

Agency and Portfolio Choice in Public Pension Funds

(Very Preliminary)

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Abstract

Boards of public pensions are prone to unique agency frictions because of their status as being in the public sector. We model public pension boards' hiring and compensating of investment managers to achieve optimal portfolios for constituents. Agency conflicts manifest in board preferences over manager quality and portfolio choice, reflecting underfunding pressures, outrage constraints on paying market compensation to managers, bureaucratic incentives and board political capture. Testing the model in global data covering \$5.4 trillion of assets, we find underfunding induces risking-up to hedge funds (a 37% change) and private equity (a 23% change). However, boards cannot hire more skilled managers to oversee these riskier portfolios if workers are prone to outrage (having lower incomes). Whereas underfunded boards act as if less risk averse, funds with bureaucrat trustees instead look overly conservative, taking 0.05 portfolio weight away from risky asset classes. Consistent with a story of picking discrete, politically-favored funds, political boards invest 0.017 away from vanilla equities into hedge funds and private equity, which respectively underperform by 7.4% and 1.8%. We tie the mechanism to a hiring of lower quality managers (\$44,642 lower pay), consistent with our model that board influence over investment manager quality and compensation matters.

Keywords: Public pension funds, underfunding, state investment, pension board of directors, trustees, fund management, bureaucracy, governance, politicization, asset allocation, compensation

JEL codes: G11, G23, G30

I Introduction

Towers Watson, a consultancy, estimates that in 2015 sovereign and public pension funds worldwide controlled assets valued at over \$10 trillion. The boards of such funds face a unique set of potential agency issues – political pressures, bureaucratic incentives, outrage constraints on compensation to management, and strains from the fiscal condition of the pension. Our study asks how such board agency frictions can cause distortions in their investment management decisions relative to what would be optimal for fund beneficiaries who have weak control rights. As motivation, it is not hard to find anecdotes of investment decisions being misallocated such as those we provide as Appendix Table 1. Board members, especially those connected to the state government (governors, state treasurers, etc.) are often cited for taking kickbacks in cash or campaign contributions for tilting investments to willing financial intermediaries. Other anecdotes concern boards taking on excess risk (e.g., Orange County) to shore up underfunded liabilities. We argue that the frequency of anecdotes is not just a coincidence, but rather is indicative of agency frictions emerging from public sector agency issues of board members. With this in mind, our approach focuses on the board as the actor who hires and compensates managers to implement portfolios. We ask whether these agency issues affect portfolio allocations and performance and study the extent to which frictions emerge through manager quality and compensation.

We frame our contributions in a mean-variance portfolio choice model that embeds agency frictions. The setup is one of a public pension board hiring and compensating an investment manager, who constructs the portfolio over assets. The ultimate owners of the pension fund are its constituent beneficiaries. If the board represented constituents only, the board would offer the manager a compensation contract that would induce her to invest in a mean-variance efficient portfolio over fixed income and a frontier risky asset. Boards, however, do not always perfectly represent constituents.

In the model, the board’s hiring and compensating investment managers involves three dimensions of choice. First, boards choose the experience level of the investment manager. Experience leads to skill in capturing the full risk premium, but has no payoff in fixed income investing. Since the investment manager’s outside options are increasing in experience, the board chooses the level of management skill by setting the expected pay level. Second, boards choose the risk of the portfolio by setting a linear contract term on fund performance. Third, in addition to the standard fixed income asset and a mean-variance frontier risky asset, our model includes a third asset that is also risky but non-frontier in returns. This asset produces benefits for politicians. Boards choose the weight on the political asset by offering a side payment added to the compensation contract proportional to the investment weight in the political asset.

The model sets up a framework for exploring the how agency frictions affect the comparative statics of the boards’ contract choices – manager skill, risk level, and political asset weight. The first agency friction we explore is underfunding of liabilities. As Ang, Chen and Sundaresan (2013) have noted, underfunding

creates pressures on pension plans resulting from the costs associated with seeking and securing additional funding if the fund return realization is below that which is needed to cover liabilities. In the Ang et al model, managers respond as if they have lower risk aversion, risking up their portfolios in response. In our comparative statics, a less risk averse board sets a compensation contract to induce the manager to tilt the portfolio away from fixed income and toward the frontier risky asset. In addition, the board will want to hire a skilled manager to capture the risk premium from the now larger risky allocation.

However, a second agency friction may come into play. Boards are constrained in how much they can pay managers by an outrage constraint. Workers and retirees may be outraged by large compensation packages for investment management. This constraint may be especially true for teachers' pension funds or pensions of states with low public employee income levels relative to the going rate for investment managers. This agency concern manifests itself in media attention induced by a few pensioners or workers who do not understand the value of skill in investment management. Because public boards are career sensitive to negative media attention, a small outrage implies an agency friction which boards will seek to avoid. If outrage binds, boards will seek to pay lower compensation. Additionally, when underfunding happens, boards may not be able to react by hiring a manager with high skill in realizing risk premia.

The third agency friction concerns bureaucratic incentives. The archetypal bureaucrat is a career civil servant, a position with significant stability. This individual has no reason to worry about electoral outcomes. Having self-selected a civil servant role, their career concerns are best achieved by seeking stability in pension returns, which can be captured as an aversion to risky assets. As Holmstrom (1999) noted, administrators with career concerns might be overly risk averse if their decisions shapes perceptions about their talent. In this case, boards would be afraid to recommend investments with downside risks, possibly resulting in an allocation incongruent with the risk preferences of the beneficiaries.

Finally, we consider the archetypal 'pure politician' board member, who is a prominent politician facing periodic elections. Their prominent position makes them particularly well positioned to benefit from political investments – those that enhance the local economy to produce votes, those that enhance their own careers through campaign contributions, and those that enhance their own, powerful pockets. Our ideas in this realm are not new. Recent papers that have shown public pension plans have preferences for local-tilted assets in specific asset classes (Brown, Pollet, and Weisbenner (2015); Hochberg and Rauh (2013); Dyck and Morse (2011); Bernstein, Lerner, and Schoar (2013)) and for assets tilted toward political favors more generally (Andonov, Hochberg and Rauh (2016)). In our model, board politicization causes the manager to invest in the political asset. Since the political asset does not have as much sensitivity to manager skill, the model predicts that politicized boards will hire lower quality managers and risky asset classes' performance as a whole will suffer.

The comparative statics of our model set up empirical tests. We manually collect data on 166 public

pension funds and sovereign funds from five regions – the U.S., Canada, Oceania, Scandinavia and the U.K. and Continental Europe for 1996-2014. Our sample accounts for \$5.6 trillion at the end of the sample period. Our use of global data allows us to explore a larger range of governance structures and asset allocations, and ensures that our results speak to a meaningful portion of the world’s government pension holdings. We also hand collect data on board structures, board member characteristics, and manager characteristics.

Our first contribution documents the effect of liability concerns on public pension funds. Our work is consistent with the new work of Andonov, Bauer and Cremers (2016). We find evidence that the degree of underfunding induces a risking-up. On average, a pension fund with a standard deviation higher underfundedness allocates a statistically significant 0.003 more portfolio weight to hedge funds (a 37% change) and 0.020 more to real estate/private equity (a 23% change). In exchange, they allocate less to fixed income and infrastructure and natural resources. The percentage change in allocation to fixed income is small relative to the mean allocation in fixed income (a 3% change); however, the additional allocation to hedge funds and real estate/private equity is quite large relative to their means. We find no evidence that the risking-up due to underfunding results in higher portfolio performance, but it does result in more portfolio volatility.

The theoretical framework suggests an underfunded fund would want to hire a higher-skilled manager because underfunded pensions place more portfolio weight on risky securities where skill is valued, unless the board faces an outrage constraint that inhibits paying market prices for highly-skilled investment managers. Our findings are consistent with outrage binding when we extend the Adonov, Bauer and Cremers (2016) work in exploring the implication of underfunding for manager selection. Underfunded boards neither pay higher compensation to chief investment officers nor perform any better within asset class than other pension funds.

Our second contribution studies outrage explicitly. We measure the average wage level at each pension fund using the contribution total amount and the contribution rate by fund. We construct an outrage variable as the inverse of the log of average worker wages, under the assumption that outrage is more likely among lower paid pension workers. In a state fixed effects model, we find that a one standard deviation larger outrage variable (\$18,470 in worker wages) associates with 10.6% (\$43,028) lower total compensation of the investment manager. In addition, we find that the underfunded pensions who do not face outrage indeed pay higher investment manager compensation.

Our third contribution documents how the risk aversion tendencies of bureaucrats affect portfolio choice. We find that a pension fund with a single extra bureaucrat on the board of trustees allocates 0.021 (6% change) more of portfolio weight to fixed income and 0.024 (72% change) more portfolio weight to natural resources and infrastructure. These magnitudes reflect a significant 0.02 reduction (23% change) in allocations to real estate/private equity and a 0.03 reduction (5% change) in vanilla equities. Bureaucrats de-risk the portfolio.

Our fourth contribution builds off (and confirms) the concurrent work of Andonov, Hochberg and Rauh (2016) as well as their prior work Hochberg and Rauh (2012). These papers respectively document underperformance within the private equity asset class by U.S. public pensions due to politicization of the board and local bias. We have collected similar data as Andonov et al (2016) on board connections to the government. We confirm their insightful findings that pension boards with politically appointed or employed (ex officio) chairpersons perform worse in private equity and real estate. We estimate that pensions with political chairs have 1.8 percentage points lower returns within that asset class.

Our fifth contribution broadens this finding of Andonov et al (2016) to cast politicization in the picture of risk across asset classes. We find that political chairs risk-up portfolios by switching into the riskier asset classes within the set of risky asset classes, keeping fixed income allocations constant. Andonov et al (2016) have a similar finding within the spectrum of private equity asset class. We find that political chairs invest 0.009 more portfolio weight in hedge funds (a 109% change) and 0.012 more in private equity and real estate (an 14% change) in exchange for less weight in vanilla public equities. Furthermore, we also study the role of political contributions, as in Andonov et al (2016). We find that when the standing governor experienced a standard deviation higher campaign contribution in the last election cycle relative to the prior three governor elections in that state, pension funds with a political chair invest in hedge funds and real estate/private equity. As before, the size of these effects is small 0.009 more allocations to hedge funds and 0.013 more to real estate/private equity, but the change represents a 107% increase for the hedge funds and 15% increase for real estate/private equity.

A question emerges as to the motivation for this risking-up. We document that these politicized chairs, which are de facto entirely a U.S. phenomenon in our data, have more professional financial industry experience than other board chairs. Thus, it could be that the risking-up reflects an effort to enhance reputation through increasing returns in asset classes that have a greater variation in returns. The other possibility is that these riskier asset classes (hedge funds and private equity / real estate) present greater opportunities for providing political favors with their more discrete investment choices vis-a-vis public equities. The final contribution helps us to sort out these alternatives, finding evidence in favor of political favoritism.

Our sixth and final contribution is that not only do political chairs underperform in private equity and real estate (1.8 percentage points), but they also underperform in hedge funds (by 7.4 percentage points) and perhaps (statistically weakly) in infrastructure and natural resources. Furthermore, we provide evidence that politicization effects on portfolio choice and performance happen through the channel of manager selection. Our theory suggests that because boards tilt toward political assets and away from frontier risky assets, where skill is most valued in capturing the risk premium, political boards will hire less skilled managers. We find boards with a political chair hire chief investment officers with 11% lower log compensation, or, \$44,642 lower compensation at the mean. This result suggests an additional cost to public pensions in the US, with

poorer quality management contributing to underperformance, a real cost to U.S. workers and retirees.

II Model

The owners of a pension fund are its constituents, the beneficiaries. Constituents, if perfectly represented, would invest in a mean-variance efficient portfolio over a risky asset and fixed income, incorporating their risk aversion λ_C . Pension boards, however, represent the constituents imperfectly over three decision dimensions that affect portfolio choice – investment manager skill, risk level, and portfolio weight on politically-motivated assets.

II.A Assets and Investment Manager Quality

The pension board hires and compensates an investment manager to allocate the pension’s capital among asset classes and to construct within-asset class portfolios (often via delegation choices). Managers are risk averse, with the same risk aversion as the constituents of the pension fund λ_C . Managers are heterogeneous in only one dimension, their degrees of experience, represented by the skill parameter s . The supply of any type of manager is transparent and perfectly competitive. A manager of type s has an outside option $O(s)$, where $O(\cdot)$ is an increasing function such that more experienced managers have higher outside options.

The manager chooses portfolio weights among three assets: fixed income, mean-variance efficient securities and political assets. Fixed income pays a riskless return r_f :

$$\text{Fixed income : } E[R_f] = r_f$$

We assume that there is a continuum of mean-variance efficient risky securities, all with the same Sharpe ratio of φ . For any positive standard deviation σ_{MV} , there is a unique security with variance σ_{MV}^2 and risk premium $\phi_{MV} = \varphi\sigma_{MV}$. Managers only earn a fraction s of the potential premium ϕ_{MV} , in proportion to their skill. Only managers with maximal skills (i.e., $s = 1$) can capture the full underlying risk premium:

$$\begin{aligned} \text{Mean-variance efficient securities : } E[R_{MV}] &= r_f + s\phi_{MV} \\ &= r_f + s\varphi\sigma_{MV} \end{aligned}$$

The “riskness” of the MV-asset to the portfolio is given by the risk level chosen, times the weight allocated to the MV asset as

$$x = w_{MV}\sigma_{MV} \tag{1}$$

Note that any combination of leverage on MV-securities (w_{MV}) times the level of risk on the MV-security (σ_{MV}) that gives the same product $w_{MV}\sigma_{MV}$ will generate portfolios with the same riskiness. Empirically, what we will observe is that some pensions risk-up in weights and some in the volatility within the risky asset class. Either form of risk has implications for a pension and thus our choice to model risk accordingly.

The political asset has a worse Sharpe ratio than MV-efficient securities, but bestow upon the board a political gain, which we describe on the next subsection.

$$\textit{Political asset} : E[R_P] = r_f + s\phi_P, \text{ where } \phi_P/\sigma_P < \varphi$$

For tractability, we assume that the MV-efficient securities and political assets have a joint normal distribution with correlation ρ , which is large enough to prevent hedging between asset classes.¹ The manager’s job is choose the MV-efficient security risk level σ_{MV} and then form the portfolio by selecting the weights on MV-efficient securities, political assets, and fixed income as w_{MV} , w_P , and $(1 - w_{MV} - w_P)$, respectively.

II.B Preference for Risk

Although investment managers and constituents have the same risk aversion λ_C , effective board risk aversion, denoted by λ_B , can be affected by liability obligations. Ang, Chen, and Sundaresan (2012) model the tensions pensions face due to the constant need to fund payments to retirees. Their main inference is that when funding is low, pension boards have an a lower effective risk aversion, i.e., a desire to "swing for the fences". The resulting risk-taking behavior is similar to gambling for resurrection ideas of Addoum, van Binsbergen, and Brandt (2012).

Another reason for incongruity in risk preferences stems from the career concerns of the board members. As Holmstrom (1999) noted, administrators take into account that the results from their decisions will impact beliefs about their true skills, which in turn influences their future career possibilities. This leads, in theory, to an overly conservative portfolio allocation.

Because our agenda is mainly empirical, we adopt reduced form conclusions from these models, assuming that career concerns and underfunded status results in a higher risk appetite, as in:

$$\lambda_B = \frac{\lambda_C}{\theta} \tag{2}$$

where $\theta \geq 1$ is an exogenous variable capturing the risking-up pressure.

II.C Political Incentives

Another conflict of interest between the constituents and the board comes from the incentive to tilt the portfolio allocation towards assets that might provide some political gain to the board, which we call political assets. Andonov, Hochberg and Rauh (2016) find that U.S. pension funds with political boards tend to invest

¹Hochberg and Rauh (2012) find no evidence of such hedging. The preclusion of any hedging is admittedly overly strong for practice. However, the gist of the model is about risking up or down and tilt toward politicized asset classes, which focuses on the asset class mix as the mechanism to achieve risk preferences. See the appendix for the explicit restriction on ρ that prevents the portfolio manager from taking short positions in any asset class.

in less profitable private equity funds, and Dyck and Morse (2009) and Bernstein, Lerner and Schoar (2009) show a similar pattern in the investments of sovereign wealth funds.

We incorporate the incentive to invest in political assets in our model by assuming that the board receives an additional riskless payment of L dollars for each dollar invested in political assets. The compensation could be in for quid pro quo favors with financial intermediaries or simple in the form of votes rewarded for local investment. If pay is the compensation to the manager and R is the total return of the portfolio, the assumption of mean-variance preferences implies that the utility of the board is given by:

$$U_B = E[R - pay] + Lw_L - \frac{1}{2}\lambda_B Var[R - pay]. \quad (3)$$

II.D Compensation Contract

The board asserts its preferences for risk and for political investments by offering a compensation contract to the investment manager. We restrict our model to linear contracts. First, the manager receives a cash salary c , independent of her performance. In order to motivate risky investments, the board gives a share $1 - a$ of the realized financial return to the manager. The board also asserts its political preferences by giving an additional transfer of T dollars for each dollar invested in political assets. Linear compensation is given by:

$$pay(R, w_P) = c + (1 - a)R + Tw_P. \quad (4)$$

We assume that the portfolio manager have CARA utility with risk aversion λ_C . Incorporating (4), the manager chooses risk and political asset weight (x, w_P) solving the following program:

$$\max_{x, w_P} U_M = \max_{x, w_P} \left\{ E[pay] - \frac{1}{2}\lambda_M Var[pay] \right\} \quad (5)$$

II.E Outrage Constraint

The final agency issue affecting the board is what we call an *outrage constraint*. In practice, many state pensions have a limit to which they can compensate managers. Such a limit may be explicit (e.g., the managers may not earn more than twice the salary of the the prime minister) or explicit (e.g., driven by the possibility of negative media coverage and subsequent political action). We write the outrage constraint in a reduced form, assuming that there could be an exogenous fund-specific upper bound \bar{s}^{out} on the quality of the manager that the board can hire. In mathematical terms,

$$Outrage Constraint: s \leq \bar{s}^{out}. \quad (6)$$

III Model Solution

We solve for the optimal contract and for the manager quality by backwards induction. First, starting from the last decision node, we assume that the manager with experience s is hired and from that we compute the optimal contract offered by the board, assuming the board has rational expectations and anticipate the choices of the manager for a given compensation contract offered. Next we compute the value of s that maximizes the ex-ante utility of the board.

III.A Optimal Contract

The board maximizes the expected monetary payoff penalized by the variance, with penalizing factor λ_B . The optimization problem is constrained by (i) the manager participation constraint and (ii) the manager incentive constraint. The participation constraint obligates the board to offer a contract that generates an expected utility for the manager not smaller than his outside option $O(s)$. The underlying program, which defines the indirect utility $V_B(s)$ of the board when hiring the manager with experience s , is given by:

$$\begin{aligned}
 V_B(s) \equiv \max_{c,a,T} U_B &= E[R - pay + Lw_P] - \frac{1}{2}\lambda_B \text{Var}[R - pay] \\
 &= (L - T)w_P + aE[R] - c - \frac{1}{2}\lambda_B a^2 \text{Var}[R], \tag{7}
 \end{aligned}$$

subject to :

$$\begin{aligned}
 \text{(participation constraint)} \quad &c + (1 - a)E[R] + Tw_L - \frac{1}{2}\lambda_M(1 - a)^2 \text{Var}[R] \geq O(s); \\
 \text{(incentive constraint)} \quad &\{x, w_P\} = \arg \max_{x, w_P} \{U_M | c, a, T\};
 \end{aligned}$$

In the appendix we show that the optimal choices of a and T are given by:

$$a^* = \frac{\lambda_C}{\lambda_C + \lambda_B}, T^* = (1 - a^*)L \tag{8}$$

The value of a reflects the standard sharing rule in which the less risk averse agent receives a larger component of the risky outcome, while the more risk averse agent receives a larger component of riskless payoff. The additional transfer to the manager for each unit of investment in the political asset will be a share $1 - a^*$ of the total transfers received by the board as a reward for those investments. Consequently, on the optimal contract, the manager receives the same fraction $1 - a^*$ of the financial return and of the “political return”. The optimal base salary c^* will be the number that makes the participation constraint binding.

Similarly to other models where agents have mean-variance preferences, the indirect utility of the board

will depend on the Sharpe ratio of all securities, penalized by the (harmonic) average risk aversion. The board indirect utility will also depend on the outside option of the manager, given that more experienced managers will require a larger share of the payoff. Let $B(s) = (s\varphi, s\phi + L)'$ and $\lambda = (\lambda_M^{-1} + \lambda_B^{-1})^{-1}$. In the appendix we show that the indirect utility when hiring a manager with experience s is:

$$V_B(s) = \frac{1}{2\lambda} B(s)^\top \begin{bmatrix} 1 & \rho\sigma_L \\ \rho\sigma_L & \sigma_L^2 \end{bmatrix}^{-1} B(s) - O(s). \quad (9)$$

III.B Manager Experience

The board will chose the manager experience that satisfies the outrage constraint and maximizes their ex-ante utility:

$$\max_s V(s), \text{ s.t. } s \leq \bar{s}^{out} \quad (10)$$

On the appendix we show that, if the outrage constraint is not binding, then marginal disturbances around the optimal s^* are such that the marginal increase on the squared Share ratio is equal to the marginal cost of hiring a slightly better manager:

$$\frac{(\sigma_L^2\varphi^2 - 2\rho\sigma_L\varphi\phi + \phi^2)s^* + (\phi - \rho\sigma_L\varphi)L}{\lambda\sigma_L^2(1 - \rho^2)} = O'(s^*) \quad (11)$$

A closed form solution for the manager experience can be obtained through a simple second-order approximation of the outside option function. Under a few assumptions explained in the appendix, the Taylor approximation of $O(\cdot)$ around the minimal manager experience \underline{s} is given by:

$$O(s) \approx o + \frac{\kappa}{2}(s - \underline{s})^2 \text{ for } s \in [\underline{s}, 1]. \quad (12)$$

The number o represents the outside option of the most inexperienced manager, while κ represents how quickly the wages of portfolio managers increase with their experience. Plugging this formulation of the outside option on the first order condition for the manager experience (11) we find:

$$s^*(\theta, L) \approx \frac{\theta^{-1}\kappa\sigma_L(1 - \rho^2)\underline{s} - (\rho\varphi\sigma_L - \phi)L}{\theta^{-1}\kappa\sigma_L(1 - \rho^2) - (\sigma_L^2\varphi^2 - 2\rho\sigma_L\varphi\phi + \phi^2)} \quad (13)$$

The model solution is completely characterized by equations (11) for the manager experience, (8) for the optimal contract, and by the portfolio chosen by the investment manager.

Table: Univariate Comparative Statics

Panel A: Outrage Constraint Not Binding			
Variable	Model Notation	Partial Derivative With Respect To	
		Political Pressure ∂L	Risk Up Pressure $\partial \theta$
Policy Variables:			
Manager experience	∂s	< 0	> 0
Riskness on MV	∂x	< 0	> 0
Weight on political	∂w_P	> 0	?
Outcome Variables:			
Exp. return on MV	$\partial E[R_{MV}]$	< 0	> 0
Exp. return on political	$\partial E[R_P]$	< 0	> 0
Portfolio Exp. return	$\partial E[R]$	< 0	> 0

Panel B: Outrage Constraint Binding			
Variable	Model Notation	Partial Derivative With Respect To	
		Political Pressure ∂L	Risk Up Pressure $\partial \theta$
Policy Variables:			
Manager experience	∂s	$= 0$	$= 0$
Riskness on MV	∂x	< 0	> 0
Weight on political	∂w_P	> 0	?
Outcome Variables:			
Exp. return on MV	$\partial E[R_{MV}]$	$= 0$	$= 0$
Exp. return on political	$\partial E[R_P]$	$= 0$	$= 0$
Portfolio Exp. return	$\partial E[R]$?	> 0

III.C Comparative Statics

The table above summarizes the comparative statics of the main endogenous variables of the model. Panel A assumes that the outrage constraint is not binding, while Panel B assumes that the outrage constraint is binding.

Funds subject to more intense political incentives (L) tilt the pension fund portfolio toward the political asset. Because the benefit of skill is lower in expected political asset returns than in the expected returns to the MV security, funds with larger political incentives L , choose lower manager skill s . Thus, by hiring worse managers, the performance in risky asset classes is reduced.

The misallocation resulting from risk-up pressures (θ) depends on whether the outrage constraint is binding or not. If it is not binding, higher risking-up pressure results in the board hiring more skilled managers to oversee the allocation in the riskier securities that will compose a larger fraction of the portfolio. Thus, the performance in all asset classes increases. When the outrage constraint is binding, risk-up pressures are more harmful: the resulting allocation still puts more weight on risky securities than the optimal portfolio

for the constituents, but a better manager is not hired. As a result, the pension takes on more risk, but the manager does not optimally implement the portfolio, leaving returns on the table that could have helped the underfunding situation.

IV Data & Statistics

IV.A Funds

Our sample comes from the intersection of two datasets of public pensions – data on U.S. public pensions funds the Center for Retirement Research at Boston College and data on global public pension funds (defined benefit plans) with over \$10 billion in assets under management identified in *Pensions & Investments*.

Because of the need to manually search for trustees and managers (and their biographies), we restrict our sample to institutions located in the North America, Oceania, and Europe. For each fund, we collected asset allocations and performance over the 1996-2011 period in a series of steps. We first gather as much information as possible from annual reports, funds’ websites and funds’ cached websites, and via direct requests to the funds. We then filled in missing data, when available, with information from the Boston College CRR dataset and CEM Benchmarking. Table 1, panel A reports the geographic distribution of funds. In sum, we have 158 funds, 56% from the United States, with the other 44% divided very equally among Canada, Continental Europe, Scandinavia and the UK, and Oceania. Panel B of table 1 shows that, for each year, we have reasonable geographical variation on the distribution of funds. As of the last year in the sample, the pension funds cover \$5.4 trillion in assets. Because the sample represents a broad number of countries outside the U.S. and 49 of the U.S. states in the U.S, the sample speaks to a meaningful proportion of the practices of pension funds around the world.

IV.B Boards & Managers

Our research design calls for data on fund investment officers (CEOs and CIOs). We look up the names of the current officers on the website. The website usually records a short bio of these individuals, including hiring date, education, and experience. With this starting point, we search backwards, finding the managerial turnover and prior executives education and experience. Using publicly available sources (e.g., the data collected based on the Freedom of Information Act and similar legislation in other countries), we also gather information on the compensation of top managers through internet searches. The compensation data is sometimes dynamic but is admittedly quite incomplete going back in time. Thus, we never use the data to speak to the compensation sensitive to performance, but we do have sufficient data to speak to level differences in the cross section of pension funds. Thus, we want a single measure of compensation per fund.

We interpolate the data for funds for which we have a time series, and then take an average for each fund. Out of the 158 pensions in our data, we have average manager compensation for 69 of them.

We then turn to the board, collecting the same biographical education and experience for the chairperson of the board we did for executives. We also record each current member of the board, and whether they have any financial background in education or experiences. We quantify the political structure of the fund, recording the percent of board members appointed or elected by the politicians, working constituents, and retired constituents. To do so, we identify the legislation that regulates how the fund is organized; if such legislation is not available, we use materials issued by the fund instead, or eventually identify political affiliation directly from board member bios. To address the demographic variation across funds' members, we collect information on the age structure of constituents, retiree-versus-worker composition, and pension liability-to-assets ratio from each pension fund's website.

Table 2 reports summary statistics of pension fund characteristics. Our first characteristic of interest is the level of funding or the pensions liabilities, following Novy-Marx and Rauh (2014) and Andonov, Bauer and Cremers (2016). We have data on the funded ratio, the level of assets to liabilities, but not for all funds. The other measure of liability strains comes from Rauh (2008), who finds intuitively that funds with a higher age profile of pension beneficiaries have more liabilities concerns. Thus we first construct the average age of pension constituents combining the average age of workers and retirees with the fraction of members being retired. Consistent with Rauh (2008), Panel B in Table 2 shows that the correlation between age and funded ratio is a significant -0.29. But Age may be correlated with the funded ratio but it also may additional information about future liability pressures. Thus we construct an *Underfunded Index*, defined as the negative of the standardized funded ratio plus the standardized age variable. The underfunded index has correlations of 0.81 with age and of -0.79 with the funded ratio.

The second group of variables on panel A reports the characteristics of the pension fund board that relates to political, bureaucratic and outrage pressures. *Chair Political* is an indicator capturing, in almost equal proportions, chairs appointed by the governor or ex officio. Twenty-two percent of funds have *Chair Political* equal to 1. Appointees often (63%) have direct private finance sector experience (i.e., generally in asset management), which is much higher than the one third of overall chairs that have private financial sector experience. The ex officio chairs have different histories, but are powerful politicians. More than naught, they are either the governor, the mayor (if a municipal fund), or the state treasurer. For example, Michael Bloomberg is included in the sample as the chair of the New York City Retirement Fund when he was mayor. We put these groups together because they both are politically connected and thus in our model, more prone to tilt the portfolio towards securities that could yield to political dividends and because Andorov, Hochberg and Rauh (2016) find political influence happens for both groups. It is interesting to note that *Chair Political* equal zero outside of the U.S. This is not by design of our data, but just de facto.

The *Bureaucrat* variable is the proportion of non-chair trustees that are ex-officio members. Ex officio trustees are generally not politicians per se, but one step lower in government ladders, making them more removed from elections and political motives. We posit, however, these are the trustees with the strongest career concerns. Our cushion theory assumes that such a group is most likely to exhibit strong negative utility over losses, which could lead to an overly conservative management style. We show some statistics on the profile of these members later, but examples of bureaucrats include the state bank supervisor, the superintendent of teaching, the state auditor, etc. As Table 2 shows, across the whole sample, an average board has 53% bureaucrats, with an interquartile range expanding from almost 0 to 1. In the U.S., the mean pension board has 65% bureaucrats. Other countries, however, also have bureaucratic boards, with the mean board having 32% bureaucrats. Thus, any bureaucrat story is not solely a US phenomenon.

We construct a measure of *outrage* using the average wage from the constituents, computed from the Public Pension Census. Anecdotal evidence suggests that public outrage is more likely when the wages of the constituents are low when compared to the compensation of the portfolio manager (e.g., public pension of teachers). This motivates the definition of the *outrage* variable as the inverse of the log-average salary of beneficiaries of the pension plan. As table 2 shows, the average plan is associated with a wage of \$40,760 per year and standard deviation of \$18,470.

Liabilities and political pressures acting on the board are exogenous parameters in our model. The last group of variables reported in Table 2, the characteristics of the manager, are the empirical counterparts of the endogenous manager experience s . *CIO Total Compensation* is important because it will shed light on the mechanisms through which agency problems affect performance. Our model predicts that incentives to invest in political assets makes skilled managers less attractive to the board, and hiring worse managers might impact the performance in all asset classes. We focus on the CIO (chief investment officer) rather than the CEO of the pension fund to focus on the execution of the fund rather than the broader CEO roles which include management of fund personnel, distributions, and liabilities as well investments. The median and mean CIO make respectively \$266,260 and \$405,840. In the U.S., the median and mean CIO earn \$109,895 and 260,847 respectively, roughly half the global standard.

We use the amount of political donation received by the current governor of a given state from financial firms as a proxy for political pressure to invest in specific assets. Aggregate donations from financial firms for each state comes from FollowTheMoney.org. We define a measure of abnormal political contribution, simply called *Political Contribution*, by dividing the total donation received by the current governor in a given state in the last election by the average donation received by the last three governors in the same state. As Table 2 shows, the average abnormal contribution is 17%, which indicates an increasing trend for this type of contribution.

IV.C Allocations & Performance

We analyze how pension funds allocate assets and perform on five asset classes: (i) hedge funds, (ii) real estate and private equity, (iii) public equities, (iv) natural resources and infrastructure, and (v) fixed income. We order these roughly in descending order of risk. It is not possible to isolate a single “political asset class” as in the model because, within each class, there might be a fraction of “mean-variance efficient” securities. For example, some venture capital funds might overinvest in local companies if the governor is trying to promote local growth and jobs. Other venture capital investments reflect mean variance efficient portfolio goals of diversified investments. Likewise, examples in the press suggest relationships between other private equity firms or hedge funds and government officials. These may be political and other hedge fund investments may reflect financial returns goals alone. However, it is easy to see that political gains on vanilla public securities such as ETFs, stocks of large public companies and governmental bonds offer little room for gains in terms of kickbacks or political benefits. Hence, we conjecture that political pressures might motivate investments in three more discrete-like asset classes – hedge funds, real estate/private equity, and infrastructure/natural resources.

Table 3 reports summary statistics of portfolio weights and realized returns in each asset class. As expected, fixed income and public equities account for the largest fraction of portfolios. They are also the classes with the largest average raw returns, perhaps an initial indication of underperformance on classes subject to political pressures or perhaps due to benchmarking. Panel B reports the correlations between portfolio weights and shows a noteworthy pattern: allocation on fixed income is negatively correlated with the weight in any other asset class. This is coherent with our model prediction that risk-up pressures (i.e., θ) might induce the board to consider shifting the allocation from riskless securities to high volatility assets.

V Results

Our theory motivates the importance of agency issues in the board, highlighting how four agency dimensions across boards imply misallocations, working through manager quality. Below we organize the discussing of tables by agency issues measured at the board – *Underfundness*, *Outrage*, *Bureaucrats* and *Chair Political*.

V.A Underfunding

A pension fund facing greater underfunded liabilities would, according to our model, increase the risk of the portfolio and hire a manager of higher quality to take advantage of risk premia in higher-risk asset classes. As a result, portfolio risk and returns would increase, as would manager compensation. However, if the fund faces an outrage constraint over manager compensation, the pension fund would still risk-up the portfolio,

but would not increase the manager quality or see improvement of within-asset class returns. We present a series of four tables to speak to these predictions.

We first ask how *Underfundness* might induce risking-up in weights among asset classes (Table 4) and at the pension fund level (Table 5). Table 4 is a system of seemingly unrelated regressions with portfolio weights on the left hand side, controlling for country fixed effects and year. We focus on column 1 within each panel to isolate the effect of *Underfundness*. We find that underfunded pension funds tilt their investments significantly to riskier asset classes. A standard deviation increase in *Underfundness* (one standard deviation = 1.47) implies 0.003 more portfolio weight allocated to hedge funds (a 37% change) and 0.020 more to private equity and real estate (a 23% change). In exchange, they allocate 0.01 less to fixed income (a 3% change) and 0.004 less to infrastructure and natural resources (an 11% change) and 0.008 more to vanilla stocks (a 1% change). The overall shift is a 0.023 from less risky to more risky assets, very much in line with the finding and magnitude of Adonov, Bauer and Cremers (2016). Note that we only focus on column 1 of the tables for now, but we only interpret results that appear robust when including the other variables studies below (column 3) and when adding controls for the quality of the board member experience (column 4 includes fraction of the board with private sector financial experience and fraction of the board with public sector experience).

The distortions on the asset allocation created by risk-up pressures have a strong impact on the overall risk of the portfolio. Table 5 reports the results of regressing pension fund volatility, defined as the standard deviation of the funds' returns on a 3-years rolling window, on *Underfundness* and time effects. Column 1 reports a positive significant relationship. An increase of one standard deviation of *Underfundness* is accompanied by an increase of 81 basis points in annualized volatility. Using the language of Ang, Chen, and Sundaresan (2012), this result is coherent with managers increasing the standard deviation of the pension fund payoff in order to increase the value of the liability shortfall put option.

If a board is facing underfunded liabilities such that their effective risk aversion drops, our theory suggests that they will decide to risk-up the portfolio and hire a more qualified manager to better take advantage of the risk premia in the risky asset classes. Thus, we would expect higher within-asset class returns in the risky classes and higher manager compensation, *unless* the board faces an outrage constraint over paying managers high compensation. Tables 6 and 7 report that *Underfundedness* is neither correlated with within-asset class excess returns over benchmarks (columns 1 in Table 6 across the panels) nor with manager (CIO) compensation (column 1 of Table 7). The result is consistent with outrage binding.

V.B Outrage

In practice, boards of pension funds might be constrained on the types of managers that they can hire. Highly skilled managers require large salaries, which could trigger outrage of the media and of part of the

constituents. Board members of pensions susceptible to outrage could preventively (and non-optimally) hire low quality managers, adversely effecting the probability of the fund to meet its obligations.

We test for the existence of outrage constraints by analyzing the correlation between our proxy for *outrage* – defined as the inverse of the log wages of constituents – and the total compensation of the pension fund CIO. If the decisions of the board are unconstrained and everything else is held constant, then the quality of the manager should be independent of the wages of the beneficiaries of the fund. However, if there is outrage when the salary of the CIO is excessively larger than the wages of constituents, then the CIO compensation should be negatively correlated with our proxy for outrage.

The CIO total log compensation is the left hand variable of our regression. We focus on the coefficients of the *Outrage* variable and on the interaction of *Outrage* with *Underfunded*, since outrage could be more prevalent in funds facing liability problems. We use several controls to partially address the possibility that both the constituents wages and the optimal CIO salary could be correlated with other pension fund characteristics. Importantly, we include country and state fixed effects to account for geographical heterogeneity on the level of salaries. However, we are unable to totally rule out the possibility of omitted variables biases in our estimates.

We find a robust negative correlation between *Outrage* and *Log Of Manager Compensation*. The first column of table 8 reports that an one standard deviation increase of the outrage variable (\$18,470 in wages) associates with 10.6% (or \$43,028) lower total compensation of the investment manager. The coefficient of *Outrage* is significant on the first five regressions, evidencing the strong correlation between *Outrage* and *Manager Compensation*. On the last regression the coefficient on the interaction between *Outrage* and *Underfunded* is significant, coherently with the intuition that pensions facing liability problems (and usually asking for additional contribution form the constituents) are more prone the outrage.

V.C Bureaucrats

In addition to underfunding, a second important factor characterizing the risk appetite of a pension fund relates to the career concerns of trustees. Holmstrom (1999) argues that administrators with career concerns might be overly risk averse if their decisions shapes perceptions about their talent. In this case, boards would be afraid to recommend investments with downside risks, possibly resulting in an allocation incongruent with the risk preferences of the beneficiaries. This might be particularly relevant when a large fraction of trustees are political bureaucrats, individuals that by self-selection are risk averse and seeking stability. Indeed, this is what we find. Columns 2 of Table 5 shows that pension funds with a standard deviation higher fraction of bureaucrats in the cross section invest 0.021 (= 0.531 coefficient * 0.40 sd) more portfolio weight into fixed income, a 6% increase against the mean fixed income portfolio weight of 0.346. They also invest 0.01 more in infrastructure and natural resources. This 0.031 of risking-down of the portfolio comes at the expense of

portfolio weights in private equity (reduction of 0.02 in portfolio weight), vanilla equities (-0.01), and hedge funds (-0.002).

Bureaucratic risking-down does not appear to reduce overall portfolio realized risk, however. In Table 5, starting in column 2, we find that bureaucratic boards have slightly higher realized volatility, but this correlation is not robust to other controls. Likewise, Table 6 reports that bureaucratic boards do not perform significantly different than other pension funds in excess returns over benchmark for any asset class. Nor do bureaucratic hire any different manager; compensation reported in Table 7 is not statistically different for bureaucratic boards than for any other pension funds.

To summarize, although we find no performance or outcome results, we think the finding that bureaucratic boards risk-down 0.031 of the portfolio weight is an important finding, not heretofore considered in the literature. To reinforce this finding, we gather the titles of all trustees. Table 9 presents the distribution of titles. The largest category (24%) is that of treasurer. Other financial categories involve the revenue commissioners and controllers, auditors, and the finance director. But equally likely are the superintendent of education (9.89%), personnel commissioner (7.69%), and city commissioner (6.59%). Our takeaways here are first, that some of these ex officio board members have some, albeit somewhat distant, finance training, but second, all are titles that are very much career government officials, with a few possible exceptions.

V.D Chair Political

Another agency issue in the board which we investigate concern political capture. When chairpersons of the board are closely tied to the government, either directly ex officio being the governor, for instance, or directly by appointment of the governor, the chair may have incentives to tilt portfolios to politically favored investments or to local tilted investments. These investments are likely to be in less commoditized asset classes, i.e. not in S&P indexing but in private equity and hedge funds. Like Andonov et al (2016), our theory posits that performance in politically-tilted investments should be lower. Our theory also suggests that politically compromised boards will not have the incentive to pay for highly-skilled managers, since the political chair will be making selections in to political assets and thus the portfolio need for skill is lower.

Table 4 reports results very consistent with this theory. Political chairs reduce allocations to the more commodity-like vanilla stocks by 0.017 in portfolio weights and allocate toward securities more prone to political and career favoritism – hedge funds (+0.009) and real estate and private equity (+0.012). De facto this is a risking-up. Table 5 does not show that the portfolios of politicized boards realize greater volatility, however. In fact, risk may have little to do with the decision-making. One hypothesis is simply that the asset classes easiest to extract favoritism happen to be riskier. A competing hypothesis is when chairs are political appointees or themselves governors (e.g.), they will have convex career reputation gain over positive excess returns. They try to be the next Swensen, the Yale endowment manager famous for outperforming.

In this story, the risking-up we observe in Table 4 is exactly that, risking-up to achieve performance.

We can look to within asset class performance to disentangle these stories of what it means that political chairs risk-up portfolios. Table 6 reports, consistent with the predictions of the model, that funds with a political chair have worse performance fairly consistently across asset classes. We find and confirm the finding of Andonov, Hochberg and Rauh (2016) that political boards have poorer returns on private equity. Pension funds with political chairs have 1.8 percentage points lower excess returns in that asset class. We build on their evidence and document the novel finding that political boards hire managers with even worse performance on hedge funds, performing 7 percentage points lower excess returns in hedge funds. The hedge fund result draws into question whether local tilt is driving the result, rather supporting the interpretation of Andonov et al (2016) that it is political favoritism into less good investments that is likely a major cause of the lost returns. Furthermore, our result do not support risking-up for the sake of adding risk premia to returns.

In Table 7, we find that political boards, by the other hand, hire considerably worse managers, with salaries 15% lower than the managers hired by non-political chairs. If risking-up were political boards' agenda, they would hire better managers, not worse ones. Instead, political boards have low marginal utility of managerial skills, so they hire low-quality investors that have worse performance in many asset classes.

Why do political chairs distort the choices of the pension fund? One possible mechanism is that some state governors would like to give kickbacks to financial institutions that contributed to their winning political campaigns. Therefore, if the governor appoints the chair, he can more easily tilt the portfolio allocation towards assets that generates benefits to the political contributors. We test this conjecture by including the interaction of *Chair Political* with *Political Contribution* on the regressions of portfolio weights (table 9) and returns (table 10). Consistently with our hypothesis, political chairs will bias the allocation towards hedge funds, real estate and private equity following large abnormal contributions of financial firms: we find that when the standing governor experienced a standard deviation higher campaign contribution in the last election cycle relative to the prior three governor elections in that state, pension funds with a political chair invest in hedge funds and real estate/private equity. As before, the size of these effects is small 0.009 more allocations to hedge funds and 0.013 more to real estate/private equity, but the change represents a 107% increase for the hedge funds and 15% increase for real estate/private equity.

According to our model, chairs enjoying political benefits from the portfolio allocation should hire less qualified managers, implying in worse performance within each asset class. We don't find evidence that the level of political contribution by financial firms can affect the pension fund performance. Table 10 reports that the coefficient of the interaction between *Chair Political* and *Political Contribution* is negative and statistically insignificant if the dependent variable is the return on hedge funds or the return on real estate/private equity. Given the small power of our tests resulting from the large variance of returns and

from the small sample size, we are unable to assess the correlation between contributions and returns.

VI Conclusion

In this paper, we analyze how a broad spectrum of agency frictions can cause misallocation underperformance of public pension funds' portfolios. We propose a simple model that takes into account (i) political pressures on the fund board, (ii) liability-driven preferences for risk, (iii) career-driven preferences for overinvestment in fixed-income, and (iv) outrage concerns constraining the types of managers that can be hired. We find evidence consistent with prior work that underfunded pensions risk-up. Our new evidence suggests that such pension boards are constrained from hiring better managers who could better put these risky aspects of the portfolio at work in earning risk premia.

Perhaps our most novel evidence concerns the career concerns of bureaucrats, who have a strong impact on the portfolio allocation. Ex-officio trustees have important (other) positions in the public sector, such as state treasurers, superintendents of education or auditors. Any type of public scandal related to losses on pension funds they are administrating could greatly damage their careers as public administrators. Our evidence suggests these career concerns lead to conservative management style, with an additional 3 percent of portfolio weights being tilted toward low-risk investment.

Finally, we find evidence on politicization of the board chair, supporting anecdotes and prior work that public funds are captured by private interests. This is specially relevant in the recent scenario of steady growth on the population age expectancy, with the associated problems on the retirement systems worldwide. For instance, recent estimates accounts for a pension shortfall worth \$78 trillion in the G20. Hence, misallocation of investments of pension funds can be extremely harmful, to the extent that they can increase the unfundedness of retirement plans and the burden on the new generations. Our paper calls for measures to improve the governance of public pension funds and for more academic work to help in enlightening and freeing boards from frictions on hiring and paying the qualified managers and not compromising their incentives to maximize value for pension beneficiaries.

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