Politics and Hidden Borrowing: Electoral Cycles and State Defined Benefit Pension Plans*

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Abstract

I investigate how political incentives affect the policies of public-sector defined benefit (DB) pension plans in the United States. I document that "pension deficits"—the difference between liability accrual rates and asset accumulation rates—are systematically higher in gubernatorial election years relative to non-election years. This electoral cycle pattern is explained by systematic election year dips in governmental contributions. Subsequent findings suggest incumbent Governors conduct "hidden" borrowing on behalf of taxpayers in election years in order to increase his/her election chances. Specifically, electoral cycles are more pronounced for states in which taxpayers bear the burden of underfunded public plans and for states with less transparent pension systems, and pension deficits are larger during elections that are more closely contested and during gubernatorial terms in which the incumbent is eligible to run for reelection. Plans exhibiting larger electoral cycles in pension deficits are associated with larger deterioration in funding levels, and states containing such plans are associated with lower economic growth. I conduct falsification tests, including analysis of private-sector DB pension plans and of unexpected Governor transitions, in order to rule out alternative explanations for my findings.

Key words: Pension plans, political economy, agency conflict, public finance, career concerns, information asymmetry.

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1 Introduction

Public sector defined benefit (DB) pension plans allow governments to defer payment to their workers by offering guaranteed future retirement benefits. In the United States, the aggregate liability formed by state-level DB pension plan obligations is enormous, with Novy-Marx and Rauh (2011) estimating unfunded pension liabilities to be as high as $4.43 trillion as of 2009. Motivated by the idea that politicians undertake opportunistic actions for politically motivated purposes, I investigate how electoral incentives can motivate incumbent state Governors to shape public pension policies for their own benefit. Specifically, Governors may "borrow' on behalf of taxpayers using their discretionary power over how public pension assets accumulate and how public pension liabilities accrue.

On the asset side, Governors may divert governmental contributions intended to fund state pension plans towards more politically expedient uses, such as increasing public services, cutting taxes, or reducing the state budget deficit. Anecdotal accounts suggest this to be an attractive option. In the run-up to the 1990 gubernatorial election, New York Governor Mario Cuomo worked to lower contributions to state pension plans by $1.3 billion, using the funds to reduce the budget deficit instead. After Governor Cuomo secured his reelection bid, the New York State of Appeals ruled in 1993 that the state had illegally borrowed from state pension funds, and ordered the state to pay back the shortfall over the next 12 years.

On the liability side, DB pension benefits promised to public sector employees represent debt-like obligations for the government. Incumbent Governors may be tempted to raise benefits in order to gain political support from public sector labor unions. In the early 2000's, California Governor Gray Davis pushed through numerous bills to increase state pension benefits, winning strong support from public sector unions along the way at the expense of creating large unfunded pension liabilities for taxpayers. Pension benefits also provide employers with a potential bargaining chip that can be used to negotiate against wage increases. By raising promises of pension benefits for public sector employees, for instance, the incumbent administration can keep payroll growth in check in the short run, freeing up funds for more immediate uses.

Spurred by the idea that political incentives are strongest immediately prior to an election, I investigate whether the net amount of borrowing conducted through state pension plans is systematically different in election years versus non-election years. To this end, I construct a novel "pension deficit" flow variable by taking the difference between the rate at which pension plan liabilities accrue (benefit accruals) and the rate at which pension plan assets accumulate (contributions). My findings indicate that that state DB pension plan deficits (surpluses) are on average 11% higher (lower) in gubernatorial election years

compared to in non-election years. I include a variety of state-level and plan-level control variables, as well as plan fixed effects and year fixed effects, to control for potential confounding factors.

Separating the pension deficit measure into its two components (contributions and benefit accruals), I find that the electoral cycles in pension deficits are largely explained by election year decreases in pension contribution rates, as the magnitude of election year "dips" in contributions are almost identical to those of election year "spikes" in pension deficits. The significant electoral cycle in contribution rates is unsurprising given Governors' significant powers over the state budget process through which contributions are approved. Accordingly, I find contribution cutbacks to be larger for election years that coincide with the passage of a state budget relative to election years that do not.

In contrast to contributions, I find that benefit accruals do not exhibit a significant electoral cycle pattern. This may be attributed to the inflexibility of pension benefit policy, which is typically set through multi-year labor contracts and/or special statutory provisions, as well as to the fact that benefit accruals are imprecisely measured due to discretionary actuarial assumptions. Nevertheless, I find states with higher rates of public sector union membership experience significantly larger election year increases in benefit accrual rates relative to states with lower union membership rates, which suggests a motive to grant higher pension benefits in exchange for election year political support from strong labor unions.

To gain a deeper understanding of the Governor's incentive to increase election year pension deficits, one must first understand how taxpayers and public pension employees are affected by pension funding policy, and in particular which stakeholder group bears the future burden of underfunded public pension plans. In particular, higher pension deficits today necessarily implies future cuts to government spending, future increases in taxes, or future cuts to pension benefits. The first two outcomes are at the expense of the wider taxpayer base, while the third outcome is at the expense of public sector employees.

If public sector employees bear the future burden of pension underfunding, then election year spikes in pension deficits effectively constitute funds appropriated from public employees by incumbent politicians to "buy" votes from the electorate. However, the empirical evidence contradicts this interpretation, as I exploit cross-sectional variation in legal frameworks across states and find electoral cycles in pension deficits to be concentrated in states in which public sector employees enjoy *stronger* legal protections over their future DB retirement benefits. This suggests that public pension plan participants with weak protections over their benefits have both the incentive and the means to limit politically-motivated policies that devalue

their future retirement benefits.[1]

The implication is that strong benefit protections create a moral hazard for employees to ignore the consequences of pension borrowing, as taxpayers are left to bear the burden through higher future taxes or lower public services. This should not be an issue if rational and forward-looking voters can observe government pension policies and understand that higher pension deficits serve only to "kick the can down the road". Under such a scenario, election year spikes in pension deficits would be politically self-defeating for incumbent Governors if such policies were not in the best interests of voting taxpayers who ultimately determine election outcomes.

In reality, voters are unlikely to be able to perfectly monitor the government's public pension policies due to well established free rider problems inherent in political settings with diffuse voters,[2] as well as due to the inherent opacity of DB pensions plans that rely on complex actuarial methods to evaluate and report on funding levels. Previous research has shown information asymmetry to be an important factor in generating politically-motivated electoral cycles in fiscal deficits (Shi and Svensson (2006), Alt and Lassen (2006)), based on the idea that incumbent politicians would attempt to "fool" voters with increased deficit spending only if voters cannot directly observe that the higher spending is financed through debt.

Following this logic, state pension plans provide incumbent Governors with a particularly opaque channel to finance politically-motivated expansionary activities in election year. Using an index measure of state pension opacity based on journalist surveys, I find that electoral year spikes in pension deficits are significantly more pronounced in states with more opaque pension systems relative to states with more transparent pension systems, which supports the notion of state DB pension plans constituting a channel for "hidden" deficit financing prone to politically-motivated manipulations.

I find additional evidence that election concerns drive pension borrowing decisions. First, the incentive to win additional votes should be stronger for closely contested elections that are near a "tipping point", and I find election year pension deficit spikes are indeed larger for close elections in comparison to lopsided ones. I also find that pension deficits are smaller when the incumbent Governor is ineligible to run for reelection due to term limits. Lastly, I find no significant difference in electoral cycle patterns in pension deficits between Republican and Democrat Governors, which suggests that my results are not driven by the ideological preferences of one particular party's partisan supporters.

[1] For example, employees can collectively exert political pressure through lobbying by their unions, exert economic pressure through collective bargaining, or directly influence pension policy through employee representation on state pension boards of trustees.

[2] See, for instance, Becker (1983).

Next, I investigate whether systematic election year pension deficit spikes have real consequences. I find that state DB pension plans exhibiting larger electoral cycles in pension deficits tend to experience larger increases in unfunded liabilities over the 2001-2015 sample period. On average, the electoral cycle in pension deficits can explain 6.65% of the average increase in pension underfunding, which suggests that election year pension deficit spikes are not totally offset by lower rates of pension deficits during non-election years and play an economically significant role in explaining the deteriorating funding status of state DB pension plans in recent years. Furthermore, I find suggestive evidence that states containing plans that exhibit larger electoral pension deficit cycles are associated with lower economic growth over the sample period.

I run additional tests in order to rule out plausible alternative explanations for my findings. Most notably, I find no evidence of an electoral cycle pattern in pension deficits for private-sector DB pension plans. Since private sector plans should be immune from political incentives relating to gubernatorial elections, this finding supports the key assumption behind my main empirical test, in that pension policies unaffected by political incentives should exhibit no systematic election year effects. I also find no evidence of pension deficit increases during years in which states experience unexpected governor turnovers, which mitigate concerns that my findings are driven by leadership transition effects unrelated to reelection incentives.

At its root, my paper is about how information frictions can lead to short-sighted decisions in the context of a principal-agent relationship. This relates to the broad literature on managerial myopia, including works by Stein (1988), Bebchuk and Stole (1993), and Nagarajan, Sivaramakrishnan, and Sridhar (1995), who provide models of how hidden information problems can lead to myopic corporate decisions. In particular, Narayanan (1985) and Stein (1989) show myopic decisions can arise due to hidden action problems using reputation building models. However, the corporate finance literature has found mixed success in finding empirical evidence in support of such theories. For example, Meulbroek, Mitchell, Mulherin, Netter, and Poulsen (1990) reject the prediction from Stein (1988) that takeover threats induce myopic corporate polices.

In this paper, I turn to the public sector to search for evidence of short-sighted decisions stemming from distortionary career concerns. As noted by Tirole (1994), career concern incentives as described in Holmström (1999) should be especially strong in the public sector due to the lack of high powered incentive contracts. Furthermore, while large block shareholders are able to concentrate ownership and overcome agency-induced managerial myopia (Wahal and McConnell (2000), Edmans (2009)), diffuse taxpayers cannot accumulate votes in order to overcome the free rider problem. Therefore, political elections and public sector defined

pension policies provide a particularly appropriate setting for an empirical investigation into distortionary incentives.

The idea that political agency problems are most pronounced in election years comes from the political cycles literature, which examines politicians' incentives to manipulate macroeconomic outcomes for reelection purposes.[3] My work delivers the insight that opaque public pension plans offer governments a "hidden" way to finance expansionary election year policies,[4] an interpretation that potentially reconciles the finding of Poterba (1994) and Rose (2006), who empirically document fiscal policies to be systematically more expansionary during gubernatorial election years, with the findings of Peltzman (1992), who find that voters in gubernatorial elections tend to punish budget deficits and reward fiscal conservatism. This also relates to the recent literature on financial innovation regarding how the opacity of complex financial products can be exploited by politicians. For example, Pérignon and Vallée (2017) find that local governments in France tend to increase their use of complex structured loans ahead of closely-contested elections as a non-transparent way to temporarily shroud budget deficits.

My work also relates to the literature that explores how political elections affect financial markets and firm behavior. Prior research has identified political cycles in banking regulation (Brown and Dinc (2005), Liu and Ngo (2014), Haselmann, Kick, Behn, and Vig (2015), Cole (2009)), firm-level investment (Julio and Yook, 2012), discretionary accounting choices (Kido, Petacchi, and Weber, 2012), and rates of job and plant creation (Bertrand, Kramarz, Schoar, and Thesmar, 2007). In the corporate governance literature on board elections, Fos, Li, and Tsoutsoura (2016) find temporal proximity to board election increases CEO turnover-to-performance sensitivity.

Surprising, little work has been done to examine the impact of political incentives on public pension funding decisions. The existing literature on this topic has identified various factor that affect public pension funding levels. These factors include taxpayer mobility (Inman, 1982), unionization rates (Mitchell and Smith, 1994), state demographics (Giertz and Papke (2007), Kelley (2014)), and state fiscal conditions (Chaney, Copley, and Stone (2003), Munnell, Aubry, and Quinby (2011b), Splinter (2011)). Elder, Wagner, et al. (2015) study how political polarization and electoral uncertainty can lead to greater pension underfunding, but their results are based on noisy measures of pension funding and political conditions, and lack a clear empirical strategy to distinguish political causes from confounding economic

[3] See Nordhaus (1975), Rogoff and Sibert (1988), Rogoff (1990), Alesina, Roubini, and Cohen (1997), and Persson and Tabellini (2002) for the major theories on what generates political cycles.

[4] This relates to work by Shi and Svensson (2006) and Alt and Lassen (2006), who find the budgetary transparency helps to mitigate electoral cycles in budget deficits in OECD countries.

channels.[5] By exploiting the exogenous scheduling of gubernatorial elections, I am able to plausibly identify a strictly political motive behind how state governments fund their DB pension plans. My work also contributes to the literature by (1) constructing a novel flow measure of pension borrowing that accounts for the fact that pension deficits are jointly determined by contributions and benefits, (2) providing a testable conceptual framework relating to employee moral hazard and uninformed voters to explain the roots of political incentives regarding public pension borrowing, and (3) using falsification tests that rule out alternative explanations for documented electoral cycle patterns.

The remainder of this paper is organized as follows. Section 2 describes how the institutional setting of state DB pension plans gives rise to incentives for Governors to borrow through the pension system for politically-motivated purposes. Section 3 describes the empirical strategy that I employ to identify an electoral cycle pattern in pension deficits and the political incentives behind the pattern. Section 4 describes data used in the empirical analysis. Section 5 reports and interprets the empirical results and supplementary findings. Section 6 concludes.

2 State Defined Benefit Pension Plans

In this section, I outline the institutional setting surrounding state DB pension plans and detail the institutional roots behind Governors' incentives to use public pensions for political purposes. First, I describe how the balance of of state pension assets and liabilities are determined by the flow of contribution and benefit policies over time. I then describe the Governor's discretionary power over contribution and benefit policies. Next, I explain how taxpayers and public employees are affected by public pension underfunding and what that implies for the Governor's political incentives. Last, I explain the opacity of public pension plans to the general public and how that opacity can distort the Governor's incentives.

2.1 State Pension Assets and Liabilities

I focus my analysis on *defined benefits* (DB) pension plans, which comprise the majority of all U.S. public-sector plans at the state level. According to the 2015 BLS Employee Benefits Survey, 84% of all public-sector workers in state and local governments were eligible to participate in a DB pension plan, and 89% of those eligible workers were active participants in those plans. At its core, a DB pension plans consists of a collection of liabilities,

[5] For instance, Epple and Schipper (1981) make the point that governments may borrow through the public pension system as a way to smooth taxes and public spending in response to economic shocks, to the benefit of taxpayers.

which represent promises of future benefits to employees, and a collection of assets, which is accumulated in order to fund those promises before they become due.[6]

In contrast to defined contribution (DC) plans, which provide benefits that fluctuate with the market value of a plan's assets, DB benefits are predefined in advance. Typically, a participating employee's annual benefit is determined by the product of their average salary over the final 3-5 years of employment, the number of years of employment, and a plan-specific accrual rate. For example, an employee with an average ending salary of $100,000 and possessing 20 years of service would receive a base annuity of $60,000 under a plan with an accrual rate of 3%.[7]

As semi-fixed promises of future payment to employees, DB pension benefits constitute a debt-like liability for state retirement systems. Each year, state DB plans accrues new liabilities as active employees gain an additional year of service, and a portion of existing pension liabilities is retired as benefits are distributed to retiring employees. Conceptually, the evolution of a DB plan's liability from year t to year $t+1$ follows:

$$Liab_{t+1} = Liab_t(1 + r^{Liab}) + Acc_{t+1} - Benefits_{t+1}, \tag{2.1}$$

where *Liab* denotes the stock of pension liabilities, r^{Liab} denotes the discount rate used to calculate the present value of future obligations, *Acc* denotes the present value of new benefits accrued, and *Benefits* denotes benefits paid.

While Eq. 2.1 provides a conceptual representation of how DB pension liabilities change over time, the practical process of accounting for DB pension liabilities is considerably more complicated. In order to estimate the expected present value of future benefits, a DB plan must make assumptions about future wage growth, mortality rates, inflation, discount rates, etc. In practice, state plans hire specialized actuarial consultants to calculate DB pension liabilities via complicated actuarial methods. These practical considerations relating to actuarial assumptions are accounted for in my empirical analysis, but are omitted here in order to highlight *Acc* as a conceptual flow measure of pension liability accruals.

On the asset side, contributions are set aside every year to match the steady accrual of benefits. The contribution funds are invested in marketable securities and held in trust until they are distributed to plan beneficiaries. Conceptually, a DB plan's assets evolves according to

$$Assets_{t+1} = Assets_t(1 + r^{Assets}) + Contrib_{t+1} - Benefits_{t+1}, \tag{2.2}$$

[6] In this way public DB pension plans are *pre-funded*, which is in contrast to the *pay-as-you-go* funding scheme of U.S. Social Security, in which each generation takes on the full burden of paying for the previous generation's benefits.

[7] Most plans apply a cost-of-living adjustment (COLA) add-on to adjust for inflation.

where *Assets* denotes the stock of pension assets, r^{Assets} reflects the rate of return on investment, *Contrib* denotes the flow of contributions into pension assets, and *Benefits* denotes benefits paid from pension assets.

When a plan's liabilities exceed its assets, the plan is considered to be *underfunded*, and the shortfall difference is termed the *unfunded liability*. Combining 2.1 and 2.2 allows us to express the evolution of a plan's unfunded liability as follows:

$$UnfLiab_{t+1} = UnfLiab_t(1 + r^{Liab}) + Acc_{t+1} - Contrib_{t+1} - (r^{Liab} - r^{Assets})Assets_t, \quad (2.3)$$

where *UnfLiab* denotes the stock of unfunded liabilities.

Conceptually, *UnfLiab* represents the the "net" indebtedness of a pension plan, in the sense that any accrued benefit obligations not covered by accumulated assets must be eventually be repaid. *UnfLiab* can be negative, in which case a plan's assets are more than sufficient to cover its accrued liabilities and the plan is considered to be *overfunded*.

The policy variable of interest is the difference between the accrued liability and the contribution amount—i.e. the "pension deficit" ("pension surplus"):

$$PenDef_t = Acc_t - Contrib_t. \quad (2.4)$$

At its core, *PenDef* represents the rate at which the government borrows through the state pension system. Eq. 2.3 shows that, assuming $r^{Liab} = r^{Assets}$, a DB pension plan grows more underfunded (or less overfunded) at a rate that is increasing in *PenDef*. In this paper, I focus on how Governors can manipulate *PenDef* through their discretion over contributions and benefit accrual policies.

2.2 Governor Discretion over State Pension Policy

In practice, both government employers and employees are responsible for funding state DB pension plans. This means that *Acc* is split into two portions: the part for which government employers are responsible (denote this *AccGov*) and the part for which employee members themselves are responsible (denote this *AccMbrs*). Similarly, *Contrib* consists of contributions from the government employers (denote this *ContribGov*) and contributions from employee members (denote this *ContribMbrs*). This means that the total pension deficit can be decomposed into $PenDef = PenDefGov + PenDefMbrs$, where

$$PenDefGov_t = AccGov_t - ContribGov_t, \quad (2.5)$$

represents the government's share of the pension deficit, and

$$PenDefMbrs_t = AccMbrs_t - ContribMbrs_t, \tag{2.6}$$

represents the employees' share of the pension deficit.

As chief executive of the state government, the Governor has powers to shape *PenDefGov* on a year-to-year basis. While other policymakers, such as state legislators, also play a role in the formulation of public pension policy, I focus on Governors due to their prominent roles in shaping the state budget and their oversight over state administrative agencies. Furthermore, public officials with political interests aligned with the Governor's interests may also wield influence over pension policy. For instance, members of the Governor's cabinet, members of the Governor's party in the state legislature, and Governor-appointed members of the pension board all have incentives to keep the incumbent Governor in office.[8] In contrast to *PenDefGov*, *PenDefMbrs* tends to be relatively inflexible, as employee contribution rates are typically set through collective bargaining agreements and/or statutory provisions that require special legislative actions.

Governors have significant discretion over *ContribGov*, which are typically approved as part of the budgeting and legislative appropriations process. According to Novy-Marx and Rauh (2014), pension contributions will eventually reach 14.1% of state and local budget revenues, absent significant policy reforms. Historically, Governors have played a prominent role in the budget process, with the responsibility of submitting budget proposals and signing enacted budgets into law. In many states, Governors have the authority to veto line items and spend unanticipated funds without legislative approval. In certain instances, such as in Illinois in 2006 and 2007, Governors have cut special deals with legislators to implement "pension holidays" that drastically reduced budgetary contributions.

There is a clear temptation for politicians to temporarily divert contributions away from state pension plans towards more immediately pressing needs. In recent years, for example, the Governors of New Jersey[9] and Connecticut[10] both made cuts to state pension contributions, citing that the funds were needed for the more urgent purpose of preventing immediate budget cuts. In certain cases, it may indeed be in the public's best interest to use public pension plan funds as means to prevent painful short-term budgetary cuts. The insight of this paper is that it is unclear why such stopgap measures should be more prevalent during

[8] In 1993, New York State Comptroller H. Carl McCall was accused by his political opponents of giving an "election-year gift" to his mentor Gov. Mario Cuomo by proposing a short-term reduction in state pension contributions.

[9] Zernike, Kate "Christie Vetoes 2015 Pension-Paying Budget" *The New York Times* 30 Jun. 2014.

[10] De Avila, Joseph, "Connecticut Governor, Unions Reach Deal to Restructure Pension Payments" *The Wall Street Journal* 9 Dec. 2016.

election years.

Governors also play a role in determining pension benefits, albeit in a more limited capacity. Typically, pension benefits are set through long-term collective bargaining agreements or through special legislative approval, which renders benefit policy less discretionary and flexible in comparison to contribution policy. However, Governors can assert their influence over benefit policies through their ability to set the legislative agenda and veto bills. In 2001, for instance, California Governor Gray Davis approved legislation that significantly increased the benefits for state employees, after making public assurances that the increased benefits would put no additional pressures on the state budget.[11] By the time that it became clear that the higher pension obligations would impose significant fiscal burdens, Governor Davis had been re-elected to a second term in the 2002 election.

Raising public pension benefits provides a channel for politicians to win the support from politically-powerful labor unions. For example, New York State Comptroller H. Carl McCall pursued such a strategy for a 2002 gubernatorial election bid, as media accounts at the time noted that *"Mr. McCall, who is planning a run for governor in 2002, has called for automatic pension increases, cementing his standing as a favorite of state workers and retirees."*[12] Pension benefit increases also serve as a potential bargaining chip that state governments can use to negotiate against wage concessions during labor negotiations with their employees. In fact, the relative generosity of public sector retirement benefits has been used to explain the earning differential between public and private sector workers (Munnell, Aubry, Hurwitz, and Quinby, 2011a).

2.3 Who Bears the Costs of Underfunded Public Pension Plans?

As Eq 2.3 shows, unfunded liabilities are decreasing in *Contrib*, increasing in *Acc*, and decreasing in $r^{Assets} - r^{Liab}$. Therefore, a state DB plan looking to improve its funding situation must either raise contributions (which imposes a cost on taxpayers), lower benefits (which imposes a cost on employees), or realize asset returns in excess of assumed discount rates. Thus, the political economy of the Governor's decision regarding pension funding policies hinges crucially on how state pension debts are expected to be repaid.

First, it is important to establish that reliance on excess realized returns to make up for unfunded liabilities tends to be a naive and unsustainable solution. The vast majority of state DB plans discount their liabilities at the expected rate of return on invested assets,

[11] Crane, David "Dow 28,000,000: The Unbelievable Expectations of California's Pension System" *The Wall Street Journal* 19 May 2010.

[12] Perez-Pena "Legislators Back Pension Rises For Retired Public Employees" *The New York Times* 14 Jun. 2000.

usually in the 7-9% per annum range in accordance to equity-heavy portfolios. As Novy-Marx and Rauh (2011) and Brown and Wilcox (2009) point out, this severely undervalues pension liabilities, as DB liabilities should be discounted at a lower rate that more appropriately reflects the underlying risk of quasi-fixed pension obligations.[13]. Even if one disregards the inappropriate discount rate, it is unrealistic for state plans to expect to earn consistently above-market returns over the long run. Rauh et al. (2010) estimates that 20 states will run out of pension funds by 2025 given their current funding policies, assuming average returns of 8%.

Therefore, underfunded plans must eventually raise contributions or reduce benefits. With respect to benefits, it is generally difficult for state DB plans to cut state pension benefits that have already accrued to employees (i.e. $Liab_t$ in Eq. 2.3), as accrued benefits represent debt-like obligations with strong legal protections in most states. With few exceptions, such as the 2013 Detroit bankruptcy, public sector DB pension plans rarely "default" on their promises to pay benefits already accrued by employees.

In certain states, government employers have more leeway to cut benefits that have yet to accrue (i.e. reducing Acc going forward).[14] At the extreme, some states operate under a "gratuity" principle, which allows employers to reduce public DB pension benefits at will. At the other extreme, some states have constitutional provisions that prevent the state from reducing pension benefits that employees expect to earn over their employment tenures. According to Munnell and Quinby (2012), it is practically impossible to cut benefit accruals in such states without amending the state constitution.

When benefit protections are weak, state employees have the incentive to monitor the government and prevent them from taking actions that would increase unfunded liabilities, as this would put the employees' retirement savings at risk. In comparison to diffuse voters who face the classic free rider problem, employee members of state DB plans have more concentrated interests and are in a better position to take on a monitoring role through various institutional channels, including employee representatives on pension boards of trustees and lobbying through public sector labor unions. When benefit protections are weak, however, employees are largely insulated from the consequences of pension underfunding, and the burden falls upon taxpayers through future contribution increases.

As noted in the previous section, state pension contributions come from both the government ($ContribGov$) and from employees ($ContribMbrs$). However, the employee's share of contributions tends to be inflexible, as it is typically set through long-term labor contracts

[13] The mismatch of risk between a plan's assets and its liabilities implies that taxpayers implicitly bear the cost of the risk premium (Bader and Gold, 2007).

[14] Since federal laws regulating pension benefits do not apply to state pension plans, individual states are responsible for the level of legal protection afforded to employees' rights to state pension benefits.

and/or requires special legislative approval in a manner similar to benefit policies. Furthermore, just as employees can pose legal challenges to attempts by state employers to cut pension benefits, they can also turn to the courts to prevent employers from raising employee contribution rates. For example, in 2012 the Superior Court of Arizona ruled against S.B. 1614, a bill introduced in 2011 to reform the state pension system by increasing employee contributions, because it violated the pension protection clause of the Arizona Constitution.

In the end, increasing governmental contributions is the most plausible course of action for plans facing large unfunded liabilities. The unfunded liability for most state DB pension plans is either implicitly or explicitly the obligation of the state government (Giertz and Papke, 2007), and since governments are financed through tax revenue, taxpayers bear the ultimate burden of funding these contributions. This sets up a potential agency conflict between incumbent politicians and taxpayers, in that the government may borrow on behalf of taxpayers through the state pension system in a manner that taxpayers would not choose for themselves. This conflict is discussed in more detail in the following section.

2.4 State Pension Policy Opacity

When unfunded state pension liabilities represent a debt burden for taxpayers, the Governor's pension policy decisions should in theory be disciplined by forward-looking taxpaying voters who anticipate that higher pension deficits incurred today necessarily imply future tax increases or spending cuts. Under the principle of Ricardian equivalence, voters with rational foresight will discount any current expansionary fiscal activity funded through pension deficits, and may even punish Governors for exhibiting fiscal imprudence (Brender and Drazen, 2008).

However, state DB pension plans present a vulnerable target for political interference due to their inherent opacity. This is because politicians have the incentive to manipulate voters' perceptions of their governing abilities through "hidden" forms of borrowing that are not directly observable to the public. The existing literature has highlighted the importance of this information asymmetry as the key friction in rationalizing the occurrence of political cycles in fiscal deficits (Alt and Lassen (2006), Shi and Svensson (2006)). Furthermore, Coate and Morris (1995) argue that welfare transfers to political special interests tend to be funneled through non-transparent channels.

Voters pay limited attention to state pension finances due to free rider problems that arise when the future tax burden of current unfunded pension liabilities is dispersed across a large population base. For an individual voting taxpayer, it may not be worth the effort to delve into the details of public pension plan reports and individual line items on the state

budget in order to understand the long run fiscal implications of pension contribution and benefit policies. For example, when Governor Cuomo raided New York state pensions in the early 1990's, the New York Times reported that *"there is no mystery in why politicians find the pension funds, which are worth more than $700 billion nationally, such attractive targets. Reducing the amount a state gives to the funds is likely to generate less protest from the voters than raising taxes."*[15]

There are also various institutional reasons why public pension plans tend to be opaque to the public. For instance, the complexity of actuarial methods used to report pension liabilities and determine contribution rates makes it difficult for the average voter to evaluate the long-term consequences of pension policies. In order to estimate the expected present value of future benefits, a DB plan must make assumptions about future wage growth, mortality rates, inflation rates, discount rates, among a host of other economic and demographic factors. This makes it easy for government employers to manipulate actuarial assumptions in order to "cover up" pension costs.[16]

Even if one takes the government's financial reports at face value, institutional features of the state budget process make it difficult for voters to observe the impact of pension policies in a timely manner. In particular, the protracted nature of the state budget and legislative appropriations process makes it difficult for the public to appreciate the long-term implications of state pension contributions in the short run. This implies that incumbent Governors have an especially strong incentive to borrow through the state pension system right before an election, with the understanding that voters will likely not be able to fully appreciate the impact until after the election is over.[17]

Figure 1 presents an example of a typical state budget cycle based on information provided by the National Association of State Budget Officers (NASBO). Before the start of a given fiscal year, the Governor's office adopts or amends a recommended contribution rate suggested by the pension board of trustees. After consulting with other governmental agencies, the Governor submits a proposed budget to the legislature, which is eventually finalized and signed into law just before the start of the fiscal year. It is not until after the end of the fiscal year that a plan releases its audited end-of-year financial statements.

As Figure 1 shows, there is a one-year delay between when state governments set their

[15] Verhovek, Sam Howe "The Region; States Are Finding Pension Funds Can Be a Bonanza Hard to Resist" *The New York Times* 22 Apr. 1990.

[16] Kido et al. (2012) find that state DB pension plans tend to underreport their unfunded liabilities in election years relative to non-election years, and attribute their findings to politically motivated actuarial manipulations. Bergstresser, Desai, and Rauh (2006) and Stefanescu, Xie, and Yang (2015) further document manipulation of DB pension plan actuarial assumptions in the private sector.

[17] In a stylized model presented in Appendix C, a temporary lag in voters' ability to observe the impact of pension policies is sufficient to generate election year spikes in pension deficits.

pension contribution rates and when the impact on unfunded pension liabilities is reported. In addition, the impact on unfunded liabilities is generally not reported directly in the general fund budget—which covers the majority of state appropriation, expenditure and receipt transactions and is the primary focus of public attention—but released separately via financial reports provided by the state pension plans themselves. For instance, a 2010 New York Times report described how New York State officials regularly concealed costs by excluding expenses from the general fund, leading the State Comptroller Thomas DiNapoli to declare the state's balance sheet to be unreliable.[18]

In comparison to changes in pension contribution rates buried in the state budget, changes to state pension benefits are more likely to receive public scrutiny. However, the complexity of the actuarial valuation process may nevertheless serve to obfuscate the funding impact of benefit policy.[19] For example, Senate Bill 400, the legislation that significantly increased benefits for California Public Employees' Retirement System (CALPERS) participants in 2001, met with little opposition in the state legislature after actuaries provided estimates that the investment earnings on pension assets would be sufficient to cover the increased pension costs.

To sum up, the information asymmetry problem stemming from the opaqueness of public pension policy, combined with the moral hazard problem relating to employees being insulated from the consequences of underfunding, create the incentives for Governors to use state pension borrowing for politically self-interested purposes at the expense of taxpayers. This intuition is formalized in a stylized model presented in Appendix C, which applies the career concerns framework of Holmström (1999) in a political setting. In the following section, I describe empirical tests used to determine whether such distortionary reelection incentives play a significant role in driving state pension policy.

3 Empirical Strategy

In this section, I describe the empirical tests I use to evaluate how Governors' reelection incentives affect governmental borrowing conducted through state DB pension plans. First, I look for an electoral cycle in pension deficits to check whether governments increase their rates of borrowing through state pension plans in election years. To this end, I estimate the

[18] Confessore, Nicholas "Grab Bag of Gimmickry Hides State Deficit" *The New York Times (City Room Blog)* 6 Apr. 2010. Web. `https://cityroom.blogs.nytimes.com/2010/04/06/albany-accounting-hides-deficit-size-comptroller-says/?src=mv`.

[19] Glaeser and Ponzetto (2014) argue that "shrouded" public pension packages are better understood by public-sector workers than by than ordinary taxpayers.

following OLS specification:

$$PenDef_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + X_{it}\beta + \epsilon_{it} \tag{3.1}$$

in which *PenDef* denotes the pension deficit, α denotes a constant intercept, κ_i denotes a plan-specific indicator, λ_t denotes a year-specific indicator variable, X_{it} denotes a column vector of control variables, $Election_{it}$ denotes a dummy variable indicating whether an election occurs in period t in plan i's state, and ϵ_{it} denotes an unobservable mean-zero error term.

We expect δ_0 to be positive if pension deficits are higher in election years relative to non-election years. The null hypothesis is there should be no systematic electoral cycle patterns in pension deficits in the absence of political distortions. The credibility of this assumption is supported by the fact that gubernatorial elections occur at pre-determined and fixed intervals and therefore should not be influenced by confounding factors. Furthermore,, the inclusion of year and plan fixed effects implies that 3.1 essentially forms a repeated difference-in-difference estimation framework in which plans from states with offsetting electoral cycles serve as control groups for one another. In particular, plan-level fixed effects account for time-invariant differences between different plans, while the year fixed effects account for time-specific shocks that commonly affect all plans.

I also estimate Eq. 3.1 using *PenDefGov*, the government's share of the pension deficit, and *PenDefMbrs*, the employee share of the pension deficit, as the dependent variable. We expect politically-motivated pension borrowing to be reflected through election year increases in *PenDefGov*, but Governors may also be tempted to increase *PenDefMbrs* as a form of election year wealth transfer to public employees. For instance, a Governor may grant a special contribution holiday to employees in exchange for political support from unions or as a bargaining chip during election year wage negotiations. However,*PenDefMbrs* is relatively inflexible due to long-term labor contracts and statutory contribution rates, as described in Section 2.

While my baseline specification in Eq. 3.1 places the focus on the difference between election years and non-election years, it is not immediately obvious whether one should expect a sharp election year spike in pension deficits or a more gradual increase in pension deficits throughout the electoral cycle. The dynamics depend on whether the incumbent's incentive to inflate performance rises gradually as election year draws near, or whether the increased media scrutiny and voter attention in election years produce a sharp surge in the incumbent's desire to inflate performance for political purposes.[20]

[20] In a theoretical context, a sharp election year spike may arise if the opacity of the incumbent's actions with

To investigate the full electoral cycle dynamics, I include dummy variables indicating one year before the election ($Election_{t+1}$) and two years before the election ($Election_{t+2}$) in estimating Eq. 3.1. Positive coefficient estimates on these additional dummy variables would indicate that increases in pension deficits occur earlier in the electoral cycle. Note that the coefficient for the dummy variable for three years before the election ($Election_{t+3}$) is not included since it is absorbed by the intercept term, as each electoral cycle is at most four years long.

Next, I separate *PenDef* into contributions (*Contrib*) and benefit accruals (*Acc*) and check whether the two components exhibit electoral cycle patterns by estimating Eq. 3.1 using *Contrib* and *Acc*, respectively, as the dependent variable.[21] On the contribution side, we expect the Governor's budgetary discretion to drive election year reductions to contributions, particularly in the government's share (*ContribGov*). Thus, I further include an interaction term between $Election_{it}$ and a dummy variable indicating the passage of a state budget ($Budget\ Year_{it}$) to check whether election year reductions in *ContribGov* are more pronounced during budget years.

On the benefits side, we expect *Acc* to be higher in election years relative to non-election years. However, the relative inflexibility of benefit policy makes it less likely for benefit accruals to exhibit systematic electoral cycle patterns. Nevertheless, the incentive to grant higher benefits in exchange for political support should be stronger in states with relatively powerful public sector labor unions. To test this empirically, I include an additional interaction term between $Election_{it}$ and the state-level public sector union membership rate ($Pub\ Union\ Mbrshp_{it}$) in estimating Eq. 3.1 with *AccGov* as the dependent variable.

I conduct several follow-up tests to determine whether electoral cycles in pension deficits stem from a politically-motivated agency conflict between politicians and taxpayers.[22] First, I exploit variation in the strength of public pension benefit legal protections across states, and include interaction terms between $Election_{it}$ and various measures of benefit protection strength in estimating Eq. 3.1. We should expect states that provide stronger benefit protections to exhibit more pronounced electoral cycles in pension deficits, as benefit protections insulate employees from the consequences of underfunded pension plans and reduces their incentives to monitor the government's pension funding policies.

To highlight the importance of information asymmetry between Governors and taxpayers,

respect to public pension policy is only temporary, or if the signal of the incumbent's fiscal performance regarding his underlying ability is only informative for one period. This is discussed in greater detail in Appendix C.

[21] See Appendices C.1 and C.2 for theoretical justifications for electoral cycles in pension benefits and contributions, respectively.

[22] See Proposition 1 and Proposition 2 from Appendix C for a theoretical basis for these predictions.

I include interaction terms between $Election_{it}$ and measures of state pension transparency in estimating Eq. 3.1. We expect to find election year spikes in pension deficits to be larger for plans in states with more opaque pension systems, as the incentive to finance expansionary activities through pension borrowing depends on the incumbent's ability to temporarily hide the pension borrowing from taxpayers.

I investigate several political factors involving Governors' reelection motives. First, I interact $Election_{it}$ with the electoral margin of victory ($VicMargin_{it}$) and include the term in estimating Eq. 3.1. Following the logic that electoral incentives are stronger for more competitive elections, we expect pension deficits to be higher for elections that are more closely contested. Next, I exploit the existence of gubernatorial term limits by including $Lame\ Duck_{it}$, a dummy variable indicating reelection ineligibility, in estimating Eq. 3.1. If reelection incentives drive pension borrowing, then pension deficits should be higher during terms in which the incumbent Governor is reelection-eligible. Lastly, I include interaction terms between $Election_{it}$ and a dummy variable indicating the incumbent Governor belongs to the Republican party ($Republican_{it}$), in order to check whether election year spikes in pension deficits can be explained by differences in partisan preferences between Democrat and Republican voters.

I perform several tests to evaluate the economic consequences of electoral cycles in pension borrowing. First, I check whether election year spikes in pension deficits are associated with deteriorating pension funding levels by estimating the following OLS specification:

$$\Delta UnfundedLiab_i = \alpha + \delta \cdot PenDefCyc_i + \bar{X}\beta + \epsilon_i \tag{3.2}$$

where $\Delta UnfundedLiab_i$ denotes the time series average for the annual change in the level of unfunded liabilities (scaled by payroll), $PenDefCyc_i$ denotes the average time-series difference between election year and non-election year pension deficits, $\bar{X}_i$ denotes a set of control variables which have been averaged along the time series for plan i, and ϵ_i denotes the residual error term.

We expect the coefficient on $PenDefCyc_i$ to be positive if larger electoral cycles in $PenDef$ are associated with larger increases in unfunded liabilities over the sample period. This would indicate that state governments do not create sufficient buffers in non-election years to offset higher election year pension deficits, leading to steadily deteriorating funding levels over time.

Note that estimating Eq. 3.1 with $UnfundedLiab_{it}$ as the dependent variable constitutes an alternative way to test the impact of electoral cycles on the level of unfunded liabilities. However, as mentioned earlier, unfunded liabilities are self-reported and calculated using ac-

tuarial assumptions and methodologies that can be manipulated, leading to under-reporting of unfunded liabilities in election years (Kido et al., 2012).[23] By taking the time-series average over the sample period in estimating Eq. 3.2, I circumvent this concern to a large extent, as it is much more difficult to hide funding deterioration over a 15-year period.

Ultimately, we are interested in whether electoral cycles in pension deficits lead to real economic consequences. There is fierce debate in both policy and academic circles over how public debt impacts economic growth. Our empirical setting allows me to ask a more specific question of whether "debts" incurred through the public pension system can have adverse effects on economic growth. To this end, I estimate the OLS following specification:

$$\ln(GDP\ Growth)_j = \alpha + \delta \cdot PenDefCyc_j + \epsilon_j \tag{3.3}$$

where $ln(GDP\ Growth)_j$ denotes the average GDP log growth rate for state j over the sample period, and $PenDefCyc_j$ denotes the average $PenDefCyc_i$ across sample plans in state j, weighted by plan liabilities. We expect a negative coefficient estimate on $PenDefCyc_j$ if systematic election year spikes in state pension borrowing are associated with lower economic growth.

I also estimate Eq 3.3 using $ln(HPI\ Growth)_j$, the average log growth rate in house prices for state j over the sample period, as the dependent variable. This test is motivated by Epple and Schipper (1981), who show that public pension underfunding can be capitalized in house prices through the market's expectation of higher future property taxes. We should expect a negative coefficient on $PenDefCyc_j$ if systematic election year pension borrowing is capitalized through falling house prices.

Lastly, I run several robustness tests to rule out alternative explanations for my main findings. Most importantly, I estimate 3.1 using a sample of *private sector* DB pension plans that should be unaffected by Governors' reelection incentives. This falsification test serves to address concerns that, in the absence political incentives, electoral cycle patterns in DB pension plan policies may still occur due to political cycles in economic conditions. For example, private firms may reduce DB pension contributions in election years due to systematic economic downturns that correlate with the electoral cycle.[24] I also address concerns that my results are driven by increased uncertainty surrounding transition of political

[23] In unreported results, I find suggestive evidence that state plans overstate the value of plan assets in election years. Public pension plans use actuarial methods to smooth over fluctuations in asset values, and I find that the difference between the actuarial value and market value of plan assets is systematically larger in election years.

[24] The existence of electoral cycles in aggregate output and employment at the national level is rejected by Alesina and Roubini (1992) who examine a sample of OECD countries. The authors find evidence of an electoral cycle pattern in inflation, but their findings indicate that inflation tends to occur immediate after elections rather than before elections. I control for inflation assumptions in my empirical specifications.

leadership,[25] by checking whether state pension deficits exhibit systematic patterns following unexpected changes in the Governorship due to death, resignation, or impeachment.

4 Data

4.1 State Pension Data

I investigate the annual pension deficit policies of state-administered defined benefits pension plans over the period 2001-2015. The primary source of public pension data comes from the Public Plans Database (PPD) maintained by the Center for Retirement Research. The PPD maintains data starting in 2001 from 150 public pension plans, consisting of 115 plans administered at the state level and 35 administered at the local level, which covers 90% of public pension membership and assets in the United States.

The PPD data includes information on public pension contributions broken down by originating source. Using the PPD contribution measures, I construct $ContribGov_{it}$, a measure of contributions from the government, by aggregating regular contributions from employers (*contrib_ER_regular*) and contributions directly from the state (*contrib_ER_state*), and scaling by total covered payroll.[26] This represents the total discretionary governmental spending directed towards funding pension plan i in year t, as a percentage of payroll. Scaling by payroll makes contribution rates comparable between plans of differing sizes, and follows public pension accounting conventions that express pension costs as a fraction of payroll. I multiple these fractions by 100 in order to express them in percentage terms for clearer exposition in tables.

Next, I construct $ContribMbrs_{it}$, a measure of contributions from participating employee members, by aggregating regular contributions from employees (*contrib_EE_regular*), contributions used to purchase service credits (*contrib_EE_PurchaseService*),[27] and other uncategorized contributions coming from employees (*contrib_EE_other*), and scaling by total covered payroll. The aggregate contribution rate $Contrib_{it}$ is defined as the sum of $ContribMbrs_{it}$ and $ContribGov_{it}$.

I construct measures of benefit accruals based on *normal cost rates*, which are self-reported figures that represent the present value of benefits accrued by plan i in year t as a percentage of payroll. The normal cost rate is calculated by apportioning the total

[25] This is motivated by Julio and Yook (2012) who find that corporate investment tends to be lower during election years due to higher levels of political uncertainty.

[26] Covered payroll represents the total pensionable earnings among participants. Normalizing by payroll is standard in public pension accounting in order to make plans of different sizes comparable.

[27] Service credit contributions represents contributions made by employees to directly purchase accrued pension benefits as a means to increase their accrued pension savings.

present value of an employee's expected benefits in retirement to each year of an employee's work life, based on a specific actuarial cost method, and is reported in annual actuarial valuation reports. The PPD data provides both the employer's share of the normal cost rate ($NormCostRate\_ER_{it}$), which I use as my measure of the government's share of the normal cost rate, denoted $AccGov_{it}$, as well as employees' share of the normal cost rate ($NormCostRate\_EE_{it}$), which I use as my measure of the employees' share of the normal cost rate, denoted $AccMbrs_{it}$. The total rate of benefit accruals, denoted Acc_{it}, is the sum of $AccGov_{it}$ and $AccMbrs_{it}$.

I define $PenDef_{it}$, the pension deficit, as the difference between Acc_{it} and $Contrib_{it}$. This measure represents the rate at which that the government effectively borrows from the state pension plan, as described in Eq. 2.4 from Section 2. I further define $PenDefGov_{it}$, the government share of $PenDef_{it}$, as the difference between $AccGov_{it}$ and $ContribGov_{it}$, and define $PenDefMbrs_{it}$, the employee share of $PenDef_{it}$, as the difference between $AccMbrs_{it}$ and $ContribMbrs_{it}$.

Since normal costs are actuarially-determined figures, I include observable actuarial assumptions as control variables in order to account for changes in benefit accruals that come from actuarial assumptions and not from changes in the underlying benefits. In particular, I control for contemporaneous values of *Discount Rate*, the reported rate used to discount future benefit obligations, *Inflation Rate*, the assumed inflation rate used in the actuarial valuation of liabilities, and *CostMthd EAN*, a dummy variable that indicates whether the plan uses the Entry Age Normal (EAN) actuarial cost method in order to value its liabilities. The EAN method is the most common cost method, and also the most conservative one in terms of liability recognition. A more detailed explanation of actuarial valuation methods can be found in Appendix B.

In addition to contemporaneous actuarial control variables, I also include several plan-level control variables constructed from the PPD data. This includes lagged values of $ln(Payroll)$, defined as the natural log of total payroll among plan participants, $ln(Avg\ Salary)$, defined as the natural log of average salary among plan participants, and *Income*, defined as the total non-contribution income (including investment income) scaled by payroll. In particular, $ln(Payroll)$ and $ln(Avg\ Salary)$ control for variation in plan size and employee wage levels, while *Income* controls for changes to pension funding levels due to changes in investment returns.

I keep observations which contain non-missing variables for my benchmark regression specifications. This results in an unbalanced panel of 114 plans corresponding to 1,318 observations over 15 years from all 50 states. I winsorize all continuous variables at the 1% level at both tails. A detailed list of variable descriptions can be found in Appendix A.

Table I presents the descriptive statistics for the variables used in my main regression specifications. The table shows that on average, contribution rates are larger than benefit accrual rates, with the average *Contrib* at 17.979% of payroll and the average *Acc* at 12.5% of payroll. This results in an average *PenDef* of -5.39% of payroll, indicating an average surplus. This surplus can be attributed to the persistent underfunding of plans in my sample, which results in plans contributing more funds on average than accruing new liabilities in order to service the amortized costs of their unfunded liabilities. We see that the surplus is largely driven by the difference between *ContribGov* and *AccGov* rather than the difference between *ContribMbrs* and *AccMbrs*. This is consistent with the fact that employee shares of benefit accruals and contributions are usually set, either by contract or statute, to the same rate, while the burden of unfunded pension liabilities falls upon the government.

Table II presents a breakdown of pension plans by state. The number of plans in each state ranges from 1 to 5, with the average state containing 2.76 state-administered DB pension plans. Table II also includes summaries of the average size of pension plans in the sample in terms of payroll, as well as averages for *Contrib*, *Acc*, and *PenDef*. The table reveals there is substantial cross-state variation in terms of plan size as well as pension contribution and benefit policies.

4.2 State Politics Data

I obtain data on gubernatorial elections from Carl Klarner's website (www.klarnerpolitics.com).[28] I supplement and verify Klarner's Governors data set against information extracted from Book of the States provided by the Council of State Government Knowledge Center. From these data sources, I also obtain data on gubernatorial election voting results, gubernatorial term limits, party affiliations of incumbent Governors, and Governors' prior political experience. Data regarding institutional budgetary rules comes from the National Conference of State Legislatures website.

The schedule of U.S. gubernatorial elections is exogenous and set by law. Governors are elected to four-year terms in all states except for New Hampshire and Vermont, where each term is two years. Gubernatorial elections are held in early November in all states except for Louisiana, which holds its elections in October. Figure 2 shows that gubernatorial elections are staggered over my sample period, with the majority of elections occurring two years offset from presidential elections. Figure 3(a) provides an illustrated map of how gubernatorial electoral cycles vary across states.

I define $Election_{it}$ as a dummy variable that indicates whether plan i is located in state

[28] I thank Carl Klarner for making early updates of his datasets available for use.

that holds an election in fiscal year t. Specifically, a plan-year observation is associated with $Election_{it} = 1$ if and only if an election occurs between the start and end of fiscal year t. For example, a plan-year observation with fiscal year beginning in July 2006 is counted as an election year only if an election takes place in November 2006. This timing convention conforms to the timing of pension policy choices and election dates as illustrated in Figure 1, in the sense that the pension policy decision occurs prior to the election, and the impact on the pension plan's funding status is revealed in audited financial reports only after the election.

I define $VicMargin_{it}$ as the margin of victory in percentage points between the winning gubernatorial candidate and the runner-up in year t for the state in which plan i is located. If no election takes place in year t, then $VicMargin_{it}$ is set to equal zero. I define $Lame\ Duck_{it}$ as a dummy variable that indicates whether an incumbent Governor faces binding term limits in their current term.[29] Figure 3(b) provides an illustrated map of states which impose gubernatorial term limits.

I define $Republican_{it}$ as a dummy variable that indicates whether the incumbent Governor belongs to the Republic party,[30] $Budget\ Year_{it}$ as a dummy variable that indicates whether a the state passed a budget in year t, $BalBudget_i$ as a dummy variable that indicates the state is subject to balanced budget restrictions, and $LegisExp_{it}$ as a dummy variable that indicates whether the incumbent Governor possesses prior experience as a member of the state legislature. Figure 4(a) provides a map illustrating the geographic distribution of states with biennial versus annual budgets, and Figure 4(b) provides a map of states with balanced budget restrictions.

4.3 Other Data

In order to control for state-specific economic factors, I include state-level control variables in my empirical specifications. These include lagged values of $Deficit\ Shock_{it}$, which measures the unexpected per capita deficit for a given state in year t. This measure is constructed using data obtained from NASBO's *Fiscal Survey of States* following the methodology from Poterba (1994). In particular, Splinter (2011) documents that states tend to reduce contributions towards public DB pension plans when they experience negative budgetary shocks. I also include $State\ Unemp_{it}$, the state unemployment rate taken from the Bureau of Labor Statistics Local Area Unemployment Statistics, and $Pub\ Union\ Mbrshp_{it}$, the state-level public sector unionization rate taken from Barry Hirsch and David Macpherson's website

[29] The majority of states maintain term limits for their Governors, although the exact nature of the term limit can differ from state to state.

[30] Republicans hold the Governor's office in 52.35% of the plan-year observations in my sample.

www.unionstats.com, as additional control variables. Descriptive statistics for these variables are included in Table I, and a more detailed description of variable definitions is found in Appendix A.

Data on legal protections for state employees' pension benefits comes from Munnell and Quinby (2012). I define the *Weak Protect*$_i$ and *Strong Protect*$_i$ as dummy variables that indicate whether plan i is located in a state that protects benefits under the gratuity principle and the constitutional protection principle, respectively. Some states offer benefit protections only to public sector employees that meet a certain threshold of employment tenure. For example, benefit protections may be offered only after a certain vesting period or after the employee is eligible for retirement. Accordingly, I define *Unconditional Protect*$_i$ as a dummy variable that indicates whether plan i is located in a state that offers unconditional benefit legal protections.

Figure 5(a) and Figure 5(b) provide illustrated geographic breakdowns of benefit protection legal regimes across states. Figure 5(a) shows several intermediate forms of benefit protection regimes; some states protect benefits as explicit contractual arrangements (contract principle), some states offer protection of benefits even where no contract has been explicitly stated (promissory estoppel), and some states considers public pension benefits to be property that cannot be taken away without due process (property principle). A comparison of Figure 5(a) and Figure 5(b) reveals the existence of states that provide unconditional but weak protection of state pension benefits (such as Texas), as well as states that provide strong protection of state pension benefits that are conditional on vesting or retirement eligibility (such as Michigan).

I obtain data on institutional transparency from the *State Integrity Investigation* (SII), a joint data project conducted by nonpartisan investigative news and open data organizations.[31] The SII provides index measures based on surveys of experienced journalists that reflects the degree of state government transparency and accountability across 13 different categories. I focus on the particular indices that fall under the categories of (1) state pension fund transparency and (2) state budget process transparency.

The SII pension transparency index is based on journalists' survey responses to questions such as whether *"citizens can access information on state pension funds within a reasonable time period and at no cost,"* and whether *"state pension funds information is made available in open data format."* The score is on a scale from 0 to 100 and a higher score indicates a

[31] The State Integrity Investigation is a collaboration between the Center for Public Integrity, Global Integrity and Public Radio International. The project was first carried out in 2011, and was updated in 2015 using more rigorous methods that required reports to supply more specificity. I base my measure based on the 2015 scores. See `https://www.publicintegrity.org/accountability/state-integrity-investigation/` for details.

greater level of transparency in state pension fund management. The similarly-constructed budget transparency index is based on journalists' responses to questions such as whether *"the state budgetary debate process is conducted in a transparent manner,"* and whether *"citizens can access itemized budget allocations within a reasonable time period and at no cost."* Illustrated breakdowns of the geographic variation in state pension transparency and in budget process transparency scores are presented in Figure 6(a) and Figure 6(b), respectively.

I obtain data on state budgetary revenues and expenditures from the U.S. Census Bureau's Annual Survey of State Government Finances in order to check for electoral cycle patterns in several variables related to state fiscal policy. In particular, I construct per capita measures of tax revenues ($Taxes_{it}$), general fund expenditures ($Spend_{it}$), education expenditures ($Edu\ Spend_{it}$), capital outlay expenditures ($Cap\ Spend_{it}$), and police expenditures ($Police\ Spend_{it}$). The final three expenditure variables listed represent items that are especially likely to be targeted for politically-motivated purposes.

Lastly, I obtain data on state economic growth from the Bureau of Economic Analysis, and data on state housing prices from the Federal Housing Finance Agency. Specifically, I construct $ln(GDP\ Growth)_j$ as the time-series mean of the annual log growth rate of real GDP for state j over the sample period, and $ln(HPI\ Growth)_j$ as the time-series mean of the quarterly log growth rate of seasonally-adjusted house price index values (based on purchases only) for state j over the sample period. These variables allow me to check whether electoral cycles in pension deficits impact real economic outcomes.

5 Results

In this section, I present the results from estimating the empirical specifications outlined in Section 3 in order to show that political incentives distort how state governments borrow from state DB pension plans. I also present supplementary tests and robustness checks to understand whether these findings are driven by contributions or benefit accruals, as well as to rule out alternative explanations for the documented electoral cycle patterns.

5.1 Main Results

To estimate how pension deficits in election years differ from non-election years, I estimate 3.1 using *PenDef*, *PenDefMbrs*, and *PenDefGov*, respectively, as the dependent variable, and present the results in Table III. Columns (1), (3), and (5) do not include any control variables, while columns (2), (4), and (6) include the full set of control variables described in

the previous section.[32] The signs on the coefficients on the control variables lack statistical significance for the most part and are therefore difficult to interpret. All specifications presented contain year fixed effects and plan fixed effects. Standard errors are robust to heteroskedasticity and clustered at the state level.

The estimates from columns (1) and (2) reveal a statistically-significant and positive relationship between $Election_{it}$ and $PenDef_{it}$. The magnitude of the estimate is economically significant, as the coefficient estimate in column (2) implies that governmental pension deficits as a percentage of payroll are on average 0.603 percentage points higher in election years relate to non-election years. Relative to the sample mean 5.392 percentage point surplus, this represents a 11.2% increase (decrease) in pension deficits (surplus). With the sample average payroll at $4.67 billion per plan, this represents a difference of $28.15 million between election and non-election years in dollar terms.

Columns (3) to (6) show that the electoral cycle pattern in *PenDef* is driven by the government share of the pension deficit and not the employee share. The coefficient estimate on $Election_t$ when *PenDefMbrs* is the dependent variable is small and statistically insignificant, while the same estimate when *PenDefGov* is the dependent variable is significant and similar in magnitude to the estimates on *PenDef* in columns (1) and (2). This is consistent with expectations, as the Governor has significantly greater discretion over the government's share than over employees' share of the pension deficit, as described in Section 2.

Next, I estimate the same specifications as in Table III and include additional indicator variables for the other years in the electoral cycle. The results are presented in Table IV, which shows the full dynamics of how *PenDef*, *PenDefMbrs*, and *PenDefGov*, respectively, vary over the electoral cycle. Column (1) shows that the pension deficit spike is confined to the final year of the electoral cycle as the coefficient on $Election_t$ is significant while the coefficients on $Election_{t+1}$ and $Election_{t+2}$ are not. Estimates from columns (2) and (3) reinforce the evidence provided by Table III in that the election year effect is driven by discretionary governmental pension policies rather than by inflexible employee contribution and benefit accrual rates. The magnitudes of the coefficient estimates on $Election_t$ are similar to those found in Table III, while the coefficients on $Election_{t+1}$ and $Election_{t+2}$ are statistically insignificant and close to zero for all specifications.

Given the increased voter engagement and media scrutiny of state politics in the lead-up to an election, it is unsurprising that pension deficits experience a sharp increase in election years. The sharp election year effect supports the temporary nature of the information

[32] Note that the number of observations reported is less than than the full 1,316 sample size. This is due to the dropping of singleton groups (i.e. states with only one observation) during the estimation process. According to Correia (2015), maintaining singleton groups when fixed effects (in this case plan fixed effects) are nested within clusters (in this case states) can overstate statistical significance and lead to incorrect inference.

asymmetry regarding pension policy, which renders policies undertaken in earlier years in the electoral cycle ineffective in influencing voters' perceptions by the time the election occurs. It is also consistent with the idea that the most recent fiscal performance is most predictive of an incumbent politician's future performance, in which case voters rationally weigh the most recent fiscal year more heavily in evaluating the incumbent candidate. Appendix C provides a more detailed discussion of the theoretical basis behind a sharp election year effect.

5.2 Electoral Cycles in State Pension Contributions

Since pension deficits reflects the difference between benefit accruals and contributions, the documented electoral cycles in *PenDef* can be explained by election year spikes in *Acc*, election year dips in *Contrib*, or a combination of both. We begin by looking at contributions, as it constitutes the more discretionary policy choice facing Governors. To this end, I estimate 3.1 using various contribution measures as the dependent variable and report the results in Table V.

Column (1) shows that *Contrib* experiences a statistically significant election year drop, which is about equal in magnitude to the 0.603 percentage point increase in *PenDef* reported in Table III. We see from columns (2) and (3) that the election year dips in *Contrib* are entirely explained by election year dips in *ContribGov*. The evidence suggests that governments cut back on their own share of pension contributions in election years, but do not provide election year contribution breaks to employees. This is consistent with our earlier findings on pension deficits, and also in our line with expectations relating to the Governor's greater discretion over the government's share of pension contributions.

I conduct additional tests to check whether larger election year contribution reductions are associate with cases where the Governor possesses greater budgetary discretion. To this end, I exploit the fact that some U.S. states pass a state budget on a biennial rather than on annual basis. In general, annual budget cycles allow for more flexibility and responsiveness, while biennial budget cycles provide more opportunity for oversight.[33] This means that Governors have less discretion to influence election year pension contributions when the election coincides with an off-budget year.

I interact $Election_{it}$ with $Budget\ Year_{it}$, a dummy variable indicating a budget year, and include the interaction term in Eq. 3.1. The estimation results are reported in column (4) of Table V, which reveal a positive and significant coefficient estimate on $Election_{it} \times Budget\ Year_{it}$, and a coefficient estimate of zero on $Election_{it}$. This indicates that election year dips in governmental contributions are confined to budget years, thereby reinforcing the

[33] See The Hon. Leon Panetta's testimony before the House of Representatives Rules Committee (March 16, 2000), at `http://archives.democrats.rules.house.gov/archives/rules_hear09.htm`.

notion that budgetary discretion plays an important role in the Governor's ability to borrow through state pension plans.

I also exploit the fact that state budgets are passed via an appropriations process through the state legislature. I interact $Election_{it}$ with $LegisExp_{it}$, a dummy variable that indicates whether the Governor has prior experience as a member of the legislature, and include the interaction term in estimating Eq. (4.1). The results from column (5) of Table V reveal that the coefficient estimate on $Election_{it} \times LegisExp_{it}$ is positive and statistically significant, which implies that Governors who possess prior legislative experience leverage their experience to reduce contribution rates in election years. Column (6) of Table V shows that the coefficients on $Election_{it} \times Budget\ Year_{it}$ and $Election_{it} \times LegisExp_{it}$ remain negative and statistically significant when both are included in the empirical specification.

If Governors cut back on state pension contributions in election years, what do they do with the redirected funds? While we cannot directly track the redirected contribution funds dollar for dollar, we can look at overall electoral cycle patterns in state spending. The previous literature has documented the occurrence of expansionary spending policies in election year, and I corroborate those findings here by regressing various budgetary variables at the state level, including per capita spending ($Spend$) and per capita tax revenue ($Taxes$), on the election year dummy variable and a host of control variables.[34]

The results are presented in Table VI, and while column (1) shows that an election year decrease in taxes is not statistically significant, column (2) shows that state spending tends to increase in election year. These findings suggest that Governors look to expand budgetary expenditures during election years without raising taxes. I also examine budgetary expenditures on particularly visible items in columns (4)-(6) in Table VI. In particular, I find election year increases in particularly visible items, including per capita spending on education ($Edu\ Spend$), capital outlay projects ($Cap\ Spend$), and police ($Police\ Spend$).[35]

5.3 Electoral Cycles in State Pension Benefit Accruals

Turning to the liability side of the balance sheet, I estimate 3.1 using various measures of benefit accruals as the dependent variable and present the results in Table VII. The positive coefficient estimate from column (1) shows that Acc tends to be higher in election years relative to non-election years, but the effect is not statistically significant. Results reported

[34] I also include the interaction term $Election_{it} \times BalBudget_i$ to compare states that allow budget deficits to be carried over from year to year versus states that do not in order to account for the findings of Rose (2006), who show that expansionary spending in election years is attenuated by the presence of balanced budget requirements.

[35] Prior literature has found election year increases in police hiring (Levitt et al., 1997) and decreases in college tuition rates (Reynolds, 2014).

in column (2) and column (3) show similar findings if we use *AccMbrs* or *AccGov* as the dependent variable in the specification.

The lack of significant election year effects in benefit accruals is consistent with the fact that pension benefits are relatively inflexible as they are typically set according to multi-year labor agreements and/or require special legislative approval. Moreover, the normal cost is a noisy measure of benefit accrual rates as it is determined via actuarial methods that incorporate many assumptions about future economic and demographic conditions. Election-year increases in benefits may further be concealed by unobservable actuarial manipulations that understate election year election unfunded liabilities, as documented by Kido et al. (2012). Therefore, the coefficients reported in Table VII likely underestimate systematic election year increases in benefit accrual rates.

Next, I examine instances in which we should expect to see larger and more significant election year increases in benefit accruals. In particular, we should expect larger election year benefit increases in states with higher rates of public sector union membership if raising pension benefits provides a way for Governors to gain political support from labor unions in election years. Furthermore, we focus on *AccGov* rather than *AccMbrs* since it is self-defeating to make employees themselves responsible for paying for a benefit increase if the objective is to generate a welfare transfer to workers.

I interact the $Election_{it}$ with $Pub\ Union\ Mbrshp_{it}$ and include the interaction term in estimating 3.1 with *AccGov* as the dependent variable. The results are reported in column (4) of Table VII, and the positive and statistically significant coefficient estimate on $Election_{it} \times Pub\ Union\ Mbrshp_{it}$ indicates that election year increases in state pension benefit accruals are indeed larger for plans in states with stronger public sector unions. In terms of economic magnitude, a plan in a state in the 75th percentile of public sector union membership experiences a relative 0.33 percentage point election year in *AccGov* increase relative to a plan in a state in the 25th percentile of public sector union membership. Note that the negative coefficient on $Election_{it}$ in column (4) suggests that the government may even lower its share of pension benefit accruals when public sector unions are especially weak.

These finding suggest an alternative interpretation to the results from Mitchell and Smith (1994), who find that higher state unionization rates are associated with lower levels of state pension funding. The authors speculate that this is due the government reducing contributions in response to upward pressures on salaries stemming from collective bargaining. Our results suggest that the underfunding may also stem from public sector labor unions' ability to increase benefits for their constituents by exploiting politicians' reelection incentives, without bothering to consider how those benefits will be funded.

Since significant changes to state pension policies usually require legislative approval, I

check whether Governors who possess legislative experience are more likely to increase benefit accrual rates in election years. To this end, I interact $Election_{it}$ with $LegisExp_{it}$ and include it in estimating 3.1 with $AccGov$ as the dependent variable. The results in column (5) of Table VII shows a positive and significant coefficient on the interaction term. This suggests that legislative experience not only provides Governors with more budgetary discretion over pension contributions, but also increases their ability to influence benefit policies. Column (6) of Table VII shows that the coefficients on $Election_{it} \times Pub\ Union\ Mbrshp_{it}$ and $Election_{it} \times LegisExp_{it}$ remain positive and significant when both are included in the empirical specification.

Overall, Tables V and VII show that electoral cycles in pension deficits are primarily driven by lower contributions in election years, but that in certain scenarios, the Governor may also face election year pressures to raise benefits. As expected, the pattern is found only in the government share of contributions and benefit accruals, since these are the items over which the Governor has discretion. Therefore, I focus on $PenDefGov$ as the policy variable of interest in the following sections.

5.4 Electoral Cycles and Employee Benefit Protections

In order to understand the the political economy behind the electoral cycles documented thus far, we turn to an examination of the institutional factors that distort the incentives of incumbent Governors. First, we investigate the idea that opportunistic borrowing through state pension systems hinges on taxpayers rather than employees bearing the consequences of pension underfunding.

Exploiting variation is state-level legal regimes, I interact $Election_{it}$ with various indicators of benefit protection strength as described in Section 4 and include the interaction terms in Eq. 3.1. The results are reported in Table VIII, and show that election year spikes in pension deficits are significantly larger for states offering stronger legal protection as well as for states offering unconditional legal protection for state pension benefits. Note that the level effects for the legal protection variables are not reported since they are time-invariant and thus absorbed by plan fixed effects.

The coefficient estimates on the interaction terms are economically significant. The coefficient estimate on $Election_{it} \times Strong\ Protect_i$ in column (1) implies that state pension plans from states that provide constitutional protection of employee pension benefits experience a 1.817 percentage point (35.3% relative to the sample mean) election year increase in pension deficits relative to states that do not. Similarly, states that operate under the gratuity principle experience a 1.679 percentage point (33.3% relative to the sample mean)

election year decrease in pension deficits relative to states that provide stronger forms of protection. States that provide unconditional protection of state pension deficits experience a 1.009 percentage point (19.6% relative to the sample mean) election year increase in pension deficits relative to states that places tenure requirements on legal protections of state pension benefits.

These findings suggest that strong benefit protections which insulate employees from the future costs of underfunded pension plans create a moral hazard them to ignore opportunistic election year pension borrowing. This creates the necessary conditions for an agency conflict between Governors and taxpayers, in which the Governor borrows through the state pension system in a manner in which taxpayers may not choose for themselves.

5.5 Electoral Cycles and Pension Plan Opacity

If taxpayers can perfectly observe governmental pension policies, then any pension policy decisions not in the best interests of taxpaying voters should be self-defeating from the incumbent Governor's perspective. Thus, I investigate the idea that information asymmetry plays an important role in generating the distortionary reelection incentives that drive electoral cycles in pension deficits.

I interact $Election_{it}$ with measures of pension plan opacity and include the interaction terms in estimating Eq. 3.1. First, I interact $Election_{it}$ with $Opaque\ Pensions_i$, a dummy variable indicating if the SII state pension transparency index measure (as described in Section 4) is in the bottom decile of the sample, and with $Transparent\ Pensions_i$, a dummy variable indicating the same index measure is in the top decile.

Column (1) of Table IX shows that the estimate on $Election_{it} \times Opaque\ Pensions_i$ to be positive and the estimate on $Election_{it} \times Transparent\ Pensions_i$ to be negative. The point estimates are statistically significant and indicate that pension plans in the bottom decile of pension transparency experience a 1.081 percentage point (21.5% relative to the sample mean) election year pension deficits increase relative to plans in the middle 80 percentile, while pension plans in the top decile of pension transparency experience a 1.228 percentage point (23.5% relative to the sample mean) election year pension deficit decrease. The economic magnitudes and significance of the estimates do not change much when both interaction terms are included together in one specification, as reported in column (4).

Since, the state budget process ultimately determines pension contributions, I conduct a similar test using the SII indicator for the transparency of the state budget process. I interact $Election_{it}$ with $Opaque\ Budget_i$, a dummy variable indicating whether the SII budget transparency index measure is in the bottom decile of the sample, as well as $Transparent\ Budget_i$,

a dummy variable indicating whether the same index measure is in the top decile.

Column (2) of Table IX reveals that the estimate on $Election_{it} \times Opaque\ Budget_i$ to be positive but insignificant, while the estimate on $Election_{it} \times Transparent\ Budget_i$ is negative and significant. The point estimate on the latter term indicates that states in the top decile of budget transparency experience a 0.794 percentage point (15.6% relative to the sample mean) lower election year pension deficit spike relative to plans in the middle 80 percentile.

Overall, the results reported in Table IX support the idea that information asymmetry forms a key friction in generating the incentive distortions that drive election year spikes in pension deficits, and further suggest that pension transparency is more important than budgetary transparency. When all interaction terms are included in column (3), the coefficient estimates on the budget transparency interaction terms are no longer significant while the estimates on the pension transparency interaction terms remain largely unchanged. A possible explanation is that nontransparent budgetary process provide incumbent Governors with alternative channels to fund opportunistic election year activities, such as delaying infrastructure investment.

5.6 Electoral Cycles and Political Factors

I investigate various political factors to determine whether Governors' reelection concerns drive their incentives to borrow opportunistically through state pension plans. First, I test whether electoral cycles in pension deficits are stronger for elections that are more closely contested. To this end, I include $VicMargin_{it}$, an inverse measure of election closeness, in estimating Eq. 3.1.[36].

The results are presented in Table X, and column (1) shows that the coefficient estimate on $Election_{it} \times VicMargin_{it}$ is indeed negative and statistically significant. The point estimate of -2.232 implies that a close election in which the winning candidate barely edges out the runner-up candidate is associated with an election year spike in pension deficits that is 0.446 percentage points (8.8% relative to the sample mean) higher than an election in which the winning candidate prevails by a margin of 20 percentage points.

Next, I include $Lame\ Duck_{it}$, a dummy variable indicating whether binding term limits apply to the incumbent Governor, in estimating Eq. 3.1. The results are presented in column (3) of Table X and the negative estimate on $Lame\ Duck_{it}$ reveal that lame duck (i.e. reelection-ineligible) Governors incur lower pension deficits on average, which is consistent

[36] Since voting occurs only during election years, $VicMargin_{it}$ is set to zero for non-election years. This means that we do not need to include the interaction term between $VicMargin_{it}$ and $Election_{it}$, since the coefficient on $VicMargin_{it}$ directly captures the marginal effect of election closeness conditional on the occurrence of an election year

with the idea that politicians who are unable to seek reelection have a weaker incentive to inflate their performance through concealed pension borrowing. Interesting, Besley and Case (1995) and Alt, De Mesquita, and Rose (2011) find that taxes and spending are higher under lame duck Governors, which the authors attribute to reduced fiscal prudence stemming from a lack of electoral accountability. My findings suggests a silver lining to the lower accountability associated with lame duck terms, as it may serve to limit distortionary actions motivated by reelection ambitions.

Surprisingly, the estimated coefficient on interaction term $Election_{it} \times Lame\ Duck_{it}$ is positive, which implies that reelection-ineligible Governors incur higher pension deficits in election years. However, this result is potentially confounded by electoral competitiveness, as reelection-eligible incumbent Governors tend to enjoy a significant electoral advantage (Ansolabehere and Snyder Jr, 2002).[37] Indeed, the statistical significance of the interaction term is statistically weak and disappears when the terms involving $VicMargin_{it}$ are included in the specification, as reported in column (5).

Lastly, we check whether party affiliation have any effects on a Governor's propensity to raise pension deficits during election years. U.S. politics is dominated by a two party system, and each party may wish to cater to its core constituency, with Democratic voters preferring higher spending and Republican voters preferring lower taxes.[38] Therefore, we must consider the possibility that electoral cycles in pension deficits, rather than being a sign of distorted political agency, simply reflect the policy preferences of a partisan electorate.

I interact $Election_{it}$ with $Republican_{it}$, and include the interaction term in Eq. 3.1. The estimation results are reported in column (3) of Table X, and show that there is no statistically significant effect of having an incumbent Republican Governor relative to having an incumbent Democrat Governor. The estimate remains insignificant when interaction terms relating to other political variables are included in column (4). These results suggest that electoral cycles in pension deficits are not driven by policies catered to the political preferences of one particular party's partisan base.

[37] Another possibility is that the incumbent's party exerts greater influence towards the end of the incumbent's lame duck term, and the party is strongly motivated to secure the election for the successor candidate, whose chances of victory are helped by burnishing in the incumbent party's perceived performance.

[38] The previous literature has found mixed results in identifying partisan differences in opportunistic fiscal activities by the two major U.S. political parties. Poterba (1994) finds no difference in electoral cycles in fiscal policy at state level. Alesina et al. (1997) find Democrats tend to be associate with more expansionary monetary policy, but only in first half of electoral cycle. Cunha, Ferreira, and Silva (2016) find that Democrats are more likely to exploit exogenous reductions to credit constraints.

5.7 Consequences of Electoral Cycles in Pension Deficits

Thus far, we have shown that pension deficits tend to be higher in election years *relative* to in non-election years. The natural follow-up is to determine whether such electoral cycles lead to increases in the *level* of unfunded liabilities over time. The more benign possibility is that governments accumulate sufficient pension surpluses in non-election years to offset the increased election year pension borrowing.[39] The other possibility is that each successive incumbent chooses to "kick the can down the road" by not accumulating sufficient buffers during non-election years.

Following steps outlined in Section 3, I collapse my sample along the time series and estimate Eq. 3.2 where the variable of interset is $PenDefCyc_i$, the average difference in election year pension deficits and non-election year pension deficits, and the dependent variable is $\Delta UnfundedLiab_i$, the average change in unfunded liabilities over the sample period. The estimation results are reported in Panel A of Table XI, and show that the point estimate is positive across all specification and statistically significant at the 1% level, even when state fixed effects are included in columns (2), (4), and (6). This indicates that a greater degree of electoral cyclicality in *PenDef* is associated with a larger increase in the level of unfunded pension liabilities over time, which implies that state governments do not "save up" in non-election years to sufficiently offset higher election year pension deficits.

Columns (1) and (2) report results using the baseline definition of $PenDefCyc_i$, which is the difference, for each plan i, between the time series average of $PenDef_{it}$ conditional on t being an election year and the time series average of $PenDef_{it}$ conditional on t being a non-election year. The point estimate of 1.306 in column (2) indicates that the average plan, which experiences a 0.603 percentage point difference between election year and non-election year *PenDef* according to Table III, experiences a 0.788 percentage point higher $\Delta UnfundedLiab_i$ over the sample period. This accounts for 6.65% of the sample mean of $\Delta UnfundedLiab_i$ (11.02 percentage points), which implies that the electoral cyclicality of pension deficits can explain an economically significant portion of the increasing level of unfunded pension liability over the sample period.

Columns (3) and (4) report the same estimation results using a measure of pension deficit cyclicality that has been adjusted for aggregate time trends. Specifically, $PenDefCycD_i$ is defined in the same manner as $PenDefCyc_i$, but uses the estimated residual terms from the OLS regression $PenDef_{it} = \alpha + \delta \cdot t + \epsilon_{it}$ instead of the raw $PenDef_{it}$ when computing conditional time series averages. The point of removing the linear time trend component

[39] Note that artificial cycles in pension borrowing may still be welfare-destroying in this scenario if taxpayers prefer smooth policy paths with respect to fiscal policy—in effect, politicians may be gambling with taxpayer dollars by putting the state balance sheet in a vulnerable state following every election.

is to ensure that the measure of cyclicality is not influenced by some plans having their electoral cycles starting later in the sample period relative to other plans. The coefficient estimates on $PenDefCycD_i$ are similar in magnitude to those for $PenDefCyc_i$ and remain statistically significant.

Similarly, Columns (5) and (6) report the same estimation results using a measure of pension deficit cyclicality that has been adjusted for control variables, plan fixed effects, and time fixed effects. Specifically, $PenDefCycR_i$ is defined in the same manner as $PenDefCyc_i$, but uses the estimated residuals from the OLS regression $PenDef_{it} = \alpha + \kappa_i + \lambda_t + X_{it}\beta + \epsilon_{it}$ instead of using the raw $PenDef_{it}$ when computing conditional time series averages. Again, the coefficient estimates on $PenDefCycR_i$ are similar in magnitude to those for $PenDefCyc_i$ and remain statistically significant.

Next, I check whether electoral cycles in pension deficits are associated with changes in real economic outcomes—in particular, growth rates in state GDP and house prices. I compute state-level measures of pension deficit cyclicality, following steps described in Section 3, and estimate Eq. 3.3. Panel B of Table XI reports the estimation results from using $ln(GDP\ Growth)$, the state GDP log growth rate, as the dependent variable in columns (1)-(3), and $ln(HPI\ Growth)$, the house price index log growth rate, as the dependent variable in columns (4)-(6).

There is heated debate about whether government debt affects economic growth.[40] In our setting, larger unfunded liabilities incurred through election year spikes in pension deficits may impose a form of public debt overhang that adversely impacts state economic growth. Indeed, the negative coefficients in columns (1)-(3) suggest that larger electoral cycles in state pension deficits are associated with lower economic growth, although only two of the coefficient estimates are (weakly) significant and the sample size of states is small. However, this evidence is only suggestive and does not necessarily imply causal connections.

Another real consequence of pension underfunding is the possibility of lower house price. As Epple and Schipper (1981) show, unfunded pension liabilities can be capitalized through house prices if the housing market rationing impounds expectations of higher future taxes into current prices. The negative coefficients in columns (4)-(6) are consistent with this interpretation, but the estimates are not statistically significant. One potential explanation for the weakness of this result (aside from the small sample size) is provided by Brinkman, Coen-Pirani, and Sieg (2016), who show that downpayment constraints in the housing market can dampen the capitalization of underfunded liabilities into house prices.

[40] See the controversy surrounding Rogoff and Reinhart (2010), for instance.

5.8 Falsification Tests

My benchmark empirical tests rely on the identifying assumption that, in the absence of political distortions, pension policies should not exhibit any systematic electoral cycle patterns. A natural way to test this assumption is to examine corporate DB pension plans in the private sector, which should be immune from political incentives relating to state gubernatorial elections. Therefore, running my benchmark tests on a sample of corporate DB plans provides a natural placebo test on my main findings.

I construct a sample of corporate DB pension plan policies using data from the Compustat Pension Annual database (ACO_PNFNDA). I construct the dependent variables and control variables using the same method as in the public plan sample, with $PenDefFirm$, $ContribFirm$, and $AccFirm$ as the dependent variables. Corporate plans face different reporting and regulatory standards relative to public sector plans, so many variables may not be perfectly comparable between the corporate sample and public plan sample.[41] Compustat does not report the inflation assumptions and the actuarial cost method made by corporate plans. However, it does include the wage growth assumption, which I include as an additional control variable.[42] I assign each corporate plan to the state of its headquarters in order to match it to the gubernatorial election data.

The results from estimating 3.1 on the sample of corporate DB plans are presented in Table XII. The results show no election year effect for any of the specifications, as all coefficient estimates for election year dummy variables are statistically insignificant. This result provides evidence in support for the assumption that pension policies unaffected by political incentives do not exhibit electoral cycle patterns, which implies that the electoral cycle patterns that I identify in public sector DB pension plans are driven by political incentives.

I also exploit occurrences of sudden Governor changes due to death, resignation, or impeachment in order to address the concerns that my results are driven by leadership transition effects unrelated to reelection considerations. In particular, I address the concern that additional uncertainty associated with election years may affect public pension policies. For instance, the government may choose to finance expansionary policies through pension borrowing in order to stimulate the economy in response to uncertainty-induced economic slowdowns.

Following this logic, sudden and unexpected changes in Governors due to exogenous

[41] I scale the private pension deficit, contribution, and accrual variables by the payroll variable XLR in order to match the variable construction of their public plan counterparts. However, XLR is missing for the majority of firms and thereby significantly limits the sample size. If I scale by total employment (EMP), which has significantly fewer missing observations, I obtain qualitatively similar results.

[42] The PPD data also includes wage growth assumptions but it is missing for most of the sample.

causes should also be associated with periods of high political uncertainty. Therefore, I estimate the following OLS specification

$$PenDef_{it} = \alpha + \kappa_i + \lambda_t + \nu_0 \cdot Gov\ Change_{it} + X_{it}\beta + \epsilon_{it} \tag{5.1}$$

in which $Gov\ Change_{it}$ represents a dummy variable that indicates whether there was an unexpected change in the state Governorship in year t due to death, impeachment, or resignation.

The estimation results are reported in Table XIII, and show that sudden Governor changes do not have detectable effects on *PenDef*, *PenDefMbrs*, or *PenDefGov*. The same is true if one includes a lagged value of *Gov Change* in the specification, as reported in columns (2), (4), and (6), in order to account for the possibility that political uncertainty over unexpected Governor changes persists for more than one year. These results suggest that it is anticipation of reelection prospects, rather than leadership transitions per se, that drives election year spikes in pension deficits. Note that there are few occurrence of unexpected Governor changes in my sample (60 out of 1,318 plan-year observations in sample). This leads to large estimated errors that limit the statistical power of the test.

5.9 Other Robustness Checks

As a final robustness check, I address concerns that my main results are driven by regional shocks that affect a small number of states that share the same gubernatorial election schedules. As seen in Figure 2, the majority of states hold their elections in years that are two years offset from presidential elections (i.e. in 2002, 2006, 2010, etc.). The concern is that regional shocks that affect the small number of states that are "off-cycle" from this dominant schedule drive my main findings. Due to the potential clustering of state election schedules, there is also the concern that correlated pension policies across states could lead to correlated standard errors that understate standard error estimates in my benchmark tests.

To address these concern, I estimate my benchmark test following 3.1, but add *region* × *year* fixed effects as well as cluster standard errors by year in addition to by state.[43] The inclusion of *region* × *year* fixed effects controls for time-varying shocks at the census region level,[44] while clustering by standard errors by year accounts by correlation of standard errors across states within a given year. The results are reported in Table XIV, and show that my

[43] Clustering by year be problematic as the number of years in my sample is not large. This can lead to a downward bias in the cluster-robust variance matrix estimate and consequently over-rejection of the null hypothesis. Therefore, I follow the suggestions of Cameron and Miller (2015) and use bootstrap clustering methods in order to estimate standard errors when clustering by year.

[44] The U.S. consists of four census regions: Northeast, Midwest, South, and West.

main estimation results remain largely unchanged whether one includes *region* × *year* fixed effects, clusters by year and by state, or does both. Figure 3(a) illustrates that on-cycle states and off-cycle states do not follow obvious patterns of geographic clustering, which should further mitigate concerns that my results are driven by correlated pension policies across states that cluster together geographically.

6 Conclusion

In this paper, I investigate an electoral cycle in the borrowing state governments conduct through public DB pension plans. The premise is that state Governors, who possess discretion over public pension policy, face incentives to increase "pension deficits" for politically motivated purposes. The result is a systematic pattern in which pension borrowing is higher during election years relative to non-election years. I present empirical evidence that state DB pension plans increase their rate of borrowing during election years, and that this pattern is driven by election year reductions in governmental contributions. I run additional tests in order to rule out alternative explanations for the documented electoral cycle patterns.

I find strong empirical support that electoral cycles in pension deficits are rooted in an agency conflict between politicians and taxpayers. In particular, election year spikes in pension deficits are larger in states which place the burden of unfunded public pension liabilities on taxpayers rather than state employees, and which contain less transparent public pension system. I also find that Governors' reelection incentives drive pension funding policy, as pension deficits are higher during more closely contested elections and during the terms of reelection-eligible incumbents.

My work offers implications regarding potential policy remedies to address the distortionary incentives underlying electoral cycles in pension deficits. One possibility is to place stricter restrictions that limit governmental discretion over contributions. For example, Kentucky passed legislation in 2013 that required state governments to follow up on their contribution promises. Another potential solution is to address the underlying opacity of public pension plans. For example, the Governmental Accounting and Standards Board (GASB) recently passed new disclosure rules that placed stricter restrictions on the use of discount rates and actuarial smoothing methodologies. Reforming pension systems by loosening protections over state pension benefits presents another option to mitigate the conflict between politicians and taxpayers. However, removing benefit protections may have unintended effects on the labor supply decisions of for public sector employees, and therefore should be approached with great care.

Lastly, my results suggest that electoral cycles in state pension borrowing have real con-

sequences. In particular, I find that plans that exhibit larger election year spikes in pension deficits also experience larger increases in total unfunded liabilities over the sample period. This suggests that state governments do not accumulate sufficient buffers during non-election years to offset the higher election year pension borrowing. I also find suggestive evidence that states that contain plans that exhibit larger electoral cycles in pension borrowing also experience lower economic growth. However, much more work is needed to improve our understanding of how public pension underfunding affects the real economy.

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Appendix A Variable Definitions

$Election_{it}$: Indicator variable that takes on a value of one if a gubernatorial election occurs before the end of the fiscal year for plan i's state in fiscal year t, and zero otherwise (Source: Klarnerpolitics.com, The Book of the States).

$ContribGov_{it}$: Total employer contributions ($contrib\_ER\_regular + contrib\_ER\_state$) divided by total pensionable earnings of plan participants ($payroll$) (source: CRR Public Plans Database).

$ContribMbrs_{it}$: Total employee contributions ($contrib\_EE\_regular + contrib\_ER\_other + contrib\_EE\_PurchaseService$) divided by total pensionable earnings of plan participants ($payroll$) (source: CRR Public Plans Database).

$Contrib_{it}$: The sum of $ContribGov_{it}$ and $ContribMbrs_{it}$ (source: CRR Public Plans Database).

$AccGov_{it}$: The employer's share of the normal cost rate ($NormCostRate\_ER$) (source: CRR Public Plans Database).

$AccMbrs_{it}$: The employee's share of the normal cost rate ($NormCostRate\_EE$) (source: CRR Public Plans Database).

Acc_{it}: The sum of $AccGov_{it}$ and $AccMbrs_{it}$ (source: CRR Public Plans Database).

$PenDef_{it}$: The difference between Acc_{it} and $Contrib_{it}$ (source: CRR Public Plans Database).

$PenDefGov_{it}$: The difference between $AccGov_{it}$ and $ContribGov_{it}$ (source: CRR Public Plans Database).

$PenDefMbrs_{it}$: The difference between $AccMbrs_{it}$ and $ContribMbrs_{it}$ (source: CRR Public Plans Database).

$ln(Payroll)_{it}$: The natural log of total pensionable earnings of plan participants ($payroll$) (source: CRR Public Plans Database).

$ln(Avg\ Salary)_{it}$: The natural log of the average salary among active participants ($ActiveSalary\_avg$) (source: CRR Public Plans Database).

$Income_{it}$: The difference between total income ($income\_net$) and total contributions ($contrib\_tot$), divided by total pensionable earnings of plan participants ($payroll$) (source: CRR Public Plans Database).

$Discount\ Rate_{it}$: The assumed return on investments used to discount plan liabilities reported under GASB requirements ($InvestmentReturnAssumption\_GASB$) (source: CRR Public Plans Database).

$Inflation\ Rate_{it}$: The assumed inflation rate ($InflationAssumption\_GASB$) (source: CRR Public Plans Database).

CostMthd EAN$_{it}$: An indicator variable that takes on a value of one if the plan uses the Entry Age Normal cost method in order to evaluate pension liabilities, and zero otherwise (source: CRR Public Plans Database).

Deficit Shock$_{it}$: Per capita unexpected budget deficit—i.e. $(expenditure\ shock - revenue\ shock)/state\ population$, where $expenditure\ shock = actual\ expenditures - projected\ expenditures - enacted\ expenditure\ adjustments$ and $revenue\ shock = actual\ revenue - projected\ revenue - enacted\ expenditure\ revenue$ (see Poterba (1994)) (source: National Association of State Budget Officers (NASBO) Fiscal Survey of States).

State Unemp$_{it}$: State unemployment rate (source: Bureau of Labor Statistics).

Pub Union Mbrshp$_{it}$: Proportion of state public-sector workers that are members of a labor union (source: Unionstats.com (Hirsch and Macpherson)).

$\Delta\, UnfundedLiab_i$: The plan-level time series average for $\Delta \frac{Unfunded\ Liab_{it}}{Payroll_{it}}$, where Δ indicates the first difference operator, and *Unfunded Liability*$_{it}$ is the unfunded actuarial accrued liability (*UAAL_GASB*) (source: CRR Public Plans Database).

$PenDefCyc_i$: $\bar{E}_i[PenDef_{it}|Election_{it} = 1] - \bar{E}_i[PenDef_{it}|Election_{it} = 0]$, where $\bar{E}_i[X|Y]$ denotes the time-series average, for plan i, of X conditional on Y (source: CRR Public Plans Database).

$PenDefCycD_i$: $\bar{E}_i[PenDefD_{it}|Election_{it} = 1] - \bar{E}_i[PenDefD_{it}|Election_{it} = 0]$, where $\bar{E}_i[X|Y]$ denotes the time-series average, for plan i, of X conditional on Y and $PenDefD_{it}$ represents the residual term from estimating $PenDef_{it} = \alpha + \delta \cdot t + \epsilon_{it}$ (source: CRR Public Plans Database).

$PenDefCycR_i$: $\bar{E}_i[PenDefR_{it}|Election_{it} = 1] - \bar{E}_i[PenDefR_{it}|Election_{it} = 0]$, where $\bar{E}_i[X|Y]$ denotes the time-series average, for plan i, of X conditional on Y and $PenDefR_{it}$ represents the residual term from estimating $PenDef_{it} = \alpha + \kappa_i + \lambda_t + X_{it}\beta + \epsilon_{it}$ (source: CRR Public Plans Database).

Budget Year$_{it}$: An indicator variable that takes on a value of one if the plan i is located in a state that passed a budget in year t (source: Klarnerpolitics.com).

LegisExp$_{it}$: An indicator variable that takes on a value of one if the Governor has prior experience in the state legislature (source: Klarnerpolitics.com).

Opaque Pensions$_{it}$: An indicator variable that takes a value of one if plan i is in a state that is in the bottom decile in terms of the SII transparency indicator for state pension fund management, and zero otherwise (source: Center for Public Integrity State Integrity Investigation).

Transparent Pensions$_{it}$: An indicator variable that takes a value of one if plan i is in a state that is in the top decile in terms of the SII transparency indicator for state pension fund management, and zero otherwise (source: Center for Public Integrity State Integrity Investigation).

Opaque Budget$_{it}$: An indicator variable that takes a value of one if plan i is in a state that is in the bottom

decile in terms of the SII transparency indicator for state budget process, and zero otherwise (source: Center for Public Integrity State Integrity Investigation).

Transparent Budget$_{it}$: An indicator variable that takes a value of one if plan i is in a state that is in the top decile in terms of the SII transparency indicator for state budget process, and zero otherwise (source: Center for Public Integrity State Integrity Investigation).

Transparent Budget$_{it}$: An indicator variable that takes a value of one if plan i is in a state that is in the top decile in terms of the SII transparency indicator for state budget process, and zero otherwise (source: Center for Public Integrity State Integrity Investigation).

VicMargin$_{it}$: The margin of victory (as a fraction of 1) between the winning candidate and the runner up given a gubernatorial election occurs in year t, and zero otherwise (source: Klarnerpolitics.com).

IncumbLoses$_{it}$: An indicator variable that takes on a value of one if the incumbent Governor loses an election in year t, and zero otherwise. (source: Klarnerpolitics.com).

Lame Duck$_{it}$: An indicator variable that takes on a value of one if the plan i is located in a state a Governor facing binding term limits in year t (source: Klarnerpolitics.com).

Republican$_{it}$: An indicator variable that takes on a value of one if the incumbent Governor belongs to the Republican party. (source: Klarnerpolitics.com).

Strong Protect$_i$: An indicator variable that takes on a value of one if the plan i is located in a state that offers constitutional protection of state DB pension benefits (source: Munnell and Quinby (2012)).

Weak Protect$_i$: An indicator variable that takes on a value of one if the plan i is located in a state that offers protection of state DB pension benefits under the gratuity principle (source: Munnell and Quinby (2012)).

Unconditional Protect$_i$: An indicator variable that takes on a value of one if the plan i is located in a state that offers unconditional protection of state DB pension benefits (source: Munnell and Quinby (2012)).

Gov Change$_{it}$: An indicator variable that takes a value of one if plan i is in a state where there was an unexpected Governor change due to death, resignation, or impeachment in year t and zero otherwise (source: Klarnerpolitics.com, The Book of the States).

$ln(GDP\ Growth)_j$: The time-series mean in the annual log growth rate of real GDP for state j over the 2001-2015 sample period (source: Bureau of Economic Analysis).

$ln(HPI\ Growth)_j$: The time-series mean in the quarterly log growth rate of seasonally-adjusted house price index values (based on purchases only) for state j over the 2001-2015 sample period (source: Federal Housing Finance Agency).

Appendix B Actuarial Valuations Methods

The information provided here is a brief summary of the much fuller description, including detailed formulas, found in Section II of Novy-Marx and Rauh (2011). We begin with the concept of the Accumulated Benefit Obligation (ABO), which reflects the terminal value of a plan's liabilities if all benefits were permanently frozen at its current level. Calculating the ABO requires assumptions about mortality rates and future inflation, and these assumptions are applied to the current benefit formula, wages, and employees' accumulated years of service to arrive at a discounted present value. In essence, the ABO captures benefits that have already been promised and accrued.

A broader concept of pension liabilities is the Projected Value of Benefits (PVB), which accounts for expected future years of service and wage growth for current employees. Estimating the PVB requires additional actuarial assumptions about salary growth rates and job separation rates. The PVB method is a significantly more conservative estimate of pension liabilities relative to the ABO, as it operates under the implicit assumption that the plan sponsor cannot curtail future benefit accruals for current employees.

Almost all state plans apply one of two liability measures—the Projected Benefit (PBO) and the Entry Age Normal (EAN)—both of which fall in between ABO and the PVB in terms of conservatism. The PBO takes the PVB and prorates it by current years of accrued service, which implies recognition of projected wage growth but not future years of service. The EAN takes the PVB and amortizes it into a series of annual accruals such that each accrual is a constant percentage of projected salary. Assuming that the wage growth rate is lower than the discount rate, the EAN is more conservative than the PBO, and is interpreted to account for some future service in addition to wage growth.

Appendix C A Model of Politically-Motivated Pension Borrowing

I present a stylized model based on the framework of Holmström (1999) to show how reputational concerns can distort public DB pension policy decisions in a political setting. An incumbent politician makes public pension policy decisions on behalf of voting taxpayers, but is motivated by reelection concerns in addition to caring about voters' utility. Policy choices are not immediately transparent to all voters, which results in the incumbent agent taking hidden action in an attempt to manipulate election results.

Voters are rational and make the utility-maximizing choice between the incumbent and a challenger at election time. The incumbent agent, who cares about voter welfare but also derives private benefits from holding political office, holds a temporary informational advantage over voters regarding public pension policy. The result is a "signal-jamming" equilibrium, in which the incumbent attempts to boost the signal of his governing ability during election year by "borrowing" from the

public pension plan to increase the provision of public goods, even though voters are rational and anticipate the incumbent's opportunistic behavior in equilibrium.

The model is in the spirit of Persson and Tabellini (2002), Alt and Lassen (2006), and Shi and Svensson (2006), who show that nontransparent fiscal policies compel politicians to undertake shrouded fiscal deficits in order to inflate their perceived performance. I apply the same idea to public pension plan policies, and further show that electoral cycle patterns in policy decisions can emerge when agents' innate qualities remain constant over time, given that that the information asymmetry over policy is temporary. This assumption provides a different mechanism for generating political cycles compared to the existing literature, and is motivated by the institutional features of the public pension system as described in Section 2. The model also generates novel testable predictions relating to the closeness of elections and the strength of legal protections over benefits.

C.1 Pension Benefits

We first consider the case in which an incumbent political agent make decisions over public sector employee wages and pension benefits, but do not allow them to make contributions to prefund the pension plan.

I adopt a two-period setting in which a political agent makes decisions that affect the welfare of tax-paying voters. In the first period ($t = 1$), the incumbent agent, denoted I, is assumed to be the leader with authority over policy decisions regarding granting defined benefits to a governmental worker. An election occurs near the end of the period, in which voters decide whether to re-elect agent I or a political challenger, denoted C, to become the leader in the second period ($t = 2$).[45]

Voters and agents derive utility from consuming a public good in each period t. The public good, denoted g_t, represents the production of public goods net of taxes. Voter utility, denoted U_v, is determined by the sum of the public goods produced during the two periods—i.e. $U_v = g_1 + g_2$.

At t=1, the public good output is determined according to

$$g_1 \equiv \eta_I - w + \epsilon_1 \tag{C.1}$$

where η_I denotes I's fiscal competence, w denotes the employee wage bill, and ϵ_1 denotes a random shock.

Public sector employees are paid a wage w in wages period 1 and a pension benefit b in period 2. To abstract away from labor demand considerations, we assume public goods production requires the employment of a single worker. Furthermore, the incumbent is able to commit in period 1 to paying b in period 2. To employ the worker, the government must provide adequate compensation according to the worker's participation constraint:

$$u(w) + u(b) \geq \bar{u} \tag{C.2}$$

[45] One can think of the agents as individuals or political parties in this setup.

where $\bar{u}$ denotes the the worker's reservation utility, and $u(\cdot)$ denotes a concave utility function such that $u'(\cdot) > 0$ and $u''(\cdot) \leq 0$. The concavity of $u(\cdot)$ implies that the employee prefers consumption to be smoothed over the two periods.

The incumbent agent sets w and b at the beginning of period 1. An election takes place at the end of period 1, at which point voters decide whether to elect I or C as the leader. At $t = 2$, public good output is determined according to

$$g_2 \equiv \theta\eta_I + (1 - \theta)\eta_C - b + \epsilon_2, \tag{C.3}$$

where $\theta \in \{0, 1\}$ takes on a value of 1 if the incumbent is re-elected and 0 otherwise, η_C denotes the challenger's fiscal competence, b denotes the promised pension benefit, and, ϵ_2 denotes a random shock term that is independent from ϵ_1.

We assume that political agents care about voters' utility, but also derive positive benefits from holding political office, such that the incumbent's utility is defined as $U_I = U_v + \theta x$, where x is assumed to be strictly positive and represents the "ego rents" of being in power, following Rogoff (1990).

The fiscal competence ("ability") parameter η captures the innate qualities of the political agent, such as how well he is able to eliminate wasteful spending or deal with unexpected fiscal shocks. As is standard in models of career concerns, ability is not directly observed, and voters and agents alike must make inferences about the incumbent's ability through observing g_1. We assume η_I and η_C to be invariant over time, with the following common prior distribution at the beginning of $t = 1$:

$$\eta_i \sim N(m_{i1}, \frac{1}{h_{i1}}), \tag{C.4}$$

for $i \in \{I, C\}$.

The random output shocks ϵ_t are also not directly observable, and are normally distributed according to

$$\epsilon_i \sim N(0, \frac{1}{h_{\epsilon 1}}), \tag{C.5}$$

where η_I, η_C, ϵ_1 and ϵ_2, are independently distributed and unaffected by w and b.

At the beginning of $t = 1$, the incumbent decides on public pension policies b and w. Next, g_1 is realized and observed by everyone, followed by an election in which voters decide whether to vote for I or C. Crucially, we assume that the representative voter, who casts the decisive vote in the election, observes b and w before the election only with probability $1 - \rho$, while with probability ρ she does not observe b and w until after the election. The parameter ρ captures the degree of policy opacity. In the second period, the elected leader collects the ego rent x and repays the promised benefit b, but has no influence on public goods output g_2 except through his ability.

Voters form posteriors about the incumbent agent's ability from observing output and pension policies. Let m_{I2} and h_{I2} denote the mean and precision of the representative voter's posterior about η_I, conditional on having observed g_1 and w. If the representative voter observes w or b

before the election, she will rationally form a posterior mean of m_{I2} at election time.[46] Since priors about ability and output shocks are jointly independent and normally distributed, we can apply Bayes' law to express m_{I2} as

$$m_{I2} = (1-\mu)m_{I1} + \mu z, \tag{C.6}$$

where $z \equiv g_1 + w = \eta_I + \epsilon_1$ represent the period 1 signal of the I's ability conditional on observing g_1 and w, and

$$\mu \equiv \frac{h_\epsilon}{h_{I1} + h_\epsilon}, \tag{C.7}$$

represents the relative weight of the signal.

Let $\hat{m}_{I2}$ and $\hat{h}_{I2}$ denote the mean and precision of the representative voter's posterior about I's ability conditional on having observed g_1 but not w. Thus, if the representative voter does not observe w or b before the election, she will form a posterior mean of $\hat{m}_{I2}$ at election time. Applying Bayes' law, we express $\hat{m}_{I2}$ as

$$\hat{m}_{I2} = (1-\mu)m_{I1} + \mu\hat{z} = m_{I2} + \mu(\bar{w} - w), \tag{C.8}$$

where $\bar{w}$ represent the representative voter's conjecture about w, and $\hat{z} \equiv g_1 + \bar{w} = z - w + \bar{w}$ denotes the period 1 signal of the incumbent's ability conditional on observing g_1 but not w.

The precision of the representative voter's posteriors about the incumbent's ability evolves deterministically—i.e. $h_{I2} = \hat{h}_{I2} = h_{I1} + h_\epsilon$—regardless of whether the she observes w or not. Since utility is linear in the incumbent agent's ability, voters and agents only care about the posterior mean. From this point forward, reputation refers to the posterior mean of an agent's ability, unless stated otherwise. Since C cannot influence g_1 in any way during the first two periods, there is no learning about the challenger's ability—i.e. $m_{C2} = \hat{m}_{C2} = m_{C1}$ and $h_{C2} = \hat{h}_{C2} = h_{C1}$. It is only through the incumbent's power to enhance his reputation by manipulating w and b that the possibility of a political agency conflict arises.

We solve the optimization problems facing voters and the incumbent agent, given each other's optimal strategies. At election time, the representative voter understands that g_1 is already set and therefore chooses θ to maximize expected period 2 utility g_2:

$$\max_\theta \hat{E}_1[\eta_C + \theta(\eta_I - \eta_C) - b + \epsilon_2], \tag{C.9}$$

where $\hat{E}_1[\cdot]$ denotes the expectation function with respect to voters' information set at election time.

[46] Note that if she observes b, she can "back out" b as we assume that she understands that the employee's participation constraint will be binding in equilibrium.

It follows that the representative voter's optimal strategy follows

$$\theta = \begin{cases} 1 & \text{if } m_{I2} - m_{C2} \geq 0 \\ 0 & \text{if } m_{I2} - m_{C2} < 0, \end{cases} \tag{C.10}$$

if she observes w or b before the election, and

$$\theta = \begin{cases} 1 & \text{if } \hat{m}_{I2} - \hat{m}_{C2} \geq 0 \\ 0 & \text{if } \hat{m}_{I2} - \hat{m}_{C2} < 0. \end{cases} \tag{C.11}$$

if she does not.

The intuition behind C.10 and C.11 is straightforward. The representative voter understands that b has already been set, and therefore bases her election decision entirely on comparing the reputations of I and C hinges on whether the incumbent is able to influence this voting decision is whether the representative voter is able to observe w before the election.

Anticipating the voter's decision process, the incumbent chooses w and b at the beginning of period 1 according the following constrained optimization problem

$$\begin{aligned} \max_{b,w} \quad & E_1[\eta_I - w + \epsilon_1 + \eta_C + \theta(\eta_I - \eta_C + x) - b + \epsilon_2] \\ \text{subject to} \quad & u(w) + u(b) \geq \bar{u}, \end{aligned} \tag{C.12}$$

where $E_1[\cdot]$ denotes the expectation function with respect to the incumbent's information set at the beginning of period 1.

If the representative voter observes w or b before the election, we see from C.7 that she can "back out" the true signal of the incumbent's ability ($z = \eta_I + \epsilon_1$), in which case the incumbent's choices for w and b would have no effect on the election result. It follows from first order conditions that the incumbent's optimal policy under full transparency (i.e $\rho = 0$) is characterized by $w = b$.

It is immediately clear that $w = b$ also characterizes the first-best policy from voters' perspective.[47] Intuitively, the incumbent agent and voters face the same marginal benefits and marginal costs to adjust w and b when election results are exogenous to w and b. In the absence of reelection incentives, the incumbent minimizes spending on employee compensation on behalf of voting taxpayers by offering wages and benefits that perfectly smooth the employee's consumption over the two periods.

If the representative voter does not observe w or b before the election, then we see from C.8 that the incumbent can use w to influence the signal of the incumbent's ability ($\hat{z} = z - w + \bar{w}$). In effect, the incumbent boosts his reputation by inflating output through paying a lower period 1 wage. To see this, let us denote $\Omega = E_1[w(\eta_I - \eta_C + x)]$, and express the partial derivative of Ω with respect to w via the following lemma (see D.1 in Appendix D for proof).

[47] This is trivially obtained by solving for the w and b that maximizes U_v subject to C.2

Lemma 1. *Let $\Phi(v;\mu,\sigma^2)$ denote the probability density function for a normally distributed random variable V with mean μ and variance σ^2. It follows that*

$$\frac{\partial\Omega}{\partial w} = -\rho\mu\phi(\mu(w-\bar{w}); m_1^{\Delta}, \frac{\mu}{h_{I1}})(x+\mu(w-\bar{w})) \tag{C.13}$$

where $m_1^{\Delta} \equiv m_{I1} - m_{C1}$ denotes the difference between the common prior beliefs of I's and C's abilities, and $\frac{\mu}{h_{I1}}$ is the variance of $m_{I2} - m_{C2}$ given the incumbent's information set at the beginning of period 1.

Eq. C.13 presents an intuitive representation of the incumbent's reelection incentive. The first term ρ captures the fact that w affects I's election-time reputation only if the representative voter does not observe w before the election, in which case the decrease in election probability is $-\mu\phi(\mu(w-\bar{w}); m_1^{\Delta}, \frac{\mu}{h_{I1}})$ and unambiguously negative. The $x+\mu(w-\bar{w})$ component can be further decomposed into an ego rents term, x, which is unambiguously positive, and an "election distortion" component, $\mu(w-\bar{w})$, which is ambiguously signed. This distortion component may be negative or positive, depending on the relative difference between w and $\bar{w}$. For example, by lowering w when $w < \bar{w}$, the incumbent creates additional states of the world in which he wins the election even when he believes C to have a higher ability. Following the same logic, the incumbent can eliminate such suboptimal states by lowering w when $w > \bar{w}$.

In equilibrium, voters conjecture correctly about w, which implies that $w = \bar{w}$ and

$$\omega^* \equiv \left.\frac{\partial\Omega}{\partial w}\right|_{w=\bar{w}} = -\rho\mu\phi(\mu(0; m_1^{\Delta}, \frac{\mu}{h_{I1}})x \tag{C.14}$$

where ω^* represents the equilibrium "election manipulation incentive" term.

When voters form the correct conjecture about w, there is no election distortion and the only marginal effect on agent I's utility is through the unambiguously positive expected ego rents channel. If ρ is positive, then $\omega^* < 0$ and the incumbent agent faces an additional benefit from lowering w. In equilibrium, the incumbent does not gain any advantage, but still lowers w in order to "protect" his reputation.

From Eq. C.14, it is immediately obvious that ω^* is decreasing in ρ, which captures the idea that greater opacity leads to stronger election manipulation incentives. Moreover, ω^* is increasing in m_1^{Δ} if $m_1^{\Delta} < 0$ and decreasing in m_1^{Δ} if $m_1^{\Delta} > 0$.[48] This captures the idea that the election manipulation incentive is greater when the election is "closer" in the sense that the difference between the prior reputations of the incumbent and the challenger is small.

We obtain the following proposition (see D.2 in Appendix D for proof):

Proposition 1. *The equilibrium pension benefit, b^*, satisfies the following conditions:*

[48] This stems from the characteristics of the normal probability density function. The same results should hold for similar distributions in which median is the same as the mode and the probability density function is strictly increasing to the left of the median and strictly decreasing to the right of the median. I thank Masahiro Watanabe for pointing this out.

(a) Ceteris paribus, b^* is increasing in ρ,

(b) If $\rho > 0$, then ceteris paribus b^* is decreasing in m_1^Δ for $m_1^\Delta > 0$ and increasing in m_1^Δ for $m_1^\Delta < 0$, and

(c) If $\rho = 0$, then ceteris paribus b^* is unaffected by m_1^Δ.

Part (a) of Proposition 1 formalizes the idea that a greater degree of opacity leads to a stronger incentive for the incumbent agent to increase pension benefits during election year. Part (b) formalizes the idea that the incentive to manipulate voters through election year pension borrowing is higher when the election is closer to a "tipping point" between the incumbent winning and the challenger winning, while part (c) captures the idea that the manipulation incentive exists only if the pension system is not fully transparent.

The general intuition behind Proposition 1 is that the incumbent wants to realize additional short term wage savings by providing higher pension benefits in order to inflate the signal of his period 1 performance. In the real world, short term wage savings constitute one of several potential channels motivating incumbent politicians to grant higher pension benefit. For example, the incumbent may wish to increase benefits to win direct political support from public sector labor unions. I focus on only the wage savings channel for the sake of model parsimony.

C.2 Pension Contributions

We now consider the case in which unfunded benefits are not wholly guaranteed to employees, but the incumbent agent can make contributions into the public pension fund in period 1. To shift the attention to contribution policy rather than benefits policy, we assume b has been set and cannot be changed by the incumbent at the beginning of period 1. This assumption is justified by the relative inflexibility of pension benefit policy, which is explained in detail in Section 2.

The basic framework of remains the same as in Appendix C.1. Voter utility is $U_v = g_1 + g_2$ and the incumbent agent's utility is $U_I = U_v + \theta x$. There are two periods and an election occurs in period 1. However, we modify the public goods output in the two periods to be

$$g_1 \equiv \eta_I - w - k + \epsilon_1 \tag{C.15}$$

$$g_2 \equiv \theta\eta_I + (1-\theta)\eta_C - \pi(b-k) + \epsilon_2, \tag{C.16}$$

where k denotes the pension contribution in period 1, π denotes the portion of the unfunded pension liability (i.e. $b-k$) that is paid out of g_2 to the employee in period 2, and the remaining variables are defined as before.

Due to the imperfect guarantee on the unfunded portion of the pension benefit, the worker's participation constraint is now

$$u(w) + u(k + \pi(b-k)) \geq \bar{u} \tag{C.17}$$

where $k+\pi(b-k)$ reflects that fact that the employee is paid the entirety of the funded contribution

k plus a portion π of the unfunded benefit.[49]

Note we allow for the possibility that $b < k$, in which case the fund is overfunded and the employee receives a payment greater than b in the second period. This can be interpreted as pension beneficiaries "skimming" the surplus of overfunded public pension plan funds though benefit increases. We also allow for the possibility for $k < 0$, which is difficult to interpret. We may insert an additional constraint that $k \geq 0$, but the case of when this constraint binds is not economically interesting, so for the sake of simplicity we assume the equilibrium is characterized by an interior solution at which $k > 0$.

The timeline of the model is similar to before. The incumbent agent chooses w and k at the beginning of period 1. This is followed by the realization of g_1 and then an election between the incumbent and the challenger. The representative voter first observes w and k before the election with probability $1 - \rho$, and first observes w and k after the election with probability ρ.

The incumbent's ability and the random shock terms follow the same distributions as in Appendix C.1, which means that the representative voter's inference of η_I is characterized by Eq. C.6 if she first observes ρ prior to the election—i.e. $m_{I2} = (1-\mu)m_{I1} + \mu z$ where $z = \eta_I + \epsilon_1$. However, if she first observes ρ after the election, then her inference of η_I is characterized by

$$\hat{m}_{I2} = (1-\mu)m_{I1} + \mu\hat{z} = m_{I2} + \mu(\bar{w} - w + \bar{k} - k), \tag{C.18}$$

where $\bar{w}$ represent the representative voter's conjecture about w, $\bar{k}$ represent the representative voter's conjecture about k, and $\hat{z} \equiv g_1 + \bar{w} = z - w + \bar{w} + \bar{k} - k$ denotes the period 1 signal of the incumbent's ability conditional on observing g_1 but not w or k.

Eq. C.18 indicates that the incumbent can manipulate w and k in order to inflate his reputation in the eyes of uninformed voters. As before, the precision of the representative voter's posteriors about the incumbent's ability evolves deterministically, and there is no learning about the challenger's ability.

As in Appendix C.1, the representative voter understands that she cannot affect g_1, w, or k with her election choice and therefore makes her decision based on C.10 if she first observes w and k before the election, and based on C.11 if she first observes w and k after the election.

The incumbent agent anticipates the representative voter's decision rule and optimizes according to

$$\begin{aligned} \max_{k,w} \quad & E_1[\eta_I - w - k + \epsilon_1 + \eta_C + \theta(\eta_I - \eta_C + x) - \pi(b-k) + \epsilon_2] \\ \text{subject to} \quad & u(w) + u(k + \pi(b-k)) \geq \bar{u}, \end{aligned} \tag{C.19}$$

to determine his choices for w and k at the beginning of period 1.

Again, let $\Omega = E_1[w(\eta_I - \eta_C + x)]$ represent the incumbent's marginal utility bonus from winning

[49] An alternative formulation is to make the benefit payment be b with probability π and k with probability $1-\pi$. However, this introduces addition complications relating to employee risk aversion, which we abstract away from by making the benefit payment deterministic.

the election. We can show that changing w and changing k have the same marginal effect on Ω, as stated in the following lemma (see D.3 in Appendix D for proof):

Lemma 2. *Let $\Phi(v;\mu,\sigma^2)$ denote the probability density function for a normally distributed random variable V with mean μ and variance σ^2. It follows that*

$$\frac{\partial\Omega}{\partial w}=\frac{\partial\Omega}{\partial k}=-\rho\mu\phi(\mu(w-\bar{w}+k-\bar{k});m_1^{\Delta},\frac{\mu}{h_{I1}})(x+\mu(w-\bar{w}+k-\bar{k})) \tag{C.20}$$

where $m_1^{\Delta}\equiv m_{I1}-m_{C1}$ denotes the difference between the prior beliefs of I's and C's abilities, and $\frac{\mu}{h_{I1}}$ is the variance of $m_{I2}-m_{C2}$ given the incumbent's information set at the beginning of period 1.

In equilibrium, voters correctly conjecture that $w=\bar{w}$ and $k=\bar{k}$, and so we can express the equilibrium election manipulation incentive ω^* as

$$\omega^*\equiv\left.\frac{\partial\Omega}{\partial w}\right|_{w=\bar{w},k=\bar{k}}=\left.\frac{\partial\Omega}{\partial k}\right|_{w=\bar{w},k=\bar{k}}=-\rho\mu\phi(\mu(0;m_1^{\Delta},\frac{\mu}{h_{I1}})x. \tag{C.21}$$

As in Appendix C.1, the equilibrium election incentive ω^* is nonpositive, and is strictly negative if $\rho>0$. This leads to the following proposition (see D.4 in Appendix D for proof).

Proposition 2. *The equilibrium pension contribution, k^*, satisfies the following conditions:*

(a) If $\pi>0$ then ceteris paribus k^* is decreasing in ρ,
(b) If $\pi>0$ and $\rho>0$, then ceteris paribus k^* is increasing in m_1^{Δ} for $m_1^{\Delta}>0$ and decreasing in m_1^{Δ} for $m_1^{\Delta}<0$, and
(c) If $\pi=0$, then ceteris paribus k^* is not affected by ρ nor m_1^{Δ}.

Proposition 2 closely parallels Proposition 1 from the previous section. Specifically, election year manipulation incentives are increasing in the degree of opacity and in the closeness of the election. However, Proposition 2 also illustrates that the incentive to reduce k depends on a nonzero portion of the pension benefit b being guaranteed. Intuitively, if $\pi=0$, then any reduction in k is perfectly offset by the worker demanding a higher w in period 1, which leaves the incumbent's reputation unchanged in the eyes of the uninformed voter.

The intuition underlying Proposition 2 mirrors the intuition underlying Proposition 1. The incumbent prefers to redirect pension contributions into increasing pre-election public goods output, but lowering contributions is immediately offset by the employing making higher wage demands in response. The more insulated the employee is against losses from unfunded benefits, the less the offsetting wage demands, and the greater the incentive to cut back on contributions.

Just as in the previous section, we use employee wages as a parsimonious modelling mechanism, but alternative mechanisms are possible For example, rather than demanding higher wages

from underfunded pension plans, the incumbent may exert direct political pressure on the incumbent. Regardless of the mechanism, higher benefit protections in essence create a moral hazard for employees to abstain from disciplining the incumbent from cutting back on contributions.

While the stylized model only includes one period before the election, it is easy to extrapolate backwards to show that the incentive to manipulate election results would not extend backwards if one were to include additional periods prior to the election period. This is due to the assumption that any potential information asymmetry between the incumbent and voters is resolved by the end of the period. Therefore, any opportunistic borrowing conducted through the pension plan during non-election years would be revealed by the time that the election occurs. This assumption is motivated by the one year gap between when pension benefit and contributions policies are set and when their impact on pension funding levels are disclosed to the public, which is explained in Section 2.

An electoral year spike in pension borrowing or dip in pension contributions can also result if voters put more weight on the most recent performance during election time. This may arise from an irrational recency bias on the part of voters, or if voters are rational and understand that the most recent performance is more predictive of future performance. For example, Persson and Tabellini (2002), Alt and Lassen (2006), and Shi and Svensson (2006) present models of electoral cycles in budget deficits based on the assumption that the politician's innate ability follows an MA(1) process. This means that only election-year activities are informative about the incumbent future performance, and voters rationally discard pre-election performance.

Appendix D Proofs

D.1 Proof of Lemma 1

Proof. In order to express the partial derivative of Ω with respect to w, it is useful to first re-frame the voter's election decision in terms of m_2^{Δ}, which we define as $m_2^{\Delta} = m_{I2} - m_{C2}$. Substituting C.7 and C.8 into C.10 and C.11, we obtain

$$\theta = \begin{cases} 1 & \text{if } m_2^{\Delta} \geq 0 \\ 0 & \text{if } otherwise, \end{cases} \tag{D.1}$$

if the representative voter observes d before the election and

$$\theta = \begin{cases} 1 & \text{if } m_2^{\Delta} \geq \mu(w - \bar{w}) \\ 0 & \text{if } otherwise, \end{cases} \tag{D.2}$$

if the representative voter does not observe w before the election.

At the beginning of period 1, m_2^Δ is a random variable that follows the distribution

$$m_2^\Delta|\Psi_1 \sim N(m_1^\Delta, \frac{\mu}{h_{I1}}), \tag{D.3}$$

where Ψ_1 denotes the incumbent's information set at the beginning of period 1, and we get $Var(m_2^\Delta|\Psi_1) = \frac{\mu}{h_{I1}}$ from the fact that

$$\begin{aligned} Var(m_2^\Delta|\Psi_1) &= Var((1-\mu)m_{I1} + \mu z - m_{C2}|\Psi_1) \\ &= \mu^2 Var(\eta_I + \epsilon_I) \\ &= \frac{\mu}{h_{I1}}. \end{aligned}$$

Therefore, we can express Ω as

$$\begin{aligned} \Omega &= E_1[\theta(\eta_I - \eta_C + x)] \\ &= E_1[\theta(m_{I2} - m_{C2} + x)] \\ &= E_1[\theta(m_2^\Delta + x)], \end{aligned}$$

where the second line follows from applying the law of iterated expectations, and the third line follows the definition of m_2^Δ. Next, we use the definition of the expectation function as an integral, and apply D.1, D.2, and D.3 to obtain

$$\Omega = \rho \int_{\mu(w-\bar{w})}^{\infty} (m_2^\Delta + x)\phi(m_2^\Delta; m_1^\Delta, \frac{\mu}{h_{I1}})\mathrm{d}m_2^\Delta + (1-\rho)\int_0^\infty (m_2^\Delta + x)\phi(m_2^\Delta; m_1^\Delta, \frac{\mu}{h_{I1}})\mathrm{d}m_2^\Delta,$$

which follows from the fact that the representative voter's decision follows D.2 with probability ρ, and follows D.1 with probability $1-\rho$.

Differentiating both sides with respect to w and applying the fundamental theorem of calculus, we obtain the required result

$$\frac{\partial \Omega}{\partial w} = -\rho\mu\phi(\mu(w-\bar{w}); m_1^\Delta, \frac{\mu}{h_{I1}})(x + \mu(w-\bar{w})).$$

□

D.2 Proof of Proposition 1

Proof. To solve the optimization problem according to C.12, we take the first order necessary conditions of the Lagrangian

$$\mathcal{L} = E_1[\eta_I - w + \epsilon_1 + \eta_C + \theta(\eta_I - \eta_C + x) - b + \epsilon_2] + \lambda[u(w) + u(b) - \bar{u}],$$

to obtain

$$\omega^* + \lambda u'(w) = 1 \tag{D.4}$$

$$\lambda u'(b) = 1 \tag{D.5}$$

$$u(w) + u(b) = \bar{u} \tag{D.6}$$

$$\lambda > 0, \tag{D.7}$$

where $\omega^* \equiv \frac{\partial \Omega}{\partial w}\Big|_{w=\bar{w}}$ represents the equilibrium equilibrium election manipulation incentive.

It is immediately clear from D.4 and D.5 that $w = b$ under full transparency (i.e. when $\omega^* = 0$). To show how b varies with ρ, we differentiate both sides of D.4, D.5, and D.6 with respect to ρ to obtain

$$\frac{\partial \omega^*}{\partial \rho} + \frac{\partial \lambda}{\partial \rho} u'(w) + \lambda u''(w) \frac{\partial w}{\partial \rho} = 0 \tag{D.8}$$

$$\frac{\partial \lambda}{\partial \rho} u'(b) + \lambda u''(b) \frac{\partial b}{\partial \rho} = 0 \tag{D.9}$$

$$u''(w) \frac{\partial w}{\partial \rho} + u''(b) \frac{\partial b}{\partial \rho} = 0. \tag{D.10}$$

Solving for $\frac{\partial b}{\partial \rho}$, we obtain

$$\frac{\partial b}{\partial \rho} = \frac{u'(b)u'(w)}{\lambda(u''(b)u'(w)^2 + u''(w)u'(b)^2)} \frac{\partial \omega^*}{\partial \rho}. \tag{D.11}$$

Since $u'(\cdot) > 0$ and $u''(\cdot) < 0$, and $\lambda > 0$, it follows that $\frac{u'(b)u'(w)}{\lambda(u''(b)u'(w)^2 + u''(w)u'(b)^2)}$ is negative, which implies that $\frac{\partial b}{\partial \rho}$ has the opposite sign as $\frac{\partial \omega^*}{\partial \rho}$. But we know from C.14 that $\frac{\partial \omega^*}{\partial \rho} < 0$, which means that $\frac{\partial b}{\partial \rho} > 0$. This completes the proof for part (a).

Following a similar path, we differentiate both sides of D.4, D.5, and D.6 with respect to m_1^Δ and solve for $\frac{\partial b}{\partial m_1^\Delta}$, we obtain

$$\frac{\partial b}{\partial m_1^\Delta} = \frac{u'(b)u'(w)}{\lambda(u''(b)u'(w)^2 + u''(w)u'(b)^2)} \frac{\partial \omega^*}{\partial m_1^\Delta}. \tag{D.12}$$

Since we have already established $\frac{u'(b)u'(w)}{\lambda(u''(b)u'(w)^2 + u''(w)u'(b)^2)}$ is negative, D.12 implies that $\frac{\partial b}{\partial m_1^\Delta}$ has the opposite sign as $\frac{\partial \omega^*}{\partial m_1^\Delta}$. Using the definition of ω^* from C.14 and by the properties of the normal distribution function, it follows that

$$\frac{\partial \omega^*}{\partial m_1^\Delta} \begin{cases} > 0 & \text{if } m_1^\Delta > 0 \\ < 0 & \text{if } m_1^\Delta < 0 \\ = 0 & \text{if } m_1^\Delta = 0, \end{cases}$$

which means that

$$\frac{\partial b}{\partial m_1^\Delta}\begin{cases} <0 & \text{if } m_1^\Delta > 0 \\ >0 & \text{if } m_1^\Delta < 0 \\ =0 & \text{if } m_1^\Delta = 0, \end{cases}$$

which completes the proof for part (b) and (c).

□

D.3 Proof of Lemma 2

Proof. Following the same logic as the first part of the proof from D.1, we can express Ω as follows:

$$\Omega = \rho \int_{\mu(w-\bar{w}+k-\bar{k})}^{\infty} (m_2^\Delta + x)\phi(m_2^\Delta; m_1^\Delta, \frac{\mu}{h_{I1}})\mathrm{d}m_2^\Delta + (1-\rho)\int_0^{\infty}(m_2^\Delta + x)\phi(m_2^\Delta; m_1^\Delta, \frac{\mu}{h_{I1}})\mathrm{d}m_2^\Delta$$

which we apply the fundamental theorem of calculus to differentiate with respect to w and k, respectively, to obtain the required results

$$\frac{\partial \Omega}{\partial w} = -\rho\mu\phi(\mu(w-\bar{w}+k-\bar{k}); m_1^\Delta, \frac{\mu}{h_{I1}})(x+\mu(w-\bar{w}+k-\bar{k})),$$

and

$$\frac{\partial \Omega}{\partial k} = -\rho\mu\phi(\mu(w-\bar{w}+k-\bar{k}); m_1^\Delta, \frac{\mu}{h_{I1}})(x+\mu(w-\bar{w}+k-\bar{k})).$$

□

D.4 Proof of Proposition 2

Proof. The Lagrangian associated with the optimization problem according to C.19 is

$$\mathcal{L} = E_1[\eta_I - w - k + \epsilon_1 + \eta_C + \theta(\eta_I - \eta_C + x) - \pi(b-k) + \epsilon_2] + \lambda[u(w) + u(k+\pi(b-k)) - \bar{u}]$$

which yields the first order necessary conditions

$$\omega^* + \lambda u'(w) = 1 \tag{D.13}$$

$$\omega^* + (1-\pi)\lambda u'(s) = 1-\pi \tag{D.14}$$

$$u(w) + u(s) = \bar{u} \tag{D.15}$$

$$\lambda > 0, \tag{D.16}$$

where $\omega^* \equiv \frac{\partial \Omega}{\partial w}\Big|_{w=\bar{w},k=\bar{k}} = \frac{\partial \Omega}{\partial k}\Big|_{w=\bar{w},k=\bar{k}}$ represents the equilibrium equilibrium election manipulation incentive and $s = k + \pi(b-k)$ represents employees' period 2 consumption.

It is immediately clear from D.13 and D.14 that $w = s$ under full transparency (i.e. when $\omega^* = 0$). To show how k varies with ρ, we differentiate both sides of D.13, D.14, and D.15 with respect to ρ to obtain

$$\frac{\partial \omega^*}{\partial \rho} + \frac{\partial \lambda}{\partial \rho} u'(w) + \lambda u''(w) \frac{\partial w}{\partial \rho} = 0 \tag{D.17}$$

$$\frac{\partial \omega^*}{\partial \rho} + (1-\pi)(\frac{\partial \lambda}{\partial \rho} u'(s) + (1-\pi)\lambda u''(s) \frac{\partial k}{\partial \rho}) = 0 \tag{D.18}$$

$$u''(w)\frac{\partial w}{\partial \rho} + (1-\pi)u''(s)\frac{\partial k}{\partial \rho} = 0. \tag{D.19}$$

Solving for $\frac{\partial k}{\partial \rho}$, we obtain

$$\frac{\partial k}{\partial \rho} = \frac{-\pi u'(w)}{(1-\pi)\lambda^2(u''(w)u'(s)^2 + u''(s)u'(w)^2)} \frac{\partial \omega^*}{\partial \rho}. \tag{D.20}$$

Since $u'(\cdot) > 0$ and $u''(\cdot) < 0$, and $\lambda > 0$, it follows that

$$\frac{-\pi u'(w)}{(1-\pi)\lambda^2(u''(w)u'(s)^2 + u''(s)u'(w)^2)} \begin{cases} > 0 & \text{if } \pi > 0 \\ = 0 & \text{if } \pi = 0, \end{cases}$$

which implies that $\frac{\partial k}{\partial \rho}$ has the same sign as $\frac{\partial \omega^*}{\partial \rho}$ if $\pi > 0$, and is zero otherwise. But we know from C.21 that $\frac{\partial \omega^*}{\partial \rho} < 0$, which means that $\frac{\partial k}{\partial \rho} < 0$ if $\pi > 0$. This completes the proof for part (a).

Following a similar path, we differentiate both sides of D.13, D.14, and D.15 with respect to m_1^Δ and solve for $\frac{\partial k}{\partial m_1^\Delta}$, we obtain

$$\frac{\partial k}{\partial m_1^\Delta} = \frac{-\pi u'(w)}{(1-\pi)\lambda^2(u''(w)u'(s)^2 + u''(s)u'(w)^2)} \frac{\partial \omega^*}{\partial m_1^\Delta}. \tag{D.21}$$

Since we have already established $\frac{-\pi u'(w)}{(1-\pi)\lambda^2(u''(w)u'(s)^2+u''(s)u'(w)^2)}$ is nonnegative, D.21 implies that $\frac{\partial k}{\partial m_1^\Delta}$ has the same sign as $\frac{\partial \omega^*}{\partial m_1^\Delta}$ if $\pi > 0$, and is equal to zero otherwise. Using the definition of ω^* from C.21 and by the properties of the normal distribution function, it follows that

$$\frac{\partial k}{\partial m_1^\Delta} \begin{cases} < 0 & \text{if } m_1^\Delta < 0 \\ > 0 & \text{if } m_1^\Delta > 0 \\ = 0 & \text{if } m_1^\Delta = 0, \end{cases}$$

if $\pi > 0$, and $\frac{\partial k}{\partial m_1^\Delta} = 0$ if $\pi = 0$. This completes the proof for part (b) and (c).

□

Figure 1: Illustrative Example of Institutional Timeline

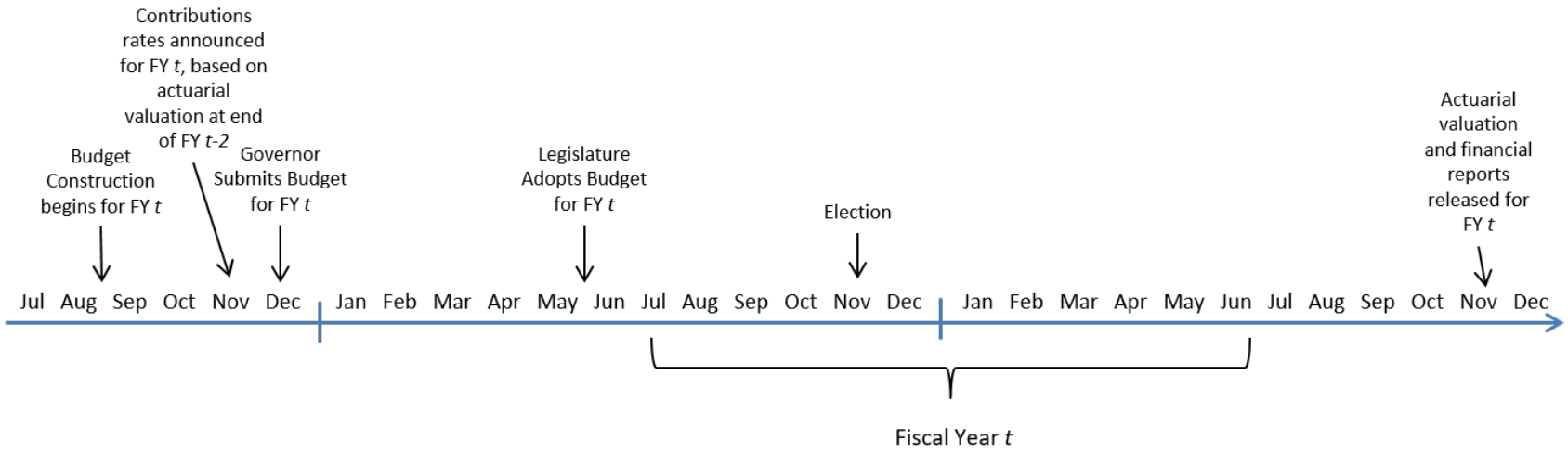


Figure 2: Frequency of Gubernatorial Elections (2001 to 2015)

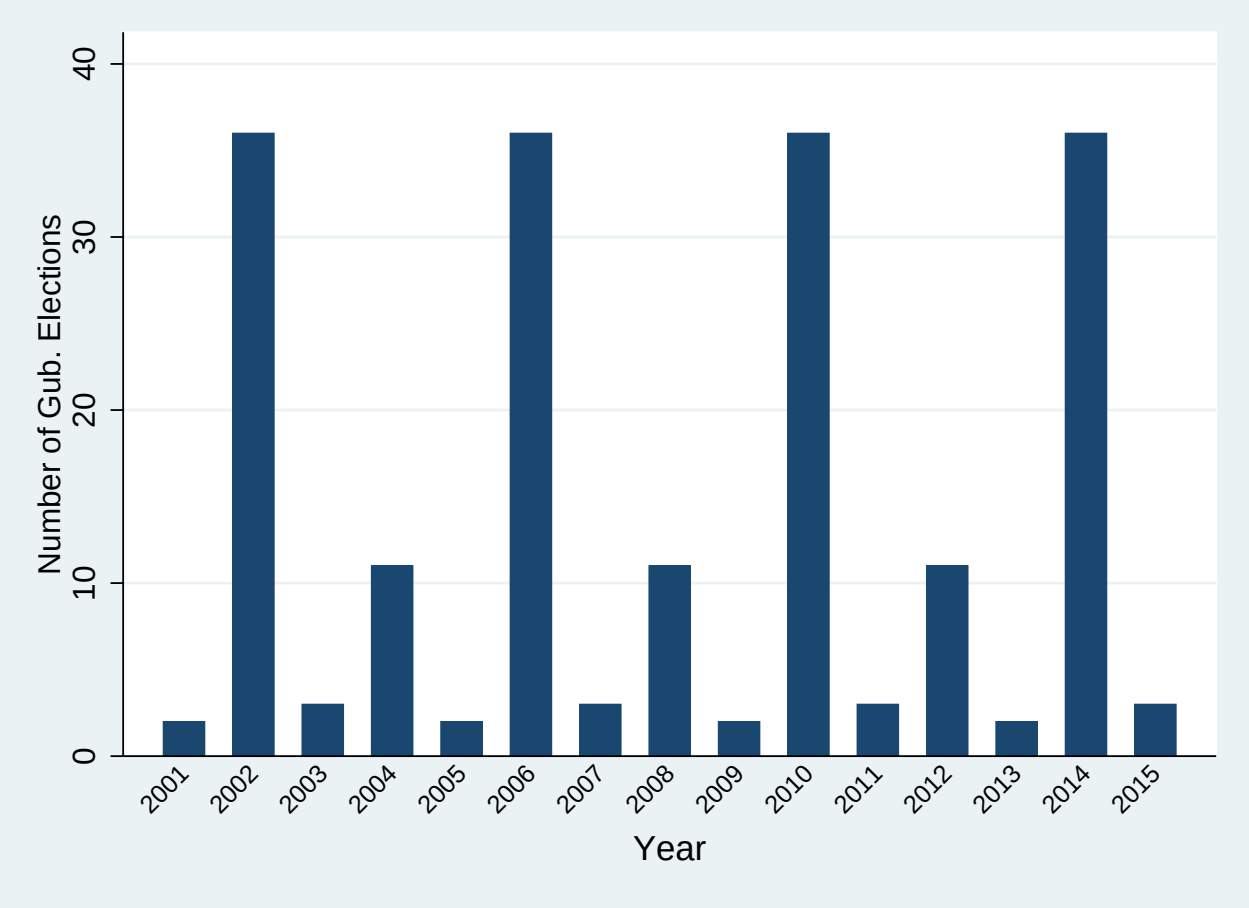
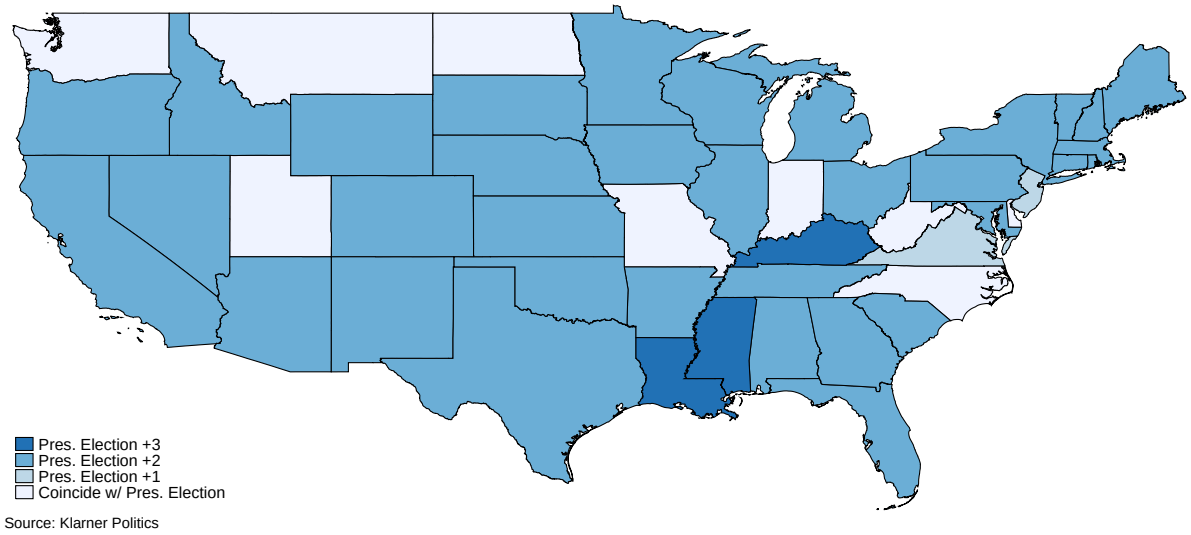
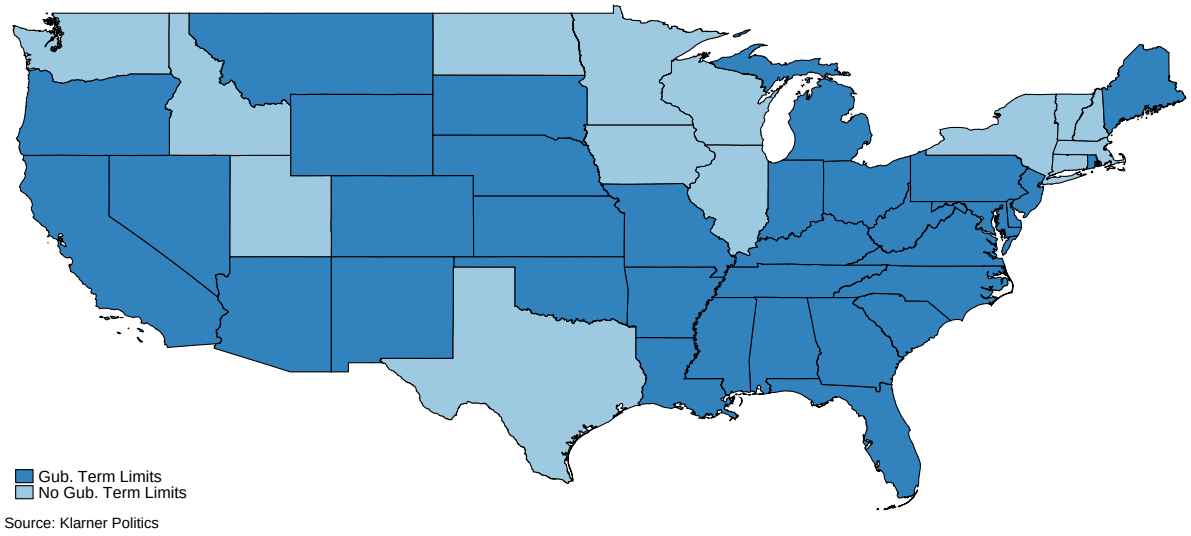


Figure 3: Geographic Variation in Political Institutions

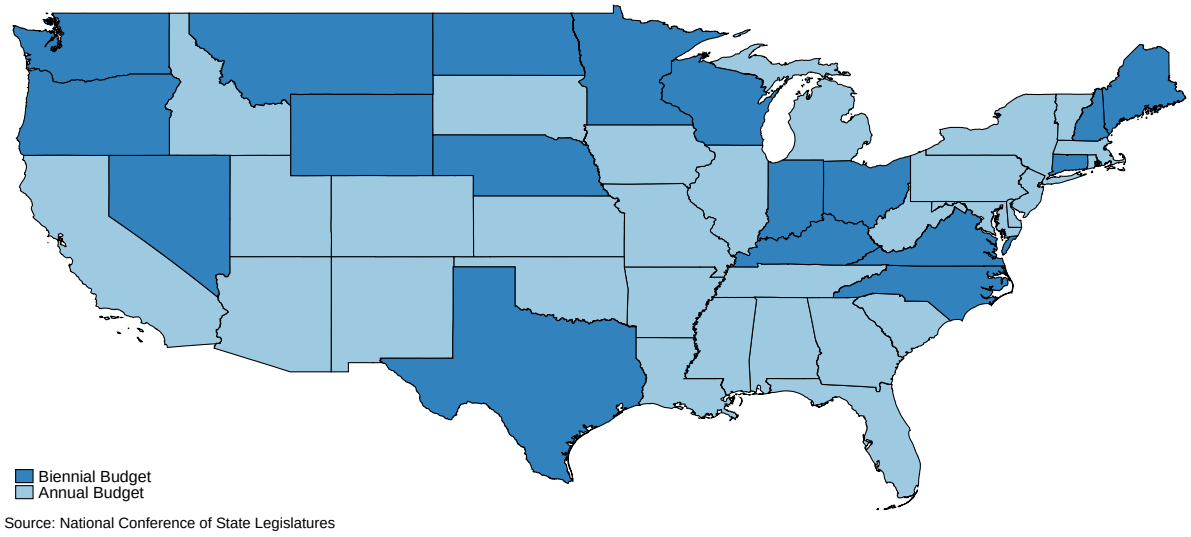


(a) Gubernatorial Electoral Cycles (as of 2015)



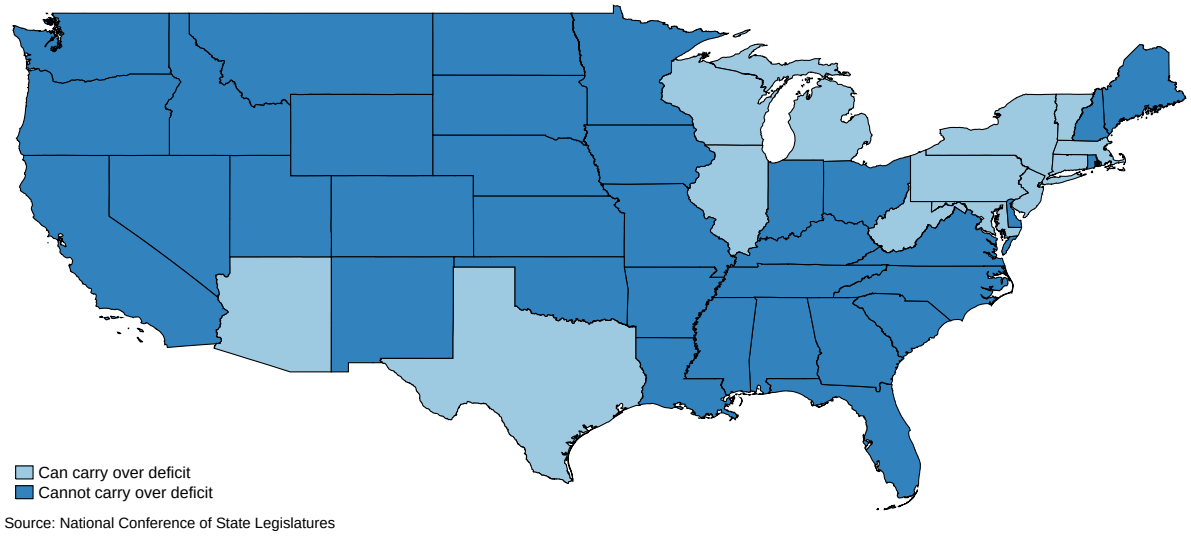
(b) Gubernatorial Term Limits (as of 2015)

Figure 4: Geographic Variation in Budgetary Institutions



Source: National Conference of State Legislatures

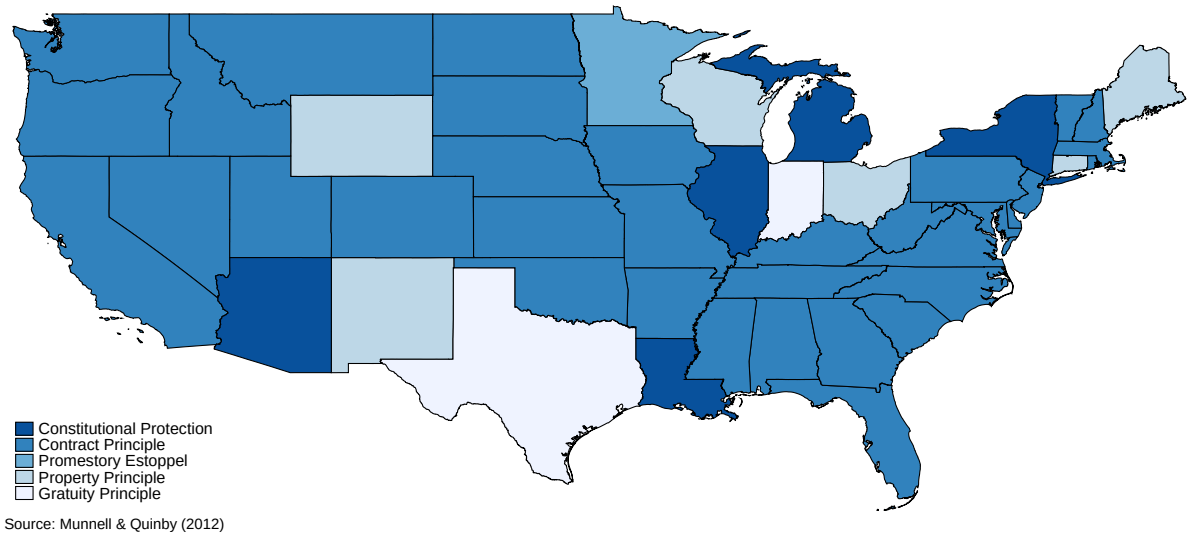
(a) Annual vs. Biennial Budget Cycles (as of 2015)



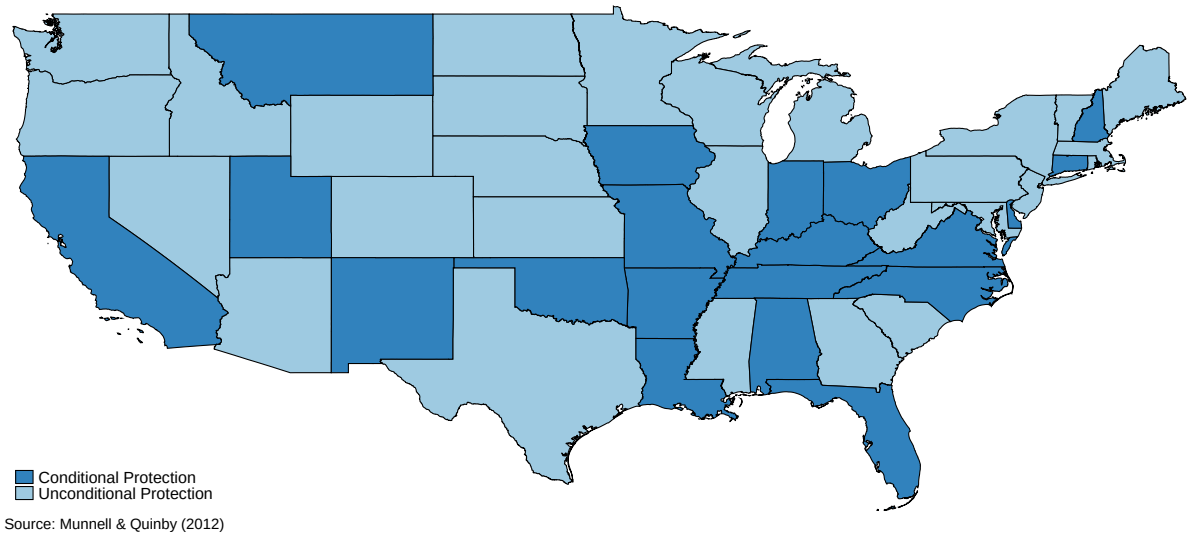
Source: National Conference of State Legislatures

(b) State Balanced Budget (No-Carry-Over Rule) Restrictions

Figure 5: Geographic Variation in Public Pension Benefit Protection Legal Regimes

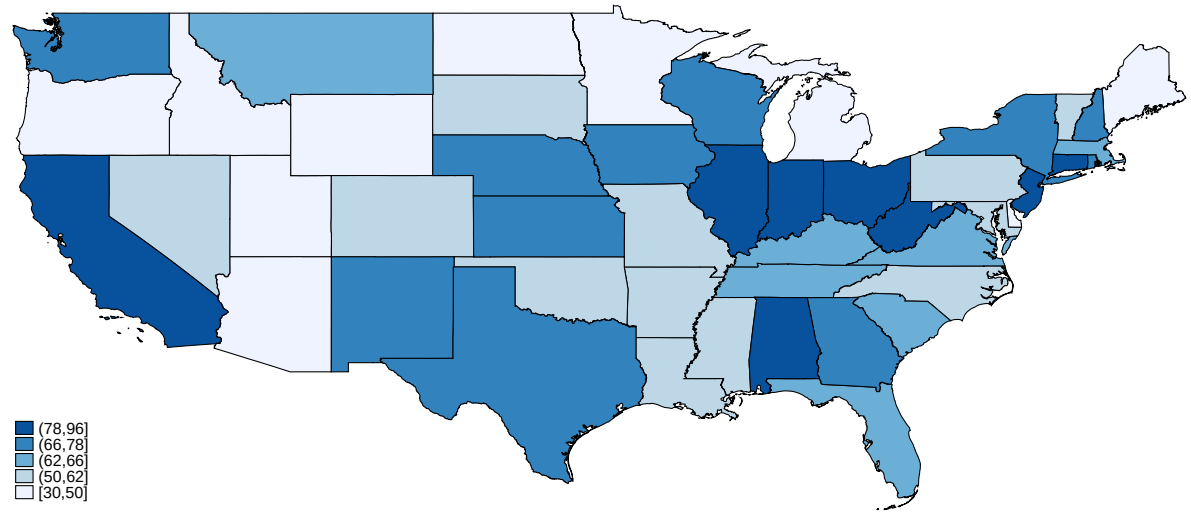


(a) State Pension Benefit Legal Protection Regimes



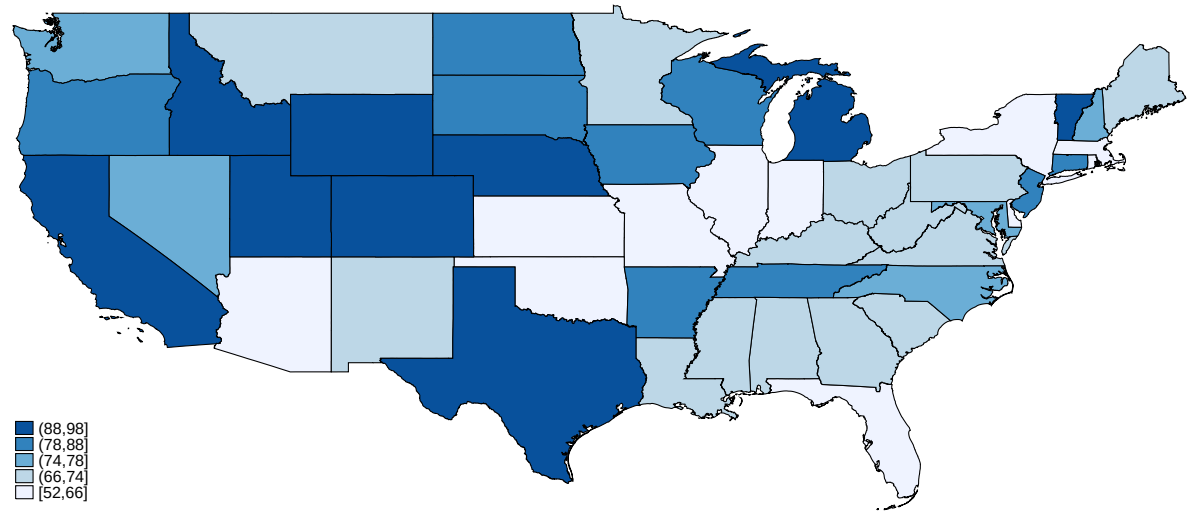
(b) State Pension Benefit Legal Protection Conditions

Figure 6: Geographic Variation in Transparency Indicators



Source: Center for Public Integrity State Integrity Investigation

(a) State Integrity Investigation Transparency Score for State Pension Fund Management



Source: Center for Public Integrity State Integrity Investigation

(b) State Integrity Investigation Transparency Score for State Budget Process

Table I: Descriptive Statistics

This table presents summary statistics for the variables in my benchmark regression specifications. The sample consists of 114 state-administered public pension plans (covering all 50 states) over the period 2001 to 2015. *Contrib* denotes the total pension contribution scaled by payroll, *ContribMbrs* denotes the employee pension contribution scaled by payroll, *ContribGov* denotes the governmental pension contribution scaled by payroll, *Acc* denotes the total benefit accrual scaled by payroll, *AccMbrs* denotes the employee benefit accrual scaled by payroll, *AccGov* denotes the governmental benefit accrual scaled by payroll, *PenDef* denotes the pension deficit scaled by payroll, *PenDefMbrs* denotes the employee pension deficit scaled by payroll, *PenDefGov* denotes the governmental pension deficit scaled by payroll, Election denotes a dummy variable for a gubernatorial election year, *ln*(*Payroll*) denotes the natural log of total payroll among plan participants, *ln*(*Avg Salary*) denotes the natural log of average salary among plan participants, *Income* denotes non-contribution income scaled by payroll, *Discount Rate* denotes the assumed discount rate reported by the plan, Inflation Rate denotes the inflation rate assumed by the plan, *CostMthd EAN* denotes a dummy variable for Entry Age Normal being the actuarial cost method, Deficit denotes the per capita unexpected state deficit, *State Unemp* denotes the state unemployment rate, and *Pub Union Mbrshp* denotes the state unionization rate among public-sector workers. Detailed definitions for all variables can also be found in Appendix A. All variables except for Election are winsorized at the 1% level at both tails. Missing variables account for differences in number of observations.

	Observations	Mean	Std Dev	P25	Median	P75
Pension Contributions						
Contrib	1,316	17.979	9.469	11.866	16.667	22.428
ContribMbrs	1,316	6.052	3.560	3.625	6.408	8.234
ContribGov	1,318	11.911	8.604	6.493	10.200	14.290
Pension Accruals						
Acc	1,318	12.500	4.270	9.870	11.529	14.480
AccMbrs	1,318	5.710	2.832	3.990	6.000	7.689
AccGov	1,318	6.852	4.113	4.170	6.030	8.250
Pension Deficits						
PenDef	1,316	-5.392	8.258	-8.236	-3.938	-0.796
PenDefMbrs	1,316	-0.319	1.848	-0.633	-0.139	0.126
PenDefGov	1,318	-5.065	7.967	-7.966	-3.619	-0.429
Electoral Cycle						
Election	1,318	0.262	0.440	0.000	0.000	1.000
Plan-Level Control Variables						
ln(Payroll)	1,318	7.851	1.107	7.190	7.902	8.564
ln(Salary)	1,318	3.746	0.273	3.568	3.734	3.912
Income	1,318	0.219	0.485	-0.048	0.296	0.525
Discount Rate	1,318	0.079	0.004	0.075	0.080	0.080
Inflation Rate	1,318	0.034	0.006	0.030	0.032	0.035
CostMthd EAN	1,318	0.804	0.397	1.000	1.000	1.000
State-Level Control Variables						
Deficit Shock	1,318	-0.018	0.108	-0.069	-0.011	0.033
State Unemp	1,318	0.063	0.020	0.048	0.059	0.075
Pub Union Mbrshp	1,318	0.333	0.177	0.175	0.282	0.509

Table II: Average Payroll and Pension Policies by State

This table presents a state-by-state summary, including the number of plans for each state, as well as the average Payroll, average *Contrib*, average *Acc*, and average *PenDef* for each state. Detailed definitions for all variables can be found in Table I as well as Appendix A.

	Number of Plans	Payroll	Contrib	Acc	PenDef
AK	2	1021.927	26.387	13.881	-12.656
AL	2	4520.158	14.695	9.917	-4.778
AR	2	1441.067	13.712	11.391	-2.329
AZ	3	3458.666	19.558	15.492	-4.067
CA	3	21108.221	16.731	18.415	0.378
CO	3	2568.761	22.707	12.953	-9.754
CT	3	3160.995	26.223	10.294	-15.191
DE	1	1670.206	8.641	9.776	1.136
FL	1	24803.133	10.635	10.084	-0.550
GA	2	5944.057	14.492	10.742	-3.750
HI	1	3504.771	15.822	10.391	-5.474
IA	2	4544.873	17.596	14.508	-3.088
ID	1	2469.950	17.345	14.204	-3.141
IL	4	5418.373	26.020	16.094	-9.827
IN	2	4302.572	14.900	8.882	-5.839
KS	1	5815.819	12.321	8.345	-3.976
KY	3	2474.669	18.614	11.087	-7.526
LA	5	2153.382	30.756	15.132	-15.627
MA	2	4868.025	23.433	11.528	-11.903
MD	2	4772.687	14.643	10.924	-3.719
ME	2	937.685	18.887	14.073	-4.814
MI	3	4292.982	21.670	9.700	-11.499
MN	4	3085.265	14.641	11.105	-3.381
MO	5	1795.267	21.466	12.715	-8.747
MS	1	5319.257	20.737	10.561	-10.176
MT	2	851.190	16.865	10.967	-5.898
NC	2	8071.481	11.771	12.003	0.232
ND	2	569.737	13.559	9.584	-3.539
NE	1	1436.878	17.937	11.438	-6.500
NH	1	2431.064	17.213	10.520	-6.693
NJ	3	9382.403	15.950	9.340	-6.612
NM	2	2116.240	22.768	16.577	-6.191
NV	2	2591.627	26.258	21.507	-4.749
NY	3	12400.116	10.369	12.063	1.575
OH	4	5428.947	22.380	15.106	-6.258
OK	3	2042.291	22.326	14.089	-8.231
OR	1	8281.775	8.409	8.120	-0.286
PA	3	6382.234	13.381	14.296	0.914
RI	2	931.877	20.295	11.878	-8.418
SC	2	4047.379	18.680	11.277	-6.637
SD	1	1346.206	13.401	11.771	-1.629
TN	2	3902.333	12.996	9.611	-3.384
TX	5	9267.403	12.331	10.346	-1.693
UT	2	2139.902	20.159	16.843	-3.301
VA	1	13771.987	8.664	9.330	0.666
VT	2	441.174	12.471	8.978	-3.493
WA	4	3392.746	7.137	10.897	3.715
WI	1	11890.885	11.458	12.908	1.450
WV	2	1203.019	29.414	9.673	-18.710
WY	1	1473.984	11.922	11.161	-0.761
Total	3	4667.729	17.979	12.500	-5.392

Table III: Electoral Cycles in Pension Deficits

This table reports the estimation results from the OLS regression $PenDef_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$ in columns (1) and (2). In column (3) and (4), *PenDef* is replaced by *PenDefMbrs* as the dependent variable, and in columns (5) and (6), *PenDef* is replaced by *PenDefGov* as the dependent variable. The variables of interest is $Election_{it}$ and coefficient δ_0 captures the relative difference in the outcome variable between election years and non-election years. X_{it} denotes the set of control variables, and is included in columns (2), (4), and (6). Control variables included lagged values of *ln(Payroll)*, *ln(Avg Salary)*, *Income*, *Deficit Shock*, *State Unemp*, and *Pub UnionMbrshp*, as well as contemporaneous values of *Discount Rate*, *Inflation Rate*, and *CostMthdEAN*. Detailed definitions for all variables can be found in Table I as well as Appendix A. All specifications include both plan and year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the state level. The sample consists of 114 state-administered public pension plans for the period 2001 to 2015 described in Table I. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) PenDef	(2) PenDef	(3) PenDefMbrs	(4) PenDefMbrs	(5) PenDefGov	(6) PenDefGov
Election	0.581**	0.603***	-0.021	-0.012	0.605**	0.613***
	[0.218]	[0.211]	[0.091]	[0.089]	[0.231]	[0.199]
ln(Payroll)		12.704		-2.879**		15.560*
		[9.134]		[1.353]		[8.090]
ln(Salary)		-15.472*		-1.986		-13.467
		[8.795]		[1.679]		[8.641]
Income		-0.843*		0.073		-0.904**
		[0.450]		[0.122]		[0.420]
Deficit Shock		0.631		-0.208		0.827
		[2.863]		[0.383]		[2.761]
State Unemp		-30.748		-2.701		-28.202
		[29.112]		[10.717]		[24.828]
Pub Union Mbrshp		-6.051		-1.564		-4.493
		[8.992]		[1.864]		[8.012]
Discount Rate		63.339		-0.198		63.692
		[101.704]		[34.699]		[111.216]
Inflation Rate		-53.375		11.455		-64.960
		[46.087]		[21.108]		[44.761]
CostMthd EAN		-2.899		-0.186		-2.713
		[2.873]		[0.298]		[2.603]
Fixed Effects	Plan, Year	Plan, Year	Plan, Year	Plan, Year	Plan, Year	Plan, Year
Observations	1,312	1,312	1,312	1,312	1,314	1,314
Adjusted R-squared	0.649	0.677	0.565	0.589	0.632	0.672

Table IV: Dynamics of Electoral Cycles in Pension Deficits

This table reports the estimation results from the OLS regression $Y_i t = \alpha + \kappa_i + \lambda_t + \sum_{j=0}^{2} \delta_j \cdot Election_{it+j} + X_{it}\beta + \epsilon_{it}$, where the outcome variable Y_{it} is $PenDef_{it}$ in column (1), $PenDefMbrs_{it}$ in column (2), and $PenDefGov_{it}$ in column (3). The coefficients δ_j's captures how contribution rates are affected by proximity to gubernatorial elections on a year-to-year basis over the electoral cycle. All specification include the set of control variables X_{it}, including lagged values of *ln(Payroll)*, *ln(Avg Salary)*, *Income*, *Deficit Shock*, *State Unemp*, and *Pub Union Mbrshp*, as well as contemporaneous values of *Discount Rate*, *Inflation Rate*, and *CostMthd EAN*. Detailed definitions for all variables can also be found in Table I as well as Appendix A. All specifications include both plan and year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the state level. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) PenDef	(2) PenDefMbrs	(3) PenDefGov
Election	0.759***	0.074	0.686***
	[0.272]	[0.139]	[0.242]
Election(t+1)	-0.005	0.006	-0.008
	[0.398]	[0.087]	[0.373]
Election(t+2)	0.368	0.198	0.176
	[0.323]	[0.149]	[0.274]
ln(Payroll)	12.715	-2.873**	15.566*
	[9.131]	[1.348]	[8.092]
ln(Salary)	-15.559*	-2.027	-13.513
	[8.712]	[1.690]	[8.558]
Income	-0.867*	0.062	-0.917**
	[0.455]	[0.119]	[0.430]
Deficit Shock	0.690	-0.176	0.856
	[2.854]	[0.390]	[2.741]
State Unemp	-31.484	-3.088	-28.554
	[29.330]	[10.866]	[24.943]
Pub Union Mbrshp	-5.949	-1.514	-4.442
	[9.041]	[1.871]	[8.057]
Discount Rate	61.416	-1.189	62.745
	[101.847]	[35.326]	[110.901]
Inflation Rate	-53.079	11.616	-64.809
	[46.011]	[20.933]	[44.827]
CostMthd EAN	-2.913	-0.194	-2.720
	[2.875]	[0.300]	[2.606]
Fixed Effects	Plan, Year	Plan, Year	Plan, Year
Observations	1,312	1,312	1,314
Adjusted R-squared	0.677	0.590	0.672

Table V: Electoral Cycles in Pension Contribution Rates

This table reports the estimation results from the OLS regression $Y_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$ in columns (1) to (3), $ContribGov_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + \rho \cdot Budget\ Year_{it} \cdot Election_{it} + \pi \cdot Budget\ Year_{it} + X_{it}\beta + \epsilon_{it}$ in column (4), and $ContribGov_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + \rho \cdot LegixExp_{it} \cdot Election_{it} + \pi \cdot LegixExp_{it} + X_{it}\beta + \epsilon_{it}$ in column (5), where Y_{it} represents various measures of pension contribution rates, $BudgetYear_{it}$ is a dummy variable indicating whether there a state budget passed in year t, and $LegisExp_{it}$ is a dummy variable indicating whether the incumbent Governor has prior experience in the state legislature. Column (6) reports the results from including all terms from columns (4) and (5). All specification include the set of control variables X_{it}, including lagged values of *ln(Payroll)*, *ln(Avg Salary)*, *Income*, *Deficit Shock*, *State Unemp*, and *Pub Union Mbrshp*, as well as contemporaneous values of *Discount Rate*, *Inflation Rate*, and *CostMthd EAN*. Detailed definitions for all variables can also be found in Table I as well as Appendix A. All specifications include both plan and year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the state level. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) Contrib	(2) ContribMbrs	(3) ContribGov	(4) ContribGov	(5) ContribGov	(6) ContribGov
Election	-0.618**	0.011	-0.628***	0.200	-0.328	0.466
	[0.234]	[0.086]	[0.219]	[0.218]	[0.232]	[0.280]
Election × Budget Year				-1.179***		-1.141***
				[0.366]		[0.365]
Budget Year				0.574***		0.553***
				[0.176]		[0.162]
Election × LegisExp					-1.830**	-1.789**
					[0.893]	[0.871]
LegisExp					1.460*	1.454*
					[0.812]	[0.811]
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Plan, Year	Plan, Year	Plan, Year	Plan, Year	Plan, Year	Plan, Year
Observations	1,312	1,312	1,314	1,314	1,314	1,314
Adjusted R-squared	0.726	0.871	0.692	0.692	0.694	0.694

Table VI: Electoral Cycles in State Fiscal Outcomes

This table reports the estimation results from the OLS regression $Y_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + \rho_0 \cdot BalBudget_i \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$, where $BalBudget_i$ takes on a value of one if state i does not allow deficits to be carried over from one year to the next. In The outcome variable Y_{it} is $Taxes_{it}$ (per capita tax revenue) in column (1), $Spend_{it}$ (per capita general fund expenditure) in column (2), $Edu\ Spend_{it}$ (per capita expenditure on education) in column (3), $Cap\ Spend_{it}$ (per capita expenditure on capital outlays) in column (4), and $Police\ Spend_{it}$ (per capita expenditures on police) in column (5). X_{it} denotes the set of control variables, which include lagged values of *State Unemp*, *Pub Union Mbrshp*, *State GDP*, *Deficit Shock*, and *State Debt*. All specifications include both state and year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the state level. The sample consists of 50 states for the period 2001 to 2015. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) Taxes	(2) Spend	(3) Edu Spend	(4) Cap Spend	(5) Police Spend
Election	-0.006	0.063***	0.034**	0.014*	0.002**
	[0.024]	[0.022]	[0.013]	[0.008]	[0.001]
Election × BalBudget	0.022	-0.026	-0.024*	-0.005	-0.001
	[0.028]	[0.025]	[0.013]	[0.008]	[0.001]
State Unemp	0.027	-0.051	-0.021*	-0.007	-0.001
	[0.026]	[0.034]	[0.011]	[0.008]	[0.001]
Pub Union Mbrshp	0.011	-0.000	0.002	-0.002	0.000
	[0.010]	[0.008]	[0.003]	[0.001]	[0.000]
State GDP	0.111***	0.074***	0.020***	0.017***	0.000
	[0.025]	[0.016]	[0.005]	[0.006]	[0.000]
Deficit Shock	-0.367	0.272	0.047	0.024	-0.001
	[0.431]	[0.212]	[0.071]	[0.028]	[0.003]
State Debt	0.016	0.113*	0.003	-0.003	0.003
	[0.052]	[0.058]	[0.024]	[0.015]	[0.002]
Fixed Effects	State, Year	State, Year	State, Year	State, Year	State, Year
Observations	647	647	647	647	647
Adjusted R-squared	0.888	0.968	0.946	0.890	0.915

Table VII: Electoral Cycles in Pension Benefit Accrual Rates

This table reports the estimation results from the OLS regression $Y_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$ in columns (1) to (3), $AccGov_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + \rho \cdot Pub\ Union\ Mbrshp_{it} \cdot Election_{it} + \pi \cdot Pub\ Union\ Mbrshp_{it} + X_{it}\beta + \epsilon_{it}$ in column (4), and $AccGov_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + \rho \cdot LegixExp_{it} \cdot Election_{it} + \pi \cdot LegixExp_{it} + X_{it}\beta + \epsilon_{it}$ in column (5), where Y_{it} represents various measures of pension accrual rates, $Pub\ Union\ Mbrshp_{it}$ is the state-level public sector unionization membership rate in year t, and $LegisExp_{it}$ is a dummy variable indicating whether the incumbent Governor has prior experience in the state legislature. Column (6) reports the results from including all terms from columns (4) and (5). All specification include the set of control variables X_{it}, including lagged values of *ln(Payroll)*, *ln(Avg Salary)*, *Income*, *Deficit Shock*, *State Unemp*, and *Pub Union Mbrshp*, as well as contemporaneous values of *Discount Rate*, *Inflation Rate*, and *CostMthd EAN*. Detailed definitions for all variables can also be found in Table I as well as Appendix A. All specifications include both plan and year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the state level. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) Acc	(2) AccMbrs	(3) AccGov	(4) AccGov	(5) AccGov	(6) AccGov
Election	0.063	0.001	0.062	-0.271*	-0.011	-0.330**
	[0.080]	[0.043]	[0.067]	[0.157]	[0.078]	[0.144]
Election × Pub Union Mbrshp				1.058**		1.022**
				[0.489]		[0.451]
Pub Union Mbrshp				2.077		1.905
				[3.098]		[2.969]
Election × LegisExp					0.444**	0.435**
					[0.175]	[0.182]
LegisExp					-0.421	-0.414
					[0.344]	[0.338]
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Plan, Year	Plan, Year	Plan, Year	Plan, Year	Plan, Year	Plan, Year
Observations	1,314	1,314	1,314	1,314	1,314	1,314
Adjusted R-squared	0.860	0.917	0.863	0.864	0.864	0.864

Table VIII: Benefit Protection Strength and Electoral Cycles in Pension Deficits

This table reports the estimation results from the OLS regression $PenDefGov_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + \rho \cdot W_i \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$ in columns 1, 2, and 3, where W_i represents *Strong Protect*$_i$ (a dummy variable indicating whether a plan's state provides constitutional protection of public pension plan members' benefits) in column (1), *Weak Protect*$_i$ (a dummy variable indicating whether a plan's state provides protection of public pension plan members' benefits under the gratuity principal) in column (2), and *Unconditional Protect*$_i$ (a dummy variable indicating whether a plan's state provides unconditional protection of public pension plan members' benefits) in column (3). Column (4) reports the estimation results from including all terms from columns (1), (2), and (3). All specification include the set of control variables X_{it}, including lagged values of *ln*(*Payroll*), *ln*(*Avg Salary*), *Income*, *Deficit Shock*, *State Unemp*, and *Pub Union Mbrshp*, as well as contemporaneous values of *Discount Rate*, *Inflation Rate*, and *CostMthd EAN*. Detailed definitions for all variables can also be found in Table I as well as Appendix A. All specifications include both plan and year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the state level. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) PenDefGov	(2) PenDefGov	(3) PenDefGov	(4) PenDefGov
Election	0.320	0.731***	0.039	-0.014
	[0.214]	[0.200]	[0.238]	[0.166]
Election × Strong Protect	1.817***			1.525***
	[0.334]			[0.336]
Election × Weak Protect		-1.679**		-1.502***
		[0.687]		[0.515]
Election × Unconditional Protect			1.009***	0.857***
			[0.327]	[0.302]
Control Variables	Yes	Yes	Yes	Yes
Fixed Effects	Plan, Year	Plan, Year	Plan, Year	Plan, Year
Observations	1,314	1,314	1,314	1,314
Adjusted R-squared	0.673	0.672	0.672	0.673

Table IX: Pension Plan Opacity and Electoral Cycles in Pension Deficits

This table reports the estimation results from the OLS regression $PenDefGov_{it} = \alpha + \kappa_I + \lambda_t + \delta_0 \cdot Election_{it} + \pi \cdot Opaque\ Pensions_i \cdot Election_{it} + \rho \cdot Transparent\ Pensions_i \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$ in column (1), and $PenDefGov_{it} = \alpha + \kappa_I + \lambda_t + \delta_0 \cdot Election_{it} + \pi \cdot Opaque\ Budget_i \cdot Election_{it} + \rho \cdot Transparent\ Budget_i \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$ in column (2), where $Opaque\ Pensions_i$ is a dummy variable indicating whether a state is in the bottom decile in terms of state pension SII transparency score, $Transparent\ Pensions_i$ is a dummy variable indicating whether a state is in the top decile in terms of state pension SII transparency score, $Opaque\ Budget_i$ is a dummy variable indicating whether a state is in the bottom decile in terms of state budget SII transparency score, $Tranpsarent\ Budget_i$ is a dummy variable indicating whether a state is in the top decile in terms of state budget SII transparency score. Column (3) reports the estimation results from including all LHS terms from columns (1) and (2). All specification include the set of control variables X_{it}, including lagged values of $ln(Payroll)$, $ln(Avg\ Salary)$, *Income*, *Deficit Shock*, *State Unemp*, and *Pub Union Mbrshp*, as well as contemporaneous values of *Discount Rate*, *Inflation Rate*, and *CostMthd EAN*. Detailed definitions for all variables can also be found in Table I as well as Appendix A. All specifications include both plan and year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the state level. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) PenDefGov	(2) PenDefGov	(3) PenDefGov
Election	0.509**	0.681***	0.518**
	[0.212]	[0.236]	[0.243]
Election × Opaque Pensions	1.081**		1.123**
	[0.474]		[0.466]
Election × Transparent Pensions	-1.228***		-0.782**
	[0.431]		[0.327]
Election × Opaque Budget		0.299	0.470
		[1.077]	[1.096]
Election × Transparent Budget		-0.794**	-0.556
		[0.392]	[0.332]
Control Variables	Yes	Yes	Yes
Fixed Effects	Plan, Year	Plan, Year	Plan, Year
Observations	1,314	1,314	1,314
Adjusted R-squared	0.672	0.672	0.672

Table X: Political Factors and and Electoral Cycles in Pension Deficits

This table reports the estimation results from the OLS regression $PenDefGov_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + \rho \cdot VicMargin_{it} + X_{it}\beta + \epsilon_{it}$ in column (1), $PenDefGov_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + \rho \cdot VicMargin_{it} + \pi \cdot VicMargin_{it} \cdot IncumbLoses_{it} + X_{it}\beta + \epsilon_{it}$ in column (2), $PenDefGov_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + \rho \cdot Lame\ Duck_{it} + \pi \cdot Lame\ Duck_{it} \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$ in column (3), and $PenDefGov_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + \rho \cdot Republican_{it} + \pi \cdot Republican_{it} \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$ in column (4). $VicMargin_{it}$ is the margin of victory between the winning candidate and the runner-up in the gubernatorial election in year t if an election occurred and zero otherwise, $IncumbLoses_{it}$ is a dummy variable that indicates if the incumbent Governor loses reelection in year t, $Lame\ Duck_{it}$ indicates whether the Governor faces binding term limits, and $Republican_{it}$ indicates whether the Governor is a member of the Republican party. Column (5) reports the results from including all terms from columns (1), (2), (3), and (4). All specification include the set of control variables X_{it}, including lagged values of *ln(Payroll)*, *ln(Avg Salary)*, *Income*, *Deficit Shock*, *State Unemp*, and *Pub Union Mbrshp*, as well as contemporaneous values of *Discount Rate*, *Inflation Rate*, and *CostMthd EAN*. Detailed definitions for all variables can also be found in Table I as well as Appendix A. All specifications include both plan and year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the state level. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) PenDefGov	(2) PenDefGov	(3) PenDefGov	(4) PenDefGov	(5) PenDefGov
Election	1.043***	0.746**	0.373*	0.747***	0.680*
	[0.303]	[0.338]	[0.208]	[0.268]	[0.381]
VicMargin	-2.232**	-2.198**			-2.384**
	[0.976]	[1.018]			[1.098]
Lame Duck			-0.913**		-0.834**
			[0.391]		[0.384]
Election × Lame Duck			0.861*		0.764
			[0.464]		[0.481]
Election × Republican				-0.218	-0.122
				[0.515]	[0.500]
Republican				-0.556	-0.665
				[0.635]	[0.631]
gub_election_legCtrl		0.517			0.467
		[0.463]			[0.459]
Control Variables	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Plan, Year	Plan, Year	Plan, Year	Plan, Year	Plan, Year
Observations	1,280	1,280	1,318	1,318	1,280
Adjusted R-squared	0.681	0.681	0.675	0.674	0.683

Table XI: Consequences of Electoral Cycles in Pension Deficits

Panel A reports plan-level cross-sectional regression estimation results from $\Delta\, UnfundedLiab_i = \alpha + \delta \cdot Z_i + \bar{X}_i\beta + \epsilon_i$, where Z_i represents $PenDefCyc_i$ (the plan-level time series average of *PenDef* conditional on election year minus the plan-level time series average of *PenDef* conditional on non-election year) in columns (1) and (2), $PenDefCycD_i$ ($PenDefCyc_i$ adjusted for time trends) in columns (3) and (4), and Residual $PenDefCycR_i$ ($PenDefCyc_i$ adjusted for time-varying covariates, plan fixed effects, and time fixed effects) in columns (5) and (6). $\Delta\, UnfundedLiab_i$ denotes the plan-level time series average for annual changes in unfunded liabilities scaled by payroll. $\bar{X}_i$ denotes the plan-level time-series averages for the set of control variables, which includes lagged values of *ln*(*Payroll*), *ln*(*Avg Salary*), *Income*, *Deficit Shock*, *State Unemp*, and *Pub Union Mbrshp*, as well as contemporaneous values of *Discount Rate*, $InflationRate$, and *CostMthd EAN*. Panel B reports state-level cross-sectional regression estimation results from $Y_j = \alpha + \delta \cdot Z_j + \epsilon_j$, where j indexes states, Y_j represents the time-series average of log growth rates in state GDP in columns (1)-(3) and in house price index values in columns (4)-(6), and Z_j represents the weighted averages of $PenDefCyc_i$, $PenDefCycD_i$, and $PenDefCycR_i$, respectively (weighted by plan liabilities). Detailed definitions for all variables can be found in Table I as well as Appendix A. State level fixed effects are included in columns (2), (4), and (6). Standard errors are corrected for heteroskedasticity and clustered at the state level in Panel A. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

Panel A: Changes in Unfunded Liabilities

	(1) Δ UnfundedLiab	(2) Δ UnfundedLiab	(3) Δ UnfundedLiab	(4) Δ UnfundedLiab	(5) Δ UnfundedLiab	(6) Δ UnfundedLiab
PenDefCyc	1.338***	1.306***				
	[0.487]	[0.396]				
PenDefCycD			1.361**	1.384***		
			[0.523]	[0.438]		
PenDefCycR					1.228***	0.867***
					[0.425]	[0.273]
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects		State		State		State
Observations	106	106	106	106	103	103
Adjusted R-squared	0.330	0.614	0.324	0.620	0.348	0.591

Panel B: State-Level Economic Outcomes

	ln(GDP Growth)	ln(GDP Growth)	ln(GDP Growth)	ln(HPI Growth)	ln(HPI Growth)	ln(HPI Growth)
PenDefCyc	-0.142*			-0.031		
	[0.076]			[0.026]		
PenDefCycD		-0.153*			-0.031	
		[0.077]			[0.027]	
PenDefCycR			-0.071			-0.016
			[0.065]			[0.022]
Observations	50	50	48	50	50	48
Adjusted R-squared	0.048	0.056	0.004	0.010	0.007	-0.010

Table XII: Electoral Cycles in Private-Sector DB Pension Policies

This table reports the estimation results from the OLS regression $Y_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$, where Y_{it} is $DefFirm_{it}$ in column (1), $ContribFirm_{it}$ in column (2), and $AccFirm_{it}$ in column (3). All specification include the set of control variables X_{it}, including lagged values of *ln(Payroll)*, *ln(Avg Salary)*, *Income*, *Deficit Shock*, *State Unemp*, and *Pub Union Mbrshp*, as well as contemporaneous values of *Discount Rate*, and *Wage Growth*. Control variable coefficient estimates are not reported in order to conserve space. All specifications include both plan and year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the state level. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) DefFirm	(2) ContribFirm	(3) AccFirm
Election	0.135	-0.352	-0.316
	[0.492]	[0.299]	[0.600]
ln(Payroll)	18.500***	-1.946**	16.030**
	[6.467]	[0.791]	[6.439]
ln(Avg Salary)	-15.292**	2.453***	-12.179
	[7.167]	[0.869]	[7.651]
Income	-0.365***	-0.007	-0.377***
	[0.112]	[0.031]	[0.117]
Deficit Shock	1.696	-1.863	0.631
	[6.569]	[2.132]	[5.955]
State Unemp	0.719	-0.340	0.571
	[0.889]	[0.257]	[0.894]
Pub Union Mbrshp	-0.346	-0.014	-0.332
	[0.237]	[0.059]	[0.211]
Discount Rate	-1.479	0.134	-1.445
	[1.028]	[0.181]	[0.964]
Wage Growth	-0.429	0.129	-0.175
	[0.587]	[0.178]	[0.593]
Fixed Effects	Plan, Year	Plan, Year	Plan, Year
Observations	2,430	2,431	2,439
Adjusted R-squared	0.671	0.317	0.670

Table XIII: Unexpected Governor Changes and Pension Deficits

This table reports report the estimation results from the OLS regression $Y_{it} = \alpha + \kappa_i + \lambda_t + \omega_0 \cdot Gov\ Change_{it} + X_{it}\beta + \epsilon_{it}$ where Y_{it} represents the outcome variable $PenDef_{it}$ in columns (1) and (2), $PenDefMbrs_{it}$ in columns (3) and (4), and $PenDefGov_{it}$ in columns (5) and (6). A lagged $Gov\ Change_{it-1}$ is added to the specification in columns (2), (4), and (6). All specification include the set of control variables X_{it}, including lagged values of $ln(Payroll)$, $ln(Avg\ Salary)$, *Income*, *Deficit Shock*, *State Unemp*, and *Pub Union Mbrshp*, as well as contemporaneous values of *Discount Rate*, *Inflation Rate*, and *CostMthd EAN*. Detailed definitions for all variables can also be found in Table I as well as Appendix A. All specifications include both plan and year fixed effects. Standard errors are corrected for heteroskedasticity and clustered at the state level. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) PenDef	(2) PenDef	(3) PenDefMbrs	(4) PenDefMbrs	(5) PenDefGov	(6) PenDefGov
Gov Change	0.257	0.300	0.067	-0.005	0.188	0.303
	[0.888]	[0.835]	[0.132]	[0.138]	[0.887]	[0.848]
Gov Change(t-1)		-0.133		0.222		-0.352
		[1.198]		[0.179]		[1.222]
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Plan, Year	Plan, Year	Plan, Year	Plan, Year	Plan, Year	Plan, Year
Observations	1,312	1,312	1,312	1,312	1,314	1,314
Adjusted R-squared	0.676	0.676	0.589	0.589	0.671	0.671

Table XIV: Accounting for Geographic Clustering of State Electoral Cycles

This table reports the estimation results from the OLS regression $Y_{it} = \alpha + \kappa_i + \lambda_t + \delta_0 \cdot Election_{it} + X_{it}\beta + \epsilon_{it}$, where the outcome variable Y_{it} is *PenDef* in columns (1) and (2), *PenDefMbrs* in columns (3) and (4), and *PenDefGov* in columns (5) and (6). All specification include the set of control variables X_{it}, including lagged values of *ln(Payroll)*, *ln(Avg Salary)*, *Income*, *Deficit Shock*, *State Unemp*, and *Pub Union Mbrshp*, as well as contemporaneous values of *Discount Rate*, *Inflation Rate*, and *CostMthd EAN*. Detailed definitions for all variables can also be found in Table I as well as Appendix A. Standard errors are corrected for heteroskedasticity and double clustered at the state and year level. Bootstrap clustering is applied due to the small number of years in the panel. Plan-level and year-level fixed effects are included in columns (1), (3), and (5), while plan-level and region-year fixed effects are included in the remaining columns, where region represents the U.S. Census geographic grouping of U.S. states into *Northeast*, *Midwest*, *South*, and *West* regions. Standard errors are in parentheses, with *, **, and *** denoting significance at the 10%, 5%, and 1% level, respectively.

	(1) PenDef	(2) PenDef	(3) PenDefMbrs	(4) PenDefMbrs	(5) PenDefGov	(6) PenDefGov
Election	0.603**	0.524***	-0.012	0.026	0.613***	0.499***
	[0.214]	[0.107]	[0.099]	[0.089]	[0.173]	[0.162]
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Plan, Year	Plan, Year × Region	Plan, Year	Plan, Year × Region	Plan, Year	Plan, Year × Region
Cluster by	State, Year	State, Year	State, Year	State, Year	State, Year	State, Year
Boostrap Cluster	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,312	1,312	1,312	1,312	1,314	1,314
Adjusted R-squared	0.677	0.685	0.589	0.594	0.672	0.683