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

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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 pension contributions. 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 state and local governments did increase their pension contributions relative to the actuarially recommended amounts, but that the absolute level of their contributions did not deviate from its pre-pandemic trend due to decreases in payroll and other factors that lowered the recommended contribution rates.

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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 will 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 government contributions to public pension funds. We aggregate defined benefit pension contributions to the level of the sponsoring government, and we consider the effect of the federal aid packages on pension contributions for both state and local governments in 2021 and 2022. To address concerns about endogeneity, we use a difference-in-difference design and an instrumental variable estimator that relies on variation in congressional representation. Using alternative specifications, we show that our results are robust to different ways of measuring the amount of aid that governments received, and we show how the effect of aid varies across state governments and local governments.

We find that state and local governments did increase their pension contributions relative to the actuarially recommended amounts, but that the absolute level of their contributions did not deviate from its pre-pandemic trend due to decreases in payroll and other factors that lowered the recommended contribution rates. In our preferred specification, an additional thousand dollars of aid per capita resulted in an increase of 5 percentage points in the amount that governments contributed as a share of the actuarially determined contribution (ADC), the amount recommended based on actuarial standards. When we aggregate aid to the state level rather than trying to allocate aid to specific governments, our coefficient estimate decreases to 3 percentage points. In heterogeneity analyses, we also show that local governments increased their contributions more than state governments did, although the

results are imprecise.

We contribute to two distinct areas of research. First, we add to an emerging body of research that looks at the effects of the Covid-19 pandemic and the resulting fiscal stimulus on economic outcomes. Several papers have documented the heterogeneous nature of employment and earnings dynamics during and after the pandemic (Crossley et al., 2021; Green and Loualiche, 2021; Larrimore et al., 2023; Autor et al., 2023). Others have attempted to measure the efficiency of the policy response, particularly as it relates to the number of jobs saved (Clemens et al., 2022b; Autor et al., 2022; Granja et al., 2022). Our work complements other analyses that measure the impact of the aid to state and local governments (Clemens et al., 2022b), except that rather than measuring the effect on jobs, we examine whether subnational governments used the windfall to address their largest liability, namely unfunded pension liabilities.

We also contribute to a broader literature that studies the purpose and efficacy of intergovernmental grants. The literature on fiscal federalism has long concerned itself with the conditions under which decentralized provision of public goods can yield efficient outcomes (Oates, 1972; Tiebout, 1956). To understand the efficacy of decentralized provision, various researchers have probed the budgetary incidence of federal transfers. Early estimates suggested that each dollar in unrestricted block grants generates increases in spending that range from 60 cents to one dollar (Clemens and Veuger, 2023; Hines and Thaler, 1995). Recent estimates have been more mixed, especially as they pertain to education spending (Gordon, 2004; Knight, 2002), with Lutz (2010) in particular finding that ninety cents per grant dollar are spent on tax reduction (Gordon, 2004; Lutz, 2010; Knight, 2002). To our knowledge, very little of this work has looked at the effect of federal aid on debt reduction, particularly as it relates to the pension system.

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 governments 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, using longitudinal data to examine pre-pandemic trends and shifts in actuarial benchmarks. We also explore alternative means of measuring federal aid and allocating stimulus across different subnational levels of government.

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, under a market-based valuation

this rises to approximately $6.5 trillion, 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. 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 extent to which pension liabilities should be funded. 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 contribution 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 approximately 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 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 govern-

ments to use the funds to close budget gaps. However, the ARPA did place some restrictions on the use of funds. The funds had to be obligated by December 2024 and spent by December 2026. More importantly, 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, then 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 law suit, 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.

3 Data and Variables

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 incidence of federal assistance, we aggregate pension information to the level of the sponsoring government. Our final sample includes 113 governments, encompassing 50 states and 63 localities, over the years 2016-2022.

For data on federal assistance, we draw on the Covid Money Tracker developed by the Committee for a Responsible Federal Budget (Committee for a Responsible Federal Budget, 2024). 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.

One challenge we face is measuring the precise amount of aid received by individual government entities. 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 the state government as well as cities and counties within the state that administer their own defined benefit pension plans. This is particularly challenging in areas such as transportation, where funding to a state transportation agency may also have secondary benefits to local governments within a state.

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, state and local governments received approximately $800 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. We discuss how to interpret any differences in magnitude between these estimates.

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 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 pension contributions. 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 of the 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.

This leads us to estimate the following set of equations:

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

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

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 the amount of congressional representation per million residents following the pandemic. 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. $PandemicAid\_Post$ is federal aid during the "post-treatment" period in which aid was awarded and zero otherwise; we use 2020 population figures to scale the aid. $Reps\_Post$ takes the value of the number of Representatives and Senators per million residents representing a jurisdiction 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.

Our measure of pension contributions is the absolute amount of the contribution scaled by the actuarially determined contribution (ADC). The ADC, as defined by 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 "normal" cost (the cost of newly accruing pension benefits) and the amortized cost to eliminate any unfunded liability. As governments frequently base their contributions on the ADC (NASRA, 2023), it represents a useful benchmark for assessing funding performance. Although the ADC is based in part on the normal cost, which is a function of payroll and thus potentially endogenous to federal assistance, the normal cost is calculated prior to the start of the fiscal year on the basis of projected payroll, and consequently the ADC is orthogonal to any impact that federal stimulus may have on the level of employment. We confirm this below by showing that federal aid has no effect on the calculation of the ADC.

The inclusion of city and county governments in our sample provides an important source of variation and ensures that our strategy does not simply compare small vs large states. For our main analysis, 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 tables, we show results using a measure of Congressional representation that apportions the number of Representatives to local governments on the basis of population.

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.[1] 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 based on the fact that most federal aid passed before April would inform budget decision-making for the upcoming fiscal year beginning July 1.[2] However, the coefficient of interest in our main analysis, β_2, represents an average effect across the two post-treatment years.

Finally, because we are interested in the aggregate effect of pandemic fiscal assistance on pensions, in our main analyses we weight observations by the size of the associated pension plans, as measured by the total amount of liabilities. However, we show the unweighted results in appendices. We cluster all standard errors at the government level.

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

[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.

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 50 state governments and 63 local governments.[3] The figure weights observations by the size of the associated pension liabilities so as to be consistent with our analytical approach (Appendix Figure A1 shows the unweighted version of the same figure). 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). As noted above, 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. The figures exclude governments without complete sets of observations.[4]

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 are roughly one-third the size of employer contributions. As employee contributions are determined primarily by contract and by statue, 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.)

[3] We exclude the District of Columbia because it has no representation in Congress.
[4] Figure 1a excludes data from 17 local governments.

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 a stark increase in 2022. As shown in Appendix Figure 2, 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 declined both because of the reductions to payroll but also 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 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 103 percent of the recommended amount. While these results are merely descriptive, they preview our more formal quantitative findings below.

5.2 Validation Exercises

Because our DiD design relies on variation in treatment that arises due to Congressional representation, we address concerns about differential pre-trends by examining graphically the evolution of pension funding prior to the pandemic for those with high and low Congressional representation. We divide the governments in our sample into two groups: those with Congressional representation per capita above the median and those with representation per capita below the median. Figure 2 shows the trends for both of these groups in terms of the amounts contributed as a share of the ADC. As in our regressions, we weight observations by the amount of associated pension liabilities. The figure confirms that the two groups are on parallel trends prior to diverging in 2021. We test this formally by regressing pension contributions as a share of the ADC from 2016 to 2019 on an annual time trend and an annual time trend interacted with an indicator for above median Congressional representation. The interaction term has a coefficient of 0.00 and is insignificant with a p-value of 0.76. We

obtain similar results if we instead use a continuous measure of Congressional representation.

To further validate our empirical approach, we conduct a placebo test whereby we look at the effect of federal pandemic stimulus aid on pension contributions 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 2 and include both OLS and 2SLS specifications, with and without covariates. In all cases, the coefficients are near-zero and not statistically significant, providing further support for our approach.

Finally, we also examine the effect of federal assistance on the ADC. Our approach assumes that the measurement of the ADC is orthogonal to federal assistance. However, if federal aid impacts the calculation of the ADC, then any results we find could be driven by changes in the ADC rather than by an effect on pension contributions. Appendix Table A2 shows the effect of pandemic relief on the (log) ADC. None of the coefficients are significant at the five percent level, and three of the four are negative. If aid were to affect the ADC through its effect on payroll, we would expect a positive association between aid and the ADC.[5]

5.3 Main Results

Table 3 presents our main results. As noted above, we focus on (employer) contributions as a share of the ADC. Columns 1-2 show the results for OLS specifications with and without covariates. Columns 3-4 shows results for 2SLS specifications. The coefficients are extremely stable across the specifications and are all significant at the one percent level. For the 2SLS specifications, the F-stat is over 350, well above the commonly used benchmark of 10 (Stock et al., 2002). The coefficients imply that an increase of $1,000 in aid per capita (relative to the actual increase of approximately $800 per person using the broad measure of aid)

[5]Because we observe differential pre-trends in the ADC by high/low Congressional representation, we include a time trend and a time trend interacted with treatment status.

was associated with a five percentage point increase in pension contributions as a share of the ADC. As shown in Figure 1c, state and local governments contributed 95 percent of the ADC prior to the pandemic; in 2022, contributions rose to 103 percent of the ADC on average. Appendix Table A3 breaks out the results by year. Consistent with the descriptive figures, the effects are concentrated 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 8-9 percentage point increase in contributions as a share of the ADC. There is no significant effect 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, 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 $400 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 - 13 percentage points of the ADC, as compared with five percentage points in Table 3.

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 slightly smaller than the main effects due to the larger amount of aid dollars that are

counted - three percentage points vs five percentage points. However, the 2SLS coefficients remain significant at the one percent level. Thus, while the magnitude of our coefficients vary somewhat according to how we measure federal aid, our overarching conclusion that states increased their contributions relative to the ADC remains unchanged.

To investigate the effect of weighting, we present results from unweighted regressions in Appendix Table A4. The OLS specifications look almost identical to the main results, while the 2SLS specifications produce slightly larger coefficients - 0.07 vs 0.05. Both of the 2SLS coefficients are significant at the one percent level. The unweighted regressions do have lower F-stats in the first stage - 105-106 vs 363-391 - leading us to prefer the weighted regressions for statistical as well as substantive reasons.

Next, 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 A5, the coefficient estimates are completely unchanged, though in this case the F-stats are lower, implying that measuring Congressional representation at the state level is more highly correlated with federal pandemic stimulus aid than measures that apportion representation at the local level.

5.5 Heterogeneity

In this section, we explore heterogeneity in the response to federal aid across three 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. Finally, we examine heterogeneity across pension plans for different classes of employees. To do so, we no longer aggregate all of the

plans for each government-year, but instead shift our analysis to the plan-year level. We include separate interaction terms for teacher plans and police/fire plans (to contrast with general employees).[6]

Table 5 presents the results. None of the interaction terms are statistically significant. Nevertheless, the magnitude of the coefficient on the interaction term for local governments implies that there is a large gap between the effect on state governments and local governments. While imprecisely measured, the coefficient on the interaction term implies that while state governments increased their contributions by 4.6 percentage points in response to an increase of $1,000 in aid per capita, local governments increased their contributions by 10.9 percentage points. To the extent that governments on average are careful to comply with the restrictions on the use of federal aid, the difference between state and local governments may reflect differing levels of administrative capacity: local governments are less likely to comply with complicated regulations, especially in policy areas of low transparency and public visibility. On the other hand, there does not appear to be a difference between governments with well-funded pensions and those with poorly funded pensions. The fact that pandemic aid had equal impacts on well-funded and poorly-funded plans stands somewhat in contrast to prior work, which has found that governments with lower funding ratios tend to increase their contributions over time (Giesecke and Rauh, 2022); one might expect that governments with lower funding ratios would be more likely to take advantage of generous pandemic aid to address shortfalls in their pension funding. Similarly, there appears to be no significant variation in the effects across different classes of employees.

5.6 Threshold Effects

Finally, we explore the effect that pandemic aid had on the distribution of outcomes. Figure 3 plots the distribution of our main outcome variable – contributions as a percentage

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

of the ADC – both pre- and post-pandemic. The post-pandemic distribution appears shifted to the right, consistent with our empirical findings. However both distributions have a long right tail, and it is especially prominent for the post-pandemic distribution. Six governments reported pension contributions in either 2021 or 2022 that exceeded 200 percent of the ADC (Alameda County, California; the state of Arizona; Bismarck, North Dakota; the state of Kansas; Knox County, Tennessee; and Phoenix, Arizona). While these observations are notable, perhaps more notable is the fact that they represent a small share of the distribution. It appears that few governments made an "extraordinary payment of an accrued, unfunded liability" as prohibited by the ARPA. Instead, most governments simply moved closer to paying the full amount of the ADC.

We confirm this quantitatively by discretizing our outcome variable. We consider the effect of pandemic aid separately on binary indicators for contributions in excess of 50 percent of the ADC, 75 percent of the ADC, 100 percent of the ADC, and 125 percent of the ADC. The results are in Table 6. While there is a small and statistically significant effect at the top of the distribution - an increase in $1,000 in aid per capital increases the probability that governments will contribute at least 125 percent of the ADC by two percentage points – the largest effect is in the middle. An increase in $1,000 in aid per capita increases the probability that governments will contribute at least 100 percent of the ADC by 11 percentage points. Thus, the biggest effect of the pandemic aid was to increase the likelihood that governments would make the full amount of their actuarially recommended contributions.

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. Our descriptive results indicate

that while the absolute level of pension contributions did not increase in 2021-2022 relative to its pre-pandemic trajectory, there were declines in payroll and in actuarially determined contributions. Using a difference-in-difference design and an instrumental variable approach based on Congressional representation, we find that subnational governments did increase their contributions relative to the actuarially-recommended amounts. Our preferred specifications indicate that the average government increased its pension contribution by five percentage points as a share of the ADC in response to an increase of $1,000 in aid per capita. We find that the aid had a larger effect on local governments than on state governments, although we are not able to measure the difference with much precision. We observe no heterogeneity on the basis on funding ratios or type of employee.

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 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 pension contributions as a share of the ADC, this effect was modest, and operated primarily to increase the contributions of governments that were not paying the full amount of the ADC. Only a few governments made "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 for pension relief. Based on the aggregate value of the actuarially determined contributions in

our sample (roughly $300 billion in 2019 dollars across 2021-2022), we estimate the increase in total contributions to be approximately $15 billion, or two percent of the total stimulus.

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
Employer pension contributions (billions of 2019 dollars)	1.3	3.1	0.00	32
Employee contributions (billions of 2019 dollars)	1.0	0.25	0.00	3.5
Employer contributions as percent of the ADC	0.99	0.25	0.00	3.5
Employer contributions as percent of payroll	0.25	0.27	0.05	4.9
Aid per resident - broad measure (thousands of 2019 dollars)	0.81	0.65	0.00	3.3
Aid per resident - narrow measure (thousands of 2019 dollars)	0.38	0.35	0.00	2.0
Pension liabilities (billions of 2019 dollars)	50	105	0	960
Representatives per million residents, 2020	2.0	0.83	1.30	5.2
Unemployment rate	5.4	2.0	1.2	17.4
Share of households receiving SNAP	0.13	0.06	0.02	0.44

Note: Pension data come from the Public Plans Database and are aggregated to the government-year level. 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: Placebo Tests

	(1)	(2)	(3)	(4)
	Employer Contribution as % of ADC			
	OLS		2SLS	
Aid per Resident	0.01	-0.00	0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Gov Fixed Effects	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes
N	410	410	410	410
R^2	0.90	0.91	0.90	0.91

Note: *** $p < 0.01$, ** $p < 0.05$, *$p < 0.10$. 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. The analysis covers 2016-2019. Covariates include the lagged unemployment rate and the lagged share of households receiving SNAP. Observations are weighted by pension liabilities. Standard errors in parentheses are clustered by government.

Table 3: Main Results

	(1)	(2)	(3)	(4)
	Employer Contribution as Percent of ADC			
	OLS		2SLS	
Aid per Resident * Post	0.05***	0.04***	0.05***	0.05***
	(0.02)	(0.02)	(0.02)	(0.02)
Gov Fixed Effects	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes
N	601	601	601	601
R^2	0.78	0.78	0.78	0.78
First Stage F-Stat			363	391

Note: *** $p < 0.01$, ** $p < 0.05$, *$p < 0.10$. This table presents OLS and IV estimates of the effect of federal aid on public pension contributions, expressed as a share of the ADC. 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. Observations are weighted by pension liabilities. Standard errors in parentheses are clustered by government.

Table 4: Alternative Measure of Aid

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Narrow Measure of Aid				Aggregating to State Level			
	Employer Contribution as Percent of ADC				Employer Contribution as Percent of ADC			
	OLS		2SLS		OLS		2SLS	
Aid per Resident * Post	0.14***	0.14***	0.13***	0.13***	0.03**	0.03***	0.03***	0.03***
	(0.04)	(0.05)	(0.04)	(0.04)	(0.01)	(0.01)	(0.01)	(0.01)
Gov Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes	No	Yes	No	Yes
N	601	601	601	601	232	231	232	231
R^2	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
First Stage F-Stat			755	881			175	312

Note: *** $p < 0.01$, ** $p < 0.05$, *$p < 0.10$. This table is similar to Table 3 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. Observations are weighted by pension liabilities. Standard errors in parentheses are clustered by government.

Table 5: Heterogeneity

	(1)	(2)	(3)
	Employer Contribution as Percent of ADC		
		2SLS	
	State vs Local Govs	Low vs High Funding	General Employees vs Teachers vs Police/Fire
Aid per Resident * Post	0.046***	0.059**	0.048***
	(0.015)	(0.024)	(0.016)
Aid per Resident * Post * Local Gov	0.063		
	(0.081)		
Aid per Resident * Post * High Funding Ratio		-0.026	
		(0.032)	
Aid per Resident * Post * Teacher's Plan			-0.017
			(0.027)
Aid per Resident * Post * Police/Fire Plan			-0.00
			(0.024)
Fixed Effects	Yes	Yes	Yes
Covariates	Yes	Yes	Yes
N	601	601	1,234
R^2	0.78	0.78	0.72

Note: *** p < 0.01, ** p < 0.05, *p < 0.10. This table presents 2SLS estimates of the effect of federal aid on public pension contributions. Each specification includes one or more interaction terms to estimate the difference between the effects on 1) state vs local governments, 2) governments with low vs high pension funding ratios, and 3) plans for different classes of employees (general vs teachers vs police/fire). Columns 1-2 are estimated at the government level, while column 3 is estimated at the plan level and includes plan-level rather than government-level fixed effects. 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. Observations are weighted by pension liabilities. Standard errors in parentheses are clustered by government.

Table 6: Threshold Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\frac{Cont}{ADC} \geq 0.50$		$\frac{Cont}{ADC} \geq 0.75$		$\frac{Cont}{ADC} \geq 1$		$\frac{Cont}{ADC} \geq 1.25$	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Aid per Resident * Post	0.01	0.01	0.01	0.00	0.12*	0.11*	0.02*	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.07)	(0.06)	(0.01)	(0.01)
Gov Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	601	601	601	601	601	601	601	601
R^2	0.60	0.60	0.77	0.77	0.62	0.62	0.60	0.60
First Stage F-Stat		391		391		391		391

Note: *** $p < 0.01$, ** $p < 0.05$, *$p < 0.10$. This table presents OLS and IV estimates of the effect of federal aid on public pension contributions. The outcome variables are discretized measures of the main outcome variable, contribution as a share of the ADC. In columns 1-2, the outcome variable measures when contributions are greater than or equal to 50 percent of the ADC. In column 3-8, these percentages are 75, 100, and 125. 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. Observations are weighted by pension liabilities. Standard errors in parentheses are clustered by government.

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

Figure 1a: Employer and Employee Contributions

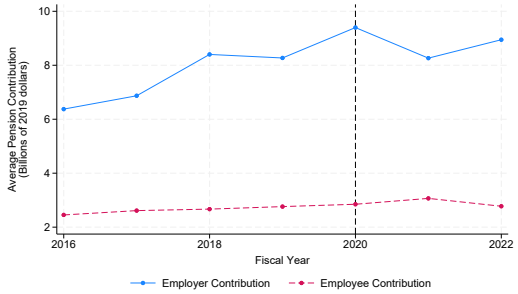


Figure 1b: Employer Contributions as Percent of Payroll

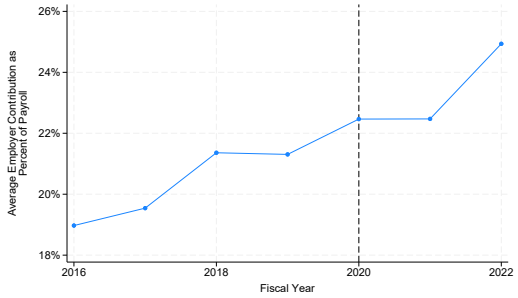
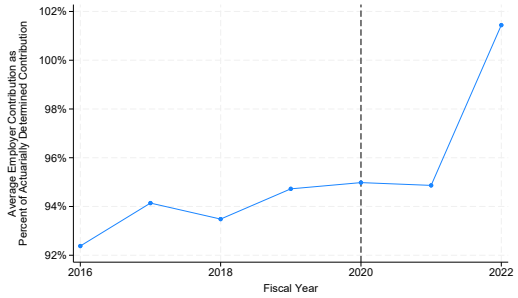
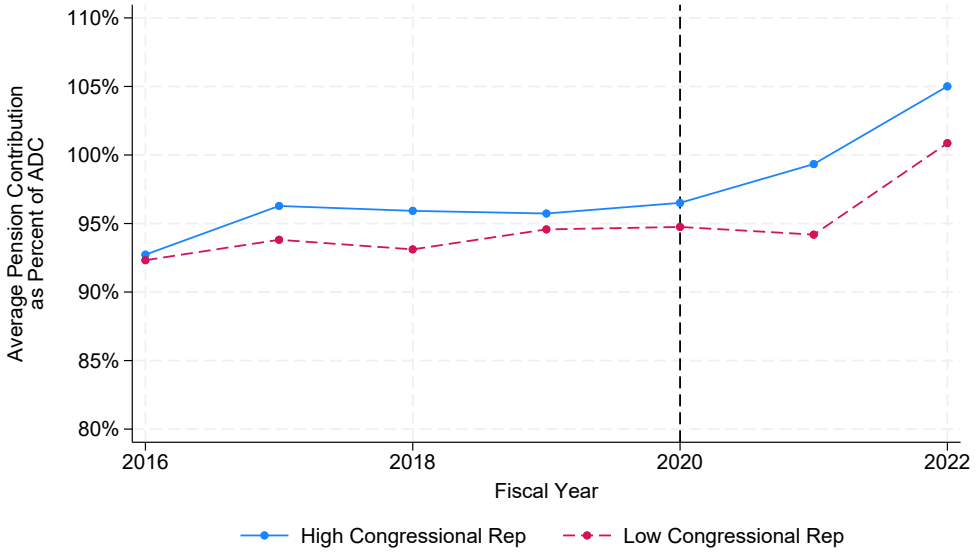


Figure 1c: Employer Contributions as Percent of ADC



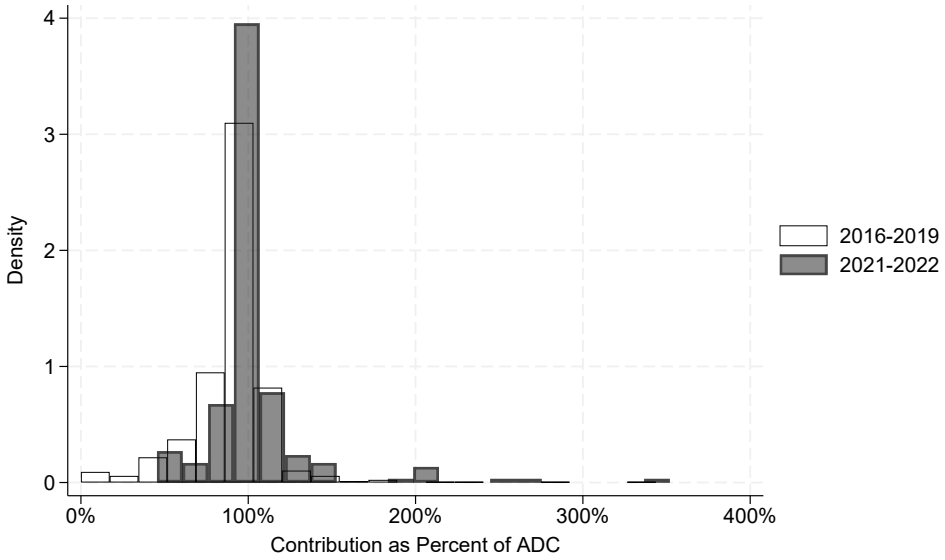
Note: Source: Public Plans Database. The figures depict annual average a) government pension contributions by both employers and employees, b) employer contributions as a percent of payroll, and c) employer contributions as a percent of the actuarially determined contribution for state and local defined benefit plans (2016-2022). Observations are weighted by pension liabilities. 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. The figures exclude governments without complete sets of data.

Figure 2: Average Employer Contributions as a Percent of ADC, High and Low Congressional Representation



Note: Source: Public Plans Database. This figure depicts the average contributions made by state and local governments to their defined-benefit pension plans as a percent of the actuarially determined contribution (ADC) between 2016-2022. Governments with "High Congressional Representation" are governments in states with per capita congressional representation in 2020 above the median. 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 service cost (the cost of newly accruing pension benefits) and a portion of the cost to eliminate any unfunded liability. The figure excludes governments without complete sets of data. Annual means are weighted by pension liabilities.

Figure 3: Distribution of Contributions as Percent of ADC



Note: Source: Public Plans Database. The figures show the distribution of employer contributions as a percent of the ADC pre- and post-pandemic. The darker distribution with a thicker outline, representing 2021-2022, is shifted to the right and includes more observations above 150%.

Table A1: Covid 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: Effect of Federal Aid on the ADC

	(1)	(2)	(3)	(4)
	Log ADC			
	OLS		2SLS	
Aid per Resident * Post	-0.06	-0.01	-0.05*	0.01
	(0.04)	(0.03)	(0.03)	(0.02)
Gov Fixed Effects	Yes	Yes	Yes	Yes
Time Trends	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes
N	601	601	601	601
R^2	0.99	0.99	0.99	0.99

Note: *** $p < 0.01$, ** $p < 0.05$, *$p < 0.10$. This table estimates the effect of federal assistance on the actuarially determined contribution (ADC). 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. Observations are weighted by pension liabilities. Standard errors in parentheses are clustered by government.

Table A3: Results by Year

	(1)	(2)	(3)	(4)
	Employer Contribution as Percent of ADC			
	OLS	2SLS	OLS	2SLS
	2021		2022	
Aid per Resident * Post	0.02	0.02	0.08***	0.09***
	(0.02)	(0.02)	(0.02)	(0.03)
Gov Fixed Effects	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes
N	512	512	499	499
R^2	0.82	0.82	0.80	0.80
First Stage F-Stat		295		405

Note: *** $p < 0.01$, ** $p < 0.05$, *$p < 0.10$. This table presents OLS and 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: Unweighted

	(1)	(2)	(3)	(4)
	Employer Contribution as Percent of ADC			
	OLS		2SLS	
Aid per Resident * Post	0.04**	0.04**	0.07***	0.07***
	(0.02)	(0.02)	(0.02)	(0.02)
Gov Fixed Effects	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	No	Yes
N	607	607	607	607
R^2	0.63	0.63	0.63	0.63
First Stage F-Stat			105	106

Note: *** $p < 0.01$, ** $p < 0.05$, *$p < 0.10$. This table is similar to Table 3 except that the observations are unweighted. 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 A5: Using an Alternative Measure of Congressional Representation

	(1)	(2)	(3)	(4)
	Employer Contribution as Percent of ADC			
	OLS		2SLS	
Aid per Resident * Post	0.05***	0.04***	0.05***	0.05***
	(0.02)	(0.02)	(0.02)	(0.02)
Gov Fixed Effects	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes
N	601	601	601	601
R^2	0.78	0.78	0.78	0.78
First Stage F-Stat			3.1	2.9

Note: *** $p < 0.01$, ** $p < 0.05$, *$p < 0.10$. This table is similar to Table 3 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. Observations are weighted by pension liabilities. Standard errors in parentheses are clustered by government.

Figure A1: Pension Contributions Over Time - Unweighted

Figure A1a: Employer and Employee Contributions

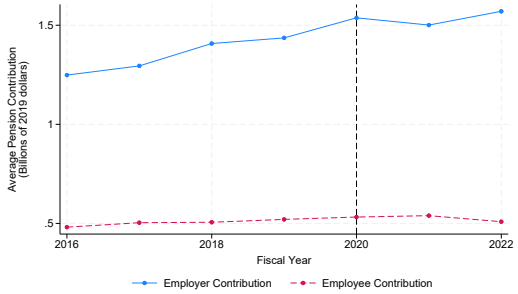


Figure A1b: Employer Contributions as Percent of Payroll

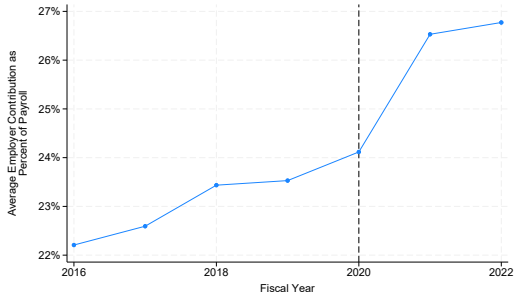
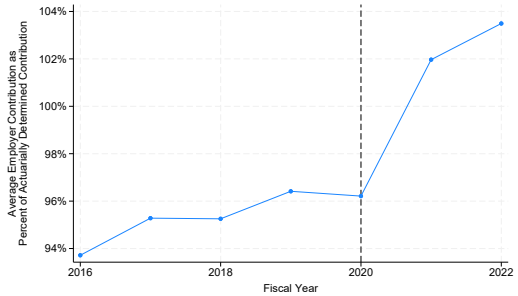


Figure A1c: Employer Contributions as Percent of ADC



Note: Source: Public Plans Database. The figures are the same as those in Figure 1 except that the observations are unweighted. The figures depict average a) government employer and employee pension contributions, b) employer contributions as a percent of payroll, and c) employer contributions as a percent of the actuarially determined contribution between 2016-2022 for state and local defined benefit plans. 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 service cost (the cost of newly accruing pension benefits) and a portion of the cost to eliminate any unfunded liability. The figures exclude governments without complete sets of data.

Figure A2: Payroll and ADC

Figure A2a: Payroll

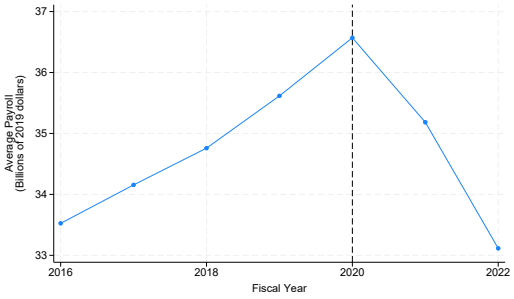
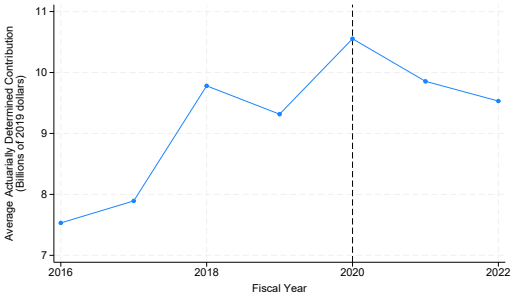


Figure A2b: ADC



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