Agency in Public Pension Performance

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Abstract

Because public funds are political organizations, their board members are particularly sensitive to outrage over high compensation of investment managers. High inequality between finance salaries and that of local workers raises the possibility that public funds will not contract for the highest quality managers. We model public pension boards' hiring and compensating of investment managers to achieve optimal portfolios for constituents in the presence of this and other political frictions. We then test the model in global data covering $5.6 trillion in assets. When we estimate a system of compensation and returns equations, we find that one standard deviation lower outrage coming from more local workers and public finance administrators on the board results in $80,000 more in manager compensation. In turn, we find significant excess returns from relaxing outrage constraints leads to a value add of $14-20 million per year for an average public fund, driven by 16-22 basis points excess performance in alternatives and 9-12 basis points in public equities. We confirm the prior politicization results in the literature and show that our outrage effect is orthogonal to underfunding and political pay-to-play results.

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

1. Introduction

Public funds worldwide (defined as sovereign and public pension funds) accounted for \$10 trillion in assets in 2015 according to Tower Watson. Politicization of some of these fund's decisions lowers their performance. For example, Hochberg and Rauh (2013) and Bradleya, Pantzalisa and Yuan (2016) show that overinvestment in local assets deliver lower returns. This paper explores a neglected, but potentially similarly important channel through which politicization can affect performance. The political nature of public funds constrains management contracting and the ability to attract and motivate investment talent. Constituents of pension plans may be outraged at high compensation contracts for investment management, and because public funds are political, the board of trustees takes such outrage into account when making contracting decisions.

If such a constraint indeed affects performance, the implications may be growing in important in places such as the U.S. and U.K. with ever-more-polarizing salaries. With increasing income inequality between the top finance professional echelons and others, public funds facing outrage over pay will find it increasingly hard to attract and retain skilled investment professionals. As such, our paper documents yet another effect of inequality on the livelihoods of those who live on *main street*, who lose pension wealth relative to those whose investments are more professionally managed.

Consider the State of Illinois and the Province of Ontario Teachers' pension plans, both large public funds with excess of \$40 billion in assets. Because of differences in governance structures, management contracting differs dramatically across these plans, as does performance. At Illinois Teachers, trustees are representatives from the local community (teachers) or political appointees. Our paper shows that such trustees are sensitive to their constituents' outrage over management compensation levels, expecting condemnation if they agree to large investment management salaries. In contrast, at Ontario Teachers' board trustees are insulated from such outrage, with no teachers or politicians are on the board. The average pay for top investment talent at Illinois' Teachers is one tenth that at Ontario Teachers, correlating strongly with differences in the funds' returns.

The links between management contracting frictions and performance in this example are intriguing but underfunding, investing in local political assets, or other factors could also account for such performance differences. Pinning down the importance of the human capital channel for public fund performance, and relating it to more direct channels of political influence that can affect returns, requires both theoretical foundations and empirical evidence. This is what we set out to provide in this paper.

We start by introducing a theoretical model in which agency costs affect management contracting and impact asset allocation and performance. We focus on three agency frictions that arise from political influence on the composition of the board of trustees. We introduce an 'outrage pay constraint' particular to public funds that can limit managers' salaries. We also incorporate two other agency costs tied to the political relationships in public funds raised in prior literature. We allow for political benefits from public fund asset management choices, as highlighted in papers that show directed local investments by politically connected boards (e.g Bradleya, Pantzalis and Yuan (2016), Bernstein, Lerner, and Schoar (2013), Hochberg and Rauh (2013), Brown, Pollet, and Weisbenner (2015), Dyck and Morse (2014)). We also allow for underfunding to affect risk preferences of boards Adonov, Bauer and Cremers (2017). 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 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).

We model the consequences of agency costs in a principal-agent model of a public pension board hiring and compensating an investment manager, who constructs the portfolio over three assets – a mean-variance efficient risky asset, a political risky asset non-frontier in returns, and fixed income. Boards choose the quality level of the investment manager, where quality leads to skill in capturing the full risk premium. Boards then set the compensation contract of the manager, effectively choosing the risk of the portfolio with performance pay and with a transfer to the manager for investing in the political asset. Our model provides comparative statics relating board agency to outcomes in investment manager quality and asset allocation decisions, with implications for portfolio risk and performance.

We then test the theoretical predictions in hand-collected data on board structures, governance, manager compensation, asset class allocations, and performance, for a global sample of large public funds that account for more than $5.4 trillion in assets. We select public funds with $10 billion or more in assets. The final data set includes 176 large public funds from five regions – the U.S., Canada, Oceania, Scandinavia and the U.K., and Continental Europe for 1996-2014. While all public funds are potentially exposed to agency frictions, we exploit the fact that some (like Ontario Teachers) have insulated themselves from some of these risks through board structure choices made long ago. A global sample provides heterogeneity both in fund exposure to political agency costs and differences in compensation to test the importance of the human capital channel. For this purpose, we introduce novel sample of compensation of top investment executives in these funds, based on annual reports, public records and other sources.

Our empirical methodology mimics our theoretical setting by setting up a system of two equations whereby compensation is determined by outrage, politicization, underfunding and other board and time characteristics. Then, performance is determined by outrage-predicted compensation. With a structurally-motivated, linear system of two equations we can draw causal interpretations if under exogeneity and relvance conditions. Our main exogeneity condition is akin to the exclusion restriction; namely, that the percentages of municipal workers, teachers and public sector finance administrators on a board do not affect within-asset class performance except through the mechanism of managerial contracting.

We start by documenting the mechanism of outrage affecting compensation of the first equation of our system. We find that a standard deviation increase in the percent of trustees who are municipal workers or whose background is in public sector financial administration results in $58,000 to $80,000 lower investment manager compensation.

We then document the relationship between outrage-predicted compensation and performance. We find that an increase in compensation resulting from a one standard deviation lower participation of municipal workers or local public finances administrators results in higher excess returns in alternatives (16-22 basis points) and public equities (9-12 basis points). The overall calculation is that, for a cost of $58,000 to $80,000 in relaxing outrage, a public pension could hire a manager who could perform $14 to $20 million better in annual value add. We document that these results are not driven by realizing excess risk. In fact, the tracking error of these less outrage-bound managers is lower.

Third, we find that other political agency costs identified in the literature also impact asset allocation and returns, but including them in the model or in our regressions does not eliminate the importance of the human capital channel. Consistent with Adonov, Bauer and Cremers (2017) we find that underfunding leads to increased asset allocation to alternatives. Consistent with Adonov, Hochberg and Rauh (2016) and Hochberg and Rauh (2012) we find that politicization has a direct effect on returns in alternatives asset classes. We interpret our results as complementing these papers, showing an important and neglected human capital channel whereby politics can also undermine returns.

The rest of the paper is organized as follows. Section 2 introduces a theoretical model of portfolio choice with political agency costs and management contracting. Section 3 lays our empirical methodology, and section 4 describes our data. In section 5 we present our empirical results, and we conclude in section 6.

2. Agency-Portfolio Choice Model

Constituents of a pension fund, if perfectly represented, would invest in a mean-variance efficient portfolio over a risky asset and fixed income, incorporating their risk aversion λ_C. In boards of public funds, governance rules affect who acts as a trustee, creating what we call political agency costs that can affect three decision dimensions of portfolio choice – investment manager skill, risk level, and portfolio weight on politically-motivated assets.

2.1. Assets, Investment Manager Quality, and Board Governance

The public fund board hires and compensates an investment manager to allocate the pension's capital among asset classes and to construct within-asset class portfolios. 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 skill, represented by the 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 skilled managers have higher outside options.

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

$$\text{F}ixed\ Income\colon E\left[R_f\right] = r_f$$

We assume that there is a mean-variance efficient risky security with variance σ_{MV}^2 and risk premium φ_{MV}. Intuitively, this asset represents an arbitrary frontier portfolio of risky securities, and any pension fund not affected by agency problems would invest in a combination of the MV-efficient risky security and fixed income.

$$\text{Mean variance efficient securities: } E[R_{MV}] = r_f + s\varphi_{MV}$$

Managers 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.

The political asset is also risky with variance σ_P^2 and risk premium φ_P.

$$\text{Political Asset: } E[R_P] = r_f + s\varphi_P \text{ where } \varphi_P/\sigma_P < \varphi_{MV}/\sigma_{MV}$$

Again, managers earn a fraction s of the potential premium. It has a worse Sharpe ratio than the MV-efficient risky security, but bestows a political gain, which we describe in the next subsection.

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 to 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.

Each public fund has a board of trustees that makes management contracting choices to maximize their utility. Trustees have a fiduciary duty to act in the best interests of their beneficiaries. At the same time individual members receive private costs and benefits from their funds' choices that create incentives to deviate from a strict interpretation of this duty. Governance rules dictate the composition of the board of trustees amongst the categories of constituents, political appointees, and others, as well as determining whether the board chair is a political appointee or selected on other criteria. Variation across public funds in the governance rules they adopt determine the extent to which a given public fund is exposed to political agency costs.

[1] Hochberg 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.

2.2. Political Agency Costs I: Private Costs and Outrage Pay Constraints

Constituent trustees and political appointees, each of which are explicitly or implicitly elected, expect to bear private costs if the funds' management contracting choices outrage those who elect them. The most visible component of contracting is the level of compensation. Constituents' reference point for appropriate wage levels for investment professionals may be anchored by their own compensation, by being a worker in the local community, or by experience in doing public sector budgetary tasks. We assume that the higher the fraction of board members that are concerned about such outrage costs in compensation setting, the greater the likelihood the board will have an effective limit on the realized compensation they are willing to pay for an investment professional. Such a limit may be explicit (e.g., the managers may not earn more than twice the salary of the governor) or implicit (e.g., driven by the possibility of negative media coverage and subsequent political action).

We write the outrage constraint in a reduced form, assuming the existence of an exogenous fund-specific cap s^{out} on the quality of the manager that the board can hire:

$$\text{Outrage Constraint:} \, s \leq s^{out} \qquad (4)$$

For simplicity, we assume that the cap s^{out} can assume two values: binding or not binding. When the cap is not binding, the choices of the board are not affected by the outrage constraint and the condition (4) is irrelevant. When the cap is binding, the quality of the manager will be lower than under the first best. Cross-sectionally the deviation from optimal will vary in comparative statics along the other political agency costs, as we will report when we compare comparative statics for outrage-constrained and not constrained public funds.

2.3. Political Agency Costs II: Private Political Benefits

Fund choices can also create private benefits for political trustees, as shown in anecdotal examples of pay-to-play arrangements and a series of papers. These political benefits include votes from creating employment opportunities for local citizens, or side-benefits (e.g. campaign contributions or direct payouts). Andonov, Hochberg and Rauh (2016) find that U.S. pension funds with political boards tend to invest in local and less profitable private equity funds, Dyck and Morse (2009) and Bernstein, Lerner and Schoar (2009) show a similar pattern in the investments of sovereign wealth funds, and Bradleya, Pantzalisa and Yuan (2016)) show not only a local bias but a bias to invest in politically-connected firms.

We incorporate the political agency cost from this private benefit for political appointees in our model by assuming that the board receives an additional riskless payment of L dollars for each dollar invested in political assets. If *pay* is the compensation to the manager, *R* is the total return of the portfolio, and λ_B is the risk aversion of the board, the assumption of mean-variance preferences implies that the utility of the board is given by:

$$U_B = E[R - pay] + Lw_P - \frac{1}{2}\lambda_B Var[R - pay] \tag{3}$$

2.4. Political Agency Costs III: Board Preference for Risk

Finally, we allow for the possibility that the risk aversion of the board differs from that of investment managers and constituents, which are both assumed to 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 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). Such increased risk taking in the presence of underfundedness has been found in US public funds, for example, by Adonov, Bauer and Cremers (2016).

We assume that underfunded status results in a higher risk appetite, as in:

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

where θ is an exogenous variable capturing the risking-up pressure.

2.5. Solving for the Optimal Contract and Manger Quality

We solve the model by considering funds in the last period of the model, assuming that a manager with quality *s* already is hired. The board asserts its preferences for risk and for political investments by offering a compensation contract to the investment manager. For any quality *s*, we derive the optimal contract. Next, we calculate the optimal manager quality *s* chosen by the board, from which we can figure out the resulting asset allocation. As our agenda is to set up our empirical estimation, we focus on obtaining comparative statics describing how portfolio allocation, manager quality and return moments depends on (i) outrage constraints, (ii) political incentives, and (iii) risk-up pressures.

2.5.1. Manager Incentives

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 the manager an additional transfer of T dollars for each dollar invested in political assets. Linear compensation is given by:

$$pay(R, w_p) = c + (1-a)R + Tw_p \tag{5}$$

Like the constituents, we assume that the portfolio manager has CARA utility with risk aversion λ_C. Incorporating (4), the manager chooses risk and political asset weight (w_{mv}, w_p) solving the following program:

$$\max_{w_{mv}, w_P} U_M = \max_{w_{mv}, w_P} \left\{E[pay] - \frac{1}{2}\lambda_M Var[pay]\right\} \tag{6}$$

2.5.2. Optimal Compensation Contract

The board maximizes the expected monetary payoff penalized by the variance, with penalizing factor $\lambda_B = \lambda_C/\theta$, which depends on the risk-up pressure θ capturing agency problems inducing excess (or deficit) of risk taking. The optimization problem is restricted by (i) the manager incentive constraint, and by (ii) the manager participation constraint, which obligates the board to offer a contract that generates an expected utility for the manager not smaller than her outside option $O(s)$. The participation constraint is the channel connecting political incentives and within-asset class performance: political boards have little gains when hiring skilled managers, so they minimize compensation by choosing managers with small outside options and poor investment skills.

The underlying program, which defines the optimal contract and the indirect utility $V_B(s)$ of the board when hiring the manager with quality s, is given by:

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

subject to:

(participation constraint) $c + (1-a)E[R] + Tw_P - \frac{1}{2}\lambda_M (1-a)^2 Var[R] \geq O(s)$

(incentive constraint) $\{w_{mv}, w_P\} = \underset{w_{mv}, w_P}{\operatorname{argmax}}\{U_M | c, a, T\}$

In the appendix, we show that the optimal contract is given by:

$$a^* = \frac{\lambda_C}{\lambda_C + \lambda_B} \tag{8}$$

$$T^* = (1 - a^*)L.$$

The optimal variable payment factor a^* reflects the standard sharing rule in which the less risk averse agent receives a larger component of the risky outcome. In the optimal contract, the manager receives the same fraction $1 - a^*$ of the financial return and of the "political return". The resulting base salary c^* will be the number that makes the participation constraint binding.

2.5.3. Optimal Manager Quality

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

$$\max_s V_B(s)\,, \ \text{s.t.}\ s \leq s^{out} \tag{10}$$

The solution to problem (10) provides the comparative statics illustrating how different pension funds face diverse performance-cost tradeoffs when choosing the manager quality. Highly politicized and outrage-constrained funds might prefer to hire low quality managers, while funds with better governance would choose a larger value for s, in accordance to the constituents' preferences.

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. In the appendix we show that this leads to the following first order condition:

$$O'(s^*) = \frac{(\sigma_P^2 \varphi_{MV}^2 - 2\rho\sigma_P\sigma_{MV}\varphi_{MV}\varphi_P + \sigma_{MV}^2\varphi_P^2)s^* + (\sigma_{MV}^2\varphi_P - \rho\sigma_P\sigma_{MV}\varphi_{MV})L}{\lambda\sigma_P^2\sigma_{MV}^2(1-\rho^2)} \qquad (11)$$

2.5.4. Comparative Statics

The table below presents comparative statics drawn from equation (11).[1] Panel A reports the effect of outrage hindering the contracting mechanism whereby boards hire skilled managers to optimize their allocations and performance. If outrage binds, the public fund hires less quality managers. Because the managers lack skill to capture the risk premium, these lower quality managers tilt the portfolio towards fixed income and away from risky assets. The fund then exhibits lower overall portfolio returns as well as lower returns within the risky asset classes.

Panel B reports the effect of the two other agency problems on the compensation mechanism and outcomes. When boards are more political, they hire less quality managers because the pressure to invest in the political asset class over the MV asset makes the returns to paying for quality lower. The overall risk weight is ambiguous, but it is not ambiguous that the portfolio returns will be lower. When boards face risking-up pressure (the second column in Panel B), they hire more skilled managers because they want to benefit maximally from moving more of their portfolio to risky assets. As a result, the more risky portfolio has a higher overall return.

If outrage were to be binding, however, the effects in Panel B that work through compensation would be neutralized. This is particularly important for the risk-up pressure. Panel C shows these cross partial effects (misusing the terminology slightly for a discrete change). Boards with strong risk appetite, would have a desire to hire skilled managers to take full advantage of risky securities, but these funds would be unable to offer compensation contracts that attract these higher quality managers. These public funds would thus be unable to risk-up the portfolio and its returns to the degree desired from Panel B with the outrage constraint binding.

[1] A closed form solution for the manager quality 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 quality $\underline{s}$ is given by:

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

The number o represents the outside option of the lowest skilled 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:

$$s^*(\theta, L) \approx \frac{\lambda\kappa\sigma_P^2\sigma_{MV}^2(1-\rho^2)\underline{s} + (\sigma_{MV}^2\varphi_P - \rho\sigma_P\sigma_{MV}\varphi_{MV})L}{\lambda\kappa\sigma_P^2\sigma_{MV}^2(1-\rho^2) - (\sigma_P^2\varphi_{MV}^2 - 2\rho\sigma_P\sigma_{MV}\varphi_{MV}\varphi_P + \sigma_{MV}^2\varphi_P^2)} \qquad (13)$$

Comparative Statics

Panel A: Change in Allocation and Performance Caused by the Binding of the Outrage Constraint

Variable	Model Changes	With respect to: $\Delta Outrage$
Mechanism		
Manager quality	Δs	< 0
Allocation Outcomes:		
Weight on fixed inc.	$\Delta(1 - w_P - w_{MV})$	> 0
Weight on all risky	$\Delta(w_P + w_{MV})$	< 0
Return Outcomes:		
E[return on MV]	$\Delta E[R_{MV} + R_P]$	< 0
E[portfolio return]	$\Delta E[R]$	< 0

Panel B: Partial Derivatives: Effect of Political and Risk-up Pressures on Allocation and Performance

		With Respect To	
Variable	Model Partials	Political pressure ∂L	Risk-up pressure $\partial \Theta$
Mechanism:			
Manager quality	$\partial[s]$	< 0	> 0
Allocation Outcomes:			
Weight on MV	$\partial[w_{MV}]$	< 0	> 0
Weight on political	$\partial[w_P]$	> 0	?
Weight on fixed inc.	$\partial[(1 - w_P - w_{MV})]$	?	< 0
Weight on risky	$\partial[(w_P + w_{MV})]$	?	> 0
Return Outcomes:			
E[return on MV]	$\partial[E[R_{MV}]]$	< 0	> 0
E[return on political]	$\partial[E[R_P]]$	< 0	> 0
E[portfolio return]	$\partial[E[R]]$	< 0	> 0

Panel C: Cross-Partial Derivatives: The Effect of Outrage Binding (Δ) on the Partial Effect of Risk-up Pressure on Allocation and Performance

Variable	Model Change with $\Delta Outrage$:	With Respect To Partial Effect of Risk-up pressure $\partial \Theta$
Mechanism:		
Manager quality	$\Delta\partial[s]$	< 0
Allocation Outcomes:		
Weight on risky	$\Delta\partial[(w_P + w_{MV})]$	< 0
Return Implications:		
E[portfolio return]	$\Delta\partial[E[R]]$	< 0

3. Empirical Methodology

3.1. System of linear structural equations

We use a two-equation, linear version of the model relationships to estimate how agency affects public fund outcomes working through the compensation contract mechanism. We choose the simpler linear form approach for two reasons. First, our dataset of compensation observations is limited in sample size such that we are not entirely comfortable with inference from more complex moment optimization. Second and more directly, our model is one of board characteristics working through the mechanism of compensation contracts and leading to allocation and returns distortions. In our model, outrage only affects allocations and performance through the management contract. This restriction lends itself to a structural two-stage least squares (2SLS) specification, where we can make linear assertions as if we were in an instrumental variables (IV) setting.

The standard IV assumptions for a causal interpretation are that variables used as instruments are relevant in explaining variation in the key independent variable and are exogeneous to key outcome variable conditional on the main independent variable. In our setting, the realtionship is not an instrument per se, but a linear structural system of two equations. Nevertheless, we still need the relevance and exclusion restrictions to argue a plausibly causal interpretation. In particular, the exogeneity condition will be that outrage, measured as board trustees composition and the constitutent wage levels, does not affect the asset class allocations or returns, except through the mechanism of the investment manager contract. We need to define the first equation variables more fully in order to discuss the plausibility of the exclusion restriction.

Our structural-linear system of equations is as follows:

System Equation I:

$$\begin{aligned}\mathrm{Log}(Manager\ Compensation)_{it} &= \alpha_1 MunicipalWorkers_i + \alpha_2 Teachers_i + \alpha_3 LocalPublicFinances_i \\ &+ \alpha_4(-LogConstituentWages_{it}) + \alpha_5 LogMunicipalIncome_{it} \\ &+ \alpha_6 Underfunding_{it} + \alpha_7 PoliticalBoard_i + X_{it}^{covariates}\,\Gamma^{eq\ I} + \varepsilon_{it}^{eq\ I}\end{aligned}$$

System Equation II:

$$Y_{it}\begin{Bmatrix}\in & allocation\ outcomes, \\ & performance\ outcomes\end{Bmatrix}$$
$$= \beta_1 \operatorname{Log}(\widehat{Manager\ Compensation})_{it} + \beta_2 Underfunding_{it} + \beta_3 PoliticalBoard_i + X_{it}^{covariates}\,\Gamma^{eq\ II} + \varepsilon_{f,t}^{eq\ II}$$

It is a natural dynamic system of events that the manager contracting happens first, followed by the allocation decisions and the realization of returns. The subscripts *i* and *t* respectively refer to the specific public fund and year.

In System Equation I, we capture the outrage sentiment with three board trustee characteristics and one constituency characteristic. A trustee is more likely to perceive costs from outrage and thus more likely to want to implement outrage pay constraints on investment manager compensation if she herself had a history as a local worker (variables: *MunicipalWorkers*[1] and *Teachers*[2]), if she dealt in local government finances (*LocalPublicFinances*[3]), or if she represented beneficiaries with low incomes (-*LogConstitutentWages*). The first three are expressed as a percentage of all trustees with that characteristic. A final variable included in System Equation I that is excluded from the second equation is the log of the median municipal household income, whose purpose is to level public funds in the local area wage levels.

We also include in System Equation I the covariates from System Equation II (the log of public fund size and year fixed effects) and the other political agency variables. The two other agency variables are *Political Board* and *Underfunding*. In the model, the board needs to motivate the manager to invest in the political asset by providing a fraction of the political benefit as an inducement. Andorov, Hochberg and Rauh (2016) establish that Political Boards are prone to tilt the portfolio towards securities that could yield political dividends. We define *Political Board* as an indicator variable capturing chairs appointed by the governor. Appointees often (63%) have direct private finance sector experience (generally in asset management), which is much higher than the one third of overall chairs that have private financial sector experience. The third political agency friction – the board preference for risk – is a measure of the extent to

[1] Municipal workers are largely police, fire workers, librarians, workers at city hospitals, and other such public municipal service occuaptions that are not internal to the running of the government administration per se.
[2] Teachers include school superintendents.
[3] The most common categories here are treasurer, revenue commissioners and controllers, auditors, and the finance director.

underfunding of the pensions' liabilities, following Novy-Marx and Rauh (2014) and Andonov, Bauer and Cremers (2016).

System Equation II takes the outrage-predicted compensation as one of the three key independent variables, alongside *Politicial Board* and *Underfunding*, to explain fund allocations across asset classes and performance.

We estimate this system as if an IV and cluster standard errors at the fund level. Because of relatively thin data on compensation, the system is best thought of as a short panel.

3.2. Exclusion Restriction

We argue that the percent of trustees who have their career experience as teachers, as municipal workers, or in public sector financial administration (auditors, revenue commissioners, etc.) is exogenous to fund performance except through the choice of the quality of the investment manager and the form of the investment manager compensation contract. Note that the percentage of trustees in these various categories are variables often established by charter, which are written decades before the current time and are only amended with significant difficulty. For instance, teachers in a teachers pension fund are, by charter, allocated specific trustee seats. The actual person serving in the role may be elected, but the designation of a trustee seat will be *ex ante* assigned.

The exclusion restriction implies that these people do not influence the security selection itself. Note that we do not feel comfortable asserting this assumption for *Political Board* and *Underfunding*. Political board chairs may assert certain asset manager relationships in kickback or local bias schemes. Likewise, the level of underfunding may imply the board actively asserts asset class of security risking-up. However, it is plausible and likely that the local worker and public finance administrator percentages do not have these direct relationships to investment manager decisions.

4. Data

All money data are reported in 2010 U.S. dollars. We divide data construction and statistics into the subcategories below. Statistics of all variables appear in Tables 1-3, as described.

4.1. Public Funds Sample

We assemble a sample of large public funds, with the scale of funds helping to ensure the ability to invest in risky asset classes, where investment skill is more likely to matter, and where data is more readily available. Our initial sample comes from the intersection of two sets of public funds – U.S. public pension funds covered by the Center for Retirement Research (CRR) dataset at Boston College and all global public funds that had over $10 billion in assets under management identified in *Pensions & Investments* in 2011. Because of the need to manually search for trustees and managers, we limited the sample to funds in North America, Oceania, and Europe.

For each fund, we collected asset allocations and performance over the 1996-2011 from a combination of sources: annual reports, funds' current and cached websites, direct requests to the funds, the Boston College CRR dataset and CEM Benchmarking. The level of detail in terms of breakdown by asset class and within asset class differs across funds.

Table 1, panel A reports the geographic distribution of funds. In sum, we have 176 funds and 1688 fund-year observations. The average public fund is large, having $45 billion in assets, with some very large funds included (median=$14 billion). Fifty-nine percent of the funds are from the United States, with the other 41% divided equally among Canada, Continental Europe, Scandinavia and the UK, and Oceania. Panel B of Table 1 shows that, we have reasonable geographical variation on the distribution of funds for most years. As of the last year in the sample, the pension funds cover $5.4 trillion in assets.

4.2. Compensation Data

We hand-collect compensation. For some funds, compensation data is readily available, being provided in annual reports that are similar to salary disclosures in publicly traded firms. For others, we relied on public filings, or reported compensation in newspapers and other sources that derived their information from freedom of information requests or other sources.

We sought to collect information on salary, bonus and total compensation for the CEO, the CIO, and the board chair. The lack of consistent detail across funds lead us to focus in the empirical results on a single total compensation figure, and we collapse the data on CEO and CIO, using the salary of the highest paid executive to avoid losing observations. We interpolate (but not extrapolate) the data for funds for which we have a time series but with gaps. The resulting compensation variable includes all geographies spanned by our sample.

We report summary statistics on compensation in our dataset in Table 2. The median total compensation of the investment executives is $500,000 USD, with a mean of $766,000. A quarter of the fund managers make salary of $262,000 or less.

4.3. Variables to Capture Political Agency Costs

To create the outrage and political measures, we manually gather cross-sectional board structure data across funds as of 2011 by reading each public fund legislation to lay out the trustee charter organization. Within the structure, we manually identify the history of each trustee from board member bios or other web information sources (e.g., linkedin). Table 2 presents the summary statistics of these outrage board characteristics. The mean percentage of trustees who are municipal workers is 14.7%; (b) the mean percentage of trustees who are teachers is 7.7%; and (c) the mean percentage of trustees who worked in local public finances (generally with budgetary responsibility in public administration such as a State Treasurer or State Finance Director) is 34.4%. The wage measure of outrage is defined as the inverse of the log-average salary of beneficiaries of the pension plan in that year.

The second agency concern is politicization of the board. Using the same data as above, we construct *Political Board* equal to 1. Fourteen percent of boards have a Political Board. It is interesting to note that *Political Board* is equal to zero outside of the U.S., which is not a mechanical result, but rather a finding in the data.

Our constituency measure of outrage, is the plan members' reference pay level. We construct this constituent pay outrage variables as negative of the log average wages of active members of the plan. Members' average salaries are collected from annual reports when directly available, or constructed from the total contributions and from the average rates of contribution (also from funds' annual reports) otherwise. The underlying motivation for this definition is that trustees closely connected to a class of workers with low salaries might be more reluctant to hire expansive and skilled managers. The mean and median constituent wages, reported in Table 2, are respectively $57,902 and $53,611.

Our liability strain (*Underfunding*) measure is an index of two variables. We have data on the funded ratio (the level of assets to liabilities), but not for all funds. The other measure of liability strain comes from Rauh (2008), who finds that funds with a higher age profile of pension beneficiaries have more liabilities concerns. In order to use information from both sources, we construct the average age of pension constituents – combining the average age of workers and retirees with the fraction of members being retired – and then we define the *Underfunded Index* 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.

4.4. Asset Class Allocations and Performance Data

We analyze how pension funds allocate assets and perform in three primary asset classes: (i) alternatives (which includes hedge funds, private equity and real estate), (ii) public equities (which includes domestic and foreign equities), and (iii) fixed income (which also includes cash). This rank ordering reflects expected underlying risk, going from highest to lowest. We conjecture that alternatives provide the greatest ex ante opportunities for providing private benefits to politicians. This is related in part to their typical "2 and 20" compensation structure, with the potentially larger payoffs for fund managers providing a larger pool of capital that can be diverted providing kickbacks or other benefits than is available for vanilla public securities and bonds, which are subject to more intense transparency and compliance regulations.

Table 3 reports summary statistics of portfolio weights and realized returns in each asset class. All foreign fund returns are calculated in US dollars. As expected, fixed income and public equities account for the largest fraction of pensions' portfolios. Alternatives and equities provide the largest average raw returns, with mean returns of 5.8% and 4.8% respectively, with fixed income providing lower returns of 2%. We then present information on excess returns, measured as gross returns minus fund-reported benchmark returns. Excess returns, as expected, are all statistically indistinguishable from zero. For overall portfolio returns, we measure both raw portfolio returns as well as the excess portfolio return, which is the sum of excess returns across the asset classes.

We use a final measure of performance as the closeness of the investment manager relative to benchmark, i.e., the realized tracking error. We estimate in-sample, fund-level tracking error, as the standard deviation of the error term in a no constant model of regressing funds' realized return on the benchmark. Table 3 reports that the mean tracking error for 117 funds is 0.065. A quarter of the funds have tracking error virtually zero (smaller than 0.0003), which indicates a group of passive indexers.

5. Results

5.1. Relevance: Does Outrage Affect Compensation

We set the stage for our empirical analysis by presenting figures that, consistent with the example we use to motivate the paper, suggest linkages between board characteristics and realized compensation. Figure 1-3 first splits into quantiles funds by their respective % who are (1) municipal workers, (2) teachers, (3) have public sector finance experience. More importantly in the second part of each panel we also plot the mean and median wages. In all plots there is a negative relationship, particularly looking at median wages, with higher percentages of trustees sensitive to outrage being associated with lower compensation levels.

In Table 4 column 1, we represent results from the System Equation I. Recall that this equation regresses log compensation on the outrage variables, *PoliticalBoard*, *UnderfundingIndex*, local median income, log fund size and year fixed effects. In the Table 4 version of this first stage equation, we include weights of the asset classes, because our second stage outcome variable is the portfolio return. The underfunded index and log fund size are both lagged variables.

Our main interest is in whether the outrage variables are relevant. Although we find negative coefficients on all outrage variables (outrage lowers compensation), it is *MunicipalWorkers* and *LocalPublicFinances* that are able to significantly explain variation in manager compensation. A fund with a one standard deviation higher percentage of trustees with the backgrounds as municipal workers *MunicipalWorkers* (0.13 more percentage points) and *LocalPublicFinances* (0.21 more percentage points) have, respectively, $58,534 and $80,396 less manager compensation from the mean level. We do not find that *UnderfundedIndex* has an impact. However, consistent with our model, funds that have *Political Board* = 1 pay their investment managers $141,615 less in compensation.

Other variables are largely as expected. Larger funds pay higher compensation, as do funds located in regions with higher median household incomes. Wages are higher if there is a greater weight on private equity and on foreign equities.

Before moving to the System Equation II outcome estimations, we finally want to note that the F-statistic for the instruments is 15.8 and that the r-squared is 0.517. The model, which is largely cross-sectional (86 funds in 290 observations), does a good job of capturing variation in compensation.

5.2. Outcome Estimations

5.2.1. Do Outrage Pay Constraints affect Excess Returns?

The numbered columns in Table 4 represent outcome results deriving from the second equation, estimation of the effect of the outrage channel through compensation. The outcome variables across the models in Table 4 are excess returns for the entire portfolio (model 1), excess returns in alternatives (model 2), excess returns in public equities (model 3) and excess returns in fixed income (model 4). In each of the models, we include the most granular asset class weights we have for that asset class, to control for risk differences in exposures. Ideally, we would have Sharpe-like exposure controls, but we do not know the components of the holdings. The benchmarks, however, vary by each fund and thus should at least properly benchmark the first moment of risk, namely the return implication.

The observations vary by column because some public funds do not have exposures to all of the asset classes and some funds only report performance at the aggregate portfolio level. We do not report the first equation estimation for each column; they are materially the same as the estimation presented in the first column. The columns labeled (5) to (8) reproduce models 1 to 4, in OLS specifications, just for reference comparisons.

We find a positive and significant coefficient on log compensation in model 1. To interpret our system of equations effect, we start with a one standard deviation *decrease* in either (both acting together is unlikely) *MunicipalWorkers* or *LocalPublicFinances.* (We switch to decreasing outrage so that we can speak to possible benefits of unwinding existing outrage constraints.) Funds that have lower outrage pay more in compensation (0.123 and 0.173 log points respectively for *MunicipalWorkers* or *LocalPublicFinances*) and enjoy 22 basis points (*MunicipalWorkers*) to 31 basis points (*LocalPublicFinances*) higher excess returns. Evaluated at the mean fund (a $45 billion AUM public fund), these higher return would generate, respectively,

$100 million to $141 million in more wealth. However, because the estimation is more precise at the asset class level, we prefer the economic significance interpretation of models 2 to 4.

In models 2-4 we replace portfolio excess returns with excess returns in alternatives, public equities and fixed income respectively. These regressions show the drivers of overall portfolio returns. The coefficient on alternatives (0.0131) and equities (0.0069) are both positive and significant. Alternatives has a mean portfolio weight of 0.126. Thus, a one standard deviation lower *MunicipalWorkers* [*LocalPublicFinances*] composition results in a within-asset class return implication of 16 basis points [22 basis points], which leads to $9.2 million [$12.9 million] in value add. For the larger asset class public equities, with 0.513 of the AUM, a similar calculation leads to an impact of low outrage leading to 9 basis points [12 basis points]. IN value add, reducing *MunicipalWorkers* outrage increases wealth by $20 million in public equities and reducing *Local PublicFinances* outrage increase wealth by $28 million in public equities.

The fixed income model suggests, however, that the extra focus that compensation puts on risky asset class comes at the expense of lower fixed income returns. With 0.346 of the portfolio being in fixed income, the economic magnitude of model 4 would be that low outrage is associated with 9 basis points (*MunicipalWorkers*) to 12 basis points (*LocalPublicFinances*) lower performance, with a value add loss of $14 to $20 million. .

In aggregate, our results suggest a payoff of $14 to $20 million, with small compensation concessions of $58,000 to $80,000.

Note that we also find that *Political Boards* are associated with lower performance, consistent with Andonov, Hochberg and Rauh (2016). We devote a section to discussing the other agency effects momentarily.

5.2.2. Robustness of Return Results to Realized Risk

A potential concern with focusing solely on excess returns as a performance measure is that excess returns might be correlated with taking on increased risk, so that higher excess returns do not increase a funds' Sharpe ratio. We address this possibility in Table 5 by using the realized tracking error. These regressions purely cross-sectional at the fund level. As before, we first include the compensation equation, System Equation I, as the first, unnumbered column. With the fewer number of observations, we drop the instruments without power in these tests.

The focus of our attention in models 1-3 is the coefficient on the System Equation I predicted log compensation. Model 1 presents results for portfolio tracking error using all 80 funds with available data. We find that instrumented compensation not only predicts higher excess returns (Table 4) but it is associated with lower realized tracking error. This is inconsistent with the story that our findings in Table 4 result from a sorting of funds by within asset class risk. The result is consistent with the story of our model, that higher compensated managers have skill in security selection in keeping their tracking errors low.

To further explore this robustness, in models 2-3 we split the sample into those with low portfolio allocation to alternatives (below median), and those with high allocation to alternatives (above median). If the higher returns in risky asset classes (and lower returns in fixed income) result from a sorting of funds by how risky the security selection is within asset class, we would be surprised to see any lower tracking error for the outrage-predicted compensation for the risky funds. Yet, this is what we find. The lower realized tracking errors are concentrated in riskier funds. This is again consistent with our story that managers that are paid more because of lower outrage are simply better.

5.2.3. Do Outrage Pay Constraints affect Asset Allocations?

In Table 6 we explore the other aspect of our theory, the possibility that outrage pay constraints affect funds' asset allocation. As before, the System Equation I estimation is presented in the first column, with similar results as in Table 4. The F-statistic for the relevance of instruments is 23.2.

Because the asset class weights are constrained to be between 0 and 1, with many funds having low exposures to alternatives, we estimate Table 6 using a Tobit second stage model. Because the asset class weights are jointly determined, we report two sets of standard errors. The top standard error is a fund-clustered standard error, as before, and the bottom is a robust standard error under the seemingly unrelated assumptions.

We find that funds with compensation not inhibited by outrage exhibit a shift in their risky asset exposures. In particular, the lower outrage – high compensation funds have higher allocations to alternatives and fixed income in lieu of public equities. Inside our model, such an effect may arises with the hiring of a skilled manager that can extract a larger fraction of the premia in riskier asset classes. Using SUR standard errors, only the negative impact on public equities is significant at conventional levels, but we proceed to discuss the impact, as in our sample size, this is a rather stringent robustness specification.

We calculate the economic magnitudes as we did for Table 4, focusing on a one standard deviation decrease in outrage measured by either *MunicipalWorkers* or *LocalPublicFinances*. For a decrease in *MunicipalWorkers*, we find that relaxing outrage-hindered compensation results in about 0.63% more allocation to both alternatives and fixed income, with an offset of 1.4% decrease in public equities weights. (The estimates need not perfectly add up to 0.) For a decrease in *LocalPublicFinances*, we find that relaxing outrage-hindered compensation results in about 0.89% more allocation to both alternatives and fixed income, with an offset of 2.0% decrease in public equities weights. In percentage changes, alternatives increase by 4.9% to 6.9% and public equities decrease by 2.8% to 3.9%. The percentage change effect for fixed income are small.

5.3. Other Agency Costs: Can We Speak to Mechanisms?

Now we turn our attention to the agency variables linked to the public nature of funds. Prior empirical work has documented the importance of these variables, notably for performance. Our contribution here looks at the relationship with some attempt to speak to whether the prior findings might work through the compensation contracting, versus directly. We cannot, however, use the system of equations to properly identify causality of whether these effects work through compensation because either the direct channel of politicization and underfunding directly being correlated with outcomes is very possible. The exclusion restriction is likely to fail. As this is not the primary focus of our paper, we nevertheless continue with the estimation with these agency variables in both the compensation and the outcome equations.

The first of these variables is *Political Board*. Pay-to-play arrangements of political funds may cause public funds to invest in political assets (e.g. local assets) to provide private political benefits for the board chair. The second variable is *UnderfundedIndex*, assumed to predict risking up of portfolios due to pressures from liability obligations.

Returning to the excess returns system in Table 4, we find that *Political Board* significantly explains variation in compensation. Over-and-above this effect, *Political Board* significantly explains lower returns in alternatives (model 2). The point estimate is large; 367 basis points lower performance in alternatives for *Political Board* =1 funds. This is consistent with the research of Andonov, Hochberg and Rauh (2016) that found that political funds were more likely to invest in local private equity that underperformed. Our theory suggests that politically compromised boards will not have the incentive to pay for highly-skilled managers, since the *Political Board* will be making selections into political assets and thus the portfolio need for skill is lower. Using the language of our model, a large reward for political investments L leads to a manager with low quality (s), large weights in political assets (w_P), and small weights on vanilla assets (w_{MV}). Our empirical results suggest that above any role in compensation, *Political Board* affects performance directly. One way to see this is that pay-to-play relationships need not be dependent on the manager quality level.

The asset allocation estimations in Table 6 seem to support this pay-to-play interpretation for *Political Board.* Pay-to-play anecdotes in the media suggest that such activity is primarily about a political board or, often, board and manager collusion, directing funds to particular asset manager who represent alternatives funds (e.g., hedge funds, private equity, etc.) What is different about these alternatives funds structures is that they are by definition bulky investments that are not atomistic in properties like stocks. Table 6 supports this shift in allocations, as we find a negative, significant coefficients on *Political Board* for public equities allocations, which seem to be offset by positive shifts to alternatives and fixed income. The fact that these shifts do not result in additional positive returns (Table 4) or risk (Table 5) supports the punchline of these anecdotes and the prior literature.

Finally, we turn our attention to the impact of *UnderfundedIndex*. The only significant impact is on asset class weights. Consistent with prior papers, notably, Andonov, Bauer and Cremers (2016) we find that *UnderfundedIndex* strongly predicts allocations to alternatives and negative allocations to fixed income, with significant results using the SUR standard errors.

6. Conclusion

In this paper, we develop hypotheses as to how agency frictions affect management selection, asset allocation and performance in public funds and then test those predictions using a hand-collected global panel data set. The main contribution is to introduce and then explore both in theory and in the data the potential importance of the human capital channel – how political agency costs can impact management contracting and through this channel impact performance, asset class weights and tracking error. In both the model and the empirics we are careful to allow for other channels through which political agency costs can affect public funds, including the channel of private political benefits from local investments, and the impact of underfunded status.

We see three primary contributions. First, there are outrage pay constraints on compensation driven by public funds' governance structures. Second, and most importantly, those outrage pay constraints impact fund performance and hence beneficiary welfare. We find that instrumented compensation improves portfolio excess returns, with the gains coming as expected from the risky asset classes where skill is particularly important. The excess portfolio returns associated with weaker outrage pay constraints does not come at the expense of greater overall risk, with realized tracking error lower for funds that are less affected by outrage pay constraints. There are weaker impacts of these pay constraints on asset allocation, perhaps indicating that trustees or the managers they hire do not fully consider their comparative skill in making their asset management choices. All of these results are consistent with politically-related contracting constraints reducing managerial skill.

Our paper suggests that measures to change the governance of public pension funds to insulate them from political agency costs have the potential to benefit beneficiaries. Freeing boards from frictions on hiring and paying qualified managers is associated with better returns. And this may be of increasing importance, given growing income inequality which increases such outrage pressures to which public fund boards are particularly exposed.

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Appendix A: Model Solution

In this appendix we prove that the optimal manager quality chosen by the board and the optimal contract offered to the portfolio manager are given by equations (8) and (11).

A.1. Optimal Contract

First, we assume that the manager with quality $\boldsymbol{s}$ is hired, and then we calculate the optimal contact offered by the board of trustees. We can clearly assume that $T = (1-a)L$, given that financial and political returns are perfectly exchangeable in our model, which implies that the board would always offer the same fraction of political and of financial returns to the portfolio manager. To find new optimal value of the risk sharing parameter $\boldsymbol{a}$**,** note that the objective function of the portfolio manager simplifies to:

$$r_f + (1-a)w^\intercal B(s) - \frac{1}{2}\lambda_C(1-a)^2 w^\intercal \Sigma w \tag{A.1}$$

Where w is the vector of portfolio weights, Σ is the covariance matrix of returns, and $B(s)$ is the vector $B(s) = (s\varphi_{MV}, s\varphi_P + L)^\intercal$. The optimal response that maximizes (A.1) is given by:

$$w = (1-a)^{-1}\lambda_C^{-1}\Sigma^{-1}B(s) \tag{A.2}$$

Now we can write the board's objective function as follows:

$$r_f + w^\intercal aB(s) - c - \frac{1}{2}\lambda_B a^2 w^\intercal \Sigma w \tag{A.3}$$

Let $k = \frac{a}{1-a}$. Basic algebra shows that (A.3) is proportional to

$$k - \frac{1}{2}\frac{\lambda_B}{\lambda_C}k^2 \tag{A.4}$$

Which is maximized by $k = \frac{\lambda_B}{\lambda_C}$. This implies that the optimal a is given by

$$a^* = \frac{\lambda_C}{\lambda_C + \lambda_B} \tag{A.5}$$

A.2. Optimal Manager Quality

By plugging the optimal contract into the board objective function, we find the following indirect utility function:

$$V_B(s) = r_f + \frac{1}{2\lambda} B(s)^{\intercal}\Sigma^{-1}B(s) - O(s) \tag{A.6}$$

Where $\lambda = (\lambda_C^{-1} + \lambda_B^{-1})^{-1}$. The underlying first order condition for the choice of the optimal quality is:

$$B(s)^{\intercal}\Sigma^{-1}\varphi = O'(s) \tag{A.7}$$

Where $\varphi = (\varphi_{MV}, \varphi_P)^{\intercal}$. It's easy to see that this implies in the following condition:

$$\frac{(\sigma_P^2\varphi_{MV}^2 - 2\rho\sigma_P\sigma_{MV}\varphi_{MV}\varphi_P + \sigma_{MV}^2\varphi_P^2)s + (\sigma_{MV}^2\varphi_P - \rho\sigma_P\sigma_{MV}\varphi_{MV})L}{\lambda\sigma_P^2\sigma_{MV}^2(1-\rho^2)} = O'(s) \tag{A.8}$$

Appendix B: Comparative Statics Computations

In this appendix we compute the signals of the partial derivatives stated on the panels A and B on the comparative statics section of the paper. First we consider the case when the outrage constraint is not binding, and after that we compare the derivatives of the biding and not-biding cases.

B.1. Partial Derivatives of Manager Quality

If the outrage constraint is not binding, then the optimal manager quality s^* maximizes the ex-ante utility function of the board $V_B(s)$, which can be written as:

$$V_B(s) = \frac{1}{2\lambda} B(s)^{\intercal}\Sigma^{-1}B(s) - O(s) \tag{B.1}$$

where Σ is the covariance matrix of returns, $O(s)$ is the outside option for a manager with quality s, and $B(s)$ is a vector defined by $B(s) = (s\varphi_{MV}, s\varphi_P + L)^{\intercal}$. It's easy to see that we can write the underlying first order condition as

$$\lambda^{-1}\boldsymbol{\varphi}^{\intercal}\Sigma^{-1}[s\boldsymbol{\varphi} + L\boldsymbol{e}_2] = O'(s) \tag{B.2}$$

where $\boldsymbol{\varphi} = (\varphi_{MV}, \varphi_P)^{\intercal}$ and $\boldsymbol{e}_2 = (0,1)^{\intercal}$. Differentiating (B.2) with respect to the political return L we get:

$$[O''(s^*) - \lambda^{-1}\boldsymbol{\varphi}^\intercal\Sigma^{-1}\boldsymbol{\varphi}]\frac{\partial s}{\partial L} = \lambda^{-1}\boldsymbol{\varphi}^\intercal\Sigma^{-1}\boldsymbol{e}_2 \tag{B.3}$$

The term $[O''(s^*) - \lambda^{-1}\boldsymbol{\varphi}^\intercal\Sigma^{-1}\boldsymbol{\varphi}]$ is positive by the concavity of the objective function on the maximum, while the term $[\lambda^{-1}\boldsymbol{\varphi}^\intercal\Sigma^{-1}\boldsymbol{e}_2]$ is negative if the Sharpe ratio of the mean-variance efficient securities is sufficiently larger than the Sharpe ratio of the political assets. This implies that:

$$\frac{\partial s}{\partial L} < 0 \tag{B.4}$$

Now differentiating (B.2) with respect to the political return λ we get:

$$[O''(s^*) - \lambda^{-1}\boldsymbol{\varphi}^\intercal\Sigma^{-1}\boldsymbol{\varphi}]\frac{\partial s}{\partial \lambda} = -\lambda^{-1}O'(s) \tag{B.5}$$

The term $[O''(s^*) - \lambda^{-1}\boldsymbol{\varphi}^\intercal\Sigma^{-1}\boldsymbol{\varphi}]$ is positive, while the term $[-\lambda^{-1}O'(s)]$ is negative, which implies that:

$$\frac{\partial s}{\partial \lambda} < 0 \tag{B.6}$$

B.2. Partial Derivatives of Portfolio Weights

The vector of portfolio weights will be given by:

$$\boldsymbol{w} = \lambda^{-1}\Sigma^{-1}[s\boldsymbol{\varphi} + L\boldsymbol{e}_2] \tag{B.7}$$

Differentiating (B.7) with respect to L we get:

$$\frac{\partial \boldsymbol{w}}{\partial L} = \lambda^{-1}\{\det(\Sigma)\}^{-1}\begin{bmatrix} \sigma_{MV}\sigma_P^2\left(\frac{\varphi_{MV}}{\sigma_{MV}} - \frac{\varphi_P}{\sigma_P}\right)\frac{\partial s}{\partial L} - \rho\sigma_{MV}\sigma_P \\ \sigma_{MV}^2 - \sigma_{MV}^2\sigma_P\left(\frac{\varphi_{MV}}{\sigma_{MV}} - \frac{\varphi_P}{\sigma_P}\right)\frac{\partial s}{\partial L} \end{bmatrix}$$

from which follows that:

$$\frac{\partial w_{MV}}{\partial L} < 0,\ \frac{\partial w_P}{\partial L} > 0 \tag{B.8}$$

Similar algebra shows that (i) the investment in fixed income is increasing on the risk aversion, and (ii) the investment on the mean-variance efficient security is decreasing on the risk aversion.

B.3. Comparison between Constrained and Unconstrained Cases

Now we compare the values of the partial derivatives with respect to the exogenous variables when boards are constrained and unconstrained. It’s easy to see that:

$$\left[\frac{\partial \boldsymbol{w}}{\partial L}\right]_{unconstrained} = \lambda^{-1}\Sigma^{-1}\left[\frac{\partial s}{\partial L}\boldsymbol{\varphi} + \boldsymbol{e}_2\right] \tag{B.9}$$

$$\left[\frac{\partial \boldsymbol{w}}{\partial L}\right]_{constrained} = \lambda^{-1}\Sigma^{-1}\boldsymbol{e}_2 \tag{B.10}$$

And therefore:

$$\Delta\frac{\partial \boldsymbol{w}}{\partial L} \equiv \left[\frac{\partial \boldsymbol{w}}{\partial L}\right]_{constrained} - \left[\frac{\partial \boldsymbol{w}}{\partial L}\right]_{unconstrained} = \lambda^{-1}\frac{\partial s}{\partial L}\Sigma^{-1}\boldsymbol{\varphi} \tag{B.10}$$

And therefore:

$$\Delta\frac{\partial w_{MV}}{\partial L} < 0, \qquad \Delta\frac{\partial w_P}{\partial L} > 0$$

A similar argument shows that:

$$\Delta\frac{\partial (w_P + w_{MV})}{\partial \lambda} > 0, \qquad \Delta\frac{\partial w_{MV}}{\partial \lambda} > 0$$

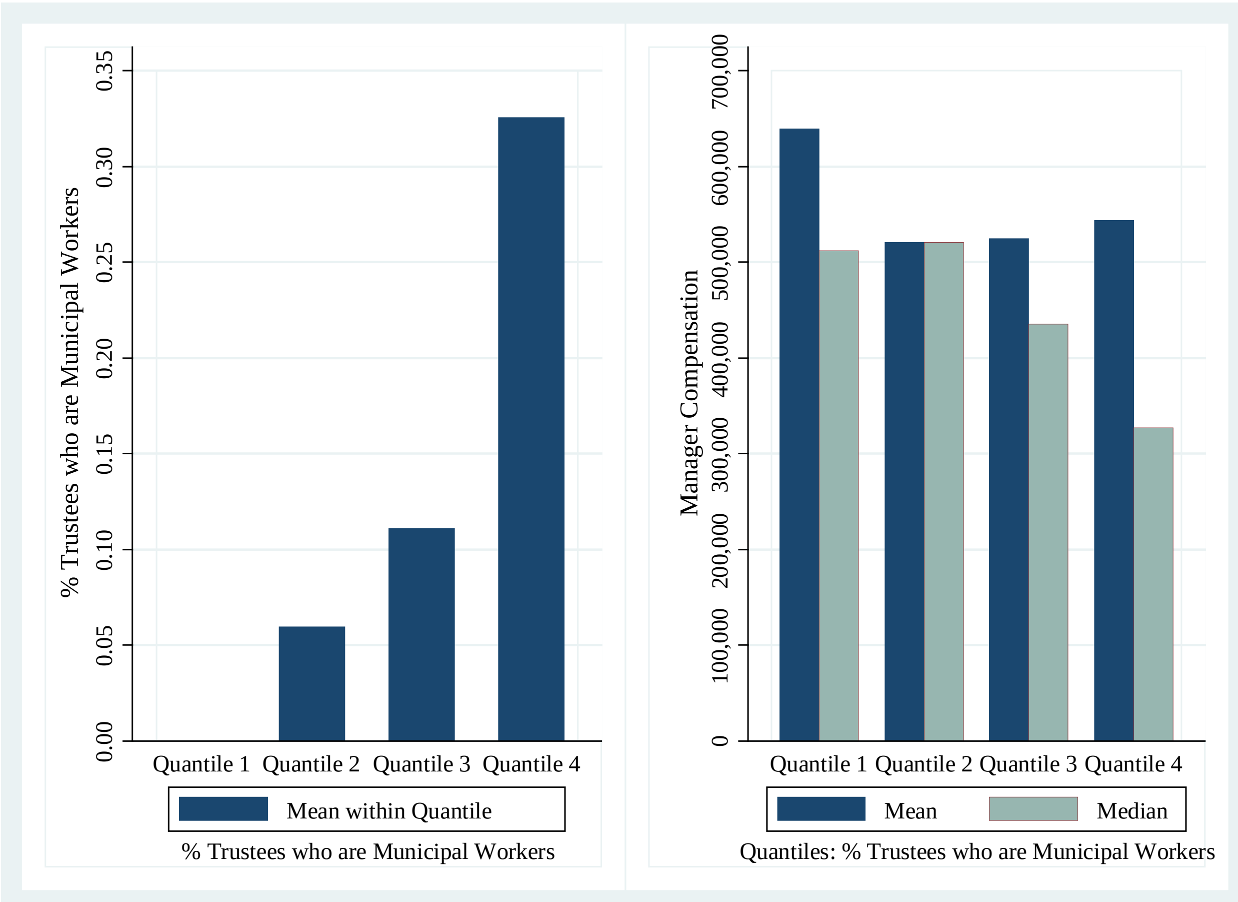

Figure 1: Percentage of Trustees who are Municipal Workers & Relationship to Compensation

The left panel presents the quantiles of the percentage of trustees who are municipal workers. Municipal workers are those working in the police, fire department, library, community hospital, etc. This panel simply displays the average percent of trustees (the y-axis) for each quantile to summarize the quantile used in the right panel. The right panel plots the mean (blue/darker bars) and median (green/lighter bars) manager compensation of the pension fund per quantile of percentage municipal workers. Manager compensation is defined as the higher of the CEO or CIO compensation for a pension fund. Data are collapsed to a single average observation per pension.

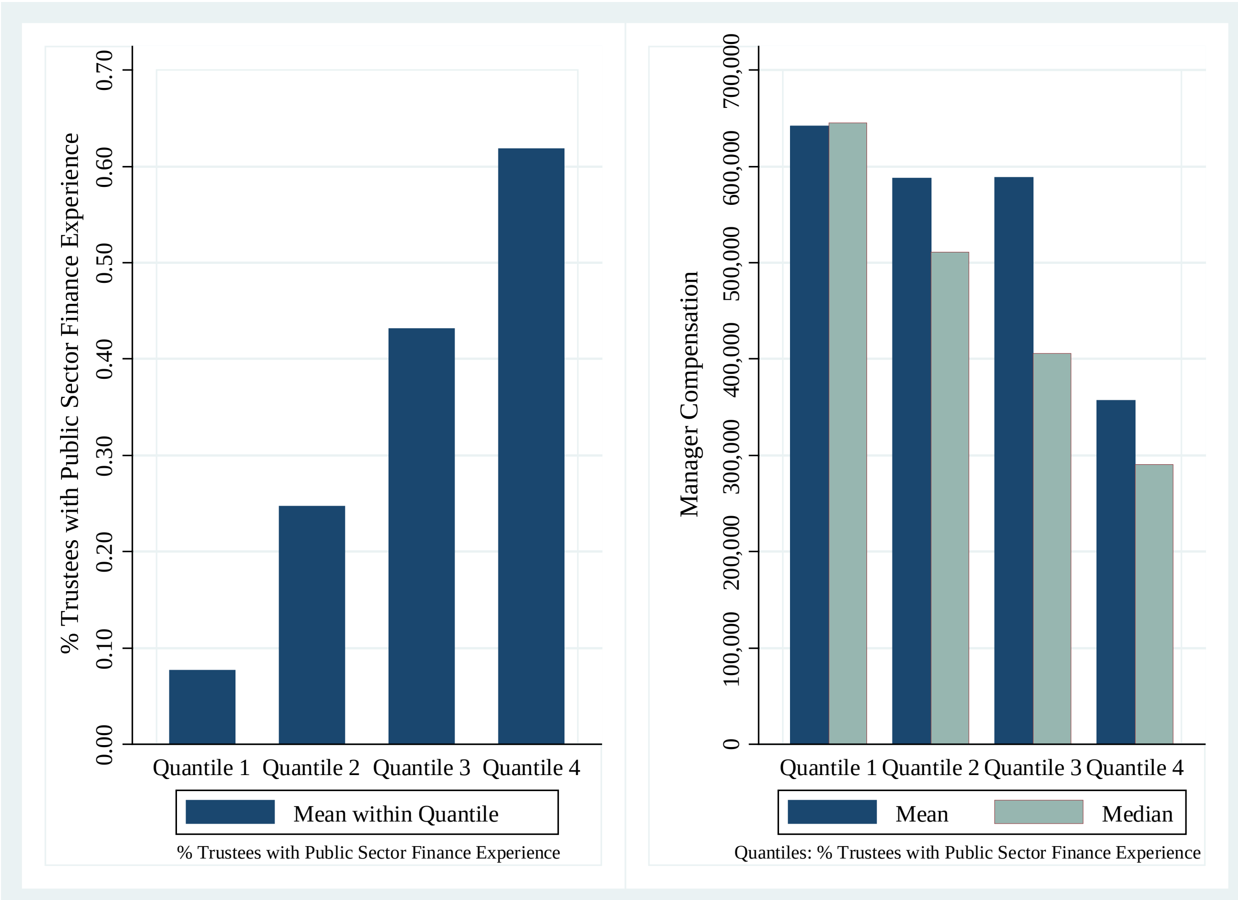

Figure 2: Percentage of Trustees who have Public Sector Finance Experience & Relationship to Compensation

The left panel presents the quantiles of the percentage of trustees who have experience in finance in the public sector. This panel simply displays the average percent of trustees (the y-axis) for each quantile to summarize the quantile used in the right panel. The right panel plots the mean (blue/darker bars) and median (green/lighter bars) manager compensation of the pension fund per quantile of percentage public sector finance experience. Manager compensation is defined as the higher of the CEO or CIO compensation for a pension fund. Data are collapsed to a single average observation per pension.

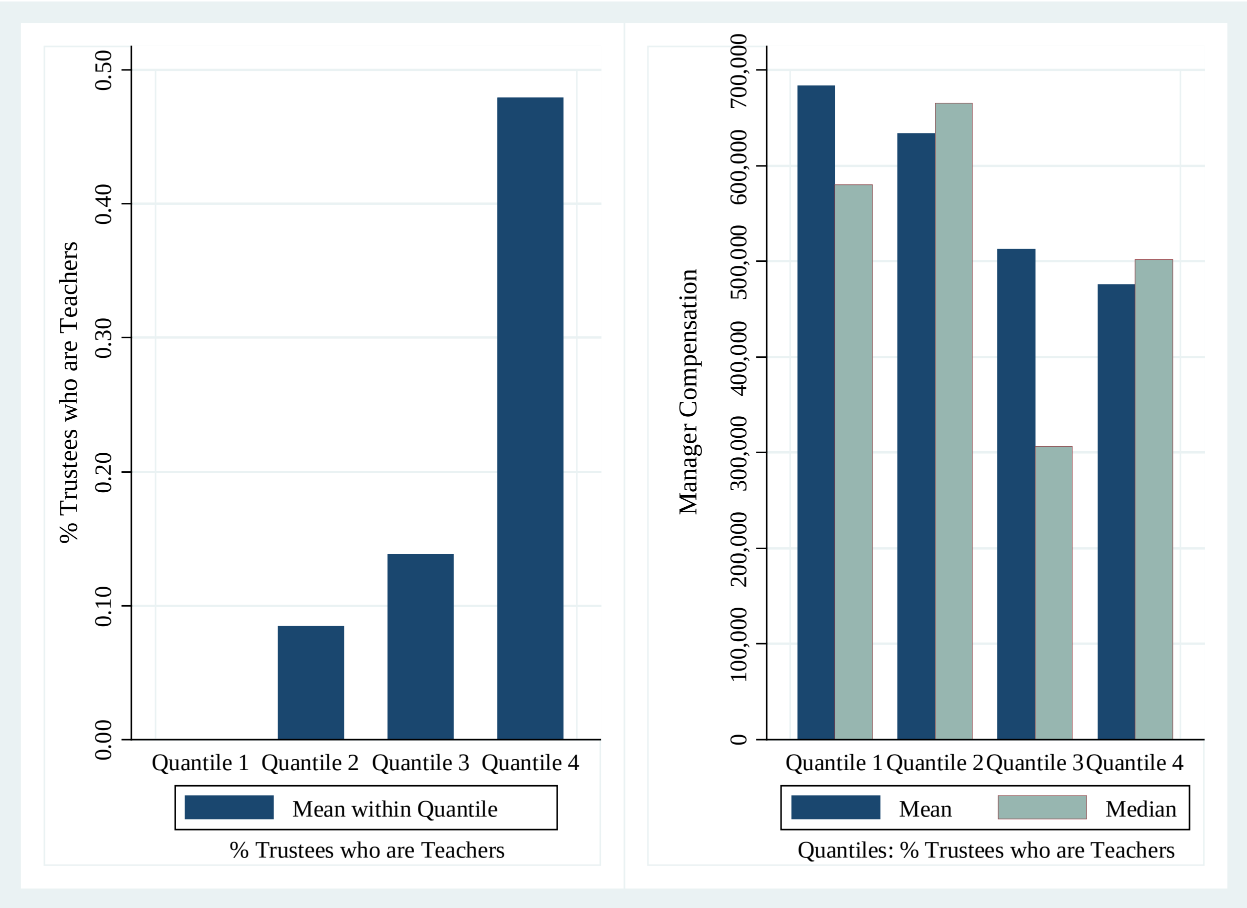

Figure 3: Percentage of Trustees who are Teachers & Relationship to Compensation

The left panel presents the quantiles of the percentage of trustees who are teachers. This panel simply displays the average percent of trustees (the y-axis) for each quantile to summarize the quantile used in the right panel. The right panel plots the mean (blue/darker bars) and median (green/lighter bars) manager compensation of the pension fund per quantile of percentage teachers. Manager compensation is defined as the higher of the CEO or CIO compensation for a pension fund. Data are collapsed to a single average observation per pension.

Table 1: Pension Fund Profile Statistics

This table reports the distribution of the years and geographies of the sample of pension funds. First two columns on panel A are the number of unique pension funds and their observations. The last four columns on the panel A are summary statistics of the total assets under management (AUM) for each region. Panel B reports the number of funds in each region and in each year.

Panel A: Assets under Management by Region

			Assets under Management ($billion)			
	Number of funds	Fund-Year Observations	Mean	25th Percentile	Median	75th Percentile
Canada	16	203	36.01	11.45	17.01	55.60
Continental Europe	18	133	25.56	9.14	13.12	22.37
Oceania	17	146	15.97	7.99	13.09	19.65
Scandanavia and UK	21	168	217.94	8.95	56.86	235.19
United States	104	1038	25.39	6.36	12.23	29.83
Total	176	1688	45.03	7.59	13.76	34.95

Panel B: Counts of Funds by Geography and Year

	Canada	Continental Europe	Oceania	Scandinavia and UK	United States	Total
1995	3	0	0	1	10	14
1996	4	0	1	1	16	22
1997	5	0	2	1	22	30
1998	5	0	2	3	28	38
1999	6	0	2	4	37	49
2000	11	3	4	4	49	71
2001	15	4	4	4	58	85
2002	15	8	6	7	64	100
2003	15	8	9	8	66	106
2004	15	10	9	12	73	119
2005	15	10	11	12	79	127
2006	16	12	14	16	82	140
2007	16	14	16	19	85	150
2008	16	17	16	19	91	159
2009	16	18	17	19	93	163
2010	16	18	17	20	93	164
2011	14	11	16	18	92	151
Total	203	133	146	168	1038	1688

Table 2: Board and Manager Variables: Summary Statistics

Panel A reports the summary statistics, and Panel B reports the correlations, of the main variables characterizing the governance of pension funds in our sample. `% Trustees who are Municipal Workers' is the percent of the pension board whose career is in the municipal laborforce, defined as police, fire department, hosptials, libararies, and other non-civil servant positions.`% Trustees with Public Sector FInance Experience' is the percent of the pension board whose background is in public sector financial positions (e.g., city controllers, auditors, etc.). `% Trustees who are Teachers' is the percent of the pension board who are teachers. 'Chair Political' is a dummy taking value 'one' if the chair is appointed by the government, and 'zero' otherwise. `Underfunded Index' is an index constructed by taking the mean across the standardized value of (1- the funded ratio) and age. The use of age follows from Rauh (2008) to proxy for how underfunded pensions are (because they lack a workingforce paying in when the age gets higher) when the underfunded ratio data do not exist.

Panel A: Statistics

	Count	Mean	Standard Deviation	25th percentile	Median	75th percentile
Manager Compensation						
Manager Compensation ($)	525	766,178	988,161	262,112	500,271	790,351
Log Manager Compensation	525	13.13	0.840	12.48	13.12	13.58
Board Variables						
% Trustees who are Municipal Workers	1877	0.077	0.130	0	0	0.118
% Trustees with Public Sector Finance Experience	1532	0.344	0.212	0.167	0.364	0.500
% Trustees who are Teachers	1877	0.147	0.207	0	0.083	0.182
Wages of Constituents	1594	57,902	21,272	43,612	53,611	67,299
Outrage = -Log Wages of Constituents	1594	-10.91	0.332	-11.12	-10.89	-10.68
Political = Chair of Board is Appointed by Government	2133	-0.001	1.165	-0.501	0	0.307
Underfunded Index	1844	0.137	0.344	-0.501	0	0

Panel C: Correlations

	Compen-sation	Log Com-pensation	Municipal Workers	Public Sec-tor Finance	Teachers	Outrage Wages	Political
Manager Compensation	1						
Log Manager Compensation	0.829***	1					
% Trustees who are Municipal Workers	-0.096**	-0.094**	1				
% Trustees with Public Sector Finance Experience	-0.099*	-0.14***	-0.008	1			
% Trustees who are Teachers	-0.138***	-0.143***	-0.188***	-0.035	1		
Outrage = -Log Wages of Constituents	-0.054	-0.091*	-0.11***	-0.089***	-0.22***	1	
Political = Chair of Board is Appointed by Governme	-0.158***	-0.25***	-0.09***	0.395***	0.019	-0.029	1
Underfunded Index	-0.054	-0.078*	0.075***	-0.039	0.100***	0.049*	0.016

Table 3: Performance and Portfolio Weights: Statistics

This table reports summary statistics of the portfolio weights and returns by asset classes. Asset classes are: (i) alternatives, defined as hedge funds, real estate, private equity, and infrastructure, (ii) public equities, and (iii) fixed income. The weighted sum of the weights times performance do not necessarily equal the portfolio returns because some pension funds in the sample only report aggregate performance.

	Count	Mean	Standard Deviation	25th percentile	Median	75th percentile
Portfolio Weights						
Alternatives: Hedge Funds / Real Estate / PE / Infrastructure	1602	0.126	0.099	0.056	0.110	0.175
Public Equities	1602	0.513	0.144	0.428	0.549	0.613
Fixed Income	1602	0.346	0.143	0.261	0.320	0.390
Fund Return by Asset Class						
Alternatives: Hedge Funds / Real Estate / PE / Infrastructure	1439	0.058	0.107	0.000	0.050	0.122
Equities	1029	0.048	0.142	-0.068	0.088	0.152
Fixed Income	1124	0.020	0.019	0.009	0.017	0.028
Excess Returns						
Alternatives: Hedge Funds / Real Estate / PE / Infrastructure	1442	-0.003	0.068	-0.003	0.000	0.001
Equities	1599	0.002	0.039	0.000	0.000	0.005
Fixed Income	892	0.005	0.031	-0.003	0.003	0.012
Portfolio Returns						
Portfolio Return	1801	0.034	0.095	0.000	0.001	0.101
Excess Portfolio Return	1201	-0.024	0.119	-0.105	-0.013	0.022
Fund-Level Realized Tracking Error	117	0.065	0.060	0.0003	0.059	0.119

Table 4: The Effect of Agency in Manager Contracting on Excess Returns

The far left column presents the first stage estimate, where log manager compensation is instrumented with `% Trustees who are Municipal Workers', `% Trustees with Public Sector Finance Experiences,`% Trustees who are Teachers', and `Outrage Wage' (=-log(average wages) of constitutuents). The final row presents the F-stat for the relevance of these instruments. The dependent variable in numbered columns is excess return over benchmark, with the asset class noted in the column. Columns (1)-(4) present the second stage IV results, and columns (5) - (8) present the corresponding OLS results for comparison. Weights are asset allocation weights, and the choice of weights correspond to the finest subset of allocatitons we consistently have for the columns. `Political Board' is equal to one for funds whose chair is appointed by the government. `Underfunded Index' is the funded ratio and age index of underfunding pressures. `Log Size' is the log of the lagged fund AUM. `Log MSA Income' is the log of MSA income. All money variables are in 2010 USD. Year fixed effects are included. Standard errors are clustered at the fund level. *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable:	Log Compen-sation	Log Excess Returns for Allocations in:				Log Excess Returns for Allocations in:			
		Portfolio	Alterna-tives	Public Equities	Fixed Income	Portfolio	Alterna-tives	Public Equities	Fixed Income
Model:	1st Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage	OLS	OLS	OLS	OLS
Log Compensation		0.0185*	0.0131*	0.0069**	-0.0074**	0.0117	0.00686	3.82E-06	-0.000481
		[0.0108]	[0.00767]	[0.00312]	[0.00294]	[0.00801]	[0.00425]	[0.00209]	[0.00196]
Political Board	-0.330***	0.0219	-0.0367*	0.00275	-0.00539	0.0174	-0.0414**	-0.0007	-0.00126
	[0.111]	[0.0159]	[0.0202]	[0.00298]	[0.00417]	[0.0137]	[0.0190]	[0.00323]	[0.00374]
UnderfundedIndex(lag)	0.00697	0.00468	0.000562	0.00164	0.000729	0.00465	0.000391	0.00186	0.000571
	[0.0425]	[0.00641]	[0.00576]	[0.00195]	[0.00225]	[0.00640]	[0.00569]	[0.00200]	[0.00224]
Log Size (lag)	0.273***	0.0114**	-0.00471	-0.000673	0.00328	0.0131**	-0.00329	0.000283	0.000869
	[0.0469]	[0.00553]	[0.00374]	[0.00166]	[0.00250]	[0.00566]	[0.00380]	[0.00185]	[0.00285]
Weight_H.F.	0.760	0.180	0.103			0.172	0.109		
	[1.009]	[0.150]	[0.162]			[0.147]	[0.161]		
Weight_P.E.	1.722*	-0.0198	0.0683			-0.0126	0.0729		
	[0.895]	[0.126]	[0.0891]			[0.119]	[0.0896]		
Weight_ R.E.	-3.985***	0.134	0.0251			0.0964	-0.00095		
	[0.976]	[0.117]	[0.0783]			[0.119]	[0.0767]		
Weight_Stocks (Domestic)	-0.0973	0.116**		0.0194		0.100*		0.0148	
	[0.559]	[0.0564]		[0.0144]		[0.0553]		[0.0138]	
Weight_Stocks (Non-Domestic)	1.289**	0.126**		0.0151		0.126**		0.0174	
	[0.587]	[0.0634]		[0.0173]		[0.0636]		[0.0162]	
Weight_Fixed Income	-0.655	0.119			-0.0277	0.106			-0.0325
	[0.598]	[0.0884]			[0.0210]	[0.0916]			[0.0244]
Weight _Cash					-0.0845				-0.0965
					[0.0542]				[0.0634]
% Trustees who are Municipal Workers	-0.955**								
	[0.484]								
% Trustees with Public Sect. Fin Exp.	-0.829***								
	[0.246]								
% Trustees who are Teachers	-0.0841								
	[0.223]								
Outrage (- log wages)	-0.0598								
	[0.152]								
Log MSA Income	1.084***								
	[0.150]								
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	290	290	311	327	256	290	311	327	256
Number of Funds	86	86	89	93	80	86	89	93	80
R-Squared	0.517	0.445	0.137	0.123	0.176	0.446	0.140	0.123	0.190
IV F-Stat	15.81								

Table 5: : The Effect of Agency in Manager Contracting on Tracking Error

Observations in this table are limited to one observation per fund, collapsed to funds who have at least 3 years of portfolio returns for which tracking errors can be calculated. The far left column presents the first stage estimate, where log manager compensation is instrumented with `% Trustees who are Municipal Workers' and`% Trustees with Public Sector Finance Experiences'. (We limited to two instruments because of the smaller sample.) The final row presents the F-stat for the relevance of these instruments. The dependent variable in numbered columns is the realized tracking error for the fund, calculated by regressing portfolio returns on benchmark returns with no constant for each pension fund. The residuals are squared, and we take the standard deviation of the mean squared error across time. Columns (1)-(4) present the second stage IV results, and columns (5) - (8) present the corresponding OLS results for comparison. Columns (1) and (5) present the result for the full sample. Columns (2) and (5) (Low Risk) limit the sample to those with below average portfolio weights in alterntives; columns (3) and (6), to above average weights in alternatives (high Risk). Weight_alterntives and weight_publi equities are asset allocation weights, leaving fixed income excluded. `Political Board' is equal to one for funds whose chair is appointed by the government. `Underfunded Index' is the funded ratio and age index of underfunding pressures. `Log Size' is the log of the lagged fund AUM. `Log MSA Income' is the log of MSA income. All money variables are in 2010 USD. *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1.

		(1)	(2)	(3)	(4)	(5)	(6)
Dependent Var:	Log Compensation	Portfolio Tracking Error			Portfolio Tracking Error		
Sample:		All	Low Risk	High Risk	All	Low Risk	High Risk
	1st Stage	2nd Stage	2nd Stage	2nd Stage	OLS	OLS	OLS
Log Compensation		-0.0515**	0.0265	-0.104**	-0.00658	-0.0106	-0.0083
		[0.0252]	[0.0264]	[0.0503]	[0.00883]	[0.0116]	[0.0144]
Political Board	-0.24	-0.0470**	-0.017	-0.0972**	-0.0153	-0.0176	-0.0206
	[0.181]	[0.0232]	[0.0300]	[0.0476]	[0.0156]	[0.0247]	[0.0203]
Underfunded Index	-0.0056	-0.0108	-0.0043	-0.0132	-0.00706	-0.00208	-0.0153
	[0.0647]	[0.00732]	[0.00938]	[0.0171]	[0.00554]	[0.00746]	[0.00966]
Log Size (lag)	0.159**	0.013	0.0166	0.0246	0.0110*	0.0155	0.0069
	[0.0766]	[0.00786]	[0.0126]	[0.0154]	[0.00577]	[0.0103]	[0.00772]
Weight_Alternatives	0.0563	0.154			0.0916		
	[0.967]	[0.111]			[0.0776]		
Weight_Public Equities	0.609	0.118			0.171***		
	[0.741]	[0.0830]			[0.0442]		
% Trustees who are Municipal Workers	-0.861						
	[0.596]						
% Trustees with Public Sect. Fin Exp.	-1.295***						
	[0.398]						
Log MSA Income	0.993***						
	[0.274]						
Constant	-0.278	0.449	-0.537	1.041*	-0.126	-0.0498	0.0742
	[3.166]	[0.314]	[0.431]	[0.529]	[0.116]	[0.186]	[0.202]
Observations	80	80	40	40	91	47	44
IV F-Stat	9.39						

Table 6: The Effect of Agency in Manager Contracting on Asset Class Weights

The far left column presents the first stage estimate, where log manager compensation is instrumented with `% Trustees who are Municipal Workers', `% Trustees with Public Sector Finance Experiences,`% Trustees who are Teachers', and `Outrage Wage' (=-log(average wages) of constitutuents). The final row presents the F-stat for the relevance of these instruments. The dependent variable in numbered columns is fund portfolio weight allocated to the asset class noted in the column. Columns (1)-(3) present the second stage IV results, and columns (4) - (6) present the corresponding OLS results for comparison. `Political Board' is equal to one for funds whose chair is appointed by the government. `Underfunded Index' is the funded ratio and age index of underfunding pressures. `Log Size' is the log of the lagged fund AUM. `Log MSA Income' is the log of MSA income. All money variables are in 2010 USD. Year fixed effects are included. *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. Two sets of standard errors are presented beneath the coefficient - standard errors clustered at the fund level (top) and robust standard errors under the seemingly unrelated assumption (bottom), inlcuded because of the joint determination of allocation weights.

		(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	Log Compen-sation	Asset Class Weight in:			Asset Class Weight in:		
		Alternatives	Public Equities	Fixed Income	Alternatives	Public Equities	Fixed Income
Model:	1st Stage	Tobit 2nd Stage	Tobit 2nd Stage	Tobit 2nd Stage	OLS	OLS	OLS
Log Compensation		0.0499	-0.116	0.0517	0.0117	-0.0198	0.00798
		[0.0162]***	[0.0201]***	[0.0162]***	[0.00700]*	[0.00862]**	[0.00783]
		[0.0314]	[0.0451]***	[0.0323]	[0.00979]	[0.0131]	[0.0132]
Political Board	-0.236	0.0238	-0.0658	0.0241	0.0012	-0.00865	-0.0018
	[0.103]**	[0.0173]	[0.0231]***	[0.0187]	[0.0144]	[0.0176]	[0.0160]
		[0.0328]	[0.0397]*	[0.0275]	[0.0286]	[0.0288]	[0.0214]
Underfunded Index (lag)	0.0194	0.0194	-0.00701	-0.0132	0.0195	-0.00738	-0.013
	[0.0402]	[0.00588]***	[0.00812]	[0.00658]**	[0.00563]***	[0.00692]	[0.00629]**
		[0.00882]**	[0.00891]	[0.00656]**	[0.00868]**	[0.00769]	[0.00639]**
Log Size (lag)	0.28	0.00467	0.0164	-0.0139	0.0142	-0.00773	-0.00298
	[0.0397]***	[0.00669]	[0.00892]*	[0.00722]*	[0.00540]***	[0.00664]	[0.00603]
		[0.0116]	[0.0193]	[0.0124]	[0.00777]*	[0.0102]	[0.00822]
% Trustees who are Municipal Workers	-1.294						
	[0.455]***						
% Trustees with Public Sect. Fin Exp.	-1.054						
	[0.207]***						
% Trustees who are Teachers	-0.00405						
	[0.210]						
Outrage (- log wages)	0.036						
	[0.139]						
Log MSA Income	1.04						
	[0.128]***						
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y
Observations	334	334	334	334	334	334	334
Pseudo R-squared	0.423				-0.135	-0.054	-0.054
IV F-Stat	23.21						