Pension Pressure:

Impact of Public Pension Fund Liabilities on Cities *

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Abstract

Most U.S. cities have defined-benefit pensions for their public workers, creating an obligation that exposes sponsoring cities to shortfall risk. Large funding gaps in recent years have required increased pension payments and generated fiscal stress for cities. To analyze the effect of this "pension pressure", I assembled a novel dataset which captures the universe of cities and their pensions in California from 2003 to 2016. I focus on the changes in city unfunded liability contributions. These mandatory, externally determined payments are plausibly exogenous to cities' year-to-year spending needs. Using a first differences empirical specification, I find that cities primarily reduce non-current expenses, specifically capital investment. I also show that cities cut payrolls and employment, with police employment declines specifically. Further, there are accompanying increases in crime rates. These estimates imply that pension pressure impairs local public service provision, with contributions displacing other spending.

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1 Introduction

In the United States, state and local public workers largely have their retirements secured by defined benefit (DB) pensions, guaranteeing them an annuity in retirement. Compared to the private sector where they are uncommon, 83% of full-time state and local workers participate in a DB pension plan.[1] The extent of these plans corresponds to a substantial obligation for the sponsoring government employers, and ultimately, their taxpayers: the overall present value of the benefits expected to be paid to these retired public workers is nearly $6 trillion.[2]

To meet this obligation, governments and their employees make yearly contributions to a retirement system, which then invests the contributions. Unlike with other types of plans, such as individual retirement accounts, governments are exposed both to investment volatility in their largely equity-based portfolios and to the shortfall risk of their invested contributions inadequately covering liabilities. Middling investment returns in the early 2000s were exacerbated by the Great Recession; in 2009, pensions lost nearly a quarter of the market value of their assets. This has created persistent asset-liability gaps measured in hundreds of billions dollars for local governments which are likely to deteriorate further in any near-term recession or low return investment environment. To shore up their funds, retirement systems have increased the contributions government employers must make. In total, state and local governments spent about 4.3% of their total $3.7 trillion expenditures in 2017 on pension contributions, up from an expenditure share less than half that size in 2002.[3] A few cities across the U.S. have even faltered under the resulting fiscal stress, with places like Stockton, California and Central Falls, Rhode Island filing for bankruptcy in the

[1] "National Compensation Survey: Employee Benefits in the United States, March 2018," Employee Benefits Survey, U.S. Bureau of Labor Statistics.

[2] Author's calculations using the Public Plans Database developed by the Center for Retirement Research at Boston College. The figure reported is based on the plans' own actuarial assumptions, including long-term asset returns and retirement patterns. Other work, such as Novy-Marx and Rauh (2014), argue that the plans' should use a discount rate less than their assumed rates of return, which are generally around 7%, which would increase liabilities substantially.

[3] Author's calculations using Census of Governments and Annual Survey of Public Pensions.

early 2010s. Altogether, the "pension pressure" placed on cities forms a large and lasting challenge to their fiscal health. I provide insight into the local impacts of short-term changes in pension pressure.

In this paper, I look at how cities accommodate changes in their required retirement contributions to DB pensions by altering their budgets and provision of local public services. The size of their obligations is driven by a stock of past decisions, rather than current choices; the onus comes not from new workers, for whom the present value of future pension disbursement is quite small, but from obligations to retired and near-retiring workers. Pension promises to workers are considered inalienable contracts, preventing cities from addressing pension pressure through a reduction of pension benefits for existing public employees.[4] For existing employees, this means that benefits can only become more generous, and reforms like higher retirement ages affect only new workers - reforms which are only long-term solutions rather than short-term relief.[5] Cities must resolve this pension pressure in their budgets now by raising taxes, cutting funding for services, or in rare cases, reneging on other debts. The choices cities make in response to pension pressure has implications for who bears the cost, as well as the short-run marginal value placed on different services and budget items.

I develop a novel data set covering California's cities from 2003 to 2016. The key components are city-level pension information derived from yearly actuarial valuation reports for over 1,000 pension plans and uniform financial reports on city budgets compiled by the state government. I focus on variation in cities' contributions to cover unfunded liabilities, which are mandatory payments resulting from funding gaps. I analyze how these contributions alter city budgets and outcomes using a first differences model capturing year-to-year changes, and provide estimates of the effects of pension pressure specifically and of mandatory expenditures more generally. I argue that these are plausibly causally identified

[4]This "California Rule" interpretation of DB pension promises is followed by a number of states and has been established through over 70 years of court cases.

[5]CalPERS. "Vested Rights of CalPERS Members: Protecting the pension promises made to public employees." July 2011. Web, accessed 31 Mar. 2019. This work can be found at: Link

given several key institutional details. First, compared to other portions of their required contributions, these payments are not based on the current size of the cities' payrolls. Second, the payments cannot be shirked in this sample, which includes only cities which have their assets managed by a state agency; even during its bankruptcy crisis when it reneged on other debts, Stockton made its contributions. Third, changes in contributions to unfunded liabilities stem primarily from pension asset shocks, which are further lagged two years when translated from actuarial valuation to the payments cities make; these contribution changes are unlikely to be associated with idiosyncratic changes in local economic conditions and tax bases. Further, cities do not appear to engage in much smoothing in anticipation of contribution changes.

In my preferred specification I find that, on average, when the city's unfunded liability cost – where the unfunded liability cost is the component of pension contributions that is required and arguably exogenous – increases by one dollar, current expenditures of California cities go up by $0.43. The cities' current expenditures consist of their employees' wages and benefits, private contracting, and other miscellaneous expenses. Spending on retirement reported by cities increases by $0.81, which is partially offset a $0.34 decrease in wages, suggesting that cities reduce employment, cut salaries, or both. Job cuts are one part of this response to pension pressure: police employment, which is on average about one quarter of total city employment, sees a loss of nearly 0.07 jobs per 100,000 city residents for every dollar increase in pension pressure. Combining this with the average 2005 to 2015 change in UAL cost of 34 and comparing with the average 2005 police employment of 211, this suggests an average long-term reduction of 2.3 (1.1%) paid police positions per 100,000 residents. If the marginal police officer provides social benefit through crime reduction, as in Mello (2019), the reduced public safety employment could lead to reductions in residents' welfare. I find evidence that crime rates rise, and the estimated direct costs of crime increase by around $0.46 per capita for every dollar increase in the UAL cost.[6] Non-current spending,

[6]To construct a cost-weighted measure of crime, I follow previous work and use $67,794 and $4,064 for the average weighted direct costs of violent and property crimes as estimated in Autor et al. (2017).

which includes investment in land, buildings, improvements, and equipment as well as debt payments, goes down by slightly more than a dollar. Non-current expenses are only partially funded from current revenues, with the rest funded through future revenues via debt. I find that cities reduce the level of debt that they hold, suggesting cities are compelled to service pension debts rather than debts for capital investment. These results are robust across a range of specifications, including those with untrended and trended city demographic controls, city-level trends, year fixed effects, and population weighting. The results imply that past public service provision in the form of city worker benefits are weighing on present, and through reduced capital investment, future public service provision.

The literature has said much on both the size of the pension problem and the political mechanisms that drive it. In 2009 near the financial crisis's height, the gap between assets and liabilities for state-level public pensions in the U.S. was calculated to be $3.23 trillion when using market discount rates (Novy-Marx and Rauh, 2009). In both recent theory and empirical work, generous public pensions have been variously linked to public worker union political clout (Kelley, 2014; Bouton et al., 2020), the ignorance of the median voter to complex pension issues (Glaeser and Ponzetto, 2014), poor local voter turnout (Trounstine, 2013), institutional constraints on debt and expenditure (Bouton et al., 2020; Glaeser, 2013), and political competition between parties for valuable union votes (Dippel, 2022; Bagchi, 2019).

However, less is known about the consequences of public worker pensions, especially their effects on cities.[7] At the state level, Shoag (2013) indicates that the investment returns of state-controlled pension plans significantly affects government spending, generating secondary effects on income and employment. Through a regression discontinuity design using the San Diego city boundary, MacKay (2014) finds that negative news about the city pension decreased housing prices. This paper contributes to the discussion by analyzing how cities

[7] A political science paper, Anzia (2022), surveys the issue using Comprehensive Annual Financial Reports (CAFR). Their findings complement mine by correlating total retirement spending with public-sector employment and collective bargaining.

alter spending and employment in response to pension debts.

I also contribute to a more general literature examining fiscal shocks and their effects on local government budgets. On the expenditure side – where my paper contributes – there are relatively few papers. Baicker (2004) finds that expensive capital crime trials lead to increased taxes and some decreases in police spending and investments. Similarly, I find that pension pressure sees cities reducing police employment and capital investment. On the revenue side, Shoag et al. (2019) shows that cities react to tax losses from large retail store closures by reducing police and administrative spending and raising revenue elsewhere. The cities in my sample also likely reduce their non-retirement public safety and administrative expenditures, but data limitations mean I cannot separate out the increase in spending in these categories from their contributions to their pensions. Similarly, reductions in local revenue induced by the Great Recession or by Chinese import exposure have been tied to reductions in spending on public goods like education, recreation, and waste management (Cromwell and Ihlanfeldt, 2015; Feler and Senses, 2017). Further, local governments facing reductions in military personnel presence after the Cold War reduced capital and increased debt (Komarek and Wagner, 2021). Natural disasters like California wildfires and Atlantic hurricanes also form fiscal shocks that have long-term consequences on municipal budgets through both the revenue and expenditure pathways (Liao and Kousky, 2022; Jerch et al., 2020). My results are overall similar but not identical to those in the literature: as in many papers on local fiscal stress, capital investments are the main target for cuts. I also find that wages decrease as benefit payments rise. Because I can go beyond data on spending patterns alone, I also show that cities cut workers from their payrolls – namely, police officers – with public safety consequences suggested by an increase in crime and its costs.

2 Background

2.1 Pension Accounting

In California, the vast majority of cities have DB pensions in contract with the California Public Employees' Retirement System (CalPERS). Most of the largest cities, like Los Angeles and San Diego, as well as some smaller cities like Alameda or Emeryville, maintain their own retirement systems in addition to or in place of contracting with CalPERS. CalPERS and the few independent retirement systems manage the cities' assets, meeting current and future obligations to members through a combination of investment returns and contributions. These contributions come from both working members and their employers, and cover two sources of cost; Figure 1 shows these costs. The first is the normal cost, which is intended to cover the present value of future benefits for each working member's additional year of service. Employee payments towards the normal cost are typically a set percentage of wages defined in the employees' contracts. Employers - that is, the cities - pay the rest of the normal cost not covered by employees. The total normal cost paid is relatively constant for cities. The second is the amortization of the unfunded actuarial liability (UAL), which is paid only by employers. My paper mainly focuses on city-year variation in contributions on the unfunded liability, as opposed to the contributions as a whole, in my empirical approach. Before describing it further, I formalize the contributions made by employers and employees in equations. Each year t, retirement systems assess each city i's pension plans, creating actuarial valuations that determine their required contributions, where the normal cost is split,

$$Contributions_{it}^{fixed} = NormalCost_{it} + UALPayment_{it}$$

$$NormalCost_{it} = NormalCost_{it}^{city} + NormalCost_it^{employee}.$$

The UAL is a common summary measure of the funding gap formed by the difference between the value of assets and the actuarial accrued liabilities; that is, the UAL for city i can be expressed as $UAL_i = Liabilities_i - Assets_i$. Actuaries develop estimates for a pension plan's liabilities, which are the present value of expected future benefits from the prior service of retired and working plan members. The estimates are based on proprietary models, plan member demographics, and assumptions on mortality rates, service length, payroll growth, investment returns, among others. Reducing the complexities behind actuarial models for the purposes of providing background, liabilities can be written as the plan's estimated future benefits, discounted using the retirement system's assumed rate of return (ARR),

$$Liabilities_i = \sum_{t=1}^{\infty} \frac{Benefits_{it}}{(1+ARR)^t}. \tag{1}$$

If there was limited investment return volatility and the actuarial assumptions made throughout the duration of the plan were correct, then normal cost contributions, which cover the liabilities accrued by workers within each year, would be enough for the invested contributions to exactly cover a plan's liabilities. But in reality assets fall below, and occasionally exceed, plan liabilities. Payments (credits in overfunded plans) towards the UAL are intended to close the gap between assets and liabilities, typically amortized over a 20- or 30-year period. Employers are solely responsible for this cost. Therefore, the presence of an unfunded liability adds to an employer's cost of maintaining a DB pension plan, and in many cases the UAL cost exceeds the entire normal cost. To give an example, Oakland's Miscellaneous Plan (which is for workers not in the emergency services) paid 22 million on the normal cost and 31 million on the unfunded liability in the fiscal year ending 2013.

Unlike the normal cost portion of the contributions, the UAL payment is prone to year-to-year fluctuations and changes over time. Primarily, changes in the UAL payment stem from asset markets. Volatility in the performance of the pension plan's investments means volatility in the size of the funding gap, changes which must be amortized.[8] Other

[8]Many pension plans dampen volatility through a variety of mechanisms. One method is smoothing market gains or losses across a number of years, called a smoothing period, to generate the "actuarial value of assets". For instance, a 10% decrease in market value of assets for a system with a four year smoothing period would only register as a 2.5% decrease in actuarial value in that year.

factors, like changes in the assumed rate of return (ARR), which is the discount rate for future benefit payments, play a lesser role. Since they are responsible for its payment, employers bear the entirety of the UAL payment volatility. Moreover, employer contributions typically exceed employee contributions.[9] It is not possible for employers to manage the stresses placed on their budgets by their changing contributions through nonpayment or underpayment: CalPERS imposes large fines on contracting cities which fail to pay, essentially precluding this behavior from cities.

A few additional features of pensions are useful in analysis. First, shocks to pension assets are unlikely to be associated with local economic conditions, since pensions hold diversified portfolios heavily favoring global funds. As of June 30, 2016, CalPERS' Public Employees' Retirement Fund held 51.9% and 20.3% of its total investments in global equity and global fixed income, respectively (CalPERS, 2016) (CalPERS, 2016).[10] Second, there is a lag between actuarial valuations and the contributions determined from them. The CalPERS system has a two-year lag: for example, a given plan's actuarial valuation at the end of fiscal year 2012 determines the contributions for the fiscal year ending 2015. The other systems in California have one-year lags. This lag is useful empirically, since it reduces the simultaneity of the effects of macroeconomic shocks on pension contributions and on local tax revenue.[11] In my empirical approach, I use city-year variation in contributions on the unfunded liability, rather than variation in contributions from normal costs, which depend on the current size and composition of a city's workforce.

2.2 City Budgets

Compared to other layers of government, urban public finance has some unique characteristics. In the United States in general, and California specifically, cities have limited

[9] E.g. for Anaheim's Miscellaneous plan FYE 2008, the city paid 14.953% and employees paid 8% of payroll.

[10] The next three largest asset classes are real assets (10.8%), private equity (9.0%), and inflation assets (6.0%).

[11] Although not shown in this paper, controlling for changes in tax revenues does not qualitatively alter the estimates to be reported in Section 5.

independence; their budgetary activities are ultimately constrained by their respective state governments (Glaeser, 2013). The California Constitution proscribes local governments from incurring any debts greater than their revenues, and thus imposes balanced budgets on cities. There are a few exceptions to this rule. Mainly, cities can issue municipal bonds to finance capital projects, but only with two-thirds voter approval. Changes in tax rates similarly require a super-majority vote. Cities also face caps in the form of the "Gann Limit", which like Proposition 13 is another legacy of the 1970s tax revolt. It limits the growth in taxes and expenditures based on population and income growth, though these do not seem be binding constraints (Kousser et al., 2008). Pension pressure, in the form of rising retirement expenses, comes into this setting and forces budget reallocations.

For exposition purposes, I present a model of a simple budget with these institutional details in mind. Each year a municipal government must create a balanced budget such that,

$$Expenses_t = Taxes_t + OtherRevenue_t + CapitalDebt_t - FundChange_t$$

with expenses further dividing into non-retirement current expenses, non-current expenses (e.g. investments into infrastructure), and retirement contributions,

$$Expenses_t = CurrentExpenses_t + NonCurrentExpenses_t + Contributions_t^{fixed}$$

where retirement expenses are externally determined (although changing over time) due to legal restrictions obligating the city to pay. Cities can meet their rising pension costs by either raising more money or dropping expenditures elsewhere; they can choose to cut services, raise taxes, take on debt, use up government funds, or some combination of these. From a simple economic model incorporating the incentives of cities and their politicians and using the above budget constraint, one can hypothesize that their specific choice will be guided by a combination of desire for reelection and maximizing resident happiness. I provide insight into these choices and as a result of pension pressure.

3 Data

3.1 Overview

I focus on California and its cities in my analysis. Cities are important entities in California, and on average spend over double per person than the state government spends.[12] Incorporated municipalities also contain nearly 80% of the state's residents. Figure 2 shows the market value of assets and accrued liability for the state's municipal pensions.[13] Statewide, city pensions were nearly fully funded in the years leading up to 2009, when pensions lost around a quarter of their investments. Despite some investment returns in the ensuing years, pension assets have failed to again meet the liabilities; in 2013's valuations, city pensions were unfunded by around $35 billion dollars, or about $1,100 per Californian living in cities. As they are based largely on the size of the gap, contributions have correspondingly changed, and range between around 0% to 10% of total city expenditure.

3.2 City Finance Data

To explore this topic, I developed a rich, novel panel of financial reports and pension funds covering all of the cities in California from 2003 to 2016. Data from the California State Controller provides detailed fiscal information on the nearly 482 cities in California. Each fiscal year, all California cities are required by law to submit a Financial Transactions Report (FTR) according to a uniform classification system.[14] Among the information collected are (1) expenses for total wages, retirement, private contracting, and other total costs, (2) expenses for specific services such as general government, public safety, culture and leisure, and health, and (3) fund management in the form of debt service and issuance of long term

[12]See: https://www.ppic.org/publication/the-state-local-fiscal-relationship/

[13]Here the liability is the Entry Age Normal Accrued Liability. As mentioned previously, the discount rate for calculating liabilities is higher than the market discount rate more typically used for present value.

[14]California State Controller's Office, Nov. 2018. "Cities Financial Transactions Report Instructions." Web, accessed 6 Apr. 2019. These instructions are available at: https://www.sco.ca.gov/Files-ARD-Local/LocRep/Cities%20FTR%20Instructions.pdf

debt, and (4) emergency services employment. Table 1 provides definitions for categorical expenditures and examples of what each includes. Uniformity and completeness allows a rare view into U.S. cities not seen in other data sets, and allows comparisons across cities not possible otherwise. For reference, one frequently employed dataset is the U.S. Census of Governments, which has gathered financial information from all levels of American government since 1957. However, the Census of Governments is limited by its relatively infrequent five-year recurrence, which cannot be remedied by the small and changing sample of the intercensal Annual Survey of State and Local Government Finances. I discuss comparisons between the FTRs and these other city finance data sources in Appendix B.

3.3 Pension Data

I pair this with city-level information on pension funds. For the cities I gathered data on plan standing, payroll, contributions, numbers and types of members, and other details from a number of sources. My primary source on pensions were actuarial valuation reports from CalPERS, which is by far the largest provider of public worker plans in California. Every fiscal year, CalPERS sends out actuarial valuations to each contracting public agency, which inform them of their plan's standing; I attained these via a public records request. All in all, there were a little over 17,000 actuarial valuations, each representing a different plan-year observation from the 15 years of interest. These valuations range from 10 to 80 pages and consequently differ considerably in their contents, both across time and between plans in the same year.[15] To help give a sense of what these reports look like, I present two relevant pages from the Annual Valuation Report for Riverside, CA for 2005 at the end of Appendix C. I scraped these valuations for pertinent information on the standing of municipal plans. A few cities have some or all of their pensions serviced by a non-CalPERS system, such as San Francisco by the San Francisco Employees' Retirement System. Although I don't use non-CalPERS cities in most of my empirical analysis, I am also able to scrape the

[15]These differences in contents stem from whether the plan was in a risk pool, which I describe further in Appendix C.

plan information for many of these using actuarial valuations sourced from their website or by request. For the few pension-years which escaped this effort, I supplemented with the California State Controller's Public Retirement Systems Financial Data, which stem from yearly obligatory standardized reports like the city FTRs. From these sources, I aggregated all pension plans to the city level.[16]

I avoid using cities that have non-CalPERS plans because instead of state management they are controlled locally. The non-CalPERS retirement systems are generally city departments. For example, the Los Angeles City Employees' Retirement System is part of the city itself. It is plausible that cities with their own retirement system would be able to influence the pension's choice of investments, actuarial assumptions, or most importantly, the amount of contributions requested by the valuation or the amount paid by the city (if they choose to shirk). The consequent concern for possible endogeneity is not without precedent. For instance, in the early 2000s San Diego altered pension policy in order to avoid increased contribution payments resulting from investment losses (MacKay, 2014). Collectively, the cities that do remain after sample restrictions had 22.5 million residents in 2016.

Table 2 presents summary statistics on city expenditures for the CalPERS sample, including the normal and unfunded liability costs sourced from the annual valuations. Expenditures are shown in both inflation-adjusted per-capita dollars and shares of total expenditures. The table is broken into two cross-sections from the fiscal years ending 2005 and 2015, allowing some comparisons over time. One takeaway is that pension expenditure, on average, rises from about 11.8% to about 22.5% of city wages between the two years; UAL costs alone rise from about 2.2% to 10.8% of city wages. Another takeaway is that total expenditures are split about 80-20 between current and non-current expenditures, where non-current spending mostly consists of capital investments.

[16]Cities tend to have multiple plans. Within a city the different plans are divided into the categories of safety (e.g. firefighters and police) and miscellaneous, and then further by generosity (for instance, 2% at 60 versus 3% at 50). In 2015, the City of Oakland had two independently administered plans, and two CalPERS administered plans. Other cities have even more plans: Laguna Beach had nine plans through CalPERS in 2015.

3.4 Additional Data

A handful of other sources supplement the pension and city financial data in order to provide a more complete picture of the region's cities. To transform variables to their real per capita equivalents, I use city population estimates and the fiscal year average California CPI from the California Department of Finance. The latter of these is constructed using a population-weighted average of the US Bureau of Labor Statistics CPIs for California locations.

To adjust for differences in municipal demographic characteristics, I also collect data on cities from the National Historical Geographic Information System (NHGIS).[17] The NHGIS ties Decennial Census information to cities using historical city shapefiles. This provides city-level data which is otherwise sparse. Unfortunately, intercensal demographic data is either limited, like to population (as used in this paper), or at county-level and above. The demographic and economic controls from the year 1990 are used to form a baseline prior to the start of the data series in 2003. Specifically, I use as controls the proportions of city residents who are white, black, Asian, Hispanic, under 25 years of age, and over 65 years of age; the proportion of households which are home-owners; and the median home price and median rent. In some empirical specifications I additionally allow the baseline controls to have changing effects over time by interacting each with a linear time trend.

Police employment data are from the FBI's Uniform Crime Reporting Data System (UCR). I gathered the agency-level Law Enforcement Officers Killed in Action (LEOKA) files for 2002–2015.[18] The LEOKA files report counts of police officers and civilian employees at each agency. I merged agencies to cities based on name. Not all cities have their own police agency: only about three-quarters of the cities in my sample do. My analysis of public safety employment outcomes is correspondingly restricted to the cities with independent police services. The summary statistics for the LEOKA-sourced police employment counts,

[17] Source: Manson and Ruggles (2022)

[18] LEOKA data sourced from Kaplan (2021). Since LEOKA employment is reported in October in each calendar year, I assign them to the fiscal year ending in June the following calendar year.

along with the FTR-sourced fire and EMS employment counts, are shown in Table 3. I also acquired crime and arrest counts for index offenses from the UCR Return A files. I aggregate the crime counts to the agency-fiscal year level using the monthly data from 2002-2016. To account for record errors and outliers known to be issues in the UCR data, I implement a cleaning procedure similar to that documented in Mello (2019).[19] I transform these into crime and arrest rates per 100,000 residents by scaling them using city population. To construct a cost-weighted measure of crime, I follow previous work and use $67,794 and $4,064 for the average weighted direct costs of violent and property crimes as estimated in Autor et al. (2017).

4 Strategy

In my study, I aim to recover the effects of spending towards public retirement funds on budgets and public service provision for sponsoring cities in California. I discuss details that help inform my choice of model and present my empirical specification in this section.

4.1 Setup

To expand on information provided so far, a few facts are useful in my analysis. First, shocks to pension assets are unlikely to be associated with local economic conditions, which would bias my estimates. Based on twenty states, Shoag (2011) finds that pension plans on average only over-allocate within their state with 0.31% of their portfolio relative to the share that would be allocated if the plan invested only in the Standard and Poor's 500 index; CalPERS specifically, the primary pension plan in this paper, is shown to have an in-state bias of 0.38%. Brown et al. (2015) finds a higher average bias at 4.1% of portfolios, based on 27 state plans for quarters in which they self-managed asset allocation, though

[19] One key aspect of cleaning the data involves using local linear regressions to identify extreme observations relative to their nearest neighbors. If the changes in a count exceeds a threshold, defined by city population groups, then that count is set to missing and, if possible, overwritten by backwards filling, forwards filling, or interpolation to maintain panel integrity.

this too does not present much threat to analysis. Further, my analysis concerns local governments whose pension assets are held outside of their control at the state-level. This advantage is provided by my novel data on municipal DB pensions which are contracted with a state retirement system; here, CalPERS. Second, there is a lag between actuarial valuations and the contributions determined from them, which reduces the simultaneity of the effects of macroeconomic shocks on both pension contributions and local tax revenue. In my regressions, I assume that there is no correlation in each differenced error with its differenced UAL payment, an assumption which seems more plausible given the institutional lag separating outcome and the regressor of interest temporally. Third, California municipal budgets have several constraints; most importantly, the balanced budget requirement means yearly changes in pressure affect the city within the year, rather than having a delayed effect in future years.

Fourth, retirement expenses vary drastically across both time and cities, allowing sufficient variation for identification. Over time, retirement expenses can change fairly drastically: city contributions to Los Angeles' three retirement plans increased by nearly a factor of 6 from 2003 to 2016. They also differ between cities based on generosity and funding history: different cities hold different stocks of pension assets due to historical choices. Therefore even though all cities experience similar percentage returns on investments, the associated gains and losses are based on an interaction with the city-specific asset stock. My analysis focuses on using these plausibly exogenous investment shocks interacting with city pension assets and their effects on city retirement expenses. In Figures 3 and 4 I show the between-city variation in pension pressure from 2005 to 2015. The former map focuses on the cities in the Bay Area and Central Valley, while that latter focuses on those of Southern California. These demonstrate that some cities have had little change in their real per-capita expenditure on pension expenditures through the decade including the Recession, while others have come under budgetary pressure. I also show that year-to-year changes in the UAL cost are different between cities across time in Figure 5. The plot further shows that changes in the UAL cost did not exclusively occur at the onset of the Great Recession. Instead, they occurred throughout the sample period, and the largest average increase preceded the Recession. Altogether, the variation thus demonstrated provides the basis for an empirical strategy using first-differences.

4.2 Specification

In order to uncover the effect of pension pressure on city behavior, I use the city's contribution based on only the unfunded liability. Within my context, cities must make mandatory unfunded liability contributions as determined by the state agency CalPERS. Cities may only influence the size of the contributions over the long term: for instance, by making enduring reductions in their covered payrolls. In the short term, cities cannot meaningfully influence these payments, and must instead adjust in other ways.

I take advantage of the short term inability to control using first-differenced panels of California's cities and pensions. For each city c at time t, I define

$$\Delta UALPayment_{c,t} = UALPayment_{c,t} - UALPayment_{c,t-1};$$

that is, as the change in the payment on the unfunded accrued liability (UAL) of the city's pensions relative to the level in the previous year. The change in the UAL contribution is measured in real per-capita 2016 dollars using yearly population estimates, as are other variables where appropriate. Similarly, $\Delta Y_{c,t}$ is the year-on-year change in an outcome of interest, like safety expenditure or employment. An empirical model of their relationship is

$$\Delta Y_{c,t} = \beta \Delta UALPayment_{c,t} + \gamma X_{c,t} + \epsilon_{c,t}, \tag{2}$$

where the coefficient β measures the contemporaneous one-year change in the outcome of interest from changes in the UAL cost. Further, $X_{c,t}$ is a vector of covariates, discussed further below; $\epsilon_{c,t}$ is the error term, clustered by city; and regressions are weighted by the city's average population during the sample period, fiscal year end 2003 through 2016, to enable β to better capture the average experience of cities' residents.

As with unit fixed-effects, first-differences removes any bias stemming from time-invariant differences between cities. The small affluent and urban city of Beverley Hills contrasts the sprawling cheap and agricultural city of Modesto in ways that likely influence both the levels in the outcome, like culture and recreation expenditure, and the size of the unfunded liability, like the extent of their civil service. This allows better cross-city comparisons, and for β to represent the effect of per-capita intensity of pension pressure on per-capita outcomes. Unlike the fixed-effect model, though, first-differences focuses on short term, year-on-year changes rather than deviations from the long term mean in each panel. A first-differences model reduces concern that estimates are distorted by cities making long-term choices that change both their unfunded liability payments and outcomes of interest. First-differences does reduce the effective number of observations, though, since any stand-alone missing values in the mildly unbalanced city panel lead to two missing differences. For this reason, I provide the number of observations in brackets for each estimate in the tables described in the results section.

One challenge to β measuring a causal effect arises if cities' differential "treatment" – that is, $\Delta UALPayment_{c,t}$ – is instead correlated with differential trends across cities, leading to spurious estimates. I seek to address this concern in several ways. In addition to including the year-on-year change in the log of population, $X_{c,t}$ contains a vector of baseline city demographic variables from the year 1990, over a decade from the beginning of the sample. The city demographic variables included are: the proportions of city residents who are white, black, Asian, and Hispanic; the proportions of residents who are below the age of 25 and over the age of 64; the proportion of residents who are homeowners; and the city's median home price and rent. Inclusion of these covariates helps account for any potential long term secular trends associated with city characteristics; for instance, if cities with a higher proportion of homeowners have had smaller expansions in city expenses.

To address possible empirical concerns, check for robustness, and examine heterogeneity, I modify the baseline first-differenced model in a few ways. For brevity I include all of these modifications in the following equation, though each are added in to the model iteratively in the results. The model inclusive of all modifications is

$$\Delta Y_{c,t} = \beta \Delta UALPayment_{c,t} + \gamma X_{c,t} + \eta X_{c,t}t + \phi_c + \rho_t + \epsilon_{c,t}. \tag{3}$$

First, I allow baseline city characteristics to have linearly time-varying impacts on year-on-year changes in outcomes by adding $X_{c,t}t$. Second, I include a city fixed-effect ϕ_c. In the context of a first-differenced model, the inclusion of a unit fixed-effect controls for unit-level linear time trends. Thus, the city fixed-effect adds a more stringent control to abate any contamination of estimates by secular trends. For instance, El Segundo, a small city in Los Angeles county with both an agglomeration of aerospace industries and large per capita pension debts may have had unique budget impacts from changes in national aerospace spending. Third, I add a year fixed-effect ρ_t to capture state-level shocks. While the institutional lag between actuarial valuations and the contributions determined from them removes the simultaneity of effects of macroeconomic shocks on pension contributions and city finances, national and state level policy, e.g. an expansion of the California government's grants to cities. Fourth, I present unweighted regressions, allowing each city to enter equally in the regressions. Therefore – after restricting my sample to cities with CalPERS plans only – the largest city, Long Beach, with a population around 450,000, enters the regression with the same weight as the smallest, Etna, with around 750 residents. The resulting unweighted estimates provide the average experience of cities, rather than the average experience of city residents.

4.3 Retirement Spending and Persistence

Before proceeding to a discussion of results, I first validate the connection between the UAL payment recorded in the actuarial valuations and the retirement spending recorded in the Financial Transaction Reports (FTRs). In Table 4, and in the tables on city spending and other outcomes to follow, I show estimates from five empirical specifications. Each column contains estimates produced from a different model. The first corresponds to Equation 2. The second, third, and fourth columns' estimates differ from column 1 through the iterative addition of trended baseline covariates, city fixed effects, and year fixed effects. The fifth column repeats column 1 with an unweighted specification to explore heterogeneity by city size through comparison to the other models' estimates. In Panel A, I perform a "sanity check" on the connection between my two primary data sources, CalPERS actuarial valuations and city Financial Transaction Reports (FTRs), each of which each have information on city retirement spending. I show that a one dollar change in the valuation-derived UAL payment is strongly linked with an increase in the retirement spending reported in the FTRs. The estimate in column 3, which includes city fixed effects, is an highly significant increase of \$0.81, with similar estimates in the other columns. I provide two comments on these point estimates. First, a 1:1 change is within the 95% confidence interval for the majority of models. Second, cities report in their FTRs any contribution to retirement funds, including both their contributions towards DB pension liabilities accrued in the current year (normal cost) and contributions towards the funding gap (UAL cost). The reduction in city payrolls that I find would simultaneously reduce the normal cost portion of the city's total retirement costs and thus pull the estimated relationship away from 1. In Panel B, I assess the significance of once, twice, and thrice lagged differences in the UAL cost on city retirement costs. Unlike the unlagged first-difference, these do not have a consistently significant association with retirement spending across the five models. This suggests that my sample's cities are not simply experiencing persistent changes in their UAL cost, and that first-differences is a reasonable model for this dynamic panel.

5 Results

In this section, I study contributions towards unfunded liabilities in municipal DB pensions, concentrating on their impacts on city spending, public safety employment, and crime. Throughout, I present estimates of β in Equation 2, which captures the plausibly causal short term responses cities have to changes in mandatory, externally determined expenditures. Baseline estimates of the effects on each outcome of interest are accompanied by those from models incorporating additional covariates, fixed effects, and weighting differences to demonstrate robustness to increasingly stringent controls and to examine heterogeneity.

5.1 Budget

I first estimate the effects on non-categorical city spending outcomes – that is, those that are not for the specific uses described in Table 1 like community development. These are reported in Table 5. Both the outcome variables and the cost associated with the unfunded actuarial liability (UAL) are presented in terms of the change in per capita, 2016 dollars. Outcomes in this table and the following tables are shown as rows, where the estimates displayed are the coefficient β on the term $\Delta UALPayment_{c,t}$.

A one dollar change in pension pressure does not alter total expenditure. Instead, cities increase current spending - which includes the UAL cost - and decrease non-current spending. Breaking down current spending, the total retirement spending reported by cities goes up by around \$0.80 across all specifications, as described previously. Cities' wage expenditure decreases around 33 cents for every dollar increase in the UAL cost. The effect on wages is highly statistically significant. This is not effectively a change in the price of city workers, as would be the case with a change in the normal cost, which covers current workers' pension liabilities accrued that year and increases with additional workers or higher wages. The amount of the unfunded liability is not dependent on current worker pay, so cannot explain the change in wages. Instead, one possible explanation is that if cities combine wages and retirement costs in their budgets as worker compensation, and there are some frictions in adjusting the budget allocated to compensation, a reduction in wages is a credible response to higher retirement costs. Breaking down non-current spending into capital and debt service, I find that cities reduce their spending on capital investments like buildings and equipment. The reductions are large - in column 4's model with city and year fixed effects, for each additional real per capita dollar spent on servicing the UAL cost, cities significantly spend $1.14 less on non-current expenses and $0.84 less on capital investment specifically. Note that investment is only partially funded from current revenues, with the rest funded through future revenues via debt. These are not unlike the findings in other research on local fiscal shocks; for example, Cromwell and Ihlanfeldt (2015), where capital investment receives the majority of the budget cut.

The Financial Transaction Reports also categorize expenses according to their use in providing city services. In Table 6, I examine the effect of the unfunded liability on current categorical expenditures; namely, (1) health, (2) safety, (3) general government, (4) transportation, (5) community development, and (6) culture/recreation. City governments vary in terms of which services and how they provide them, but these categories summarize the diverse set of services cities provide. Also, by aggregating over the many variables the financial transaction reports provide, I minimize the issue of multiple comparisons (e.g., looking at individual items like sewer capital expenses). Current spending on safety and general government, two categories with the most pensioned workers, rise with changes in the pension costs consistently in each specification. In the model with city fixed effects in Column 3, general government and safety spending increase by $0.38 and $0.32, respectively, with each dollar increase in the UAL cost. I assume the rises in spending in these categories are due to their pensions, which are typically the largest and most generous of all public workers in cities; that is, retirement expenditures inflate the cost of providing these services, as cities spend money to make up for past generosity and under-performing pension investments. Unfortunately, the Financial Transaction Reports do not separate categorical expenditures into wages, retirement, and other expenses. I instead look at employment below to translate these spending pattern changes into employment changes. Culture expense also rises significantly in some specifications, though the negative point estimate in the unweighted regression in column 5 indicates heterogeneity by city population; that is, that only large cities see increases in culture and recreation. One possible insight into the difference is that the median city with an average population under 10,000, a group which forms about one-fifth of the sample, spend about one-third less in terms of shares of total expenditure than the overall median city (5.0% versus 7.7% of total expenditure). Thus, these estimates suggest that pension pressure inflates the cost of city service provision, but data limitations mean that we cannot conclude whether service quality is affected or not from these estimates alone.

5.2 Safety Employment and Crime

To gain further insight into service provision, I look at public safety employment for cities which directly employ paid police, firefighters, and emergency medical staff.[20] In Table 7 I show that any rise in spending on safety is not driven by a concurrent rise in employment. In fact, the number of paid police personnel per 100,000 residents decreases by around 0.07 per 100,000 residents as pension pressure increases, a reduction which is split between officers and civilian employees. There are negligible changes in firefighters and emergency medical technicians. The average 2005 to 2015 change in UAL cost is 34 and the average police employment was around 211 in 2005. Combined with the estimate, back-of-the-envelope calculations indicate an average long-term reduction of 2.3 (1.1%) paid police positions per 100,000 residents. In magnitude, this is around 5% the magnitude of the estimated per capita effect of the police employment grant studied in Mello (2019). So even as public safety takes up a larger portion of the budget (in an accounting sense) at the

[20]Not all cities directly have paid position. For instance, police services may be contracted out to the county sheriff's department, firefighting departments may be volunteer, and emergency medical technicians may be employed privately by ambulance services and hospitals.

detriment of other categories, taxpayer money is going to paying down previously generous service rather than maintain or improve current service.

The documented police employment decreases encourage exploring their public safety effects. I use the crime and arrest rates as reported in the city-level FBI Universal Crime Reporting Return A data from 2003-2016. More specifically, Table 8 includes as outcomes the year-to-year changes in both total property and violent crime per 100,000 residents. I consider the model with city fixed effects in column 3, which accounts for city-level trends in crime and arrest rates. For each one dollar increase in the city's unfunded liability cost, the property crime rate significantly increases by 3.3 (0.10% of the mean) and the violent crime rate increases by 0.56 (0.05% of the mean). Furthermore, assuming the costs of the average violent and average property crimes are $67,794 and $4,064, the estimated direct costs of crime increase by about $0.52 per capita, and are significant in both statistical and economic senses. I do not find any statistically significant changes in the arrest rates per capita across my models. However, the change in the property crime clearance rate - defined as the ratio of arrests to crime within a fiscal year - is significantly related to the change in the unfunded liability contribution in all but the model with city and year fixed effects. From column 3, I estimate that a one dollar increase corresponds to a 0.024 percentage point (0.16% of the mean) reduction in the clearance rate.

The results should not necessarily be interpreted as stemming only from policing changes, however. For instance, while the reduced police employment documented previously is possibly an important channel for changes in the crime rates, an idea which is bolstered by the simultaneous reduction in arrests for property crimes, the estimates are ultimately reduced form. Other changes, like those in non-public safety services, could also help explain the results. Still, I further compute IV estimates for police employment on the costs of crime victimization, using a two-stage specification of the form,

$$\Delta Police_{c,t-1} = \theta \Delta UALPayment_{c,t-1} + \gamma X_{c,t-1} + \eta X_{c,t-1}(t-1) + \phi_c + \epsilon_{c,t-1} \tag{4}$$

$$\Delta CostCrime_{c,t} = \beta \Delta \widehat{Police}_{c,t-1} + \nu X_{c,t} + \rho X_{c,t}t + \tau_c + \sigma_{c,t} \quad (5)$$

where police employment and UAL payments are once-lagged in reference to the costs of crime victimization. I estimate a significant reduction in \$56 per capita for each additional police employee per 10,000 residents. This can most directly be compared to Mello's (2018) estimate of a reduction of \$35 per capita, generated by using the federal police employment grants as an instrument. Though my estimate is sensitive to model choices in both magnitude and significance, it helps support the hypothesis that the change in police officers is the main channel for the crime increase. Together, my results provide suggestive evidence that the strain of pension pressure on city fiscal resources leads to an increase in crime.

5.3 Other Outcomes

I also look at how municipal debt is influenced by pension liabilities. I present four different outcomes in Table A1 - (1) the number of outstanding debts, (2) whether new debt is issued, (3) the amount of debt issued, and (4) the outstanding principal. These outcomes are worth exploring since investment, which is largely funded through debt, is the main lever cities use in response to pension pressure as reported in Appendix Table 5. Cities may seek debt for other reasons as well. The model in Bouton et al. (2016) supposes that local governments simultaneously choose the levels of debt and retirement entitlements for the benefit of interest groups, and shows that they may act as substitutes or complements depending on the institutional setting. Anecdotally, a few cities in California, such as Healdsburg, Monrovia, and Pleasant Hill, explicitly took loans or issued bonds to pay down their unfunded liabilities, and therefore reduce their yearly pension cost.[21][22] The number of outstanding debts does not change. Looking at the other three outcomes in the Table A1, I find that the cities issue new debt but the amount of outstanding principal still declines. Thus, the reduction of capital investment has an associated reduction in principal,

[21] See the following links: Healdsburg, Monrovia, and Pleasant Hill

[22] These cities had high implied rates of interest on the unfunded liability (the actuarially assumed rate of return is around 7.5% at this time in CalPERS), so they refinanced using cheaper debt.

outweighing any other debt-seeking.

5.4 Additional Robustness and Heterogeneity of Key Results

Lastly, I examine the robustness and heterogeneity of the results. In Appendix Table A3, I provide estimates of the key elements from the finance, police employment, and crime tables. Column 1 reproduces earlier estimates from a model in first-differences with a city fixed-effect. Column 2 shows that all of the key results are robust to trimming the top and bottom 5% of observed changes in the UAL cost. In columns 3 and 4, I restrict the sample to cities which held above and below median assets per capita, respectively, in 2003. I find that the above median assets cities have results that are again comparable to column 1 across the results. For below median assets cities I find that the estimated effect on total city payrolls is comparable but several other estimates lose their significance and the estimated effect on non-current spending is near-zero. Note that the connection between changes in employer UAL cost, as reported in the cities' actuarial valuations of their pensions, and changes in the retirement spending, as reported in the cities' financial transaction reports, is smaller with a retirement spending increase of $0.61 for every dollar in UAL costs. Finding blunted effects across the results in the below median asset cities is not surprising since the variation in UAL costs is correspondingly reduced.

In columns 5 and 6 I show the results of non-differenced fixed-effect specifications. That is, specifications of the form

$$Y_{c,t} = \beta UALPayment_{c,t} + \gamma X_{c,t} + \eta X_{c,t}t + \phi_c + \rho_t + \epsilon_{c,t}. \tag{6}$$

As mentioned in the research design section, these no longer capture the within-year responses of cities to changes in pension pressure, and instead show longer term outcomes which likely reflect endogenous choices by the cities. Still, with the inclusion of a linear city time trend to help capture patterns in city spending and outcomes, the estimates in column 6 are qualitatively similar to those in column 1. I find comparable reductions in wages, non-current spending, and police employment, and an increase in the estimated costs of crime victimization, though estimates are generally noisier.

6 Conclusion

The growth of costs for public worker pensions represents a serious challenge for local governments and taxpayers, and has been an especially keen issue in the aftermath of the Great Recession. In 2017, over 99% of cities with pensions in California had funding gaps in their retirement plans, and half of these had unfunded liabilities over $1,000 per resident. The literature has concentrated on documenting the scope of the problem, as well as theorizing about its political and economic origins. Yet it has been relatively silent about how cities are affected, and how they choose to confront this pension pressure. One reason is that researchers have lacked quality data linking municipal pensions to their cities. I bridge this gap by developing a novel data set. I link rich city financial data to researcher-collected information from the state retirement system to provide the universe of municipal pensions and cities in California. Using the resulting panel and first-differenced models, as well as institutional information, I estimate plausibly causal effects. I find that in response to growing unfunded pension liabilities cities reduce spending on non-current expenses, specifically capital investment, and wages as benefit payments rise. I also show that beyond just changes in spending patterns, cities cut workers from their payrolls. These cuts include police officers, which could have public safety consequences including changes in crime rates. This implies that taxpayers are getting worse public services for their dollar, with contributions on pension debts displacing spending in cities.

Future research should continue to examine the public pensions of local governments, as much of the research has focused on the state level. The lowest layers of governments – cities, counties, school districts, water districts, fire districts, and more – provide public goods and services which directly impact the everyday lives of taxpayers. Most of these have defined pensions for their public workers. Collectively, the debts hidden in their public worker pensions will present an important and growing threat to the fiscal health of local governments, impacting the amenities they provide and the revenue they demand.

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Figures

Figure 1: Diagram of Pension Payments

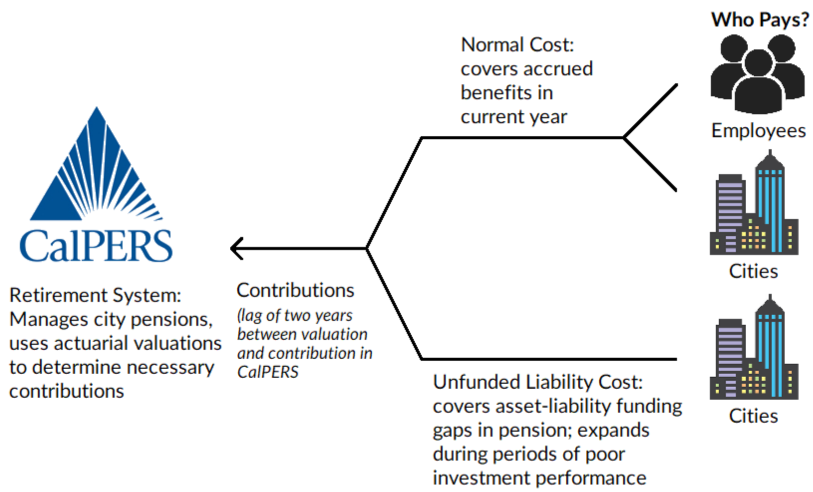


Figure 2: Municipal Pension Assets and Liabilities in California

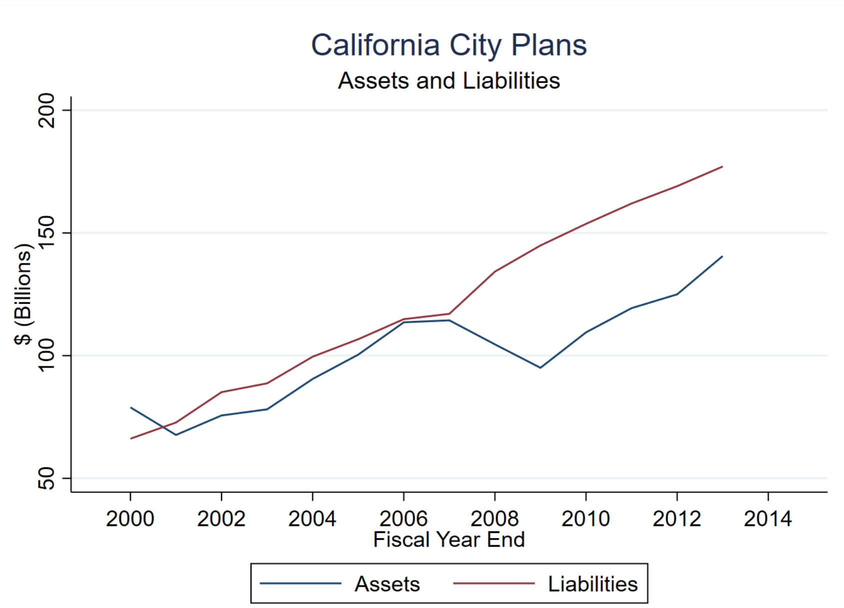
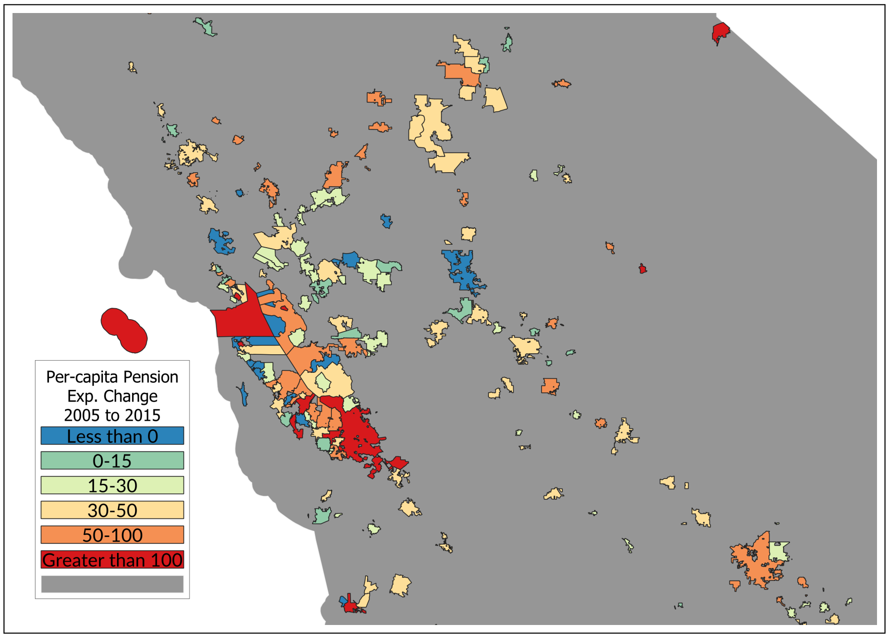
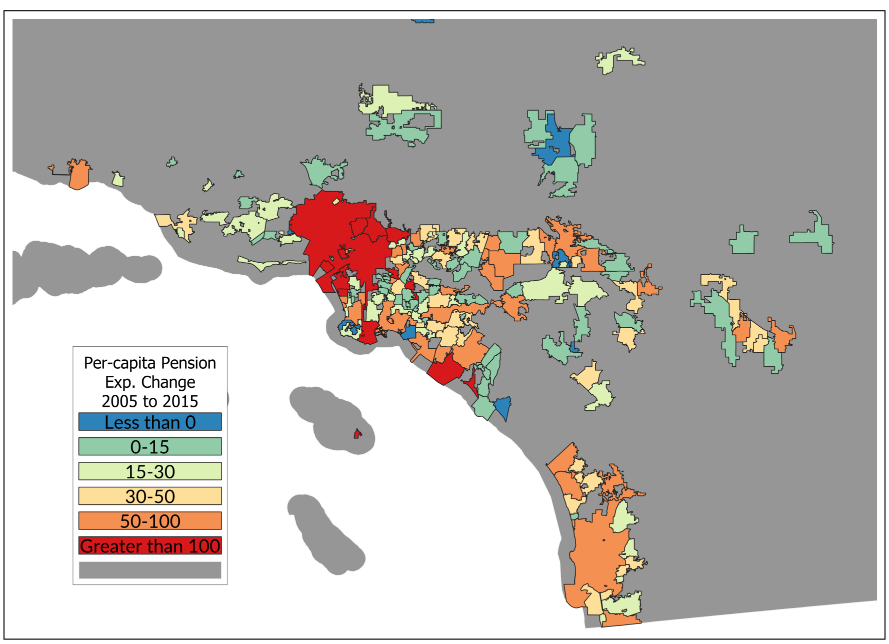


Figure 3: Central California: 2005-2015 Change in Pension Pressure



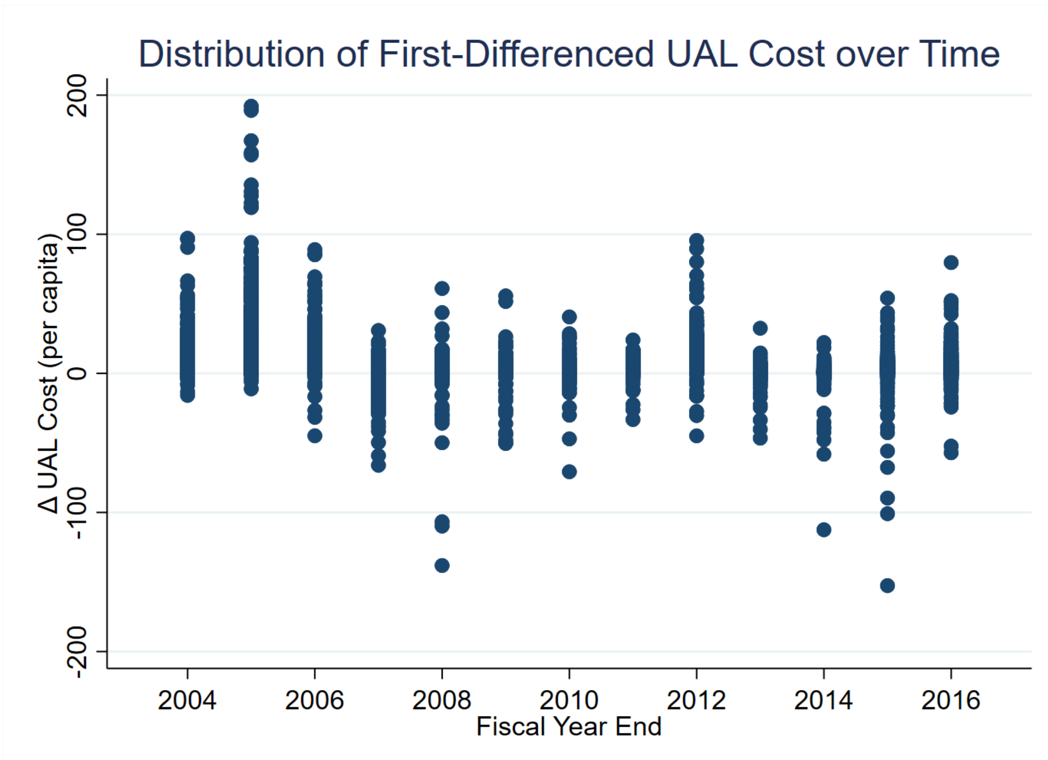
Source: Researcher-collected California pension data on CalPERS and other systems.

Figure 4: Southern California: 2005-2015 Change in Pension Pressure



Source: Researcher-collected California pension data on CalPERS and other systems.

Figure 5: Distribution of First-differenced UAL Cost over Time



Notes: "UAL Cost" refers to the payment a city is required to make to pay down its unfunded actuarial liability. Source: Researcher-collected California pension data on CalPERS and other systems.

Tables

Table 1: Definitions of Categorical Expenditures

Category	Definition
Public Safety	Expenditure to protect city residents. Includes law enforcement, fire suppression and prevention, and emergency medical services, along with various other services like animal regulation.
General Government	Expenditure to maintain functioning of the city government. Includes government officials (e.g., the city clerk) and their staff as well as administrative support services (e.g., budgeting and finances).
Transportation	Expenditure to facilitate the movement of people and goods. The primary components are streets, street landscaping and drainage, parking, and public transit.
Community Development	Expenditure to support the current and long-term economic wellbeing of the city. Includes planning, construction regulation, redevelopment, public housing, and community promotion.
Culture and Recreation	Expenditure to provide cultural and recreational opportunities. Category includes parks, libraries, public pools, museums, and community centers.
Health	Expenditure for sanitation and human health. Category includes sewers, solid waste removal, hospitals, and cemeteries.

Notes: Sourced from the Cities Financial Transactions Report (FTR) Instructions, which are given to cities by the California State Controller's Office to create uniform financial reports.

Table 2: Summary Statistics for City Expenses

	2005		2015	
	Per-capita	Share	Per-capita	Share
	(1)	(2)	(3)	(4)
Total	1648		1642	
	(1332)		(1313)	
Current	1299	0.809	1312	0.807
	(966)	(0.117)	(1113)	(0.119)
Non-current	349	0.191	329	0.193
	(502)	(0.117)	(372)	(0.119)
I. Current: Total				
Wages	412	0.271	411	0.249
	(358)	(0.101)	(382)	(0.086)
Benefits	185	0.113	216	0.129
	(162)	(0.056)	(216)	(0.055)
Normal Cost	44	0.026	47	0.029
	(39)	(0.014)	(42)	(0.013)
UAL Cost	11	0.006	45	0.027
	(21)	(0.011)	(50)	(0.018)
Private	216	0.141	257	0.153
	(272)	(0.112)	(406)	(0.113)
Other	477	0.296	446	0.286
	(446)	(0.137)	(409)	(0.140)
II. Current: Categorical				
Safety	433	0.286	442	0.297
	(319)	(0.108)	(323)	(0.106)
General Government	162	0.107	174	0.110
	(171)	(0.074)	(220)	(0.071)
Transportation	137	0.092	139	0.085
	(163)	(0.64)	(240)	(0.058)
Comm. Development	142	0.092	129	0.079
	(155)	(0.059)	(195)	(0.060)
Culture/Recreation	171	0.103	148	0.088
	(230)	(0.080)	(202)	(0.067)
Health	201	0.112	201	0.115
	(310)	(0.113)	(316)	(0.117)
III. Non-current				
Capital	270	0.152	229	0.136
	(430)	(0.112)	(293)	(0.107)
Debt	79	0.039	100	0.057
	(187)	(0.043)	(150)	(0.063)
N (cities)	412	412	428	428

Notes: Standard errors in parentheses. Expenditure variables are presented as per capita, 2016 dollars and as shares of total expenditures. Definitions of categorical expenses are provided in Table 1.

Table 3: Summary Statistics for Public Safety Employment and Crime

	2005		2015	
	Per 100k	Obs.	Per 100k	Obs.
	(1)	(2)	(3)	(4)
I. Public Safety Employment				
Total Police	210.8	291	183.6	302
	(120.3)		(123.2)	
Police, Officers	151.9	291	134.1	302
	(90.5)		(95.4)	
Police, Non-officers	58.9	291	49.5	302
	(40.1)		(36.4)	
Fire	95.6	215	94.9	201
	(66.8)		(77.8)	
EMS	34.2	122	46.8	114
	(50.2)		(68.2)	
II. UCR Crime and Arrest Rates				
Violent Crime	1054.4	408	862.9	413
	(628.3)		(556.2)	
Property Crime	3271.1	408	2406.6	413
	(1808.5)		(1403.0)	
Violent Arrests	601.2	408	535.0	413
	(444.4)		(407.0)	
Property Arrests	519.0	408	438.2	413
	(879.7)		(587.6)	

Notes: Standard errors in parentheses. Employment variables are rescaled per 100,000 residents of a city. Observations listed are cities for which police, fire, or EMS services, respectively, have employees which are paid directly by the city. Police employment data is sourced from the Law Enforcement Officers Killed in Action (LEOKA) files, while fire and EMS employment data are from the cities' Financial Transaction Reports. Crime and arrest counts for index offenses are from the UCR Return A files.

Table 4: Pension UAL Payment on Retirement and Benefit Spending (first differences)

	(1) Base	(2) Trended Covars	(3) City FE	(4) City, Year FEs	(5) Unweighted
	Panel A. Valuation UAL Cost on FTR Retirement Spending				
UAL Cost	0.873***	0.811***	0.814***	0.760***	0.837***
	(0.086)	(0.090)	(0.096)	(0.108)	(0.203)
	[4807]	[4807]	[4805]	[4805]	[4807]
	Panel B. Persistence of UAL Cost on FTR Retirement Spending				
UAL Cost, t-1	0.166***	0.045	-0.008	-0.134	0.146*
	(0.062)	(0.074)	(0.076)	(0.122)	(0.082)
	[4432]	[4432]	[4430]	[4430]	[4432]
UAL Cost, t-2	0.029	-0.015	-0.059	0.014	0.145
	(0.054)	(0.057)	(0.061)	(0.118)	(0.172)
	[4055]	[4055]	[4050]	[4050]	[4055]
UAL Cost, t-3	0.062	0.090	0.079	-0.060	-0.057
	(0.058)	(0.064)	(0.067)	(0.086)	(0.225)
	[3673]	[3673]	[3671]	[3671]	[3673]
Model versions:					
Covariates	✓	✓	✓	✓	✓
Trended Covariates		✓	✓	✓	✓
City FE			✓	✓	
Year FE				✓	
Unweighted					✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city retirement spending, as reported in their Financial Transaction Reports. All regressions, except those indicated otherwise, are weighted by the city's average population during the sample period. All financial variables are in per capita, 2016 dollars. Standard errors in parentheses, clustered by city. Sample sizes are in brackets for each regression. The coefficients' significance levels are symbolized as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data cover 2003-2016 from California Financial Transaction Reports (FTR) and researcher collected pension data.

Table 5: Results: First-differences, Current and Noncurrent Expenditure

	(1) Base	(2) Trended Covars	(3) City FE	(4) City, Year FEs	(5) Unweighted
Total Expenditure	-0.178	-0.659	-0.722	-0.808	-0.641
	(0.388)	(0.442)	(0.472)	(0.675)	(0.609)
	[5281]	[5281]	[5280]	[5280]	[5281]
Deficit	0.071	-0.063	-0.039	1.002	-0.810
	(0.491)	(0.581)	(0.621)	(0.808)	(0.563)
	[5281]	[5281]	[5280]	[5280]	[5281]
Current	0.766***	0.436*	0.419	0.299	0.472*
	(0.243)	(0.234)	(0.255)	(0.390)	(0.254)
	[5281]	[5281]	[5280]	[5280]	[5281]
Wages	-0.212***	-0.343***	-0.343***	-0.327***	-0.261**
	(0.062)	(0.072)	(0.077)	(0.095)	(0.117)
	[5281]	[5281]	[5280]	[5280]	[5281]
Benefits	0.876***	0.773***	0.769***	0.733***	0.808***
	(0.099)	(0.104)	(0.105)	(0.136)	(0.145)
	[5281]	[5281]	[5280]	[5280]	[5281]
Retirement	0.873***	0.811***	0.814***	0.760***	0.837***
	(0.086)	(0.090)	(0.096)	(0.108)	(0.203)
	[4807]	[4807]	[4805]	[4805]	[4807]
Contracting	0.024	-0.001	-0.129	0.148	0.192
	(0.257)	(0.259)	(0.252)	(0.391)	(0.240)
	[4747]	[4747]	[4743]	[4743]	[4747]
Other	0.066	-0.002	0.114	-0.254	-0.299
	(0.410)	(0.398)	(0.407)	(0.571)	(0.263)
	[5281]	[5281]	[5280]	[5280]	[5281]
Non-current	-0.944***	-1.095***	-1.141***	-1.106**	-1.113
	(0.351)	(0.373)	(0.403)	(0.539)	(0.695)
	[5281]	[5281]	[5280]	[5280]	[5281]
Debt Service	-0.212	-0.261	-0.297*	-0.365**	-0.390
	(0.146)	(0.168)	(0.177)	(0.184)	(0.302)
	[5281]	[5281]	[5280]	[5280]	[5281]
Capital	-0.732**	-0.834***	-0.844**	-0.742	-0.723
	(0.305)	(0.314)	(0.337)	(0.472)	(0.495)
	[5281]	[5281]	[5280]	[5280]	[5281]
Model versions:					
Covariates	✓	✓	✓	✓	✓
Trended Covariates		✓	✓	✓	✓
City FE			✓	✓	
Year FE				✓	
Unweighted					✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city current and noncurrent expenditures. All regressions, except those indicated otherwise, are weighted by the city's average population during the sample period. All financial variables are in per capita, 2016 dollars. Standard errors in parentheses, clustered by city. Sample sizes are in brackets for each regression. The coefficients' significance levels are symbolized as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data cover 2003-2016 from California Financial Transaction Reports (FTR) and researcher collected pension data.

Table 6: Results: First-differences, Categorical Expenditure

	(1) Base	(2) Trended Covars	(3) City FE	(4) City, Year FEs	(5) Unweighted
Public Safety	0.483***	0.396***	0.381***	0.316**	0.194
	(0.087)	(0.097)	(0.101)	(0.136)	(0.131)
	[5281]	[5281]	[5280]	[5280]	[5281]
General Government	0.277**	0.313**	0.355***	0.348**	0.161
	(0.120)	(0.125)	(0.131)	(0.158)	(0.103)
	[5281]	[5281]	[5280]	[5280]	[5281]
Transportation	0.006	-0.012	-0.019	-0.055	0.274
	(0.052)	(0.063)	(0.075)	(0.103)	(0.204)
	[5281]	[5281]	[5280]	[5280]	[5281]
Community Development	0.061	0.036	0.009	0.067	0.090
	(0.112)	(0.126)	(0.130)	(0.221)	(0.082)
	[5281]	[5281]	[5280]	[5280]	[5281]
Culture/Recreation	0.212	0.225*	0.276**	0.182	-0.155
	(0.130)	(0.132)	(0.137)	(0.186)	(0.194)
	[5281]	[5281]	[5280]	[5280]	[5281]
Health	-0.188	-0.228	-0.247	-0.203	0.025
	(0.145)	(0.150)	(0.161)	(0.190)	(0.144)
	[5279]	[5279]	[5278]	[5278]	[5279]
Model versions:					
Covariates	✓	✓	✓	✓	✓
Trended Covariates		✓	✓	✓	✓
City FE			✓	✓	
Year FE				✓	
Unweighted					✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city outcomes. All regressions, except those indicated otherwise, are weighted by the city's average population during the sample period. All financial variables are in per capita, 2016 dollars. Standard errors in parentheses, clustered by city. Sample sizes are in brackets for each regression. The coefficients' significance levels are symbolized as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data cover 2003-2016 from California Financial Transaction Reports (FTR) and researcher collected pension data.

Table 7: Results: First-differences, Public Safety Employment

	(1) Base	(2) Trended Covars	(3) City FE	(4) City, Year FEs	(5) Unweighted
Police Emp. (LEOKA)	-0.045***	-0.068***	-0.062***	-0.051*	-0.054**
	(0.015)	(0.016)	(0.017)	(0.026)	(0.024)
	[3709]	[3709]	[3707]	[3707]	[3709]
Police Officers (LEOKA)	-0.032***	-0.046***	-0.044***	-0.040**	-0.040***
	(0.009)	(0.010)	(0.011)	(0.017)	(0.012)
	[3709]	[3709]	[3707]	[3707]	[3709]
Police Civilians (LEOKA)	-0.013	-0.022**	-0.018*	-0.011	-0.013
	(0.010)	(0.010)	(0.010)	(0.015)	(0.022)
	[3709]	[3709]	[3707]	[3707]	[3709]
Fire Emp.	0.009	-0.008	-0.003	-0.009	0.039
	(0.015)	(0.017)	(0.018)	(0.030)	(0.065)
	[2599]	[2599]	[2592]	[2592]	[2599]
EMS Emp.	-0.019	-0.024	-0.020	-0.009	0.003
	(0.023)	(0.024)	(0.026)	(0.030)	(0.022)
	[1309]	[1309]	[1288]	[1288]	[1309]
Model versions:					
Covariates	✓	✓	✓	✓	✓
Trended Covariates		✓	✓	✓	✓
City FE			✓	✓	
Year FE				✓	
Unweighted					✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city public safety employment outcomes. All regressions, except those indicated otherwise, are weighted by the city's average population during the sample period. All financial variables are in per capita, 2016 dollars. Employment outcomes are per 100,000 city residents. Standard errors in parentheses, clustered by city. Sample sizes are in brackets for each regression. The coefficients' significance levels are symbolized as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data cover 2003-2016 from California Financial Transaction Reports (FTR), researcher collected pension data, and Law Enforcement Officers Killed in Action (LEOKA) files.

Table 8: Results: First-differences, Crime Rates

	(1) Base	(2) Trended Covars	(3) City FE	(4) City, Year FEs	(5) Unweighted
Crime Cost	0.335**	0.455***	0.515***	0.346**	0.142
	(0.132)	(0.138)	(0.144)	(0.151)	(0.198)
	[5177]	[5177]	[5176]	[5176]	[5177]
Violent Crime Rate	0.345*	0.486***	0.562***	0.451**	0.071
	(0.179)	(0.188)	(0.195)	(0.202)	(0.288)
	[5177]	[5177]	[5176]	[5176]	[5177]
Property Crime Rate	2.483***	3.088***	3.301***	0.979	2.302***
	(0.486)	(0.500)	(0.532)	(0.679)	(0.487)
	[5177]	[5177]	[5176]	[5176]	[5177]
Violent Arrest Rate	-0.018	0.024	0.110	0.228	-0.097
	(0.176)	(0.180)	(0.187)	(0.240)	(0.226)
	[5177]	[5177]	[5176]	[5176]	[5177]
Property Arrest Rate	-0.142	-0.226	-0.197	-0.022	-0.175
	(0.163)	(0.175)	(0.179)	(0.240)	(0.292)
	[5177]	[5177]	[5176]	[5176]	[5177]
Violent Clearance Pct.	-0.016	-0.019*	-0.016	-0.001	-0.000
	(0.010)	(0.011)	(0.012)	(0.015)	(0.011)
	[5106]	[5106]	[5105]	[5105]	[5106]
Property Clearance Pct.	-0.017***	-0.023***	-0.024***	-0.006	-0.020***
	(0.004)	(0.005)	(0.005)	(0.007)	(0.006)
	[5107]	[5107]	[5106]	[5106]	[5107]
Model versions:					
Covariates	✓	✓	✓	✓	✓
Trended Covariates		✓	✓	✓	✓
City FE			✓	✓	
Year FE				✓	
Unweighted					✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city crime outcomes. All regressions, except those indicated otherwise, are weighted by the city's average population during the sample period. All financial variables are in per capita, 2016 dollars. Crime and arrest rates are per 100,000 residents. "Crime Cost" is per capita, and assumes $67,794 and $4,064 are the costs of the average violent and average property crimes, respectively. Standard errors in parentheses, clustered by city. Sample sizes are in brackets for each regression. The coefficients' significance levels are symbolized as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data cover 2003-2016 from researcher collected pension data and the Uniform Crime Reporting Return A files.

Appendix A. Additional Tables

Table A1: Results: First-differences, Debt

	(1) Base	(2) Trended Covars	(3) City FE	(4) Unweighted	(5) >100k Pop
Num. of Outstanding Debts	-0.000	-0.004	-0.002	-0.001	0.078**
	(0.006)	(0.007)	(0.007)	(0.003)	(0.034)
	[4744]	[4744]	[4741]	[4744]	[733]
Any Debt Issued	0.003*	0.003**	0.004**	0.003***	-0.002
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
	[5281]	[5281]	[5280]	[5281]	[735]
Amount Debt Issued	1.105**	1.150**	1.297**	0.811	-0.306
	(0.517)	(0.543)	(0.591)	(1.079)	(0.383)
	[5281]	[5281]	[5280]	[5281]	[735]
Outstanding Principal	-2.031*	-3.185***	-3.102***	-2.050	-4.987**
	(1.129)	(1.110)	(1.149)	(1.336)	(2.154)
	[4744]	[4744]	[4741]	[4744]	[733]
Model versions:					
Covariates	✓	✓	✓	✓	✓
Trended Covariates		✓	✓	✓	✓
City FE			✓		
Unweighted				✓	
Large cities					✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city outcomes. All regressions, except those indicated otherwise, are weighted by the city's average population during the sample period. All financial variables are in per capita, 2016 dollars. Standard errors in parentheses, clustered by city. The coefficients' significance levels are symbolized as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data cover 2003-2016 from California Financial Transaction Reports (FTR) and researcher collected pension data.

Table A2: Results: First-differences, Tax

	(1) Base	(2) Trended Covars	(3) City FE	(4) Unweighted	(5) ¿100k Pop
Num. of Tax Measures	-0.001	-0.001	-0.001	-0.001	0.004*
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
	[5281]	[5281]	[5280]	[5281]	[735]
Any Tax Measures	-0.002	-0.002	-0.002	-0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
	[5281]	[5281]	[5280]	[5281]	[735]
Model versions:					
Covariates	✓	✓	✓	✓	✓
Trended Covariates		✓	✓	✓	✓
City FE			✓		
Unweighted				✓	
Large cities					✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city outcomes. All regressions, except those indicated otherwise, are weighted by the city's average population during the sample period. All financial variables are in per capita, 2016 dollars. Standard errors in parentheses, clustered by city. The coefficients' significance levels are symbolized as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data cover 2003-2016 from California Financial Transaction Reports (FTR) and researcher collected pension data.

Table A3: Key Results: Robustness and Heterogeneity

	First Difference				Levels	
	(1) City FE	(2) Trimmed, 5%	(3) > Median Assets	(4) < Median Assets	(5) City, Year FEs	(6) With City Time Trends
Deficit	-0.039	0.111	-0.125	1.634	-0.557	-0.851
	(0.621)	(0.777)	(0.650)	(2.501)	(0.550)	(0.942)
	[5280]	[4962]	[2682]	[2598]	[5280]	[5280]
Current	0.419	0.136	0.364	1.075**	0.553	1.468*
	(0.255)	(0.304)	(0.273)	(0.540)	(0.650)	(0.806)
	[5280]	[4962]	[2682]	[2598]	[5280]	[5280]
Retirement	0.814***	0.788***	0.826***	0.610***	0.841***	0.931***
	(0.096)	(0.104)	(0.103)	(0.117)	(0.080)	(0.122)
	[4805]	[4532]	[2433]	[2372]	[4879]	[4879]
Wages	-0.343***	-0.429***	-0.338***	-0.377**	-0.266	-0.290**
	(0.077)	(0.085)	(0.081)	(0.177)	(0.217)	(0.128)
	[5280]	[4962]	[2682]	[2598]	[5280]	[5280]
Non-current	-1.141***	-1.016***	-1.211***	0.071	-0.512	-1.473**
	(0.403)	(0.382)	(0.425)	(0.904)	(0.582)	(0.631)
	[5280]	[4962]	[2682]	[2598]	[5280]	[5280]
Debt Service	-0.297*	-0.311	-0.326*	0.265	0.251*	-0.126
	(0.177)	(0.214)	(0.187)	(0.305)	(0.132)	(0.149)
	[5280]	[4962]	[2682]	[2598]	[5280]	[5280]
Capital	-0.844**	-0.704**	-0.885**	-0.193	-0.762	-1.347**
	(0.337)	(0.315)	(0.358)	(0.825)	(0.559)	(0.633)
	[5280]	[4962]	[2682]	[2598]	[5280]	[5280]
Police Emp. (LEOKA)	-0.062***	-0.050***	-0.061***	-0.066	-0.130***	-0.060**
	(0.017)	(0.012)	(0.018)	(0.058)	(0.035)	(0.025)
	[3707]	[3430]	[2497]	[1210]	[3731]	[3731]
Crime Cost	0.515***	0.584***	0.571***	-0.006	0.133	0.396*
	(0.144)	(0.173)	(0.151)	(0.476)	(0.258)	(0.204)
	[5176]	[4860]	[2658]	[2518]	[5177]	[5177]
Violent Crime Rate	0.562***	0.654***	0.658***	-0.459	0.111	0.523*
	(0.195)	(0.235)	(0.203)	(0.682)	(0.350)	(0.280)
	[5176]	[4860]	[2658]	[2518]	[5177]	[5177]
Property Crime Rate	3.301***	3.468***	3.072***	7.497***	1.424	1.014
	(0.532)	(0.606)	(0.551)	(1.423)	(0.931)	(0.701)
	[5176]	[4860]	[2658]	[2518]	[5177]	[5177]

Notes: Shows the impact of city unfunded actuarial liability (UAL) payment on city outcomes, where the specific outcomes in each row are key results drawn from earlier in the paper. Each column presents the results from either first-differenced regressions (columns 1-4) or level fixed-effect regressions (columns 5-6). Column 1 reproduces the results from previous tables from a model in first-differences with a city fixed-effect. Column 2 repeats this but trims the top 5% and bottom 5% of observations in terms of the change in the city UAL cost. Columns 3 and 4 restrict the sample to cities which held above and below median assets per capita, respectively, in 2003. Column 5 and 6 instead present results from level fixed-effect regressions, where column 5 has city and year fixed-effects and column 6 adds a city-specific linear time trend. All regressions, except those indicated otherwise, are weighted by the city's average population during the sample period. All financial variables are in per capita, 2016 dollars. Standard errors in parentheses, clustered by city. Sample sizes are in brackets for each regression. The coefficients' significance levels are symbolized as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data cover 2003-2016 from California Financial Transaction Reports (FTR) and researcher collected pension data.

Appendix B. Comparisons to other City Data

To my knowledge, the California FTR data has not been used before. One reason may be that it has only recently come available; the change to the California Government Code which provides for the FTRs to be published digitally only came into effect after January 1, 2016. Without a demonstration of its substance, researchers may be unlikely to use it.

Researchers typically view the Census of Governments (CoG) and the associated Annual Survey of State and Local Government Finances as good sources of information on the behavior of cities. So, it provides a good dataset to compare the California FTRs to. Note that I cannot combine the CoG and Annual Surveys to get any sizeable panel of cities, since the Census only occurs every 5 years and the Annuals Surveys have relatively small and random samples. Still, I compare the CoG and FTR data where possible, to be described below.

The California State Controller provides a lengthy document instructing cities how to categorize budget items in the FTRs.[23] Similarly, the Census guides cities in answering the survey with the several hundred page Government Finance and Employment Classification Manual. Since cities differ in organizational and reporting structure, these survey instructions endorse comparisons closer to apples-to-apples than would otherwise be possible. Within a year and within a dataset, cities should be comparable, provided they respond accurately. However, the FTRs and CoGs have different categories and may use different definitions even for like categories. For instance, 'Parks and Recreation' in the CoG includes all "recreational and cultural-scientific facilities" like public parks, marinas, stadiums, and museums (but not libraries, which are separate). 'Parks and Recreation' in the FTRs is much more limited to maintenance of monuments and open spaces and expenses for athletics. With this in mind, I compare operating expenses for a few areas of interest - police,

[23]Cities Financial Transactions Report Instructions, California State Controller's Office.[24]https://www.sco.ca.gov/Files-ARD-Local/LocRep/Cities%20FTR%20Instructions.pdf

fire, health, parks and recreation, and libraries - using the 2012 Census of Governments and California FTRs from 2012. Out of these, police and fire are the most comparable. In the following table, I present summary statistics for the categories from each dataset as well as a percentage difference variable generated as

$$\%Diff_{c,2012} = \frac{|FTR_{c,2012} - CoG_{c,2012}|}{max\{FTR_{c,2012}, \quad CoG_{c,2012}\}}.$$

Table B1: Comparison of FTR and CoG City Categorical Expenses, 2012

Category	Data	Obs.	Mean	Std. Dev.	Min.	Max.	# Exact Matches
Police	FTR	481	20.2	95.9	0.015	1971.5	
	CoG	429	20.4	86.1	0.015	1664.7	
	% Diff.	429	0.041	0.155	0	0.948	361 of 429
Fire	FTR	326	12.0	38.4	0.001	556.1	
	CoG	307	11.7	31.7	0.001	422.5	
	% Diff.	300	0.016	0.102	0	0.996	287 of 300
Parks & Rec.	FTR	482	7.8	28.4	0	476.1	
	CoG	461	6.4	21.7	0.001	318.3	
	% Diff.	456	0.183	0.235	0	1	95 of 456
Libraries	FTR	188	4.7	14.4	0.001	137.9	
	CoG	183	3.6	9.8	0.002	95.1	
	% Diff.	178	0.100	0.211	0	0.994	86 of 178
Health	FTR	482	17.0	127.4	0	2553.1	
	CoG	356	4.8	46.6	0.001	847.6	
	% Diff.	356	0.815	0.271	0	1	6 of 356

All amounts are in 1,000,000s of dollars, barring the percent differences. Expenses are categorical operational expenses as they are defined in the Financial Transaction Reports (FTR) Instructions and Census of Governments (CoG) Government Finance and Employment Classification Manual for the fiscal year 2011-2012.

In general, the FTRs consistently report more cities than the CoG in 2012. Two categories, police and fire operating expenditures, have a high number of observations that are exactly the same, followed by libraries with around half of them matching. Further, for police over 90% of the values are within 5% of one another. The categories of 'Parks and Recreation' and 'Health' tend to have different values in the FTRs and the CoG for the reasons mentioned previously; the original 'Health' variable in the FTRs includes sewers and waste disposal, which is separate in the CoG. In my main dataset, I remove sewers and waste as well, since these tend to be operated as enterprises by the city.

I also compared the cities with extreme differences in FTR and CoG values from each category to their respective Comprehensive Annual Financial Report (CAFR) values. For the CAFRs, I attempted to acquire them from the city's website, with mixed success. Some cities post the past decade of financial statements, while others post nothing. Since it would be a process to contact each city's officials to get them otherwise, building a dataset from CAFRs would be difficult. From tables where I compare the FTR, CoG, and CAFR data to one another, it looks like the FTRs better reflect the information presented in a city's audited financial statements (where they are available). For brevity, I only include one of these covering 'police'.

Table B2: Comparison of 2012 Police Expenditures, Extrema

City	FTR	CoG	CAFR
Lompoc	9.54	19.08	unavailable
Healdsburg	4.15	8.30	7.01[1]
Santa Cruz	19.78	39.56	unavailable
Highland	6.95	0.36	unavailable
San Clemente	12.10	0.65	11.98
Laguna Woods	1.30	0.11	1.62[1]
Rosemead	6.66	0.61	7.52[1]
Cerritos	13.56	1.31	unavailable
Montague	0.21	0.03	unavailable
Santa Fe Springs	8.80	1.61	unavailable
San Jacinto	8.62	1.64	unavailable
La Mirada	7.45	1.62	8.33[1]
Lancaster	26.40	6.10	23.49[1]
Imperial Beach	6.85	1.69	10.23[1]
Lakewood	10.88	2.92	12.28[1]

All amounts are in 1,000,000s of dollars. Comparison of Financial Transaction Reports (FTR) and Census of Governments (CG) data with Comprehensive Annual Financial Report (CAFR). This table looks at cities where the CG and FTR differ by a large margin in fiscal year 2011-2012.

Includes fire expenses with police as “Safety”.

Appendix C. Further Information on CalPERS Data

The California Public Employees' Retirement System (CalPERS) is the largest retirement system in the state of California, and services the majority of city's retirement plans, who contract with CalPERS for their benefits. In my study, it is therefore critical to know plan-level detail from these contracting city agencies; otherwise, I would be limited to a sample consisting of cities with independently serviced pensions, which tend to be in high population, established areas due to historical reasons related to the County Employees Retirement Law of 1937.

However, the readily available data on the Secretary of State's website was missing most city-plan-years from the years 2005-2016, and CalPERS does not immediately provide this information. To gather the necessary information, I submitted a public information request on CalPERS's online portal, asking for all records on each CalPERS contracting agency from 2003 to 2017 in order to match to my city financial data.[25] The records I obtained were "Annual Valuation Reports", which as per the language of the documents contain "important actuarial information about [the contracting agencies'] pension plan at CalPERS." These contain information about each plan's standing and expected future contributions. All in all, there were a little over 17,000 actuarial valuations, each representing a different plan-year observation from the 15 years of interest. Using Python, I turned these PDFs into text streams which I subsequently scraped into CSV files. The Annual Valuation Reports were variable both within and between years in terms of their length and contents. To help give a sense of what these reports look like, I present two pages from the Annual Valuation Report for Riverside, CA for 2005 below.

More specifically, I deemed that there are two general templates for the reports: 'short' and 'long'. 'Short' reports were provided to plans which in 2003 had less than 100 members, whereas the 'long' reports were provided to plans with 100 or more members. This

[25]CalPERS: Public Records Requests https://www.calpers.ca.gov/page/contact/public-records-requests

separation stemmed from CalPERS pooling these smaller employer-plans together in order to reduce the size of fluctuations in their year-to-year contributions. While possibly a boon by providing more predictable budgeting in smaller agencies, risk pooling is a bane for a researcher trying to build a data set. From 2004-2010, 'short' valuations do not report assets and liabilities on a per-plan basis. Instead, there is only the value of a "Side Fund", which is the difference in fundedness between risk pool and plan, as well as plan membership and payroll. Separately in Risk Pool Valuations, information on the risk pool's financial status is provided in aggregate each of these years. In 2011, they again calculate assets and liabilities for all plans, using the following formula to reestablish plan fundedness

$$\mathbf{MVA_{plan}} = \frac{\mathbf{Liabilities_{plan}} + SideFund_{plan}}{Liabilities_{pool} + SideFund_{pool}} * MVA_{pool}.$$

For me to calculate the fundedness for the period 2004-2010, I need either of the two bolded quantities in the equation above so that I can get the other. Since I have data at either end (for the majority of plans), I choose to interpolate the liabilities between the two points, and then calculate the MVA_{plan} using the equation above. This assumes liabilities move linearly, which in aggregate is mostly the case. Assets are allowed to move up and down with macroeconomic shocks through the MVA_{pool} term, and incorporating plan Side Funds means plans vary in fundedness appropriately. The end result is having information for the CalPERS contracting agencies for about ~96% of the plan years after interpolation, and about three-quarters before.