Pension Fund Asset Allocation and Liability Discount Rates*

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Abstract

This paper studies the regulatory incentives of U.S. public pension funds to increase risk-taking arising from their unique regulation linking their liability discount rates to the expected return on assets, which enables them to report a better funding position by investing more in risky assets. Comparing public and private pension funds in the U.S., Canada, and Europe, U.S. public funds seem susceptible to these incentives. More mature U.S. public funds as well as funds with more political and participant-elected board members take more risk and use higher discount rates. The increased risk-taking of U.S. public plans is negatively related to their performance.

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Keywords: pension funds, defined benefit, public policy, regulation, liability discount rates, asset allocation, risk-taking, asset-liability management.

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1 Introduction

Defined benefit (DB) pension funds promise retirement benefits that depend on the employee's earnings history, tenure of service and age. DB retirement systems typically pool the assets of multiple generations and allow for intergenerational as well as intragenerational risk-sharing (Merton, 1983; Shiller, 1999). The risk-sharing can create conflicts of interest between the different stakeholders or across generations, particularly when a DB pension fund is underfunded, i.e., when asset values are lower than the value of their liabilities representing the promised pension benefits (Novy-Marx and Rauh, 2011b; Brown, 2008). The reported funding shortfall in pension fund accounting statements depends crucially on the liability discount rate used to value the stream of promised benefits. In general, the higher the discount rate, the lower the reported present value of the liabilities and the stronger the pension plan's funding position as reported in the accounting statements. In this paper, we consider the incentives of current stakeholders to use a higher liability discount rate in order to reduce the probability that a low reported funding level triggers regulatory increases in the contribution payments and public discussions on reductions in future (or even already accrued) pension benefits.[1]

Our starting point is that the regulation of U.S. public DB pension funds allows considerably more discretion in setting the liability discount rate compared to the regulation of other DB pension plans (specifically of U.S. corporations and both public and private plans in Canada and Europe). We consider how this difference in regulation is associated with pension fund strategic asset allocation and investment performance. U.S. public DB funds follow the Government Accounting Standards Board (GASB) guidelines for discounting liabilities, which allow them to base their liability discount rates on the (assumed and thus more discretionary) expected rate of return on their assets (Brown and Wilcox, 2009). In contrast, the regulations pertaining to the discount rates of U.S. private as well as Canadian and European public and private pension plans

[1]For instance, among U.S. public pension funds, the employer (i.e., the state, county or city) needs to pay an additional catch-up contribution to cover the already accrued, but unfunded liabilities over the next 30 years. The size of these amortization payments depends on the dollar value of the funding deficit.

require that these are based on high credit quality interest rates and thus cannot be managed by modifying the allocation to risky assets. For instance, Canadian public and private pension plans discount their liabilities using market yields of high-quality corporate debt instruments (Canadian Institute of Actuaries, 2011), while U.S. corporate plans use a discount rate that is a combination of upper-medium and high-grade long-term corporate bonds (Rauh, 2006).

The GASB regulations for U.S. public DB funds have two important consequences, the first of which has been studied extensively in the literature and the second of which is new and the main empirical contribution of our paper. The first consequence is that GASB guidelines allow U.S. public funds to severely understate their liabilities. The accrued pension benefits of U.S. public plans appear legally well protected such that using the expected return on assets will generally imply a discount rate that is too high. Brown and Wilcox (2009) and Novy-Marx and Rauh (2011b) suggest that promised pensions should be discounted at a rate that reflects the time value of money and the uncertainty of these liabilities. Brown and Pennacchi (2015) further argue that for funding purposes pension funds should always use default-free discount rates.

The second consequence of GASB regulations is that the link between the discount rate and the expected return on their assets affords U.S. public pension funds considerable discretion to manage their liability discount rate by changing their allocation across asset classes and choosing an expected return for individual asset classes. The main 'regulatory incentives hypothesis' we posit is that the regulatory link between the liability discount rate and the expected rate of return on assets gives U.S. public funds an incentive to increase their strategic allocation to risky assets. A larger allocation to risky assets allows these funds to employ higher expected returns and thus to justify a higher discount rate and, as a consequence, lower the reported value of the liabilities. Further, as GASB regulations serve only as guidelines, the extent to which U.S. public plans respond to these incentives may depend on their board composition. Specifically, differences in the board representation of various stakeholder groups could be associated with funds' decisions on the allocation to risky assets, which in turn could have consequences for their

investment performance.

When testing the regulatory incentives hypothesis, we argue that U.S. public pension funds that are more mature have stronger incentives to invest more in risky assets in order to maintain a higher liability discount rate, because reducing the discount rate creates larger immediate economic costs for more mature funds. We measure pension fund maturity as the percentage of retired pension plan members. More mature pension funds have larger accrued liabilities for a given number of participants, since on average these participants have accrued liabilities for a longer period of time. If a pension fund is underfunded - as essentially all U.S. public DB funds are in our sample period - then it is required to pay 'catch-up' (deficit-reduction) contributions to amortize the total unfunded accrued liability (GASB, 1994; Novy-Marx and Rauh, 2014).[2] The size of these catch-up contributions depends on the dollar amount of the funding deficit, rather than on the funding ratio itself (as long as the pension fund is underfunded). Since mature pension funds have larger accrued liabilities, any reduction in the liability discount rate results in a larger increase in the dollar amount of their reported liabilities and thus in their funding deficit, which translates into higher required contribution payments. Higher required contribution payments create an immediate extra economic burden for taxpayers and/or employers (as well as potential additional burden for the participants) servicing a mature pension plan.[3]

We define the percentage allocated to risky assets as investments in public equity, alternative assets and risky fixed income (i.e., high yield bonds). In line with our hypothesis, we document that a 10 percent increase in the percentage of retired members of U.S. public funds is associated with a 5.34 percent increase in their allocation to risky assets, while for all other pension funds, a

[2]Online Appendix Figure E.1 shows that essentially all U.S. public pension funds are underfunded during our sample period.

[3]The following example illustrates the economic consequences of lowering the liability discount rate in case of underfunding. In 2012, the actuary of CalPERS recommended lowering the discount rate from 7.75% to 7.25% (see "CalPERS Should Cut Assumed Return to 7.25% from 7.75%, Actuary Recommends", Bloomberg, March 7, 2012). The article states: "Lowering the return would boost the state's pension costs, as a percent of payroll, as much as 4.2 percent in the year beginning July 1, according to a CalPERS staff report. Local governments could see an increase of as much as 4.5 percent. The costs for some public-safety agencies could jump as much as 6.5 percent. ... The board rejected a similar proposal ... last year. Board members at the time expressed concern that lowering the rate to 7.5 percent would burden local governments when they were already facing financial strains." One week later, the CalPERS board decided to indeed lower the discount rate, but by only half as much as recommended by its actuary (see "CalPERS Lowers Investment Target to 7.5%," Wall Street Journal, March 14, 2012).

10 percent increase in the percentage of retired members is associated with a 1.70 percent lower allocation to risky assets. This increased risk-taking enables more mature U.S. public funds to use higher discount rates, as a 10 percent increase in their percentage of retired members is associated with a 69 basis point increase in their discount rate.[4]

In contrast, the asset allocation of our control group, consisting of U.S. corporate funds as well as Canadian and European funds, becomes more conservative as the funds mature. This result is in line with Rauh (2009) and suggests that these pension funds take less investment risk when their promised benefits need to be met sooner and become less uncertain due to increased retirements. In line with this intuition, more mature funds in the control group use lower discount rates that better reflect the shorter duration of their cash-outflows and the corresponding generally upward sloping yield curve.

The regulatory incentives hypothesis further suggests that U.S. public funds increase allocations to risky assets especially at times when expected asset returns decline. Our empirical proxy for the level of expected asset returns is the nominal level of interest rates, which is exogenous to individual pension plans. During our sample period, the 10-year U.S. Treasury yield fell from 7 percent in 1994 to less than 2 percent in 2012. As the level of interest rates falls, the expected rates of return on both risky and non-risky assets fall, though U.S. public funds can refrain from lowering their liability discount rate by increasing their allocation to risky assets. Consistent with our hypothesis, only U.S. public plans significantly increase their allocation to risky assets when interest rates are falling. Economically, the approximately 5 percentage point decline in the yield on ten-year Treasury securities is associated with a 15 percentage point increase in their allocation to risky assets.

Taking more risk may affect the pension fund investment performance as well. The regulatory incentives hypothesis implies that U.S. public funds change their asset allocation in order to manage the liability discount rate and the reported funding level rather than based on investment

[4]Similarly, Mohan and Zhang (2014) examine financial constraints at the state level and document that public DB pension funds from states with lower credit ratings invest more in equity.

opportunities and asset-liability considerations. However, if asset allocation decisions are in substantial part driven by regulatory incentives, U.S. public funds may be looking for additional investments in risky assets at times when they have relatively fewer attractive opportunities or limited capacity to select and monitor additional risky investments, in which case we could expect them to underperform.

We evaluate the investment performance by adjusting the pension fund returns for both their investment costs and benchmark performance within various asset classes, thus taking asset allocation decisions as given. We find that U.S. public plans underperform the benchmarks by about 57 basis points a year, and their underperformance is substantially worse if the fund is more mature. A 10 percent increase in the maturity of U.S. public funds is associated with 23-40 basis point lower returns (depending on the specification). The underperformance of mature U.S. public plans is primarily due to lower returns in equities and alternative assets, i.e., those risky assets in which they particularly increased their allocation in order to maintain higher liability discount rates. None of the other groups of pension funds underperform on average.

Next, we consider whether the appointment procedure and the composition of pension plan boards of trustees matter in explaining cross-sectional differences in U.S. public pension funds' response to regulatory incentives.[5] Pension fund trustees represent three stakeholder groups: the plan participants, the state (employer) and taxpayers (citizens). Board members differ also in the appointment procedure. They can be elected by plan participants, appointed by government officials or serve as an ex-officio member by the virtue of holding another position.

By not lowering their liability discount rate even if nominal government yields decline sharply, pension funds can avoid increases in their required contribution payments covering funding shortfalls. We hypothesize that trustees with a relatively shorter horizon will have a stronger interest in avoiding or postponing an increase in these required contribution payments, i.e., state-political trustees and participant-elected trustees (especially those at mature funds).

[5]We hand-collect data on the board composition of U.S. public pension funds from their Comprehensive Annual Financial Reports (CAFRs).

The first group of state-political board members includes politicians like treasurers, comptrollers or other government officials working for the public entity sponsoring the pension fund. We expect that these trustees have relatively short-term incentives due to the fairly short political cycle, preferring to postpone required contribution increases, pension restructuring negotiations and other fiscally costly decisions as long as possible.[6]

Second, participant-elected trustees represent the currently employed and retired plan members and effectively hold a short-term "call option" on the pension fund assets that may incentivize them to increase risk-taking. In the short-term, plan participants are not obliged to pay higher contributions if increased risk-taking results in low returns and underfunded liabilities, but they could benefit from increased benefits if risk-taking yields good returns. It is only after reported underfunding persists for a prolonged period that plan members may be exposed to reductions of future benefits (as has happened, for example, in Rhode Island and New Jersey).[7] In addition, as any reductions are arguably unlikely to apply retroactively to accrued benefits, this short-term "call option" is more valuable for participant elected and ex-officio trustees of more mature U.S. public funds, who as a result may have stronger incentives to maintain higher discount rates.

We find that U.S. public DB pension funds with a higher percentage of state-political and participant-elected trustees invest more in risky assets and use higher liability discount rates, consistent with our intuition that these trustees have stronger incentives to maintain high liability discount rates. For instance, pension plans whose boards consists only of state-political members invest 10 percentage points more in risky assets than a pension plan without state-political trustees. In addition, more mature pension plans with a higher percentage of participant-elected

[6]Mitchell and Smith (1994) discuss how several states have reduced budget deficits in the short run by altering the actuarial assumptions used to compute their pension obligations. For example, in 1989, New York State Common Retirement Fund raised the assumed rate of return on pension fund assets from 8% to 8.75% which lowered pension contributions by $325 million annually and helped balance a state budget deficit (see "States Are Finding Pension Funds Can Be a Bonanza Hard to Resist," New York Times, April 22, 1990). Interestingly, New York State Common Retirement Fund is governed only by politicians, because the New York State Comptroller is the sole trustee directly accountable for the performance, oversight and management of the fund.

[7]The Rhode Island Retirement Security Act of 2011 was implemented on July 1, 2012 and it tied the cost-of-living adjustments (COLAs) to the funding level and actual investment returns. This act suspended any COLAs until the funding level exceeds 80 percent. In New Jersey, Chapter 78, P.L. 2011 of the Pension and Health Benefit Reform Law, suspended future COLAs for all participants as of August 1, 2011. The retirement committees have the authority to reactivate the COLA on pensions when a target funded ratio of 75-80 percent is achieved.

trustees also have greater allocations to risky assets, use higher discount rates, and obtain lower investment returns.

Brown and Wilcox (2009), Novy-Marx and Rauh (2009), Pennacchi and Rastad (2011) and Mohan and Zhang (2014) suggest that GASB regulation may encourage sponsors to invest in riskier portfolios than they would otherwise choose in order to justify a higher discount rate and report a lower funding gap. Our main contribution is to empirically test this prediction, and document that U.S. public funds seem to act on these incentives, thereby relating asset allocation decisions to pension fund regulation. By comparing U.S. public funds with public Canadian and European funds, we show that fund type (public versus private) is not the key determinant of the differences in strategic asset allocation and liability discount rates. By comparing U.S. public funds with U.S. private funds, operating within the same country, we show that differences in regulation, not country effects, explain the allocation and discount rate choices of funds.

With regard to pension fund performance, Goyal and Wahal (2008) document lower returns of U.S. public pension funds in public equity, whereas Hochberg and Rauh (2013) find that they underperform in private equity and real estate. Our contribution to this literature is to show that differences in regulation are associated with the investment performance of large institutional investors. The underperformance of U.S. public funds in equity and alternative assets can be potentially explained by excessive risk-taking due to regulatory incentives.

Our paper also contributes to the literature on pension fund governance. Cocco and Volpin (2007) document agency conflicts among the corporate executives acting as trustees of U.K. private pension funds. Among U.S. public pension funds, prior research finds that pension funds whose boards have a high fraction of members who are politically-affiliated or representing plan participants take more risk (Pennacchi and Rastad, 2011; Bradley, Pantzalis, and Yuan, 2016). Our paper finds that asset allocation decisions are related to stakeholder representation, to the appointment procedure of board members, and to fund maturity. We thus provide novel evidence and an explanation of how board composition affects pension fund investments and returns.

2 Empirical design and regulatory background

This paper examines whether the asset allocation and performance of U.S. public pension funds are related to their distinct regulation concerning their liability discount rates. In this context, it is important to note that U.S., Canadian, and European pension funds generally face no limits on the proportion of investments they can make in risky assets.[8]

U.S. public pension funds follow the GASB guidelines, which allow them to base their liability discount rates on the expected return on their assets.[9] Our regulatory incentives hypothesis argues that since U.S. public funds are unconstrained in the proportion of their assets that can be invested in risky asset classes, they use GASB guidelines strategically to justify a higher discount rate and present a better funding position by investing more in risky assets, which in turn may reduce required contribution payments or postpone potential pension reforms.

To test the regulatory incentives hypothesis, we compare the asset allocation, discount rates and performance of U.S. public funds with pension funds that face different regulatory standards. Indeed, one concern is that, in addition to regulation, other economic determinants of risk-taking behavior could also influence the differences in asset allocation between U.S. public funds and other funds. We construct two control groups of pension funds to address these issues.

The first group consists of U.S. corporate pension funds, which we argue face similar investment opportunities as U.S. public funds. For example, both private and public U.S. pension funds overweight domestic assets (Goyal and Wahal, 2008) that expose them to correlated performance shocks. By comparing U.S. public pension funds with U.S. private funds, we test whether differences in regulation, not country effects, explain the asset allocation and performance of funds. The second control group is comprised of Canadian and European public and private

[8] See the OECD Secretariat (2011) Survey of Investment Regulation of Pension Funds.

[9] The first GASB statement was issued in 1987, in which U.S. public plans were advised to discount their liabilities using the expected return on asset regardless of their funding status. The only major revision of GASB discounting guidelines occurred in June 2012 and does not affect our sample period. According to the GASB Statement No. 67, Paragraph 44, published in 2012, the discount rate should be conditional on the funding status: "if the amount of pension plan assets is projected to be greater than the liabilities, then the actuarial present value of benefit payments should be determined using the expected rate of return on those investments. The actuarial present value of unfunded benefit payments should be calculated using a municipal bond rate" (GASB, 2012).

pension funds. Private and public funds may be subject to differences in career risk and life-cycle patterns among their participants. In addition, public and corporate funds face different implicit guarantees by the government for support in case of funding problems (Brown, 2008). We show below that there are no differences in the regulation of public and private pension funds in Canada and Europe. In our empirical tests, we find that public funds in Europe and Canada make similar allocation decisions as their private counterparts, while U.S. public plans make distinct investment decisions from U.S. corporate funds, such that we can attribute the differences in asset allocation to the distinct regulation, and not to the plan type.

Most importantly for our empirical identification, the discount rates of U.S. private funds as well as Canadian and European public and private funds do not depend on the expected rate of return on their investments and hence cannot be managed by modifying the allocation to risky assets. For instance, until 2004, U.S. corporate plans were required to discount their liabilities using the 30-year Treasury rate, both for funding purposes and when estimating their deficit reduction (i.e., catch-up) contributions. Since 2006, firms have been allowed to discount their liabilities using a rate that is a blend of long-term corporate bonds, including both upper-medium and high-grade securities (Rauh, 2006).[10] In our analysis, we are only making relative comparisons and are not arguing that U.S. corporate plans had or have no regulatory latitude at all.[11]

In contrast to the U.S., Canadian public and private pension plans are regulated in the same way. The accounting standards developed by the Canadian Institute of Actuaries require their discount rate to be selected based on market yields of high-quality corporate debt instruments

[10]The Pension Protection Act of 2006 was the latest regulatory change that affected corporate DB plans in our sample period. Title 3 of The Pension Protection Act of 2006 states the amendments to ERISA affecting interest rate assumptions. These amendments became part of the 29 U.S. Code §1083 - Minimum funding standards for DB pension plans. Thus, since 2008, U.S corporate pension funds determine the present value of liabilities using a segmented yield curve based on a 24-month average of investment-grade corporate bonds of varying maturities. The IRS publishes these segment interest rates monthly. Alternatively, a plan sponsor may determine the present value of liabilities by using either the entire yield curve (also published monthly by the IRS) or the published rates from any of the four months prior to the valuation year.

[11]The relation between pension accounting standards and corporate decisions has been extensively studied in the prior literature. See for example An, Huang, and Zhang (2013), Bergstresser, Desai, and Rauh (2006), Brown (2008), Campbell, Dhaliwal, and Schwartz (2012), Love, Smith, and Wilcox (2011), Rauh (2006), and Rauh (2009).

that match the timing and amount of the expected benefit payments. These standards leave limited room for discretion, only allowing latitude in defining "high quality," or which specific debt instruments are to be included, and how to address the lack of suitable debt instruments at very long-term maturities (Canadian Institute of Actuaries, 2011).[12] Funding deficits must be covered over 5-10 years, and the burden can be shared between employees and employer.

Our small sample of European pension funds consists almost entirely of Dutch funds (and a few U.K. funds). In the Netherlands, pension funds have almost no discretion in choosing their liability discount rate. Until 2004, Dutch pension funds were obliged to use a discount rate of maximum 4 percent. Thereafter, the Financial Assessment Framework set the requirements for discounting the liabilities by using the term structure of nominal risk-free interest rates. In this regime, if the funding ratio is less than 105 percent, the fund must submit a recovery plan that involves both higher contributions and lower inflation protection of benefits.[13] The U.K. pension regulator prescribes private and public plans to discount their liabilities using the yields on U.K. government securities of appropriate terms. These discount rates can be adjusted for broader economic factors, such as economic growth and wage inflation. The additional contributions to cover funding deficit are typically paid by the employer.[14]

Taken together, their regulation leaves U.S. public funds with considerably more discretion to choose liability discount rates than U.S. private funds or (public and private) pension funds in Canada and Europe. If U.S. public plans act in line with the regulatory incentives hypothesis, then we would expect to observe differences in their asset allocation, discount rates and performance. In our analysis, we explore whether regulation is a separate channel providing such incentives and we do not assume that a proper valuation of the liabilities removes all incentives for more risk-taking.

[12]Further, in Canada, only the province of Ontario has established pension benefit insurance. Crossley and Jametti (2013) find that insured plans in Canada invest 5 percent more in equities than do similar plans without benefit guarantees. Our data does not include the province in which Canadian funds are registered, but we control for fund fixed effects, which should absorb the differences in asset allocation due to such cross-jurisdiction variation.

[13]See the Pension Act 2007 (Pensioenwet) - Financial Assessment Framework technical provisions.

[14]See the U.K. Pensions Act 2004 - Code of practice no. 3.

3 Data

To study the effect of different regulatory standards on pension fund asset allocation and performance, we use the CEM Benchmarking Inc. data. The dataset comprises more than 850 DB pension funds for the 1990-2012 period, covers three regions (U.S., Canada, and Europe) and enables us to look at both cross-sectional and time series variation.[15]

On the liabilities side, CEM provides information on the number of active and retired plan members, inflation protection policy and liability discount rates. The data on the number of active and retired plan members enables us to estimate the percentage of retired members as a proxy for fund maturity. Even though the dataset does not contain precise data on participants' age and life expectancy, the increasing longevity will be reflected in the higher number of retired members over time (as they live longer).

On the assets side, CEM provides detailed data on the pension fund strategic asset allocation. Annually, pension funds submit their strategic (target) and their actual (realized) asset allocation policy to CEM. The actual asset allocation policy can be affected by market movements due to expected transaction costs of rebalancing or due to inertia. For example, relatively large positive returns in the equity market would tend to increase the share of this asset class in a pension fund's actual asset allocation. Hence, to capture more precisely the asset allocation decisions made by pension fund boards, we use the strategic asset allocation weights when calculating the riskiness of the investment policy. We define the percentage allocated to risky assets as a sum of the strategic allocation weights to equity, alternative asset classes, and risky fixed income investments. Alternative assets include investments in real estate, private equity, hedge funds, commodities, natural resources and infrastructure. We classify allocations to high yield, emerging

[15]The small sample of European pension funds consists almost entirely of Dutch funds and a few U.K. funds. The relatively long time series and broad cross-sectional coverage of the CEM data provide strong statistical power, such that our main results are derived in pooled panel regressions at the [fund x year] level, with pension fund fixed effects as well as year fixed effects, using robust standard errors that are independently double-clustered in both the time and fund dimensions. CEM data has been used previously by French (2008) to study the cost of active investing, and by Andonov, Bauer, and Cremers (2012) to examine the asset management skills of pension funds.

market debt and mortgages as risky fixed income investments.[16] The non-risky assets include investments in cash and investment-grade fixed income assets.

In our analysis, we split the sample into public and private pension funds. Our sample of U.S. public pension funds includes both state and local plans. The private subsample captures the funds classified as "corporate" and "other" in the CEM database. In the U.S. and Canada, the "other" category is mainly composed of multi-employer or Taft-Hartley funds, often referred to as union funds. In Europe, the "other" category covers mainly industry-wide funds, which are common in the Netherlands. We combine the category "other" with "corporate" and label this group "private" funds, because these pension funds are established by private-sector employers and are subject to the same regulation. For example, all U.S. private DB pension plans are regulated by the Employee Retirement Income Security Act (ERISA) and have an insurance program within the the Pension Benefit Guarantee Corporation (PBGC).[17]

Table 1 presents summary statistics. Panel A shows that the majority of observations are U.S. pension funds, followed by Canadian funds and a smaller number of European funds.[18] Pension funds included in the CEM database had more than $4.54 trillion in assets under management in 2012 and covered around 29 percent of global DB pension fund assets (more than 16 percent of total global pension fund assets).[19] U.S. pension funds included in the dataset controlled more than 40 percent of total assets under management by the U.S. DB pension sector. Canadian pension funds included in the CEM database held approximately 80-90 percent of the total assets under management by Canadian pension funds. To our knowledge, this is the broadest global database on pension fund asset allocation and performance available for academic research.

[16] All our results are robust to calculating the percentage allocated to risky assets in two different ways: (1) removing the risky fixed income assets from the risky assets; and (2) calculating the percentage allocated to risky assets based on the actual asset allocation instead of the strategic asset allocation weights. We provide details in Online Appendix B.

[17] PBGC insurance programs were created as part of ERISA in 1974 to protect pension benefits. In 1980, the U.S. Congress enacted the Multiemployer Pension Plan Amendments Act of 1980 to strengthen the protection for multiemployer plans.

[18] The summary statistics in Table 1 start in 1993, because in the 1990-1992 period we have an insufficient number of cross-sectional observations for the liability discount rates.

[19] The comparison is based on the Global Pension Assets Study 2012 conducted by Towers Watson. A comparison based on the "Pensions&Investments/Towers Watson World 300: Largest retirement funds" yields even stronger conclusions about the relevance of CEM data.

In Panels B and C of Table 1, we document different trends in the allocation to risky assets between public and private pension plans. The strategic allocation to risky assets of public pension funds increased from 56.1 percent in 1993 to 72.4 percent in 2012, mainly due to increased risk-taking among U.S. public pension funds.[20] Private plans decreased their allocation to risky assets from 63.0 percent in 1993 to 60.2 percent in 2012. Additionally, we observe significant regional effects: compared to Canadian and European funds, U.S. pension funds on average allocate a greater percentage of their assets to risky investments.

Pension funds have been maturing over time and private plans are generally more mature than public plans. The percentage of retired members among private funds increased from 31.1 percent in 1993 to 56.7 percent in 2012, while among public funds it increased from 27.6 percent in 1993 to 41.9 percent in 2012. The difference in maturity between public and private funds is the result of a growing number of U.S. corporations having chosen to freeze their DB pension plans and replace them with defined contribution (DC) plans for new employees (Rauh, Stefanescu, and Zeldes, 2012). Some U.S. public retirement systems have also introduced DC plans, but the private sector is shifting more rapidly towards DC plans. In Canada and Europe, the differences in the percentage of retired members between public and private funds are smaller.

Table 1 indicates that U.S. pension funds, on average, use higher discount rates than Canadian and European funds. Among U.S. funds, public plans maintain steady discount rates around 7.5-8.0 percent during the entire period. In sharp contrast, the liability discount rates of U.S. private pension funds decrease from 8.2 percent in 1993 to 4.4 percent in 2012, closely following the trend in interest rates. The discount rates of Canadian plans also decrease over time. Most European funds use fixed discount rates of 4 percent before 2000, following strict (Dutch) regulatory guidelines. Afterwards, their liability discount rates move together with government bond yields, consistent with the revised regulation. In both Europe and Canada, there is no significant difference between the discount rates used by public and private pension funds.

[20] European public pension funds also seem to increase their allocation to risky assets over time, but this sub-sample is small and the averages are volatile over time.

We also present summary statistics for fund size, returns and inflation protection policy in Table 1. To control for differences in inflation protection policy across funds, we create a dummy variable equal to one if a pension fund provides contractual inflation protection, and zero if the fund provides ad hoc inflation protection or no protection at all to the plan members. On average, public pension funds are larger and more likely to provide inflation protection than private plans. We measure performance using net benchmark-adjusted returns. We calculated these returns by subtracting the investment costs and benchmark returns from the gross returns in different asset classes, and then aggregating these up across asset classes.[21]

We extend the analysis of U.S. public (state and local) pension funds by hand-collecting board composition data from the Comprehensive Annual Financial Reports (CAFRs). The board composition is reported in the CAFRs Introduction section and the exact regulation is clarified in the Financial section (Notes to the Basic Financial Statements - Plan Description). We also look at the state or municipal codes and statues to verify the board composition and to understand the election and appointment procedures.[22]

We are able to collect board data for 120 out of the 164 U.S. public funds in our sample, for a total of 987 annual observations. Pension funds have on average nine board members with a significant cross-sectional variation. The time series variation of board variables is limited as only 19 U.S. public pension funds experience a change in the board composition during our sample period, while 101 funds maintain the same board structure over time. Additionally, regulations pertaining to the board composition of most plans were adopted long ago. For instance, the board composition of county retirement systems in California (Orange County ERS, San Diego County ERS, Los Angeles County ERS etc.) has been defined by the County Employees Retirement Law

[21]The investment costs include the costs of all internal and external money managers hired by the pension fund. Internal investment costs include not only the cost of compensation and benefits of employees managing internal portfolios, but also expenses for support staff, consulting, research, legal, trading services and overhead costs. External investment costs capture the management fees paid to investment consultants and external asset managers, while the performance fees are directly subtracted from the returns. Importantly, the net benchmark-adjusted returns remove all investment fees from the returns.

[22]For example, the board composition of Texas state pension funds (Texas ERS, Texas Teachers RS, Texas County and District RS etc.) is defined in the Texas Government Code Title 8: Public Retirement Systems.

of 1937 and has not changed since then. As a result, it seems unlikely that board compositions themselves are endogenous to the current funding levels or market conditions.

Only 13 pension plans have a separate board that makes asset allocation and investment decisions, but is not directly responsible for the actuarial assumptions and liability discount rate choice. We capture this separation of responsibilities by creating a dummy variable (*InvBoard*) that is equal to one if a pension fund has a separate investment board.[23]

We categorize board members into three groups based on whom they represent and we calculate the percentage of board members in that category. First, state trustees represent the state, county or city as an employer. Second, plan participant trustees represent the currently employed and retired plan members. Third, general-public trustees represent the citizens (taxpayers), and do not work for the state or participate in the pension plan. Board members also differ in the appointment procedure: trustees can be elected by plan members, appointed by a governmental executive or serve as an ex-officio member by the virtue of their function.

Table 2 reports descriptive statistics. Almost all pension plans have at least one state representative on the board. The vast majority of state board members are either appointed by a governmental executive or serve as an ex-officio member. Typical examples of state-ex-officio board members are: state treasurer, controller, comptroller, personnel director, director of finance, superintendent of public instruction etc. State-appointed trustees are usually appointed by the Governor, Mayor, Speaker of State House of Representatives or President of State Senate etc., and frequent examples are state senators, state representatives, elected officials of local government, school board representatives etc. In our analysis, we combine the state-appointed and state-ex-officio board members, and label the variable as state-political board members, because these two groups of trustees are either elected politicians or appointed by elected politicians. On average, state-appointed and state-ex-officio trustees together represent around 22.9 percent

[23]For example, Los Angeles County Employees Retirement Association has a retirement and an investment board. The Board of Retirement is responsible for the overall management of the retirement system, while the Board of Investments is responsible for establishing investment policy and objectives, as well as exercising authority and control over the investment management.

(16.8 + 6.1) of the board members.

State-elected board members participate in the boards of only four funds. They are also governmental officers, but the main characteristic is that they are elected by plan participants. Thus, we do not combine them with the state-appointed and state-ex-officio trustees. For example, in Michigan Municipal RS, three officers of a municipality or court are elected as employer (state) trustees by the plan participants at the annual meeting.

General-public board members hold, on average, 27.5 percent of the pension fund board seats. These board members typically work in the local financial industry and are appointed by governmental officials.[24] For example, CalSTRS has three general public representatives on the board appointed by the Governor and confirmed by the Senate and, in 2014, these trustees worked at a brokerage and investment banking firm, venture capital firm, and insurance company.[25]

Trustees representing plan participants are present in the board of 112 out of 120 U.S. public pension funds and hold on average 47.7 percent of the board positions. The majority of these trustees are elected by plan participants. Five pension plans in our sample have ex-officio plan board members, who are all union representatives. For example, the heads of the three unions with the largest number of participating employees sit on the board of New York City ERS.[26] In our analysis, we combine the participant-elected and participant-ex-officio board members, and label the variable as *participant-electexof* board members. Jointly these two categories represent 33.9 percent of the board members.

Almost 14 percent of the board trustees are plan members appointed to the board. The appointment procedure involves two groups of stakeholders. Typically, plan participants nominate several candidates and a governmental official appoints one of them to the pension fund board. For instance, in Texas Teachers RS, two trustees are appointed by the governor from the three

[24] In our sample, only one pension fund, Kentucky Teachers RS, has two general-public board members elected by plan participants. In all other funds these trustees are appointed to the board.

[25] The information has been retrieved from the biographies of CalSTRS retirement board members posted on CalSTRS website.

[26] The plan participant ex-officio trustees are not always union representatives, but in our case this holds for all five plans - New York City ERS, Louisiana School ERS, Oklahoma Firefighters Pension System, Prince George's County Police & Fire Pension System and Massachusetts Bay Transportation Authority Retirement Fund.

public school active member candidates who have been nominated by employees of public school districts, while one trustee is appointed by the governor from the three higher education active member candidates nominated by employees of higher education institutions.

We also collect data on the self-reported funding ratios of U.S. public pension funds from the CAFR Actuarial section. These funding ratios compare the pension fund actuarial value of assets and liabilities calculated based on GASB asset valuation methods. The actuarial value of liabilities is estimated using the discount rates presented in Table 1. The average self-reported funding ratio is around 84.0 percent and has been decreasing over time.

4 Pension fund maturity and allocation to risky assets

We begin by documenting the trend in asset allocation and discount rates among U.S. public plans, because this relation is central to the regulatory incentives hypothesis. Figure 1 plots the average percentage allocation to risky assets, liability discount rate of these funds as well as the 10-year U.S. Treasury yield through time. The plot shows an almost completely flat line for the discount rate used by U.S. public pension funds. These plans can justify maintaining a discount rate of around 8 percent by offsetting the declines in risk-free rate (and overall expected assets return) with an increased allocation to risky assets. The average discount rate of 8 percent enables U.S. public plans to understate the promised value of pension benefits, as it does not reflects the time value of money and the uncertainty of these liabilities. In particular, the accrued benefits of U.S. public plans appear well protected during our sample period, as they are backed by constitutional non-impairment clauses and common law (Brown and Wilcox, 2009).[27]

[27]For example, in response to the Orange County bankruptcy filing in 1994, the county executive proposed a 40 percent budget reduction and layoffs of 1,000 people. In spite of these financial difficulties, retirement obligations were met in full (Brown and Wilcox, 2009). The Orange County ERS is part of our sample during the entire period, including the most problematic years (1994-1996) for the county. However, recent events have increased the uncertainty surrounding the accrued and future DB pension benefits. The city of Detroit filed for bankruptcy in July 2013, which is after the end of our sample period. If the bankruptcy judges rule to impair the pensions, despite the Michigan state constitutional protection, Detroit plan members will be the first ones to experience a haircut on their pension promises. However, in Illinois, the non-impairment constitutional provision was interpreted broadly and Illinois Supreme Court decision No.2014 MR1 declared the pension reform unconstitutional. The court ruled that "membership in any pension system shall be an enforceable contractual relationship, the benefits of which shall not be diminished or impaired. (Illinois Constitution, Article XIII, §5.) This constitutional language

In the first test of the regulatory incentives hypothesis, we study the relation between the allocation to risky assets and fund maturity. Rauh (2009) finds a negative correlation between risk-taking and fund maturity among U.S. corporate funds, which suggests that as the cash flows resulting from promised benefits become less uncertain, private pension funds take less investment risk. This result is consistent with (Black, 1989; Bodie, Merton, and Samuelson, 1992; Sundaresan and Zapatero, 1997; Lucas and Zeldes, 2009), who argue that investing in risky assets can help younger pension funds hedge against increases in future pension benefits, especially if the promised benefits are tied to real wages.

However, according to the regulatory incentives hypothesis, more mature U.S. public funds should have stronger incentives to use a higher discount rate, because reducing the discount rate creates larger immediate economic costs for more mature funds. This argument is based on the economic costs of increased annual required contribution payments. More mature pension funds have larger accrued liabilities for a given number of participants, since on average these participants have accrued liabilities for a longer period of time. Underfunded pension funds (i.e., essentially all of the U.S. public DB funds in our sample) are required to pay 'catch-up' contributions to amortize the total unfunded accrued liability. The size of these amortization contributions depends on the dollar value of the funding deficit (GASB, 1994). Since more mature pension funds have larger accrued liabilities, any reduction in the liability discount rate leads to a greater increase in the dollar amount of the reported liabilities and funding deficit for more mature funds. Thus, more mature U.S. public pension funds face larger increases in the contribution payments required to amortize their funding deficits, such that we expect that they will invest more in risky assets in order to maintain a higher discount rate.[28]

is unambiguous and the Pension Protection Clause is given effect without resort to other aids for construction."

[28]In Online Appendix A, we use different stylized scenarios to explain how liability discount rate changes affect the required contribution payments and pension funding status depending on pension fund maturity. In addition to the basic scenario with required catch-up contributions, we also analyze two alternative scenarios. First, we analyze the consequences if a pension fund does not receive the entire amount of annual required contributions from the employer. According to Novy-Marx and Rauh (2014), 45 percent of U.S. public funds received less than the full required amount of contributions in 2009 from their public sponsor. If a pension fund does not receive the entire amount of annual required contributions from the sponsor (or employer), it faces a prolonged negative trend in its funding status in the years after the discount rate reduction, in addition to the initial reduction. This negative trend is steeper among more mature pension funds, because their cash outflows for pension payments

We examine this test of the regulatory incentives hypothesis and relate the percentage allocated to risky assets ($\%Risky_{i,t}$) to the percentage of retired members ($\%Retired$) using pooled panel regressions with year (YD_t) and fund fixed effects (FE_i):

$$\%Risky_{i,t} = \beta_0 + \beta_1 \%Retired_{i,t} + \beta_2 X_{i,t} + \beta_3 YD_t + \beta_4 FE_i + u_{i,t} \quad (1)$$

where $X_{i,t}$ refers to the control variables, and $u_{i,t}$ is the idiosyncratic error. We independently double cluster the robust standard errors in all regressions by pension fund and by year. In the regressions, we include interaction terms to capture the distinct regulation of U.S. public funds.

As controls we include fund size, inflation protection policy and plan type. Log of pension fund assets captures any effect of scale on allocation decisions. We control for inflation protection policy following the Campbell and Viceira (2005) argument that pension fund asset allocation should depend on the indexation policy. We also include a dummy variable that equals one for public pension plans to control for differences in allocation to risky assets between public and private plans, because their participants could face different career risks and life-cycle patterns.

Table 3 presents that pension funds with a higher proportion of retired members invest less in risky assets, which is consistent with Rauh (2009). Based on column (1), a 10 percent increase in the percentage of retired members is associated with a 1.59 percent reduction in the allocation to risky assets. This amounts to about 14% of the standard deviation in the allocation to risky assets and thus seems economically meaningful. In contrast to other funds, more mature U.S. public funds invest more in risky assets and this positive relation is consistent with the regulatory incentives hypothesis. Based on column (2), for all funds except U.S. public pension funds, a 10 percent increase in the percentage of retired members is associated with a 1.70 percent lower allocation to risky assets. However, for U.S. public funds, a 10 percent increase in the percentage

are larger than the inflows from normal contributions. In effect, mature pension funds continue to pay the entire promised amount of pensions to retirees, even though they are not fully funded. Second, we study the impact of lower investment returns on required contribution payments. Lower returns negatively affect all pension funds, but again the effects are more pronounced among mature pension plans. See also Novy-Marx and Rauh (2011a) for a broader discussion on the policy options available to U.S. public funds.

of retired members is associated with a 5.34 percent increase in the allocation to risky assets [0.1*(-0.170) + 0.1*0.704 = 0.0534]. The interaction term *%Retired*Public*U.S.* is economically and statistically significant in all estimations.

Additionally, we replace the fund fixed effects with a dummy variable for U.S. pension funds and document significant regional differences. Based on column (4), U.S. pension funds invest more in risky assets than Canadian and European funds.[29]

However, contrary to the life-cycle theory, other theoretical papers (such as Lustig and Van Nieuwerburgh, 2008) argue that wage growth is negatively correlated with returns on risky assets and Pennacchi and Rastad (2011) find related empirical evidence. This theory predicts that pension funds with a lower percentage of retired members should hold less risky assets. A full-scale analysis of the relation between human capital and returns on risky assets is beyond the scope of our paper. Rather, our results suggest that it is difficult to rationalize the decisions of U.S. public funds even using the Lustig and Van Nieuwerburgh (2008) theory. First, unlike the regulatory incentives hypothesis, this theory does not imply that more mature U.S. public pension funds will use higher discount rates, which we document in the next section. Second, it also does not imply that pension funds modify their asset allocation policy when the interest rates decline, as we show below.

The substantial decline in yields on government bonds during our sample period is exogenous to individual pension plans. For example, the yield on ten-year U.S. Treasury notes decreased from 7.09 percent in 1994 to 1.80 percent in 2012. This decline in the yields reduces the expected return on both risky and non-risky assets (the risk-free rate declines, even if risk premiums remain the same), and puts pressure on U.S. public plans to reduce their discount rates. As explained previously, their regulations allow U.S. public plans to maintain the same expected return and liability discount rate by increasing the proportion allocated to risky assets.

[29]The regression in Table 3 column (4) includes interaction terms, which can influence the region dummy variable. In Online Appendix Table B.9, we estimate a regression without any interaction terms and without the public-type dummy variable, and find that U.S. pension funds allocate around 7 percent more to risky assets than Canadian funds and 12 percent more than European funds.

To test whether the declining trend in interest rates is associated with pension fund asset allocation, we add interaction terms with the ten-year Treasury yield in the previous year to the regression model.[30] Our results in Table 3 columns (5)-(7) indicate that, as treasury yields declined, especially U.S. public pension funds increased their allocation to risky assets. Based on column (6), the approximately 4 percentage points decline in the yield on ten-year U.S. Treasuries over this period is associated with a 12 percentage points increase in the allocation to risky assets of U.S. public pension funds [-4 * (0.015 - 0.010 - 0.034) = 0.116].

We perform two robustness checks and present the results in Online Appendix B. First, we disaggregate the risky assets into equity, alternative assets and risky fixed income assets. Alternative assets, like private equity, real estate and hedge funds, are generally considered to be riskier and less liquid than public equity and fixed income (Sadka, 2010; Fung, Hsieh, Naik, and Ramadorai, 2008; Phalippou and Gottschalg, 2009). Hence, by increasing the allocation to alternative assets, U.S. public pension funds could declare ex ante higher expected return on assets. We document that more mature U.S. public funds invest more in all three groups of risky assets, but the percentage increases in their allocation to alternative assets are economically larger than the increases in equity and risky fixed income.

Second, we reduce the number of interaction terms by analyzing the relation between fund maturity and risk-taking in two sub-samples. Using the sub-sample of U.S. pension funds increases the magnitude of our findings and indicates that our results are not determined by differences across countries. Moreover, the relation between the treasury yields and the allocation to risky assets is significant only for U.S. public funds and not for U.S. corporate plans. Examining the sub-sample of only public pension funds (thus excluding all private funds) indicates that the positive relation between fund maturity and risk-taking is present only among U.S. public pension funds, i.e., cross-type differences do not determine the allocation to risky assets.[31]

[30] For Europe, we use the Eurozone countries' 10-year government bond yields (changing composition over time and weighted average) provided by Eurostat.

[31] We also construct a matched sub-sample of pension funds, matching each U.S. public pension fund with a non-U.S. public fund, separately for each year, based on two variables – fund size and the percentage of retired members. The results in Appendix B confirm that only mature U.S. public funds invest more in risky assets.

5 Pension fund liabilities valuation

Based on financial theory, a discount rate should reflect the timing and riskiness of the promised value of future cash-flows. Thus, more mature pension funds, whose liabilities have shorter duration and are more likely to be paid, should use lower discount rates than younger funds because the yield curve is generally upward sloping. Financial theory also argues that the projected liabilities of mature pension plans are more akin to those of a (shorter duration) bond rather than of equity (Lucas and Zeldes, 2006; Benzoni, Collin-Dufresne, and Goldstein, 2007) and these plans should use lower discount rates. However and as explained in the introduction, our regulatory incentives hypothesis argues that more mature U.S. public pension funds have stronger incentives to present a more favorable funding position by using a higher discount rate, since the amount of their funding deficit and catch-up contribution payments are relatively more affected by lowering the liability discount rate.

To test the relation between fund maturity, allocation to risky assets, and discount rates, we estimate the following pooled panel regression model with year and fund fixed effects:

$$LDR_{i,t} = \gamma_0 + \gamma_1 \%Risky_{i,t} + \gamma_2 \%Retired_{i,t} + \gamma_3 X_{i,t} + \gamma_4 YD_t + \gamma_5 FE_i + \varepsilon_{i,t} \quad (2)$$

where $LDR_{i,t}$ represents the liability discount rate of fund i in year t, $X_{i,t}$ captures the control variables, and $\varepsilon_{i,t}$ is the idiosyncratic error.

Table 4 shows that the allocation to risky assets is positively related to liability discount rates. However, this relation is reduced by half once we control for the allocation to risky assets of U.S. public pension funds. Based on column (2), especially U.S. public funds that allocate a larger percentage of their assets to risky investments use higher discount rates.

In general, more mature plans use lower liability discount rates. However, fund maturity is strongly positively related to the discount rates of U.S. public plans, which is in line with our regulatory incentives hypothesis. In particular, the interaction term *%Retired*Public*U.S.* in

column(3) is positive and significant indicating that for U.S. public pension funds, a 10 percent increase in the percentage of retired members is associated with an increase in the discount rate of 69 basis points [0.1 * (8.234-1.344)]. As a comparison, a 10 percent increase in fund maturity is associated with a 13 basis points reduction in the discount rates of all other funds.

We extend our analysis by examining the relation between interest rates and liability discount rates, and add interaction terms with the 10-year government bond yields to the panel regressions.[32] Based on their regulation, treasury yields would be expected to be positively associated with the discount rates used by U.S. private funds, Canadian and European pension funds. According to financial theory, the treasury yield (as a proxy for the risk-free rate of return) should also be positively related with the expected return on both risky and non-risky assets, and consequently to the discount rate of U.S. public funds. However, U.S. public plans could avoid incorporating the decline in interest rates in their discount rates, by strategically using the flexibility in GASB regulation, i.e., by investing more in risky assets and managing the expected return of their assets.

Consistent with the observed pension fund regulation, in column (6), we find that in general discount rates are positively associated with yields: a 100 basis point decrease in the government bond yield is associated with a decrease in the liability discount rate of 39 basis points for U.S. private funds and both public and private pension fund types in Canada and Europe. The relation is less than proportional because private pension funds base their discount rates mainly on high-quality corporate (not government) yields and their regulatory standards allow some smoothing of the changes in interest rates over time. For example, prior to the Pension Protection Act of 2006, U.S. private plans were permitted to smooth interest rates over four years when

[32]Novy-Marx and Rauh (2011b) find that the effective average duration of U.S. public funds is roughly 13 years. We use the ten-year Treasury rate, because the 15-year rate is not available in all regions covered by our study and because in our estimations we focus on the trend in Treasury yield, which is highly correlated across Treasury yields of different maturities. We do not have sufficient data to estimate more precisely the maturity and distribution of cash-flows over time separately for each pension fund. However, we focus on the general trend in interest rates, and the 10-year and 20-year yields exhibit similar trends over time, such that the potential duration mismatch should not be a significant problem. For instance, the U.S. 10-year Treasury yield declined from 7.09 in 1994 to 1.80 percent in 2012, while the 20-year yield declined from 7.49 in 1994 to 2.54 percent in 2012.

determining the discount rates (Brown, 2008), while Dutch pension plans used a flat discount rate of maximum 4 percent until 2004.

In sharp contrast, Treasury yield changes have no discernible relation to the liability discount rates of U.S. public pension funds. The interaction term *Yield*Public*U.S.* is negative and significant, completely outweighing the unconditional relation of Treasury yields with discount rates. Based on column (6), a 100 basis point decrease in the Treasury yield is associated with a reduction in their discount rate of only 0.8 basis points (0.388 - 0.380), which is not significantly different from zero.

In columns (7)-(9), we include year fixed effects. The *Yield* variable is identified by cross-country differences in these regressions, while the year fixed effects absorb the declining trend over time, i.e., that annual Treasury yields in Europe, Canada and U.S. are highly positively correlated. However, the interaction term *Yield*Public*U.S.* remains negative and significant, indicating that the liability discount rates of U.S. public pension funds do not reflect the trend in interest rates, even though the expected return on assets depends on them.

As a robustness check, we reduce the number of interaction terms and analyze the association between liability discount rates and pension fund characteristics separately in the sub-sample of U.S. funds and in the sub-sample of public pension funds. The results presented in online Appendix C confirm that mature U.S. public funds use higher rates to discount their liabilities and their discount rates are not related to the dynamics in government bond yields.

6 Pension fund performance

This section examines whether the performance of U.S. public funds is related to their preference for riskier asset allocations. According to the regulatory incentives hypothesis, U.S. public plans increased their allocation to risky assets in order to maintain a high liability discount rate and report a better funding position. This implies that part of their asset allocation may not be due to the availability of attractive investment opportunities or the funds' ability to select

and monitor additional risky investments. As a result, we hypothesize that U.S. public funds may underperform compared to other pension funds. The underperformance may be greater among more mature U.S. public pension funds because, as we have shown, they seem to respond relatively more strongly to the GASB regulatory incentives. An alternative hypothesis is that U.S. public funds invest more in risky assets because they have become more successful in selecting and monitoring investments in equity, alternative assets and high yield bonds. If this is the case, U.S. public funds would deliver similar or even higher returns than other pension funds.

We disentangle these two alternative explanations by analyzing pension fund net benchmark-adjusted returns. We first calculate returns of pension fund i in year t separately for each asset class by subtracting the investment costs and the self-reported benchmark return in that asset class from the gross returns, and then aggregate across all asset classes held by the fund. The CEM data includes the self-declared benchmarks, which are usually market indexes against which performance is measured. The advantage of using net benchmark-adjusted returns instead of analyzing directly the net returns is that the benchmarks reflect the geographical allocation and exposure to different asset classes. For example, if a fund invests internationally in equity, then the equity benchmark returns are a weighted average of indexes in multiple countries.[33]

The net benchmark-adjusted returns capture the security selection skills of the pension funds. Even if pension funds increase the allocation to risky assets, as long as they invest passively and buy the index, their net benchmark-adjusted returns would be equal to zero. However, in Online Appendix Figure D.1, we observe that pension funds manage around 80 percent of their assets actively and only 20 percent passively. In Online Appendix Table D.1, we also examine the

[33]A potential worry is that, even though the CEM database is anonymous, pension funds may strategically choose their benchmark in order to report an outperformance, or only participate in years with better performance. In Online Appendix Table D.1, we examine closer the benchmarks reported by pension funds. In equity, fixed income and alternative assets, pension funds select well-established market indexes (like Russell 3000, S&P500, TSE300, MSCI World, Barclays U.S. Aggregate, FTSE/NAREIT Index, HFRI Index etc.) as their benchmarks. We double check the reported return values for these benchmarks and find that they correspond to the values that we could calculate using other major financial databases. Moreover, we do not observe a difference in the benchmark returns reported by U.S. public pension funds and other pension funds in our sample. Online Appendix D gives further details on our performance measures and additional self-reporting tests conducted on the CEM database. All tests indicate that the performance of pension funds is not related to their presence in the CEM dataset.

possibility that pension funds with a higher percentage invested in risky assets allocate more to passive mandates. If a pension fund has a limited active management capacity and expertise, but it wants to invest more in risky assets, the fund could simply increase the allocation to passive mandates within risky assets. In this case, we should observe a positive association between the percentage invested in passive mandates and the percentage invested in risky assets. However, we document no significant association between the percentage invested in passive mandates and the percentage invested in risky assets. The interaction term capturing the allocation to risky assets of U.S. public funds is also close to zero and insignificant. Thus, we conclude that all pension funds engage primarily in active asset management and their performance can differ from the benchmark returns.

We relate the net benchmark-adjusted returns ($NTR - BM_{i,t}$) of fund i in year t to the percentage of retired members ($\%Retired_{i,t}$), and the percentage allocated to risky assets ($\%Risky_{i,t}$), using panel regressions with year (YD_t) and regional, or fund fixed effects (FE_i):

$$NTR - BM_{i,t} = \rho_0 + \rho_1 \%Risky_{i,t} + \rho_2 \%Retired_{i,t} + \rho_3 X_{i,t} + \rho_4 YD_t + \rho_5 FE_i + \upsilon_{i,t} \qquad (3)$$

We include interaction terms to capture the different regulation of U.S. public plans and control for fund size, plan type and inflation protection policy. We also control for two variables capturing differences in the asset management style: the percentage allocated to active mandates and the percentage of assets delegated to external asset managers. Columns (4)-(9) of Table 5 add controls for the previous year's net benchmark-adjusted performance and for the lagged changes in allocation to risky assets. The previous year's net benchmark-adjusted performance captures persistence in returns and potentially investment skills. The lagged changes in allocation to risky assets control for pension funds implementing large changes in their investment policy over periods of time that could expose them to implementation costs, i.e. illiquidity, transaction costs etc. We independently double cluster the robust standard errors by fund and by year.

Results in Table 5 columns (1)-(4) show that U.S. public pension funds underperform other pension funds by 34 to 58 basis points annually, while there is no significant underperformance or outperformance of Canadian and European public versus private pension funds. The lower net benchmark-adjusted returns of U.S. public funds are related to two main factors: the allocation to risky assets and fund maturity. Based on column (5), a 10 percent increase in the strategic allocation to risky assets of U.S. public plans is associated with an increase in underperformance of 10.4 basis points annually. In column (9), we also find that more mature U.S. public pension funds underperform: a 10 percent increase in the percentage of retired members of U.S. public funds is associated with 9.4 basis points lower returns.

In Table 6, we further explore the underperformance of U.S. public pension funds by controlling for fund fixed effects. We document that the 40 basis points underperformance of U.S. public plans documented in column (1) can be attributed to the lower returns of more mature public pension funds. When controlling for fund fixed effects, a 10 percent increase in the percentage of retired members of U.S. public pension funds is associated with a decrease in the returns of 23-40 basis points. Overall, the underperformance is greater among more mature U.S. public plans exploiting the GASB regulatory incentives to manage the discount rate.

Table 7 analyzes the performance of U.S. pension funds separately in equity, alternative assets, risky fixed income assets and non-risky assets (cash and investment grade bonds). Equity and fixed income returns are based on market returns, while pension fund returns in alternative assets are based not only on transaction prices but also on appraisal values, and thus partly on potentially stale prices. At the same time, our sample period includes 23 years and the average holding period of a property or private equity fund is typically around 5-10 years, most deals will have been completed during our sample period, such that their total average performance should be reflected in the database.[34]

[34]Online Appendix D.III discusses further the pension fund performance in alternative assets. Importantly, we use annual data and real estate and private equity investments are typically appraised at least once a year. In addition, pension funds, on average, underperform their self-reported benchmarks in alternative assets.

We find that U.S. public pension funds have 25 basis points lower annual return in equity and 236 basis points lower return in alternative assets. These results support our regulatory incentives hypothesis, as the underperformance of U.S. public pension funds is concentrated in the asset classes that experienced highest increases in allocations. Moreover, in Table 7 columns (2) and (4), we document that mature U.S. public pension funds are the ones underperforming in equity and alternative assets. A 10 percent increase in the percentage of retired members of U.S. public pension funds is associated with a decrease in their annual returns in alternative assets of more than 150 basis points.

In risky fixed income assets, the performance of U.S. public plans is lower, but not statistically significant, possibly due to the lower number of observations. In non-risky assets, we do not find a difference in the performance between private and public pension funds. The public dummy variable is close to zero and the interaction term $\%Retired * Public$ is not significant. This result shows that U.S. public pension funds do not perform differently from other pension funds in assets where their allocation is not inflated by regulatory incentives.

An alternative explanation why U.S. public pension funds underperform is that they just have lower skills than other pension funds, regardless of regulatory differences. However, the low skills hypothesis seems insufficient to fully explain the underperformance of U.S. public plans, because it does not predict that pension fund maturity is related to investment skills and performance, while the regulatory incentives hypothesis argues that especially mature U.S. public pension funds will be susceptible to the GASB regulatory incentives and perform worse.

7 Pension fund governance

The regulatory incentives hypothesis posits that GASB guidelines allow U.S. public funds to maintain high liability discount rates by increasing their allocation to risky assets. However, GASB rules serve only as guidelines and pension funds have considerable discretion in choosing their expected rate of return on assets, which can then be applied as their discount rate. The

relative extent to which U.S. public pension funds respond to the regulatory incentives may depend on their governance. Among U.S. public plans, the board of trustees has the power to decide on the asset allocation policy and actuarial assumptions adopted by the plan. We hypothesize that the board composition is associated with the risk-taking and discount rate choice because board members differ in their incentives to follow the GASB guidelines.

First, we expect that state-appointed and state-ex-officio board members will invest more in risky assets and maintain higher discount rates, because they have stronger short-term incentives to minimize the contribution payments from the employer to the pension fund during their political cycle and use the budget resources for other purposes. The employer contribution payments depend on the reported funding deficit. If the pension plan is underfunded, the employer has the obligation to pay catch-up contributions to amortize the unfunded accrued liability. By investing more in risky assets and using a higher discount rate, state-appointed and state-ex-officio trustees can present a better current funding position and reduce the size of required contribution payments. In our analysis, we combine the state-appointed and state-ex-officio board members, and label the variable as *state-political* trustees.

Second, we expect that elected and ex-officio trustees representing plan participants will invest more in risky assets, because plan members hold a short-term "call option" on the pension fund assets. In the short-term, plan participants are not obliged to pay higher contributions if increased risk-taking results in low returns and funding shortfall, but they could benefit from higher pensions in case of good returns. However, in the long-term (i.e., after a prolonged period of funding problems), their contribution rates can be increased and promised benefits can be reduced. Thus, we expect that the positive relation between the allocation to risky assets and the percentage representation of participant elected and ex-officio trustees will be more pronounced among mature funds, because the "call option" is more valuable for them as the changes in contributions and benefits cannot be implemented retroactively. Pension plans governed by these two groups of trustees may further have lower performance due to potentially lower financial

skills and experience of these trustees.[35] In our analysis, we combine the participant elected and ex-officio trustees, and label the variable as *participant-electexof* board members.

Additionally, we examine the actions of appointed board members from the general public. General-public trustees represent taxpayers (i.e., citizens) and resemble outside independent directors governing corporations (Adams, Hermalin, and Weisbach, 2010) or at least "grey" directors (Hermalin and Weisbach, 1988). General-public board members may have fewer incentives to maintain higher discount rates because they do not work for the state or participate in the pension plan, and so cannot benefit from higher pensions if increased risk-taking pays off. Basically, the constituency they represents has written a long-term "put option" on the pension assets.[36]

In our regression analysis, we implemented four changes related to our earlier specifications. First, we cannot use pension fund fixed effects in the regressions after including the governance variables, because 101 out of 120 U.S. public funds have a constant board composition over time. Second, we replace the *%Retired* variable with a dummy variable that equals one if a U.S. public fund has an above median percentage of retired members in a given year. We use this dummy variable to reduce estimation noise when implementing an interaction with the governance variables. The first column in the tables with governance results verifies that we obtain the same results with the retired dummy variable as with the continuous *%Retired* variable. Third, we control for two more governance variables: pension fund board size and whether a pension fund has two separate boards that make the investment and actuarial decisions. Fourth, we also control for the self-reported funding ratios of U.S. public plans.

Table 8 analyzes the relation between pension fund board composition and allocation to risky

[35]For example, the three participant-ex-officio board members of the New York City Employees' Retirement System in 2014 are the President of Transport Workers Union Local 100, President of Teamsters Local 237 City Employees Union in New York, and Executive Director of District Council 37 AFSCME. They have no educational background in finance or economics, and no professional experience in the finance industry.

[36]On the other hand, general-public trustees are usually finance practitioners, giving rise to potential opportunistic behavior. Accordingly, many pension funds have adopted explicit rules regulating potential conflicts of interest. Of course, codes of conduct do not solve all potential agency conflicts and general-public trustees may propose to invest more in risky assets for opportunistic reasons.

assets. Column (1) confirms that more mature pension funds invest 1.8 percent more in risky assets. Boards with a higher representation of state-political and participant-electexof board members invest more in risky assets. For instance, an increase of one standard deviation in the *%State-political* (0.23) is associated with 2.39-3.06 percent higher allocation to risky assets (0.23*0.104 or 0.23*0.133).

The allocation to risky assets by state-political board members does not depend on the fund maturity, which is in line with their short-term incentives to maintain a higher discount rate and reduce the required contribution payments in any situation. However, the allocation to risky assets by participant elected and ex-officio board members does depend on plan maturity, which is line with our prediction that the short-term "call option" on plan assets is more valuable for mature plan participants. If a pension fund belongs to the more mature group of funds (i.e., with the retired dummy equal to one), a one standard deviation increase in *%Participant-electexof* (0.27) is associated with an increase in the allocation to risky assets of around 3.50 percent.

In Table 9, we relate the pension fund board composition to liability discount rates. Column (1) confirms the result that more mature U.S. public funds use higher discount rates. Further, pension funds governed by boards heavily populated by state-political trustees use around 35 basis points higher discount rates, which is consistent with their incentives to report a lower funding deficit. Again, this result does not depend on the fund maturity, as state trustees have incentives to reduce the required contribution payments in any situation, regardless of fund maturity. We find that pension funds with more participant-elected and participant-ex-officio board members use higher discount rates, if they belong to the more mature group of funds. It seems that elected and ex-officio trustees representing plan participants of mature pension funds are willing to present lower funding problems and delay pension reforms with potentially negative consequences for the plan members.

Table 10 studies the relation between pension fund performance and governance. The retired dummy variable confirms our previous result that more mature U.S. public pension funds have

lower net benchmark-adjusted returns. The lower performance of more mature U.S. public pension funds is mainly due to the lower performance of mature funds with a high representation of participant elected and ex-officio trustees in the board, potentially because these trustees have lower financial skills, but still decide to invest more in risky assets.

U.S. public pension funds with more general-public trustees invest slightly more in risky assets, but the economic effect is smaller than the magnitudes for state-political and participant-electexof trustees. In Table 10, we find no relation between the board representation of general public appointed trustees and the net benchmark adjusted returns. Thus, the slightly higher allocation to risky assets does not adversely affect performance.[37] We interpret our result that general-public board members are less susceptible to the regulatory incentives as a complementary evidence to the corporate finance literature on better governance by outside directors (Gillette, Noe, and Rebello, 2003; Weisbach, 1988).

We estimate these results by comparing the actions of state-political and participant-elected trustees with those of two other groups of trustees, whose appointment procedure requires support from both the public employer and its employees. Participant-appointed trustees are nominated to the board by plan participants and appointed by government officers, while state-elected trustees are nominated by the government and elected by plan participants. Following (Coles, Daniel, and Naveen, 2015), we interpret our results as suggesting that their appointment procedure results in more effective teamwork and reduces the importance of regulatory incentives.

While our results only indicate associations and cannot show causation, these results seem broadly consistent with the incentives and skills of board members. The fact that pension funds change board composition quite infrequently suggests that the relation between asset allocation, performance and board representation is unlikely to arise mainly from the endogenous selection of different trustee types by struggling pension funds.

[37]Based on the biographies of pension fund board members, it seems that general public board members have more asset management experience than the other trustees. Thus, it could be that boards more heavily populated by general public board members, have the knowledge and capacity to select and monitor more risky investments. Alternatively, even if the business connections of general public trustees negatively affect some investments, these trustees still manage to compensate with a better performance on the remaining investments.

8 Conclusion

We empirically explore whether and how the GASB regulatory link between the discount rates and expected return on assets is related to the asset allocation and performance of U.S. public pension funds. To do so, we compare the investments of U.S. public funds with U.S. corporate, Canadian and European pension funds. Our results suggest that, gradually, U.S. public funds have become the biggest risk-takers among pension funds internationally. In addition, U.S. public funds with a higher percentage of retired members invest more in risky assets and maintain higher liability discount rates. We find that U.S. public plans underperform compared to other pension plans by about 57 basis points per year. This underperformance is particularly strong for mature U.S. public funds with large allocations to equity and alternative assets.

These findings are consistent with the hypothesis that U.S. public pension funds (or at least a subset of them) use the GASB regulation strategically to maintain higher liability discount rates by increasing the allocation to risky assets with higher expected return. The extent to which U.S. public funds respond to the regulatory incentives depends on their board composition. In particular, U.S. public pension funds with a higher percentage representation of state-political or participant-elected and participant-ex-officio board members invest more in risky assets as they mature, use higher discount rates and underperform compared to pension funds with lower representation of these two groups of trustees.

When deciding whether to lower the level of the liability discount rate, government entities sponsoring an underfunded DB pension fund face a trade-off between the immediate extra costs necessary to cover the funding deficit if the discount rate is lowered and the potential costs from postponing in the form of higher costs in the future. On one hand, government entities may face political problems when they need to raise more cash to cover a larger reported funding gap, because additional cash flows to the pension system are tangible and visible. On the other hand, government entities could also face problems from creating an unsustainable pension system if an excessive discount rate camouflages situations where the fund is actually rapidly losing assets

and has a deteriorating ability to fulfill the projected future pension benefits. The political costs of such camouflage seem vague and are arguably only relevant if the general public (taxpayers) can see through the framing effects. Our interpretation is that our empirical results are most consistent with U.S. public pension funds opting primarily for the second option.

Our evidence that pension funds seem to act on their regulatory incentives has important implications for designing retirement systems and the governance of institutional investors. Pension fund investment decisions and performance could influence overall welfare and result in intergenerational transfers. Further, given the amount of assets under management by pension funds, correlated changes in their strategic asset allocation could also have implications for asset pricing. We leave these questions for future research.

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Figure 1: **Asset allocation and liability discount rates of U.S. public pension funds**

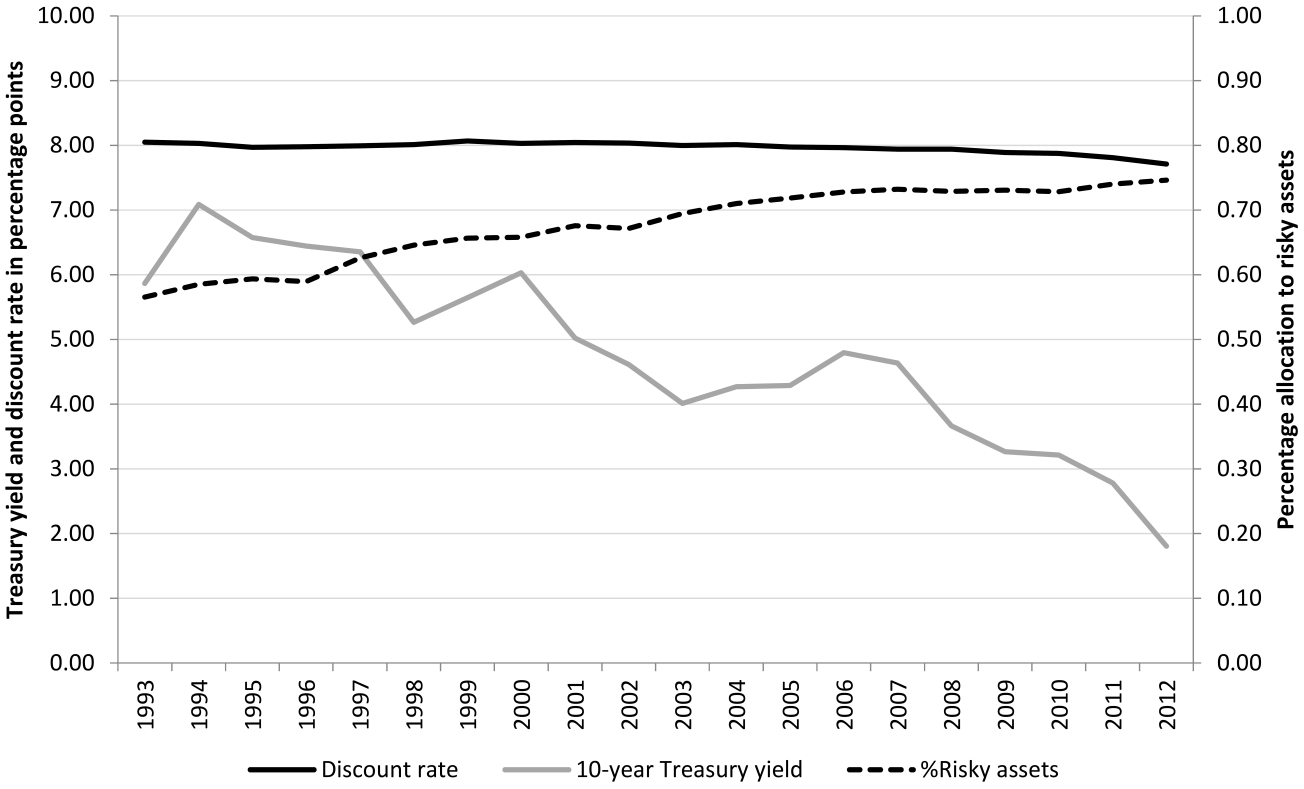

Table 1: **Summary statistics**

This table provides descriptive statistics for pension fund asset allocation, maturity, liability discount rates, fund size, inflation protection policy and performance. In Panel A, rows *Funds* and *Obs.* present the total number of funds and observations during the entire sample period. In Panels B and C, we show the means and standard deviations (in parentheses) of variables separately in 1993 and 2012. *%Risky* shows the average percentage allocation to risky assets based on the strategic asset allocation policy. The risky assets include allocations to equity, alternative asset classes (i.e., hedge funds, private equity, and real estate), and risky fixed income (i.e., high yield bonds, emerging markets debt, and mortgages). *%Retired* presents the average percentage of retired members from total plan members. *LDR* presents the average liability discount rates used by the pension funds. The *Fund size* row reports the average total assets under management (in billions US$) of the pension funds. *Inflation protection* is a dummy variable taking a value of one if a pension fund provides a contractual inflation protection. The *Returns* row presents the average net benchmark-adjusted returns in percentage points. We show the statistics for all funds and separately by region. We also report the statistics separately for public and private (corporate) pension funds.

	All funds		**U.S.**		**Canada**		**Europe**	
	Public	Private	Public	Private	Public	Private	Public	Private
Panel A: Total number of pension funds and observations								
Funds	229	634	164	363	56	181	9	90
Obs. [Fund x year]	1882	3616	1353	2017	487	1283	42	316
Panel B: Summary statistics in 1993								
Funds	39	147	34	83	5	64		
%Risky	0.561	0.630	0.566	0.665	0.531	0.585		
	(0.174)	(0.126)	(0.183)	(0.135)	(0.101)	(0.097)		
%Retired	0.276	0.311	0.286	0.323	0.205	0.296		
	(0.105)	(0.160)	(0.102)	(0.167)	(0.112)	(0.151)		
LDR	8.101	7.986	8.049	8.214	8.400	7.695		
	(0.679)	(0.884)	(0.694)	(0.787)	(0.548)	(0.922)		
Fund size	9.133	2.259	9.399	3.380	7.323	0.804		
	(14.587)	(5.841)	(15.263)	(7.530)	(9.727)	(1.203)		
Inflation protection	0.641	0.153	0.618	0.013	0.800	0.328		
	(0.486)	(0.361)	(0.493)	(0.112)	(0.447)	(0.473)		
Returns	1.465	0.828	1.406	2.031	1.868	-0.731		
	(2.031)	(2.732)	(2.020)	(2.247)	(2.300)	(2.520)		
Panel C: Summary statistics in 2012								
Funds	87	214	63	127	20	53	4	34
%Risky	0.724	0.602	0.746	0.617	0.651	0.592	0.749	0.560
	(0.087)	(0.152)	(0.071)	(0.160)	(0.085)	(0.108)	(0.141)	(0.174)
%Retired	0.419	0.567	0.404	0.618	0.465	0.505	0.417	0.474
	(0.122)	(0.252)	(0.077)	(0.250)	(0.212)	(0.241)	(0.028)	(0.233)
LDR	7.215	4.642	7.708	4.360	6.075	5.415	4.467	4.023
	(0.974)	(1.024)	(0.361)	(0.866)	(0.447)	(0.931)	(1.557)	(1.371)
Fund size	31.790	8.318	32.543	8.085	15.749	2.734	100.131	17.896
	(52.502)	(15.178)	(44.430)	(11.073)	(27.964)	(3.498)	(159.103)	(29.234)
Inflation protection	0.598	0.228	0.556	0.083	0.700	0.521	0.750	0.324
	(0.493)	(0.420)	(0.501)	(0.278)	(0.470)	(0.505)	(0.500)	(0.475)
Returns	0.033	0.674	-0.192	0.539	0.598	1.218	0.737	0.344
	(1.462)	(1.436)	(1.526)	(1.522)	(1.192)	(1.221)	(0.542)	(1.206)

Table 2: **Summary statistics: Board composition of U.S. public pension funds**

The variable *Board size* presents the total number of pension fund board members. *InvBoard* is a dummy variable equal to one if a pension fund has a separate investment board. In this row, columns *Funds* and *Obs.* present the number of pension funds (observations) for which the *InvBoard* dummy is equal to one. For the board composition data, columns *Funds* and *Obs.* present the number of funds and observations that have at least one board member belonging to that category. We split the board members in three categories. *%State* measures the percentage of board members representing the employer, i.e. state, county, city or other public entity. State trustees can be elected to the board by plan members (*%State-elected*), appointed by a governmental executive (*%State-appointed*) or serve as an ex-officio member by the virtue of holding another governmental position (*%State-ex-officio*). *%GenPublic* measures the percentage of board members that represent the citizens (taxpayers) and do not work for the state or participate in the pension plan. General public board members can be either elected to the board by plan members (*%GenPublic-elected*), or appointed to the board (*%GenPublic-appointed*). *%PlanMem* measures the percentage of board trustees representing the currently employed and retired plan participants. Board members representing plan participants can be elected by plan members (*%Participant-elected*), appointed to the board (*%Participant-appointed*), or serve as an ex-officio member, because they are union leaders (*%Participant-ex-officio*). The last row, *Funding ratio*, presents the average self-reported funding ratio of U.S. public pension funds with board composition data.

	Funds	Obs.	Mean	Median	StDev
Board size	120	987	9.177	9.000	2.759
InvBoard	13	109	0.110	0.000	0.314
%State	107	824	0.248	0.182	0.230
%State-elected	4	42	0.018	0.000	0.086
%State-appointed	50	332	0.061	0.000	0.116
%State-ex-officio	86	673	0.168	0.111	0.221
%GenPublic	84	715	0.275	0.286	0.223
%GenPublic-elected	1	10	0.002	0.000	0.022
%GenPublic-appointed	83	705	0.273	0.286	0.225
%Participant	112	925	0.477	0.444	0.214
%Participant-elected	82	655	0.334	0.429	0.273
%Participant-appointed	44	353	0.138	0.000	0.234
%Participant-ex-officio	5	21	0.005	0.000	0.037
Funding ratio	116	936	0.840	0.849	0.168

Table 3: **Panel regressions: Percentage allocated to risky assets**

In this table, we estimate a panel model. The dependent variable is the percentage allocated to risky assets based on the strategic asset allocation of pension funds. The risky assets include allocations to equity, alternative asset classes, and risky fixed income. As independent variables, we include *%Retired*, the percentage of retired members from total pension fund members; *%Retired*Public*, an interaction term capturing the percentage of retired members among public funds; *%Retired*U.S.*, an interaction term capturing the percentage of retired members among U.S. pension funds; *%Retired*Public*U.S.*, an interaction term capturing the percentage of retired members among U.S. public funds; $Yield_{t-1}$, the Treasury yield in the previous year; $Yield_{t-1}$ **Public*, an interaction term capturing the effect of the previous year's Treasury yield on public funds; $Yield_{t-1}$ **U.S.*, an interaction term capturing the effect of the previous year's Treasury yield on U.S. funds; and $Yield_{t-1}$ **Public*U.S.*, an interaction term capturing the effect of the previous year's Treasury yield on U.S. public funds; *Fund size*, the logarithm of total pension fund assets; *Inflation protection*, a dummy variable taking a value of one if a fund provides a contractual inflation protection; *Public*, a dummy variable taking a value of one if a pension fund is public; *Public*U.S.*, a dummy variable for U.S. public funds; and *U.S.*, a regional dummy variable. Where indicated, we include year dummies and fund fixed effects. We independently double cluster the robust standard errors by pension fund and by year. We report standard errors in brackets. *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variable: Percentage allocated to risky assets						
%Retired	-0.159***	-0.170***	-0.102**	-0.084**	-0.122***	-0.106***	-0.092***
	[0.035]	[0.033]	[0.046]	[0.034]	[0.032]	[0.030]	[0.021]
%Retired*Public*U.S.		0.704***	0.714***	0.454***			
		[0.142]	[0.157]	[0.124]			
%Retired*Public			0.018	-0.007			
			[0.067]	[0.063]			
%Retired*U.S.			-0.094*	-0.075*			
			[0.057]	[0.040]			
$Yield_{t-1}$	-0.000	-0.005	-0.002	-0.001	-0.007	0.001	0.006
	[0.006]	[0.006]	[0.005]	[0.008]	[0.006]	[0.005]	[0.006]
$Yield_{t-1}$*Public*U.S.					-0.036***	-0.034***	-0.023***
					[0.006]	[0.008]	[0.008]
$Yield_{t-1}$*Public						-0.010*	-0.024***
						[0.005]	[0.005]
$Yield_{t-1}$*U.S.						0.015***	0.010**
						[0.006]	[0.005]
Fund size	0.014	0.013	0.011	0.007***	0.022	0.012	0.005**
	[0.015]	[0.015]	[0.014]	[0.002]	[0.015]	[0.014]	[0.002]
Inflation protection				0.015**			0.017**
				[0.007]			[0.007]
Public*U.S.				-0.181***			0.088**
				[0.049]			[0.041]
Public				-0.007			0.118***
				[0.030]			[0.029]
U.S.				0.121***			0.042
				[0.018]			[0.027]
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	Yes	No	Yes	Yes	No
Double clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,498	5,498	5,498	5,450	5,498	5,498	5,450
R^2	0.734	0.746	0.747	0.209	0.751	0.756	0.227

Table 4: **Panel regressions: Liability discount rates**

In this table, we estimate a panel model. The dependent variable is the liability discount rate used by the pension funds. As independent variables we include *%Risky*, the percentage allocated to risky assets based on strategic asset allocation policy; *%Risky*Public*, an interaction term capturing the percentage allocated to risky assets of public funds; *%Risky*U.S.*, an interaction term capturing the percentage allocated to risky assets of U.S. pension funds; *%Risky*Public*U.S.*, an interaction term capturing the allocation to risky assets of U.S. public funds; *%Retired*, the percentage of retired members from total pension fund members; *%Retired*Public*, an interaction term capturing the percentage of retired members among public funds; *%Retired*U.S.*, an interaction term capturing the percentage of retired members among U.S. pension funds; *%Retired*Public*U.S.*, an interaction term capturing the percentage of retired members among U.S. public funds; *Yield*, the 10-year Treasury yield; *Yield*Public*, an interaction term capturing the effect of the Treasury yield on public funds; *Yield*U.S.*, an interaction term capturing the effect of the Treasury yield on U.S. funds; and *Yield*Public*U.S.*, an interaction terms capturing the effect of the Treasury yield on U.S. public funds. *Fund size*, the logarithm of total pension fund assets; *Inflation protection*, a dummy variable taking a value of one if a fund provides contractual inflation protection; *Public*, a dummy variable taking a value of one if a pension fund is public; *Public*U.S.*, a dummy variable capturing U.S. public funds; and *U.S.*, a regional dummy variable. Where indicated, we include year dummies and fund fixed effects. We independently double cluster the robust standard errors by pension fund and by year. We report standard errors in brackets. *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variable: Liability discount rate used by pension funds								
%Risky	1.837***	0.949**	1.284***	-0.040	0.634	1.135***	0.931***	-0.205	0.579
	[0.416]	[0.471]	[0.320]	[0.527]	[0.781]	[0.348]	[0.287]	[0.448]	[0.746]
%Risky*Public*U.S.		3.071***		1.345	1.178			-0.268	-0.502
		[0.816]		[1.015]	[1.516]			[0.744]	[1.445]
%Risky*Public				0.066	1.275			0.177	1.105
				[0.750]	[1.280]			[0.468]	[1.348]
%Risky*U.S.				1.230*	0.036			1.186*	0.073
				[0.635]	[0.874]			[0.644]	[0.821]
%Retired	-1.145***	-1.154***	-1.344***	-0.192	0.203	-1.398***	-0.733***	-0.546***	-0.084
	[0.297]	[0.296]	[0.315]	[0.336]	[0.377]	[0.266]	[0.241]	[0.183]	[0.174]
%Retired*Public*U.S.			8.234***	7.605***	2.772***				
			[2.156]	[2.229]	[0.843]				
%Retired*Public				0.250	-0.258				
				[0.715]	[0.497]				
%Retired*U.S.				-1.544***	-0.948**				
				[0.456]	[0.384]				
Yield	0.080	0.029	0.023	0.036	0.097	0.388***	0.015	0.081	0.132
	[0.083]	[0.073]	[0.079]	[0.077]	[0.255]	[0.051]	[0.079]	[0.081]	[0.239]
Yield*Public*U.S.						-0.380***	-0.470***	-0.608***	-0.522***
						[0.033]	[0.035]	[0.060]	[0.066]
Yield*Public								0.001	-0.090
								[0.047]	[0.070]
Yield*U.S.								0.286***	0.126
								[0.078]	[0.101]
Fund size	0.079	0.109	0.076	0.063	-0.092***	-0.208*	0.197*	0.027	-0.107***
	[0.116]	[0.107]	[0.126]	[0.114]	[0.035]	[0.117]	[0.108]	[0.092]	[0.032]
Inflation protection					0.150*				0.180**
					[0.081]				[0.076]
Public*U.S.					-1.183				3.419***
					[1.050]				[1.064]
Public					-0.347				0.102
					[0.877]				[1.041]
U.S.					1.211**				0.236
					[0.608]				[0.785]
Year dummies	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Double clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,307	5,307	5,307	5,307	5,267	5,307	5,307	5,307	5,267
R^2	0.815	0.820	0.827	0.831	0.546	0.819	0.839	0.848	0.586

Table 5: **Panel regressions: Pension fund net benchmark-adjusted performance**

We estimate a panel model. The dependent variable is pension fund net benchmark-adjusted performance. As independent variables we include *Public*, a dummy variable taking a value of one if a pension fund is public; *Public*U.S.*, a dummy variable capturing U.S. public funds; *%Risky*, the percentage allocated to risky assets based on strategic asset allocation policy; Δ*%Risky*$_{t-1}$, the lagged change in the percentage allocation to risky assets; *%Risky*$_{t-1}$ and *%Risky*$_{t-2}$, the percentage allocated to risky assets in years *t-1* and *t-2*; *%Retired*, the percentage of retired members from total pension fund members; *%Risky*Public*, an interaction term capturing the percentage allocated to risky assets of public funds; *%Risky*Public*U.S.*, an interaction term capturing the allocation to risky assets of U.S. public funds, *%Retired*Public*, an interaction term capturing the percentage of retired members among public funds; *%Retired*Public*U.S.*, an interaction term capturing the percentage of retired members among U.S. public funds; *Fund size*, the logarithm of total pension fund assets; *Inflation protection*, a dummy variable taking a value of one if a fund provides contractual inflation protection; *%External*, percentage of assets delegated to external managers; *%Active*, percentage of assets managed actively; and *Return*$_{t-1}$, the net benchmark-adjusted return of pension funds in the previous year. In all models we include year dummies and U.S. region dummy variable. We independently double cluster the robust standard errors by pension fund and by year. We report standard errors in brackets. *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Dependent variable: Net benchmark-adjusted returns									
Public*U.S.	-0.344**	-0.487***	-0.572***	-0.580***	0.232	0.290	0.262	-0.411	-0.324	-0.345
	[0.141]	[0.175]	[0.189]	[0.191]	[0.411]	[0.685]	[0.677]	[0.302]	[0.351]	[0.353]
Public		0.049	0.176	0.164	0.101	-0.339	-0.383	0.211	0.557*	0.547*
		[0.160]	[0.185]	[0.185]	[0.339]	[0.578]	[0.610]	[0.264]	[0.312]	[0.309]
U.S.		0.201	0.036	0.049	0.174	0.030	0.045	0.192	0.008	0.021
		[0.269]	[0.211]	[0.214]	[0.269]	[0.213]	[0.218]	[0.271]	[0.210]	[0.213]
%Risky	0.266	0.075	-0.202	0.882	0.366	-0.161	0.886	0.116	-0.078	0.974
	[0.724]	[0.645]	[0.686]	[0.924]	[0.851]	[0.835]	[0.817]	[0.651]	[0.666]	[0.921]
%Risky*Public					-0.085	0.844	0.897			
					[0.614]	[0.836]	[0.881]			
%Risky*Public*U.S.					-1.040**	-1.335	-1.311			
					[0.471]	[0.904]	[0.891]			
%Retired	0.232	0.174	0.149	0.149	0.203	0.172	0.170	0.268	0.409*	0.408**
	[0.262]	[0.249]	[0.197]	[0.194]	[0.243]	[0.182]	[0.179]	[0.245]	[0.211]	[0.207]
%Retired*Public								-0.253	-0.786	-0.744
								[0.750]	[0.814]	[0.812]
%Retired*Public*U.S.								-0.404	-0.942**	-0.945**
								[0.347]	[0.385]	[0.389]
Fund size	0.044	0.031	0.071	0.072	0.033	0.070	0.070	0.029	0.065	0.066
	[0.058]	[0.052]	[0.057]	[0.057]	[0.053]	[0.059]	[0.059]	[0.053]	[0.059]	[0.058]
Inflation protection	0.052	0.104	0.009	0.010	0.108	0.004	0.004	0.102	0.002	0.003
	[0.144]	[0.113]	[0.130]	[0.130]	[0.116]	[0.133]	[0.134]	[0.113]	[0.131]	[0.131]
%External	-0.122	-0.175	-0.091	-0.084	-0.160	-0.084	-0.078	-0.163	-0.060	-0.054
	[0.278]	[0.213]	[0.203]	[0.202]	[0.214]	[0.204]	[0.202]	[0.211]	[0.196]	[0.195]
%Active	0.195	0.201	0.119	0.111	0.207	0.124	0.115	0.205	0.124	0.115
	[0.361]	[0.363]	[0.347]	[0.343]	[0.362]	[0.346]	[0.342]	[0.364]	[0.348]	[0.344]
Δ*%Risky*$_{t-1}$			-1.154			-1.180			-1.162	
			[0.979]			[1.014]			[0.984]	
%Risky$_{t-1}$				-2.245			-2.254			-2.222
				[1.508]			[1.515]			[1.506]
%Risky$_{t-2}$				1.051			1.074			1.062
				[0.992]			[1.032]			[0.997]
Return$_{t-1}$			-0.004	-0.004		-0.004	-0.004		-0.005	-0.005
			[0.099]	[0.099]		[0.099]	[0.099]		[0.099]	[0.099]
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,412	5,412	3,693	3,693	5,412	3,693	3,693	5,412	3,693	3,693
R^2	0.121	0.122	0.133	0.133	0.122	0.133	0.133	0.122	0.134	0.134

Table 6: **Panel regressions: U.S. pension fund net benchmark-adjusted performance**

We estimate a panel model and the dependent variable is the net benchmark-adjusted performance only of U.S. pension funds. As independent variables we include *%Risky*, the percentage allocated to risky assets based on strategic asset allocation policy; Δ*%Risky*$_{t-1}$, the lagged change in the percentage allocation to risky assets; *%Risky*$_{t-1}$ and *%Risky*$_{t-2}$, the percentage allocated to risky assets in years *t-1* and *t-2*; *%Retired*, the percentage of retired members from total pension fund members; *%Risky*Public*, an interaction term capturing the percentage allocated to risky assets of public funds; *%Retired*Public*, an interaction term capturing the percentage of retired members among public funds; *Fund size*, the logarithm of total pension fund assets; *Inflation protection*, a dummy variable taking a value of one if a fund provides contractual inflation protection; *%External*, percentage of assets delegated to external managers; *%Active*, percentage of assets managed actively; and *Return*$_{t-1}$, the net benchmark-adjusted return of pension funds in the previous year. Except model (1), in all the other models we include year dummies and fund fixed effects. Model (1) includes *Public* dummy variable that takes a value of one if a pension fund is public. We independently double cluster the robust standard errors by pension fund and by year. We report standard errors in brackets. *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: Net benchmark-adjusted returns of U.S. funds							
%Risky	0.025	0.070	0.234	-0.167	0.707	0.280	0.347	1.048
	[0.759]	[1.084]	[1.472]	[1.502]	[1.800]	[1.045]	[1.091]	[1.600]
%Risky*Public			-0.410	0.264	0.362			
			[1.854]	[2.284]	[2.281]			
%Retired	0.155	0.596	0.599	0.993	0.931	0.663	1.131	1.076
	[0.286]	[0.706]	[0.705]	[0.687]	[0.673]	[0.701]	[0.743]	[0.734]
%Retired*Public						-2.271**	-4.028*	-3.830*
						[1.139]	[2.257]	[2.170]
Public	-0.400**							
	[0.180]							
Fund size	0.066	0.208	0.211	0.488	0.487	0.258	0.598	0.592
	[0.055]	[0.414]	[0.412]	[0.586]	[0.587]	[0.408]	[0.599]	[0.598]
%External	-0.060	-0.752	-0.718	-0.572	-0.566	-0.690	-0.433	-0.427
	[0.243]	[0.708]	[0.767]	[0.938]	[0.930]	[0.710]	[0.826]	[0.822]
%Active	0.209	-0.789	-0.794	-0.740	-0.798	-0.772	-0.683	-0.733
	[0.432]	[0.903]	[0.897]	[0.922]	[0.926]	[0.903]	[0.912]	[0.914]
Inflation protection	0.067							
	[0.180]							
Δ*%Risky*$_{t-1}$				-1.456*			-1.567*	
				[0.825]			[0.816]	
%Risky$_{t-1}$					-2.405***			-2.308***
					[0.900]			[0.878]
%Risky$_{t-2}$					1.114			1.295
					[1.164]			[1.134]
Return$_{t-1}$				-0.146	-0.146		-0.148	-0.148
				[0.117]	[0.117]		[0.118]	[0.117]
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,325	3,353	3,353	2,224	2,224	3,353	2,224	2,224
R^2	0.141	0.329	0.329	0.279	0.279	0.329	0.280	0.280

Table 7: **Panel regressions: Performance of U.S. pension funds by asset class**

We estimate a panel model. The dependent variable is the net benchmark-adjusted performance of U.S. pension funds. In columns (1) and (2) the dependent variable measures the performance in equity, in columns (3) and (4) performance in alternative assets, in columns(5) and (6) performance in risky fixed income assets, and in columns(7) and (8) performance in non-risky assets, such as cash and investment grade bonds. As independent variables we include *%Risky*, the percentage allocated to risky assets based on strategic asset allocation policy; *%Retired*, the percentage of retired members from total pension fund members; *%Retired*Public*, an interaction term capturing the percentage of retired members among public funds; *Fund size*, the logarithm of total pension fund assets; and *Inflation protection*, a dummy variable taking a value of one if a fund provides contractual inflation protection. Columns with odd numbers include *Public* dummy variable that takes a value of one if a pension fund is public. In columns with odd numbers, we include only year fixed effects, whereas in columns with even numbers we include both year and fund fixed effects. We independently double cluster the robust standard errors by pension fund and by year. We report standard errors in brackets. *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Equity		*Alternative assets*		*Risky fixed income*		*Non-risky assets*	
%Risky	1.155**	1.679	5.973	8.594	3.937	6.255	0.241	0.231
	[0.578]	[1.064]	[3.703]	[6.759]	[2.750]	[6.514]	[0.555]	[0.716]
%Retired	0.125	0.566	-0.450	-0.103	-1.236	-2.790	0.277	0.595*
	[0.279]	[0.815]	[1.472]	[3.375]	[1.123]	[2.729]	[0.206]	[0.331]
%Retired*Public		-4.308*		-15.807*		-6.136		1.743
		[2.372]		[9.178]		[10.490]		[1.993]
Public	-0.249**		-2.364**		-0.862		0.064	
	[0.111]		[1.051]		[0.706]		[0.173]	
Fund size	0.036	0.069	0.506**	2.365	0.501***	-0.563	0.046	-0.170
	[0.063]	[0.484]	[0.207]	[1.839]	[0.179]	[2.586]	[0.051]	[0.163]
Inflation protection	0.127		0.569		-0.400		-0.013	
	[0.169]		[0.572]		[0.427]		[0.131]	
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Double clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,295	3,321	2,524	2,544	624	627	3,296	3,322
R^2	0.167	0.307	0.100	0.348	0.159	0.358	0.276	0.399

Table 8: **Panel regressions: Percentage allocated to risky assets and governance**

The dependent variable is the percentage allocated to risky assets by U.S. public pension funds. We include two board composition variables in the models. *%Participant-electexof* measures the percentage of board members representing the plan participants, who are either elected by the plan members or serve on the board as union leaders. *%State-political* captures the percentage of board members representing the employer (state, country, city or other public entity), who are either appointed by a governmental executive or serve as an ex-officio member by the virtue of holding another governmental position. *%GenPublic-appointed* measures the percentage of board members appointed from the general public. In the models, we also include *Retired dummy*, a dummy variable equal to one if a U.S. public pension fund has an above-median percentage of retired members in a given year. *%Participant-electexof*Retired dummy* and *%State-political*Retired dummy* are interaction terms between the governance variables and the retired dummy variable. We also control for *Fund size*, the logarithm of total pension fund assets; *Inflation protection*, a dummy variable taking a value of one if a fund provides a contractual inflation protection; *Board size*, the total number of pension fund board members; *InvBoard*, a dummy variable equal to one if a pension fund has a separate investment board; and *Funding ratio*, the self-reported funding ratio of U.S. public public funds. We include year dummies and independently double cluster the robust standard errors by pension fund and by year. We report standard errors in brackets. *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

	(1)	(2)	(3)	(4)
Dependent variable: Percentage allocated to risky assets				
Retired dummy	0.018*	-0.001	-0.050***	-0.040**
	[0.010]	[0.010]	[0.017]	[0.019]
%Participant-electexof		0.083***	0.047	0.048*
		[0.030]	[0.029]	[0.029]
%State-political		0.104***	0.119***	0.133***
		[0.032]	[0.032]	[0.034]
%GenPublic-appointed		0.037	0.058*	0.055*
		[0.032]	[0.032]	[0.032]
%Participant-electexof*Retired dummy			0.131***	0.124***
			[0.036]	[0.036]
%State-political*Retired dummy				-0.033
				[0.037]
Fund size	0.006*	0.005	0.005*	0.005
	[0.003]	[0.004]	[0.003]	[0.003]
Inflation protection	0.019	0.010	0.010	0.010
	[0.014]	[0.010]	[0.010]	[0.010]
InvBoard		-0.001	0.004	0.004
		[0.016]	[0.015]	[0.015]
Board size		0.004	0.003	0.003
		[0.003]	[0.002]	[0.002]
Funding ratio		0.050	0.046	0.046
		[0.048]	[0.045]	[0.045]
Year dummies	Yes	Yes	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Observations	1,352	935	935	935
R^2	0.244	0.295	0.327	0.328

Table 9: **Panel regressions: Liability discount rates and governance**

The dependent variable is the liability discount rate used by U.S. public pension funds. We include two board composition variables in the models. *%Participant-electexof* measures the percentage of board members representing the plan participants, who are either elected by the plan members or serve on the board as union leaders. *%State-political* captures the percentage of board members representing the employer (state, country, city or other public entity), who are either appointed by a governmental executive or serve as an ex-officio member by the virtue of holding another governmental position. *%GenPublic-appointed* measures the percentage of board members appointed from the general public. In the models, we also include *Retired dummy*, a dummy variable equal to one if a U.S. public pension fund has an above-median percentage of retired members in a given year. *%Participant-electexof*Retired dummy* and *%State-political*Retired dummy* are interaction terms between the governance variables and the retired dummy variable. We also control for *Fund size*, the logarithm of total pension fund assets; *Inflation protection*, a dummy variable taking a value of one if a fund provides a contractual inflation protection; *Board size*, the total number of pension fund board members; *InvBoard*, a dummy variable equal to one if a pension fund has a separate investment board; and *Funding ratio*, the self-reported funding ratio of U.S. public public funds. We include year dummies and independently double cluster the robust standard errors by pension fund and by year. We report standard errors in brackets. *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

	(1)	(2)	(3)	(4)
Dependent variable: Liability discount rate				
Retired dummy	0.125***	0.007	-0.136*	-0.144
	[0.043]	[0.047]	[0.079]	[0.093]
%Participant-electexof		0.153	0.046	0.045
		[0.159]	[0.165]	[0.163]
%State-political		0.319**	0.365**	0.355*
		[0.158]	[0.160]	[0.183]
%GenPublic-appointed		0.088	0.149	0.151
		[0.174]	[0.162]	[0.164]
%Participant-electexof*Retired dummy			0.381**	0.386**
			[0.153]	[0.154]
%State-political*Retired dummy				0.025
				[0.167]
Fund size	0.009	-0.028	-0.027	-0.027
	[0.015]	[0.022]	[0.022]	[0.022]
Inflation protection	0.057	0.112***	0.113***	0.113***
	[0.052]	[0.042]	[0.042]	[0.042]
InvBoard		-0.042	-0.027	-0.027
		[0.069]	[0.067]	[0.067]
Board size		0.008	0.007	0.007
		[0.014]	[0.014]	[0.014]
Funding ratio		-0.130	-0.141	-0.140
		[0.244]	[0.234]	[0.234]
Year dummies	Yes	Yes	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Observations	1,323	935	935	935
R^2	0.077	0.177	0.196	0.196

Table 10: **Panel regressions: Performance and governance of U.S. public pension funds**

The dependent variable is the net benchmark-adjusted performance of U.S. public pension funds. We include two board composition variables in the models. *%Participant-electexof* measures the percentage of board members representing the plan participants, who are either elected by the plan members or serve on the board as union leaders. *%State-political* captures the percentage of board members representing the employer (state, country, city or other public entity), who are either appointed by a governmental executive or serve as an ex-officio member by the virtue of holding another governmental position. *%GenPublic-appointed* measures the percentage of board members appointed from the general public. In the models, we also include *Retired dummy*, a dummy variable equal to one if a U.S. public pension fund has an above-median percentage of retired members in a given year. *%Participant-electexof*Retired dummy* and *%State-political*Retired dummy* are interaction terms between the governance variables and the retired dummy variable. We also control for *Fund size*, the logarithm of total pension fund assets; *Inflation protection*, a dummy variable taking a value of one if a fund provides a contractual inflation protection; *%External*, percentage of assets delegated to external managers; *%Active*, percentage of assets managed actively; *Board size*, the total number of pension fund board members; *InvBoard*, a dummy variable equal to one if a pension fund has a separate investment board; and *Funding ratio*, the self-reported funding ratio of U.S. public public funds. We include year dummies and independently double cluster the robust standard errors by pension fund and by year. We report standard errors in brackets. *, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

	(1)	(2)	(3)	(4)	(5)
Dependent variable: Net benchmark-adjusted returns					
Retired dummy	-0.195*	0.075	0.533*	0.864	0.861
	[0.118]	[0.075]	[0.302]	[0.564]	[0.560]
%Participant-electexof		-0.311***	0.031	0.078	0.077
		[0.107]	[0.061]	[0.069]	[0.111]
%State-political		-0.309	-0.458*	-0.011	-0.006
		[0.255]	[0.276]	[0.485]	[0.489]
%GenPublic-appointed		0.221	0.027	-0.066	-0.071
		[0.408]	[0.317]	[0.234]	[0.228]
%Participant-electexof*Retired dummy			-1.224**	-1.465*	-1.466*
			[0.591]	[0.794]	[0.803]
%State-political*Retired Dummy				-1.067	-1.069
				[0.848]	[0.857]
Fund size	0.005	0.068	0.065	0.061	0.068
	[0.090]	[0.101]	[0.100]	[0.100]	[0.096]
Inflation protection	-0.007	-0.210	-0.212	-0.218	-0.214
	[0.200]	[0.268]	[0.260]	[0.262]	[0.265]
%External					0.037
					[0.267]
%Active					0.075
					[0.484]
InvBoard		0.015	-0.034	-0.028	-0.034
		[0.170]	[0.149]	[0.138]	[0.119]
Board size		0.013	0.016	0.016	0.015
		[0.044]	[0.045]	[0.045]	[0.043]
Funding ratio		1.077	1.110	1.100	1.109
		[0.797]	[0.803]	[0.798]	[0.822]
Year dummies	Yes	Yes	Yes	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes	Yes
Observations	1,350	934	934	934	934
R^2	0.127	0.107	0.110	0.111	0.111