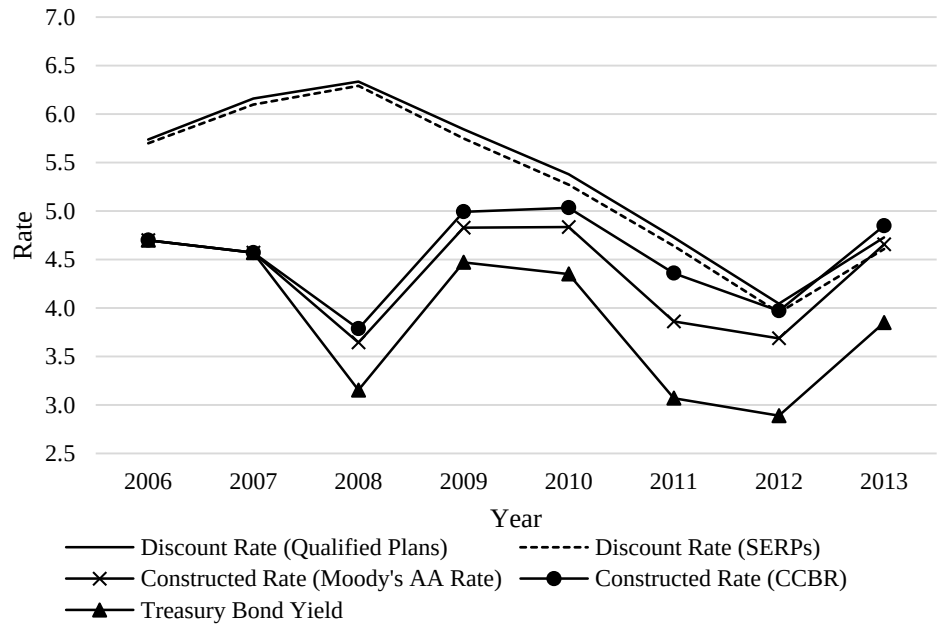


Figure 3: Plan Discount Rates vs. Benchmark Rates

This figure depicts the comparison of average plan discount rates with benchmark rates during 2006–2013. In Panel A, we use the constructed rates as benchmark rates, which is a weighted-average rate using each of two high-quality bond rates (*Moody's AA Rate and CCBR*) and the 30-year Treasury bond yield based on the transition schedule given in PPA 2006. The trend of the Treasury bond yield is also depicted in Panel A. In Panel B, we use *Moody's AA Rate and CCBR* as benchmark rates.

Panel A. Plan discount rates vs. constructed rates and Treasury bond yield



Panel B. Plan discount rates vs. high-quality bond rates

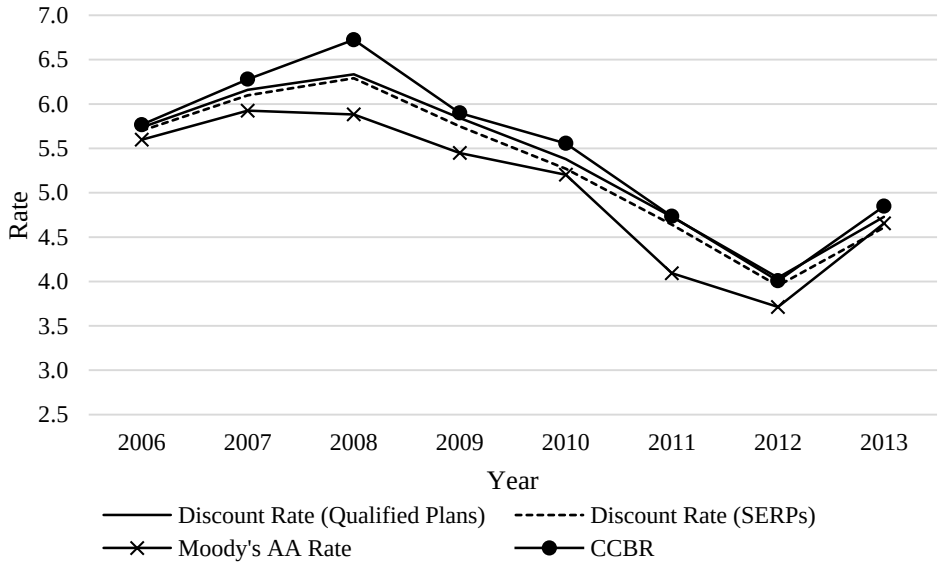


Table 1: Summary Statistics

Pre Freeze is a dummy variable equal to 1 if the firm freezes its DB pension plan in the next fiscal year and 0 otherwise. *Bonus*, *Equity*, and *Salary* are executive compensation variables (in thousands of dollars) extracted from ExecuComp at the executive level. To handle cases when *Bonus*, *Equity*, and *Salary* are equal to 0, we calculate and report the natural logarithmic transformation of (1 + *Bonus*), (1 + *Equity*), and (1 + *Salary*), respectively. *Sales (ln) lag* is the natural logarithmic transformation of lagged *Sales*. *ROA* is the ratio of net income to total assets. *Negative Income* equals 1 if the firm's net income is negative and 0 otherwise. *Income Increase* equals 1 if the firm's net income increases from last year and 0 otherwise. *Return* is the stock return (including distribution and reinvestment) during the current fiscal year. *Return Volatility* is the volatility of monthly stock returns over the current fiscal year. *M/B* is the ratio of the market value of common equity to the book value of common equity. *Leverage* is the ratio of the sum of long- and short-term debt to total assets. *Total Assets (ln) lag* is the natural logarithmic transformation of lagged total assets. *Cash Flow Volatility* is the median value of cash flow volatility for firms in the same two-digit SIC industry, while firm cash flow volatility is the standard deviation of a firm's cash flow (scaled by total assets) in the previous 10 years. *Funding%* is the ratio of the company's overall pension assets to pension obligations (Compustat items: *PPLAO*/*PBPRO*), and *Underfunded* is a dummy variable that equals 1 if *Funding%* is less than 100% and 0 otherwise. *Relative Pension Size* is the ratio of the projected pension benefit obligation to total assets.

	Pre Freeze = 1			Pre Freeze = 0			Mean	*t*-test	Median	Median Test
	N	Mean	Median	*N*	Mean	Median	Diff	*p*-value	Diff	*p*-value
Bonus (ln)	1,505	5.201	5.860	60,326	5.049	5.628	0.153	0.011	0.232	0.000
Equity (ln)	1,472	5.441	6.278	59,100	5.382	6.218	0.059	0.433	0.060	0.267
Salary (ln)	1,505	6.099	6.111	60,326	6.021	6.014	0.078	0.000	0.097	0.000
Sales (ln) lag	1,505	8.369	8.264	60,326	8.011	7.896	0.358	0.000	0.368	0.000
ROA	1,505	0.023	0.028	60,326	0.038	0.036	-0.016	0.000	-0.008	0.000
ROA lag	1,505	0.030	0.034	60,326	0.041	0.037	-0.010	0.000	-0.002	0.081
Negative Income	1,505	0.202	0.000	60,326	0.146	0.000	0.056	0.000	0.000	0.000
Income Increase	1,505	0.542	1.000	60,326	0.600	1.000	-0.057	0.000	0.000	.
Return	1,505	0.051	0.032	60,326	0.103	0.084	-0.052	0.000	-0.052	0.001
Return lag	1,505	0.080	0.027	60,326	0.100	0.071	-0.020	0.054	-0.044	0.000
Return Volatility	1,505	0.110	0.088	60,326	0.100	0.087	0.009	0.000	0.000	0.810
M/B	1,505	2.297	1.884	60,326	2.618	1.917	-0.321	0.000	-0.034	0.588
Leverage	1,505	0.260	0.235	60,326	0.265	0.254	-0.005	0.208	-0.019	0.000
Total Assets (ln) lag	1,505	8.784	8.573	60,326	8.456	8.318	0.328	0.000	0.255	0.000
Cash Flow Volatility	1,505	0.039	0.036	60,326	0.037	0.036	0.002	0.001	0.001	0.035
Underfunded	1,505	0.832	1.000	59,854	0.785	1.000	0.047	0.000	0.000	.
Funding%	1,505	0.830	0.819	59,854	0.855	0.823	-0.025	0.000	-0.004	0.420
Relative Pension Size	1,505	0.201	0.124	60,326	0.156	0.099	0.045	0.000	0.025	0.007

Table 2: Executive Annual Bonuses before Pension Freezes

This table reports the results of regressing executive bonuses on a forthcoming pension freeze and other firm and executive characteristics. We estimate the following OLS regression:

$$Bonus_{ijt} = \alpha + \beta_1 \times Pre\ Freeze_{it} + \gamma_1 \times Salary_{ijt} + \gamma_2 \times X_{i,t\ or\ t-1} + \eta_t + \mu_i + \varepsilon_{ijt}.$$

Pre Freeze is 1 if the firm is freezing its pension plans the following fiscal year and 0 otherwise. Because of zero salary and bonus payouts for some cases, we add 1 (in thousands of dollars) and take the natural logarithmic transformation of (1 + *Bonus*) and (1 + *Salary*). The remaining variables are defined in the Appendix. Columns 1 and 2 report the regression results for all firms with DB pensions while columns 3 and 4 restrict the sample to firms that implemented pension freezes during our sample period. We control for industry-year fixed effects in columns 1 and 3; and we control for year fixed effects and firm fixed effects in columns 2 and 4. Robust standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	All Firms with Defined Benefit Pension Plans		Firms that Froze Defined Benefit Pension Plans	
Dependent variable: Bonus (ln)	(1)	(2)	(3)	(4)
Pre Freeze	0.167*	0.219**	0.218**	0.258***
	(0.093)	(0.090)	(0.103)	(0.091)
Salary (ln)	1.157***	1.097***	1.295***	1.095***
	(0.057)	(0.051)	(0.109)	(0.107)
Sales (ln) lag	0.261***	0.053	0.252***	-0.159
	(0.025)	(0.075)	(0.048)	(0.129)
ROA	2.062***	1.790***	2.636**	3.019***
	(0.484)	(0.541)	(1.091)	(1.010)
ROA lag	0.273	0.660*	-0.164	0.373
	(0.380)	(0.383)	(0.858)	(0.752)
Negative Income	-0.466***	-0.481***	-0.440***	-0.401***
	(0.086)	(0.086)	(0.156)	(0.152)
Income Increase	0.437***	0.529***	0.325***	0.458***
	(0.043)	(0.042)	(0.092)	(0.089)
Return	1.055***	0.951***	1.113***	0.952***
	(0.057)	(0.053)	(0.113)	(0.103)
Return lag	0.467***	0.450***	0.535***	0.483***
	(0.048)	(0.049)	(0.089)	(0.094)
Return Volatility	-3.166***	-3.519***	-4.409***	-4.624***
	(0.580)	(0.558)	(1.110)	(1.130)
M/B	0.002	-0.019***	0.004	-0.023**
	(0.007)	(0.006)	(0.013)	(0.012)
Leverage	0.274	-0.440*	0.461	-0.317
	(0.193)	(0.259)	(0.419)	(0.533)
CEO Dummy	-0.020	0.020	-0.224**	-0.071
	(0.049)	(0.046)	(0.093)	(0.093)
Constant	-4.201***	-2.002***	-4.906***	0.012
	(0.318)	(0.601)	(0.545)	(1.074)
Industry-Year Fixed Effects	Yes	No	Yes	No
Year Fixed Effects	No	Yes	No	Yes
Firm Fixed Effects	No	Yes	No	Yes
Observations	61,831	61,831	16,845	16,845
Adjusted R-squared	0.362	0.439	0.426	0.424

Table 3: Propensity Score Matching Model

This table reports the results of a propensity score matching model for firms that choose to freeze pensions versus firms that do not. The caliper is 0.25 times the standard deviation of estimated propensity scores (approximately 0.6%). Panel A reports the first-stage probit model that estimates the propensity to freeze a DB plan based on various firm-level characteristics. We control for year fixed effects and industry fixed effects. Panel B reports the second stage regression of baseline specification on treatment and control groups. We control for year fixed effects and industry fixed effects in column 1; and industry-year fixed effects in column 2. We report the distribution of propensity scores for treatment and control firms in Panel C, the univariate comparisons between treatment and control groups on the mean and median of independent variables in the first-stage regression in Panel D, and those of bonuses in Panel E. All variables are described in the Appendix. Standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: First-stage probit model

Dependent variable: Pre Freeze	(1)
Total Assets (ln) lag	0.058***
	(0.022)
ROA	-0.869*
	(0.467)
ROA lag	-0.455
	(0.527)
Return	-0.057
	(0.087)
Return lag	0.002
	(0.085)
M/B	-0.009
	(0.010)
Leverage	-0.178
	(0.202)
Cash Flow Volatility	3.668
	(3.557)
Underfunded	0.032
	(0.109)
Funding%	-0.021
	(0.209)
Relative Pension Size	0.466***
	(0.129)
Constant	-2.413***
	(0.543)
Year Fixed Effects	Yes
Industry Fixed Effects	Yes
Observations	9,893
Pseudo R-squared	0.070

Panel B: Second-stage OLS regression

Dependent variable: Bonus (ln)	(1)	(2)
Pre Freeze	0.322**	0.333**
	(0.153)	(0.132)
Salary (ln)	1.277***	1.243***
	(0.181)	(0.179)
Sales (ln) lag	0.231***	0.284***
	(0.066)	(0.075)
ROA	5.892***	6.868***
	(2.234)	(2.407)
ROA lag	-3.644*	-3.821*
	(2.207)	(2.252)
Negative Income	-0.217	0.289
	(0.363)	(0.391)
Income Increase	0.458**	0.404*
	(0.198)	(0.237)
Return	1.504***	1.549***
	(0.259)	(0.295)
Return lag	0.378	0.431
	(0.293)	(0.298)
Return Volatility	-6.329**	-5.833**
	(2.553)	(2.362)
M/B	0.033	0.038
	(0.032)	(0.034)
Leverage	1.115*	1.272*
	(0.665)	(0.712)
CEO Dummy	-0.155	-0.147
	(0.155)	(0.152)
Constant	-2.607*	-4.551***
	(1.382)	(1.218)
Year Fixed Effects	Yes	No
Industry Fixed Effects	Yes	No
Industry-Year Fixed Effects	No	Yes
Observations	2,562	2,562
Adjusted R-squared	0.382	0.478

Table 3 (continued)

Panel C: Estimated propensity score distributions

Propensity Scores	*N*	p1	p5	Median	p95	p99	Mean	S.D.
Treatment	214	0.004	0.010	0.031	0.092	0.128	0.038	0.028
Control	214	0.004	0.009	0.032	0.093	0.128	0.038	0.027
Difference	.	0.000	0.000	-0.001	-0.001	0.000	0.000	0.000

Panel D: Differences in first stage regression variables between treatment firms and control firms

	Treatment			Control			Mean	*t*-test	Median	Median Test
	N	Mean	Median	*N*	Mean	Median	Diff	*p*-value	Diff	*p*-value
Total Assets (ln) lag	214	8.869	8.720	214	8.913	8.606	-0.044	0.807	0.113	0.699
ROA	214	0.033	0.032	214	0.031	0.034	0.003	0.674	-0.002	0.847
ROA lag	214	0.035	0.037	214	0.039	0.033	-0.004	0.450	0.004	0.439
Return	214	0.085	0.082	214	0.047	0.032	0.037	0.346	0.050	0.334
Return lag	214	0.096	0.040	214	0.097	0.054	-0.001	0.984	-0.014	0.562
M/B	214	2.256	1.919	214	2.698	1.966	-0.442	0.092	-0.047	0.847
Leverage	214	0.255	0.232	214	0.255	0.233	0.000	0.997	-0.001	1.000
Cash Flow Volatility	214	0.038	0.036	214	0.038	0.036	0.000	1.000	0.000	1.000
Underfunded	214	0.813	1.000	214	0.832	1.000	-0.019	0.614	0.000	.
Funding%	214	0.846	0.835	214	0.834	0.817	0.012	0.553	0.018	0.246
Relative Pension Size	214	0.177	0.097	214	0.171	0.082	0.006	0.769	0.015	0.439

Panel E: Differences in bonuses between executives at treatment firms and control firms

	Treatment			Control			Mean	*t*-test	Median	Median Test
	N	Mean	Median	*N*	Mean	Median	Diff	*p*-value	Diff	*p*-value
Bonus (ln)	1,293	5.296	5.886	1,269	4.989	5.815	0.307	0.001	0.071	0.165

Table 4: Equity Awards and Pension Freezes

This table reports the results of regressing executive equity awards on a forthcoming pension freeze and other firm and executive characteristics. We estimate the following OLS regression:

$$Equity_{ijt} = \alpha + \beta_1 \times Pre\ Freeze_{it} + \gamma_1 \times Salary_{ijt} + \gamma_2 \times X_{i,t\ or\ t-1} + \eta_t + \mu_i + \varepsilon_{ijt}.$$

The variable *Pre Freeze* is 1 in the current year if the firm is freezing its pension plans the following fiscal year and 0 otherwise. The remaining variables are defined in the Appendix. Columns 1 and 2 report the regression results for all firms with DB pensions while columns 3 and 4 restrict the sample to firms that implemented pension freezes during our sample. We control for industry-year fixed effects in columns 1 and 3; and we control for year fixed effects and firm fixed effects in columns 2 and 4. Robust standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	All Firms with Defined Benefit Pension Plans		Firms that Froze Defined Benefit Pension Plans	
Dependent variable: Equity (ln)	(1)	(2)	(3)	(4)
Pre Freeze	-0.189	-0.149	-0.224*	-0.146
	(0.132)	(0.111)	(0.128)	(0.110)
Salary (ln)	1.439***	1.532***	1.282***	1.348***
	(0.066)	(0.058)	(0.119)	(0.102)
Sales (ln) lag	0.367***	0.226***	0.390***	0.184
	(0.031)	(0.077)	(0.053)	(0.150)
ROA	1.086*	0.552	-0.110	-0.254
	(0.588)	(0.545)	(1.179)	(0.971)
ROA lag	1.535***	0.878*	2.628***	2.100**
	(0.479)	(0.467)	(0.908)	(0.939)
Negative Income	0.061	0.030	0.243	0.145
	(0.087)	(0.073)	(0.191)	(0.125)
Income Increase	0.046	0.054	0.216**	0.219***
	(0.048)	(0.041)	(0.095)	(0.084)
Return	0.106*	0.159***	0.268**	0.224**
	(0.064)	(0.055)	(0.117)	(0.091)
Return lag	0.083	0.186***	0.165	0.228**
	(0.060)	(0.051)	(0.114)	(0.097)
Return Volatility	-1.473**	-2.183***	-0.813	-2.690***
	(0.632)	(0.521)	(1.083)	(0.913)
M/B	0.041***	0.021**	0.024	0.018*
	(0.010)	(0.009)	(0.017)	(0.011)
Leverage	-0.186	-0.407	-0.725	-0.359
	(0.246)	(0.338)	(0.484)	(0.579)
CEO Dummy	0.407***	0.326***	0.534***	0.492***
	(0.057)	(0.052)	(0.108)	(0.098)
Constant	-6.376***	-5.954***	-5.668***	-4.560***
	(0.331)	(0.669)	(0.614)	(1.317)
Industry-Year Fixed Effects	Yes	No	Yes	No
Year Fixed Effects	No	Yes	No	Yes
Firm Fixed Effects	No	Yes	No	Yes
Observations	60,572	60,572	16,526	16,526
Adjusted R-squared	0.285	0.393	0.304	0.359

Table 5: Annual Bonuses before Pension Freezes: Effect of Governance

This table reports the results of regressing executive bonuses on a forthcoming pension freeze, strength of governance, their interaction term and other firm and executive characteristics. We estimate the following OLS regression:

$$Bonus_{ijt} = \alpha + \beta_1 \times Pre\ Freeze_{it} + \beta_2 \times Strong\ Governance_{it} + \beta_3 \times Pre\ Freeze_{it} \times Strong\ Governance_{it} + \gamma_1 \times Salary_{ijt} + \gamma_2 \times X_{i,t\ or\ t-1} + \eta_t + \mu_i + \varepsilon_{ijt}.$$

Pre Freeze is 1 if the firm is freezing its pension plans the following fiscal year and 0 otherwise. *Strong Governance* is 1 if the governance index is greater than 4 (the top quintile). The remaining variables are defined in the Appendix. Columns 1 and 2 report the regression results for all firms with DB pensions while columns 3 and 4 restrict the sample to firms that implemented pension freezes during our sample period. We include industry-year fixed effects in columns 1 and 3, and year fixed effects and firm fixed effects in columns 2 and 4. Robust standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	All Firms with Defined Benefit Pension Plans		Firms that Froze Defined Benefit Pension Plans	
Dependent variable: Bonus (ln)	(1)	(2)	(3)	(4)
Pre Freeze	0.342***	0.397***	0.414***	0.424***
	(0.117)	(0.108)	(0.146)	(0.110)
Strong Governance	0.012	-0.055	-0.068	-0.052
	(0.069)	(0.064)	(0.150)	(0.123)
Pre Freeze × Strong Governance	-0.850**	-0.721**	-0.906***	-0.699**
	(0.331)	(0.292)	(0.334)	(0.303)
Salary (ln)	1.102***	1.058***	1.249***	1.091***
	(0.067)	(0.061)	(0.121)	(0.130)
Sales (ln) lag	0.281***	-0.032	0.248***	-0.279
	(0.031)	(0.109)	(0.059)	(0.182)
ROA	2.215***	2.519***	0.961	2.862**
	(0.596)	(0.641)	(1.417)	(1.290)
ROA lag	0.125	0.741	1.057	1.313
	(0.484)	(0.483)	(1.144)	(1.040)
Negative Income	-0.447***	-0.461***	-0.458**	-0.343*
	(0.110)	(0.112)	(0.194)	(0.186)
Income Increase	0.402***	0.498***	0.291**	0.436***
	(0.051)	(0.050)	(0.121)	(0.109)
Return	1.119***	0.954***	1.344***	1.044***
	(0.072)	(0.067)	(0.148)	(0.128)
Return lag	0.558***	0.522***	0.643***	0.600***
	(0.059)	(0.060)	(0.120)	(0.115)
Return Volatility	-3.154***	-4.374***	-4.405***	-4.692***
	(0.697)	(0.729)	(1.416)	(1.499)
M/B	-0.001	-0.021***	0.001	-0.028*
	(0.010)	(0.008)	(0.017)	(0.014)
Leverage	0.344	-0.286	0.244	0.422
	(0.236)	(0.298)	(0.576)	(0.676)
CEO Dummy	0.058	0.082	-0.121	-0.004
	(0.056)	(0.051)	(0.101)	(0.106)
Constant	-4.027***	-1.173	-4.474***	0.743
	(0.389)	(0.862)	(0.643)	(1.518)
Industry-Year Fixed Effects	Yes	No	Yes	No
Year Fixed Effects	No	Yes	No	Yes
Firm Fixed Effects	No	Yes	No	Yes
Observations	43,657	43,657	11,323	11,323
Adjusted R-squared	0.372	0.453	0.443	0.435

Table 6: Annual Bonuses before Executive Retirement

This table reports the results of regressing executive bonuses on a forthcoming pension freeze, retirement, and other firm and executive characteristics. We estimate the following OLS regression:

$$Bonus_{ijt} = \alpha + \beta_1 \times Pre\ Depart_{ijt} + \beta_2 \times Age\#^{+}{}_{ijt} + \beta_3 \times Pre\ Depart_{ijt} \times Age\#^{+}{}_{ijt}$$
$$+ \gamma_1 \times Salary_{ijt} + \gamma_2 \times X_{i,t\ or\ t-1} + \eta_t + \mu_i + \varepsilon_{ijt}.$$

Pre Depart is 1 if the executive is departing the following fiscal year and 0 otherwise, as recorded in ExecuComp (ExecuComp items: *LEFTCO*, *RELEFT*, and *LEFTOFC*). *Age#*$^{+}$ is 1 if the executive is approaching or exceeding the retirement age the following fiscal year and 0 otherwise. We use 60, 62 and 65 as the proxies for retirement ages. Because ExecuComp stopped updating data on executive departure after 2009, our sample period is 2000–2008. All control variables are the same as in Table 2. We use the sample of all firms with DB pensions and include year fixed effects and firm fixed effects. Robust standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Bonus (ln)			Equity (ln)		
	(1)	(2)	(3)	(4)	(5)	(6)
Pre Depart	-0.317***	-0.315***	-0.226***	-0.114	-0.130	-0.190***
	(0.080)	(0.071)	(0.063)	(0.091)	(0.082)	(0.073)
Age59^{+}	-0.287***			-0.400***		
	(0.035)			(0.050)		
Pre Depart × Age59^{+}	0.458***			-0.075		
	(0.108)			(0.136)		
Age61^{+}		-0.334***			-0.520***	
		(0.046)			(0.066)	
Pre Depart × Age61^{+}		0.615***			-0.023	
		(0.110)			(0.150)	
Age64^{+}			-0.459***			-0.880***
			(0.072)			(0.109)
Pre Depart × Age64^{+}			0.587***			0.320
			(0.141)			(0.205)
Salary (ln)	1.104***	1.099***	1.086***	1.649***	1.644***	1.631***
	(0.058)	(0.058)	(0.058)	(0.083)	(0.083)	(0.083)
Constant	-0.706	-0.663	-0.611	-5.487***	-5.444***	-5.413***
	(0.693)	(0.693)	(0.695)	(1.070)	(1.069)	(1.073)
Control Variables (as in Table 2)	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	32,171	32,171	32,171	31,712	31,712	31,712
Adjusted R-squared	0.474	0.474	0.474	0.383	0.383	0.384

Table 7: Univariate Analysis on Discount Rate and Executive Retirement

Discount rate (*r*) is the rate used for calculation of the present value of pension benefits under qualified plans and SERPs, respectively, as disclosed in firms' proxy statements or 10-K filings. *Retirement* is identified if any top executive of a firm meets the retirement condition in a fiscal year under qualified plans and SERPs, respectively. *Lump Sum* is a dummy variable equal to 1 if lump-sum distribution of pension benefits is permitted and 0 otherwise. Panel A describes discount rates of qualified plans and SERPs. Panel B reports age distribution of firm years with retirement defined based only on age. Panels C and D report the univariate analysis on the discount rate in excess of the benchmark rate based on whether there is executive retirement and whether lump-sum distribution is permitted. In Panel C, we construct a weighted-average benchmark rate using each of two high-quality bond rates (*Moody's AA Rate and CCBR*) and the 30-year Treasury bond yield based on the transition schedule given in PPA 2006. In Panel D, we use *Moody's AA Rate and CCBR* as benchmark rates.

Panel A: Discount rate of qualified plans and SERPs

	Lump Sum = 1			Lump Sum = 0			Total		
Discount Rate	*N*	Mean	Median	*N*	Mean	Median	*N*	Mean	Median
Qualified Plans	3,277	5.369	5.500	1,862	5.477	5.750	5,139	5.408	5.600
SERPs	3,241	5.264	5.450	1,747	5.454	5.700	4,988	5.331	5.500

Panel B: Retirement age distribution of firm years with retirement conditional only on age

Age	*N*	p1	p10	p25	Median	p75	p99	Mean	S.D.
Qualified Plans	4,263	55	62	62	65	65	65	63.93	1.89
SERPs	4,026	55	60	62	65	65	65	63.47	2.33

Panel C: Univariate analysis on plan discount rate in excess of constructed benchmark rate

		Lump Sum = 1			Lump Sum = 0			Mean	*t*-test	Median	Median Test
Retirement = 1		*N*	Mean	Median	*N*	Mean	Median	Diff	*p*-value	Diff	*p*-value
Qualified Plans	r − Moody's AA Rate	1,087	0.923	0.885	586	1.112	1.068	-0.189	0.000	-0.182	0.001
	r − CCBR	1,087	0.743	0.640	586	0.939	0.871	-0.196	0.000	-0.231	0.001
SERPs	r − Moody's AA Rate	1,222	0.830	0.797	628	1.109	1.068	-0.279	0.000	-0.271	0.000
	r − CCBR	1,222	0.647	0.533	628	0.940	0.903	-0.293	0.000	-0.370	0.000
Retirement = 0											
Qualified Plans	r − Moody's AA Rate	2,190	1.077	0.930	1,276	1.135	1.053	-0.058	0.082	-0.124	0.002
	r − CCBR	2,190	0.890	0.699	1,276	0.956	0.818	-0.066	0.060	-0.118	0.003
SERPs	r − Moody's AA Rate	2,019	0.973	0.870	1,119	1.100	1.028	-0.127	0.001	-0.158	0.000
	r − CCBR	2,019	0.787	0.611	1,119	0.921	0.773	-0.134	0.001	-0.162	0.000

Table 7 (continued)

Panel D: Univariate analysis on Plan discount rate in excess of corporate bond rate

		Lump Sum = 1			Lump Sum = 0			Mean	*t*-test	Median	Median Test
Retirement = 1		*N*	Mean	Median	*N*	Mean	Median	Diff	*p*-value	Diff	*p*-value
Qualified Plans	r − Moody's AA Rate	1,087	0.220	0.300	586	0.387	0.360	-0.167	0.000	-0.060	0.000
	r − CCBR	1,087	-0.176	-0.070	586	-0.008	0.015	-0.168	0.000	-0.085	0.000
SERPs	r − Moody's AA Rate	1,222	0.126	0.220	628	0.362	0.340	-0.237	0.000	-0.120	0.000
	r − CCBR	1,222	-0.276	-0.130	628	-0.034	0.000	-0.242	0.000	-0.130	0.000
Retirement = 0											
Qualified Plans	r − Moody's AA Rate	2,190	0.310	0.320	1,276	0.349	0.360	-0.039	0.040	-0.040	0.000
	r − CCBR	2,190	-0.120	-0.080	1,276	-0.084	-0.020	-0.036	0.049	-0.060	0.000
SERPs	r − Moody's AA Rate	2,019	0.203	0.290	1,119	0.314	0.340	-0.111	0.000	-0.050	0.000
	r − CCBR	2,019	-0.228	-0.130	1,119	-0.118	-0.045	-0.110	0.000	-0.085	0.000

Table 8: Discount Rate and Executive Retirement

The table reports the results of regressing the discount rate in excess of the benchmark rate on *Lump Sum*, *Retirement*, and their interaction term. We estimate the following OLS regression:

$$Discount\ rate_{it} - Benchmark\ rate_t = \alpha + \beta_1 \times Lump\ Sum_{it} + \beta_2 \times Retirement_{it} + \beta_3 \times Lump\ Sum_{it} \times Retirement_{it} + \eta_t + \varepsilon_{it.}$$

Retirement is identified if any top executive of the firm meets the retirement condition in a fiscal year under qualified plans and SERPs, respectively. *Lump sum* is 1 if lump-sum distribution of pension benefits is permitted and 0 otherwise. *Discount rate* (*r*) is the rate used for calculation of the present value of pension benefits under qualified plans and SERPs, respectively. In Panel A, we construct a weighted-average benchmark rate using each of two high-quality bond rates (*Moody's AA Rate and CCBR*) and the 30-year Treasury bond yield based on the transition schedule given in PPA 2006. In Panel B, we use *Moody's AA Rate* and *CCBR* as benchmark rates. Columns 1–2 report regressions under qualified plans, while columns 3–4 report regressions under SERPs. We include year fixed effects in all regressions. Robust standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Plan discount rate in excess of constructed benchmark rate

	Qualified Plans		SERPs	
	(1)	(2)	(3)	(4)
	r − Moody's AA Rate	r − CCBR	r − Moody's AA Rate	r − CCBR
Lump Sum	-0.037	-0.042	-0.109***	-0.114***
	(0.031)	(0.031)	(0.038)	(0.038)
Retirement	0.066**	0.064**	0.069**	0.068**
	(0.030)	(0.031)	(0.030)	(0.030)
Lump Sum × Retirement	-0.141***	-0.139***	-0.140***	-0.139***
	(0.046)	(0.046)	(0.053)	(0.054)
Constant	1.076***	1.080***	1.081***	1.084***
	(0.028)	(0.028)	(0.030)	(0.030)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	5,139	5,139	4,988	4,988
Adjusted R-squared	0.691	0.724	0.623	0.660

Panel B: Plan discount rate in excess of corporate bond rate

	Qualified Plans		SERPs	
	(1)	(2)	(3)	(4)
	r − Moody's AA Rate	r − CCBR	r − Moody's AA Rate	r − CCBR
Lump Sum	-0.037	-0.038	-0.110***	-0.111***
	(0.031)	(0.031)	(0.038)	(0.038)
Retirement	0.061**	0.057*	0.067**	0.066**
	(0.029)	(0.029)	(0.029)	(0.029)
Lump Sum × Retirement	-0.133***	-0.129***	-0.130**	-0.128**
	(0.045)	(0.045)	(0.053)	(0.053)
Constant	0.341***	-0.078***	0.308***	-0.112***
	(0.023)	(0.023)	(0.022)	(0.022)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	5,139	5,139	4,988	4,988
Adjusted R-squared	0.110	0.064	0.091	0.051

Table 9: Discount Rate and Executive Retirement: Effect of Pension Size

The table reports the results of regressing the discount rate in excess of the benchmark rate on *Lump Sum*, *Retirement*, and their interaction terms. We estimate the following OLS regression:

$$Discount\ rate_{it} - Benchmark\ rate_t = \alpha + \beta_1 \times Lump\ Sum_{it} + \beta_2 \times Group\ 1_{it} + \beta_3 \times Group\ 2_{it} + \beta_4 \times Lump\ Sum_{it} \times Group\ 1_{it} + \beta_5 \times Lump\ Sum_{it} \times Group\ 2_{it} + \eta_t + \varepsilon_{it.}$$

Retirement is identified if any top executive of the firm meets the retirement condition in a fiscal year under qualified plans and SERPs, respectively. Among firms with retiring executives, we assign them into two groups based on the size of the retiring executives' pension benefits each year in a descending order. *Group 1* consists of firms of which the retiring executives' pension size is in the top quintile, and *Group 2* consists of other firms with retiring executives that year. The omitted group consists of firms without retiring executives that year. Sample period starts in fiscal year 2007, because 2006 is the first year when data on the present value of pension benefits are available. *Lump sum* is 1 if lump-sum distribution of pension benefits is permitted and 0 otherwise. *Discount rate* (*r*) is the rate used for calculation of the present value of pension benefits under qualified plans and SERPs, respectively. In Panel A, we construct a weighted-average benchmark rate using each of two high-quality bond rates (*Moody's AA Rate and CCBR*) and the 30-year Treasury bond yield based on the transition schedule given in PPA 2006. In Panel B, we use *Moody's AA Rate and CCBR* as benchmark rates. Columns 1–2 report regressions under qualified plans, while columns 3–4 report regressions under SERPs. We include year fixed effects in all regressions. Robust standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 9 (continued)

Panel A: Plan discount rate in excess of constructed benchmark rate

	Qualified Plans		SERPs	
	(1)	(2)	(3)	(4)
	r − Moody's AA Rate	r − CCBR	r − Moody's AA Rate	r − CCBR
Lump Sum	-0.036	-0.041	-0.114***	-0.119***
	(0.033)	(0.033)	(0.040)	(0.040)
Group 1	0.191**	0.190**	0.256***	0.259***
	(0.085)	(0.083)	(0.091)	(0.092)
Group 2	0.089**	0.088**	0.076**	0.075**
	(0.037)	(0.038)	(0.035)	(0.035)
(a) Lump Sum × Group 1	-0.313***	-0.314***	-0.347***	-0.352***
	(0.121)	(0.120)	(0.122)	(0.123)
(b) Lump Sum × Group 2	-0.161***	-0.160***	-0.145**	-0.145**
	(0.057)	(0.058)	(0.064)	(0.064)
Constant	1.627***	1.631***	1.611***	1.614***
	(0.027)	(0.027)	(0.028)	(0.028)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	4,331	4,331	4,183	4,183
Adjusted R-squared	0.712	0.742	0.643	0.677
p-value of test on H_0: (a) = (b)	0.228	0.219	0.091	0.086

Panel B: Plan discount rate in excess of corporate bond rate

	Qualified Plans		SERPs	
	(1)	(2)	(3)	(4)
	r − Moody's AA Rate	r − CCBR	r − Moody's AA Rate	r − CCBR
Lump Sum	-0.036	-0.037	-0.115***	-0.116***
	(0.032)	(0.032)	(0.040)	(0.040)
Group 1	0.210**	0.208**	0.259***	0.241**
	(0.085)	(0.086)	(0.093)	(0.095)
Group 2	0.070**	0.058*	0.058*	0.051
	(0.036)	(0.035)	(0.034)	(0.034)
(a) Lump Sum × Group 1	-0.333***	-0.330***	-0.348***	-0.330***
	(0.121)	(0.122)	(0.124)	(0.125)
(b) Lump Sum × Group 2	-0.145***	-0.137**	-0.125**	-0.122*
	(0.056)	(0.055)	(0.063)	(0.063)
Constant	0.365***	-0.090***	0.331***	-0.124***
	(0.024)	(0.024)	(0.023)	(0.023)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	4,331	4,331	4,183	4,183
Adjusted R-squared	0.107	0.068	0.093	0.050
p-value of test on H_0: (a) = (b)	0.135	0.125	0.066	0.090

Table 10: Discount Rate and Executive Retirement: Effect of Governance

The table reports the results of regressing the discount rate in excess of the benchmark rate on *Lump Sum*, *Retirement*, and their interaction terms. We estimate the following OLS regression:

$$Discount\ rate_{it} - Benchmark\ rate_t = \alpha + \beta_1 \times Lump\ Sum_{it} + \beta_2 \times Retirement_{it} + \beta_3 \times Lump\ Sum_{it} \times Retirement_{it} + \eta_t + \varepsilon_{it.}$$

Retirement is identified if any top executive of the firm meets the retirement condition in a fiscal year under qualified plans and SERPs, respectively. *Lump sum* is 1 if lump-sum distribution of pension benefits is permitted and 0 otherwise. *Strong Governance* is 1 if the governance index is greater than 4 (the top quintile). *Discount rate* is the rate used for calculation of the present value of pension benefits under qualified plans and SERPs, respectively. In Panel A, we construct a weighted-average benchmark rate using each of two high-quality bond rates (*Moody's AA Rate and CCBR*) and the 30-year Treasury bond yield based on the transition schedule given in PPA 2006. In Panel B, we use *Moody's AA Rate and CCBR* as benchmark rates. Columns 1–2 report regressions under qualified plans, while columns 3–4 report regressions under SERPs. We include year fixed effects in all regressions. Robust standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Plan discount rate in excess of constructed benchmark rate, subsample of *Strong Governance* = 1

	Qualified Plans		SERPs	
	(1)	(2)	(3)	(4)
	r – Moody's AA Rate	r – CCBR	r – Moody's AA Rate	r – CCBR
Lump Sum	-0.024	-0.023	-0.027	-0.024
	(0.051)	(0.051)	(0.074)	(0.073)
Retirement	0.106	0.106	0.017	0.014
	(0.096)	(0.097)	(0.069)	(0.066)
Lump Sum × Retirement	-0.030	-0.037	-0.003	-0.008
	(0.116)	(0.117)	(0.117)	(0.115)
Constant	1.015***	1.016***	1.034***	1.036***
	(0.063)	(0.063)	(0.065)	(0.065)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	691	691	653	653
Adjusted R-squared	0.722	0.750	0.666	0.700

Panel B: Plan discount rate in excess of constructed benchmark rate, subsample of *Strong Governance* = 0

	Qualified Plans		SERPs	
	(1)	(2)	(3)	(4)
	r – Moody's AA Rate	r – CCBR	r – Moody's AA Rate	r – CCBR
Lump Sum	-0.053	-0.058	-0.160***	-0.163***
	(0.042)	(0.043)	(0.047)	(0.047)
Retirement	0.086**	0.083**	0.080**	0.080**
	(0.038)	(0.038)	(0.037)	(0.037)
Lump Sum × Retirement	-0.191***	-0.188***	-0.160***	-0.161***
	(0.057)	(0.057)	(0.061)	(0.061)
Constant	1.097***	1.101***	1.105***	1.107***
	(0.040)	(0.040)	(0.041)	(0.041)
Year Fixed Effects				
Observations	2,972	2,972	2,954	2,954
Adjusted R-squared	0.675	0.708	0.619	0.654

Table 10 (continued)

Panel C: Plan discount rate in excess of corporate bond rate, subsample of *Strong Governance* = 1

	Qualified Plans		SERPs	
	(1)	(2)	(3)	(4)
	r – Moody's AA Rate	r – CCBR	r – Moody's AA Rate	r – CCBR
Lump Sum	-0.032	-0.035	-0.029	-0.029
	(0.052)	(0.052)	(0.076)	(0.077)
Retirement	0.096	0.098	0.033	0.042
	(0.091)	(0.092)	(0.063)	(0.059)
Lump Sum × Retirement	-0.014	-0.014	-0.005	-0.018
	(0.113)	(0.113)	(0.115)	(0.113)
Constant	0.117*	-0.052	0.127*	-0.044
	(0.063)	(0.063)	(0.065)	(0.064)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	691	691	653	653
Adjusted R-squared	0.125	0.026	0.105	0.015

Panel D: Plan discount rate in excess of corporate bond rate, subsample of *Strong Governance* = 0

	Qualified Plans		SERPs	
	(1)	(2)	(3)	(4)
	r – Moody's AA Rate	r – CCBR	r – Moody's AA Rate	r – CCBR
Lump Sum	-0.049	-0.049	-0.160***	-0.160***
	(0.042)	(0.042)	(0.047)	(0.047)
Retirement	0.077**	0.073**	0.068*	0.066*
	(0.037)	(0.037)	(0.037)	(0.037)
Lump Sum × Retirement	-0.183***	-0.179***	-0.144**	-0.140**
	(0.056)	(0.056)	(0.061)	(0.061)
Constant	0.197***	0.027	0.205***	0.035
	(0.040)	(0.040)	(0.041)	(0.041)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	2,972	2,972	2,954	2,954
Adjusted R-squared	0.110	0.090	0.099	0.075

Appendix

Variable Name	Variable Definition
Age#$^{+}$	Dummy variable that equals 1 if the executive age is greater than or equal to # in {59, 61, 64}. For example, Age64^{+} equals 1 if the executive is at least 64 years old and 0 otherwise.
Board size	Number of directors serving on the board (ISS data).
Bonus	Ln (1+ bonus prior to December 2006, ExecuComp item: *BONUS*; and 1+ bonus + non-equity incentive payout starting in December 2006, ExecuComp items: *BONUS* + *NONEQ_INCENT*). The units are thousands of dollars.
Cash Flow Volatility	The value of the two-digit SIC industry median of cash flow volatility, which is the standard deviation of cash flow (scaled by firm total assets) in the past 10 years. Cash flow is the sum of income before extraordinary items (Compustat item: *IB*) and depreciation and amortization (Compustat item: *DP*).
CCBR	The IRS' Composite Corporate Bond Rate.
CEO/Chairman Duality	Dummy variable that equals 1 if CEO is also chairman (ExecuComp items: *CEOANN*, *TITLEANN*).
Discount Rate (r)	The rate used for calculation of the present value of pension benefits under qualified plans and SERPs, respectively, as disclosed in firms' proxy statements or 10-K filings.
Equity	Ln (1+ dollar value of restricted stock and option awards calculated using the Black-Scholes model before December 2006, ExecuComp items: *RSTKGRNT* + *OPTION_AWARDS_BLK_VALUE*; and 1+ grant-date fair values of stock and option awards starting in December 2006, ExecuComp items: *STOCK_AWARDS_FV* + *OPTION_AWARDS_FV*). We add 1 because equity values are 0 in many cases. The units are thousands of dollars.
Funding%	Ratio of the company's overall pension assets to pension obligations (Compustat items: *PPLAO*/*PBPRO*).
% Busy Directors	Fraction of directors who serve on two or more other boards (ISS data).
% Co-opted Directors	Fraction of directors who were appointed after a CEO assumed office (ISS data).
% Independent Directors	Fraction of outside directors (ISS data).
Income Increase	Dummy variable that equals 1 if the firm's net income increases from last year and 0 otherwise.
Institutional Ownership	Fraction of shares held by institutional investors (Thomson Reuters Institutional Holdings data).
Leverage	Ratio of the sum of long- and short-term debt (Compustat items: *DLTT* and *DLC*) to total assets (Compustat item: *AT*).
Lump Sum	Dummy variable that equals 1 if lump-sum distribution of pension benefits is permitted and 0 otherwise.
M/B	Ratio of the market value of common equity (Compustat items: *PRCC_F* × *CSHO*) to the book value of common equity (Compustat item: *CEQ*).

Appendix (continued)

Moody's AA Rate	Moody's AA corporate bond index, extracted from Bloomberg (Bloomberg item: *MOODCAA*).
Negative Income	Dummy variable that equals 1 if the firm's net income is negative and 0 otherwise.
Outside Directors' Ownership	Fraction of shares held by outside directors (ISS data).
Pension Value	The present value of each executive's pension benefits (ExecuComp item: *PENSION_VALUE*) under all plans scaled by salary (ExecuComp item: *SALARY*).
Pre Depart	Dummy variable that equals 1 if the executive is departing in the next fiscal year and 0 otherwise.
Pre Freeze	Dummy variable that equals 1 if the firm freezes its DB pension plan in the next fiscal year and 0 otherwise.
Relative Pension Size	Ratio of the projected pension benefit obligation (Compustat Item: *PBPRO*) to total assets (Compustat item: *AT*).
Retirement	Dummy variable that equals 1 if any top executive meets the retirement condition in a fiscal year under qualified plans and SERPs, respectively and 0 otherwise.
Return	Stock return (including distribution and reinvestment from CRSP) in the fiscal year (CRSP item: *RET*).
Return Volatility	Volatility of monthly stock returns of the 12 months in the fiscal year.
ROA	Ratio of net income to total assets (Compustat items: *NI*/*AT*).
Salary	Ln (1 + salary) (ExecuComp item: *SALARY*). The units are thousands of dollars.
Sales	Ln (sales) (Compustat item: *SALE*).
Strong Governance	Dummy variable that equals 1 if the governance index is greater than 4. The governance index is created as an equal-weighted index of seven indicators of governance measures (Board Size, CEO/Chairman Duality, % Busy Directors, % Co-opted Directors, % Independent Directors, Institutional Ownership, and Outside Directors' Ownership).
Total Assets	Ln (total assets) (Compustat item: *AT*)
Underfunded	Dummy variable that equals 1 if the company's overall pension assets (Compustat Item: *PPLAO*) are lower than its pension obligations (Compustat item: *PBPRO*)

Online Appendix

T1: Correlation Matrix

Pre Freeze equals 1 if the firm freezes its DB pension plan the following fiscal year and 0 otherwise. *Bonus*, *Equity*, and *Salary* are executive compensation variables (in thousands of dollars) extracted from ExecuComp at the executive level. To handle cases when *Bonus*, *Equity*, and *Salary* are equal to 0, we use the natural logarithmic transformation of (1 + *Bonus*), (1 + *Equity*), and (1 + *Salary*). *Sales (ln) lag* is the natural logarithmic transformation of lagged *Sales*. *ROA* is the ratio of net income to total assets. *Negative Income* equals 1 if the firm's net income is negative and 0 otherwise. *Income Increase* equals 1 if the firm's net income increases from last year and 0 otherwise. *Return* is the stock return (including distribution and reinvestment) during the current fiscal year. *Return Volatility* is the volatility of monthly stock returns over the current fiscal year. *M/B* is the ratio of the market value of common equity to the book value of common equity. *Leverage* is the ratio of the sum of long- and short-term debt to total assets. *Total Assets (ln) lag* is the natural logarithmic transformation of lagged total assets. *Cash Flow Volatility* is the median value of cash flow volatility for firms in the same two-digit SIC industry; firm cash flow volatility is the standard deviation of a firm's cash flow in the previous 10 years. *Underfunded* is an indicator that equals 1 if the firm's pension assets are lower than that of its pension obligation and 0 otherwise. *Funding%* is the ratio of pension assets to obligations. *Relative Pension Size* is the ratio of the projected pension benefit obligation to total assets. Correlations with statistical significance better than 5% are printed in Times New Roman, and the remaining correlations in *italics*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1) Pre Freeze	1																		
(2) Bonus (ln)	0.010	1																	
(3) Equity (ln)	*0.003*	0.310	1																
(4) Salary (ln)	0.021	0.411	0.453	1															
(5) Sales (ln) lag	0.039	0.318	0.345	0.503	1														
(6) ROA	-0.036	0.272	0.118	0.076	0.040	1													
(7) ROA lag	-0.026	0.115	0.109	0.065	0.059	0.566	1												
(8) Negative Income	0.025	-0.273	-0.084	-0.063	-0.046	-0.646	-0.321	1											
(9) Income Increase	-0.018	0.232	0.037	0.029	-0.012	0.349	-0.152	-0.324	1										
(10) Return	-0.020	0.195	0.015	*-0.006*	-0.050	0.212	-0.060	-0.193	0.263	1									
(11) Return lag	*-0.008*	0.145	0.051	0.018	-0.031	0.266	0.182	-0.231	0.167	-0.105	1								
(12) Return Volatility	-0.012	-0.143	-0.104	-0.118	-0.162	-0.219	-0.278	0.272	-0.035	0.147	-0.024	1							
(13) M/B	-0.017	0.102	0.103	0.079	0.088	0.342	0.352	-0.151	0.068	-0.075	0.182	-0.116	1						
(14) Leverage	-0.011	-0.012	-0.041	*0.000*	0.091	-0.155	-0.209	0.104	-0.025	*-0.005*	-0.082	0.068	*0.007*	1					
(15) Total Assets (ln) lag	0.030	0.287	0.313	0.452	0.816	-0.088	-0.089	-0.059	*0.006*	-0.075	-0.054	-0.224	*0.004*	0.092	1				
(16) Cash Flow Volatility	0.014	0.016	0.057	0.026	-0.037	0.124	0.144	0.086	-0.029	0.043	0.028	0.209	0.095	-0.069	-0.306	1			
(17) Underfunded	0.018	0.036	0.038	0.069	*-0.003*	-0.028	-0.026	0.059	*-0.002*	0.039	0.028	0.042	-0.053	-0.039	-0.074	0.160	1		
(18) Funding%	-0.016	*0.003*	-0.021	-0.046	0.053	0.070	0.052	-0.110	0.031	*0.002*	*-0.004*	-0.089	0.074	0.042	0.127	-0.187	-0.760	1	
(19) Relative Pension Size	0.039	*-0.004*	0.018	0.019	0.058	0.020	0.024	0.085	-0.027	0.011	-0.010	0.057	0.064	-0.022	-0.153	0.274	0.038	0.025	1

T2: Executive Annual Bonuses before Pension Freezes: Robustness Tests

This table reports the results of robustness tests for Table 2. In column 1, we regress executive salary on a forthcoming pension freeze and other firm and executive characteristics. In column 2, we use the sum of *BONUS* and *LTIP* to measure annual bonuses before December 15, 2006 and use the sum of *BONUS* and *NONEQ_INCENT* afterwards. In column 3, the sample period starts from December 15, 2006, when data on discretionary bonuses (*BONUS*) are available. In column 4, we test discretionary bonuses before pension freezes. *Pre Freeze* is 1 if the firm is freezing its pension plans the following fiscal year and 0 otherwise. Because of the cases of zero bonus and salary payouts, we add 1 to the raw data (in thousands of dollars) and take the natural logarithmic transformation of (1 + *Bonus*) and (1 + *Salary*). The remaining variables are defined in the Appendix. All regressions are restricted to the sample of firms that implemented pension freezes during our sample period, and year fixed effects and firm fixed effects are included. Robust standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Salary	Annual Bonuses (Bonus + LTIP Before Dec. 2006)	Annual Bonuses (Subsample Starting Dec. 2006)	Discretionary Bonuses (Subsample Starting Dec. 2006)
	(1)	(2)	(3)	(4)
Pre Freeze	-0.004	0.214**	0.316**	0.459***
	(0.012)	(0.092)	(0.132)	(0.124)
Salary (ln)		1.181***	1.327***	-0.001
		(0.108)	(0.158)	(0.118)
Sales (ln) lag	0.159***	-0.183	0.047	0.614**
	(0.023)	(0.122)	(0.223)	(0.265)
ROA	0.026	3.370***	2.047	0.698
	(0.102)	(1.041)	(1.407)	(0.963)
ROA lag	-0.058	0.253	-0.605	-0.017
	(0.087)	(0.758)	(1.187)	(1.197)
Negative Income	-0.009	-0.335**	-0.616**	-0.062
	(0.014)	(0.140)	(0.240)	(0.202)
Income Increase	0.016*	0.393***	0.214*	-0.169
	(0.008)	(0.087)	(0.127)	(0.110)
Return	0.018*	0.937***	0.903***	0.263**
	(0.010)	(0.103)	(0.143)	(0.129)
Return lag	0.033***	0.487***	0.545***	0.214*
	(0.010)	(0.088)	(0.135)	(0.129)
Return Volatility	-0.204*	-4.784***	-4.700***	0.490
	(0.114)	(1.067)	(1.515)	(1.445)
M/B	-0.001	-0.013	-0.033	-0.027
	(0.001)	(0.014)	(0.022)	(0.018)
Leverage	-0.097	-0.212	-0.365	1.203**
	(0.061)	(0.520)	(0.811)	(0.595)
CEO Dummy	0.735***	-0.084	-0.093	-0.254***
	(0.019)	(0.093)	(0.126)	(0.096)
Constant	4.521***	-0.047	-2.670	-3.861*
	(0.187)	(1.110)	(2.056)	(2.301)
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Observations	16,845	16,842	7,531	7,531
Adjusted R-squared	0.592	0.448	0.486	0.451

T3: Discount Rate and Executive Retirement: Variation over Time

The table reports the results of regressing the discount rate in excess of the benchmark rate on *Lump Sum*, *Retirement*, and their interaction term. We estimate the following OLS regression:

$$Discount\ rate_{it} - Benchmark\ rate_t = \alpha + \beta_1 \times Lump\ Sum_{it} + \beta_2 \times Retirement_{it} + \beta_3 \times Lump\ Sum_{it} \times Retirement_{it} + \beta_{4k} \times Lump\ Sum_{it} \times Retirement_{it} \times k.Year + \eta_t + \varepsilon_{it}$$

Retirement is identified if any top executive of the firm meets the retirement condition in a fiscal year under qualified plans and SERPs, respectively. *Lump Sum* is 1 if lump-sum distribution of pension benefits is permitted and 0 otherwise. *Discount rate* is the rate used for calculation of the present value of pension benefits under qualified plans and SERPs, respectively. *k.Year* are year dummies, where *k* is 2006–2013. We choose 2008 as the base year, the first year when PPA 2006 takes effect. In Panel A, we construct a weighted-average benchmark rate using each of two high-quality bond rates (*Moody's AA Rate* and *CCBR*) and the 30-year Treasury bond yield based on the transition schedule given in PPA 2006. In Panel B, we use *Moody's AA Rate* and *CCBR* as benchmark rates. Columns 1–2 report regressions under qualified plans, while columns 3–4 report regressions under SERPs. We control for year fixed effects in all regressions. Robust standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Appendix T3 (continued)

Panel A: Plan discount rate in excess of constructed benchmark rate

Dependent variable:	Qualified Plans		SERPs	
	r − Moody's AA Rate	r – CCBR	r − Moody's AA Rate	r – CCBR
	(1)	(2)	(3)	(4)
Lump Sum	-0.037	-0.042	-0.110***	-0.114***
	(0.031)	(0.031)	(0.038)	(0.038)
Retirement	0.068**	0.066**	0.072**	0.071**
	(0.030)	(0.031)	(0.030)	(0.030)
Lump Sum × Retirement	-0.193***	-0.198***	-0.220**	-0.224***
	(0.074)	(0.074)	(0.086)	(0.086)
Lump Sum × Retirement × 2006.Year	0.115	0.124*	0.175**	0.182**
	(0.075)	(0.074)	(0.082)	(0.082)
Lump Sum × Retirement × 2007.Year	0.093	0.102*	0.122*	0.129**
	(0.057)	(0.056)	(0.063)	(0.062)
Lump Sum × Retirement × 2009.Year	0.020	0.027	0.042	0.045
	(0.069)	(0.067)	(0.073)	(0.072)
Lump Sum × Retirement × 2010.Year	0.032	0.041	0.058	0.064
	(0.076)	(0.074)	(0.086)	(0.085)
Lump Sum × Retirement × 2011.Year	0.012	0.015	0.075	0.070
	(0.067)	(0.066)	(0.082)	(0.081)
Lump Sum × Retirement × 2012.Year	0.078	0.088	0.080	0.089
	(0.077)	(0.075)	(0.089)	(0.088)
Lump Sum × Retirement × 2013.Year	0.034	0.045	0.052	0.061
	(0.078)	(0.076)	(0.091)	(0.090)
2006.Year	-1.683***	-1.541***	-1.695***	-1.554***
	(0.028)	(0.027)	(0.033)	(0.032)
2007.Year	-1.126***	-0.984***	-1.153***	-1.011***
	(0.020)	(0.020)	(0.022)	(0.022)
2009.Year	-1.688***	-1.710***	-1.735***	-1.757***
	(0.027)	(0.027)	(0.030)	(0.029)
2010.Year	-2.160***	-2.217***	-2.218***	-2.275***
	(0.028)	(0.027)	(0.033)	(0.033)
2011.Year	-1.829***	-2.187***	-1.882***	-2.238***
	(0.029)	(0.029)	(0.034)	(0.034)
2012.Year	-2.357***	-2.499***	-2.398***	-2.541***
	(0.033)	(0.032)	(0.038)	(0.037)
2013.Year	-2.633***	-2.683***	-2.703***	-2.754***
	(0.030)	(0.029)	(0.037)	(0.037)
Constant	2.739***	2.601***	2.744***	2.605***
	(0.033)	(0.032)	(0.034)	(0.034)
Observations	5,139	5,139	4,988	4,988
Adjusted R-squared	0.691	0.724	0.623	0.660

Appendix T3 (continued)

Panel B: Plan discount rate in excess of corporate bond rate

Dependent variable:	Qualified Plans		SERPs	
	r − Moody's AA Rate	r – CCBR	r − Moody's AA Rate	r – CCBR
	(1)	(2)	(3)	(4)
Lump Sum	-0.037	-0.038	-0.110***	-0.111***
	(0.031)	(0.031)	(0.038)	(0.038)
Retirement	0.063**	0.059**	0.070**	0.068**
	(0.029)	(0.029)	(0.029)	(0.030)
Lump Sum × Retirement	-0.195***	-0.190***	-0.208**	-0.206**
	(0.074)	(0.073)	(0.087)	(0.087)
Lump Sum × Retirement × 2006.Year	0.120	0.118	0.165**	0.162**
	(0.075)	(0.074)	(0.083)	(0.082)
Lump Sum × Retirement × 2007.Year	0.081	0.067	0.099	0.085
	(0.055)	(0.056)	(0.061)	(0.061)
Lump Sum × Retirement × 2009.Year	0.052	0.061	0.062	0.069
	(0.065)	(0.064)	(0.071)	(0.070)
Lump Sum × Retirement × 2010.Year	0.055	0.062	0.068	0.075
	(0.072)	(0.071)	(0.085)	(0.085)
Lump Sum × Retirement × 2011.Year	0.024	0.020	0.074	0.064
	(0.068)	(0.066)	(0.085)	(0.084)
Lump Sum × Retirement × 2012.Year	0.089	0.092	0.081	0.086
	(0.073)	(0.072)	(0.088)	(0.088)
Lump Sum × Retirement × 2013.Year	0.040	0.040	0.043	0.044
	(0.075)	(0.074)	(0.090)	(0.090)
2006.Year	-0.339***	0.335***	-0.355***	0.319***
	(0.027)	(0.028)	(0.033)	(0.033)
2007.Year	-0.235***	0.254***	-0.264***	0.227***
	(0.021)	(0.021)	(0.023)	(0.023)
2009.Year	-0.068***	0.322***	-0.122***	0.267***
	(0.024)	(0.025)	(0.027)	(0.027)
2010.Year	-0.288***	0.200***	-0.353***	0.134***
	(0.025)	(0.026)	(0.031)	(0.032)
2011.Year	0.182***	0.380***	0.123***	0.324***
	(0.029)	(0.029)	(0.034)	(0.034)
2012.Year	-0.139***	0.408***	-0.186***	0.358***
	(0.032)	(0.032)	(0.037)	(0.037)
2013.Year	-0.389***	0.261***	-0.463***	0.186***
	(0.029)	(0.029)	(0.037)	(0.037)
Constant	0.497***	-0.345***	0.505***	-0.337***
	(0.031)	(0.032)	(0.032)	(0.032)
Observations	5,139	5,139	4,988	4,988
Adjusted R-squared	0.109	0.064	0.090	0.051

T4: Discount Rate and Executive Retirement: Regression on Benchmark Rates

The table reports the results of regressing the discount rate on *Lump Sum*, *Retirement*, their interaction term, and the benchmark rate. We estimate the following OLS regression:

$$Discount\ rate_{it} = \alpha + \beta_1 \times\ Lump\ Sum_{it} + \beta_2 \times Retirement_{it} + \beta_3 \times Lump\ Sum_{it} \times Retirement_{it} + \beta_4 \times Benchmark\ rate_t + \eta_t + \varepsilon_{it.}$$

Retirement is identified if any top executive of the firm who meets the retirement condition in a fiscal year under qualified plans and SERPs, respectively. *Lump sum* is 1 if lump-sum distribution of pension benefits is permitted and 0 otherwise. *Discount rate* is the rate used for calculation of the present value of pension benefits under qualified plans and SERPs, respectively. In Panel A, we construct a weighted-average benchmark rate using each of two high-quality bond rates (*Moody's AA Rate and CCBR*) and the 30-year Treasury bond yield based on the transition schedule given in PPA 2006. In Panel B, we use *Moody's AA Rate and CCBR* as benchmark rates. Columns 1–2 report regressions under qualified plans, while columns 3–4 report regressions under SERPs. We include year fixed effects in all regressions. Robust standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Plan discount rate regressed on constructed benchmark rate

	Qualified Plans		SERPs	
Dependent variable:	Discount Rate (r)	Discount Rate (r)	Discount Rate (r)	Discount Rate (r)
	(1)	(2)	(3)	(4)
Lump Sum	-0.044	-0.047	-0.115***	-0.117***
	(0.031)	(0.031)	(0.037)	(0.037)
Retirement	0.055*	0.054*	0.066**	0.065**
	(0.029)	(0.030)	(0.029)	(0.030)
Lump Sum × Retirement	-0.128***	-0.127***	-0.132**	-0.133**
	(0.045)	(0.046)	(0.053)	(0.053)
Moody's AA Rate	0.483***		0.464***	
	(0.051)		(0.055)	
CCBR		0.485***		0.491***
		(0.054)		(0.061)
Constant	3.509***	3.504***	3.602***	3.475***
	(0.241)	(0.256)	(0.257)	(0.286)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	5,139	5,139	4,988	4,988
Adjusted R-squared	0.687	0.685	0.615	0.614

Panel B: Plan discount rate regressed on corporate bond rate

	Qualified Plans		SERPs	
Dependent variable:	Discount Rate (r)	Discount Rate (r)	Discount Rate (r)	Discount Rate (r)
	(1)	(2)	(3)	(4)
Lump Sum	-0.041	-0.041	-0.113***	-0.114***
	(0.031)	(0.031)	(0.037)	(0.038)
Retirement	0.057*	0.054*	0.065**	0.065**
	(0.029)	(0.029)	(0.029)	(0.029)
Lump Sum × Retirement	-0.129***	-0.126***	-0.129**	-0.128**
	(0.045)	(0.045)	(0.053)	(0.053)
Moody's AA Rate	0.744***		0.659***	
	(0.067)		(0.079)	
CCBR		0.787***		0.698***
		(0.072)		(0.089)
Constant	1.650***	1.098***	2.050***	1.559***
	(0.342)	(0.395)	(0.405)	(0.491)
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	5,139	5,139	4,988	4,988
Adjusted R-squared	0.688	0.689	0.615	0.615