Fiscal Stimulus or Debt Relief: The Effect of Federal Pandemic Aid on State and Local Pensions*

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June 4, 2025

Abstract

Between 2020-2021, the U.S. federal government passed four major pieces of legislation that included nearly $1 trillion in aid to state and local governments. One concern with distributing federal stimulus in the form of intergovernmental transfers is that subnational governments may use the aid to pay down unfunded pension liabilities or other debt rather than preserve employment. We examine the effect of fiscal stimulus passed in response to Covid-19 on public pensions. To address concerns about endogeneity, we use a difference-in-difference design and an instrumental variable estimator that relies on variation in congressional representation. We find that "excess" pension contributions increased, primarily in governments with low funding ratios, but that these increases represented less than one percent of total federal funding. We also find that governments reacted to pandemic aid by adopting more conservative assumptions for the calculation of pension liabilities.

JEL Codes: H77, H75, E62

Keywords: fiscal stimulus, intergovernmental grants, public pensions

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1 Introduction

Between 2020-2021, the U.S. federal government passed four major pieces of legislation that included nearly $1 trillion in aid to state and local governments. These aid packages, part of a series of bills aimed at mitigating the public health and economic impacts of the Covid-19 pandemic, represented macroeconomic stabilization of an unprecedented scale, with the second of these bills, the CARES Act, alone standing as the largest economic stimulus package in U.S. history (Wire, 2020). This extraordinary influx of aid would ultimately far surpass the fiscal gaps created by the pandemic and recession (Walczak, 2021; Committee for a Responsible Federal Budget, 2021; Greenblatt, 2021), creating a unique set of budgetary opportunities for state and local governments as well as a rare opportunity to study the interplay between fiscal federalism and local public finance.

One of the main concerns with intergovernmental transfers is that, due to misaligned preferences across different levels of governments, subnational governments may not use the funds in a manner consistent with the preferences of the higher-level government. A primary purpose of aid to state and local governments is typically to support public sector employment. Because state and local governments face balanced budget requirements that prevent them from financing operating deficits, federal aid can serve as an efficient form of fiscal stimulus as it directly preserves employment by preventing public sector layoffs. Indeed, one of the stated purposes of the American Recue Plan was to preserve jobs for front line public workers (The White House, 2021). However, due to the unprecedented size of the aid packages passed in 2020 and 2021, concerns arose immediately about how states would direct these funds and whether or not the bills represented an efficient use of federal resources (Ben-Achour, 2020), especially as state and local governments proved to be more resilient to the Covid-19 pandemic and the ensuing downturn than originally projected (Clemens et al., 2022a). One of the primary concerns raised was that governments would use the aid to "bail out state pensions" (Hulse, 2020).

When measured at their market values, unfunded public pension liabilities represent the largest liability for state and local governments in the United States (Giesecke and Rauh, 2022), exceeding fixed-income obligations in the municipal bond market. As of fiscal year 2021, the total book value of unfunded liabilities was over $1 trillion, while some estimates put the market value at more than six times that amount (Giesecke and Rauh, 2022). For governments facing a projected surplus due to the large amount of federal fiscal assistance, one natural response would be to shore up their balance sheets by paying down these unfunded liabilities.

In this paper, we examine the effect of the fiscal stimulus passed in response to Covid-19 on public pension funds. To address concerns about endogeneity, we use a difference-in-difference design and an instrumental variable estimator that relies on variation in congressional representation. We consider the effect on government contributions to pension funds by aggregating pension funds to the level of the sponsoring governments and examining pension contributions in excess of "regular" contributions, i.e. contributions that are based on a fixed percentage of payroll set at the start of the fiscal year. We remove regular contributions to avoid the contamination caused by the pandemic's effect on the public sector payroll and to more accurately assess whether governments adhered to federal regulations; since pension costs fluctuate directly with payroll, federal stimulus efforts that effectively supported public sector employment automatically resulted in higher pension costs. We examine the robustness of our results to different ways of measuring the amount of aid that governments received, and we explore heterogeneity in the effect of aid across different types of governments. We also consider the effect of federal stimulus on the actuarial assumptions used by governments to calculate their pension liabilities, namely the discount rate and the amortization period.

We find that state and local governments did increase their "excess" pension contributions in 2021-2022. However, these increases were small relative to the total size of federal stimulus. In our preferred specification, an additional thousand dollars of aid per capita

resulted in an increase of 7 dollars per capita in "excess" contributions. When we use a more narrow measure of aid, in which we look only at general aid allocated directly to governments, we find that an additional thousand dollars of aid per capita results in an increase of 13-15 dollars per capita. In heterogeneity analyses, we show that governments with lower funding ratios saw larger increases in contributions. We also find that an additional thousand dollars of aid per capita caused governments to lower their amortization periods by 1.8 years on average and decrease their discount rates by 0.3 percentage points.

We contribute to two distinct areas of research. First, we contribute to the literature that probes the budgetary incidence of federal transfers. The fiscal federalism literature has long concerned itself with the proper role of the central government in the provision of local public goods (Oates, 1972; Tiebout, 1956), and the efficacy of intergovernmental grants is a central component of this literature. Early estimates based on unrestricted block grants found support for the "flypaper effect," suggesting that federal grants stick where they are targeted (Clemens and Veuger, 2023; Hines and Thaler, 1995; Gamkhar and Oates, 1996). A later set of papers relying on exogenous variation in restricted grant funding found that federal grants can induce significant crowd out of state funds (Gordon, 2004; Knight, 2002). More recent work on Medicaid suggests that state spending is unresponsive to federal cost-sharing (Leung, 2022). To our knowledge, very little of this work has looked at the effect of grants on debt reduction, particularly as it relates to the pension system.

We also contribute to a more narrow literature on how governments respond to fiscal windfalls. State and local governments have at times experienced significant, unexpected increases in resources for reasons unrelated to intergovernments grants, such as natural resource windfalls (Raveh and Tsur, 2020; James, 2015), legal settlements (Johnson et al., 2013), or federal tax reform (Ladd, 1993). These papers have largely found that governments respond to windfalls with a mix of spending increases and tax reduction, though Raveh and Tsur (2020) find that resource windfalls can in fact lead to increases in public debt.

In a concurrent paper, Clemens et al. (2024) also look at the budgetary incidence

of pandemic-era fiscal aid to states, finding that 38 cents per dollar of federal aid flowed to general state government expenditures and 7 cents flowed to pension funding. Similar to this paper, the authors exploit variation driven by the strength of political representation and draw upon federal aid data from the Committee for a Responsible Federal Budget's (CRFB) Covid-19 Money Tracker. However, while that paper focuses on the overall incidence of the aid, this paper looks specifically at the effect on pension funding by plotting the pre- and post-pandemic trajectories of various pension-related outcomes and by examining the actuarial assumptions used by governments. In addition, rather than looking at the total amount of federal aid that went toward pension spending, this paper focuses on "excess" contributions to avoid the contamination caused by the pandemic's effects on the public sector payroll.

This paper proceeds as follows. In section 2 we provide background on the various pieces of legislation that included aid to state and local governments. In section 3 we describe the data, and in section 4 we discuss our empirical strategy. Section 5 presents the results, including a series of descriptive figures that highlight the pre- and post-treatment trends in various pension-related outcomes. Section 6 concludes.

2 Background

2.1 State and Local Pensions

Unlike the private sector, which has largely shifted to account-based defined contribution (DC) plans, state and local governments overwhelmingly offer their employees defined benefit (DB) pension plans. These plans provide a fixed stream of income for government workers in retirement and lead governments to shoulder the investment and mortality risk associated with the obligations. While a small number of state governments have begun to offer DC or hybrid plans to new hires rather than DB plans, traditional DB plans still cover approximately 90 percent of public sector workers and represent more than 90 percent of assets

(Munnell et al., 2014).

When measured at their market values, the unfunded liabilities associated with DB plans represent the largest liability of subnational government entities. While the reported value of these liabilities as of fiscal year 2021 is $1.076 trillion, this rises to approximately $6.5 trillion under a market-based valuation, exceeding the $4 trillion in outstanding fixed-income obligations (Giesecke and Rauh, 2022). The market valuation reflects the fact that state and local governments are contractually and legally obligated to pay out benefits regardless of the performance of pension assets and accordingly uses risk-free discount rates.[1] In contrast, the book values use discount rates primarily based on expected rates of return in accordance with government accounting standards.

What implications do these valuations have for financial management at the state and local level? While the valuation of pension liabilities has been the subject of extensive academic work (see, for example, Novy-Marx and Rauh (2009, 2011); Brown and Wilcox (2009)), there is less agreement over the sustainability of current funding practices. Some researchers argue that pensions are fiscally sustainable in a low-risk environment (Lenney et al., 2021), while others contend that fiscal sustainability requires significantly higher contributions than governments have made to date (Costrell and McGee, 2022; Rauh, 2021; Lucas, 2021). Regardless of the assumptions one makes about the future trajectory of interest rates, two things are clear. First, governments have been failing to meet the contributions recommended even under current discount rates; recommended contribution rates between 2014-2021 exceeded actual contributions by 2-3 percent (Giesecke and Rauh, 2022). Second, governments face significant investment risk. Under the assumption that pension assets achieve a real return of 5 percent during the next fifty years, state and local governments will need to make contributions equivalent to 12.9 percent of their wages and salaries. If pension assets instead see a real return of 2.5 percent, contributions will need to rise to ap-

[1] In practice, governments have at times successfully reduced net pension benefits for current employees, primarily through increases to employee pension contributions and reductions to COLAS (cost of living adjustments) (Aubry and Crawford, 2017). Courts have ruled that benefit reductions may be permissible if rising costs threaten essential public services (Biggs et al., 2022).

proximately 23 percent of wages (US Government Accountability Office, 2018), highlighting the sensitivity of state and local finances to variation in pension funding ratios.

2.2 Covid-19 Legislation

Following Clemens and Veuger (2021), we focus on four pieces of legislation passed during the Covid-19 pandemic that provided aid to state and local governments: the Families First Coronavirus Response Act (FFCRA), the CARES Act, the Response and Relief Act (RRA), and the American Rescue Plan Act (ARPA). All four bills were signed within a one year period, spanning March 18, 2020 (Families First) to March 11, 2021 (American Rescue Plan). Combined, these four bills provided approximately $900 billion in aid to state and local governments as part of more than $5 trillion in fiscal support. The American Rescue Plan allocated the most to state and local governments, at $520 billion, followed by the CARES Act ($190 billion), the FFCRA ($105 billion), and the RRA ($80 billion). Of the total $900 billion in state and local aid, $350 billion was provided for direct aid, $195 billion for education funding, $149 billion to mitigate the effects of the coronavirus outbreak, $118 billion in Medicaid matching funds, and $70 billion for transit grants (Committee for a Responsible Federal Budget, 2024). Appendix Table A1 provides a summary of the four bills.

The bills allocated funds in different ways. The CARES Act allocated funds to state, local, tribal, and territorial governments through the Coronavirus Relief Fund, with the amount awarded to each state proportional to its population, with a minimum of $1.25 billion. The ARPA, in contrast, awarded $500 million in direct aid to each state, then awarded a further $169 billion on the basis of each state's share of unemployed workers between October 2020 and January 2021. While the CARES Act let local governments apply for funds that would be deducted from their state's total, the ARPA included $130 billion in direct aid for cities and counties. The CARES Act stipulated that the Coronavirus Relief

Fund could only be used to cover expenses incurred between March 2020 and December 2022, while the ARPA's Coronavirus State and Local Fiscal Recovery Funds had to be obligated by December 2024 and spent by December 2026. The FFCRA and the RRA primarily allocated funds by, respectively, increasing the federal share of Medicaid and by providing formula funding to schools.

Unlike the CARES Act, which forbid governments from using federal funds for deficit reduction (U.S. Department of the Treasury, 2021), the ARPA specifically allowed governments to use the funds to close budget gaps. However, the ARPA did place some restrictions on the use of funds. Funds could not be used "to directly or indirectly offset a reduction in net tax revenue", nor could they be used "for deposit into any pension fund" (U.S. Department of the Treasury, 2021). The Treasury Department further clarified that,

> "in the context of the restriction on deposits into pension funds, 'deposit' means an extraordinary payment of an accrued, unfunded liability. The term deposit does not refer to routine contributions made by an employer to pension funds as part of the employer's obligations related to payroll, such as either a pension contribution consisting of a normal cost component related to current employees or a component addressing the amortization of unfunded liabilities calculated by reference to the employer's payroll costs" (U.S. Department of the Treasury, 2023).

In other words, to the extent that the stimulus preserved state and local jobs, governments could use ARPA funds to pay routine compensation expenses, including making contributions to cover accrued pension benefits. However, governments could not use the funds to pay down a significant portion of their unfunded liability.

After the Treasury Department issued regulations explaining these restrictions, the attorney general of Ohio filed a lawsuit, claiming that the tax cut ban impinged on the sovereignty of states. A separate suit was later filed by the attorneys general of Tennessee and Kentucky. In both cases, federal judges ruled that the ARPA provision barring tax cuts was unconstitutional (Gleason, 2021).

These lawsuits did not touch on pension funding, though it is possible that they contributed to some confusion over how the ARPA regulations would be enforced. Anecdotal evidence suggests that at least some government executives believed that stimulus-related budget surpluses could be used toward pension relief (Phaneuf, 2022). However, even in the absence of legal ambiguity, the fungibility of government aid means that states and localities receiving federal assistance may have been able to circumvent funding restrictions; any money that would ordinarily be spent on education, health, and transit, was freed up to be spent elsewhere, including on pensions. We explore the extent to which the extraordinary scope and size of this federal assistance resulted in improvements in public pension funding.

2.3 Conceptual Framework

Consider a government that administers a pension system with assets A and present discounted value of liabilities L. The unfunded liabilities $(L - A)$ represent a form of soft debt that reflects either the government's failure to make past contributions or to achieve the assumed rate of return on investments. The unfunded liabilities carry an interest cost, c.

Each year the government faces an expense equal to the benefits accrued in the current period. Should the government fail to cover this cost, it is similarly able to finance the missed payment at an interest rate of c. The value of c reflects the expected rate of return on pension assets, i.e. the opportunity cost of failing to allocate funds to the pension system where they can be invested, as well as the risk that the pension fund will be depleted and unable to cover outlays related to benefit payments in the current period, with attendant legal and political costs. This latter term is higher for governments with lower funding levels and negligible for governments with fully funded pensions.

Now consider the case whereby a government receives a positive budgetary shock in the

form of federal aid dollars. In principle, the government will allocate these dollars to the activity with the highest marginal social return, r_s. Only if the government faces interest costs on the margin that are higher than the social return that it can otherwise obtain will it divert funds to its pension system, i.e. it will allocate its windfall revenues to the pension system so long as $c > r_s$. Only when $c = r_s$ will the government be indifferent between allocating funding to the pension system and allocating windfall revenues to some alternative activity.

3 Data and Variables

3.1 Data sources

Our primary data source is the Public Plans Database, maintained by the Center for Retirement Research at Boston College and other partners. The Public Plans Data contains annual data on the largest state and local defined benefit pension plans in the United States, accounting for 95 percent of state and local pension assets. In order to draw conclusions about the allocation of federal assistance, we aggregate pension information to the level of the sponsoring government. That is, if a state government administers separate pension plans for general employees and teachers, then we sum the contributions to these plans to arrive at the total amount of contributions made by the state government. Similarly, if a local government, e.g. New York City, administers separate pension plans for general government employees and for public safety workers, we sum the contributions to these plans so that they all fall under New York City. Our dataset includes 113 governments, encompassing 50 states and 63 localities, over the years 2016-2022.

For data on federal assistance, we draw on the Covid-19 Money Tracker developed by the Committee for a Responsible Federal Budget (Committee for a Responsible Federal Budget, 2024). The Money Tracker provides detailed information about the disbursement of federal Covid-19 aid by recipient and year. We further supplement our analysis with

geographically-specific unemployment rate data from the American Community Survey and SNAP data from the USDA. Table 1 presents summary statistics.

3.2 Pandemic aid

One challenge we face is measuring the precise amount of aid received by individual government entities. It is not always clear how to measure the total amount of aid that a government receives when it receives different types of aid through various related parties, such as when state transportation agencies, which are distinct government entities, receive funds directly from the federal government. Furthermore, because we include both state and local governments in our sample, we must determine how much of the aid allocated to a particular state was available to cities and counties within the state that administer their own defined benefit pension plans.

The approach we take is twofold. First, we define two different measures of aid: a "narrow" measure that includes only general aid allocated directly to a particular government entity and a "broad" measure that includes all aid allocated to a given government, including aid to specific agencies and related parties. For example, under our broad measure, aid to the state government of Alabama would include aid to the state's education department, its health department, state transportation agencies, and any Medicaid matching funds. Aid to the city of Birmingham – in our sample because it administers its own defined benefit pension plans – would include any aid to the city as well as any of the city's agencies or public authorities that operate specifically in the city; for public authorities that include the city as only part of its service area, such as the Birmingham-Jefferson County Transit Authority, we apportion aid to the city by the city's share of the population.

Under our narrow measure, the only aid that would qualify as aid allocated to the state government would be general aid specifically designated to "State of Alabama"; the only aid that would qualify as aid allocated to the city of Birmingham would be general

aid specifically designated to "City of Birmingham." In practice, our narrow measure only includes funds allocated through the Coronavirus Relief Fund (CARES) or the State and Local Fiscal Recovery Funds (ARPA) since the FFCRA and RRA did not allocate any general aid directly to governments. As shown in Table 1, under the broad measure of aid per resident, state and local governments received approximately $770 per capita on average; under the narrow measure, they received approximately half that amount. For our main analyses, we use the broad measure of aid under the assumption that any money directed to specific government functions is fungible and will affect that government's ability to direct funding to their pension system. However, in robustness tests we also show results for the narrow measure.

Second, we conduct a separate analysis that aggregates pension funding and all federal aid to the state level, i.e. we sum up all of the pension contributions to state and local plans within a state as well as all of the federal aid, and treat each state-year as a single observation. This latter analysis accounts for the fact that local governments potentially benefit from federal aid to state governments, and vice-versa, due to the pass-through of federal aid to states. This is most relevant in the case of education, as the CARES Act and the ARPA awarded grant funding (in the form of Elementary and Secondary School Emergency Relief Funds) to state education agencies for the purposes of distributing emergency relief to schools. Although most teacher pensions are administered through statewide plans, and thus potentially impacted by the receipt of funds by a state agency, the bulk of the aid was intended to reach local governments rather than the state.

For the purpose of assigning aid across years, we allocate aid from the FFCRA and the CARES Act to FY 2021, and we allocate aid from the RRA and the ARPA to FY 2022.[2] This allocation is based on the fact that most federal aid passed before April would inform

[2]The CARES Act specifically stipulated that federal funds could only be used for expenses not accounted for in the budget most recently approved as of the date of enactment (March 27, 2020). And while not all federal aid was disbursed immediately, we assume that budgetary decisions were made on the basis of funds available for obligation.

budget decision-making for the upcoming fiscal year beginning July 1.[3] However, in our empirical analysis, we do not focus on the effects of aid by year but rather the average effect across the two fiscal years in the immediate aftermath of the legislation.

3.3 Outcome variables

Our primary outcome of interest is the amount of employer contributions in excess of "regular" contributions, which we scale by population at time t-1. By "regular" contributions, we refer to contributions that are based on a fixed percentage of payroll set at the start of the fiscal year. Pension plan actuaries calculate required contributions as a fixed dollar amount at the start of the year, and then pension systems bill that amount to contributing governments as a percentage of payroll. Thus, if state and local governments use federal Covid-19 dollars to maintain payroll (i.e., increase payroll relative to the beginning-of-year projections), then federal aid will mechanically lead to an increase in "regular" contributions. Thus, we focus on contributions in excess of these regular contributions in order to ensure that our estimates are not contaminated by this mechanical relationship between payroll and federal stimulus. We scale our estimates by population, and we use lagged population rather than contemporaneous population because of the possibility that federal aid impacted population in the current period.

Our choice of "excess contributions" is directly motivated by the regulatory language related to State and Local Fiscal Recovery Funds. As we quote above, governments were allowed to make "routine contributions....to pension funds...as part of the employer's obligations related to payroll, such as either a pension contribution consisting of a normal cost component...or a component addressing the amortization of unfunded liabilities calculated by reference to the employer's payroll costs "(U.S. Department of the Treasury, 2023). We interpret "routine" contributions "calculated in reference to... payroll costs" to refer to those

[3]Forty six states use a fiscal year that ends June 30 (NCSL, 2023). In these states, FY 2021 begins July 1, 2020.

contributions based on a fixed percentage of payroll set at the start of the year, and consequently we focus on contributions in excess of that amount coming from the state or local government employers that might have constituted "an extraordinary payment of an accrued unfunded liability."

In supplemental analyses, we also look at the actuarial assumptions that governments use to calculate their liabilities and recommended payments. Specifically, we look at the discount rate and the amortization period. Under Government Accounting Standards Board (GASB) Statement 67, the discount rate that governments use is a "blended" rate whereby governments value the funded portion of liabilities based on the expected return on plan assets and any unfunded portion based on the return on tax-exempt municipal bonds. The amortization period is the amount of time required to pay off a retirement system's unfunded actuarial accrued liabilities (UAAL). Thus, governments that adopt lower discount rates and lower amortization periods are more conservative in their fiscal outlook; they will face higher pension contributions as a result of the assumption that investments will achieve lower rates of return and that the system will pay off its unfunded liability in a shorter period of time.

4 Empirical Methods

Our goal is to estimate the effect of the federal stimulus that was passed in response to the Covid-19 pandemic on government (employer) contributions to state and local pension funds. We also separately evaluate the effect on actuarial assumptions. We focus on contributions rather than funding levels because funding levels reflect cumulative stocks that are primarily affected by investment performance, whereas contribution rates are flows dictated by the active decisions of policymakers and a function of funding discipline and budgetary pressures. Because federal aid was awarded non-randomly, we face several challenges in isolating its effect on pensions. First among them is that the allocation of federal aid may

be endogenous. Policymakers may have awarded more fiscal assistance to those states and localities that were facing greater outbreaks of Covid-19 and/or facing greater budgetary pressures. In addition, insofar as the bills were intended to preserve employment, the aid may have been awarded disproportionately to regions facing greater job losses. This would generate a positive correlation between aid dollars and budgetary pressures, biasing downward any effect on pension contributions. Another concern is that governments receiving large amounts of federal aid may have been on different economic trajectories prior to the pandemic than governments receiving small amounts of aid.

To address these concerns, we use a difference-in-difference (DiD) design and an instrumental variables estimator. The DiD design exploits temporal variation in pension contributions before and after the receipt of pandemic aid as well as differences in aid across governments. To model the varying levels of aid, we use a continuous treatment variable. We use several different methods to explore whether there were differences in the pre-treatment trajectories of governments that received more or less federal fiscal assistance. First, we present graphical evidence of the parallel trends assumption, and we formally test the difference in trends. Finally, we estimate placebos that look at the effect of pandemic aid in 2019, the year prior to the outbreak of the pandemic.

Our instrumental variable approach draws on evidence from Clemens and Veuger (2021) and Clemens et al. (2022b), who show both that a state's per capita representation in Congress is strongly predictive of variations in per capita federal aid during the Covid-19 pandemic and also that the number of congressional representatives is orthogonal to the pandemic's effects on different states. Clemens and Veuger (2021) show evidence of a small-state bias across all four pieces of legislation that we study, concluding that an additional Senator or Representative per million residents is associated with an additional $670 dollars in combined state and local aid per capita, thereby satisfying the relevance condition for instrumental variables. To provide further confirmation of this relationship, we also evaluate the strength of the instrument formally using the standard F-test. In order to satisfy the

exclusion restriction, congressional representation must affect a government's pension contributions only through the federal fiscal assistance it received. Clemens and Veuger (2021) and Clemens et al. (2022b) show that the number of congressional representatives is orthogonal to a number of proxies for state and local fiscal condition, including revenue shocks, economic shocks, the size of the public sector, and acreage of public land. In addition, they also show that the instrument is uncorrelated with other elements of the federal relief packages, which might otherwise provide a path for congressional representation to affect states' fiscal condition. Given this evidence, it seems unlikely that congressional representation could impact state and local pension contributions through any channel other than through federal aid. Appendix Figure A1 shows states with congressional representation above and below the median.[4]

This leads us to estimate the following set of equations:

$$\frac{PandemicAid\_Post_{gt}}{Population_{g,t_{2020}}} = \alpha + \beta_1(\frac{Reps\_Post_{gt}}{Population_{g,t_{2020}}}) + \delta X_{gt} + \gamma_g + \epsilon_{gt} \tag{1}$$

$$Y_{gt} = \alpha + \beta_2 \frac{\widehat{PandemicAid\_Post_{gt}}}{Population_{g,t_{2020}}} + \vartheta X_{gt} + \zeta_g + \varepsilon_{gt} \tag{2}$$

In the first stage, we identify exogenous variation in the amount of per capital federal aid that was awarded to each government g in fiscal year t during the pandemic by regressing this aid on congressional representation per million residents. In the second stage, we examine how much this exogenous variation in federal assistance impacts pension contributions, and we use the pre-treatment period (t$<$ 2020) as a means of assessing the counterfactual path of pension funding. $PandemicAid_t$ represents the total amount of federal pandemic aid

[4]We measure congressional representation at the local level on the basis of representation at the state-level. That is, we use the same value for the cities and counties in a state as we use for the state government. We base this decision on the fact that all local governments within a state benefit from two senators, and moreover that apportioning the number of Representatives at the local level requires a number of assumptions about the distribution of influence. However, in robustness tests we show results for a measure of congressional representation that apportions the number of Representatives to local governments on the basis of population.

received by a jurisdiction during fiscal year t; our baseline approach uses a broad measure of aid, as defined above. When interacted with the "post" indicator, $PandemicAid\_Post_{gt}$ takes positive values during the "post-treatment" period (2021-2022) and zero otherwise. We use 2020 population figures to scale the aid. $Reps_g$ is the number of Representatives and Senators per million residents representing a jurisdiction in 2020; when interacted with the "post" indicator ($Reps\_Post_{gt}$), it takes positive values during the post-treatment period and zero otherwise. X_{gt} represents a vector of time-varying covariates that capture exogenous measures of fiscal stress, including the unemployment rate and the share of households receiving SNAP (both measured at time t-1). γ_g and ζ_g are government fixed effects. We cluster all standard errors at the government level.

Because the first bill awarding state aid was passed in March of 2020, toward the end of fiscal year 2020 for most state governments, we exclude FY 2020 from our analysis, and use FY 2021 and FY 2022 as "post-treatment" years. As noted in Section 3, we concentrate on measuring the average effect across these two post-treatment years, and thus our coefficient of interest, β_2, represents an average effect across fiscal years 2021 and 2022. However, in appendix tables, we also show additional results by year.

5 Results

5.1 Descriptive Results

Before presenting our regression results, we first show descriptive time-series evidence of trends in pension contributions before and after the distribution of federal stimulus. We treat FY 2016-2019 as the pre-pandemic period. As noted above, we exclude FY 2020 from our analysis because the first aid bills were passed at the end of that year, and use FY 2021 and FY 2022 as "post-treatment" years.

Figure 1 shows employer and employee pension contributions over time for our sample, which includes 46 state governments and 60 local governments.[5] Figure 1a shows the absolute (unscaled) amount of contributions from employers and employees. Figure 1b shows employer contributions as a percent of payroll. Figure 1c shows employer contributions as a percent of the actuarially determined contribution (ADC). The ADC represents an amount recommended by actuaries based on the sum of the cost of newly accruing pension benefits and the amortized cost of eliminating any unfunded liability. Figure 1d represents our variable of interest, employer contributions in excess of regular contributions. The figures exclude governments without complete sets of observations.[6]

Figure 1a suggests that the level of employer and employee contributions in 2021 and 2022 remained fairly consistent with the (upward sloping) pre-pandemic trends. When aggregated to the level of the government-year, employee contributions in 2020 are roughly one-third the size of employer contributions. As employee contributions are determined primarily by contract and by statute, and represent a far smaller share of the total contribution, we focus primarily on the employer share. (From this point, unless otherwise specified, we use "contribution" to refer to the employer contribution.)

Figures 1b and 1c suggest a slightly different conclusion than Figure 1a. When scaled by either payroll (1b) or the ADC (1c), employer contributions show stark increases in 2021-2022. As shown in Appendix Figure A2, payroll declined precipitously relative to the pre-pandemic trend as a result of the lay-offs that took place in the public sector in 2021 and 2022. The ADC flattened in 2021 before declining in 2022 because of the strong performance of equity markets in 2020-2021, which lowered unfunded liabilities. Thus, it appears that, in light of these decreases, generous federal assistance allowed governments to maintain their contributions in line with the pre-pandemic trend, effectively enabling them to contribute

[5]We exclude the District of Columbia because it has no representation in Congress. We also exclude governments with plans that do not separate their regular contributions from other components of the employer contributions. This includes Connecticut, Oklahoma, Vermont, Massachusetts, Charlotte, Duluth, and Minneapolis.

[6]Figure 1d includes data from 44 states and 55 local governments.

more than was recommended by actuaries. Prior to the pandemic, the average government contributed approximately 96 percent of the recommended amount. In 2022, (employer) contributions increased to approximately 106 percent of the recommended amount. As noted above however, these trends are not necessarily informative as to whether government channeled excess savings into their pension funds. To the extent that federal aid helped governments to preserve some portion of public sector jobs, then this would mechanically lead to higher pension costs as a share of the ADC, which is calculated on the basis of projected payroll at the start of the fiscal year.

Figure 1d suggests that "excess" pension contributions increased slightly in 2021-2022 relative to the pre-pandemic trend. However, the deviation from trend does not appear to be large. While these results are merely descriptive, they preview our more formal quantitative findings below.

5.2 Validation

We address concerns about parallel trends in our DiD design by examining graphically the evolution of pension funding prior to the pandemic for governments who received different amounts of federal aid. We divide the governments in our sample into two groups: those who received per capita federal aid above the median and those who received per capital federal aid below the median. Figure 2 shows the trends for both of these groups in terms of our primary outcome variable: "excess" contributions per capita. The figure confirms that the two groups are on parallel trends prior to diverging in 2021. We test this formally by regressing the outcome variable from 2016 to 2019 on an annual time trend and an annual time trend interacted with federal aid. The interaction term is insignificant with a p-value of 0.73.

5.3 Main Results - Effect of Federal Aid on Excess Employer Contributions

Table 2 presents our main results. As noted above, we focus on employer contributions in excess of regular contributions, and we scale our estimates by lagged population. Columns 1-2 show the results for OLS specifications with and without covariates. Columns 3-4 shows results for 2SLS specifications. Appendix Table A2 shows the results for the first stage. The coefficients in Table 2 are stable across the specifications and are all significant at the five percent level, with F-stats of 112 for the 2SLS specifications. The 2SLS specifications are very close in magnitude to the OLS results. The coefficients imply that an increase of $1,000 in aid per capita was associated with an increase of $7-8 in "excess" contributions per capita. In other words, for every dollar of federal funding, less than one cent (0.7-0.8 cents) flowed to excess pension contributions.[7] Appendix Table A3 breaks out the results by year. Consistent with the descriptive figures, the effects are larger in 2022 when the American Rescue Plan was rolled out. In that year, an increase of $1,000 in aid per capita is associated with a $8.38 increase in excess contributions per capita, compared with a $5.43 per-capita increase in 2021.

5.4 Alternative Specifications and Robustness Tests

In this section, we explore the robustness of our results to alternative modeling assumptions and measurement definitions. First, to validate our empirical approach, we conduct a placebo test whereby we look at the effect of federal pandemic stimulus aid on pension contributions

[7] Clemens et al. (2024) find that states committed 7 cents per dollar of federal funds to pension funding, an effect approximately 10 times as large as our finding. However, whereas Clemens et al. (2024) focus on total pension costs, we focus instead on employer contributions that are in excess of regular contributions. As noted above, governments are allowed to allocate federal aid to pension funding so long as it is part of their obligations to payroll, i.e. a part of routine compensation expenses. We focus on "excess" contributions in order to examine whether governments used federal relief to pay down unfunded liabilities in violation of federal regulations. We attribute the large difference between our estimates to this difference in measurement.

in 2019, just before the pandemic began. The analysis measures federal aid on the basis of aid that was allocated in fiscal year 2022 and uses a "broad" measure of aid, as discussed in the data section above. The results are presented in Table 3 and include both OLS and 2SLS specifications, with and without covariates. None of the coefficients are statistically significant, providing further support for our approach.

Next, we examine how our estimates change when we use a narrow, rather than broad, measure of federal aid. In this case, we base our measure of federal aid only on the direct aid received by a state or local government. As shown in Table 1, the average amount of aid received by governments under this definition is approximately $360 per capita, or roughly half of the aid under the broad definition. Columns 1-4 in Table 4 shows the results using this measure. The pattern of results is similar to the main table, except that the magnitude of the coefficients has increased considerably; the relatively lower amount of aid received by governments now translates into a larger effect on their pension contributions - 14 dollars per capita, as compared with 7 dollars per capita in Table 2.

As another means of assessing the robustness of our findings to alternative measures of aid, we also explore the effect of aggregating all pension contributions and federal aid to the state level. That is, we sum up all of the pension contributions within a state by totaling contributions from state and local pensions plans and treat each state's total as a single observation. This enables us to account for the fungibility of aid across different levels of government. These results are presented in columns 5-8 in Table 4. The coefficients are similar in magnitude to our main estimates, and despite a much smaller sample size, the 2SLS estimates are significant at the five percent level.

Finally, we examine how our estimates change when we use a measure of congressional representation that apportions to local governments on the basis of their share of a state's population. As shown in Appendix Table A4, the 2SLS estimates are slightly smaller than the estimates in Table 2, but nevertheless are significant at the one percent level. Thus, while the magnitude of our coefficients varies somewhat according to how we measure and apportion

federal aid, our overarching conclusion that states increased their per capita contributions modestly in the post-treatment period remains unchanged.[8]

5.5 Heterogeneity

We explore heterogeneity in the response to federal aid across two different dimensions. First, we look at whether state and local governments responded differentially to the aid package by including an interaction term for local governments. Second, we explore heterogeneity across governments with high and low pension funding ratios by including an interaction term for governments with high funding ratios. Funding ratios - the ratio of plan assets to liabilities - represent the most common measure of a pension fund's health. We measure funding ratios in 2019 and divide governments into those with high and low funding ratios by median split.[9]

Table 5 presents the results. Column 1 examines heterogeneity by type of government, while column 2 examines heterogeneity by funding level. The interaction term for local governments in column 1 is not significant, suggesting that there is no significant difference between the effect on state and local governments. However, the interaction term on governments with high funding ratios is negative and significant at the five percent level. In fact, the interaction term is nearly the same magnitude as the main coefficient, suggesting that the effect of federal pandemic aid on pension contributions occurs primarily through governments with low funding ratios. This is consistent with our conceptual model whereby

[8]In addition to the above checks, we also explored potential threats to the exogeneity of the instrument. Specifically, to address the concern that variation in funding is driven not by the size of congressional representation but by some related factor, such as political partisanship, we explored whether our results differed by the share of Republicans in each state's congressional delegation. We calculated the share of Republicans in each state's delegation in the 116th Congress (2019-2020), and we created an indicator variable for whether or not a state was above or below the mean share. We used this indicator to create an interaction term, much as we do in the heterogeneity section that follows. When we include the interaction term in our main specification, the term is insignificant with a p-value of 0.17, providing some support that variation in funding is driven by congresional representation rather than partisanship.

[9]In each case, we instrument for the interaction term using the interaction term between congressional representation and the relevant indicator variable.

governments with lower funding ratios face higher risk of trust fund depletion and are consequently more likely on the margin to allocate incremental dollars to their pension funds, and it is also consistent with prior work showing that governments with lower funding ratios tend to increase their contributions over time (Giesecke and Rauh, 2022).

5.6 Effect on Actuarial Assumptions

Finally, we explore the effect that pandemic aid had on the actuarial assumptions used by states to calculate their pension liabilities and actuarially determined contributions. Table 6 presents the results. Columns 1-4 present results for the amortization period, while columns 5-8 present results for the discount rate. Appendix Figure A3 plots the two outcome variables over time to confirm the existence of parallel pre-trends. All of the coefficients in Table 6 are significant at the one percent level. According to the 2SLS estimates, an increase of $1,000 in aid per capita (relative to the actual increase of approximately $770 per person) led governments to decrease their amortization periods by an average of 1.8 years and decrease their discount rates by 0.3 percentage points. In 2019, the average amortization period was 22.5 years and the average discount rate was 7 percent, meaning that the decreases were on the order of eight and four percent respectively.

The decrease in the amortization period and the discount rate reflect more conservative assumptions; governments were amortizing their unfunded liabilities over a shorter period of time and assuming a lower rate of return on their pension assets. These changes likely reflect a more optimistic view of their finances during this time period in light of the sheer size of federal aid that they received. Given the more optimistic outlook, and the ability to contribute higher contributions in the present as documented above, governments likely expected that they would also be able to make higher contributions in the future, and updated their assumptions accordingly.[10]

[10]These more conservative assumptions suggest that our main results may be understated, as the change

6 Conclusion

In this paper, we examine how state and local governments in the United States made use of the unprecedented amount of federal aid they received during the Covid-19 pandemic. Specifically, we examine the extent to which state and local governments used this aid to bolster their pension systems by increasing contributions above and beyond the contributions that they made as a fixed percentage of payroll. Our descriptive results indicate that while the total size of pension contributions did not increase appreciably in 2021-2022 relative to its pre-pandemic trajectory, there were declines in payroll and in actuarially determined contributions, which led to an increase in the ratio of contributions relative to these benchmarks. Using a difference-in-difference design and an instrumental variable approach based on congressional representation, we find that subnational governments did increase their "excess" contributions on a per-capita basis. Our preferred specifications indicate that the average government increased its "excess" per capita pension contribution by $7 in response to an increase of $1,000 in aid per capita. We find that the aid had a larger effect on governments with lower pension funding ratios, and we also find that the aid led governments to adopt more conservative assumptions regarding their discount rate and amortization periods.

With the benefit of hindsight, the concerns that surfaced in early 2020 about the fragility of state and local budgets were overblown. The aggregate amount of state rainy day funds dropped only temporarily in fiscal year 2020; the following year they increased to a record high of $115 billion (Theal and Fleming, 2022). And these balances were not due only to federal assistance; tax collections were higher than expected, equaling or exceeding the

in assumptions increases the amount of "regular" contributions relative to the pre-stimulus baseline and lowers what is deemed "excess". Because actuarial assumptions do not directly factor into the calculation of regular contributions, it is not straightforward to adjust our measure of excess contributions to reflect the assumptions in the pre-stimulus baseline. However, to investigate the role that the change in assumptions has on our findings, we re-estimated our main specification using a subset of governments that changed their discount rate or amortization period only minimally between 2019 and 2021-2022 (less than 0.1 percentage point and less than 1 year). The pre-stimulus funding ratios of governments in this subsample are similar to those in the main sample (74% vs 72%). The resulting coefficients – ranging from 6.5 to 7.2 – are actually slightly lower than in our main specification, suggesting that our substantive conclusions do not change as a result of the change in actuarial inputs.

revenue states would have raised pre-pandemic had collections held steady after adjusting for inflation (Theal and Fall, 2022). These surpluses make clear that state and local governments did not have the capacity to spend these funds in a judicious manner. In such an environment, it would not have been surprising had they used the windfall they received from the federal government to pay down their largest liability.

And yet, by and large, that is not what they did. While we find that governments increased their "excess" contributions, this effect was modest relative to the total amount of federal stimulus they received, and operated primarily to increase the contributions of governments with poorly funded pension systems. Given that the aggregate amount of federal stimulus ($900 billion) was comparable to the aggregate amount of unfunded pension liabilities ($1.076 trillion), in principle the aid that governments received could have nearly eliminated the pension debt on their balance sheets. Instead, between 2019 and 2022, governments in our sample saw their funding ratios increase from 72 percent on average to 75 percent. We do not observe widespread evidence of "extraordinary payment[s] of an accrued, unfunded liability" in violation of federal regulations. Thus, while the amount of federal aid awarded may have been unprecedented, it does not appear that much of this aid was used immediately for pension relief. Our estimates imply that the increase in contributions during 2021-2022 was less than one percent of the total stimulus received during this time period, or between one and two percent of general aid that was awarded directly to governments.

One important caveat to our results is in order. As noted in the background section, some portions of the pandemic aid have not yet expired. While the Coronavirus Relief Fund only covered expenses incurred before December of 2022, recipients of Coronavirus State and Local Recovery funds were required to obligate the funds by December 2024 and spend them by December 2026. Thus, it is possible that governments may still use recovery funds to make more significant dents in their unfunded pension liabilities. Nonetheless, the early evidence based on our results suggests that they are not directing federal aid for this purpose to any large extent.

Why might governments not have made more of the opportunity to lower their pension debt? Was it simply that they wished to comply with federal regulations? Given the fungibility of aid and the enforcement challenges facing the federal government, not to mention the legal challenges to ARPA, it seems unlikely that governments were purely motivated by adherence to federal guidelines. More likely is that, as prior work has shown, increases in pension spending are rarely politically advantageous (Jacobs, 2011; Jacobs and Matthews, 2012). Executives cannot run for re-election on improvements to pension funding in the same way that they can advertise new school buildings or improvements in the local economy. Indeed, to the extent that voters care about fiscal management at all, these concerns often pale in relation to other priorities. Thus, the results in this paper highlight the challenge governments face in improving their long-term fiscal sustainability. Even in the face of a fiscal windfall, governments take only modest steps to address their largest liability.

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Table 1: Summary Statistics

	(1) mean	(2) sd	(3) min	(4) max
Aid per resident - broad measure (thousands of 2019 dollars)	0.77	0.62	0.00	3.0
Aid per resident - narrow measure (thousands of 2019 dollars)	0.36	0.33	0.00	2.0
Employer pension contributions (billions of 2019 dollars)	1.3	3.2	0.0	32
Employee contributions (billions of 2019 dollars)	0.48	1.1	0.0	11
Employer contributions as percent of payroll	26	27	5.2	493
Employer contributions as percent of the ADC	101	29	10	352
Employer contributions in excess of regular contributions (billions of 2019 dollars)	0.16	0.74	0.0	6.9
Employer contributions in excess of regular contributions (2019 dollars) / $\text{population}_{t\text{-}1}$	24	69	0	547
Amortization period (years)	22	5.6	0.0	38
Discount rate	7.1	0.6	3.0	8.5
Representatives per million residents, 2020	2.0	0.79	1.4	5.2
Funding ratio	0.72	0.18	0.0	1.2
Unemployment rate	5.5	2.0	1.2	17
Share of households receiving SNAP	0.13	0.06	0.02	0.44

Note: All variables are at the government-year level and cover 2016-2022 (excluding 2020) unless otherwise specified. Pension data come from the Public Plans Database. Federal aid data come from the Committee for a Responsible Federal Budget. Population data come from the Census. Unemployment rate data come from the American Community Survey (ACS). SNAP data come from the USDA.

Table 2: Main Results

	(1)	(2)	(3)	(4)
	Excess Contributions Per-Capita			
	OLS		2SLS	
Aid per Resident * Post	8.25*	7.98*	7.60**	7.10*
	(3.87)	(3.93)	(2.86)	(2.82)
Gov Fixed Effects	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes
N	622	622	622	622
R^2	0.94	0.94	0.94	0.94
First Stage F-Stat			112	112

Note: ** $p < 0.01$, * $p < 0.05$. This table presents OLS and IV estimates of the effect of federal aid on public pension contributions, expressed as the amount of employer contributions in excess of regular contributions as a share of the (lagged) population. "Regular" contributions are contributions that are set at a fixed percentage of payroll. Aid per resident is expressed in thousands of 2019 dollars. The analysis covers 2016-2022, but excludes fiscal year 2020. 2021 and 2022 are "post-treatment." Covariates include the lagged unemployment rate and the lagged share of households receiving SNAP. Standard errors in parentheses are clustered by government.

Table 3: Placebo Tests

	(1)	(2)	(3)	(4)
	Excess Contributions Per-Capita			
	OLS		2SLS	
Aid per Resident	2.13	2.30	2.23	2.90
	(1.49)	(1.52)	(1.17)	(1.58)
Gov Fixed Effects	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes
N	418	418	418	418
R^2	0.98	0.98	0.98	0.98

Note: ** $p < 0.01$, * $p < 0.05$. This table presents OLS and IV estimates of the effect of federal aid on state and local pension contributions, except that it treats 2019 as the "post-treatment" year. Contributions are measured as the amount of employer contributions in excess of regular contributions as a share of the (lagged) population. "Regular" contributions are contributions that are set at a fixed percentage of payroll. The analysis covers 2016-2019. Covariates include the lagged unemployment rate and the lagged share of households receiving SNAP. Standard errors in parentheses are clustered by government.

Table 4: Alternative Measure of Aid

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Excess Contributions Per-Capita							
	Narrow Measure of Aid				Aggregating to State Level			
	OLS		2SLS		OLS		2SLS	
Aid per Resident * Post	13.34*	12.80*	15.32*	14.17*	9.07	8.83	7.50*	6.78*
	(6.23)	(6.39)	(5.96)	(5.81)	(4.79)	(5.01)	(3.45)	(3.36)
Gov Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes	No	Yes	No	Yes
N	622	622	622	622	252	252	252	252
R^2	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.93
First Stage F-Stat			94	91			548	502

Note: ** $p < 0.01$, * $p < 0.05$. This table is similar to Table 2 except that it uses alternative measures of federal aid. Columns 1-4 include only direct aid. Columns 5-8 aggregate pension contributions and federal aid to the state level. The analysis covers 2016-2022, but excludes fiscal year 2020. 2021 and 2022 are "post-treatment." Covariates include the lagged unemployment rate and the lagged share of households receiving SNAP. Standard errors in parentheses are clustered by government.

Table 5: Heterogeneity

	(1)	(2)
	Excess Contributions Per-Capita	
	2SLS	
	State vs Local Govs	Low vs High Funding
Aid per Resident * Post	7.80*	12.27*
	(3.40)	(5.02)
Aid per Resident * Post * Local Gov	-3.85	
	(4.94)	
Aid per Resident * Post * High Funding Ratio		-11.20*
		(5.14)
Fixed Effects	Yes	Yes
Covariates	Yes	Yes
N	622	622
R^2	0.94	0.94

Note: ** $p < 0.01$, * $p < 0.05$. This table presents 2SLS estimates of the effect of federal aid on public pension contributions. Each specification includes an interaction terms to estimate the difference between the effects on 1) state vs local governments, and 2) governments with low vs high pension funding ratios. Aid per resident is expressed in thousands of 2019 dollars. The analysis covers 2016-2022, but excludes fiscal year 2020. 2021 and 2022 are "post-treatment." Covariates include the lagged unemployment rate and the lagged share of households receiving SNAP. Standard errors in parentheses are clustered by government.

Table 6: Effect of Federal Aid on Actuarial Assumptions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Amortization Period				Discount Rate			
	OLS		2SLS		OLS		2SLS	
Aid per Resident * Post	-1.41**	-1.45**	-1.75**	-1.81**	-0.22**	-0.21**	-0.32**	-0.31**
	(0.28)	(0.28)	(0.33)	(0.33)	(0.04)	(0.04)	(0.05)	(0.05)
Gov Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes	No	Yes	No	Yes
N	596	596	596	596	598	598	598	598
R^2	0.90	0.90	0.90	0.90	0.79	0.80	0.79	0.79
First Stage F-Stat			106	106			132	125

Note: ** $p < 0.01$, * $p < 0.05$. This table estimates the effect of federal assistance on actuarial assumptions. Aid per resident is expressed in thousands of 2019 dollars. The analysis covers 2016-2022, but excludes fiscal year 2020. 2021 and 2022 are "post-treatment." Covariates include the lagged unemployment rate and the lagged share of households receiving SNAP. Standard errors in parentheses are clustered by government.

Figure 1: Pension Contributions Over Time - State and Local Governments

Figure 1a: Employer and Employee Contributions

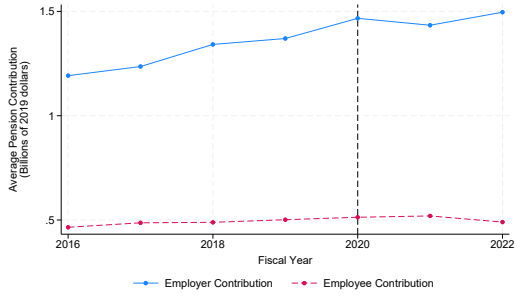


Figure 1b: Employer Contributions as % of Payroll

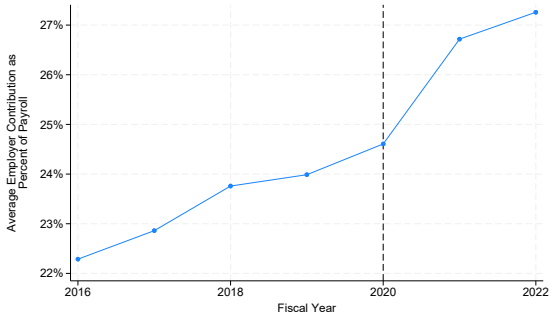


Figure 1c: Employer Contributions as % of ADC

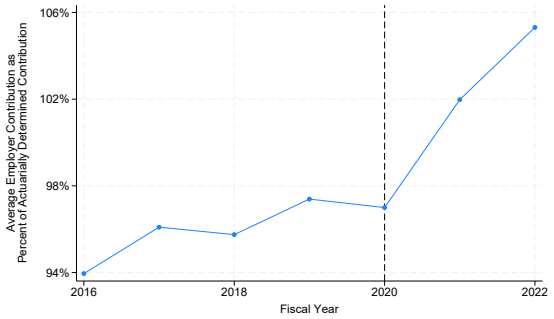
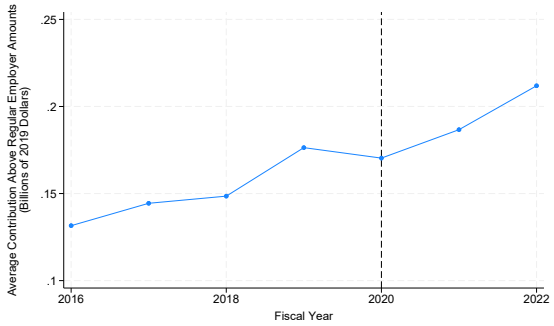
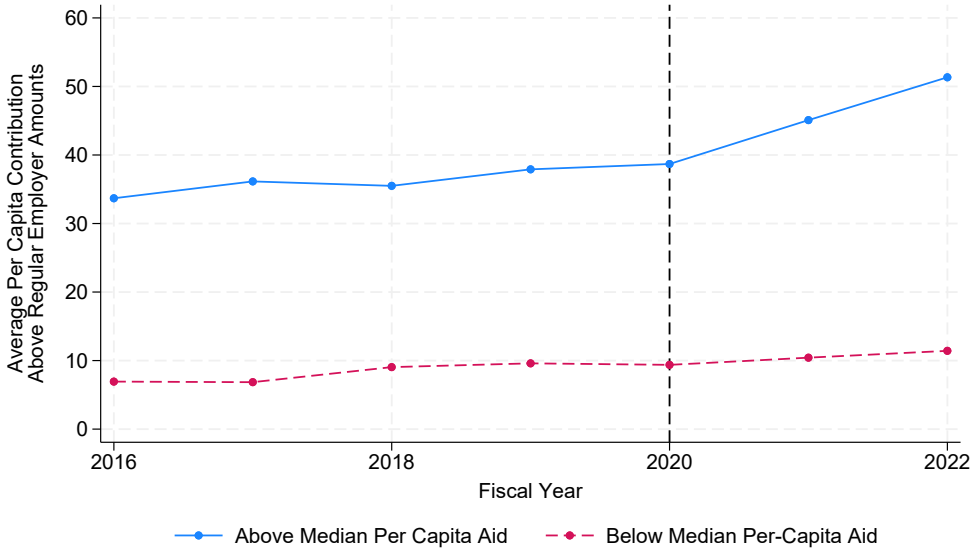


Figure 1d: Excess Employer Contributions



Note: Source: Public Plans Database. The figures depict annual average a) government pension contributions by both employers and employees, b) employer contributions as a percent of payroll, c) employer contributions as a percent of the actuarially determined contribution, and d) employer contributions in excess of "regular" contributions for state and local defined benefit plans (2016-2022). The actuarially determined contribution (ADC), defined as per the Governmental Accounting Standards Board (GASB) Statement 67, is a recommended contribution determined in conformity with actuarial standards of practice that reflects the sum of the cost of newly accruing pension benefits and a portion of the cost to eliminate any unfunded liability. "Regular" employer contributions are contributions set at a fixed percentage of payroll. The figures exclude governments without complete sets of data.

Figure 2: Contributions from Governments with Above and Below Average Per Capita Aid



Note: Source: Public Plans Database. This figure depicts the average per capita contributions made by state and local governments to their defined-benefit pension plans in excess of their "regular" contributions between 2016-2022. Governments with "Above Median Per Capita Aid" are governments in states that received above average amounts of federal pandemic aid. "Regular" employer contributions are contributions set at a fixed percentage of payroll. The figure excludes governments without complete sets of data.

Table A1: Covid 19 Relief Bills with State and Local Government Aid

Bill	Date Passed	Total Amount	Aid to State and Local Govs	Main Provisions
Families First Coronavirus Response Act (FFCRA)	March 18, 2020	$330 billion	$105 billion	Medicaid continuous coverage, Medicaid matching funds, home nutrition services
CARES Act	March 27, 2020	$2.1 trillion	$190 billion	Unemployment benefits, Paycheck Protection Program, tax relief to businesses
Response and Relief Act (RRA)	December 27, 2020	$930 billion	$80 billion	Paycheck Protection Program, stimulus checks, unemployment benefits
American Rescue Plan Act (ARPA)	March 11, 2021	$2.1 trillion	$520 billion	Stimulus checks, tax credits, unemployment benefits
Total		$5.5 trillion	$900 billion	

Source: Committee for a Responsible Federal Budget, Covid Money Tracker.

Table A2: Main Results - First Stage

	(1)	(2)
	Aid Per Capita 2SLS	
Reps Per Million Residents * Post	0.39**	0.39**
	(0.037)	(0.037)
Gov Fixed Effects	Yes	Yes
Covariates	No	Yes
N	622	622
R^2	0.72	0.73

Note: ** $p < 0.01$, * $p < 0.05$. This table presents the first-stage from the 2SLS regressions presented in Table 2. The analysis covers 2016-2022, but excludes fiscal year 2020. 2021 and 2022 are "post-treatment." Standard errors in parentheses are clustered by government.

Table A3: Results by Year

	(1)	(2)	(3)	(4)
	Excess Contributions Per-Capita			
	2SLS		2SLS	
	2021		2022	
Aid per Resident * Post	6.31**	5.43*	8.78**	8.38*
	(2.40)	(2.15)	(3.40)	(3.57)
Gov Fixed Effects	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes
N	521	521	519	519
R^2	0.97	0.97	0.94	0.94
First Stage F-Stat	75	74	138	132

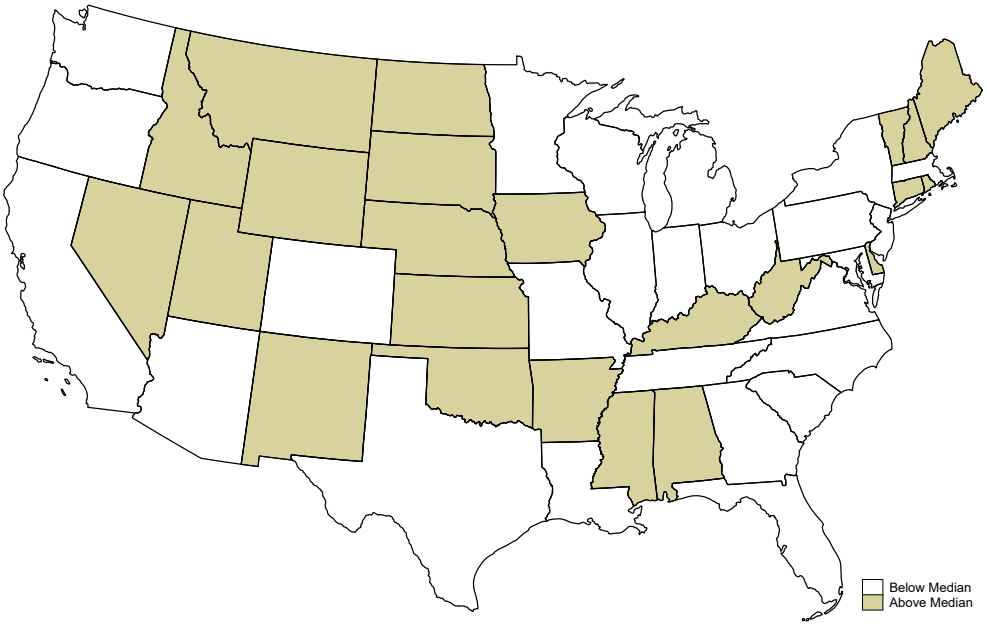
Note: ** $p < 0.01$, * $p < 0.05$. This table presents 2SLS treatment effect coefficients by year. Aid per resident is expressed in thousands of 2019 dollars. The analysis covers 2016-2022, but excludes fiscal year 2020. Covariates include the lagged unemployment rate and the lagged share of households receiving SNAP. Standard errors in parentheses are clustered by government.

Table A4: Using an Alternative Measure of Congressional Representation

	(1)	(2)	(3)	(4)
	Excess Contributions Per-Capita			
	OLS		2SLS	
Aid per Resident * Post	8.25*	7.98*	6.12**	4.97**
	(3.87)	(3.93)	(2.15)	(1.92)
Gov Fixed Effects	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes
N	622	622	622	622
R^2	0.94	0.94	0.94	0.94
First Stage F-Stat			6.3	6.0

Note: ** $p < 0.01$, * $p < 0.05$. This table is similar to Table 2 except that it uses an alternative measure of congressional representation that apportions Congressmen and Senators to local governments on the basis of their share of a state's population. Aid per resident is expressed in thousands of 2019 dollars. The analysis covers 2016-2022, but excludes fiscal year 2020. 2021 and 2022 are "post-treatment." Covariates include the lagged unemployment rate and the lagged share of households receiving SNAP. Standard errors in parentheses are clustered by government.

Figure A1: Congressional Representation Per-Capita: States Above and Below the Median



Note: This figure shows states with above- and below-median congressional representation per capita in 2020.

Figure A2: State and Local Government Payroll and ADC

Figure A2a: Payroll

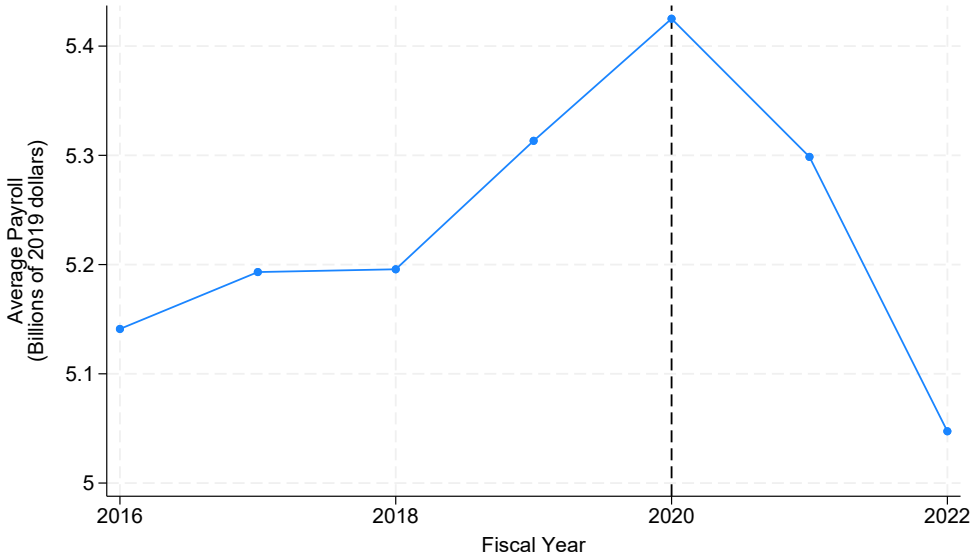
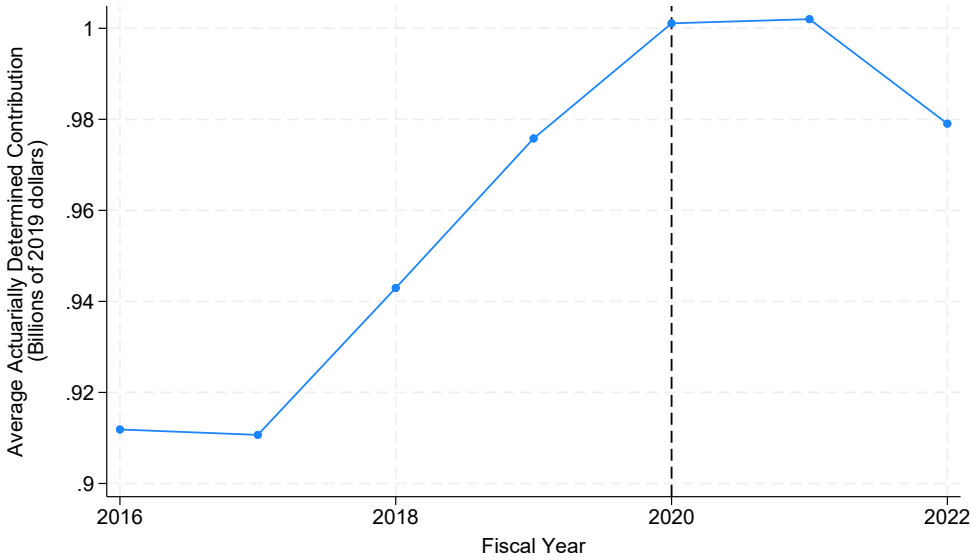


Figure A2b: ADC



Note: Source: Public Plans Database. This figure depicts average payroll and actuarially determined contributions between 2016-2022 for states and local governments. Variables are in billions of 2019 dollars. The figures exclude governments without complete sets of data.

Figure A3: Actuarial Assumptions - Governments with Above and Below Average Per Capita Aid

Figure A3a: Amortization Period

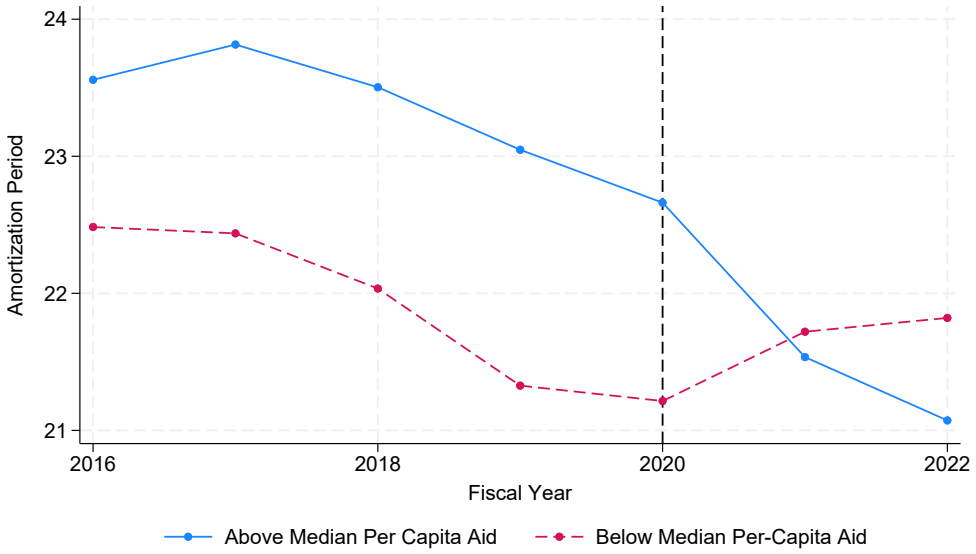
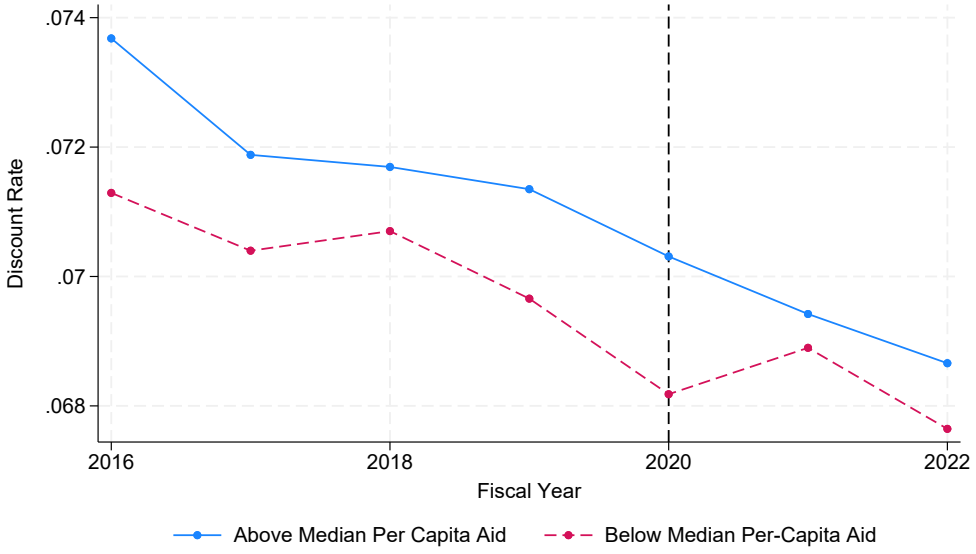


Figure A3b: Discount Rate



Note: Source: Public Plans Database. This figure depicts the actuairal assumptions used by state and local governments in their pension calculations, specifically the amortization period and the discount rate. The discount rate is a blended rate in accordance with GASB 67. Governments with "Above Median Per Capita Aid" are governments in states that received above average amounts of federal pandemic aid. The figure excludes governments without complete sets of data.