

## **Governance, Behavior, and Performance of State and Corporate Pension Funds\***

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### **Abstract**

This paper analyzes the incentive and governance structures of state and corporate pension systems, focusing on the fact that decision authority in state systems is often held by system beneficiaries. State pension systems pursue more conservative investment strategies than their corporate counterparts, holding more bonds and less equity, but are found to earn similar risk-adjusted returns. State system portfolio allocations also become more conservative as retiree control over investment policy increases, and greater retiree control is associated with marginally lower risk-adjusted asset returns. Per-capita benefits are similar in state and corporate systems, but state benefit levels fall as beneficiary control over system benefits increases. Increased beneficiary control over system benefit policy does appear to increase the security of future benefits, however, through larger and more frequent promised cost of living adjustments, and improved funding levels.

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by

Kevin J. Murphy and Karen Van Nuys

## **I. Introduction**

Almost half of the equity of U.S. publicly traded corporations is held by institutional investors, among these the giant corporate and public pension funds with 1992 assets over \$4 trillion. The equity holdings of these investors alone accounts for almost \$1.5 trillion, or 29% of the total U.S. equity market in 1992. The scope of pension funds' influence as investors is also growing: while they accounted for 31.7% of all institutional assets in 1970, they held nearly half of all institutional assets in 1992.<sup>1</sup> In the past, these pension plans have been "passive shareholders" that sold their positions in mismanaged or underperforming companies. Recently, however, several large state funds—including those representing public employees in California, Wisconsin, Florida, Pennsylvania, Connecticut and New York—have actively sought to improve the management and performance of their portfolio companies through such channels as proxy fights, shareholder-sponsored resolutions and "relationship investing." Thus, pension funds are gaining influence in asset markets through both their increasing size and their more aggressive approach to corporate governance.

Pension funds are also gaining importance as sources of benefits for American workers and income for retirees: while 41% of all wage and salary workers in American corporations were covered by a pension plan in 1960, 46% were covered in 1987. Coverage of state and local workers has also increased, from 81% in 1983 to 85% in 1988. Overall, while 14% of Americans over age 65 were receiving some kind of income from a government or private pension in 1962, 43% were receiving pension income in 1988.<sup>2</sup>

In this paper, we document and examine the investment and benefit choices made by these increasingly important sources of capital for asset markets and income for retirees. In

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<sup>1</sup> The *Brancato Report on Institutional Investment*, 1993.

<sup>2</sup> *Trends in Pensions, 1992*, U.S. Department of Labor.

exploring the behavior of corporate and state defined-benefit pension systems, we focus on their organizational structures and the incentive systems facing their decision makers. In particular, while decision makers in corporate pension systems owe fiduciary duties to both system beneficiaries and to corporate shareholders, decision makers in state plans owe a fiduciary duty only to beneficiaries, and are often beneficiaries themselves. Because beneficiaries' claims on system assets in defined-benefit pension systems are technically fixed and do not vary with fund performance, we note that the beneficiaries running state pension systems may not bear the wealth consequences of their decisions, and will therefore have weak incentives to maximize the value of pension assets. Instead, state pension system officials, whose actions are often scrutinized by the media and politicians, will manage the pension system more conservatively than their corporate counterparts, to avoid drawing negative attention to the pension system.

Since the extent of beneficiary control over system policies varies across state systems, we analyze differences in organizational structures within state pension systems as well. Because they have chosen state government jobs that are characterized by stable wages, we hypothesize that beneficiaries of state systems are relatively risk-averse and value income stability especially highly. Thus, when given control over state system policies, beneficiaries will make benefit and funding decisions that enhance the security, if not the absolute level, of benefits.

The paper is organized as follows. In Section 2, we describe the governance structures of corporate and state pension systems. We note the extent of beneficiary control in state systems, and that if state system beneficiaries' claims do not vary with the value of the system, then beneficiary-trustees deciding system policies will have weak incentives to maximize the value of the fund. In addition, we analyze the nature of beneficiaries' claims in both state and corporate systems. Although promised benefits in defined-benefit pension systems are not explicitly related to fund value, we find that, in fact, benefits paid in some systems do appear to vary positively with fund performance. In particular, benefits paid are especially sensitive to fund performance in state systems where beneficiaries have control over benefit policy. This suggests that the decision makers in these funds indeed bear some of the wealth consequences of their decisions.

Section 3 develops and tests our caretaker hypothesis of investment behavior, that state pension officials are scrutinized by the media and politicians, who are disproportionately interested in large negative investment outcomes, while corporate pension managers' investment decisions are more likely to be evaluated in the context of their performance over

their entire careers. These evaluation mechanisms lead state pension officials to invest more conservatively than corporate officials, and to avoid paying large investment management fees. We find that state pension portfolios are indeed invested more conservatively, with state funds holding less equity and more bonds and real estate than corporate funds. We also find that as retired beneficiaries' control over investment policies in state systems increases, portfolio allocations become more conservative. State funds also manage a larger fraction of their portfolios in-house, and pay outside managers lower, less performance-based fees than do corporate funds.

In Section 4, we compare the performance of state and corporate pension systems. We find that, after controlling for the large differences in portfolio allocations across the different types of funds, and for the effect of the October 1987 stock market crash, risk-adjusted returns are very similar in corporate and state plans. Within state plans, increasing retirees' control over investment policy has a marginally negative effect on asset returns. Social restrictions on state systems' investment policies, such as prohibitions on investments in firms doing business in South Africa or Northern Ireland, or system policies to invest in economically targeted investments, do not significantly affect risk-adjusted returns.

Section 5 considers the effect of organizational characteristics on system benefit policy. We find that corporate and state systems pay similar per-capita benefits, but that, within state systems, increased beneficiary control over benefit policy is associated with lower benefits. This may reflect a tradeoff that state system beneficiaries make between benefit level and benefit security: we also find that the incidence and generosity of pre-promised cost of living adjustments increase as beneficiary control over state system benefit policy increases. In Section 6, we find that state funds have lower funding ratios than corporate funds, but that funding levels increase as beneficiary control increases, again suggesting that state system beneficiaries seek to increase the security of their benefits, perhaps at the expense of overall benefit levels. Section 7 concludes.

## **II. Decision Rights and Residual Claims in Defined-Benefit Pension Systems**

Over 94% of the assets in state pension systems, and nearly two-thirds of the assets in corporate pension systems, are associated with defined-benefit plans.<sup>3</sup> In a defined-benefit

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<sup>3</sup> Source: 1993 *Money Market Directory*. The remaining assets in state systems represent defined contribution plans, while the remaining assets in corporate plans represent a combination of defined contribution plans, ESOPs and other stock plans, 401(k) plans, and employee savings plans.

pension plan, beneficiaries are promised a pre-specified future sum to be paid upon retirement. Benefits promised under the plan may vary with the employee's salary and years of service upon retirement, and may include explicit or implicit provisions for cost of living adjustments. But, importantly, the promised benefits do not depend on the amount contributed to the plan, or on the performance of plan assets. If annual contributions are insufficient to meet current pension payments, contributions to the fund must be increased. Similarly, if the invested contributions exceed those required to meet all promised future benefits, the excess investments can be (at least legally) returned to the plan sponsor through appropriation of fund assets or reduction of future contributions.

Assets set aside to fund the future defined-benefit pension liability are entrusted to "trustees" who, as fiduciaries for plan beneficiaries, are legally bound to manage the pension for the sole benefit of the plan participants. However, the manner in which these fiduciary duties are satisfied varies widely across systems, depending on how the systems are governed and how system trustees' actions are evaluated. Fund trustees of both corporate and state defined-benefit pension funds can potentially influence a wide range of pension policies, including benefit policies, asset allocations, contributions and funding levels, proxy voting, and selecting and monitoring external money managers. In practice, however, the trustees' decision authority is limited by factors such as collective bargaining agreements, pension charters, ERISA regulations (for corporate plans), and state legislation and political considerations (for state plans).

#### *Decision Authority in Corporate Pension Systems*

In corporate pension systems, pension-fund assets are typically managed by the corporate pension fund manager (often the Chief Investment Officer (CIO)) who works in the finance division. The CIO is responsible for selecting and monitoring external money managers, and allocating fund assets across asset types. The CIO reports to the Chief Financial Officer, the Chief Executive Officer, or other officers and directors who simultaneously serve as fiduciaries for plan beneficiaries (as plan trustees) and shareholders (as corporate officers). Pension benefit policy is typically set in the human resources division, and is similarly overseen by officers and directors of the firm. Thus, while individuals making investment and benefit decisions for corporate pension plans are fiduciaries for plan beneficiaries, they are also bound, through the corporate hierarchy, to a fiduciary responsibility to the shareholders. Through their ability to elect and delegate authority to the board of directors, the corporation's shareholders retain ultimate decision control rights over the corporate defined-benefit pension fund. Importantly, corporate system beneficiaries have little direct control over system policy,

other than through the fiduciary duty which they are owed and through collective bargaining and other employment agreements.

### *Decision Authority in State Pension Systems*

Governance structures in state pension systems are more complex and heterogeneous than in corporate pension systems. In order to document and describe governance structures and decision authority in state pension systems, we analyzed the governance structures of all defined-benefit pension systems covering public employees that are administered by a state-level entity and that are reported in the 1993 *Money Market Directory of Pension Funds and their Investment Advisors* (the “Money Market Directory”). Although most of the 1,175 public pension systems reported in the directory are administered locally, 107 (with total 1992 assets of \$776 billion) are defined-benefit, state-administered systems. We use “pension system” to refer to the collection of plans administered by a particular board of trustees: a single board often has authority over several pension plans (*e.g.* one plan for state police, another for judges, etc.).

Data on the organizational structures of these 107 systems are gathered from a variety of sources including system annual reports, discussions with pension officials, the Congressional Research Service (1990), the National Association of State Treasurers (NAST) survey on “State Pension Fund Investment Policies and Practices” (see Knoll, 1993) and the “Pendat” database. The Pendat database, developed by the Public Pension Coordinating Council (see Zorn, 1991), is compiled from a survey of over 200 state and local pension systems in 1991, and includes over 500 data items including information on board membership, governance, relevant state statutes, and investment restrictions. The Pendat survey covers the 25 largest state systems with the exception of the California Public Employees Retirement System (CalPERS), which we’ve added manually to the database.<sup>4</sup> Including CalPERS, this extended Pendat database covers 75 of the 107 state systems with total assets of \$693 billion, or about 90% of the total assets in all state defined-benefit pension systems.

Most state pension systems are governed by a system-level board of trustees, with state-system trustees also owing a fiduciary duty to system members.<sup>5</sup> State system boards of

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<sup>4</sup> We are grateful to Anne Elliott and Nancy Quinlan at CalPERS for helping us obtain the required data.

<sup>5</sup> See Congressional Research Service (1990), p. 32. Although state pension systems are not subject to federal requirements that investments be consistent with the “Prudent Person Rule” (requiring that the funds be managed as a prudent and knowledgeable person would manage them), over 80% of the Pendat systems have adopted such a rule, and 93% report that the trustees responsible for investment in state systems are bound to fiduciary standards.

trustees may oversee various facets of pension policy, including benefit policy, investment decisions, actuarial assumptions and administrative issues. In about two-thirds of state pension systems, the board of trustees is responsible for investment decisions over system assets. The board's investment decisions and policies are, however, subject to review and oversight by the state legislature (or other state-level committee), and many states specify asset allocation or other investment restrictions in their constitutions.<sup>6</sup> In the remaining one-third of the sample, investment authority is the exclusive domain of a state-level investment office, typically a division of the state treasurer's office.<sup>7</sup> In these systems, investment decisions are not made by the board of trustees, but instead by state representatives: elected state officials or their appointees, or a state investment board that is separate from the board of trustees. Benefit policies are also set by system boards of trustees (with state oversight) in about two-thirds of systems, with benefit policy set by legislators or other state representatives in the remaining systems.

Table A1 in the Appendix lists the 107 state defined-benefit pension systems, reports the 1992 assets and number of plans for each system, and reports the location of investment and benefit decision authority in each systems. Data on decision authority over investments are available for all 107 systems, but benefit-decision data are available for only 71 of the 75 systems participating in the Pendat survey. The board of trustees has decision authority over both investment and benefit decisions in 33 of these 71 systems, and has decision authority over neither investment not benefit decisions in 6 of these systems. Boards have decision authority over investments but not benefits in 16 systems, and have decision authority over benefits but not benefits in 16 of the 71 systems with complete data.

Table 1 presents summary statistics on board composition for all state systems and for systems grouped according to decision authority over investments and benefits. Overall, state pension system boards range in size from three to 17 members, with the average board size between nine and ten members. On average, active and retired system beneficiaries comprise about two-thirds of the board. In many cases, beneficiaries on the board include elected or

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<sup>6</sup> According to a 1990 survey conducted by the National Conference of State Legislatures (as quoted in Congressional Research Service (1990), p. 32):

The typical process is that some type of legislative committee sets up the parameters of the investment opportunities and then either a council or board, appointed by the legislature and the governor, oversees the retirement fund. Although statutory review of these funds is not required by almost two-thirds of the funds reported, most states do review their funds. Typical review happens annually and is disclosed either through an annual report or an annual audit issued to the legislature or the governor.

<sup>7</sup> These state investment offices are typically also responsible for investing state funds from other sources besides the pension system.

**Table 1**  
**Board Composition and Decision Authority of State Pension Systems**

	All Systems	Investment Decision Authority:		Benefit Decision Authority:	
		Board	State	Board	State
	(1)	(2)	(3)	(4)	(5)
Number of Systems	107	71	36	49	22
Number of Plans	181	109	72	90	34
1992 Total Assets (\$ billions)	\$776	\$475	\$301	\$348	\$246
<b>Board Composition</b>					
Average Board Size	9.3	9.3	9.3	9.0	10.0
<i>Who's on the Board:</i>					
Active Employees	55%	55%	54%	53%	57%
Retired Employees	12%	12%	11%	13%	9%
Other	33%	33%	35%	34%	34%
<i>How they got on the Board</i>					
Appointed by State Officials	51%	52%	51%	51%	49%
Elected by Active Employees	25%	28%	18%	25%	26%
Elected by Retired Employees	4%	4%	3%	3%	5%
Ex Officio	19%	16%	25% <sup>a</sup>	19%	20%

Source: System size and investment authority data from *Money Market Directory*, Pendat, and annual reports. Board composition data and benefit decision authority data available only for 74 Pendat pension systems.

<sup>a</sup>Significantly different (at 5% level) from mean Fraction Ex Officio in systems with board investment authority.

appointed state officials who, as employees of the state, are covered by the state's pension plans. Among the 72 Pendat systems reporting board-composition data, only one (representing judges in Michigan) has no system beneficiaries on its board. Fifty-three systems, or 73.6% of the sample, have boards with a majority of seats occupied by system beneficiaries, with the median system having two-thirds of its board composed of beneficiaries. Twelve systems have boards composed entirely of system beneficiaries. For this reason, we will sometimes refer to systems in which the board of trustees has authority over particular decisions as being "beneficiary-dominated."

About half of the boardmembers in state pension systems are appointees, usually appointed by the governor, state legislature, or other board members. About 30% of the boardmembers are elected by active or retired members, and the remaining 19% are *ex officio*. In the Pendat sample of state systems, 34 of 72 systems have no elected members, while 22 systems have boards with a majority of members elected by system beneficiaries. Thirteen of the 72 boards are entirely composed of appointees or *ex officio* members.

Columns (2) and (3) of Table 1 compare board composition in systems with board-level investment authority to systems where investment decisions are the domain of state-level investment divisions. Systems with state-level investment authority have a significantly larger fraction of *ex officio* boardmembers (based on a on a t-test comparison of means); there are no other significant differences in board composition. Columns (4) and (5) compare board composition in systems with board-level benefit authority to systems with state-level benefit authority. There are no significant differences in board composition for systems grouped by the location of decision rights over benefits.

### *Residual Claims in Defined-Benefit Pension Systems*

The residual claimants of defined-benefit pension systems are those who must pay for any funding insufficiencies, and who may claim any excess fund assets. Fama and Jensen (1983) argue that an organization's efficiency depends critically on the allocation of decision rights and residual claims within the organization. Many organizations are managed by individuals who are not the sole residual claimants and who therefore do not bear fully the wealth consequences of their decisions. Fama and Jensen emphasize that in such organizations it is important for the residual claimants to retain "decision control" rights: the rights to hire, fire, and set the compensation of the top-level executives.

Shareholders are the legal residual claimants in corporate defined-benefit pension systems. When plan assets are insufficient to cover promised benefits in a corporate defined-benefit plan, corporate resources must be directed towards the pension fund and away from other investment opportunities.<sup>8</sup> When these plans are overfunded, the corporation can recapture excess pension assets by reducing contributions or by terminating one plan and replacing it with a new one, and the excess pension assets can be used for other corporate purposes. Thus, as residual claimants of the corporation, the shareholders are, *de facto*, also the residual claimants of corporate defined-benefit funds.

Similarly, taxpayers are the legal residual claimants in state defined-benefit pension systems. Beneficiaries rely on the State's taxing and borrowing power to make up any shortfall in pension assets that threatens the system's ability to pay benefits when due. In fact, according to the Pendat survey, retirement benefits in over 80% of state systems are guaranteed by statute or constitutional provision, and two-thirds of state systems offer constitutional or legislative prohibitions against benefit reductions. Taxpayers can also reduce contributions or

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<sup>8</sup> Most corporate pension plans are insured through the Pension Benefit Guaranty Corp. (PBGC), which guarantees benefits in the advent of corporate bankruptcy. In non-bankrupt firms, shareholders are responsible for funding pension benefits.

claim excess plan assets when state pensions become overfunded. In 1991, for example, California's governor appropriated \$1.6 billion from a surplus account at CalPERS and applied it to the state's budget deficit.

Decision control rights in corporate pension systems are held by top-level executives who are, through the corporate hierarchy, answerable to the residual-claimant shareholders. In contrast, as shown above, state pension beneficiaries and not residual-claimant taxpayers are often the dominant decision makers in their systems. Although this apparent separation of decision control rights from the residual claimants seems inconsistent with the Fama-Jensen model of efficient organizational form, we note that shareholders and taxpayers are the *legal* but not necessarily the *only* residual claimants in corporate and state pension systems, respectively. For example, strong asset performance may make it "easier" to grant cost-of-living adjustments or other increases in benefits not promised in the original benefit contract. In addition, the financial health of the pension fund is routinely considered in collective bargaining agreements, especially by union leaders negotiating higher wages on the basis that the employer's contributions to the pension fund have been reduced due to superior fund performance (Pesando and Hyatt, 1992).

We address the potential "sharing" of the residual claim in defined-benefit pension system by analyzing whether benefits vary with the investment performance of the fund assets. If the shareholders (in corporate plans) and taxpayers (state plans) are the effective as well as legal residual claimants, there should be no relation between benefits paid and fund performance. A positive relation between benefits and performance is evidence that the shareholders' or taxpayers' residual claim is shared with plan beneficiaries.

We examine the relation between benefits and performance by analyzing the relation between fund performance and unexpected changes in the projected benefit obligation (PBO). The PBO is an actuarial concept that measures the current dollar value of the expected future pension obligation, incorporating anticipated increases in vesting, years of service, and salaries. As an example, suppose that an employer promises to pay an employee a lump sum  $V$  (or a series of retirement benefits  $B$  with an actuarial value of  $V$  upon retirement) when she retires in  $N$  years (which she will do with certainty). The projected benefit obligation for this employee is  $PBO = V/(1+r)^N$ , where  $r$  is the assumed discount rate, called the "settlement rate."

The PBO changes from year to year based on a number of factors including the passage of time (which increases the PBO for active employees but reduces it for retired employees), the hiring and vesting of new employees, death of retirees, changes in the expected rate of salary increase, and changes in the pension benefit formula. The first three of these factors are

relatively predictable (at least in an actuarial sense), are independent of pension policy decisions, and comprise what we call the expected portion of the change in PBO. To the extent that beneficiaries share in changes in the value of the pension fund, the last two are predicted to vary systematically with fund performance, and comprise what we call the unexpected portion of the change in the PBO

Appendix B derives our proxy for the expected change in the PBO,  $E[PBO]$ , as a function of the prior year's PBO, the number of active and retired members, benefits paid to current retirees, the settlement rate, the average length of service, and the average length of retirement. We examine whether changes in fund value are related to changes in employee benefits (generated either through an enhanced benefit formula or changes in the expected rate of salary increases) by estimating the following regression:

$$(1) \quad [PBO]_t^{unexpected} - E[PBO]_t = a + b(Investment\ Performance)_{t-1}.$$

The lagged term allows current investment performance  $\tilde{N}$  defined as beginning-of-period assets multiplied by the market return realized during the year  $\tilde{N}$  to be reflected in the following year's benefit policy. The slope coefficient,  $b$ , measures how much of each dollar in fund performance is transferred to employees in the form of higher benefits.

Estimating equation (1) requires detailed beneficiary, financial, and market performance data on pension systems, which we've collected from a number of sources. Appendix C details our methodology and the data sources used to calculate the market returns on the investment portfolios of state and corporate pension systems. Our primary data sources for state funds include current and past fund annual reports and balance sheets, supplemented with phone interviews and survey questionnaires sent to all state systems. Overall, we are able to estimate market returns for 64 of the 107 existing state pension systems from 1988-1992, representing \$563 billion in 1992 assets (or about 73% of all assets in defined-benefit state pension systems).<sup>9</sup> Our primary data sources for corporate funds include Compustat and Federal Form 5500, filed simultaneously with the Department of Labor and the Internal Revenue Service by all tax-exempt corporate pension funds covering more than 100 employees.

Because unexpected changes in the PBO reflect benefit decisions, we focus on the location of benefit authority in estimating equation (1). Table 2 reports coefficients for

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<sup>9</sup> Missing data for some years reduce our sample size to 292 out of 320 possible observations for the 64 systems.

equation (1) estimated separately for corporate systems, state systems in which the state makes benefit decisions, and state systems in which the board of trustees is responsible for benefit policy. For state funds, data on projected pension benefit obligations are obtained from the “Analysis of Funding Statements” in pension system annual reports. Benefits data are from the “Sources of Revenues and Expenses” schedules in the annual reports, supplemented (when necessary) using data reported to the Department of Commerce. For corporate systems, since the calculation of  $[PBO]^{unexpected}$  involves benefits paid during the year (unavailable on Compustat), we restrict our analysis to corporate funds in the Form 5500 Database from 1988-1991. The settlement rate  $r$  is obtained from various issues of the Money Market Directory for both corporate and state pension systems.<sup>10</sup> Changes in pension benefit obligations and investment performance are deflated by the number of active and retired members in each system to control for differences in the sizes of the labor forces across systems.

Column (1a) of Table 2 reports estimated coefficients for equation (1) using data for state systems where the (typically beneficiary-dominated) board of trustees makes benefit decisions. The coefficient on  $(Investment\ Performance)_{t-1}$  of .4701 is positive and significant, suggesting that beneficiaries in these systems receive 47¢ of every dollar increase in fund value through higher benefits. The results in column (1b) show that unexpected benefit changes are independent of fund performance in state systems where the state has benefit authority. In corporate systems, reported in column (1c), unexpected changes in benefits are also positively related to fund performance, though not as strongly as in state systems with board benefit authority.<sup>11</sup> The superscripts on the coefficients (derived from estimating a single equation with full interactions) indicate that the coefficients on  $(Investment\ Performance)_{t-1}$  for state-benefit-authority and corporate systems are significantly different from the coefficient in board-benefit-authority systems, but are not significantly different from one another.

Columns (2a), (2b), and (2c) of Table 2 report coefficients from fixed-effects regressions which include a separate intercept for each of the 38 board-benefit-authority systems, 17 state-benefit-authority systems, and 279 corporate pension systems with complete data. These pension-system-specific intercepts control for factors that vary across systems but are fixed over time for a given system. The estimated coefficients on  $(Investment\ Performance)_{t-1}$  show

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<sup>10</sup> When settlement-rate data are unavailable for a system during a given year, we assume that the rate is unchanged from the past year, or (when prior year data are also unavailable) we assume that the rate equals the average settlement rate across all funds in that year.

<sup>11</sup> Allen, Clark and McDermed (1993) use plan-level data from 1980 to 1985 to examine whether *ad hoc* pension benefit increases in defined-benefit corporate plans are related to plan performance. They conclude that asset performance does not explain the incidence of benefit increases in their sample, although for plans granting benefit increases, plan asset performance is related to the size of the increase granted.

**Table 2**  
**Regression Analysis of the Relation Between Pension Fund Investment Performance and Employee Benefits for State and Corporate Pension Systems, 1988-1992**

Independent Variables	Dependent Variable: Unexpected Change in the Pension Benefit Obligation per Member					
	OLS			Fixed Effects		
	State Systems			State Systems		
	Board has Benefit Authority	State has Benefit Authority	Corporate Systems	Board has Benefit Authority	State has Benefit Authority	Corporate Systems
	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
Intercept	2.4591	1.2148	1.9404	—	—	—
Lagged Investment Performance per Member	.4701 (3.6)	-.0583 <sup>b</sup> (-0.6)	.1129 <sup>a</sup> (2.5)	.4199 (2.6)	.1003 (0.6)	-.0300 <sup>a</sup> (-0.5)
Controls	Year Effects	Year Effects	Year Effects	Year Effects	Year Effects	Year Effects
R <sup>2</sup>	.1142	.0623	.0575	.4169	.3440	.5018
Sample Size	117	57	683	117	57	683

Notes: The unexpected change in the pension benefit obligation is estimated as the actual change minus the expected change (as derived in Appendix B). Investment performance is defined as beginning-of-period assets multiplied by the market return realized during the year (see Appendix C). Data for state systems from annual reports, balance sheets, and questionnaires; data for corporate systems from Form 5500 and Compustat. Fixed-effects regressions include 38, 17, and 279 pension-system-specific intercepts in columns (2a), (2b), and (2c), respectively. t-statistics in parentheses.

<sup>a</sup>-indicates that the coefficient is different (at the 1% level) from the analogous coefficient for state systems with board benefit authority.

<sup>b</sup>-indicates that the coefficient is different (at the 10% level) from the analogous coefficient for state systems with board benefit authority.

that, after controlling for system-specific factors, the unexpected change in the pension benefit obligation is positively related to the prior year's fund performance for state systems with board benefit authority, but are unrelated to performance for corporate pension systems and state systems with state benefit authority. As in the OLS regression, the effects in corporate systems are significantly different from those in board benefit authority systems, but not from those in systems where the state holds benefit authority.

Our formula for PBO does not account for changes in the system's settlement rate or changes in the composition of the beneficiary population. We therefore ran all six regressions reported in Table 1 including linear terms for the change in the assumed settlement rate and the

change in the fraction of retirees in the beneficiary population. The estimated coefficients on the variable of interest, (*Investment Performance*), were unchanged.

The results in Table 1 suggests that residual claims are shared in state systems where the board of trustees has control of benefit policies. We find no evidence that such a relationship exists in state systems where the state has benefit authority, and mixed results in corporate systems. The result for state systems with board benefit authority may reflect that the residual claims are efficiently aligned with the decision control rights: as beneficiary control over system policies increase, beneficiaries' claims on system assets depend more on the value of the fund, so that decision makers bear more of the wealth consequences of their actions. Alternatively, (although not mutually exclusively), the result may reflect that beneficiary-dominated boards with benefit authority are able to capture a portion of increased fund performance in the form of higher benefit levels.

### **III. Investment Behavior**

We have thus far seen that organizational characteristics differ across types of pension systems, and that these organizational differences translate into differences in the way benefit claims are structured in these systems. We also expect organizational differences to be related to differences in investment behaviors across systems.

#### *The Caretaker Hypothesis*

Perhaps the most important choice faced by investment decision makers in pension systems is how to allocate the fund portfolio among equities, bonds, and other assets. To develop a theory of pension officials' investment allocation decision, we focus on the systems through which those officials are evaluated, rewarded and punished for their decisions. These systems of accountability differ between state and corporate pensions and across different types of state systems. Rewards and punishments for corporate pension managers are typically determined within the firm, through the hiring, firing, promotion and compensation processes. These decisions are generally made by a few corporate officials with relatively good information about the manager's entire performance history.

In contrast, state pension officials are often accountable for their decisions to politicians or the press. In their detailed study of nine large pension systems (three state and six corporate), O'Barr and Conley (1992) emphasize the influence of the press and politicians in determining state fund behavior, and the fact that these individuals are disproportionately

interested in a fund's failures, not its successes. They quote the executive director of a large state pension fund: "There are no rewards [for superior performance]. You beat the market, somebody's going to write it up? Forget it. Underperform? They'll be happy to." (p. 141). O'Barr and Conley characterize politicians and the press as sharing "a voyeuristic interest in disaster and an indifference to solid if unspectacular performance. Thus, if they are persuaded that the chief executive is pursuing prudent policies and is showing sufficient interest in them personally, they are likely to think well of the fund and to leave the chief executive alone." (p. 144).

While large negative outcomes must also hurt a corporate pension manager's record, we argue that they are more likely to be evaluated in the context of the manager's performance over his entire career than in state systems. Given the nature of these evaluation processes, we argue that large negative outcomes are more costly for state pension officials than for their corporate counterparts. One portfolio manager we interviewed in the course of our research echoed this view. He claimed that, in contrast to corporate pension officials, state pension fund officials seemed particularly concerned that their investment activities not draw negative attention to the fund and its administration. Thus, he suggested, state pension system officials are less concerned with generating high portfolio returns than they are with avoiding high management fees and large investment risks.

These observations lead us to what we call the *Caretaker Hypothesis*, that state systems will tend to pursue conservative portfolio allocation policies (relative to corporate funds), to avoid calling negative attention to their activities. Since paying large sums to investment managers can also draw the attention of politicians and the press, we also predict that state pension systems will pursue more frugal investment strategies than corporate systems.

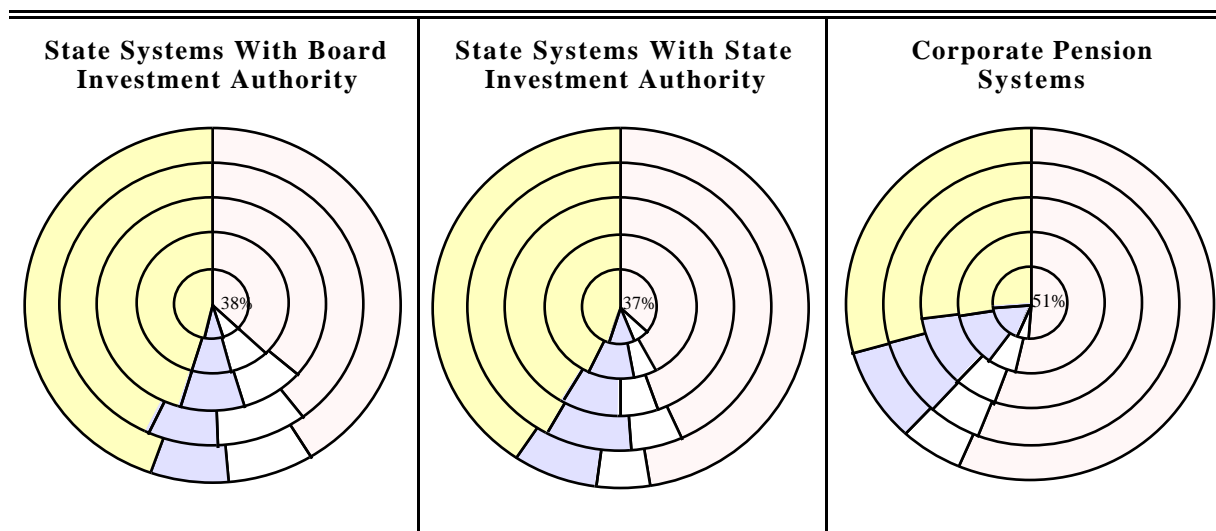
### *Portfolio Allocations*

To examine the caretaker hypothesis, we compare the value-weighted asset allocations of state and corporate pension systems from 1988 to 1992, based on asset allocation data for all state pension systems and for the largest 150 corporate pension systems using survey data reported in the annual *Money Market Directories*.<sup>12</sup> Figure 1 summarizes these comparisons. The most dramatic difference between state and corporate pension systems is that corporate

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<sup>12</sup> While all state pension systems report asset allocations in the *Money Market Directory*, they do not all update their asset allocations every year. Figure 2 is based on only updated observations. Only 103 of the 150 largest corporate defined-benefit pension systems report asset allocations in the *MMD*. Our subsequent analysis is based on this subset. These 103 corporate systems represent aggregate assets of \$343 billion (or nearly 40% of the total corporate defined-benefit fund assets reported in the directory).

**Figure 1**  
**Asset Allocations of State and Corporate Pension Systems, 1988-1992**



Source: *Money Market Directory*, various issues. Value-weighted asset allocations for state pension systems include between 79 and 85 systems (depending on data availability); allocations for corporate systems include between 95 and 103 systems. Real Estate represents real estate equities and mortgages. Stock includes international equities. Bonds include corporate debt, mortgage-backed securities, and U.S. government and agency securities.

funds are more heavily invested in equities and less in fixed-income securities than are state pension funds. Also, systems where the beneficiary-dominated board holds investment authority hold a somewhat larger percentage of their portfolio in realty (8.4% compared to 5.5% for state-investment-authority systems and 5.6% for corporate systems), including real estate equities and mortgages.

Table 3 reports estimated coefficients from regressions predicting asset allocations as a function of organization type and governance characteristics. Since pension systems with older beneficiary populations have shorter payout horizons than those with younger populations, we expect them to invest in safer assets (other things equal), to reduce the chance that a large negative investment outcome will bring current assets below current obligations. We include the proportion of the beneficiary population comprised of retirees as an explanatory variable to control for this effect, as well as a fund size control. Columns (1) through (3) show that corporate systems hold a larger fraction of their portfolio in equities and a smaller fraction in bonds and realty than either type of state system.<sup>13</sup> The regressions also suggest that systems

<sup>13</sup> Although we offer no specific hypotheses relating to real estate holdings by state systems vs. corporate, we note the comments of a fund manager in a state system (cited by O'Barr and Conley, p. 143):

ÒReal estate is the bane of every CEO in pension systems, because trustees love real estate. They can touch it. They can feel it. They can point with pride to it. And I used to joke in telling the trustees at the time when it was 5 percent of the portfolio, ÔSee, itÕs 5 percent of the portfolio, and itÕs 95 percent in-house.Õ A real major pain in the ass. They would spend

with state investment authority hold more equities, more bonds, and less realty than board-investment-authority systems, though these differences are not statistically significant.<sup>14</sup> As expected, increasing the fraction of the beneficiary population comprised of retirees affects portfolio composition, decreasing equity holdings. The result that state pension systems invest in more bonds and less equity than corporate systems is consistent with the caretaker hypothesis: such an allocation strategy decreases the variance of portfolio returns and reduces the likelihood of large negative outcomes that are particularly costly to state pension system officials.

It is also possible that state system portfolios are invested conservatively not as a result of caretaking trustees' desires not to draw negative attention to the fund, but instead because legislative or constitutional restrictions constrain them from doing anything else. As an example, pension managers in Indiana are not allowed to invest in corporate equities; many other funds restrict the fraction of the fund portfolio held in equities. Overall, 31 of the 75 Pendat systems face statutory or constitutional restrictions on asset allocations. However, over half of the Pendat systems have *system-level* policy guidelines that constrain their asset allocations even further than the legislative constraints require. That is, system trustees do not behave as though they find legislatively-imposed asset allocation restrictions binding. Rather, they often constrain themselves, voluntarily, to even more conservative portfolio choices.

Columns (4) through (6) of Table 3 examine the effect of board composition on asset allocations for the subsample of state systems where the board of trustees is responsible for investment decisions. The fractions of the portfolio held in equities and real estate decline, and the fraction held in bonds increases, with both the fraction of active and retired members on the board. These effects are largest and only significant, for the fraction of retirees on the board, however. This suggests that retirees are particularly conservative in their investment approach: as their board membership increases in systems where they have investment authority, equity and real estate holdings fall and bond holdings rise.

Our control for the age profile of the beneficiary population, retirees as a fraction of total members, has a strong and surprising effect in the regressions in columns (4) through (6) of Table 3: as the population becomes older, these funds hold riskier portfolios. This effect is contrary to what we expect, and opposite of the effect in corporate systems. This is an interesting result, although we do not have a particularly satisfactory explanation for it.

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more time concerned with that 5 percent than being concerned with the 50 percent or so that we had in equities, or the 40 percent or so I had in fixed income. Why? Who knows?Ó

<sup>14</sup> The regressions in Table 2 were re-estimated by year, and we obtained similar coefficients (although the t-statistics were smaller).

**Table 3**  
**Regressions of Asset Allocations by Type of Pension System and Governance Characteristics, 1988-1992**

Independent Variables	<i>Sample: All State and Corporate Pension Systems</i>			<i>Sample: State Systems with Board Investment Authority</i>		
	Dependent Variable: Fraction of portfolio invested in:			Dependent Variable: Fraction of portfolio invested in:		
	Equities	Bonds	Realty	Equities	Bonds	Realty
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	.3207	.3859	-.0060	.2438	.4891	-.0173
State Investment Authority (Dummy Variable)	.0212 (1.2)	-.0183 (-.9)	-.0061 (-1.0)	—	—	—
Corporate Pension System (Dummy Variable)	.1858 <sup>a</sup> (12.1)	-.1997 <sup>a</sup> (-11.2)	-.0262 <sup>a</sup> (-5.0)	—	—	—
Active Members as Fraction of Board	—	—	—	-.0302 (-0.5)	.1014 (1.3)	-.0192 (-0.7)
Retired Members as Fraction of Board	—	—	—	-.4198 (-4.2)	.5675 (4.3)	-.1407 (-2.9)
Fraction of Retirees in Membership Population	-.1610 (-3.0)	.0646 (1.0)	.0460 (2.5)	.7415 (3.6)	-1.1136 (-4.1)	.3410 (3.5)
Log(Net Assets)	.0082 (1.6)	.0074 (1.3)	.0074 (4.3)	.0005 (0.1)	.0157 (1.5)	.0035 (0.9)
Additional Controls	Year Effects	Year Effects	Year Effects	Year Effects	Year Effects	Year Effects
R <sup>2</sup>	.2315	.2407	.0930	.2008	.2243	.1744
Sample Size	588	588	588	158	158	158

Notes: Regressions include year controls. Asset allocations from *Money Market Directory*. Asset and Retiree data from Compustat for corporate systems, annual reports for state systems. Fraction of board comprised of active and retired beneficiaries from Pendet. t-statistics in parentheses.

<sup>a</sup>-indicates that the coefficient is significantly different (at the 1% level) from the coefficient on the dummy variable for state systems with state investment authority.

### *Asset Management Practices*

Table 4 presents some additional characteristics of asset management and compensation policies from a 1992 survey of public and corporate pension fund officials by Greenwich Associates. Officials at 178 corporate funds with assets over \$1 billion and 85 state funds

**Table 4**  
**Comparison of Characteristics of State and Corporate Pension Systems, 1992**

Characteristic	State Pension Systems (n=85)	Corporate Pensions with Assets > \$1 Bil (n=178)
<i>Asset Management</i>		
Percent of assets managed internally	30.6%	16.2%
Fees paid to outside managers (average basis points)	29.0	38.2
Percent of systems with performance fee arrangements with outside managers	24%	43%
Percent of systems hiring new managers in 1992	51%	67%
Percent of systems terminating managers in 1992	33%	52%
<i>Compensation of fund manager</i>		
Average 1992 salary for fund manager	\$68,700	\$104,900
Percent eligible for bonus in 1992*	8%	55%
Average bonus for managers eligible for bonus	\$9,900	\$22,500

Source: *Big Job Gets Bigger: Investment Management 1993*, Greenwich Reports.

\* Percent eligible for bonus based on all public funds (instead of state funds) and all corporate funds (instead of corporate funds with more than \$1 billion); disaggregated data are unavailable.

were interviewed for the 1992 survey.<sup>15</sup> Consistent with the view of state pension fund officials as caretakers pursuing very conservative and frugal investment strategies, the Greenwich data show that state pension funds manage a much larger fraction of their portfolios internally than do corporate funds (30.6 vs. 16.2 %, respectively), and pay much lower average fees to outside managers (29.0 vs. 38.2 basis points). State funds also use performance-fee arrangements with outside managers less often than do corporate funds, and have lower turnover among their outside money managers.

#### *Compensation of the Fund Manager*

The data on fund-manager compensation in Table 4 also support the caretaker hypothesis that state funds avoid calling negative attention to themselves by paying lower salaries to fund managers. According to the Greenwich survey, the average 1992 base salary for fund managers in state pension funds is \$68,700, compared to \$104,900 base salary for managers of corporate pension funds. State pension systems give weaker incentives to their fund managers than do corporate systems: while more than half of the corporate managers

<sup>15</sup> While the Greenwich report does not provide a size breakdown for state funds, 79 of the 107 systems in our universe of state pensions have assets exceeding \$1 billion. We therefore view the figures for large corporate systems as comparable to those for state systems.

participated in incentive bonus plans (earning average bonuses of \$22,500), only 8% of public fund managers participated in similar plans (earning average bonuses of \$9,900).

One example of state pension funds paying relatively low, non-performance-based salaries is CalPERS' former manager Dale Hanson, who, prior to 1994, was paid a flat \$99,800 salary regardless of his fund's performance (Scism, 1993).<sup>16</sup> Although data on the compensation of other individual executive directors are difficult to obtain, the Greenwich survey gives some information about the relative distribution of fund managers' salaries at corporate and public (state and local) pension systems.<sup>17</sup> While only 11% of the 563 corporate fund managers interviewed made less than \$60,000, 37% of the 313 public fund managers interviewed did so. At the upper-end of the distribution, only 3% of the public fund managers made more than \$100,000, while 22% of the corporate fund managers did so. The figures for public fund managers seem unusually low for individuals who are responsible for multi-billion dollar portfolios, but often state systems are constrained from paying higher salaries (and possibly attracting better managers) by civil-service pay guidelines that cap civil servants' compensation.

Civil-service pay restrictions also constrain state systems from tying administrators' pay to fund performance in any meaningful way.<sup>18</sup> Scism (1993) reports that, prior to September 1993, only five state pension funds offered performance-based bonuses. Pennsylvania Public School Employee Retirement System (PennPSERS) introduced bonuses in October 1993, over the objections of the state treasurer who argued that "incentive-based pay would encourage portfolio managers to take big risks." CalPERS introduced incentive bonuses effective in January 1994. Under the new compensation system, CalPERS' manager can receive a bonus of up to 20% of his salary by achieving non-investment-related objectives such as responding quickly to beneficiary problems and treating retirees courteously. The use of beneficiary-related performance objectives is perhaps the result of beneficiary control over that state pension system.

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<sup>16</sup> Hanson left CalPERS in mid-1994 to head a private-sector investment firm. Although Hanson received a substantial (by state government standard) raise at the beginning of 1994, it was not enough to keep him in the public sector.

<sup>17</sup> Salary distributions in the Greenwich survey include managers of local as well as state pension plans. Zorn (1991) provides summary statistics for the distribution of the annual pay of the highest-paid official at a sample of 70 state pension systems in 1990. While none made less than \$30,000, 14 (or 20% of the sample) earned between \$30,000 and \$50,000, and 26 (37%) earned between \$51,000 and \$70,000. At the upper-end of the distribution, 23 of the state fund managers (33%) earned between \$71,000 and \$90,000, while only three made over \$90,000.

<sup>18</sup> Some funds, including CalPERS, have circumvented such restrictions by hiring key employees, such as the Chief Investment Officer, as outside consultants who are exempt from civil service pay rules.

**Table 5**  
**Summary Statistics Comparing Investment Performance of**  
**State and Corporate Pension Systems, 1988-1992**

Market Return	State Pension Systems			Corporate Pension Plans				t-statistic for difference in means
	Median	Mean	Number	Source	Median	Mean	Number	
1988	4.1%	5.1%	61	F5500	12.0%	12.2%	339	t=-10.6***
1989	14.4%	15.1%	60	F5500	18.0%	16.6%	411	t=-3.0***
1990	9.1%	8.0%	60	F5500	1.2%	2.7%	394	t=8.4***
1991	8.8%	10.2%	56	F5500	21.0%	19.6%	357	t=-11.7***
				<i>Compustat</i>	19.8%	19.3%	386	t=-10.8***
1992	12.1%	11.6%	54	<i>Compustat</i>	7.4%	7.5%	348	t=9.3***
88-92	10.0%	9.9%	291	varies	11.0%	11.7%	1885	t=-4.8***

Notes: Investment performance is defined as the return on the system's net assets (at market values, excluding non-investment administrative expenses; see Appendix C). Data for state systems from annual reports, balance sheets, and questionnaires. Data for corporate systems based on Compustat and Department of Labor Form 5500 data. Corporate plans in the Form 5500 data are aggregated by closing fiscal month. Thus, a single corporation will be represented by more than one observation in a given year if its employees are represented by multiple plans with different fiscal closings.

\*-Significant at 10% level, \*\*-Significant at 5%, \*\*\*-Significant at 1%

#### IV. Investment Performance

Given the effect that organization structure appears to have on portfolio allocations, we might expect portfolio returns to vary with governance characteristics. Table 5 presents summary statistics comparing the investment performance (as measured by the rate of return on the market value of system net assets, defined in Appendix B) realized by state and corporate pension systems. Corporate pension systems outperformed state pension systems in 1988, 1989, and 1991, while state pension systems outperformed corporate pension systems in 1990 and 1992. Over the entire time period, corporate funds realized average returns about two percentage points higher than state systems. The average differences in performance for each year, and for all years taken collectively, are statistically significant. These results are not surprising however, given the differences in asset allocations noted above.

**Table 6**  
**OLS Regressions Comparing the Annual Investment Performance of**  
**State and Corporate Pension Systems**

Independent Variables	<i>Sample: All State and Corporate Pension Systems</i>			<i>Sample: State Systems, 1988-1992</i>	
	Years: 1988-1992	Years: 1988-1992	Years: 1989-1992	Board Investment Authority	State Investment Authority
	(1)	(2)	(3)	(4)	(5)
Intercept	.0853	.0664	.1012	.1214	.0663
State Investment Authority (Dummy Variable)	-.0032 (-0.5)	-.0036 (-0.6)	-.0036 (-0.5)	—	—
Corporate Pension System (Dummy Variable)	.0175 <sup>a</sup> (4.0)	.0150 <sup>a</sup> (3.2)	-.0037 (-0.7)	—	—
Active Members as Fraction of Board	—	—	—	.0136 (0.7)	—
Retired Members as Fraction of Board	—	—	—	-.0555 (-1.6)	—
South Africa/Northern Ireland Related Restrictions (Dummy)	—	—	—	-.0084 (-1.1)	-.0112 (-1.1)
Fund Pursues Economically Targeted Investments (Dummy)	—	—	—	.0043 (0.4)	-.0204 (-1.0)
Log(Net Assets)	.00042 (0.4)	.0015 (1.0)	.0019 (1.1)	-.0020 (-0.75)	.0041 (1.2)
Additional Controls	Year Effects	Year*Asset Allocations	Year*Asset Allocations	Year*Asset Allocations	
R <sup>2</sup>	.5170	.5576	.5857	.5585	
Sample Size	2204	976	794	252	

Notes: The dependent variable, investment performance, is the return on the system's net assets (at market values, excluding non-investment administrative expenses; see Appendix C). Asset allocation data (used in controls) from *Money Market Directory*. Return and size data for corporate systems based on Compustat and Department of Labor Form 5500 data. Return and size data for state systems from annual reports, balance sheets, and questionnaires. Governance variables from Pendat database, ETI data from Pendat, NAST, and the Department of Labor. Assets in \$millions. Columns (4) and (5) reported coefficients from a single regression with investment-authority interaction variables. t-statistics in parentheses.

<sup>a</sup>-indicates that the coefficient is significantly different (at the 5% level) from the analogous coefficient for state systems with sole state investment authority.

Table 6 presents regression results comparing annual investment performance across fund types and governance characteristics. Column (1), which includes controls for fund size and years, shows that corporate funds outperformed state funds with board investment authority by 1.8 percentage points per year, and outperformed state systems with state

investment authority by 2.1 percentage points per year in the 1988-1992 period. There does not appear to be a significant performance difference between the two types of state funds, however. But given the differences in asset allocations across types of funds noted above, the differences in portfolio returns between state and corporate funds may simply reflect the fact that state and corporate funds make different risk-return tradeoffs, while neither is investing inefficiently on a risk-adjusted basis. In order to study this possibility further, we examine system returns after controlling for asset mixes.

Column (2) of Table 6 reports estimated coefficients from a regression of pension systems' rates of return on dummy variables for corporate and state-investment-authority pension systems and control variables for the systems' asset allocations in all years. These controls include year dummies and the fraction of each fund invested in stocks, realty, and other assets interacted with year dummies (the fraction of the portfolio invested in bonds is excluded). The results confirm that corporate pensions outperformed state pensions by about 1.5 percentage points per year from 1988 through 1992, after controlling for differences in asset allocations in this way. Although the difference in performance between state and corporate funds is small relative to year-to-year changes in "market" performance, with state pension funds accounting for almost \$800 billion in assets, this relatively small difference in average performance translates into a potential loss to taxpayers of \$12 billion per year, or about one-seventh of the total amount collected in state income taxes in 1990.<sup>19</sup> The poor performance of state pension funds relative to corporate pension funds is even more startling given the results of Lakonishok, Shleifer, and Vishny (1992) suggesting that *corporate* pension funds systematically underperform the market.

The year\*asset-allocation controls in column (2) of Table 6 would appropriately control for differences in returns across asset classes if systems have common fiscal-year closings (so that the estimated coefficients on the controls would measure the annual return to each asset class). Unfortunately, while almost 84% of the corporate observations reflect December fiscal closings (and 4% reflect June closings), 72% of the state observations reflect June closings (while 19% reflect December closings). This is particularly problematic for the 1988 return data since most of the corporate observations measure returns from January 1988 through December 1988, while most of the state observations measure returns from July 1987 through June 1988. Thus, most of the 1988 returns for state systems include the effects of the October, 1987 market crash, while most of the returns for corporate systems do not. To assess the importance of this effect for the return results reported in column (2), column (3) reports

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<sup>19</sup> Source: 1993 *World Almanac*, p. 138.

results from the same regression but excluding the 1988 data for all systems. Excluding the 1988 data renders the coefficient on the corporate pension system dummy insignificant (and slightly negative), suggesting that without the 1988 data, there is no evidence of a performance differential between the different types of plans.

It is perhaps not surprising that we do not find risk-adjusted performance differences across types of funds. First, although beneficiaries have a great deal of control over investment policy in some types of state systems, we've shown that they bear some of the wealth consequences of their decisions, so would be motivated to invest efficiently. Second, if asset markets are efficient, then even inefficiently organized pension systems, where investment decision makers do not bear the wealth consequences of their decisions, will not underperform on a risk-adjusted basis: if you can't pick winners in an efficient market, then you can't pick losers either. But our measures of investment performance take into account investment expenses. Thus, if a fund pays large sums for investment advice that doesn't generate superior returns, its portfolio return, as we've calculated it, will reflect that. Thus, even if assets are efficiently priced, our measure of market return would still reflect waste of this sort. The results in column (3) show no evidence of this kind of waste, however. Thus, to the extent that our data are sufficient to detect a performance differential between state and corporate plans, we find no evidence of one.

While the first three regressions in Table 6 explore differences in performance between state and corporate systems, columns (4) and (5) explore governance-based performance differences across state systems in 1988 through 1992. These columns report results from a single regression of market performance on system governance characteristics, interacting the state investment authority dummy on each independent variable. We report the results in two columns to enhance comparability of the coefficients in systems with board versus state investment authority. In addition to the board-composition and investment-authority governance variables, the regressions also include a social-investment dummy variable indicating the existence of statute or policy restrictions on investments in South Africa or Northern Ireland, and a dummy variable indicating whether the fund pursues economically targeted investments, or ETIs. The regressions also include nineteen unreported (year)\*(asset class) variables to control for differences in asset allocations and market performances of the various asset classes.

The coefficient on the fraction of retired boardmembers in column (4) of Table 6 is negative and marginally significant, indicating that retiree board membership may be detrimental to performance in systems where the board has investment authority. While the

coefficient on the South African/Northern Ireland restriction dummy is negative in both columns (4) and (5) of Table 6, it is not significant in either type of system. Also, the practice of investing in economically targeted investments does not appear to affect portfolio returns, as evidenced by the insignificant coefficients on the ETI dummy variable.

Romano (1993) and Mitchell and Hsin (1994) also examine the effect of governance on the performance of public pension plans, although their results (and their measures of performance) are not directly comparable to ours. Romano (1993) notes the lack of a comprehensive data source for market returns, and examines the relation between book measures of asset returns and various governance characteristics. She finds the accounting earnings of state pension plans are negatively related to restrictions on South African investments, and positively related to the proportion of board members elected by beneficiaries. Mitchell and Hsin (1994) also examine the relation between performance and governance characteristics in public pension systems (including local pension plans), using self-reported one-year and five-year “market returns” reported by Pendar respondents. Similar to our results, they find a negative relation between performance and the fraction of the board comprised of retired beneficiaries. In addition, they find a marginally significant negative effect of ETIs on one-year portfolio returns, and no effect over a longer time horizon. We interpret the differences between these results and our own to reflect differences in sample composition, measurement of performance, and controls for asset allocations and risk.

#### *Evidence on Returns, Betas, and Abnormal Returns of Pension Equity Portfolios*

While the results presented in Table 6 suggest that differences in portfolio returns may be driven by more than differences in asset allocations across corporate and state systems, our controls for asset allocations are admittedly crude. It is possible that, within these broad asset classes, the two types of funds invest in assets with systematically different risk-return characteristics, and the better performance of corporate funds may reflect the riskiness of assets within an asset class, but not systematically better returns in each asset class after adjusting for risk. To explore this possibility, we examine the equity portfolios of both state and corporate pension systems using data published by CDA Investment Technologies, Inc., on their Spectrum 3 & 4 tapes. These tapes are compiled from the 13F forms that institutional investment managers are required to file quarterly with the Securities Exchange Commission.<sup>20</sup>

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<sup>20</sup> Section 13(f) of the Securities Exchange Act requires all institutional investment managers with equity portfolios worth \$100 million or more to file a form 13F with the SEC, describing their equity portfolios in detail. For the purposes of filing, an “institutional investment manager” is defined to include “...any person, other than a natural person, investing in or buying and selling securities for its own account, and any person exercising investment discretion with respect to the account of any other person” [U.S.C. 78m(f)]. Thus, both

Unfortunately, the Spectrum tapes report relatively few 13F forms filed directly by state or corporate pension funds: only 13 state pension funds and 54 corporate pension funds appear in the first-quarter Spectrum tapes during the five-year period 1987-1991. This appears to result from pension funds' common practice of using external investment advisors to manage their portfolios. In these cases, the external advisor will file a 13F form that applies to the pension funds' shares, while the pension fund never files a 13F form in its own name. Unfortunately, we have been unable to disentangle the ownership of shares invested by outside money managers, and cannot therefore reconstruct the portfolios of pension funds that do not file their own 13F forms, or that only file 13F forms covering a fraction of their equity portfolios.

The 68 state and corporate pension funds filing 13Fs from 1987-1991 reported stockholdings in 5,007 publicly traded companies. The pension-fund portfolio data were matched to monthly price and return data from CRSP's NYSE/AMEX Monthly Master File, and to monthly price and return data constructed from CRSP's NASDAQ Daily Master File. After updating the Spectrum data for missing or changed Cusip identifiers, we were able to obtain price and return data for 90% of the portfolio firms (representing 95% of the value represented in the 13F filings).

Quarterly "market betas" for each common stock held by each fund are computed using the Capital Asset Pricing Model based on the stock returns realized in the 60 months preceding the end of each quarter.<sup>21</sup> The market return used in the CAPM estimation is the value-weighted NYSE/AMEX/NASDAQ monthly return. Monthly abnormal returns for each stock in the portfolio are computed (using the quarterly betas) as:

$$(\text{Abnormal Return}) = (\text{Return}) - R_f - \beta * (\text{Market Return} - R_f),$$

where the risk-free rate of return,  $R_f$ , is defined as the yield on 3-month Treasury bills. Annual returns for each firm are constructed using the cumulative monthly returns, and the annual return and abnormal return for each pension fund is calculated as the value-weighted-average return earned by all stocks in the portfolio. Similarly, the pension fund's market beta is estimated as the value-weighted-average beta for the stocks in the portfolio as of the end of the quarter.

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state and corporate pension funds qualify as institutional investment managers, and the shares in their portfolios must be reported in quarterly 13F forms.

<sup>21</sup> We excluded firms with fewer than 48 monthly returns, but computed betas using all available data for firms with 48 to 60 monthly returns.

**Table 7**  
**Summary Statistics Comparing Equity Returns, Betas, and Abnormal Returns of**  
**State and Corporate Pension Systems filing 13-Fs, 1987-1991**

Variable	Year Ending March 31	State Pension Systems			Corporate Pension Plans			t-statistic for difference in means
		Median	Mean	Number	Median	Mean	Number	
Return on Equity Portfolio	1987	5.2%	4.3%	11	4.1%	5.8%	26	t=-0.7
	1988	16.6%	15.5%	9	16.6%	14.5%	22	0.6
	1989	29.8%	27.8%	13	30.2%	29.0%	23	-0.4
	1990	-6.6%	-6.7%	13	-4.7%	-3%	24	-1.7*
	1991	26.9%	28.0%	13	30.1%	29.0%	22	-0.4
	<i>All Years</i>	<i>16.6%</i>	<i>14.0%</i>	<i>59</i>	<i>13.2%</i>	<i>15.1%</i>	<i>117</i>	<i>-0.5</i>
Weighted-Average Beta of Equity	1987	1.02	1.04	11	1.07	1.09	26	t=-1.5
	1988	1.00	1.02	9	1.05	1.07	22	-1.8*
	1989	1.02	1.03	13	1.04	1.04	23	-0.1
	1990	.99	1.02	13	.99	1.00	24	0.7
	1991	1.00	1.01	13	.97	.95	22	1.7*
	<i>All Years</i>	<i>1.01</i>	<i>1.02</i>	<i>59</i>	<i>1.03</i>	<i>1.03</i>	<i>117</i>	<i>-0.4</i>
Abnormal Return on Equity Portfolio	1987	3.0%	3.1%	11	4.4%	5.6%	26	t=-1.0
	1988	-1.2%	-2.2%	9	-2.0%	-3.4%	22	0.9
	1989	1.7%	-.5%	13	1.8%	-.4%	23	-0.4
	1990	-.3%	-.3%	13	1.9%	5.7%	24	-1.6
	1991	-4.5%	-4.4%	13	-2.1%	-2.3%	22	-0.8
	<i>All Years</i>	<i>-.6%</i>	<i>-.9%</i>	<i>59</i>	<i>.9%</i>	<i>1.4%</i>	<i>117</i>	<i>-1.8*</i>

Notes: Data from the Spectrum database include 13 state and 35 corporate pension funds reporting equity holdings in 13F filings. Funds with less than \$200 million in equity holdings are excluded.

\*-Difference in means significant at 10% level.

The first-quarter Spectrum database generally contains 13F information as of March 31 of each year, and we eliminated ten observations reporting information as of a different date. We also eliminated 19 corporate pension funds reporting less than \$200 million in equity holdings. Our final sample includes 13 state pension plans, and 35 corporate plans, and represents total equity holdings ranging from \$47 billion in 1988 to \$84 billion in March, 1991.

Table 7 reports equity returns, market betas, and abnormal returns for state and corporate pension funds filing 13F schedules for the first quarter of 1987-1991. Across all five years, state pension systems earned average annual returns on their equity holdings of 14.0% (median 16.6%), had average quarterly market betas of 1.02 (median 1.01), and realized average abnormal returns of -.9% (median -.6%). Corporate pension funds filing 13F schedules achieved average (median) equity returns of 15.1% (13.2%), had average and median market betas of 1.03, and realized average (median) abnormal returns of 1.4% (.9%). Although most of the differences between corporate and state pension funds in Table 8 are not statistically

significant, corporate pension funds outperformed state pension funds (as measured by average returns and average abnormal returns) in all years except 1988, and the average abnormal return earned by corporate funds from 1987-1991 is significantly higher than the returns earned by state funds over the same time period.

Although there have been slight year-to-year variations, Table 7 shows that the market betas of the equity portfolios for state and corporate funds are similar and close to unity (with annual averages across funds ranging from .95 to 1.09). Market betas for state funds ranged from .835 (for CalPERS in 1991) to 1.21 (Ohio School Employees in 1990); betas for corporate funds ranged from .772 (for Digital in 1991) to 1.54 (for Allied in 1987).<sup>22</sup> The similarity of estimated betas may reflect that state and corporate fund managers follow similar equity investment strategies, or may reflect that funds are likely to file 13Fs on the portion of their equity portfolio that is managed in-house, which in turn is likely to be an indexed portfolio. With these caveats in mind, the results in Table 7 provide weak evidence that corporate funds follow equity investment strategies that are similar to state funds, but achieve higher abnormal returns.

## V. Benefit Policies

Just as pension system investment decisions (if not risk-adjusted returns) vary with organizational structure, we expect benefit decisions to be related to organizational form as well. An especially important organizational difference between corporate and state systems is the extent of beneficiary control over pension benefit policy. Beneficiary-dominated boards of trustees frequently control benefit policy in state pension systems, with two-thirds of the Pendat systems reporting that their boards of trustees make benefit decisions. Beneficiary control over benefit policy is uncommon in corporate systems.

Another important factor in understanding differences between corporate and state pension system benefit policies is that beneficiary characteristics and preferences may vary systematically across the two groups. In particular, state pension system beneficiaries are active and retired state employees who have chosen public sector jobs, generally characterized by relatively low but stable wages and secure tenure relative to the private sector. Through the self-selection process, state system beneficiaries as a group are likely to be more risk-averse, and to value income stability more highly, than corporate system beneficiaries. Thus, we

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<sup>22</sup> These ranges exclude two corporations, Berkshire Hathaway and Pennzoil, whose 13F filing indicated shareholdings in only one or two corporations (rather than a diversified portfolio of corporations).

expect that benefits in state systems will be more stable than those in corporate plans. Within state systems, if beneficiary trustees represent the interests of system beneficiaries better than trustees who are not members of the system, then we'd also expect benefits to be larger and more secure as beneficiary control over state system policy increases.

### *Benefit Levels*

We first consider the effect of organizational characteristics on the absolute level of benefits. Beneficiary-trustees who have authority over benefit policies face strong incentives to increase benefits, since beneficiary-trustees will ultimately receive higher retirement pay as a result. These incentives suggest that as members' control over benefit policy increases, benefits paid will also increase. Surprisingly, this does not appear to be the case. Table 8 presents estimation results examining how total benefits paid per system retiree vary between board of trustees and those where benefit decisions are made by the state. Data on total benefit payments and number of retirees in corporate systems are taken from Form 5500 records, while benefit payment and retiree data for state plans are from annual reports. The results reported in column (1), which include both corporate and state plans, suggests that per-capita benefit levels are similar in corporate and state systems, and that benefits in the two types of state systems are also similar. Other controls in the Table 8 regressions include the log of system net assets to control for size differences across types of systems, and year dummies to control for time trends.

Column (2) of Table 8 considers only those state systems where benefit decisions are made by the board of trustees, and examines the effect of board composition on the level of benefits per retiree. The coefficients on the fractions of the board made up of active and retired members are large, negative and highly significant, suggesting that as beneficiary membership on the board of trustees increases, benefit levels paid to retirees fall appreciably. To give an idea of the magnitude of these effects, the coefficient of -8.5188 on the fraction of active members on the board variable suggests that, if active-member representation increases by ten percentage points (by one member on a ten-member board, for example), the average annual benefit paid to current retirees falls by \$852. This negative relationship could reflect the fact that active members, not currently receiving benefits, seek to keep payments to current retirees low to have more funds available when they retire. However, it is more difficult to make such an argument for the retired members on the board, who would be cutting their own current benefits by nearly \$1300 per year for each seat on a ten-member board. Average annual per-capita benefit levels are \$8,607 in these systems.

**Table 8**  
**OLS Regressions Comparing Total Annual Benefits Paid per System Retiree**  
**State and Corporate Pension Systems, 1988-1992**

Independent Variables	<i>Sample: All State and Corporate Pension Systems</i>	<i>Sample: State Systems Where Board has Benefit Authority</i>
	(1)	(2)
Intercept	7.1457	7.3168
Corporate Pension System (Dummy Variable)	7.4245 (0.8)	—
State Benefit Authority (Dummy Variable)	-.4690 (-0.1)	—
Active Members as Fraction of Board	—	-8.5188 (-6.8)
Retired Members as Fraction of Board	—	-12.9384 (-4.9)
Log(Net Assets)	-.1531 (-0.1)	.4723 (2.1)
Additional Controls	Year Effects	Year Effects
R <sup>2</sup>	.0028	.2713
Sample Size	1693	184

Notes: The dependent variable is the total benefits paid divided by the number of system retirees. Benefit, retiree and asset data for corporate systems based on Compustat and Department of Labor Form 5500 data. Benefit, retiree and asset data for state systems from annual reports, balance sheets, and questionnaires. Governance variables from Pendat database. Net assets in \$millions, benefits per retiree in \$thousands. t-statistics in parentheses.

One complication in interpreting these results is that they only cover one aspect, retirement benefits, of a total lifetime compensation package, while presumably state employees care about the package as a whole. Thus, we do not know if low retirement benefits are compensated through higher salaries or health benefits, for example. Without comprehensive data on the other aspects of the total compensation package, it is difficult to assess how organizational characteristics affect what beneficiaries really care about.

Decreasing per-capita benefits as beneficiary control of benefit policy increases may also reflect the fact that beneficiary-trustees are making a more complex trade-off than simply higher versus lower benefits. In particular, absolute benefit levels may be lower in systems where beneficiaries have more control over benefit policy, but those benefits may also be more secure

**Table 9****Regressions Predicting the Incidence and Size of Cost of Living Adjustments  
in State Pension Systems Where Board has Benefit Authority, 1990**

Independent Variables	Logistic Regressions Predicting <i>Existence</i> of Cost of Living Adjustments		Tobit Regressions Predicting <i>Size</i> of Cost of Living Adjustments	
	<i>Ad Hoc</i> COLAs	Pre-Promised COLAs	<i>Ad Hoc</i> COLAs	Pre-Promised COLAs
	(1)	(2)	(3)	(4)
Intercept	-1.7331	-1.7256	-4.3986	-1.8939
Active Members as Fraction of Board	-2.5367 (-2.0)	5.3449 (2.9)	-3.3940 (-1.6)	10.5153 (3.1)
Retired Members as Fraction of Board	-1.9983 (-0.9)	5.1675 (1.8)	-4.0593 (-1.0)	11.6838 (2.2)
Log(Net Assets)	.2268 (1.1)	-.2070 (-.9)	.4916 (1.3)	-.4994 (-1.3)
LogLikelihood	-40.9	-29.4	-109.2	-59.2
Sample Size	63	63	63	63

Note: Data on COLAs are from Pendat at the plan-level (and not the system level). The dependent variable in the logistic regressions is 1 for plans granting the specified type of COLA during the prior fiscal year and 0 for plans not granting increases. The dependent variable in the Tobit regressions is the percentage COLA granted. Asymptotic t-statistics in parentheses.

against inflation and other threats as a result of beneficiary control. These member-trustees represent the interests of active and retired state workers, who are likely to be more risk-averse than the population at large, and facing the prospect of living off of their retirement checks. Such constituents may be willing to forego some benefits in exchange for a more secure, inflation-adjusted retirement income stream.

*Cost of Living Adjustments*

We therefore turn to the effect of beneficiary control over benefit policy on the security of benefit levels. While benefit levels in most state systems are protected against reduction by constitutional provision or legislation, most benefit formulas are calculated in nominal terms; real benefit levels are still vulnerable to inflation. Prompted by this possibility, state and corporate pensioners may seek cost of living adjustments, or COLAs, to their benefits. Table 9 reports results from regressions examining the incidence and size of both pre-promised and *ad hoc* COLAs in state pension systems. Pre-promised COLAs are increases in benefit levels,

typically tied to inflation, that are included in the benefit formula written in the original pension contract. Such COLA provisions insure retirees against inflation risk. In contrast, *ad hoc* COLAs raise benefits on a one-time basis, often in response to good investment performance, but are not promised or specified in advance and are not specifically tied to inflation. The Pendat questionnaire asks respondents whether plans in the system granted a COLA of either type in the last year (usually 1990) and, if so, its size. The logistic regressions reported in columns (1) and (2) examine the effect of beneficiary control on the incidence of *ad hoc* and pre-promised COLAs, respectively. Column (1) indicates that in systems where the board of trustees has benefit authority, more board membership by active system participants reduces the incidence of *ad hoc* COLAs will be granted. In contrast, column (2) suggests that as active members' representation increases on boards deciding benefit policy, pre-promised COLAs become significantly more common. The Tobit regression results reported in columns (3) and (4) paint a similar picture: increased board membership by active system beneficiaries reduces the size of *ad hoc* COLAs, but as the fraction of active and retired members on the board of trustees increases, pre-promised COLAs granted become more generous.

These results suggest that while beneficiary-trustees may have a negative effect on one-time, *ad hoc* benefit increases, they are effective at insuring beneficiaries against inflation risk. This emphasis on pre-promised inflation insurance for beneficiaries is consistent with state system beneficiaries who are particularly risk averse, valuing inflation protection particularly highly. It also suggests that the lower benefit levels in systems with more beneficiary control over benefit policy may be buying members increased security over the real value of their pension benefits.

## VI. Funding Behavior

While pre-promised cost of living adjustments can protect state pension system beneficiaries against inflation risk, they still bear some risk that benefits could be reduced because of funding insufficiencies. If beneficiary trustees fulfill their duty to serve beneficiaries' interests by reducing the risk of benefit reductions, then pension systems' funding policies should also reflect beneficiary-trustees' influence.

We consider funding ratios, measured as the market value of system net assets divided by the projected benefit obligation, in our full sample of state and corporate pension systems in 1988-1992. In our sample of 1442 corporate system-years, the mean funding ratio is 1.17 (median=1.12), while that for the 291 state system-years is 0.94 (median=0.94). About three-

**Table 10**  
**OLS Regressions Comparing Funding Levels in**  
**State and Corporate Pension Systems, 1988-1992**

Independent Variables	<i>Sample: All State and Corporate Pension Systems</i>	<i>Sample: State Systems</i>
	(1)	(2)
Intercept	1.0015	1.1224
Corporate Pension System (Dummy Variable)	.2081 (9.8)	—
Active Members as Fraction of Board	—	.3650 (4.1)
Retired Members as Fraction of Board	—	.1931 (0.9)
Log(Net Assets)	-.0136 (-2.1)	-.0257 (-1.7)
Additional Controls	Year Effects	Year Effects
R <sup>2</sup>	.0917	.0721
Sample Size	1733	245

Notes: The dependent variable, funding percentage, is the system's net assets (at market value) divided by its projected pension benefit obligation (PBO). PBO and asset data for corporate systems based on Compustat and Department of Labor Form 5500 data. PBO and asset data for state systems from annual reports, balance sheets, and questionnaires. Governance variables from Pendat database. Net assets and PBO in \$millions. t-statistics in parentheses.

quarters of corporate systems are 100% funded or better, with a minimum funding level of 43%, while a little less than half of state systems are fully funded, with a minimum funding level of 30% among state systems.

Column (1) of Table 10 presents regression results comparing funding levels across state and corporate systems, after controlling for the level of system assets. First, we note that larger plans tend to have somewhat lower funding ratios, as indicated by the negative and significant coefficient on the log of fund assets. The significant coefficient of .2081 on the corporate pension system dummy variable indicates that corporate plans are, on average, better funded than state plans by about 21 percentage points, after controlling for plan size. The fact that corporate systems are so much better funded than state systems, while striking, should not be surprising, since ERISA regulations include strict funding and contribution requirements for corporate funds, while state funds have no such Column (2) of Table 10 includes only state plans, and examines the effect of beneficiary board membership on state systems' funding

levels. Board membership by active system members is positively and significantly related to funding levels, while board membership by system retirees does not significantly affect funding. Since retired beneficiaries are currently receiving their pension benefits and would be first in line for future benefits, they may be less concerned about system funding levels than active members, who face the prospect of future benefit reductions if system funding is insufficient to cover the benefits they've been promised. By advocating and winning higher system funding levels, active member trustees further ensure the security of member benefits, including their own.

The fact that funding levels are so sensitive to beneficiary control of pension system policies supports the notion that, despite constitutional and legislative guarantees against benefit reductions, state pension beneficiaries do not behave as though they believed that their pension payments were secure no matter what. Instead, beneficiary trustees seem to pursue improved funding levels, presumably because improved funding status reduces the likelihood that promised benefits will decline.

## **VII. Conclusion**

Pension funds are large and increasingly important actors in the U.S. economy: they own almost one-third of all equity traded in domestic markets, and provide retirement income to over 40% of the U.S. population over age 65. But they are by no means a homogeneous group, and understanding their investment and benefit decisions requires that we examine them in the context of their organizational differences. Using such an approach, we find that organizational differences help explain many differences in investment, benefit and funding behavior, both between state and corporate pension funds and among state funds.

In our analysis of state and corporate funds, we focus on the fact that beneficiaries have significant control over system policies in state systems, but relatively little in corporate systems. Also, in contrast to corporate pension fund managers, state fund managers can easily draw negative attention from politicians and the press if their decisions generate large negative investment outcomes. We develop the hypothesis that, relative to corporate pension funds, state funds will be run by "caretakers," who manage the pension to reduce the chance of engendering negative attention from the press and politicians. This leads to particularly conservative investment behavior by state fund managers, who hold more of their portfolios in bonds, and less in equities, manage more of their assets in-house, and pay their outside money managers smaller, less performance-based fees than their corporate counterparts. Across state

funds, we find that as retirees' control over investment policy increases, funds' asset allocations shift toward bonds and away from equity. Despite these differences in investment allocation strategies, we find no evidence of a difference in risk-adjusted returns between corporate and state pension systems, and a marginally significant negative effect of retiree control over state system investment policy.

Pension benefit and funding policies are also sensitive to organizational structure. We find that greater beneficiary control over benefit policy in state systems leads to lower benefits that are more likely to be protected from inflation through promised cost-of-living adjustments. Beneficiary control over state system policy is also associated with higher funding levels in state plans. These results suggest that, as state employees who have chosen relatively stable and secure wages during their working lifetimes, state pension system beneficiaries seek similarly secure retirement benefits, by protecting them against inflation and the possibility of reduction because of underfunding.

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## Appendix Table A1

## Decision Authority and 1992 Assets in 107 State Pension Systems, Grouped by State

State Pension System	1992 Assets (\$ millions)	# Plans	Decision Authority	
			Investment	Benefits
Retirement Systems of Alabama, Employees & Judges Fund	\$3,149	2	Board	State
Retirement Systems of Alabama, Teachers Retirement System	\$6,750	1	Board	State
Alaska Dept. of Revenue, Public Employees & Teachers Fund	\$5,480	2	Board	n/a
Arizona State Retirement System	\$9,500	1	Board	n/a
Arizona Public Safety Personnel Ret. System.	\$1,448	1	Board	n/a
Arkansas Public Employees Ret. System	\$1,755	1	Board	Board
Arkansas Teachers Retirement System	\$2,610	1	Board	Board
Arkansas Local Police and Fire Ret. Plan	\$67	1	Board	Board
Arkansas State Police Retirement System	\$107	1	Board	n/a
Arkansas State Highway Employees Ret. System.	\$366	1	Board	n/a
California Employees Retirement Systems	\$67,979	3	Board	Board
California State Teachers Retirement System	\$40,700	1	Board	State
University of California Retirement System	\$15,200	1	Board	n/a
Colorado Public Employees Retirement Association	\$11,492	1	Board	State
Colorado Fire & Police Pension Association	\$775	2	Board	n/a
Connecticut State Trust Funds, State Employees	\$4,221	2	State	n/a
Connecticut State Trust Funds, Teachers Retirement Fund	\$5,334	1	State	Board
Delaware State Employees Retirement Fund	\$2,000	1	Board	Board
Florida State Board of Administration, Retirement System	\$28,676	1	State	n/a
Georgia Division of Investment, Employees Retirement System	\$5,293	4	State	Board
Georgia Division of Investment, Teachers Retirement System	\$13,529	1	State	Board
Hawaii Employees Retirement System	\$4,283	1	Board	State
Idaho Public Employee Retirement System	\$2,168	3	Board	State
Illinois State Board of Investment, Public Employees	\$3,225	3	State	State
Illinois Teachers Retirement System	\$10,453	1	Board	Board
Illinois Municipal Retirement Fund	\$5,700	1	Board	Board
Illinois State Universities Retirement System	\$4,628	1	Board	n/a
Indiana Public Employees Retirement Fund	\$4,666	3	Board	Board
Indiana State Teachers Retirement Fund	\$2,400	1	Board	Board
Indiana State Police Pension Fund	\$195	1	State	n/a
Iowa Public Employees Retirement System	\$6,256	2	Board	State
Kansas Public Employees Retirement System	\$4,515	3	Board	State
Kentucky Retirement Systems	\$4,409	3	Board	Board
Kentucky Teachers Retirement System	\$4,956	1	Board	Board
Kentucky Judicial Retirement System	\$88	1	Board	n/a
Kentucky Legislators Retirement System	\$22	1	Board	Board
Louisiana State Employees Retirement System	\$2,879	1	Board	State
Louisiana Teachers Retirement System	\$4,600	3	Board	Board
Louisiana School Employees' Retirement System	\$850	1	Board	n/a
Louisiana Municipal Police Employees Retirement System	\$577	1	Board	Board
Louisiana Municipal Employees Retirement System	\$275	1	Board	n/a
Maine State Retirement System	\$2,462	1	Board	n/a

## Appendix Table A1, continued

## Decision Authority and 1992 Assets in 107 State Pension Systems, Grouped by State

State Pension System	1992 Assets (\$ millions)	# Plans	Decision Authority	
			Investment	Benefits
Maryland State Retirement Systems	\$14,376	7	Board	Board
Massachusetts State Employees & Teachers Retirement System	\$7,050	2	State	n/a
Massachusetts Turnpike Authority Retirement System	\$81	1	Board	n/a
Massachusetts Port Authority Retirement System	\$91	1	Board	State
Massachusetts Pension Reserve Management Board	\$3,400	1	State	n/a
Michigan Dept. of Treasury, State Employees Ret. System	\$4,720	1	State	Board
Michigan Dept. of Treasury, School Employees Ret. System	\$16,293	1	State	Board
Michigan Dept. of Treasury, State Police Ret. System	\$503	1	State	Board
Michigan Dept. of Treasury, Judges/Probate Judges Ret. System	\$175	2	State	Board
Michigan Municipal Employees Retirement System	\$1,700	1	Board	n/a
Minnesota State Board of Investment, State Retirement System	\$3,493	3	State	State
Minnesota State Board of Investment, Teachers Ret. Association	\$7,069	1	State	n/a
Minnesota State Board of Investment, Public Employees Ret.	\$5,133	2	State	State
Mississippi Public Employees Retirement System	\$5,932	1	Board	Board
Missouri State Employees Retirement System	\$2,069	1	Board	Board
Missouri Public School Retirement System	\$5,300	1	Board	Board
Missouri Local Government Employees Retirement System	\$703	1	Board	State
Missouri Highway Employees & Highway Patrol Ret. System	\$576	1	Board	n/a
Montana Board of Investments, Public Employees Ret. System	\$1,306	7	State	Board
Montana Board of Investments, Teachers Retirement System	\$968	1	State	n/a
Nebraska State Investment Council, Consolidated Ret. Funds	\$1,942	5	State	n/a
Nevada Public Employees Retirement System	\$4,568	2	Board	Board
New Hampshire Retirement System	\$1,400	4	Board	Board
New Jersey Div. of Investment, Public Employees Ret. System	\$11,367	1	State	Board
New Jersey Div. of Investment, Teachers Pension & Ann. Fund	\$13,562	1	State	Board
New Jersey Div. of Investment, Police & Firemen's Ret. System	\$5,273	1	State	Board
New Jersey Div. of Investment, State Police Retirement System	\$590	1	State	n/a
New Jersey Div. of Investment, Consolidated Police & Fire Fund	\$56	1	State	n/a
New Jersey Division of Investment, Judicial Retirement System	\$121	1	State	n/a
New Mexico Public Employees Retirement Association	\$2,575	1	Board	n/a
New Mexico Educational Retirement Board	\$2,500	1	Board	Board
New York State & Local Retirement Systems	\$51,926	2	State	n/a
New York State Teachers Retirement	\$34,622	1	Board	State
North Carolina Retirement Systems	\$19,690	5	State	Board
North Dakota State Investment Board, Public Employees	\$456	1	State	Board
North Dakota State Investment Board, Teachers Fund	\$539	1	State	Board
Ohio Public Employees Retirement System	\$25,868	2	Board	State
Ohio State Teachers System	\$19,654	1	Board	Board
Ohio School Employees Retirement System	\$3,579	1	Board	Board
Ohio Police and Firemen's Disability & Pension Board	\$4,052	1	Board	n/a
Ohio State Highway Patrol Retirement System	\$296	1	Board	Board

## Appendix Table A1, continued

## Decision Authority and 1992 Assets in 107 State Pension Systems, Grouped by State

State Pension System	1992 Assets (\$ millions)	# Plans	Decision Authority	
			Investment	Benefits
Oklahoma Public Employees Retirement System	\$1,901	2	Board	Board
Oklahoma Teachers Retirement System	\$2,500	1	Board	State
Oklahoma Police Pension & Retirement System	\$531	1	Board	n/a
Oklahoma Firefighters Pension & Retirement System	\$557	1	Board	Board
Oklahoma Law Enforcement Retirement System	\$216	1	Board	n/a
Oregon Investment Council, Public Employees Ret. System	\$14,500	1	State	State
Pennsylvania State Employees Retirement System	\$11,815	1	Board	Board
Pennsylvania Public Schools Employees Retirement System	\$21,500	1	Board	State
Pennsylvania Municipal Retirement System	\$349	1	Board	Board
Rhode Island Retirement Systems	\$2,975	2	Board	n/a
South Carolina Retirement System	\$10,218	2	State	Board
South Dakota Investment Council, Retirement System	\$1,772	1	State	Board
Tennessee Consolidated Retirement System	\$10,649	1	State	State
Texas Employees Retirement System	\$8,961	1	Board	Board
Texas Teacher Retirement System	\$32,000	1	Board	Board
Texas Municipal Retirement System	\$3,100	1	Board	Board
Texas County and District Retirement System	\$3,004	1	Board	n/a
Utah State Retirement System	\$5,000	5	Board	Board
Vermont State Retirement System	\$857	3	Board	n/a
Virginia Retirement System	\$12,894	1	Board	State
Washington State Investment Board, Retirement Systems	\$16,436	8	State	n/a
West Virginia State Board of Investments, Consolidated Pension	\$1,815	3	State	n/a
Wisconsin Investment Board, Retirement Systems	\$29,043	1	State	State
Wyoming Retirement System	\$1,933	4	Board	Board

Source: 1992 Assets from the 1993 *Money Market Directory*. Benefit authority data from Pendat. Systems are classified as having state (vs. board) investment authority if (a) investments are made by a state-level division of investment, (b) the state treasurer is the sole trustee of the pension fund, or (c) the board of trustees is comprised exclusively of elected state officers.



## Appendix B

### Calculation of the Expected Change in the Projected Benefit Obligation

This appendix derives an expression for  $E[\Delta \text{PBO}]$ , the expected change in the projected benefit obligation. We compute separately the expected changes in PBO for active and retired members,  $E[\Delta \text{PBO}^A]$  and  $E[\Delta \text{PBO}^R]$ . Underlying the derivation is the assumption of a “typical” promised annual retirement benefit equal to  $xSt$ , where  $S$  is the employee’s expected terminal salary,  $t$  is the current years of service, and  $x$  is the fixed fraction of final salary paid to retirees for each year of service. Also, as a simplification, we assume that retirees live for exactly  $D$  years after retirement.

1. Assuming that the retirement benefit,  $xSt$ , is paid at the end of each year for  $D$  years, the value of the retirement benefit upon retirement is

$$V_t = xS \frac{1 - (1+r)^{-D}}{r},$$

where  $r$  is the settlement rate (or discount rate).

2. The projected pension benefit obligation for active employees with  $t$  years of service,  $\text{PBO}_t^A$ , is the present value of  $V_t$  as of period  $t$ . Assuming that the employee retires after  $T$  years,  $\text{PBO}_t^A = V_t/(1+r)^{T-t}$ . The change in  $\text{PBO}_t^A$  from period  $t-1$  to  $t$  is

$$\Delta \text{PBO}_t^A = \frac{V_t}{(1+r)^{T-t}} - \frac{V_{t-1}}{(1+r)^{T-t+1}} = \frac{xS (tr+1)}{(1+r)^{T-t+1}} = \text{PBO}_{t-1}^A \left( \frac{tr+1}{t-1} \right).$$

3. The projected pension benefit obligation for retired employees with  $T$  completed years of service retired for  $t$  years (with  $D-t$  years until death),  $\text{PBO}_t^R$ , is

$$\text{PBO}_t^R = \frac{xST}{r} \left( 1 - \frac{1}{(1+r)^{D-t}} \right).$$

The change in the projected pension benefit obligation for retired employees is

$$\Delta \text{PBO}_t^R = \text{PBO}_t^R - \text{PBO}_{t-1}^R = -xST \frac{1}{(1+r)^{D-t+1}}.$$

4. The expected change in the projected pension benefit obligation for active and retired members is therefore given by,

$$E[\Delta \text{PBO}] = \text{PBO}_{t-1}^A \left( \frac{tr+1}{t-1} \right) - xST \frac{1}{(1+r)^{D-t}}.$$

5. Data on the settlement rate,  $r$ , are available from the *Money Market Directory*, while data on  $xST$  (annual benefits paid) are available from Form 5500 for corporate funds and annual reports for state funds. Realistic assumptions can be made regarding average years of service and retirement. However, although data on the total projected benefit obligation across all employees,  $PBO_t = PBO_t^A + PBO_t^R$ , are available from Compustat for corporate funds and annual reports for state funds, data are not available on the PBO separately for active employees required to compute  $E[PBO_t]$ . We therefore estimate  $PBO_t^A$  using the identity

$$PBO_t = \overline{PBO}_t^A \cdot A + \overline{PBO}_t^R \cdot R,$$

where  $A$  and  $R$  are (respectively) the number of active and retired members in the system, and  $\overline{PBO}^A$  and  $\overline{PBO}^R$  are the *average* PBO per member for active and retired members. The PBO for active members is given by,

$$PBO_t^A = PBO_t \cdot \left( \frac{A}{A + kR} \right)$$

where  $k$  is the ratio  $\overline{PBO}_t^R / \overline{PBO}_t^A$ . We assume that the average PBO per member for active and retired members is approximated by the PBO per member evaluated at the average years of service and retirement, respectively,

$$k = \frac{\frac{xST}{r} \left( 1 - \frac{1}{(1+r)^D} \right)}{\frac{xSt}{r(1+r)^{T-t}} \left( 1 - \frac{1}{(1+r)^D} \right)} = \frac{T}{t} \frac{(1+r)^{D-t} - 1}{(1+r)^D - 1} \cdot (1+r)^{T-t}.$$

We assume in the paper that  $t=15$ ,  $T=2t=30$ ,  $=10$ , and  $D=2=20$ . Our results are not sensitive to reasonable changes in these assumptions.

## Appendix C

### Calculation of Market Returns on the Investment Portfolio

Year-to-year changes in the market value of a system's assets depend not only on capital appreciation and losses on the investment portfolio but also on inflows and outflows such as contributions made by the employer or employees, other transfers into the system, benefits paid to current retirees, refunds or withdrawals from the fund, and administrative expenses. We calculate the "net contributions" to the fund as all factors affecting fund value that are not explicitly related to the performance of invested assets:

$$(C1) \text{ Net Contributions} = (\text{Employee Contributions}) + (\text{Employer Contributions}) + (\text{Other Revenues}) \\ - (\text{Benefits Paid}) - (\text{Administrative Expenses}) - (\text{Withdrawals, Refunds, and Other Expenses}),$$

where administrative expenses include those expenses associated with providing pension benefits but do not include investment expenses (such as fees paid to outside money managers).

The market return for each period  $t$  is calculated as

$$(C2) \quad \text{Market Return} = \frac{(\text{Net Assets})_t - (\text{Net Assets})_{t-1} - (\text{Net Contributions})_t}{(\text{Net Assets})_{t-1} + .5 * (\text{Net Contributions})_t}.$$

The  $.5 * (\text{Net Contribution})$  term in the denominator reflects the assumption that, on average, net contributions are spread evenly through the period, and part of the change in net asset value reflects the half-period return on the invested net contributions.

#### STATE PENSION SYSTEMS

While state pension systems do not generally report the market performances of their investment portfolios, most monitor the market value of their investment portfolios and report details of this market value in the footnotes to their annual financial statements. We collected a 1987-1992 time series of investment-portfolio market values from current and past annual reports and balance sheets of state funds, and supplemented these data with phone interviews and survey questionnaires sent to all state systems. We also constructed (or obtained questionnaire information on) the market value of each system's "net assets" consisting of the investment portfolio plus cash, accounts receivable, and fixed assets, less accounts payable and current liabilities. We assume that book values are a reasonable approximation to market values for current assets and liabilities (unless the system specifically provided market data for

them). In cases where we cannot obtain data on changes in the market value of net assets, we use the change in the market value of investments.

Data on net contributions are obtained from the "Revenues by Source/Expenses by Type" schedules in state pension system annual reports. When these schedules are unavailable, we use data from the Department of Commerce's annual survey, "Finances of Employee-Retirement Systems of State and Local Governments." In cases where the annual report provides only combined data for administrative and investment expenses, we obtain disaggregated expense data directly from our pension system questionnaire.

#### CORPORATE PENSION SYSTEMS

We construct a sample of corporate pension plans by selecting all domestically headquartered corporations on Compustat with net pension assets exceeding \$250 million in any year from 1988 through 1992. After eliminating companies with missing data or with pension assets averaging less than \$200 million over the five years, the sample includes 356 corporations.

Data required to calculate the market return earned by corporate pension funds are available on Compustat only beginning in 1991. Data for 1988-1990 are obtained from Form 5500, filed simultaneously with the Department of Labor, the Internal Revenue Service, and the PBGC by all tax-exempt corporate pension funds covering more than 100 employees. Pension plans covered in Form 5500 are often reported and filed at the division, plant, or subsidiary (and not corporate) level. Corporate ownership of each plan was determined using the *1992 Directory of Corporate Affiliates*. Each division, plant, and subsidiary listed in the *Directory of Corporate Affiliates* for our sample of 326 companies was matched to the Form 5500 data to identify the corporate owner. Plans of joint ventures were allocated to their corporate owners according to their fractional ownership in the joint venture. Ultimately, this process identified almost 8,000 plan-years of data from defined-benefit plans in the 326 companies. In spite of this labor-intensive matching process, however, we were only able to account (on average) for about half of the pension assets reported in Compustat.

Market returns for 1991 and 1992 are calculated from Compustat as the change in the market value of pension plan assets (excluding contributions to the plan or payments by the plan), divided by the prior year's assets. Market returns for 1988-1990 are derived from the Form 5500 database using the formula in equation (C2). The market return realized by a company on its pension plan assets is estimated as the value-weighted average return across all plans for the employer during the year.