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Public Pension Accounting Rules and Economic Outcomes

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Abstract

We find a negative association between a state's fiscal condition and the use of discretion in applying Governmental Accounting Standards Board (GASB) rules to understate pension funding gaps. We also find that the use of discretion is negatively associated with states' decisions to increase taxes and cut spending. In addition, we find that the funding gap understatement is positively associated with higher future labor costs. Importantly, this association is primarily attributable to the GASB methodology, which systematically understates the funding gap. This suggests that the GASB approach is associated with policy choices that have the potential to exacerbate fiscal stress.

1. Introduction

With the financial crisis in 2007 and 2008, the subsequent recession, and the resulting loss of jobs, there has been a heightened interest in the financial outlook of state governments. In particular, politicians, voters, capital providers, and regulatory bodies have all focused on whether the deterioration in states' fiscal wellbeing and burgeoning debt balances will affect their tax policies and their ability to provide entitlement programs. In this paper, we conjecture that politicians will view defaulting on debt, raising taxes, or cutting entitlement programs to be costly political responses to fiscal stress, and as a result, politicians will use mechanisms like accounting discretion to mask deficits. We also conjecture that there are economic outcomes associated with the use of accounting discretion, as outputs from the accounting system serve as inputs into a variety of economic decisions made by governmental entities.

We focus our analysis on whether states engage in actions to mask the size of pension funding gaps and thus reduce the size of pension contributions during periods of fiscal stress and whether there are economic outcomes associated with those actions. Pension obligations are among the largest obligations states face, and taking accounting actions to improve the funded status of these obligations may reduce a state's expenditures on pensions and provide states with the flexibility to avoid raising taxes or cutting entitlement programs during economic downturns. However, using accounting discretion to reduce funding gaps is likely to result in an understated cost of labor being reflected in the state's accounting system. This is particularly important as the information that is generated by the states' accounting system serves as inputs into states' budgets, appropriations, and other control mechanisms. When an accounting system understates the costs associated with pension benefits, states may invest more in labor, as the "true-cost" of each worker is not reflected in the decision-maker's information set.

We argue that there are several elements of GASB pension reporting rules that allow states to understate their pension funding gaps, and thus lower their annual pension related expenditures.[1] In particular, governmental entities discount future pension benefits using the expected investment return on assets held in the pension trust and have the discretion to amortize investment gains and losses over future reporting periods. Jointly, these rules provide financial reporting discretion to politicians so they can reduce funding gaps and required contributions to the pension fund, which may alleviate budgetary stress and the need to increase taxes and cut spending. Thus, the main hypotheses we investigate in the paper are whether states understate their pension funding gaps in periods of fiscal stress, whether understated pension funding gaps are associated with states' decisions to engage in mid-year spending cuts and tax increases, and whether the extent to which states understate their pension funding gaps is associated with future employment costs.

To provide evidence on these hypotheses, we collect data on the state's pension obligations from two sources: the Public Pension Coordinating Council's PENDAT Survey of State and Local Government Employee Retirement Systems and the Boston College Center for Retirement Research for fiscal years from 1990-2009. We supplement this data by hand collecting information for missing plan-years directly from the state's Comprehensive Annual Financial Reports (CAFRs) and pension plan valuation reports. After accounting for missing data, we have 984 state years with pension data.

[1] The GASB released new accounting standards for public pension plans in 2012. These standards, GASB Statements No. 67 and 68, are effective for fiscal years beginning after June 15, 2013 and June 15, 2014, respectively. Because of this timeline, all of our analysis is based on the prior regulatory regime. However, we discuss the implications of our results for these new standards in the conclusion.

We start our analysis by investigating the relation between the extent to which states understate their pension funding gaps and measures of the states' fiscal condition.[2] We develop a measure of the extent to which states understate their pension funding gaps by comparing the funding gap reported in the state's accounting records under the GASB's rules to the funding gap they would have reported had they followed the Financial Accounting Standards Board's (FASB) rules. We use the funding gap calculated under the FASB rules as our benchmark because it approximates the settlement cost of the pension liability and uses the market value of the pension assets. We believe this number more accurately reflects the true size of the funding gap. The FASB approach is also consistent with the one advocated by academics (see for example, Novy-Marx and Rauh, 2011) and adopted by most other developed countries, including Canada and many European countries.

We then decompose the total understatement of the pension funding gap into three pieces: the portion that is related to the use of discretion to overestimate the expected return on plan assets, the portion that is attributable to the amortization of realized and unrealized investment returns, and the portion that reflects differences between the GASB's and FASB's rules for the selection of the appropriate discount rate. We measure the extent to which a state is fiscally stressed using two variables. Our first variable measures the extent to which the state is running a budget deficit in the current fiscal year and our second variable measures the extent to which a state has reserves to meet any fiscal shortfall.

We find that the extent to which a state is fiscally stressed is associated with the magnitude of the pension funding gap understatement. Specifically, we find that states over

[2] We focus on developing a measure of the extent to which states understate their funding gaps, and argue that the extent to which states understate their funding gaps will affect the annual expenditures states make for their pension obligations. As we discuss below, understated funding gaps can reduce expenditures for both the normal and amortization components of the Annual Required Contributions (ARC) for a state pension plan.

estimate the expected return on plan assets to a greater extent during periods when they are running budget deficits and when they have a relatively smaller cushion in their general fund balances. A higher expected return on assets will produce a lower pension liability, and hence a lower funding gap. These results suggest that states use the discretion allowed under the GASB rules to understate the funding gap when they are financially constrained. We also find that states overestimate the expected return on plan assets during periods in which the governor is in a relatively more competitive election and during periods in which the state issues debt. These results are consistent with findings in prior studies that states have incentives to manipulate the outputs of the accounting system to influence the outcomes of elections (Kido et al., 2012) and to influence debt costs (Baber and Gore, 2008). We do not find any evidence that states opportunistically set the amortization period for investment gains and losses to influence elections, reduce debt costs, or to inflate fiscal performance.

Our first set of tests provides indirect evidence that states manipulate their funding gaps to avoid raising taxes or cutting expenditures. Our second set of tests examines this question more directly by investigating whether the accounting discretion states use to understate their funding gaps reduces the extent to which fiscal stress is associated with states' decisions to raise taxes or cut expenditures. Consistent with our expectation, we find that states that overestimate the expected return on plan assets to a greater extent are less likely to engage in midyear tax increases and midyear expenditure cuts when they face fiscal stress. These results suggest that using accounting discretion to understate pension funding gaps can reduce the extent to which states have to engage in other more politically costly actions like increasing taxes or cutting expenditures in response to financial difficulties.

We conclude our paper by investigating whether there is a relation between states' future payroll costs and the extent to which states understate their pension funding gaps. In this analysis we model future payroll costs to be a function of the reported funding gap, the unreported funding gap, and various control variables for the demand for public service and the state's economic condition. The reported funding gap is obtained from the financial statements prepared under the GASB rules. The unreported funding gap is equal to the understatement calculated as we describe above. We measure states' future payroll costs over a one, three, and five-year horizon from the year the state sets its pension assumptions. We find a weak, positive relation between the expenditures on state payrolls in year T+1 and the reported pension funding gaps in year T. However, as we move out in time to year T+3 and year T+5, we find that this relation becomes insignificant. These results suggest that states with larger reported pension funding gaps tend to spend more on employment in the short term. However, over time, states respond to the reported funding gaps and reduce spending on their employment.

We also find a positive relation between the expenditures on state payrolls in year T+1 and the unreported pension funding gaps in year T. However, unlike our tests of the reported funding gap, we find that the relation between the unreported funding gap and payroll persists three and five years into the future. These results suggest that by not reporting the true economic costs of pension obligations, states tend to spend more on labor both in the short and long terms. In addition, we find that this positive relation is attributable to the understatement related to the design of the GASB rules and the results are robust to a change specification. Overall, these findings highlight that discretionary actions under the GASB rules, like distorting expected rates of returns on assets or choosing inappropriate investment smoothing horizons, are relatively transparent, and thus do not affect employment decisions. In contrast, the non-discretionary

portion of the funding gap understatement masks the true cost of each employee and government officials do not (or cannot) undo the understatement in their hiring decisions.

Our findings extend the literature on public pensions. The debate on public pensions is driven by the concern that states use a discount rate that is too large. As a result, states understate their pension funding gaps, resulting in insufficient current contributions, and hence an unfair shifting of the cost of these plans to future generations. We find that states are more likely to understate pension funding gaps during periods of fiscal stress. We also find that funding gap understatements are associated with a reduced likelihood of tax increases and expenditure cuts during periods of fiscal stress, and that these understatements are associated with future increases in payroll expenditures. Importantly, the increases in payroll expenditures appear related to the inherent design of the GASB's rules. Therefore, it is not only the case that the current GASB regime poses intergenerational fairness issues (by not requiring sufficient pension contributions), but also that it is associated with policy choices (such as increased labor expenditures) that have the potential to exacerbate public sector fiscal stress.

The paper proceeds as follows. Section 2 provides background information on financial reporting for public pension plans and Section 3 develops the hypothesis. Section 4 discusses our research design and Section 5 describes our sample. Section 6 presents our empirical findings and Section 7 concludes.

2. Background

2.1 GASB's Pension Accounting Rules

During the period of our study the financial reporting rules for pension plans of governmental entities were codified under GASB Statement No. 25, *Financial Reporting for*

Defined Benefit Pension Plans and Note Disclosures for Defined Contribution Plans, and GASB Statement No. 27, *Accounting for Pensions by State and Local Governmental Employers*. These rules define how states determine the discount rate used in calculating the present value of their pension obligations and the methods states use to determine the values of the assets that are being held to satisfy these obligations.

The GASB rules recommend that future pension benefits be discounted at a rate equal to the expected investment return on the plan's current and future assets.[3] Thus states have the ability to assume artificially high expected rates of return on plan assets, which will reduce the size of their pension liabilities, resulting in smaller pension funding gaps and potentially smaller pension contributions.[4] The GASB rules also allow states to amortize realized and unrealized investment gains and losses on the assets held in the pension trust over future reporting periods.[5] Thus, states can change the amortization periods to increase the value of the pension assets, and reduce the size of any funding gaps and potentially reduce the size of their pension contributions.[6]

By providing states with the flexibility to both reduce the size of their pension funding gaps and pension contributions, the GASB also provides states with the ability to use this accounting discretion to avoid having to enact tax increases or cut spending in times of fiscal

[3] GASB 25, paragraph 36c "… the investment return assumption (discount rate) should be based on an estimated long-term investment yield for the plan, with consideration given to the nature and mix of current and expected plan investment …."

[4] GASB 27 establishes rules for calculating the Annual Required Contributions (ARC) for governmental pensions. The ARC has two components (1) the normal cost, which is the present value of pension plan benefits accrued for the current year, and (2) a provision for amortizing any funding gap (or unfunded actuarial accrued liability) over a period of not more than 30 years. Changing pension assumptions affects both the calculation of normal cost and the amortization of the funding gap. Thus changing pension assumptions can reduce states' expenditures for their pension contribution.

[5] GASB 25, paragraph 140 "…the valuation of assets generally should reflect *some function of market value*, a term that includes both current market values and values produced by techniques that smooth the effects of short-term volatility in market values." "…, the Board has not placed constraints on the kinds of smoothing techniques or the length of smoothing periods used in the actuarial valuation of assets."

[6] For example, California chose to amortize the investment losses for fiscal 2007 over a longer amortization period than it had used prior to that time, thus leading to a higher actuarial value of assets starting with its 2008 fiscal year.

distress. For example, in fiscal 2008 the California Public Employee's Retirement Fund (PERF) had a funding gap of approximately $35 billion, with a reported pension liability of $268 billion and an actuarial value of assets of $233 billion. The Annual Required Contribution (ARC) was approximately $7.2 billion, which consists of a normal cost component of $5.0 billion, and an amortization component of $2.2 billion. The reported discount rate was 7.75%. Increasing this discount rate by an additional 25 basis points would decrease the funding gap by $10.7 billion.[7] It would also reduce California's ARC for their pensions in 2008 by approximately $790 million. Specifically, the normal cost component of the ARC would be reduced by approximately $254 million[8], and the amortization component would be reduced by approximately $536 million.[9] The deficit reported by California for this fiscal year was only $412 million. Thus, if California had increased its discount rate by 25 basis points, it would have been sufficient to eliminate the deficit entirely.[10]

2.2 Comparing the GASB's to the FASB's Pension Accounting Rules

The methodology outlined under GASB 25 and 27 is in direct contrast to the methodology required under Statement of Financial Accounting Standards (SFAS) No. 87, *Employers' Accounting for Pensions*. SFAS 87 requires that future benefit payments be

[7] The duration of the plan is about 17 years. Therefore, a 25 basis point increase in the discount rate would decrease the total pension liability by 4% ($=1.17^{0.25}-1$), or $10.7 billion (4% x $268 billion). Since the plan is underfunded, the funding gap would also decrease by $10.7 billion.

[8] Since the normal cost is the liability accrued by active participants during the current year, we use the duration of the pension plan for active members (22 years) to generate this estimate. A 25 basis point increase in the discount rate would decrease the pension liability for the active participants by 5.1% ($=1.22^{0.25}-1$). Since the normal cost is the liability accrued by active participants during the current year, the decrease in the normal cost due to a 25 basis point reduction in the discount rate is also 5.1%, or $254 million (5.1% x $5.0 billion).

[9] Since the California PERF amortizes the funding gap resulting from changes in actuarial assumptions over 20 years, the decrease in ARC is $10.7 billion/20 = $536 million.

[10] The California example reported above is not unique in our sample. Over the 2001-2009 period (i.e. the time period for which we have pension contribution information), the pension contribution was approximately 9% of total general fund expenditures. During this period there were 237 state-years in which a deficit was reported. The pension contribution was on average 6.1 times the size of the deficit. Therefore, a reduction in the pension contribution of 11% (i.e., $790/$7,200, which is the percentage decrease calculated above for the California example) would, on average, eliminate approximately two-thirds of the reported deficit (i.e., 6.1 x 11%).

discounted using an interest rate that reflects the rate at which the obligation to pay the pension benefits can be settled rather than the expected investment return on the pension assets.[11] In seeking these rates, the rule further suggests employers look to "rates of return on high-quality fixed-income investments currently available and expected to be available during the period to maturity of the pension benefits." In practice, companies in the U.S. typically use zero-coupon duration-matched Aa corporate bond rates to determine their pension liability for financial reporting purposes. Using an Aa rate provides an estimate of the cost of extinguishing the pension liability through the purchase of an annuity contract from a highly rated insurance company.

The FASB and GASB advocate two different approaches to calculating pension liabilities in part because there are inherent differences between for-profit and governmental entities, and there are inherent differences in the role of accounting information and the financial reporting process in these organizations. The FASB's approach is designed to provide an estimate of the cost of settling the obligation to pay pension benefits through the purchase of an annuity contract. In contrast, the GASB's approach supports a pension liability calculation that is primarily useful in setting a reasonable contribution schedule, and allows the use of amortization schedules in the determination of pension assets that mitigate the volatility in annual contribution requirements. Because of this, the GASB approach does not provide an accurate reflection of the settlement cost of the pension liability.

[11] SFAS 87, paragraph 44 "Assumed discount rates shall reflect the rates at which the pension benefits could be effectively settled." Additional discount rate guidance is provided by the SEC in EITF Topic No. D-36, which states: "The objective of selecting assumed discount rates is to measure the single amount that, if invested at the measurement date in a portfolio of high-quality debt instruments, would provide the necessary future cash flows to pay the benefit obligation when due. Notionally, that single amount . . . would equal the current market value of a portfolio of high-quality zero coupon bonds."

We suggest that the FASB settlement cost approach provides a more accurate reflection of the "true costs" of retirement benefits, consistent with others (e.g., Novy-Marx and Rauh, 2011). Therefore, we compare the funding gap calculated under the FASB's rules to the funding gap calculated under the GASB's rules to derive a measure of the extent to which states' pension funding gaps are understated. We then decompose this understatement to obtain measures of the discretion used by states to influence their accounting reports and the extent to which pension understatements are an artifact of the GASB's rules. We focus on two discretionary elements under GASB rules: the choice of expected returns on assets, and the amortization of realized and unrealized returns on plan assets.[12] After isolating these two discretionary portions of the understatement of the funding gap, we categorize the remainder of the understatement to be driven by the GASB's rules.

3. Hypothesis Development

We begin our analysis by examining the incentives states have to understate their pension funding gaps. Watts and Zimmerman (1978) suggest that in the for-profit sector there are a variety of different motivations (like debt, compensation contracts, and political forces) that influence the accounting choices made by firms. In the accounting literature, there are significantly fewer theoretical underpinnings for the factors affecting the accounting choices made by governmental entities. In the political science literature, Stiglitz (2002) highlights the tension underlying a government's incentives to be transparent, arguing that "Democratic societies have a strong presumption in favor of transparency and openness in government. But

[12] The main reason why we view the amortization of realized and unrealized returns on plan assets as discretionary is because it is something that the GASB rules *allow* rather than *require*. The GASB rule allows states to recognize all gains and losses immediately, or to amortize these gains and losses over extended periods (and even change these periods when the losses are particularly large). Therefore, while the rules allow many choices, the specific choice is at the discretion of the state.

there has also long been recognition that on their own, governments and their leaders do not have the incentives to disclose, let alone disseminate, information that is contrary to their interests."

Consistent with this idea, we suggest that elected officials will have the strongest motivation to obfuscate the true size of their pension funding gaps during periods in which they face fiscal stress. By understating their pension funding gap during periods of fiscal stress, states reduce their Annual Required Contributions to the pension fund, and thus can reduce their expenditures on pension obligations.[13] Virtually every state has some form of balanced budget restriction, which requires a balancing of expenditures and revenues. Thus, in periods when revenues fall below expenditures, or in periods when there are relatively fewer funds available to meet budget shortfalls, states have incentives to use accounting discretion to reduce their pension obligations and thus reduce required contributions to pension trusts. Thus our first hypothesis is:

H1: The extent to which a state understates its pension funding gap is associated with the extent to which the state is experiencing fiscal stress.

Budget shortfalls are likely to be of particular importance to state politicians, because absent accounting manipulations, balanced budget provisions will force states to either cut expenditures or increase taxes when there is an unexpected shock to revenues or expenses. Since both of these alternatives are likely to be viewed negatively by voters, we suggest that politicians have incentives to resort to accounting manipulations in lieu of real tax or expenditure changes. This idea is consistent with Gold (1983) who states that "a state … usually has considerable latitude to accelerate tax collections, defer outlays, and adopt accounting practices which avert a deficit." Understating pension obligations will bring immediate budget relief by reducing

[13] Reducing the ARC will, in general, reduce state expenditures for pension obligations but this is not necessarily always the case. For the 2001-2009 fiscal years (a period in which we have the data on ARC), we find that the ARC is 95% correlated with the actual contribution made by states to their pensions. Thus for most states, reducing the ARC will lead to reduced funding, but in some states this will not be true, which should bias against finding results.

required contributions to the pension trust and thus reduce the need to increase taxes or cut expenditures. Thus we predict that:

> ***H2: The extent to which a state engages in mid-year expenditure cuts as a response to fiscal stress is negatively associated with the extent to which the state understates its pension funding gap.***
>
> ***H3: The extent to which a state engages in mid-year tax increases as a response to fiscal stress is negatively associated with the extent to which the state understates its pension funding gap.***

We further conjecture that the understatement of pension funding gaps may affect future state hiring through the following two mechanisms. First, a state's accounting system is a central source of information that is likely to be used in a variety of different settings, including the setting of appropriations and the setting of the annual budget. When states underestimate pension funding gaps, they distort this information system so that it reflects relatively lower labor costs, which may result in states spending more on labor. For example, in its centralized budgeting process, Massachusetts derives a fully burdened rate for employees, which includes pension costs for the employees' retirement.[14] This information is then used to estimate the cost of hiring additional workers. As a result, the pension costs recorded in the state's accounting system can have a direct impact on its investments in labor. Second, understating pension obligations and funding gaps allows governments to reduce required contributions and makes more funds available for spending on employment. The effect of pension costs on public sector budgets and employment is widely acknowledged in the press, especially due to the recent surge in state and local pension costs.[15]

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[14] See http://www.mass.gov/anf/budget-taxes-and-procurement/admin-bulletins/fringe-benefits-payroll-taxes-and-indirect.html, which states in part that "Department heads are responsible for budgeting these [fringe benefit] costs from the applicable funds." The fringe benefit cost for retirement plans for 2010 was 6.16%.

[15] For example, in his 2013 testimony, New York City Mayor Michael R. Bloomberg stated that due to rising pension costs, local governments are starting to reduce the hiring of police, firefighters, and teachers. See http://www.brookings.edu/research/opinions/2012/03/13-pensions-states-gordon

The association between the pension funding gap understatement and state payroll expenditures depends on how the GASB information is used in employee hiring and compensation decisions. On the one hand, if the GASB information is used without any adjustments for understatements, employee costs will be underestimated and this can lead to increased hiring or payroll commitments.[16] Under this view, the funding gap understatement is likely to result in larger accumulated employee cost over potentially long periods. On the other hand, the existence of significant pension obligation understatements due to the GASB reporting methodology has been widely acknowledged in both the financial press and in academic work. For example, a report published by Moody's finds that when more appropriate discount rates are used to value public pension liabilities, "the 50 states have, in aggregate, just 48 cents for every dollar in pensions they have promised.[17]" Under this view, the understatements of funding gaps are transparent and should be unrelated to payroll expenditures. This leads to our fourth hypothesis (stated in alternative form):

> ***H4: The extent to which a state understates its pension funding gap is associated with its future payroll expenditures.***

4. Research Design

4.1 Estimation of pension funding gap understatement

We calculate the total funding gap understatement (TTL_UNDSTMT) as the difference between the estimated funding gap under an unbiased application of FASB rules and the reported funding gap under the GASB rules. We estimate the FASB funding gap by taking the difference

[16] For example, in 2002 San Francisco increased its employee costs by 7.5% because it incorrectly believed that its pension program was overfunded based on the GASB financial data. See http://www.publicsectorinc.com/psi_articles/2010/12/unrealistic-pension-accounting-rules-covering-a-multitude-of-shortfalls.html

[17] See http://dealbook.nytimes.com/2013/06/27/moodys-shows-wider-pension-gap-for-states/?_r=0

between the estimated pension liabilities discounted at the Treasury yield and the market value of the pension assets.[18] The reported funding gap is the difference between the reported pension liabilities and the actuarial value of assets as reported by the state under GASB. A funding gap is understated if the estimated FASB funding gap is larger than the reported funding gap. We then decompose TTL_UNDSTMT into three components: the understatement of the funding gap due to the use of discretion in estimating expected returns on plan assets (LIAB_UNDSTMT_DISC), the understatement (overstatement) of the funding gap due to the overstatement (understatement) of assets by amortizing realized and unrealized returns on plan assets (ASSET_OVSTMT), and the remainder of the understatement that is due to the design of the GASB rule (LIAB_UNDSTMT_RULE). Figure 1 depicts graphically the composition of the TTL_UNDSTMT.

The first element, LIAB_UNDSTMT_DISC, is the understatement of pension liabilities resulting from the difference between what a state used for its discount rate and what the rate would be if the state followed an unbiased application of the GASB rules. GASB allows broad discretion in setting discount rates, and states often use this discretion to set high discount rates and understate their pension liabilities.[19] We measure the discretion associated with setting abnormally large expected returns on assets (i.e. high discount rates) by estimating a "discretion-free discount rate" that is a function of the assets held in the pension trust. We estimate the

[18] As noted earlier, FASB guidance requires corporate pension plan sponsors to use zero-coupon duration matched Aa corporate bond rates to discount promised pension benefits, as a liability calculated using this rate approximates the settlement cost of the pension benefits. For public pension plans, there is some debate as to the appropriate discount rate for the purposes of estimating the settlement cost because the guarantees on public pensions are different from those on corporate pensions. For example, one could argue that public pensions are guaranteed by the state which would suggest that the state general obligation (GO) bond yield is the appropriate discount rate, or that the federal government is the ultimate guarantor which would suggest that the Treasury yield is the appropriate discount rate. Our use of the Treasury yields follows Novy-Marx and Rauh (2011).

[19] For example, California used discount rates that exceeded the actuary's recommendation for several of the most recent years. Similarly, Massachusetts uses a rate that is set by the legislature, and that is noted by the state's actuary as being higher than his recommendation in recent years.

discretion-free discount rate by multiplying the percent of pension assets allocated to each broad asset class by the long-term expected investment return on that asset class. This methodology is generally referred to as the building block approach in pension accounting guidelines, and it is the most common method that pension plan sponsors use to estimate the expected investment return on pension assets.[20]

To ensure consistency across states, we use five different asset categories: equity, fixed income, real estate, cash and short-term investment, and other.[21] We assign each asset class with long-term expected returns of 8%, 5%, 6%, 1% and 9%, respectively.[22] These return assumptions were gathered from a report prepared in 2005 by Hewitt Associates, an independent global benefit consulting company.[23] Prior studies that examine expected investment returns on pension assets have generally focused on whether higher assumptions are tied to higher equity allocations (e.g. Amir and Benartzi, 1998). Our methodology is an extension of this approach. This methodology requires a set of unbiased anticipated returns for each asset category. Because we do not have access to these unbiased anticipated returns by asset class for each year, the estimated expected return on assets only changes due to changes in asset allocations, and not due to the passage of time. However, since these anticipated returns are long-term, they should have small variation over time.[24] Moreover, we include year fixed effects in all of our specifications,

[20] A report entitled "Establishment of Discount Rate Assumption for the PERF", produced by the Actuarial Office of California Public Employees' Retirement System (CalPERS) and available online at http://www.calpers.ca.gov/eip-docs/about/board-cal-agenda/agendas/bpac/201103/item7a-0.pdf illustrates the connection between asset allocations and the discount rate under the building block approach as implemented by CalPERS.

[21] The "other" category usually includes specialized high return investment vehicles, such as hedge funds and private equity.

[22] For example, for a state with 60% equity, 30% bond and 10% real estate, we would estimate the discretion free GASB discount rate to be 6.9%.

[23] Hewitt Associates started preparing such reports in 2003 in response to updated accounting guidelines for corporate plans. These reports are not publicly available. However, a similar report, prepared by Pension Consulting Alliance, Inc. (PCA) for 2012, is available online at http://www.pensionconsulting.com/pdfdocs/2012_PCA_Asset_Class_Assumptions_Report.pdf

[24] A private conversation with a state's actuary confirms that the expected returns on plan assets are usually over 30+ years, and therefore, there is very little variation over time.

which reduce the influence of not allowing for inter-temporal variation. In robustness tests, we use an alternative measure based on the average expected return assumption for corporate pension plans to allow for inter-temporal differences in the expected investment return assumptions. The results of these tests are similar to those reported in the paper.

The second element of our decomposition, ASSET_OVSTMT, is equal to the difference between the smoothed value of pension assets used in the actuarial valuation and the market value of pension assets. The GASB rules, which allow for the amortization of investment gains and losses over time, provide states with the ability to change amortization approaches to provide immediate budget relief. We note that these discretionary changes are usually confined to periods immediately following a significant stock market boom or decline[25], and thus are likely to have the most impact during periods of fiscal distress or wellbeing.

The final element, LIAB_UNDSTMT_RULE, is equal to the difference between our estimate of the discretion-free pension liability and the pension liability calculated using the Treasury yields. Using the Treasury yields to discount the pension liability is reasonable in that promised pension benefits are protected by state constitutions and it is legally difficult (if not impossible) to break this promise. However, in robustness tests, we investigate whether our results are sensitive to the use of either Aa corporate bond rates or state general obligation (GO) bond yields as alternative discount rates. To calculate the appropriate rate for each plan, we

[25] For example, New Jersey abandoned its practice of "smoothing" asset returns and revalued assets at their market values as of June 30, 1999, at close to the peak of the technology bubble. This resulted in a significant reduction in the budgeted cost of the pension plan for the following fiscal year. Similarly, following the recent recession, California decided to amortize the losses associated with 2007 over an extended period, thus reducing the budgeted pension cost in the years immediately following the market downturn.

match the discount rate to the duration of the pension plan.[26] When we cannot find a perfect match, we interpolate the yields between the two closest maturities.[27]

4.2 Pension funding gap understatement and fiscal stress

We examine whether states use the discretion available under the GASB rules to mitigate fiscal problems using the following specifications:

$$PENSION\_UNDSTMT_{t-1} = \alpha_t + \gamma_i + \beta_1 DEFICIT_t + \beta_2 SURPLUS_t + \beta_3 TTLBAL\_RATIO_t + \beta_4 ISSUE\_STD_t + \beta_5 ISSUE\_LTD_t + \beta_6 ELECTION_t + \beta_7 ELECTION_t * COMP_t + \Theta CONTROLS_t + \varepsilon_t \quad (1)$$

where the dependent variable is the three components of the total understatement of pension funding gaps (i.e. LIAB_UNDSTMT_DISC, LIAB_UNDSTMT_RULE, ASSET_OVSTMT). We exclude 8 states that have both a biennial legislative cycle and biennial budgetary cycle from this analysis as prior research finds that those states do not respond in a timely manner to state fiscal conditions (Clemens and Miran, 2012).[28] We cluster standard errors by state and by year to correct for possible correlations across observations of a given state and of a given year (Petersen, 2009).

Equation (1) uses the understatement of the funding gap from the prior period as the dependent variable because the actuarial valuation performed during year t determines the reported funding gap (and any understatement of the funding gap) for year t-1. Take the Pennsylvania State Employees' Retirement System (SERS) as an example. Pennsylvania SERS

[26] We summarize the estimation of the duration for each plan in Appendix A.

[27] For example, Alabama ERS in fiscal year 2001 has an estimated duration of 18.5 years and the plan's actuarial valuation date is September 30. The 10 year Treasury yield on September 30, 2001 is 4.73% and the 20 year Treasury yield is 5.53%. The treasury does not have 18.5 year maturity yield. We interpolate between the 10 year maturity yield and the 20 year maturity yield to calculate the yield for 18.5 years. The interpolated yield is 5.41%.

[28] The 8 states we exclude are: Arkansas, Kentucky, Montana, Nevada, North Carolina, North Dakota, Oregon, and Texas. This list follows Clemens and Miran (2012), who analyze how states respond to deficit shocks. They find that only states with annual budgetary cycles, or states with biennial budgetary cycles and annual legislative cycles, respond to changes in the state's fiscal condition in a timely manner. Consistent with Clemens and Miran (2012), we find that including the 8 states in which both budgetary and legislative cycles are biennial in equation (1) significantly weakens our results.

has a fiscal year end date on June 30th. Assume year t is the fiscal year ending on 6/30/2009. The actuarial report for the fiscal year ending on 6/30/2008 (year t-1) was prepared using participant data gathered and provided to the actuary between 7/1/2008 and 6/30/2009 (year t) and using assumptions set between 7/1/2008 and 6/30/2009 (year t). For example, the SERS Board set the expected return on assets assumption on April 29, 2009 and Pennsylvania SERS issued its 2008 actuarial report on June 3, 2009.

We use two variables to measure a state's fiscal condition. The first variable captures the extent to which a state is running a deficit in the current fiscal year without any midyear adjustments. Specifically, we calculate EXP_MINUS_REV as the difference between final expenditures and final revenues in the general fund and then we add back any midyear spending cuts or tax changes. We undo these midyear adjustments to uncover the true fiscal condition of the state.[29] When expenditures exceed (are less than) revenues, the state is running a deficit (surplus). Since states may have different incentives to manipulate pension accounting when they are running deficits versus surpluses, we create separate variables for each. Specifically, DEFICIT (SURPLUS) equals EXP_MINUS_REV if the variable is positive (negative) and zero otherwise.

Our second variable captures the extent to which a state has reserves to cover any unexpected budget shortfalls. TTLBAL_RATIO is the ratio of total balance to expenditures in the general fund. Total balances are the sum of the general fund balances and the state's budget stabilization fund balances (i.e., rainy day fund balances). Total balances represent the cushion a

[29] Failure to undo the midyear adjustments obscures the true fiscal condition of the state. For example, assume during the fiscal year the governor learns that due to revenue shortfalls, expenditures are expected to exceed revenues by $1 million. To prevent the state from running a deficit, the governor carries out midyear spending cuts of $1.5 million, resulting in a final surplus of $0.5 million. Without undoing the midyear adjustment, we would incorrectly conclude that the state is doing well in the fiscal year. See more discussion on the importance of this adjustment in Poterba (1994).

state has when facing unexpected deficit shocks. Scaled measures of total balances are commonly used to evaluate government fiscal condition.[30] The higher the ratio, the better the fiscal condition.

Our remaining control variables account for non-fiscal incentives that may be associated with a state's decision to understate its pension funding gap. Baber and Gore (2008) find that governments' financial reporting is related to their cost of debt. If a state heavily relies on debt financing, it may have more incentives to understate the funding gap to lower the cost of debt capital. ISSUE_STD is the per capita short-term debt issued during the year and ISSUE_LTD is the per capita long-term debt issued during the year. Kido et al. (2012) find that state governments tend to understate their liabilities during an election year. ELECTION is a dummy variable equal to 1 if the year is a gubernatorial election year, and 0 otherwise. We further expect that state government's incentive to manipulate their pension is greater if the election is more competitive. Therefore, we allow ELECTION to vary based on the level of competition by including the interaction term, ELECTION*COMP, where COMP is a dummy variable equal to 1 if the election is competitive, and 0 otherwise.[31]

4.3 Pension funding gap understatement and midyear fiscal adjustments

We examine whether states use the discretion available under the GASB rules to reduce the likelihood of a midyear spending cut or tax increase using the following logit specification:

$$\begin{aligned} Pr(Midyear\ Adjustment_t) = {} & \alpha_t + \gamma_i + \beta_1 DEFICIT_t + \beta_2 SURPLUS_t + \beta_3 TTLBAL\_RATIO_t + \\ & \beta_4 DEFICIT_t * PENSION\_UNDSTMT_{t-1} + \\ & \beta_5 SURPLUS_t * PENSION\_UNDSTMT_{t-1} + \\ & \beta_6 TTLBAL\_RATIO_t * PENSION\_UNDSTMT_{t-1} + \\ & \beta_7 PENSION\_\ UNDSTMT_{t-1} + \Theta CONTROLS_t + \varepsilon_t \qquad (2) \end{aligned}$$

[30] For example, the National Association of State Budget Officer's Fiscal Survey of States suggests that a state is considered to be in good fiscal health if its total fund balances are greater than 5% of its general fund expenditures.
[31] We consider a gubernatorial election competitive if the vote for the winning candidate is between 48% and 52%.

where the dependent variable equals 1 if the state enforces midyear adjustments such as tax increases (DTAXINCREASE) or spending cuts (DSPENDCUT) in response to the fiscal stress. PENSION_UNSTMT is the three components of the total understatement of pension funding gaps (i.e. LIAB_UNDSTMT_DISC, LIAB_UNDSTMT_RULE, ASSET_OVSTMT). As with equation (1), we exclude 8 states that have both a biennial legislative cycle and biennial budgetary cycle and we cluster standard errors by state and by year.

We estimate equation (2) using a logit model because we are investigating whether tax increases and spending cuts can be avoided through the use of the discretion available under the GASB accounting rules. In robustness tests, we re-estimate equation (2) using an OLS model to investigate whether pension discretion reduces the magnitude of the spending or tax change. We recognize that equation (2) suffers from an endogeneity problem, because a state's decisions to increase tax, cut spending, and exercise discretion in pension assumptions in times of fiscal stress are jointly determined. To identify the causal effect of pension discretion on midyear fiscal adjustments, we would need at least 3 instruments (or exogenous shocks) and to jointly model these choices in a structural equation. We are unable to identify these instruments. Therefore, the results of equation (2) are association tests, not tests of causality.

We follow the labor economics literature (e.g., Matsusaka, 2009) and include a set of standard control variables that may affect state-level demand for government services. We also control for the actual funding status of the pension plan, because a funding deficit is likely to affect the state's decision to raise tax or cut spending. We discuss these variables in more detail in the following section.

4.4 Pension funding gap understatement and future labor costs

We test the association between the pension funding gap understatement and future labor cost using the following specification:

$$PAYROLL_{t+n} = \alpha_t + \gamma_i + \alpha_1 GASB\_FUNDGAP_t + \alpha_2 PENSION\_UNDSTMT_t + \Theta CONTROLS_{t+n} + \varepsilon_{t+n} \quad (3)$$

where the dependent variable is 1, 3, and 5 year ahead per capita payroll expenditure. We measure PENSION_UNDSTMT using its three components (LIAB_UNDSTMT_DISC, LIAB_UNDSTMT_RULE, ASSET_OVSTMT) to investigate which component, if any, is associated with future labor costs. GASB_FUNDGAP is the per capita reported pension liability minus the per capita reported actuarial value of assets. We include this variable to control for the effect of actual reported funded status of the pension plan on employee hiring. Since this analysis does not focus on how states respond to fiscal stress, we include all 50 states in the analysis.[32]

Our hypothesis predicts a positive association between future labor cost and pension funding gap understatement ($\alpha_2 > 0$). This positive association could arise because state officials do not internalize the true cost of their employees, or because lower pension contributions free up funds for spending on employment. We acknowledge that equation (3) cannot fully distinguish between the two alternatives.[33] However, the source of the association may provide evidence as to which alternative is the most likely explanation. More specifically, if the positive association is attributable to the rule related understatement (i.e., LIAB_UNDSTMT_RULE), this is consistent with state officials not fully understanding accounting information and investing more in labor. In contrast, if the positive association is attributable to the discretion related understatement (i.e., LIAB_UNDSTMT_DISC or ASSET_OVSTMT), this is consistent

[32] Excluding the 8 states that have both a biennial legislative cycle and biennial budgetary cycle does not affect our results.

[33] There are limited studies investigating the mechanisms through which accounting information affects real decisions. One exception is Shroff (2012), who finds that changes in accounting rules affect corporate investment decisions through changes in debt covenant slack and changes in managers' information sets.

with officials freeing up funds for employment spending through opportunistic reporting choices. In addition, by controlling for the reported funding gap, we capture any future payroll costs that are generated by providing smaller contributions.

We include a set of conventional control variables that may affect the demand for public services (Matsusaka, 2009). LnPI is the natural logarithm of state personal income per capita. POVERTY is the percentage poverty rate. DENSITY is population density defined as the number of residents per square mile. POPULATION is state population in thousands. We also control for state fiscal conditions using TTLBAL, the per capita total fund balance.

We include state fixed effects γ_i in all our tests (equations (1)-(3)). Therefore, our empirical approach exploits variation within the same state over time to account for unobserved state-specific factors that do not vary over time. This design allows cleaner identification of the impact of pension understatement on state policies. We also include year fixed effects α_t to capture omitted variables, such as general macroeconomic conditions, that are correlated with time. To reduce the effect of outliers, we winsorize all continuous variables at the top and bottom 1 percentiles. Appendix B lists detailed definitions of variables.

5. Sample Selection

We use multiple public data sources to construct our sample. We collect state sponsored defined benefit pension plan data from PENDAT Survey of State and Local Government Employee Retirement Systems, conducted by the Public Pension Coordinating Council, and from the Boston College Center for Retirement Research. The PENDAT pension plan data covers the 1990 through 2000 fiscal years and the Boston College data covers the 2001 though 2009 fiscal years. We crosscheck these data using the information from the National Association of State Retirement Administrators. When there were discrepancies between our data sources or there

was missing information [34], we collect the necessary information directly from the Comprehensive Annual Financial Reports (CAFRs) and pension plan valuation reports. We also collect each plan's valuation reports and CAFRs to obtain the information on the early retirement provisions and demographics of both the inactive and active participants to implement our duration estimation procedure outlined in Appendix A. We have 106 plans that have the information necessary to calculate funding gap understatement. After aggregating these plans to the state level, we have 984 state-year observations.[35]

We obtain monthly Treasury yield curves from the Board of Governors of the Federal Reserve System. The 30-year Treasury yields were discontinued between February 2002 and February 2006. For this period, we estimate the 30-year Treasury yields using the adjusting factor published by the U.S. Department of the Treasury. We match each plan's actuarial valuation date to the most recently published Treasury yields prior to the valuation date. We collect state governments' financial data from Census Bureau's Annual Survey of Governments and National Association of State Budget Officer's (NASBO) fiscal survey of states. The NASBO fiscal survey also provides information on enacted tax changes, midyear spending cuts, and the general fund budgets. We collect these data to construct the proxies for state fiscal conditions. We collect state employment data from the Census of Government Employment. The Census Bureau changed the base reporting period for measuring government employment and payrolls in 1996, and therefore we do not have employment related data in 1996. We collect a state's personal income data from the Bureau of Economic Analysis and a state's population data

[34] Data was often missing from the PENDAT survey. This occurred because the survey was optional, and therefore not every public retirement system provided the information each year.

[35] 47 states have 20 years of data (i.e. data for our full sample period). Maine and Tennessee have 14 years and West Virginia has 16 years of data. The missing data, which we are unable to obtain through CAFRs or valuation reports, are all in the early 1990s.

from the U.S. Census Bureau. We collect the size of the state in square miles from the American Community Survey by the U.S. Census Bureau.

6. Results

6.1 Descriptive statistics

Table 1 presents the average of each state's pension liabilities and pension assets during the fiscal years 1990-2009 (in $billions). Column [1] shows the reported pension liability, column [2] shows the estimated pension liability discounted at the discretion-free GASB rate, column [3] shows the estimated pension liability discounted at the Treasury yield, column [4] shows the actuarial value of assets, and column [5] shows the market value of assets. The pension liabilities increase as we move from column [1] to column [3] as the discount rate is typically reduced. During the sample period, the average reported discount rate is 8%, the average estimated discretion free discount rate is 6.8%, and the average Treasury yield is 5.9% (see Table 2).

The aggregate reported pension liabilities for state governments average approximately $1.77 trillion per year during the sample period. This number increases to $2.12 trillion when we measure the pension liability using the discretion-free GASB discount rate and to $2.68 trillion when we use Treasury yields.[36] California has the largest pension liability. Its reported pension liability averages $272 billion ($7,915 per capita) per year during the sample period. However, this amount soars to $412 billion ($11,890 per capita) discounted using the Treasury yields. The reported pension liability represents 32% of California's average GDP during the sample period. The next three states with the largest reported pension liabilities are New York, Ohio, and Texas.

[36] These liability numbers are considerably higher toward the end of the sample period. For example, if we only consider years after 2001 the average annual reported pension liability is about $2.5 trillion and the liability increases to over $4 trillion when discounted at the Treasury yields.

For each of these states, the average pension liability exceeds $100 billion and represents more than 20% of each state's GDP. The actuarial value of assets is fairly close to the market value of assets. This is expected since the averages of these two values should be fairly close when compared over a long sample period. The small difference between actuarial value of assets and market value of assets suggests that the understatement of pension funding gaps is largely driven by the understatement of pension liabilities, not by the overstatement of pension assets.

Table 2 reports summary statistics for the main variables. During the sample period, states on average invest 53% of their pension assets in equity, 35% in fixed income, 4% in real estate, 3% in cash, and the remaining 5% in the other category. We have a maximum of 888 observations for our regressions analysis.[37] We find that state sponsored pension funds are running deficits during the sample period. The average annual reported funding gap is $915 per capita. This number is on average understated by $3,062. Consistent with Table 1, we find that the understatement of the funding gaps mainly comes from the understatement of the plan liabilities. The average understatement of the pension liability due to the use of discretion is $1,246 per capita and the average understatement of liability due to the GASB rules is $1,978 per capita. During the sample period the actuarial value of the pension assets is on average smaller than the market value, constituting a negative asset overstatement of $163 per capita. However, this result is largely due to the market run-up prior to the technology bubble. If we exclude 1998-2000 from the sample, we find an average asset overstatement of $5 per capita (untabulated).

After adjusting for midyear spending cuts and tax changes, the average general fund deficit is $50 per capita and the average surplus is $28 per capita. Most of the deficits occur during the recession periods (i.e., early 90s, after the technology bubble of 2001, and the

[37] The state payroll data are from 1992-2010, with 1996 missing. This gives us 900 state-year observations. We lost 12 observations because West Virginia does not have pension data until 1994, Maine and Tennessee do not have pension data until 1996, and Texas does not have total balance data in 1998.

financial crisis period of 2008 and 2009) and most of the surpluses occur during the expansion period of 1995-2000. The ratio of general fund total balance to total expenditures has an average of 9.8%. The average midyear spending cut during the sample period is $15 per capita and the average enacted tax change is $5 per capita. 33% of the state-years enforce spending cuts and 36% of the state-years enact tax increases. We also find that during our sample period, states face the harshest fiscal condition in fiscal year 2009. During that year, the average deficit soars to $201 per capita, the average tax change is $46 per capita, and the average spending cut is $79 per capita (untabulated). The fiscal survey of states published by the NASBO states that fiscal year 2009 is "one of the worst, if not the worst, fiscal periods since the Great Depression."[38]

A state on average issues short-term debt of $0.092 per capita and long-term debt of $435 per capita per year. Since most of the states have gubernatorial elections every 4 years, 25% of the sample years have a gubernatorial election. Only 6% of the sample years have elections that are considered competitive. The average annual state payroll expenditures are about $707 per capita and the average total fund balance is about $238 per capita. An average state has a population of about 5.7 million and personal income per resident of $30,000. The average poverty rate is 12% and the average population density is 184 people per square mile.

6.2. Pension funding gap understatement and state fiscal conditions

We first examine whether the extent to which states understate their pension funding gaps is associated with their fiscal condition. Table 3 reports the regression results. We find strong evidence that a state's fiscal wellbeing is related to the use of discretion in calculating pension liabilities. Column [1] shows that when the dependent variable is LIAB_UNDSTMT_DISC, the

[38] Since many states experienced unusually high levels of fiscal stress in 2009, we perform sensitivity analysis to ensure that all our results related to state fiscal conditions are robust to excluding fiscal year 2009.

coefficient on DEFICIT is positive and significant (0.324, t-statistic of 2.873) and the coefficient on TTLBAL_RATIO is negative and significant (-3.259, t-statistic of -2.043). The magnitudes of the coefficients suggests that a $100 per capita deficit is associated with a $32.4 per capita understatement in state pension liabilities and a 1% decrease in the ratio of total fund balance to expenditures is associated with $3.3 per capita increase in pension liability understatement. As expected, we do not find states manipulating their pension liabilities when they are running surpluses. The coefficient on SURPLUS is not significant.

We also find that states are more likely to understate pension liabilities when they are issuing short-term debt during the year, but we do not find any association between long-term debt issuance and pension liability understatements. Since states usually use short-term debt to finance unexpected budget shortfalls, this result is consistent with our prediction that relieving a budget constraint is likely to be the first order consideration related to pension accounting manipulation. We also find that when the gubernatorial election is competitive, states are more likely to understate their pension liability.

Columns [2] and [3] show that none of the incentives are related to asset overstatement or rule related understatement of pension liability. This result is not surprising given that understatement of pension funding gaps is primarily driven by the understatement of liabilities, not by the overstatement of assets. In addition, by allowing states to use expected asset returns as the discount rates, the GASB rules systematically understate the pension liabilities in both good times and bad times. Therefore, it is expected that we find no relation between the rule related understatement and the state's incentives to underreport.

6.3. Pension funding gap understatement and midyear fiscal adjustments

Table 4 presents regression results on the association between the probability of midyear tax and spending adjustments and pension funding gap understatement. For presentation purposes, we scale the pension variables (LIAB_UNDSTMT_DISC, ASSET_OVSTMT, LIAB_UNDSTMT_RULE, and GASB_FUNDGAP) to thousands of dollars. Columns [1] and [2] show that the coefficient on DEFICIT is positive and significant, which suggests that states are more likely to enforce midyear spending cuts and tax increases when they are running deficits. We also find that the coefficient on TTLBAL_RATIO is negative and significant, which suggests that fiscally sound states (i.e. have a larger balance in the state general account) are less likely to have midyear spending cuts or tax increases. The coefficient on SURPLUS is insignificant in column [2] but positive and significant in column [1], which suggests that the larger the surplus, the less likely the state is to cut spending.[39]

We find that the effect of fiscal condition on midyear spending cuts and tax increases is mitigated by discretion related understatement of the pension liability. Specifically, the coefficient on the interaction term DEFICIT*LIAB_UNDERSTMT_DISC is negative and significant and the coefficient on TTLBAL_RATIO*LIAB_UNDERSTMT_DISC is positive and significant.[40] We find no evidence that rule related understatement of pension liability and pension asset overstatement are associated with the likelihood of midyear fiscal adjustments in

[39] Note that SURPLUS equals EXP_MINUS_REV if the variable is smaller or equal to zero and zero otherwise. Therefore the larger the surplus, the more negative the SURPLUS variable is.

[40] Ai and Norton (2003) argue that direct interpretation of the interaction term in nonlinear models provides incorrect information about the interaction effect. They propose an alternative estimator for the interaction effect in nonlinear models. However, Greene (2010) points out that the Ai and Norton measure has a different point estimate and standard error for every observation in the sample, making it difficult to draw statistical inferences using their measure. Kolasinski and Siegel (2010) suggest that the findings in Ai and Norton (2003) result from a mechanical saturation effect that arises in link functions that constrain the probability of occurrence to be between 0 and 1. They conclude that "in many contexts where researchers are primarily concerned with proportional marginal effects, the econometric best practice is to rely on the interaction term coefficient … for interpreting and statistically testing interaction effects."

times of fiscal stress. We also do not find that pension understatements are associated with the likelihood of fiscal adjustments in times of fiscal wellbeing.

To examine the economic significance of pension understatements, we calculate the marginal effects of state fiscal conditions on the likelihood of a spending cut or tax increase after moving LIAB_UNDERSTMT_DISC across its interquartiles and setting all the other variables at their mean values. We find that, for an average state with a $100 per capita deficit, moving the discretion related understatement of the pension liability from the 25th to the 75th percentile decreases the probability of a spending cut by 0.028 and the probability of a tax increase by 0.032, both of which represent a reduction in the probabilities of about 31%.[41] Given that the unconditional probability of a spending cut or tax increase is about 0.3 (see Table 2), these effects are economically significant.

Our predictions focus on whether midyear spending cuts and tax increases are less likely for states that understate their pension. Therefore, a logit model is the appropriate research design choice.[42] There are also econometric reasons why logit is the preferred approach. First, spending changes are right censored because while states may enact tax changes (either increase taxes or decrease taxes) after the budget passes, increases in appropriations outside of the usual appropriation cycle are less common and the NASBO does not provide such data. In addition, since midyear fiscal adjustments do not happen often, the data contains a significant number of zeros,[43] and an OLS specification is likely to yield biased coefficients (Wooldridge, 2002).

[41] For an average state with LIAB_UNDERSTMT_DISC at the 25th percentile, a $100 per capita deficit is associated with a 0.089 (0.103) probability of spending cut (tax increase). For an average state with LIAB_UNDERSTMT_DISC at the 75th percentile, a $100 per capita deficit is associated with a 0.061 (0.071) probability of spending cut (tax increase). Therefore, an interquartile change in LIAB_UNDERSTMT_DISC reduces the association between deficits and the probability of spending cut (tax increase) by 0.028 (0.032), which is about 31% decrease in the probability of a spending cut or tax increase (0.028/0.089, 0.032/0.103).

[42] We find similar results under a probit model.

[43] 67% of the state years have 0 midyear spending cuts, and 26% of the state years have 0 midyear tax changes.

Nonetheless, in untabulated analysis we test whether our results are sensitive to this particular choice by using an OLS model. An OLS model tests whether the magnitude of tax change (ΔTAX) or spending cut change (ΔOUTLAY) is associated with the magnitude of the pension understatement. We find weaker results when using ΔOUTLAY and ΔTAX as the dependent variables. Specifically, the coefficient on DEFICIT*LIAB_UNDERSTMT_DISC is negative and significant [*t*-statistic of -1.86] when ΔOUTLAY is the dependent variable, but negative and insignificant [*t*-statistic of -1.19] when ΔTAX is the dependent variable. In addition, the coefficient on TTLBAL_RATIO*LIAB_UNDERSTMT_DISC is positive and significant only at one tailed 10% level in the ΔOUTLAY regression [*t*-statistic of 1.520] and becomes insignificant in the ΔTAX regression [*t*-statistic of 0.604].

We perform additional robustness tests on the measurement of the fiscal condition variables. We calculate the DEFICIT and SURPLUS variables using revenues and expenditures recorded under a state's general fund, which is the key governmental fund as it holds almost all tax and fee collections and is used to pay recurring expenditures. Given that pension contributions are required annual expenditures, they are likely to be general fund expenditures.[44] This complicates our analysis because ideally we would like to measure a state's deficit status without any pension discretion and investigate whether pension discretion mitigates the effect of fiscal condition on midyear adjustments. However, this design is empirically challenging because we do not have nor do we know where to get the data necessary to estimate the discretionary component of the annual required contribution.

To address this issue, we take a conservative approach and exclude the entire reported pension contribution from the calculation of the DEFICIT variable. This test only includes 374

[44] Private conversation with a NASBO analyst confirms that although NASBO does not give states specific instructions to include spending for pension funds in general fund expenditures, most states consider spending for pension as a form of general fund spending.

observations since we do not have data on pension contributions prior to 2000. In addition, the fiscal variables have smaller variation, as now we do not have the expansion period of 1995-2000. Both factors weaken our results; however, in untabulated analyses we still find the coefficient on the interaction term DEFICIT*LIAB_UNDSTMT_DISC to be negative and significant for both spending cut and tax increase regressions [-0.017 with a *t*-statistic of -1.84 and -0.007 with a *t*-statistic of -2.60, respectively]. This suggests that pension discretion is associated with a reduced probability of spending cuts and tax increases when states are running budget deficits.

6.4. Regression results on future payroll expenditures

6.4.1. Main findings

Table 5 presents regression results on the association between pension funding gap understatement and future payroll expenditures. We find that future payroll expenditures are positively associated with the rule related portion of the understatement, but not the pension asset overstatement or the discretion related pension liability understatement. Combining with the results in Tables 3 and 4, this suggests that although states use discretion to understate their pension liability in response to fiscal stress and to reduce the probability of spending cuts or tax increases, this understatement is transparent in nature and state officials do not base their hiring decisions on this figure. In contrast, the understatement due to the design of the GASB rule is associated with states incurring higher labor costs.

In columns [2] and [3] we extend the testing window to future 3 and 5 years and find that the funding gap understatement has a long-term effect on states labor costs. We find that the statistical significance and the magnitude of the coefficient on LIAB_UNDSTMT_RULE

increase when we extend the testing window to 3 and to 5 years. One potential explanation is that state officials may take into account the past few years' estimated employee costs in their hiring decisions, so it takes time for the understatement to fully materialize. It is also possible that a new position takes time to be filled, and therefore, it takes time for the employment level to adjust.[45]

The magnitude of the coefficient on LIAB_UNDSTMT_RULE suggests that a $1,000 per capita understatement due to the high discount rate allowed under the GASB rule is associated with a per capita increase of $11 in public employee payrolls in the next 3 to 5 years. Given the average population during the sample period is about 5.7 million and the average rule related liability understatement is $1,978 per capita (see Table 2), the coefficients suggest that an average state spends an extra $125 million on hiring future employees due to the inherent methodology in the GASB rules.

Column [1] shows that the reported funding gap (GASB_FUNDGAP) is only weakly associated with next year's payroll expenditures (*p*-value = 0.06, one-tailed), and the variable becomes insignificant when we extend the window to future 3 and 5 years (columns [2] & [3]). These results suggest that states with larger reported funding gaps may spend more on employment in the short term, but that over time, these states respond to the reported funding gaps and reduce labor costs.

Regarding the control variables, we find that states in good fiscal conditions tend to increase spending on payrolls, as indicated by a positive and significant coefficient on TTLBAL.[46] States with high per capita income and low poverty rate spend more on public

[45] Using a long lag to allow employment to adjust to its new equilibriums is common in labor economics research. For example, Poterba and Rueben (1995) use a ten-year lag to study the effects of property tax limits on wages and employment of local governments.

[46] Our results are robust when we scale total balances by general fund expenditures.

workers, consistent with the idea that the demand for public services increases with citizen income. We also find that densely populated states spend more on their employees and more populated states spend less.[47] These results are in general consistent with prior studies.

We control for state heterogeneity and time effects by including state and year fixed effects. Our results are stronger both in terms of coefficient magnitude and statistical significance if we remove these fixed effects. For example, the coefficient on LIAB_UNDSTMT_RULE is 0.017 (*t*-statistic of 2.13) for T+1, 0.021 (*t*-statistic of 2.43) for T+3, and 0.024 (*t*-statistic of 2.70) for T+5. All the other pension variables (GASB_FUNDGAP, LIAB_UNDSTMT_DISC, ASSET_OVSTMT) remain insignificant across testing windows. The inclusion of state and year fixed effects also leads to high explanatory power of the model. The adjusted R^2 is above 97% across specifications, leaving little variation unexplained. However, even after removing the state and time dummies, the model still explains above half of the variation, a number that is high for a spending regression of this nature.[48]

One potential explanation for the positive association between pension understatement and future labor costs is that interest groups, such as unions, pressure state officials to increase hiring or compensation.[49] We examine this possibility by investigating whether the effect of pension understatement on future labor costs is larger for more heavily unionized states. We collect public employee union membership data from unionstats.gsu.edu, which compiled the data from the Current Population Survey (Hirsch and Macpherson, 2003). We consider a state heavily unionized (UNION = 1) if its median public employee union membership is above the sample median. We then allow the coefficients on the pension variables in equation (3) to vary

[47] The negative relation between population and payroll expenditure is likely mechanical because the payroll expenditure is measured in per capita. Our results are similar if we replace population with population growth.
[48] For example, the spending regression in Masusaka (2009) includes regional dummies, but only explains about one quarter of the variation.
[49] We thank the editor for this suggestion.

based on UNION by including the following interaction terms: GASB_FUNDGAP*UNION, LIAB_UNDSTMT_DISC*UNION, ASSET_OVSTMT*UNION, and LIAB_UNDSTMT_RULE*UNION.[50]

In untabulated results, we find that the association between the pension funding gap understatements and future labor costs is attributable to heavily unionized states. Specifically, the coefficient on LIAB_UNDSTMT_RULE is not significant across testing windows, which suggests that for weakly unionized states, rule related pension understatements do not drive up future labor costs. In contrast, the sum of the coefficients on LIAB_UNDSTMT_RULE and LIAB_UNDSTMT_RULE*UNION is positive and significant across the testing windows and the effect is stronger in the long term.[51] These results are largely consistent with the explanation that powerful unions may be one contributing factor that drives up future labor costs when pension costs are understated.

Overall, Table 5 shows that pension funding gap understatements are associated with higher future labor spending. We find that this result is primary attributable to rule related and not discretion related understatements. We also find that states adjust their future hiring in response to reported funding gaps. Jointly these results seem more consistent with the interpretation that pension funding gap understatements make it more difficult for state officials to fully understand the true cost of their employees with the result that they invest more in labor. However, we also note that we cannot completely rule out the explanation that funding gap

[50] Note that since the model has state fixed effects, it is not necessary to include the main effect of UNION.

[51] For T+1, the sum of the coefficients on LIAB_UNDSTMT_RULE and LIAB_UNDSTMT_RULE*UNION is positive, but not significant (*p*-value = 0.157). The sum of the coefficients is positive and significant at conventional levels for T+3 and T+5 (0.010, *p*-value = 0.057; 0.011, *p*-value = 0.020). The coefficient on the interaction term LIAB_UNDSTMT_RULE*UNION is positive and significant for T+3 and T+5 (0.013, *t*-statistic of 2.09; 0.016, *t*-statistic of 2.77).

understatements leave more funds available in the state's budget that can then be spent on employment.

6.4.2 Additional analyses and robustness checks

In Table 6 we use a change model to explore whether increases in funding gap understatement are associated with increases in future labor costs. The dependent variable is the next n year change in labor expenditures, where n = 1, 3, or 5. The variables of interest are the lagged n year change in pension variables.[52] Since we are taking the differences in our variables, we drop state fixed effects. Consistent with Table 5, we find that it is mainly the changes in rule related understatement of pension liabilities that are associated with future increases in payroll spending and this effect is larger in the long term. The coefficient on ΔLIAB_UNDERSTMT_RULE is positive and significant across columns [1]–[3] and the magnitude of the coefficient increases across the testing windows. We do not find changes in discretion related understatement to be associated with future changes in payroll spending. Column [1] also shows that changes in asset overstatement and changes in the reported funding gap may be associated with short-term changes in payroll spending. However, these associations disappear once we extend the testing window to longer periods.

We conduct a set of robustness tests that we summarize here without tabulation. To ensure that our results are not driven by a specific discount rate, we rerun the analyses using the Aa corporate bond rates and taxable state GO bond yields as alternative rates to measure the rule related understatement in pension liabilities. We discuss how we collect the data on these rates in Appendix C. Consistent with the results above, we find that when we measure the rule related

[52] For example, when n = 3, we examine whether the change in pension variables from T-3 to T is related to the change in payroll expenditures from T to T+3.

understatement using the Aa corporate bond rates, the understatement in pension liabilities due to the GASB methodology is positively associated with long-term labor costs. Specifically, LIAB_UNDSTMT_RULE is positively related to state payroll expenditures in the next 3–5 years. In the short-term, LIAB_UNDSTMT_RULE is still positively related to payroll expenditures. However, the statistical significance is reduced (*t*-statistic of 1.563).

We find weaker results when we take into account the riskiness of the state and measure the rule related understatement using the taxable state GO bond rates. Although LIAB_UNDERSTMT_RULE is still positively related to future payroll provisions and the magnitude of the coefficient is larger in the long run (3-5 years in the future), the statistical significance of the variable drops.[53] The weaker results are likely due to potentially large measurement error in implied state GO bond yields, because the majority of the states do not have observable GO bond yields and we need to use rating implied yield curves to proxy for their GO bond yields (see discussion in Appendix C). Regardless of the discount rates, we do not find reported funding level, discretion related understatement of pension liability, and overstatement of plan assets related to long term labor spending.

We further investigate whether our results are sensitive to the expected investment return assumptions used to calculate the discretion-free GASB discount rate. Specifically, we estimate inter-temporal differences in the expected investment return by looking at the annual change in the average nominal expected return assumption for corporate pension plans.[54] We follow this approach because both public and corporate plans use similar methodologies to set the expected

[53] The coefficient on LIAB_UNDSTMT_RULE is 0.013 (*t*-statistic of 1.70) for year T+3 and 0.014 (*t*-statistic of 1.54) for year T+5.

[54] We calculate the average disclosed discount rate for corporate plans with assets in excess of $10 million for each year in our sample period. On average, there were approximately 4,000 plans per year. The average rate was level during the early 1990's, it increased approximately 15 basis points from 1995 through 1999, and it then decreased approximately 40 basis points from 2000 through the end of our sample period. Overall, the average inflation-adjusted discretion-free GASB discount rate is 7.1%, which is 20 basis points higher than the original pre-adjustment rate of 6.8% (see Table 2).

return on assets.[55] However, the return assumption for corporate plans for ERISA reporting purposes is set by the plan actuary, and not by the firm itself, thus mitigating the potential use of discretion. Our intuition is that if the average annual nominal assumption for private pension plans decreases by a certain amount, then we would expect public pension plans to decrease by the same amount. Our results are not sensitive to using this alternative discretion-free GASB rate. Specifically, we still find that the rule related understatement of pension liabilities is positively associated with future payroll expenditures and that this association is stronger in the longer term window (3 and 5 years). The magnitude of the coefficient is also similar to our original results. We do not find any association between future labor spending and discretion related understatement of pension liabilities or overstatement of pension assets.

Finally, we rerun the analysis using the least absolute deviations (LAD) estimation to ensure that our results are not sensitive to outliers. Since the LAD estimator minimizes the sum of the absolute deviation of the residuals, LAD gives less weight to large residuals than OLS, rendering it more robust to outliers than OLS (Greene, 2002). Our results hold under LAD.

Although we find evidence that states' accounting choices on pension reporting are related to fiscal conditions, decisions to enforce midyear fiscal adjustments, and future labor spending, we emphasize that our results do not allow us to draw any causal inferences. As mentioned above, all the fiscal actions in response to a budget shortfall are simultaneously determined and we do not have a setting to tease out the effect solely attributable to pension understatements. Even though we use a long lead and lag to investigate how current pension

[55] The expected return assumption is typically calculated based on the combination of the expected price inflation and the long-term expected real rate of return on assets. Since the long-term expected real rate of return on assets has small variation over time, changes in the expected return assumption capture changes in expected price inflation. This adjustment is based on the assumption that, on average, private plans do not change their asset allocations over time. We believe this is a reasonable assumption given that we are averaging around 4,000 plans per year.

understatement relates to future labor spending, the design still does not allow us to establish causality. Therefore, we caution the interpretation of our results.

7. Conclusion

This paper examines whether governmental entities make accounting choices that are associated with fiscal stress and whether there are economic outcomes associated with those decisions. We find that states' discretion to understate pension funding gaps is associated with periods of fiscal stress and that understated funding gaps are negatively associated with the likelihood of tax increases and expenditure cuts. We also find that pension understatements are associated with higher future labor costs. Importantly, we find that the positive relation between pension funding gap understatement and future labor costs is associated with the inherent methodology in the GASB rules, which systematically understate the funding gap, and is not associated with opportunistic reporting by state governments.

Our results should be of interest to governments and policymakers, as they have important implications for the current direction of the GASB pension reporting regime. GASB recently issued Statements 67 and 68 that replace Statements 25 and 27. The new standards are intended to improve financial reporting transparency by requiring the disclosure of a substantial amount of information not required in the old regime. In addition, the new standards require that state and local governments use a single discount rate that combines both a funding approach (long-term expected rate of return on plan assets) and a liability approach (high rated municipal bond yields).[56] While this is a move toward the FASB approach, it is only a partial one, as the

[56] There are two parts to the calculation of the pension liability under the new standards. The first part is the present value of future benefit payments that can be paid out of current pension assets. These future benefit payments are discounted using the expected rate of return on the pension assets, consistent with the prior standards. The second part is the present value of future benefit payments that cannot be paid out of current pension assets. These future benefit payments are discounted using a high-quality municipal bond interest rate. Critics argue that this blended

new pension accounting standards will continue to systematically understate the funding gap, albeit on a reduced scale. This is noteworthy, since our results suggest that the funding approach is associated with states committing to additional expenditures.

rate solution still leaves room for employers to hide the true extent of underfunding and could incentivize states to increase investment in risky assets or "chase yield." (see for example, http://www.reuters.com/article/2014/05/29/usa-pensions-sec-idUSL1N0OF1E220140529).

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Appendix A

Duration Estimation

Our research design requires that we re-estimate each state's pension liabilities using alternative discount rates. To facilitate these calculations, we estimate the duration of each state's pension liability. Duration is a measure of the weighted average time over which benefit payments are made from the plan. It provides an effective approach to adjusting the pension liability to reflect different discount rates. In particular, a pension plan with a duration of 15 years will experience a 15% increase in the pension liability for a 1% reduction in the discount rate. We estimate the duration by first estimating each state's total pension liability, and then measuring the change in our estimate when we adjust the discount rate by 1%. To estimate a state's total pension liability, we use an aggregate actuarial method based on a single hypothetical participant whose characteristics reflect those of the plan as a whole. In this case, the pension liability for the entire plan is simply the pension liability for this participant. The aggregate method is commonly used to estimate pension liabilities for both public and private pension plans. When properly applied, the pension valuation under both the individual and aggregate approaches produces virtually identical results.

We estimate the pension liability separately for the active and inactive participants. For the active participants, we need three distinct groups of items for the calculation: information about the participants, information that relates to the benefit formula, and information on the specific actuarial assumptions. We collect information on the total pay, average service and average age of all the active participants to identify the attributes of the hypothetical employee for purposes of applying the aggregate cost method. We use the benefit multiplier from the plan provisions to determine the size of the retirement benefit. We use the actuarial assumptions for the discount rate, the salary growth assumption, the retiree cost of living adjustment (COLA), and the average retirement date to determine the value of this retiree benefit. For the inactive participants we follow the same approach, except that our hypothetical inactive participant is determined using the total benefit payments (rather than total pay).

We compare our estimated pension liability with the reported amount for each state in our sample and find that the difference is within 10 percent. This result suggests that our approach is reasonable and that the estimate of the duration we derive from our liability estimates is reliable.

Appendix B

Variable Definitions

ASSET_OVSTMT =	Per capita overstatement of pension assets;
COMP =	Dummy variable equal to 1 if the gubernatorial election is defined as a competitive election and 0 otherwise. We consider a gubernatorial election to be competitive if the vote for the winning candidate is between 48% to 52%;
EXP_MINUS_REV =	The difference between adjusted general fund expenditures and adjusted general fund revenues. Adjusted general fund expenditures are the reported expenditures in the general fund plus any midyear spending cuts. Adjusted general fund revenues are the reported revenues in the general fund minus any enacted tax changes during the fiscal year. A DEFICIT (SURPLUS) occurs when adjusted general fund expenditures exceed (are less than) adjusted general fund revenues;
SURPLUS =	EXP_MINUS_REV if the variable is smaller or equal to zero, and zero otherwise;
DEFICIT =	EXP_MINUS_REV if the variable is greater than zero, and zero otherwise;
DENSITY =	The number of residents per square mile;
DSPENDCUT =	Dummy variable equal to 1 if the state government enacts midyear spending cuts during the fiscal year and 0 otherwise;
DTAXINCREASE =	Dummy variable equal to 1 if the state government enacts tax increases during the fiscal year and 0 otherwise;
ELECTION =	Dummy variable equal to 1 if the year is a gubernatorial election year and 0 otherwise;
GASB_FUNDGAP =	Per capita reported pension funding gap, where pension funding gap is defined as reported plan liabilities minus reported plan assets;
ISSUE_LTD =	Per capita long-term debt issuance;
ISSUE_STD =	Per capita short-term debt issuance;
LnPI =	Natural logarithm of state personal income per capita;
PAYROLL =	Per capita annualized total payroll expenditures;
POVERTY =	State poverty rate reported by Census Bureau;

POPULATION =	State population (in thousands);
TTLBAL =	Per capita total fund balance, where total fund balance is the sum of the general fund balance and the rainy day fund balance;
TTLBAL_RATIO =	The ratio of total fund balance to total expenditures in the general fund;
TTL_UNDSTMT =	Per capita total understatement of pension funding gap;
LIAB_UNDSTMT_DISC =	Per capita understatement of pension liabilities as a result of the use of discretion;
LIAB_UNDSTMT_RULE =	Per capita understatement of pension liabilities as a result of the design of the GASB rules;

Appendix C

Data Collection on Aa Corporate Rates and Taxable State GO Bond Yields

We use the Citigroup Pension Discount Curve, which we download from the Society of Actuaries website, to estimate the appropriate Aa corporate bond rate. The Citigroup Pension Discount Curve uses a specific mathematically generated Aa yield curve and is designed specifically to meet the requirements of SFAS 87. More information on this yield curve is provided in Naughton (2014).

We collect the state general obligation bond yield from Bloomberg. We obtained state specific general obligation bond yield curves for 20 states (California, Connecticut, Florida, Georgia, Illinois, Massachusetts, Maryland, Michigan, Minnesota, North Carolina, New Jersey, New York, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington, and Wisconsin.). For the remaining 30 states, we collect their general obligation bond credit ratings from the Census Bureau's Statistical Abstract of the United States and then use these credit ratings' corresponding yield curves from Bloomberg to proxy for the states' general obligation bond yield curves. Bloomberg only has general obligation bond yield curves for AAA, AA+, AA-, A+, A-, and BBB. We interpolate between the AA+ and AA- curves to obtain an AA curve, and between A+ and A- curves to attain an A curve.

We match the actuarial valuation dates to the most recent general obligation bond yields. All the general obligation bond yields are collected either on June 30 or December 31. For plans with their actuarial valuation dates between January 1 and June 29, we use the general obligation bond yields on December 31 of the prior year. For plans with their actuarial valuation dates between June 30 and December 30, we use the general obligation bond yields on June 30 of the same year. For plans with their actuarial valuation dates on December 31, we use the general obligation bond yields on the same date. Following Novy-Marx and Rauh (2011), we assume a 25% marginal personal tax rate and calculate the taxable state general obligation bond rate by dividing each state's general obligation bond rate by (1-25%). This calculation is to remove the tax exempt premium associated with the municipal bond yields. Due to data restrictions, our sample is smaller when using the state GO bond yields to calculate the pension liabilities.[57]

[57] Bloomberg does not provide data on state yield curves until 1994. Not all states have ratings available in the 1990s. In the regression analysis, we drop 6 states (Colorado, Arizona, Idaho, Iowa, Nebraska, South Dakota) that do not have bond ratings in the 1990s.

Figure 1: Composition of Pension Funding Gap Understatement

This figure presents the components of pension funding gap understatement.

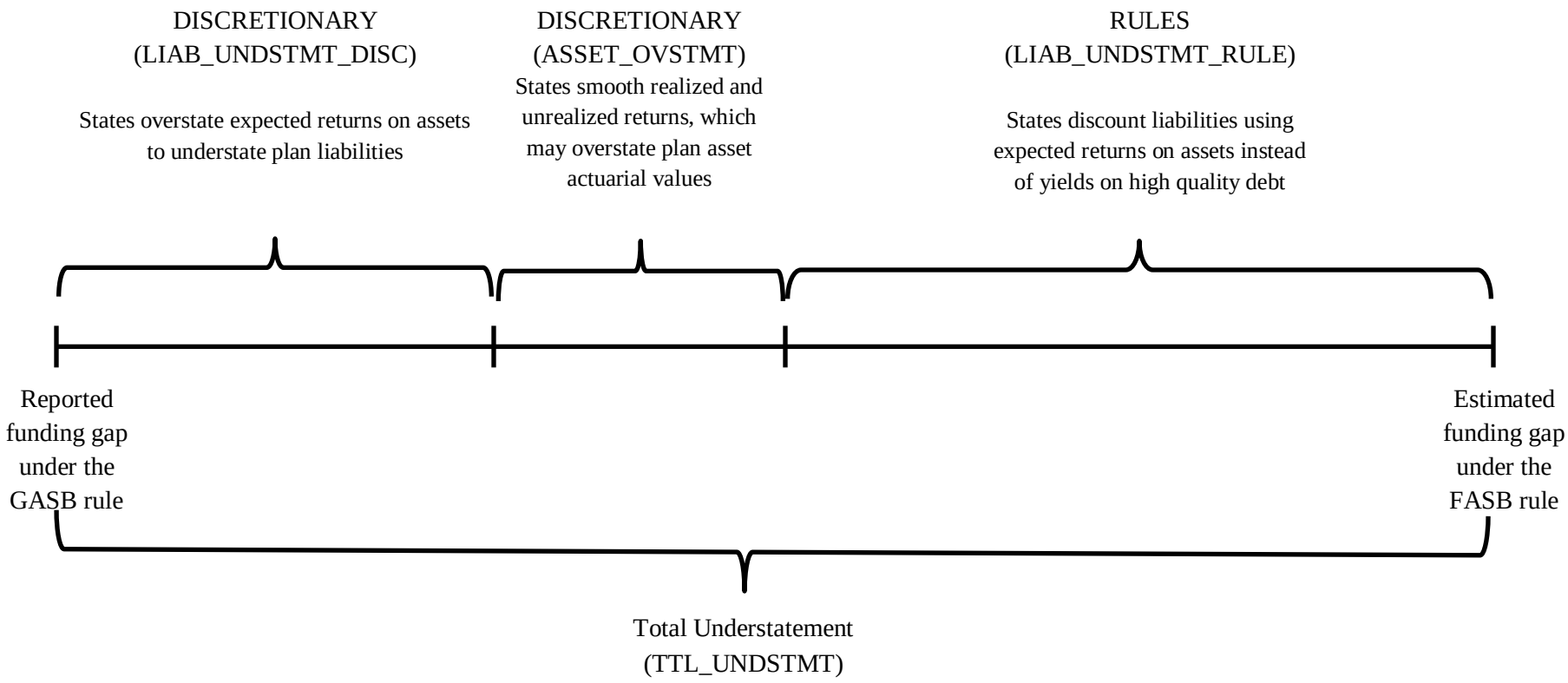

Table 1: Reported and Estimated Pension Liabilities and Pension Assets by State

This table presents each state's average annual pension liabilities as reported and as estimated using the discretion-free GASB discount rates and the Treasury yields, as well as each state's average annual actuarial and market value of pension assets. The amounts are in billions.

	Pension Liabilities			Pension Assets	
State	Reported	Discounted at Discretion-free Rates	Discounted at Treasury Yields	Actuarial Value	Market Value
	[1]	[2]	[3]	[4]	[5]
Alabama	23.33	30.94	36.28	20.97	20.29
Alaska	9.50	11.38	13.60	7.91	8.76
Arizona	21.88	25.45	33.26	21.18	20.77
Arkansas	10.96	13.02	16.90	10.07	9.79
California	272.58	325.43	412.16	253.91	266.90
Colorado	25.50	30.75	42.43	21.23	19.73
Connecticut	24.27	29.69	36.03	14.91	15.97
Delaware	3.86	4.69	5.92	4.01	4.26
Florida	75.56	87.04	112.27	73.76	78.27
Georgia	32.06	36.15	46.26	30.38	30.09
Hawaii	10.06	11.89	14.78	7.72	7.77
Idaho	6.30	7.41	9.39	5.71	5.85
Illinois	80.10	97.27	122.13	52.43	52.90
Indiana	20.65	26.04	27.95	12.89	12.93
Iowa	14.22	15.87	19.71	12.94	13.58
Kansas	10.76	12.96	17.29	8.02	8.55
Kentucky	23.84	28.34	33.93	20.12	19.59
Louisiana	22.74	27.69	33.81	14.86	15.57
Maine	10.38	11.98	15.60	7.76	7.49
Maryland	29.32	31.99	40.12	24.73	24.13
Massachusetts	33.84	41.32	56.49	25.16	24.87
Michigan	49.92	60.57	75.14	43.25	41.81
Minnesota	31.22	36.45	48.52	27.63	28.56
Mississippi	16.85	20.15	25.12	12.64	12.84
Missouri	30.27	37.71	46.56	26.30	26.64
Montana	5.34	6.51	7.89	4.45	4.23
Nebraska	4.42	5.53	6.80	3.78	3.84
Nevada	15.98	20.91	25.02	12.32	16.43
New Hampshire	3.95	4.96	6.46	2.96	3.42
New Jersey	70.12	90.09	111.28	60.85	56.66
New Mexico	15.28	18.38	22.96	12.60	12.45
New York	165.98	195.85	250.07	169.63	166.68
North Carolina	44.25	50.18	62.93	45.36	47.86
North Dakota	2.29	2.79	3.51	2.06	2.16
Ohio	119.32	143.80	179.30	98.04	104.72
Oklahoma	16.03	18.96	22.74	9.24	9.56
Oregon	34.32	39.48	52.68	33.17	33.80
Pennsylvania	65.07	78.54	100.90	61.80	62.93
Rhode Island	7.78	9.41	11.87	5.46	5.43
South Carolina	22.76	30.88	31.12	18.10	18.15

South Dakota	4.20	4.85	6.17	3.84	4.26
Tennessee	26.24	33.86	38.83	24.78	24.67
Texas	106.51	133.35	163.85	99.08	103.03
Utah	9.91	12.37	16.76	9.14	10.57
Vermont	2.06	2.57	3.26	1.75	1.69
Virginia	32.98	36.28	48.68	29.54	31.18
Washington	41.69	47.20	66.52	38.28	35.23
West Virginia	9.01	10.44	12.61	4.38	4.33
Wisconsin	50.60	57.90	77.05	49.25	51.98
Wyoming	3.75	4.59	5.95	3.54	3.77
Total	1,770	2,122	2,677	1,564	1,597

Table 2: Descriptive Statistics

This table presents descriptive information on the variables used in the analysis. All variables are defined in Appendix B.

	N	Mean	Median	Std Dev
Pension Variables				
Asset allocations (%)				
Equity	984	52.789	55	12.642
Fixed Income	984	34.941	31.550	14.539
Real estate	984	4.162	3.643	3.832
Cash and short term investment	984	2.588	1.750	2.917
Other	984	5.520	3.846	5.859
Discount rates & duration				
Reported	984	0.080	0.08	0.004
Estimated based on asset allocations	984	0.068	0.069	0.005
Treasury yields	984	0.059	0.058	0.013
Aa corporate bond rates	984	0.073	0.074	0.011
Taxable State GO bond yields	728	0.066	0.065	0.008
Duration of the plans	984	17.617	17.653	2.066
Understatement of pension liability and overstatement of pension assets (per capita)				
GASB_FUNDGAP	888	914.814	643.016	1065.484
TTL_UNDSTMT	888	3062.080	2317.469	3180.757
ASSET_OVSTMT	888	-162.814	-126.952	1015.424
LIAB_UNDSTMT_DISC	888	1245.843	1150.812	649.015
LIAB_UNDSTMT_RULE	888	1978.404	1435.265	2525.337
Other Variables				
DEFICIT (per capita)	776	49.973	0	118.702
SURPLUS (per capita)	776	-27.776	-1.832	44.479
Total balance to total expenditures (%)	776	9.833	6.325	15.492
Midyear spending cuts (per capita)	776	14.661	0	33.492
Midyear tax changes (per capita)	776	5.308	0	51.313
DSPENDCUT	776	0.326	0	0.469
DTAXINCREASE	776	0.363	0	0.481
Short-term debt issuance (per capita)	776	0.092	0	24.659
Long-term debt issuance (per capita)	776	434.569	339.788	333.574
Gubernatorial election	776	0.244	0	0.430
Gubernatorial election - competitive	776	0.057	0	0.231
Total payroll expenditure (per capita)	888	707	639	282
Total balance (per capita)	888	237.836	104.312	786.599
Personal Income (per capita)	888	30,320	29,856	7,688
LnPI	888	10.287	10.304	0.256
Poverty Rate (%)	888	12.363	11.700	3.443
Population Density	888	184.288	91.191	249.823
Population (in thousands)	888	5,677	3,948	6,230

Table 3: Understatement of Pension Funding Gaps and State Fiscal Conditions

This table presents regression analyses on the pension funding gap understatement and state fiscal conditions. All variables are defined in Appendix B. *t*-statistics are in brackets and are based on heteroskedastic consistent standard errors clustered by state and year. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

	$LIAB\_UNDSTMT\_DISC_{t-1}$	$ASSET\_OVSTMT_{t-1}$	$LIAB\_UNDSTMT\_RULE_{t-1}$
	[1]	[2]	[3]
$DEFICIT_t$	0.324***	-0.010	-0.222
	[2.873]	[-0.051]	[-0.959]
$SURPLUS_t$	0.072	-0.491	0.569
	[0.190]	[-0.551]	[0.539]
$TTLBAL\_RATIO_t$	-3.259**	-5.927	-0.304
	[-2.043]	[-1.283]	[-0.080]
ISSUE_STD	1.050**	-0.695	-0.892
	[2.080]	[-0.908]	[-0.667]
ISSUE_LTD	-0.076	-0.069	0.346
	[-0.804]	[-0.456]	[1.442]
ELECTION	-27.735	25.591	-96.150
	[-1.112]	[0.468]	[-1.179]
ELECTION*COMP	99.067*	-62.073	145.546
	[1.945]	[-0.479]	[1.037]
$LnPI_t$	1,113.969	320.732	-613.954
	[0.952]	[0.208]	[-0.162]
$POVERTY_t$	10.493	-16.683*	9.078
	[0.753]	[-1.961]	[0.303]
$DENSITY_t$	6.190**	4.199	-1.179
	[2.267]	[1.247]	[-0.126]
$POPULATION_t$	-0.118*	0.052	0.023
	[-1.809]	[0.982]	[0.091]
State FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	776	776	776
Adjusted R-squared	0.745	0.536	0.865

Table 4: Understatements of Pension Funding Gaps and Midyear Fiscal Adjustments

This table presents regression analyses of midyear spending cuts and tax increases on the pension funding gap understatement and state fiscal conditions. All variables are defined in Appendix B. The pension variables (i.e., LIAB_UNDSTMT_DISC, ASSET_OVSTMT, LIAB_UNDSTMT_RULE, and GASB_FUNDGAP) are scaled to thousand dollars per capita for presentation purpose. *t*-statistics are in brackets and are based on heteroskedastic consistent standard errors clustered by state and year. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

	DSPENDCUT	DTAXINCREASE
	[1]	[2]
DEFICIT	0.019***	0.013**
	[2.969]	[2.507]
SURPLUS	0.035*	0.001
	[1.746]	[0.066]
TTLBAL_RATIO	-0.277***	-0.129**
	[-3.320]	[-2.160]
DEFICIT x LIAB_UNDSTMT_DISC	-0.006***	-0.004**
	[-2.882]	[-2.434]
SURPLUS x LIAB_UNDSTMT_DISC	0.001	0.008
	[0.032]	[1.535]
DEFICIT x ASSET_OVSTMT	-0.001	0.001
	[-1.146]	[0.742]
SURPLUS x ASSET_OVSTMT	-0.002	-0.005
	[-0.153]	[-0.800]
DEFICIT x LIAB_UNDSTMT_RULE	-0.001	-0.001
	[-0.810]	[-1.196]
SURPLUS x LIAB_UNDSTMT_RULE	-0.003	-0.003
	[-0.808]	[-1.204]
TTLBAL_RATIO x LIAB_UNDSTMT_DISC	0.150***	0.048**
	[3.140]	[2.489]
TTLBAL_RATIO x ASSET_OVSTMT	0.012	0.004
	[1.273]	[0.885]
TTLBAL_RATIO x LIAB_UNDSTMT_RULE	-0.005	0.001
	[-1.242]	[0.324]
LIAB_UNDSTMT_DISC	-0.658	0.061
	[-1.272]	[0.201]
ASSET_OVSTMT	-0.019	-0.167
	[-0.047]	[-0.759]
LIAB_UNDSTMT_RULE	0.249	-0.098
	[1.272]	[-0.607]
GASB_FUNDGAP	0.078	0.043
	[0.225]	[0.219]
LnPI	1.280	2.728
	[0.277]	[0.911]
POVERTY	0.204*	-0.006

	[1.881]	[-0.072]
DENSITY	-0.008	0.016*
	[-0.616]	[1.692]
POPULATION	0.000	-0.000
	[1.119]	[-0.600]
State FE	YES	YES
Year FE	YES	YES
Observations	776	776
Pseudo R-squared	0.543	0.285

Table 5: Understatements of Pension Funding Gaps and Future State Payroll Expenditures

This table presents regression analysis on pension funding gap understatements and future state payroll expenditures. All variables are defined in Appendix B. *t*-statistics are in brackets and are based on heteroskedastic consistent standard errors clustered by state and year. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

	$Payroll_{t+n}$		
	[1]	[2]	[3]
	n=1	n=3	n=5
$GASB\_FUNDGAP_t$	0.016	0.009	0.010
	[1.573]	[0.825]	[0.929]
$LIAB\_UNDSTMT\_DISC_t$	0.006	0.002	0.001
	[0.702]	[0.212]	[0.103]
$ASSET\_OVSTMT_t$	0.001	-0.001	0.001
	[0.194]	[-0.351]	[0.434]
$LIAB\_UNDSTMT\_RULE_t$	0.008*	0.011**	0.011**
	[1.728]	[2.320]	[2.401]
Control variables			
$TTLBAL_{t+1}$	0.028***	0.024***	0.020***
	[8.911]	[7.328]	[3.972]
$LnPI_{t+1}$	578.381***	624.944***	635.119***
	[4.529]	[6.182]	[4.953]
$POVERTY_{t+1}$	-2.856	-3.685*	-5.752***
	[-1.639]	[-1.763]	[-2.866]
$DENSITY_{t+1}$	1.280**	1.143*	1.074
	[2.013]	[1.847]	[1.577]
$POPULATION_{t+1}$	-0.043***	-0.045***	-0.047***
	[-3.276]	[-3.288]	[-3.002]
State FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	888	789	689
Adjusted R-squared	0.971	0.972	0.976

Table 6: Changes in Understatements of Pension Funding Gaps and Changes in Future State Payroll Expenditures

This presents regression analysis on pension funding gap understatements and future state payroll expenditures using a change model. The dependent variable is the next n year change in labor expenditures, where n = 1, 3, or 5. The variables of interest are the lagged n year change in pension variables (funding level, rule and discretion based understatements of pension liabilities, and overstatement of pension assets). For example, when n = 3, we examine whether the change in pension variables from T-3 to T is related to the change in payroll expenditures from T to T+3. All variables are defined in Appendix B. *t*-statistics are in brackets and are based on heteroskedastic consistent standard errors clustered by state and year. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

	$\Delta Payroll_{t+n}$		
	[1]	[2]	[3]
	n=1	n=3	n=5
$\Delta GASB\_FUNDGAP_t$	0.005*	-0.000	0.003
	[1.864]	[-0.034]	[0.377]
$\Delta LIAB\_UNDSTMT\_DISC_t$	0.005	-0.000	0.008
	[1.356]	[-0.024]	[0.883]
$\Delta ASSET\_OVSTMT_t$	0.003*	-0.001	0.001
	[1.703]	[-0.219]	[0.136]
$\Delta LIAB\_UNDSTMT\_RULE_t$	0.001*	0.007**	0.014*
	[1.717]	[2.457]	[1.848]
Control variables			
$\Delta TTLBAL_{t+n}$	2.964	27.701**	26.222***
	[0.211]	[2.212]	[4.673]
$\Delta LnPI_{t+n}$	181.925**	392.295***	481.347***
	[2.286]	[5.672]	[4.416]
$\Delta POVERTY_{t+n}$	-0.831	-3.186***	-5.145**
	[-1.018]	[-3.195]	[-2.419]
$\Delta DENSITY_{t+n}$	1.193	1.578*	1.059
	[0.898]	[1.807]	[1.566]
$\Delta POPULATION_{t+n}$	-0.039*	-0.042***	-0.038***
	[-1.893]	[-2.692]	[-2.812]
State FE	NO	NO	NO
Year FE	YES	YES	YES
Observations	789	638	483
Adjusted R-squared	0.160	0.328	0.313