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 assemble a novel dataset which captures the universe of cities and their pensions in California from 2003 to 2019. 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 reduce non-current expenses, payrolls, and employment, with police employment declines specifically. Further, there are accompanying increases in crime rates and costs. 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 the 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 of 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, state and local 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] Projections indicate that contributions will remain high on average into at least the decade of the 2040's as the existing asset-liability gaps are closed.

[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.

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 early 2010s. Altogether, the "pension pressure" generated forms an enduring challenge for cities and their residents.

In this paper, I ask how local policymaking has changed in response to pension pressure. Specifically, 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. Further, evidence on how local policy has already shifted is also relevant into the future, given the aforementioned long-term nature of pension funding.

I develop a novel data set covering California's cities from 2003 to 2019. 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,

[4]This "California Rule" interpretation of DB pension promises, named based on its origin from a 1955 court case in the state studied empirically by this paper, 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

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. I argue that these are plausibly causally identified 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 do not increase. The cities' current expenditures consist of their employees' wages and benefits, contracting with the private sector and other governments, and other miscellaneous expenses. Spending on retirement and benefits reported by cities increases by \$1.13, which is partially offset by a \$0.27 decrease in wages, suggesting that cities reduce employment, cut salaries, or both. Job cuts are one part of this response to pension pressure; due to limited reporting on personnel across all municipal departments, I focus specifically on police. Police employment, which is on average about one quarter of total city employment, sees a loss of nearly 0.11 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 36 and comparing with the average 2005 police employment of 240, this suggests an average long-term reduction of 4 (1.7%) 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 $0.22 per capita for every dollar increase in the UAL cost.[6] Employment losses could be further reflected in other municipal departments, though I do not observe them in my data. Non-current spending, which includes investment in land, buildings, improvements, and equipment as well as debt payments, goes down by slightly less 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 do not change the level of their debts, consistent with the reduced non-current spending. They also do not change raise more revenue; thus, the average city in my sample responds to pension pressure through a reallocation of expenses. These results are broadly robust to a range of specifications. 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 of 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. Anzia (2022) asks a similar question, finding correlations between

[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).

rising retirement spending with reductions public-sector employment; further, that these are related to political power of public worker unions. Thus, the paper is complementary to my own results. However, I use novel data which decompose city expenditures further, permitting a deeper analysis of pension pressure. These data also allow me to create a longer and far less fragmented panel of cities compared to the Comprehensive Annual Financial Reports (CAFR) used by Anzia (2022). Another distinction, which is important for reaching stronger empirical conclusions, is that I do not use cities' total retirement expenditures (which changes with employment). Instead, I am able to provide plausibly causal estimates by using only the portion of city retirement spending stemming from their unfunded liability, which I am able to accomplish using detailed data on city's pension funds. The existing literature also contains a few other papers on state and local consequences of public worker pensions. 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 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 Atlantic hurricanes and California wildfires also form fiscal shocks that have long-term consequences on municipal budgets through both the revenue and expenditure pathways (Jerch et al., 2023; Liao and Kousky, 2022). Clemens et al. (2022) considers a positive rather than negative revenue shock; they find that the large amounts of federal aid only had limited short-term impacts on state and local employment within the arguably unique COVID-19 context. 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 spending patterns alone by using public safety employment data, 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

Local governments provide important public services, including policing, sanitation, transportation, and public recreation. "Pension pressure" introduces a fiscal challenge to the provision of these services. In confronting it, cities could make budget cuts or raise taxes, with residents bearing the cost of their choices. In the following section, I discuss the institutional context of cities and their pensions that shape those choices.

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,

$$Contributions_{it}^{fixed} = NormalCost_{it} + UALPayment_{it}$$
$$NormalCost_{it} = NormalCost_{it}^{city} + NormalCost_{i}t^{employee}.$$

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 in 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.[7] Other 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.[8] It is not possible for employers to manage the stresses placed on their budgets by their changing contributions through nonpayment or underpayment:

[7]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.

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

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).[9] 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 in 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. 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 in California specifically, cities have limited 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. 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" and Proposition 13, both legacies of the 1970s tax revolt. The "Gann Limit" restricts the growth in taxes and expenditures based on population

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

and income growth, though these do not seem be binding constraints (Kousser et al., 2008). Proposition 13 caps the assessed value and increases in the assessed value of property and also restricts tax rate increases, limiting the control California's cities have in controlling property tax revenue. Cities are also restricted in how they allocate spending within their budgets. Intergovernmental revenue is often required to be used on specific services or in specific ways – for instance, federal and state grants for housing services.

Pension pressure, in the form of rising retirement expenses, comes into this constrained setting and forces budget reallocations. Cities are explicitly aware of this pressure. To supplement the empirical exercises later on, I examine the budget and budget-preparation documents for the 30 largest cities in my final sample of cities[10] for the fiscal year ending 2015. Most of these cities (20 out of 30) separate post-employment benefits from other personnel expenditures in their documents, and 26 of the cities specifically comment on year-to-year changes in their pension contribution costs in their budget documents. For instance, Chula Vista's fiscal year end 2015 budget states, "the increase in retirement costs driven by rising CalPERS costs is a significant budgetary challenge facing the City."[11] As another example in the same year, Fontana's budget indicates that "due to budget challenges ahead including significant increases in the City's CalPERS retirement costs in future years and the rising cost of medical benefits, it is recommended that the City continue with its conservative budgeting approach."[12] Other cities, like Santa Rosa and Hayward, tie recent wage and benefit reductions directly to rising pension and healthcare costs.

To reduce down to the essence of this scenario: each year municipal governments must create balanced budgets in the face of retirement expenses that are externally determined (although changing over time) due to legal restrictions obligating the city to pay. Cities can meet their rising pension costs either by raising more money where feasible or by

[10]The largest city included in my final sample is Long Beach; as described further in the data section, cities like Los Angeles with locally-controlled retirement systems are dropped.

[11]City of Chula Vista. "City of Chula Vista Adopted Budget." July 2014. Web, accessed 11 Nov. 2023. https://www.chulavistaca.gov/home/showpublisheddocument/6460/635575273644800000

[12]City of Fontana. "City of Fontana Fiscal Year 2014/2015 Adopted Operating Budget." July 2014. Web, accessed 11 Nov. 2023. https://www.fontanaca.gov/ArchiveCenter/ViewFile/Item/1872

dropping expenditures elsewhere; they can choose to cut services, raise taxes, take on debt, use up government funds, or some combination of these. Cities and their politicians must make choices across these constrained options, with potential objectives such as maximizing voter happiness and improving re-electing chances. I provide insight into the realized choices made by these economic agents 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 individual cities spend twice what the state government spends per capita.[13] 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.[14] 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 2019. Data from the California State Controller provides detailed fiscal information on the nearly 482 cities in California. Each

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

[14]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.

fiscal year, all California cities are required by law to submit a Financial Transactions Report (FTR) according to a uniform classification system.[15] 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 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 A.

3.3 Pension Data

I pair this with city-level information on pension funds. For municipal governments in California, I gathered data on pension 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

[15] 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

contents, both across time and between plans in the same year.[16] 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 B. 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 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.[17]

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 remain after this sample restriction had 22.5 million residents in 2016, or almost 60% of California's population.

I also restrict the sample to cities above a population of 5,000. For one, they have

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

[17]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.

limited services and public workforces, or in the case of the cities of Industry and Vernon, are markedly different, where those two cities are essentially business and industrial zones. Secondly, their budgets tend to be more 'discrete,' with large movements in expenditures from year-to-year, presumably as they hire and fire individual workers or engage in a capital expenditure project one year and then have zero capital expenses the next. Third, they have higher rates of non-reporting in the financial transaction reports, as well as what appears to be misreporting or mis-categorization across fields; this may be a result of smaller and less-skilled administrations in these very small cities.

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 in 2005 and 2015, allowing some comparisons over time. One takeaway is that pension expenditure, on average, rises from about 12.6% to about 23.0% of city wages between the two years; UAL costs alone rise from about 2.6% to 11.4% 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.

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).[18] 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, such as to only population (as used in this paper), at county-level and above, or limited to cities with larger populations, like the American Community Survey. 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.

My analysis of public safety employment outcomes is restricted to the cities with independent police services. The summary statistics for the FTR-sourced police, fire, and EMS employment counts, are shown in Table 3. To supplement these counts and an analysis of public safety impacts of public pensions, I 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 2002-2019. 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).

[18] Source: Manson and Ruggles (2022)

[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.

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 I argue that this too does not present much threat to my analysis. Further, my analysis concerns local governments whose pension assets are held outside of their control at the state-level. This advantage, relative to other work such as Anzia (2022), 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. 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. In my results, I also check to see if cities use their general funds to mute the year-to-year volatility in pension pressure, and do not find this to be the case.

Fourth, retirement expenses vary drastically across both time and cities, allowing

sufficient variation for identification. Over time, retirement expenses can change fairly drastically: the average city's contribution to their UAL increased around $130 per capita from 2003 to 2019, and the 95 percentile city saw it rise by nearly $300.[20] 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.

[20] I check if my results are robust to removing the top and bottom 5% extrema based on the panel-length difference in pension costs.

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

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

where the coefficient β measures the contemporaneous one-year change in the outcome of interest from changes in the UAL cost. Further, ρ_t is a year fixed effect and $X_{c,t}$ is a vector of covariates, both discussed further below; $\epsilon_{c,t}$ is the error term, clustered by city.

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.[21]

[21] The panel is not strongly balanced due to missing data across one or more datasets in a given fiscal year. For instance, while rare, there are a number of years where a city fails to report their financial transactions to the state of California.

For this reason, I provide the number of observations in brackets for each estimate in the tables described in the results section.

In all regressions I include a year fixed-effect ρ_t to capture state-level shocks. As mentioned previously, the institutional lag between actuarial valuations and the contributions determined from them removes or reduces the simultaneity of effects of macroeconomic shocks on pension contributions and city finances. Still, national and state level policy, e.g. an expansion of the California government's grants to cities, could introduce bias.

Another 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. First, based on some persistence in the the UAL cost that I identify in Table 4 (further discussed below), I include the once-lagged change in the UAL cost $\Delta UALPayment_{c,t-1}$. Second, I allow baseline city characteristics to have linearly time-varying impacts on year-on-year changes in outcomes by adding $X_{c,t}t$. Third, 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 ag-

glomeration of aerospace industries and large per capita pension debts may have had unique budget impacts from changes in national aerospace spending. Fourth, I consider regressions in which I remove key Great Recession years: 2008, 2009, 2010, 2011. Thus, I "donut" out these four years from the middle of each city's panel that contained the immediate effects of that recession. Fifth, I present regressions which are weighted by city. Therefore – after restricting my sample to cities with CalPERS plans only with a population above 5,000 – the largest city, Long Beach, with a population around 450,000, enters the regression with far more weight than the smallest, Dos Palos. Each of these specifications appear in this order and are labeled accordingly in the results tables.

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 and benefit spending recorded in the Financial Transaction Reports (FTRs). In Table 4, I show estimates from three empirical specifications. Each column contains estimates produced from a different model. The first corresponds to Equation 2. The second and third columns' estimates differ from column 1 through their respective inclusions of trended baseline covariates and city fixed effects. 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 and benefit spending reported in the FTRs. The estimate in column 1 is a highly significant increase of \$1.13, with similar estimates in the other columns. I provide two comments on these point estimates. First, a 1:1 change is well within the standard error of each model. 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). In Panel B, I assess the

significance of once, twice, and thrice lagged differences in the UAL cost on city retirement costs. From the positive sign and significance of the once lagged difference, there appears to be some persistence in retirement costs. Accordingly, I include this term as a specification check in Column 2 of all proceeding tables.

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 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 current expenditures. Instead, cities reduce non-retirement current spending and decrease non-current spending. Breaking down current spending, the total retirement and benefit spending reported by cities goes up by a little over $1 across all specifications, as described previously. Cities' wage expenditure decreases around 27 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. A dollar increase in pension pressure reduces all non-employment current expenses – which includes contract services with private companies and other government agencies, materials and supplies, and other miscellaneous spending – by 43 cents, but the effect is inconsistent across specifications. Turning to non-current spending, which corresponds to long-term investments made in city services and infrastructure, I find a reduction of nearly 90 cents in spending in my base specification and even larger reductions in other specifications. Splitting non-current spending into capital and debt service, I find that the reduction is largely driven by cuts to capital investments like buildings and equipment. These cuts are large. In column 1's model for each additional real per capita dollar spent on servicing the UAL cost, cities significantly spend $0.75 less on capital investment; point estimates are similar across the other specifications, but are not consistently significant. Note that investment is only partially funded from current revenues, with the rest funded through future revenues via debt, so this does not imply that cities are running deficits. These are not unlike the findings in other research on local fiscal shocks. For example, Cromwell and Ihlanfeldt (2015) find that capital investment is the primary target of budget cuts.

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) safety, (2) general government, (3) transportation, (4) community development, (5) culture and recreation, and (6) health. 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 across nearly all specifications. In the base model in Column 1, general government and safety spending increase by \$0.35 and \$0.18, 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. All other categorical expenditures studied do not see significant changes. 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.[22] 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 0.11 per 100,000 residents as pension pressure increases. There are negligible changes in firefighters and emergency medical technicians. The average 2005 to 2015 change

[22]Not all cities have public safety employees on their payrolls. For instance, police services may be contracted out to the county sheriff's department, firefighting departments may be volunteer-based, and emergency medical technicians may be employed privately by ambulance services and hospitals.

in UAL cost is 36 and the average police employment was around 240 in 2005. Combined with the estimate, back-of-the-envelope calculations indicate an average long-term reduction of 4 (1.7%) paid police positions per 100,000 residents. For comparison, this is around 7% 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 detriment of other categories, taxpayer money is paying down previously generous service rather than maintaining or improving current service.

The documented effect on police employment encourages exploration of public safety. I use the crime and arrest rates as reported in the city-level FBI Universal Crime Reporting Return A data from 2003-2019. 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 4, which accounts for city-level trends in crime and arrest rates. For each one dollar increase in the city's unfunded liability cost, the violent crime rate increases by 0.40 (0.04% 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 $0.30 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 marginally significantly related to the change in the unfunded liability contribution in some models.

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, my results provide suggestive evidence that the strain of pension pressure on city fiscal resources leads to an increase in crime.

5.3 Taxation

Cities may respond to increasing pension pressure by raising more funds through taxation. To explore this, in Table C1 I first consider whether property, sales, or any other tax revenue reported by cities in their annual FTRs are responsive to pension pressure. I do not find any tax revenue effects across specifications. Next, I use information on municipal tax measures from the California Elections Data Archive (CEDA). From these data, I also do not find that cities are seeking additional taxes through ballot measures. Finally, I use information on the assessed value of taxable property and the amount of taxable sales in my sample of Californian cities. These data are from the California State Controller's Office and the California Department of Tax and Fee Administration, respectively, with the latter covering only 2010 onward. Turning to the regressions using these outcomes in Table C1, I find no significant effects. From this last exercise, I rule out the possibility that my main results are driven by concurrent changes in municipal tax bases. That is, the estimates of pension pressure do not appear to instead be the direct fiscal effects of recessions.

5.4 Debt and City Funds

I also look at how municipal debt is influenced by pension liabilities. I present three different outcomes concerning debt in Table C2 - (1) the count of all outstanding debts, (2) the amount of debt issued, and (3) the outstanding principal. These outcomes are worth exploring since investment, which is largely funded through debt, is one of the main lever cities appear to use in response to pension pressure as reported in 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.[23][24] Across specifications for the three outcomes reported in Table C2, I do not find that the average city in my sample is acquiring new debts.

Lastly, it is possible that cities could save money in advance of rising costs and draw down these funds as the costs are realized, especially since they know their future unfunded liability costs two years in advance. If cities engage in this behavior, they would reduce the volatility of pension expenses, which I argue would attenuate the effects presented in this paper since they are based on year-to-year changes. Still, in Table C2 I consider the year-to-year change in each city's general fund balance – which is its main operating fund – as another outcome. As with the debt outcomes, all specifications yield null estimates for general fund usage in response to pension pressure.

5.5 Additional Robustness and Heterogeneity of Key Results

Lastly, I examine the heterogeneity and robustness of the results. In Appendix Table C3, I provide estimates of the key elements from the finance, police employment, crime, and taxation tables. Column 1 reproduces the estimates which appear in Column 1 in those previous tables as a reference point. In columns 2 and 3, I restrict the sample to cities which had average populations across the panel which are below or above 50,000, respectively. I find that police employment cuts and crime cost increases are associated with smaller cities, while reductions in non-current spending are associated with larger cities. In columns 4 and 5, I restrict the sample to cities which held pension assets in 2003 that were less than or greater than 130% of their pension liabilities. The intention here is to compare cities that started with a worse funding status to those with a better funding status, as those that start with worse funding status will also experience more unfunded liability cost growth over the course of the panel. Comparing these to the overall estimates in Column 1, I find that while

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

[24]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.

both sets of cities similarly cut wage spending in response to pension pressure, the reductions in non-employment current spending and police employment and the rise in crime costs are all larger in magnitude. This suggests that there may be some non-linearity in how cities react to pension pressure. In Columns 6 and 7, I consider whether there may be a political dimension. Using 2003 voter registration data from the California Secretary of State which are aggregated by city, I split the sample into cities with Democratic voter registration shares in 2003 which are below or above the state average. Here, I find that cities with a higher share of registered voters with a Democratic affiliation experience a much larger increase of $0.42 in the costs of crime, nearly double that of the overall sample. I caution against reaching conclusions about partisan differences across municipal governments, since these cities are also more likely to have below average pension funding in 2003, and assuredly have further unobserved differences by political affiliation.

I also consider additional robustness exercises. Column 8 shows that all of the key results except non-current expenditures and crime costs are robust to trimming the top and bottom 5% of observed changes in the UAL cost. Based on Appendix A's discussion of the value and accuracy of the city finance data contained in the FTRs, I further consider whether my results are robust to removing cities with extreme differences compared to the bi-decennial Census of Governments (CoG). Specifically, I compare what cities reported in the FTR and CoG data sources in 2012 as their expenditure on the common category of "salaries and wages", and trim the top 5% and bottom 5% of cities in terms of the percent difference. All results are robust to removing these extreme observations, helping assuage concerns that my results are driven by misreporting by cities.

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 and wages as benefit payments rise. I also show that beyond just changes in spending patterns, cities cut workers from their payrolls. Among the municipal personnel that I can observe across cities – public safety workers – I find reductions in police employment, 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.

This paper presents a dispiriting account of pension pressure. As discussed before, cities cannot substantively change the size of their unfunded liabilities or their contributions in the short-term. They cannot change their past decisions, and pension debts are large relative to city budgets. But there are some policy levers available beyond reducing public services and pension generosity, as shown by recent decisions by state and local governments. For example, the small city of Healdsburg in California adopted a Pension Stabilization Fund in fiscal year 2016. This pool of money is intended to allow the city to better manage the year-to-year variation in required contributions to CalPERS and their impacts on service delivery.[25] Similarly, in 2019 CalPERS introduced the California Employers' Pension Pre-

[25]City of Healdsburg. "Pension Rate Stabilization Fund." Web, accessed November 14, 2023. Link: https://healdsburg.gov/617/Pension-Rate-Stabilization-Fund

funding Trust Fund, providing participating cities the option of making additional voluntary contributions to a lower volatility fund that can be disbursed to manage pension costs.[26] Use of these sorts of funds in localities would abate the effects reported in this paper. Pension obligation bonds are another option. In 2021, the city of Huntington Beach refinanced their unfunded liabilities using $364 million of public debt.[27] However, for the bonds to improve the city's fiscal standing, the money raised must earn financial returns in excess of their interest rate; this also introduces market timing risk from investing a large sum all at once.

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.

[26]CalPERS. "California Employers' Pension Prefunding Trust (CEPPT) Fund." Web, accessed November 14, 2023. Link: https://www.calpers.ca.gov/page/employers/benefit-programs/ceppt?subject=

[27]Bloomberg. "Huntington Beach, California Sold $364M of Pension Bonds." Web, accessed November 14, 2023. https://news.bloomberglaw.com/employee-benefits/huntington-beach-california-sold-364m-of-pension-bonds

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Figures

Figure 1: Diagram of Pension Payments

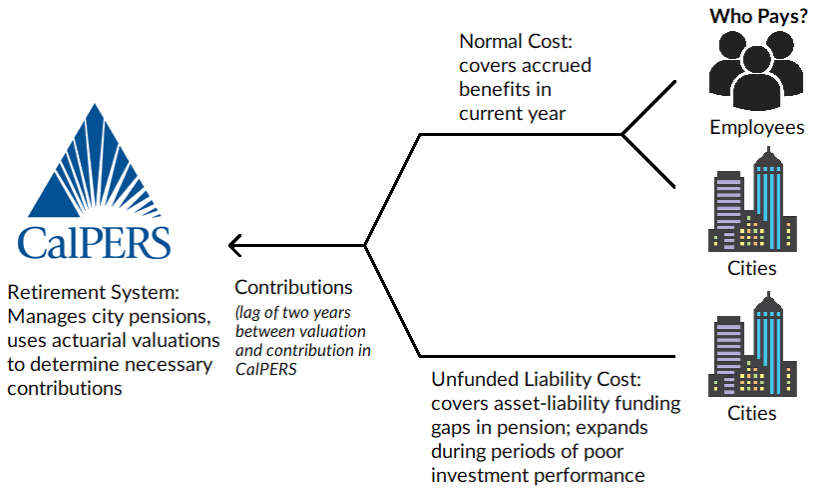


Figure 2: Municipal Pension Assets and Liabilities in California

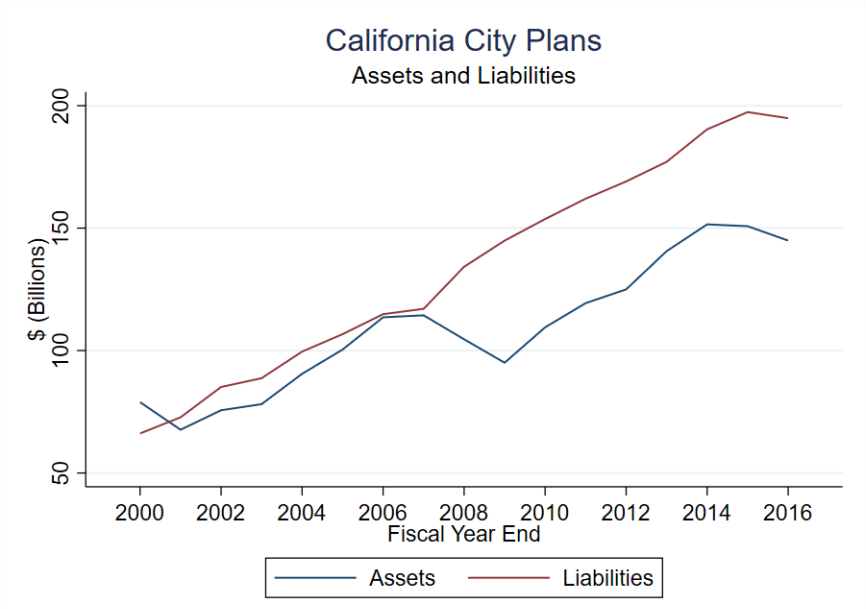
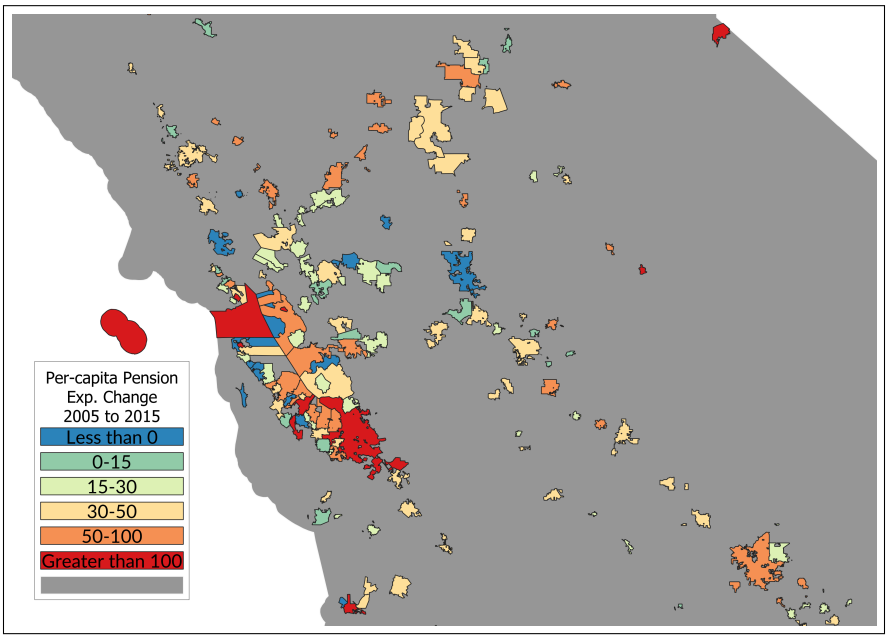
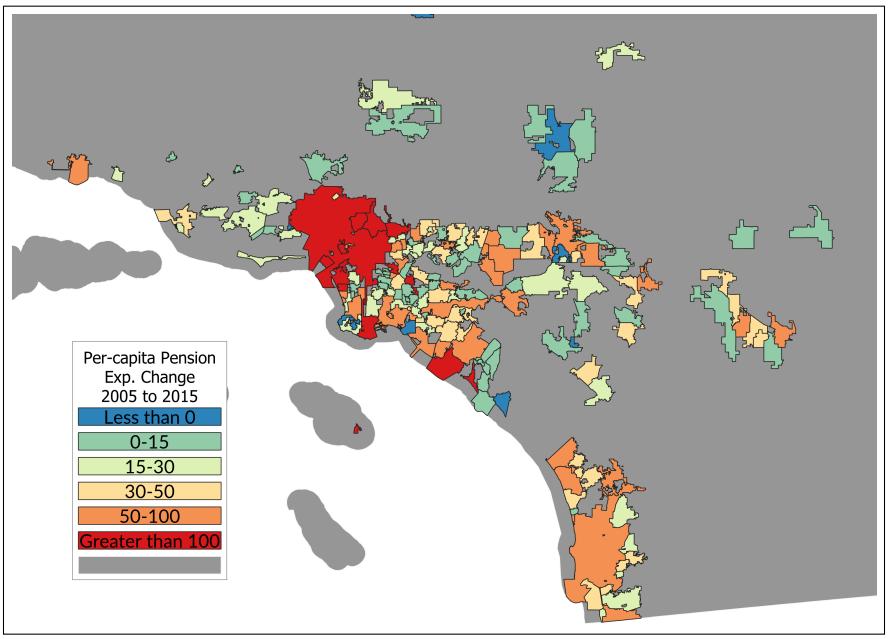


Figure 3: Central California: 2005-2015 Change in Pension Pressure



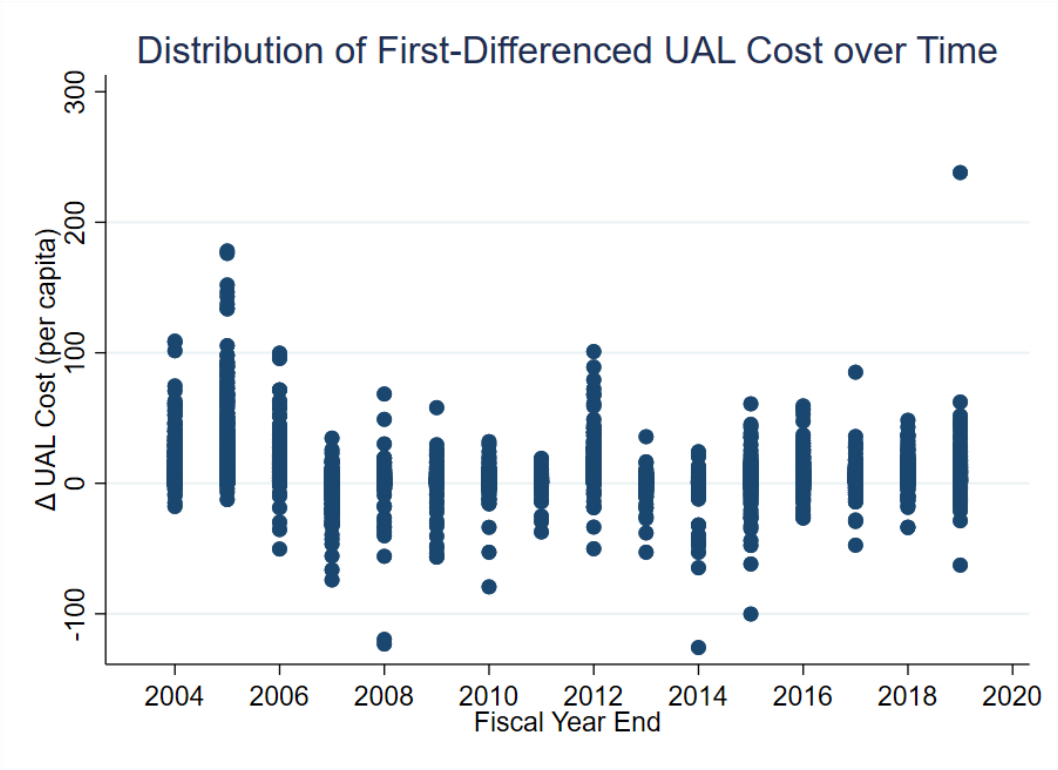
Source: Researcher-collected California pension data on CalPERS and other systems.

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.

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)
Current	1335	0.806	1338	0.808
	(840)	(0.114)	(963)	(0.113)
Non-current	360	0.194	329	0.191
	(401)	(0.114)	(311)	(0.113)
I. Current: Total				
Wages	460	0.272	422	0.250
	(329)	(0.100)	(330)	(0.086)
Emp. Benefits	271	0.160	319	0.185
	(215)	(0.084)	(284)	(0.083)
Normal Cost	46	0.027	49	0.029
	(38)	(0.014)	(39)	(0.013)
UAL Cost	12	0.006	48	0.028
	(20)	(0.010)	(46)	(0.017)
Other Current	682	0.421	693	0.423
	(484)	(0.141)	(540)	(0.143)
II. Current: Categorical				
Safety	457	0.291	469	0.306
	(275)	(0.105)	(297)	(0.103)
General Government	160	0.103	167	0.107
	(137)	(0.066)	(176)	(0.063)
Transportation	139	0.093	134	0.085
	(125)	(0.064)	(143)	(0.056)
Comm. Development	143	0.091	125	0.078
	(126)	(0.055)	(137)	(0.055)
Culture/Recreation	154	0.091	154	0.091
	(168)	(0.066)	(168)	(0.066)
Health	199	0.107	199	0.110
	(284)	(0.109)	(293)	(0.112)
III. Non-current				
Capital	278	0.155	226	0.134
	(309)	(0.109)	(237)	(0.100)
Debt	82	0.039	104	0.057
	(211)	(0.043)	(148)	(0.062)
N (cities)	372	372	387	387

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				
Police	240	270	217	282
	(129.9)		(111.8)	
Fire	162	200	157	184
	(120.9)		(144.3)	
EMS	54.7	90	65.3	91
	(73.6)		(84.3)	
II. UCR Crime and Arrest Rates				
Violent Crime	1048.6	368	838.6	378
	(580.5)		(513.2)	
Property Crime	3241.5	368	2367.6	378
	(1535.1)		(1127.2)	
Violent Arrests	587	368	517.3	378
	(395.5)		(376.6)	
Property Arrests	469.5	368	410.2	378
	(361.7)		(346.3)	

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. Public safety 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 Cov.	(3) City FE
	Panel A. Valuation UAL Cost on FTR Retirement and Benefit Spending		
UAL Cost	1.128***	1.108***	1.106***
	(0.194)	(0.193)	(0.213)
	[5972]	[5972]	[5972]
	Panel B. Persistence of UAL Cost on FTR Retirement and Benefit Spending		
UAL Cost, t-1	0.373**	0.348**	0.261*
	(0.148)	(0.150)	(0.153)
	[5581]	[5581]	[5581]
UAL Cost, t-2	0.149	0.146	0.060
	(0.205)	(0.209)	(0.232)
	[5190]	[5190]	[5189]
UAL Cost, t-3	0.261*	0.277*	0.275
	(0.149)	(0.153)	(0.175)
	[4805]	[4805]	[4804]
Model versions:			
Year FE	✓	✓	✓
Covariates	✓	✓	✓
Trended Covariates		✓	
City FE			✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city retirement and benefits spending, as reported in their Financial Transaction Reports. 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 2003-2019 from California Financial Transaction Reports (FTR) and researcher collected pension data.

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

	(1) Base	(2) Lagged Ind.	(3) Trended Cov.	(4) City FE	(5) Recession Donut	(6) Weighting
Current	-0.030	0.060	-0.065	0.343	-0.019	-0.080
	(0.229)	(0.275)	(0.237)	(0.274)	(0.254)	(0.313)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Wages	-0.267***	-0.234***	-0.280***	-0.191**	-0.240***	-0.285***
	(0.061)	(0.076)	(0.061)	(0.080)	(0.068)	(0.083)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Emp. Benefits	1.128***	1.056***	1.108***	1.106***	1.181***	1.280***
	(0.194)	(0.215)	(0.193)	(0.213)	(0.208)	(0.204)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Other Current	-0.430*	-0.317	-0.439*	-0.143	-0.486*	-0.493
	(0.246)	(0.278)	(0.251)	(0.299)	(0.267)	(0.304)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Non-current	-0.896*	-1.107*	-0.923**	-0.741	-1.056**	-1.318***
	(0.468)	(0.599)	(0.468)	(0.559)	(0.522)	(0.507)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Debt Service	-0.144	-0.177	-0.165	-0.069	-0.097	-0.359**
	(0.125)	(0.210)	(0.130)	(0.131)	(0.142)	(0.181)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Capital	-0.751*	-0.930	-0.758*	-0.672	-0.959*	-0.960**
	(0.453)	(0.586)	(0.453)	(0.545)	(0.500)	(0.407)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Model versions:						
Year FE	✓	✓	✓	✓	✓	✓
Covariates	✓	✓	✓	✓	✓	✓
Lagged UAL Cost		✓				
Trended Covariates			✓			
City FE				✓		
Weighted						✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city current and noncurrent expenditures. 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 2003-2019 from California Financial Transaction Reports (FTR) and researcher collected pension data.

Table 6: Results: First-differences, Categorical Expenditure

	(1) Base	(2) Lagged Ind.	(3) Trended Cov.	(4) City FE	(5) Recession Donut	(6) Weighting
Public Safety	0.354***	0.348***	0.365***	0.256***	0.444***	0.376***
	(0.116)	(0.129)	(0.120)	(0.097)	(0.132)	(0.130)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
General Government	0.178*	0.259**	0.183*	0.222*	0.104	0.276**
	(0.096)	(0.123)	(0.096)	(0.114)	(0.088)	(0.127)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Transportation	-0.066	-0.098	-0.066	-0.042	-0.031	-0.155*
	(0.064)	(0.085)	(0.064)	(0.081)	(0.074)	(0.088)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Community Development	0.045	0.068	0.051	0.003	0.053	0.117
	(0.067)	(0.066)	(0.066)	(0.071)	(0.076)	(0.186)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Culture/Recreation	0.042	0.112	0.037	0.136	0.051	0.127
	(0.172)	(0.203)	(0.172)	(0.202)	(0.183)	(0.160)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Health	-0.096	0.021	-0.129	0.068	-0.207	-0.241
	(0.137)	(0.211)	(0.137)	(0.160)	(0.163)	(0.170)
	[5970]	[5579]	[5970]	[5970]	[4493]	[5970]
Model versions:						
Year FE	✓	✓	✓	✓	✓	✓
Covariates	✓	✓	✓	✓	✓	✓
Lagged UAL Cost		✓				
Trended Covariates			✓			
City FE				✓		
Weighted						✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city outcomes. 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 2003-2019 from California Financial Transaction Reports (FTR) and researcher collected pension data.

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

	(1) Base	(2) Lagged Ind.	(3) Trended Cov.	(4) City FE	(5) Recession Donut	(6) Weighting
Police Emp.	-0.110**	-0.097	-0.099**	-0.118**	-0.098**	-0.099**
	(0.049)	(0.064)	(0.049)	(0.048)	(0.045)	(0.041)
	[4420]	[4136]	[4420]	[4419]	[3317]	[4420]
Fire Emp.	-0.046	-0.003	-0.049	-0.038	-0.050	-0.039
	(0.030)	(0.032)	(0.032)	(0.035)	(0.034)	(0.027)
	[3039]	[2832]	[3039]	[3036]	[2258]	[3039]
EMS Emp.	0.044	0.059	0.040	0.030	0.053*	0.045
	(0.029)	(0.040)	(0.029)	(0.031)	(0.029)	(0.075)
	[1436]	[1351]	[1436]	[1435]	[1050]	[1436]
Model versions:						
Year FE	✓	✓	✓	✓	✓	✓
Covariates	✓	✓	✓	✓	✓	✓
Lagged UAL Cost		✓				
Trended Covariates			✓			
City FE				✓		
Weighted						✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city public safety employment outcomes. 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 2003-2019 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) Lagged Ind.	(3) Trended Cov.	(4) City FE	(5) Recession Donut	(6) Weighting
Crime Cost	0.223**	0.269**	0.228**	0.295**	0.286***	0.285**
	(0.095)	(0.105)	(0.095)	(0.115)	(0.108)	(0.125)
	[5879]	[5491]	[5879]	[5879]	[4417]	[5879]
Violent Crime Rate	0.296**	0.375**	0.299**	0.401***	0.392***	0.379**
	(0.131)	(0.147)	(0.130)	(0.155)	(0.146)	(0.165)
	[5879]	[5491]	[5879]	[5879]	[4417]	[5879]
Property Crime Rate	0.532	0.369	0.618	0.571	0.484	0.688
	(0.481)	(0.491)	(0.475)	(0.605)	(0.553)	(0.528)
	[5879]	[5491]	[5879]	[5879]	[4417]	[5879]
Violent Arrest Rate	0.141	0.207	0.124	0.228	0.124	0.149
	(0.136)	(0.155)	(0.135)	(0.161)	(0.141)	(0.183)
	[5879]	[5491]	[5879]	[5879]	[4417]	[5879]
Property Arrest Rate	-0.257	-0.332	-0.256	-0.208	-0.239	-0.081
	(0.183)	(0.220)	(0.183)	(0.213)	(0.198)	(0.189)
	[5879]	[5491]	[5879]	[5879]	[4417]	[5879]
Violent Clearance Rate	0.002	0.006	0.001	0.004	-0.004	-0.004
	(0.011)	(0.013)	(0.011)	(0.013)	(0.012)	(0.012)
	[5815]	[5433]	[5815]	[5815]	[4370]	[5815]
Property Clearance Rate	-0.010*	-0.013*	-0.011*	-0.009	-0.009	-0.007
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.005)
	[5815]	[5433]	[5815]	[5815]	[4370]	[5815]
Model versions:						
Year FE	✓	✓	✓	✓	✓	✓
Covariates	✓	✓	✓	✓	✓	✓
Lagged UAL Cost		✓				
Trended Covariates			✓			
City FE				✓		
Weighted						✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city crime outcomes. 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 2003-2019 from researcher collected pension data and the Uniform Crime Reporting Return A files.

Appendix A. Comparisons to other City Data

To my knowledge, the California FTR data has only previously been used by (Liao and Kousky, 2022). 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.[28] 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,

[28]Cities Financial Transactions Report Instructions, California State Controller's Office.[29]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 A1: 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 A2: 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 B. 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.[30][31] 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.

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

[31] I should again note here the institutional lag between actuarial valuations and city payments to their retirement plan, which allows me to study municipal outcomes out to 2019.

Actuarial Office
P.O. Box 1494
Sacramento, CA 95812
Telecommunications Device for the Deaf - (916) 795-3240
(888) CalPERS (225-7377) FAX (916) 795-2744

August 24, 2006

MISCELLANEOUS PLAN OF THE CITY OF RIVERSIDE (EMPLOYER # 79)
Annual Valuation Report as of June 30, 2005

Dear Employer,

Enclosed please find a copy of the June 30, 2005 actuarial valuation report of your pension plan. This report contains important actuarial information about your pension plan at CalPERS. Your CalPERS staff actuary is available to discuss the report with you.

Changes Since Prior Year's Valuation

There may be changes specific to your plan such as contract amendments and funding changes.

In lieu of sending employer contributions on a reportable payroll cycle, Public Agencies can now prepay their annual required contributions. With this report, we have added a line entitled "Annual Prepayment Option". The discounted amounts payable under this option are shown on Page 5 for the 2006/2007 and 2007/2008 fiscal years.

Future Contribution Rates

The exhibit below displays the required employer contribution rate and Superfunded status for 2007/2008 along with an estimate of the contribution rate and the probable Superfunded status for 2008/2009. The estimated rate for 2008/2009 is based solely on a projection of the investment return for fiscal 2005/2006, namely 11%. Please disregard any projections that we may have provided to you in the past.

Fiscal Year	Employer Contribution Rate	Superfunded?
2007/2008	13.295%	NO
2008/2009	13.1% (projected)	NO

Member contributions (whether paid by the employer or the employee) are in addition to the above rates.

The estimate for 2008/2009 also assumes that there are no future amendments and no liability gains or losses (such as larger than expected pay increases, more retirements than expected, etc.). **This is a very important assumption because these gains and losses do occur and can have a significant effect on your contribution rate.** Even for the largest plans, such gains and losses often cause a change in the employer's contribution rate by one or two percent, even larger in some less common instances. These gains and losses cannot be predicted in advance so the projected employer contribution rate for 2008/2009 is just an estimate. Your actual rate for 2008/2009 will be provided in next year's report.

We are very busy preparing actuarial valuations for other public agencies and expect to complete all such valuations by the end of October. We understand that you might have a number of questions about these results. While we are very interested in discussing these results with your agency, in the interest of allowing us to give every public agency their result, we ask that, if at all possible, you wait until after October 31 to contact us with questions. If you have questions, please call (888) CalPERS (225-7377).

Sincerely,

Ronald L. Seeling, Ph.D., F.C.A., A.S.A., M.A.A.A.
Enrolled Actuary
Chief Actuary, CalPERS

Purpose of the Report

This report presents the results of the June 30, 2005 actuarial valuation of the MISCELLANEOUS PLAN OF THE CITY OF RIVERSIDE of the California Public Employees' Retirement System (CalPERS). The valuation was performed by CalPERS staff actuaries in order to:

- set forth the actuarial assets and funding liabilities of this plan as of June 30, 2005;
- certify the actuarially required employer contribution rate of this plan for the fiscal year July 1, 2007 through June 30, 2008 is 13.295%;
- provide actuarial information as of June 30, 2005 to the CalPERS Board of Administration and other interested parties; and
- provide pension information as of June 30, 2005 to be used in financial reports subject to Governmental Accounting Standards Board (GASB) Statement Number 27 for a Single Employer Defined Benefit Pension Plan.

Use of this report for other purposes may be inappropriate.

Required Contributions

	Fiscal Year 2006/2007	Fiscal Year 2007/2008
Required Employer Contributions		
Employer Contribution Required (in Projected Dollars)		
Payment for Normal Cost	$ 10,067,274	$ 11,019,336
Payment on the Amortization Bases	1,243,474	1,315,454
Total (not less than zero)	$ 11,310,748	$ 12,334,790
Annual Prepayment Option*	$ 10,896,391	$ 11,882,919
Employer Contribution Required (Percentage of Payroll)		
Payment for Normal Cost	11.732%	11.877%
Payment on the Amortization Bases	1.449%	1.418%
Total (not less than zero)	13.181%	13.295%
Required Employee Contributions (Percentage)	8.000%	7.998%

Funded Status

	June 30, 2004	June 30, 2005
Present Value of Projected Benefits	740,422,199	794,315,091
Entry Age Normal Accrued Liability	611,840,609	655,641,557
Actuarial Value of Assets (AVA)	537,352,357	634,694,032
Unfunded Liability	$ 74,488,252	$ 20,947,525
Funded Status (on an AVA basis)	87.8%	96.8%
Market Value of Assets (MVA)	$ 528,829,222	$ 649,694,885
Funded Status (on an MVA basis)	86.4%	99.1%
Superfunded Status	No	No

*Payment must be received by CalPERS between July 1 and July 15.

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 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 the left-hand-side or the bolded quantity in the numerator of 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.

Appendix C. Additional Tables

Table C1: Results: First-differences, Tax

	(1) Base	(2) Lagged Ind.	(3) Trended Cov.	(4) City FE	(5) Recession Donut	(6) Weighting
Property Tax	-0.006	-0.016	-0.001	-0.064	-0.005	-0.053
	(0.043)	(0.043)	(0.043)	(0.043)	(0.049)	(0.048)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Sales Tax	0.015	0.021	0.027	-0.026	0.017	0.041
	(0.053)	(0.055)	(0.053)	(0.050)	(0.062)	(0.042)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Other Tax	0.108	0.086	0.116	-0.009	0.100	0.070
	(0.084)	(0.088)	(0.082)	(0.082)	(0.093)	(0.056)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Num. of Tax Measures	-0.001	-0.001	-0.000	-0.001	-0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Any Tax Measures	-0.000	-0.001	-0.000	-0.001	-0.001	0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Assessed Value	16.789	22.494*	18.648	-8.513	14.141	-4.308
	(14.277)	(11.926)	(14.223)	(12.237)	(15.634)	(12.921)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Taxable Sales	-1.078	-0.543	-0.632	-7.704	-0.510	2.227
	(5.956)	(5.678)	(5.988)	(5.900)	(6.025)	(3.762)
	[3405]	[3393]	[3405]	[3405]	[3034]	[3405]
Model versions:						
Year FE	✓	✓	✓	✓	✓	✓
Covariates	✓	✓	✓	✓	✓	✓
Lagged UAL Cost		✓				
Trended Covariates			✓			
City FE				✓		
Weighted						✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city outcomes. 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 2003-2019 from California Financial Transaction Reports (FTR), researcher collected pension data, ballot measures from California Elections Data Archive (CEDA), and assessed property value from the California State Controller's Office.

Table C2: Results: First-differences, Debt

	(1) Base	(2) Lagged Ind.	(3) Trended Cov.	(4) City FE	(5) Recession Donut	(6) Weighting
Num. of Outstanding Debts	0.002	0.004**	0.001	0.002	0.002	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)
	[5433]	[5079]	[5433]	[5432]	[4094]	[5433]
Amount Debt Issued	0.953	0.952	0.971	1.228*	0.464	1.090
	(0.617)	(0.844)	(0.613)	(0.672)	(0.528)	(0.916)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Outstanding Principal	0.191	-0.073	0.188	0.454	-0.032	-0.670
	(0.871)	(1.010)	(0.881)	(0.865)	(0.959)	(0.945)
	[5433]	[5079]	[5433]	[5432]	[4094]	[5433]
General Fund	0.163	0.167	0.185	-0.060	0.175	-0.131
	(0.271)	(0.315)	(0.271)	(0.339)	(0.315)	(0.349)
	[5972]	[5581]	[5972]	[5972]	[4493]	[5972]
Model versions:						
Year FE	✓	✓	✓	✓	✓	✓
Covariates	✓	✓	✓	✓	✓	✓
Lagged UAL Cost		✓				
Trended Covariates			✓			
City FE				✓		
Weighted						✓

Notes: First-difference estimates of the impact of city unfunded actuarial liability (UAL) payment on city outcomes. 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 2003-2019 from California Financial Transaction Reports (FTR) and researcher collected pension data.

Table C3: Key Results: Heterogeneity and Robustness

	(1) Base	(2) <=50k Pop.	(3) >50k Pop.	(4) <= 130% '03 Funding	(5) > 130% '03 Funding	(6) <= State Dem. Share	(7) > State Dem. Share	(8) Trim 5% ΔUAL Cost	(9) Trim 5% CoG Diff.
Current	-0.030	0.016	-0.179	-0.070	-0.087	-0.219	0.093	0.173	-0.115
	(0.229)	(0.273)	(0.463)	(0.322)	(0.325)	(0.403)	(0.269)	(0.218)	(0.250)
	[5972]	[3593]	[2379]	[2639]	[3136]	[3313]	[2652]	[5322]	[5452]
Non-current	-0.896*	-0.870	-1.082**	-1.039	-0.754*	-0.496	-1.180	-0.546	-1.020**
	(0.468)	(0.632)	(0.508)	(0.781)	(0.440)	(0.420)	(0.739)	(0.402)	(0.512)
	[5972]	[3593]	[2379]	[2639]	[3136]	[3313]	[2652]	[5322]	[5452]
Wages	-0.267***	-0.266***	-0.308***	-0.264***	-0.305***	-0.211**	-0.288***	-0.231***	-0.304***
	(0.061)	(0.071)	(0.117)	(0.079)	(0.118)	(0.094)	(0.086)	(0.063)	(0.060)
	[5972]	[3593]	[2379]	[2639]	[3136]	[3313]	[2652]	[5322]	[5452]
Emp. Benefits	1.128***	1.087***	1.269***	1.371***	0.677**	1.277***	1.016***	1.056***	1.207***
	(0.194)	(0.219)	(0.416)	(0.277)	(0.279)	(0.187)	(0.313)	(0.181)	(0.195)
	[5972]	[3593]	[2379]	[2639]	[3136]	[3313]	[2652]	[5322]	[5452]
Other Current	-0.430*	-0.396	-0.546	-0.673*	-0.114	-0.727*	-0.250	-0.137	-0.549**
	(0.246)	(0.309)	(0.480)	(0.352)	(0.301)	(0.417)	(0.297)	(0.199)	(0.259)
	[5972]	[3593]	[2379]	[2639]	[3136]	[3313]	[2652]	[5322]	[5452]
Public Safety	0.354***	0.419***	0.108	0.335*	0.266***	0.238**	0.395**	0.184***	0.336***
	(0.116)	(0.158)	(0.109)	(0.184)	(0.078)	(0.106)	(0.164)	(0.064)	(0.128)
	[5972]	[3593]	[2379]	[2639]	[3136]	[3313]	[2652]	[5322]	[5452]
General Government	0.178*	0.100	0.340	0.211	0.078	0.162	0.179	0.202	0.183*
	(0.096)	(0.092)	(0.229)	(0.151)	(0.107)	(0.119)	(0.144)	(0.124)	(0.108)
	[5972]	[3593]	[2379]	[2639]	[3136]	[3313]	[2652]	[5322]	[5452]
Police Emp.	-0.110**	-0.127**	-0.073	-0.144**	-0.074	-0.118	-0.080	-0.132**	-0.087*
	(0.049)	(0.064)	(0.051)	(0.062)	(0.076)	(0.083)	(0.049)	(0.061)	(0.048)
	[4420]	[2565]	[1855]	[2303]	[1980]	[2307]	[2113]	[4017]	[4098]
Crime Cost	0.223**	0.244**	0.094	0.225*	0.098	0.041	0.415***	0.182	0.211**
	(0.095)	(0.122)	(0.140)	(0.119)	(0.175)	(0.137)	(0.137)	(0.127)	(0.102)
	[5879]	[3500]	[2379]	[2589]	[3093]	[3288]	[2584]	[5238]	[5359]
Property Tax	-0.006	0.020	-0.115**	-0.014	-0.036	-0.005	-0.042	-0.030	-0.018
	(0.043)	(0.054)	(0.056)	(0.060)	(0.047)	(0.071)	(0.048)	(0.036)	(0.045)
	[5972]	[3593]	[2379]	[2639]	[3136]	[3313]	[2652]	[5322]	[5452]
Sales Tax	0.015	0.026	-0.005	-0.017	0.078	0.084	-0.055	-0.013	0.022
	(0.053)	(0.072)	(0.049)	(0.069)	(0.084)	(0.071)	(0.071)	(0.062)	(0.058)
	[5972]	[3593]	[2379]	[2639]	[3136]	[3313]	[2652]	[5322]	[5452]

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. Column 1 reproduces the results from previous tables from that also appeared in Column 1. Columns 2 and 3 split the sample of cities based on their average population over the panel falling below or above 50,000, respectively. Columns 4 and 5 split the sample based on whether the ratio of pension assets to liabilities in 2003 was below or above 130%. Columns 6 and 7 split the sample into cities with Democratic voter registration shares in 2003 which are below or above the state average. Column 8 trims the top 5% and bottom 5% of cities in terms of the change in the city UAL cost. Column 9 trims the top 5% and bottom 5% of cities in terms of the percent difference of salary and wage expenditures reported in the FTRs and the Census of Governments in 2012. 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 2003-2019 from California Financial Transaction Reports (FTR) and researcher collected pension data.