NBER WORKING PAPER SERIES

WAS PANDEMIC FISCAL RELIEF EFFECTIVE FISCAL STIMULUS? EVIDENCE FROM AID TO STATE AND LOCAL GOVERNMENTS

Jeffrey Clemens
Philip G. Hoxie
Stan Veuger

Working Paper 30168
http://www.nber.org/papers/w30168

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
June 2022

We are grateful to John Kearns for outstanding research assistance. Clemens thanks the Hoover Institution for support as a Visiting Fellow. We thank Michael Farquharson, Scott Ganz, Richard Grossman, Duncan Hobbs, Ben Hyman, Ellen McGrattan, José Luis Montiel Olea, Valerie Ramey, Andres Santos, Daniel Shoag, Michael Strain, Kaspar Wuthrich, and seminar attendees at the American Enterprise Institute, the Hoover Institution, and the Stanford University Department of Economics for their comments, help, and suggestions. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Was Pandemic Fiscal Relief Effective Fiscal Stimulus? Evidence from Aid to State and Local Governments

Jeffrey Clemens, Philip G. Hoxie, and Stan Veuger

NBER Working Paper No. 30168
June 2022
JEL No. E6,H1,H7

ABSTRACT

We use an instrumental-variables estimator reliant on variation in congressional representation to analyze the effects of federal aid to state and local governments across all four major pieces of COVID-19 response legislation. Through September 2021, we estimate that the federal government allocated $855,000 for each state or local government job-year preserved. Our baseline confidence interval allows us to rule out estimates of less than $433,000. Our estimates of effects on aggregate income and output are centered on zero and imply modest if any spillover effects onto the broader economy. We discuss aspects of the pandemic context, which include the surprising resilience of state and local tax revenues as well as of broader macroeconomic conditions, that may underlie the small employment and stimulative impacts we estimate in comparison with previous research.

Jeffrey Clemens
Department of Economics
University of California, San Diego
9500 Gilman Drive #0508
La Jolla, CA 92093
and NBER
jeffclemens@ucsd.edu

Philip G. Hoxie
Department of Economics,
First Year Commons
University of California San Diego
9500 Gilman Dr. #0508
La Jolla, CA 92093
phoxie@ucsd.edu

Stan Veuger
American Enterprise Institute
1789 Massachusetts Avenue
Washington, DC 20036
stan.veuger@aei.org

I Introduction

Fiscal transfers from the federal government to state and local governments play an important role In the US federal system. During the COVID-19 pandemic, federal fiscal assistance reached unprecedented levels, with aid to state and local governments spanning four legislative vehicles and summing to almost $1 trillion.[2]

The motivation for federal fiscal stabilization arises from state and local balanced-budget constraints. When state and local governments face downturns, these constraints would, in the absence of federal relief, prevent them from contributing to countercyclical policy. As revenues decline and spending needs rise, compliance with the rules dictates tax increases and a search for budgetary savings. Savings may come from wage freezes and layoffs for members of the public-sector work force. Figure 1, for example, illustrates the reductions in state and local government employment that took place from the start of the pandemic through September 2021. These reductions can, in turn, lead to deteriorating service delivery just as needs run high.

Over the course of the pandemic, federal fiscal assistance has been distributed through a variety of channels, including general aid to states, general aid to local governments, and aid appropriated for specific functions of state and local government. A primary purpose of this aid was to limit the severity of public-sector layoffs and to increase the pace at which it would ultimately recover (Driessen and Gravelle, 2020; The White House, 2021; US Department of the Treasury, 2021b). This is motivated, at least in part, by standard concerns for macroeconomic stabilization. Our analysis thus undertakes to understand the extent to which federal assistance achieved this objective. We also assess the overall impact of federal fiscal assistance on the labor market more broadly, as well as on aggregate income and output.

The key challenge to estimating the effects of fiscal stabilization funds is a standard endogeneity concern: stabilization efforts are undertaken when and where economic conditions are poor, such that they correlate negatively with employment. To overcome this impediment, we adopt an instrumental-variables strategy. Specifically, we draw on existing work demonstrating that federal fiscal assistance to state and local governments exhibited a strong bias towards small states, which enjoy disproportionate representation in the US Congress (Clemens and Veuger, 2021a). Crucially, as our analysis confirms, the dollars driven by the US Congress's bias towards small states were orthogonal to a rich set of measures of the pandemic's direct effects on states and on the health of their populations. This and additional evidence support the validity of variations in states' over- and under-representation as an instrument.

Applying our instrumental-variables strategy, we estimate that federal fiscal assistance has had a modest impact on employment by state and local governments. In our preferred specification, we estimate that the federal government had to allocate nearly $855,000 to preserve a job-year through September of 2021. Our baseline estimates are sufficiently precise that we can rule out estimates that less than $433,000 was needed to preserve a job-year over this time period.

We next assess the effects of federal fiscal assistance on the broader labor market. In our analysis of private-sector employment, we cannot reject the null hypothesis of no effect, though our estimate is

[2] The 2009 American Recovery and Reinvestment Act (ARRA), in comparison, included some $223 billion for three years of fiscal relief for state and local governments (Inman, 2010).

imprecise. Our estimates for real wages and salaries are also near zero, but in this instance come with sufficient precision to rule out substantial impacts on total payroll. In sum, we find little evidence of meaningful spillovers from state and local government aid to the overall labor market, though we cannot rule out nontrivial impacts on employment.

We present additional analyses of effects on aggregate income and output. These estimates can be described as being of an "open economy relative multiplier" (Nakamura and Steinsson, 2014) or a "regional transfer multiplier" (Corbi et al, 2019; Pennings, 2021). They also center on zero, implying that fiscal stabilization dollars have had little overall impact on economic activity in the pandemic context. Our estimates of effects on income and output are sufficiently precise to allow us to rule out substantial effects, in particular across the period of heightened fiscal uncertainty. To illustrate the evolving magnitude of our multiplier estimates, we present impulse response functions using the local-projection method for each of our outcomes of interest (Jorda, 2005; Ramey, 2016).

Our multiplier estimates are small relative to several prominent estimates from other settings (Suárez-Serrato and Wingender, 2016; Corbi et al., 2019; Shoag, 2013 and 2016). Later, we discuss the key features of the setting we analyze that, in our view, are the most plausible explanations for this difference.

Our primary contribution is to the literature on the macroeconomic effects of federal fiscal assistance. There are many papers in this literature. Some examples include Fleck (1999), Chodorow-Reich et al. (2012), Suárez-Serrato and Wingender (2016), Corbi et al. (2019), and Pennings (2021). Other papers have estimated conceptually similar objects using other sources of windfall gains to state and local government budgets (Shoag, 2013 and 2016).[3] What differentiates our work from these earlier analyses is both the context and the magnitude of the spending shocks generated by our instrument.[4]

Papers set in the period immediately following the Global Financial Crisis (e.g., Chodorow-Reich et al., 2012) or in the Great Depression (e.g. Fleck, 1999) can be described as coming from eras of secular stagnation or rampant demand shortfalls (Eichengreen, 2015; Summers, 2015; Eggertson et al., 2019). The period we study, on the other hand, is characterized by a transition from the Great Recession's low-inflation environment to one of rapidly increasing prices, suggesting a different imbalance between aggregate demand and supply.

In addition, the standard transmission mechanisms for multiplier effects may have been blunted by pandemic restrictions on service provision and spending and by the public-health situation more broadly. This macroeconomic context may lead one to expect smaller employment and stimulative effects. In fact, it has been argued that the provision of social insurance, not aggregate-demand management, was and should have been at the heart of the economic-policy response to the pandemic (Romer and Romer, 2022). While we believe there is truth to that line of argument, in particular as far as the Paycheck Protection Program (PPP) and Unemployment Insurance (UI) components of the relief

[3] These papers do not estimate a traditional balanced budget multiplier because the spending they analyze is financed by windfall gains, as observed by Clemens and Miran (2012).

[4] Fishback (2017), Ramey (2019), and Chodorow-Reich (2020) provide overviews of the even more extensive literatures on the effects of fiscal policy more broadly defined on employment, output, and other variables of interest. Nakamura and Steinson (2014), as well as Ramey (2016 and 2019) and Chodorow-Reich (2020), provide frameworks for interpretation of the different estimates in these literatures.

efforts were concerned, policymakers explicitly intended for the state and local aid component to help preserve employment, maintain quality of state and local service delivery, and support aggregate demand.[5]

Our context also differs from the Great Recession setting in key respects related to state and local government finances and operations. State government revenues, as has now been widely documented, were far more robust to the pandemic's effects than had been anticipated (Clemens and Veuger, 2021b; National Association of State Budget Officers, 2021). By reducing expenditures, pandemic related limits on service provision (e.g., transportation to schools) further alleviated strains on state budgets. While some new expenditure needs directly related to the public-health crisis arose, in overall terms states were less liquidity-constrained than had been anticipated and thus had less cause to make rapid use of fiscal assistance dollars. While the remaining federal dollars will either be spent or used to finance reductions in taxes over time, their impact on states' economies will come after, rather than during, the period of pandemic-driven uncertainty and potential revenue and aggregate-demand shortfalls.

Finally, the magnitude of the spending shocks induced by our instrument is quite large. Variations in states' over- and underrepresentation predict considerable variations in states' funding allocations. As can be seen in Figure 2, allocations to the most over-represented states exceeded allocations to the least-represented states by several thousand dollars per capita.[6] This is considerably more variation than studies of fiscal stabilization efforts are typically able to analyze.

We also contribute to the literature on state and local government budgets over the course of the pandemic. Initial papers in this literature sought to forecast the magnitudes of the revenue shortfalls faced by various levels of government within the United States (Auerbach et al., 2020; Clemens and Veuger, 2020a, 2020b; Chernick et al., 2020; Gordon, Dadayan, and Rueben, 2020; Whitaker, 2020a; 2020b). Additional analyses have considered the pandemic's implications for spending needs (Gordon and Reber, 2020; Clemens, Ippolito, and Veuger, 2021). Researchers have also explored the effects of initial state and local aid allocations on the extent of public sector layoffs in April 2020 (Green and Loualiche, 2020). We offer the first systematic analysis of the regional employment, income, and output multiplier effects of federal allocations to state and local governments across the four major pieces of COVID-19 response legislation.

The paper is organized at follows. In Section II we introduce the data sets and sources on which our analysis relies. We turn to our empirical strategy in Section III. Sections IV and V present our empirical results for state and local government employment and the broader economy, respectively. We conclude with a discussion of our findings in Section VI.

[5] This is reflected in policy documents (e.g., as above, Driessen and Gravelle, 2020; The White House, 2021; US Department of the Treasury, 2021b), in the contemporary policy debate (e.g. Bartik, 2020; McNichol et al., 2020; Zandi, 2020), as well as in the explicit association of some elements of state and local aid with specific functions of those levels of government (e.g. education, health care).

[6] The differential between the most and least well-represented states exceeds one-third of the combined, annual per capita state and local government revenues from own sources of a typical state in recent years.

II Data

We analyze the fiscal assistance resulting from four major pieces of legislation during the COVID-19 pandemic: the CARES Act, the Families First Coronavirus Response Act (FFCRA), the Response and Relief Act (RRA), and the American Rescue Plan Act (ARPA).[7] Taken together, these packages constituted a massive relief effort that provided as much as $6 trillion in income support to households, a mix of loans, grants, and tax relief to firms and non-profits, funding for (public) health efforts, and intragovernmental grants to subnational governments. This final category includes almost $900 billion in funds for state, local, territorial, and tribal governments, as well as the District of Columbia. We focus on the impact of these funds across the 50 states.

Following Clemens and Veuger (2021a), data from the Committee for a Responsible Federal Budget (CRFB, 2021) form the foundation for our fiscal assistance variables.[8] We supplement the CRFB data with information from several sources.[9] For the bulk of our analysis, we combine the aid disbursed by each bill into one variable to avoid interactions and inconsistencies between timing, expectations, and changes in behavior associated with the political process of passing such massive bills. Our main independent variable is the grand total of aid distributed to each state per resident in millions of dollars.

Figure 2 provides an initial look at the distribution of funds across the four pieces of legislation. Dollar values are expressed on a per capita basis. Throughout this paper, we define a state's population according to the U.S. Census Bureau (2021) official count estimated during the 2020 census. Panel A shows that the distribution of money across states has not been equal, with smaller states receiving relatively more per person than larger states.

In this paper's analysis, we use a state's number of congressional representatives per million residents to instrument for federal aid per capita.[10] Clemens and Veuger (2021a) establish a relationship between the relative representation of states in Congress and the amount of aid they were allocated during the pandemic. Smaller states, such as Wyoming, receive relatively more representation per capita as each state is guaranteed two senators regardless of population, ensuring that Wyomingite voices are relatively more powerful in legislative negotiations. Congressional representation is measured using rosters of the House of Representatives and Senate during the 116th and 117th Congresses from Lewis et al. (2021). Of note, Congressional representation in 2020 was allocated according to state population in

[7] This section's description of COVID-19 relief legislation draws heavily on the description from Clemens and Veuger (2021a). Readers interested in detailed legislative histories should look to the more expansive discussion there.

[8] We use data from the CRFB's COVID-19 Money Tracker as of August 19th, 2021.

[9] As in Clemens and Veuger (2021a), "[w]e obtain information on the distribution of transit funds for the RRA and ARPA from the US Federal Transit Administration (2021a, 2021b). Data on the allocation of ARPA assistance to non-public schools come from the US Office of Elementary and Secondary Education (2021). We obtain estimates of ARPA section 9817 matching increases from Chidambaram and Musumeci (2021). We approximate the allocation of ARPA section 9819 federal matching funds for uncompensated care using FY2021 estimates of federal disproportionate share hospital allotments by state from the Medicaid and Chip Payment Access Commission (2021)." The Coronavirus Capital Projects Fund outlined in ARPA is distributed according to guidance from the United States Department of the Treasury (2021a).

[10] Congressional representation per million residents is calculated as $\frac{\#\ of\ Representatives_s + \#\ of\ Senators_s}{Pop_{s,y_{2020}}/1{,}000{,}000}$, for each state *s*. Clemens and Veuger (2021a) show that assigning greater weight to the number of senators does not qualitatively affect the estimated importance of congressional over- and under-representation.

the 2010 census, thus ensuring that Congressional representation is not affected by COVID-19-induced variations in population. Panel B shows the relationship between federal aid and our instrument.

The main outcome of interest in our analysis is state and local employment. The US Bureau of Labor Statistics employs several approaches to estimate employment levels. We primarily rely on employment counts from the Quarterly Census of Employment and Wages (QCEW), and use Current Employment Statistics (CES) data for robustness checks. The QCEW counts the monthly unemployment insurance records of 10.9 million establishments to estimate the number of "covered workers who worked during, or received pay for, the pay period that included the 12th day of the month" (US Bureau of Labor Statistics, 2021c). Estimates are broken down by establishment location and NAICS industry code. The CES, on the other hand, is based on a set of 697,000 establishments monthly, over the same time period as the QCEW, to approximate employment across states and industries. Generally speaking, the QCEW estimates are more detailed and precise, but their publication lags that of the CES numbers by several months. [11] As such, estimates that rely on the QCEW are based on data through September 2021 while estimates that rely on the CES use data through December 2021. We also analyze the effects of fiscal assistance on state-wide aggregate income and output as reported by the Bureau of Economic Analysis (BEA).

Table 1 presents summary statistics on the full set of variables used in our analysis. Because some of the variables we use in our analyses are available for different time periods, not all variables have the same number of observations. Notably, variables derived from the QCEW have fewer observations than variables derived from the CES. Additionally, some of the variables we analyze are reported at a monthly frequency while others are reported at a quarterly frequency. Further details on the definitions of key variables can be found in Appendix Table 1.

III Empirical Strategy

We seek to identify the direct impact of COVID-19 relief funds to state and local governments on employment during the COVID-19 pandemic. Equation (1) presents a "naïve" OLS model of the relationship between per capita aid and changes in the per capita employment of state and local governments:

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{TotalAid_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,m,y} + \varepsilon_{s,m,y} \quad (1)$$

In the equation above, $\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ is the arithmetic change in per capita state and local government employment in state *s* during month *m* and year *y* of the pandemic relative to the same month in 2019. $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is the total per capita funding (in millions of dollars) to state and local

[11] It should be noted that the QCEW excludes up to 700,000 state and local government employees that are sampled in the CES survey. Excluded employees include elected officials, members of a legislative body or judiciary, state National Guardsmen, and temporary employees serving during a declared emergency. Students employed in a work-study program do not enjoy Unemployment Insurance (UI) coverage and are therefore not captured by the QCEW either. For an in-depth discussion of UI coverage, see US Department of Labor (2020).

governments in state *s* pooled across all four COVID-19 relief bills. This variable is time-invariant. $X_{s,m,y}$ is a vector of state-level demographic, economic, and political controls, which we discuss in greater detail below and in Appendix Table 1.

OLS estimates of β_1 from equation (1) are subject to potential biases linked to the endogeneity of fiscal assistance allocations. If policymakers allocated more money to states with worse outbreaks of COVID-19, for example, then federal aid would be correlated with any variations in employment that were driven by variations in the severity of the pandemic. This would introduce downward bias as it would generate a spurious, negative correlation between aid dollars and employment outcomes. A more direct form of reverse causality may also arise if, for example, the severity of states' public-sector layoffs shaped federal aid allocations. In this case, the employment shock determines the amount of aid given, creating a spurious negative relationship.

We adopt an instrumental-variable approach to address these challenges. We draw on evidence from Clemens and Veuger (2021a), who show that a state's per capita representation in Congress has two relevant features. First, it is strongly predictive of variations in per capita federal aid allocations. Second, as discussed in more detail below, it is orthogonal to a rich set of measures of the pandemic's direct effects on states and on the health of their populations. This leads us to estimate the following set of equations:

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \, RepsPerMillion_s + \beta_2 X_{s,m,y} + \varepsilon_{s,m,y}. \tag{2a}$$

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid_s}}{Pop_{s,y_{2020}}} + \beta_2 X_{s,m,y} + u_{s,m,y}. \tag{2b}$$

In the first-stage regression (2a), $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is regressed on $RepsPerMillion_s$, the number of representatives and senators per million residents in 2020, and a set of additional controls $X_{s,m,y}$, the components of which we discuss below. $X_{s,m,y}$, encompasses a baseline set of controls discussed further in this section and additional robustness controls defined in Appendix A1. Robust standard errors are clustered at the state level. In our baseline analysis, we weight observations by state population, though we present robustness analyses in which we weight each state equally. Fitted values from the first stage (2a) are used to estimate the second stage (2b).

A valid instrument satisfies both the relevance and exogeneity (or exclusion) restrictions. To serve as a good instrument, congressional representation needs to be statistically related to the amount of aid disbursed by the federal government. If the relationship is not strong and the relevance restriction is failed, the fitted value will not pick up the exogenous variation needed to estimate a correctly specified second stage. As established by Clemens and Veuger (2021a), the relationship between representatives per million and COVID-19 relief aid is very strong. On a per capita basis, as can be seen in Figure 2, Panel A, small states received much more money than large states. These same small states are over-represented in Congress, a status that provides them with an advantage in the political bargaining process. Figure 2, Panel B shows that, for those states with more than two congressional representatives per million residents, the amount of aid scales almost proportionately with representation. However,

there is no such relationship for those states with less representation. Thus, congressional representation per resident is a strong instrument for the relative amount of aid received by a state. We evaluate the strength of the instrument formally in the Results section.

The exogeneity restriction requires that, conditional on other independent variables, congressional representation be structurally unrelated to other factors that influence state and local government employment during the pandemic. Here it thus becomes relevant to discuss the variables we include in $X_{s,m,y}$. In our baseline specification, the vector $X_{s,m,y}$ includes the log of state *s*'s official 2020 Census population (the level of which is used to construct other variables that require population), the share of population in state *s* that lives in a local jurisdiction eligible for financing through the Federal Reserve's Municipal Liquidity Facility,[12] and the arithmetic changes in state and local government employment per capita and private employment per capita in state *s* between December 2018 and December 2019, respectively. As proxies for the stringency of COVID-related restrictions on economic activity, the average Oxford Stringency Index (OSI) value for state *s* during March 2020 and the average OSI value for state *s* during month *m* and year *y* are also included.[13]

We advance several arguments and pieces of evidence in support of the exogeneity restriction required for equation (2b) to yield a causal estimate of the effect of federal fiscal assistance. First, we emphasize that our instrument's conditional exogeneity is plausible. Since representation imperfectly scales with population, some states will be relatively over-represented; for example, Montana's roughly 1 million residents enjoy three votes per million in Congress (2 senators and 1 representative) while 3 million Arkansans enjoy only 2 votes per million (2 senators and 2 representatives). At the same time, excepting an unlikely epidemiological relationship between state population numbers and the novel coronavirus, the number of congressional seats has no direct impact on local employment beyond its influence on the legislative priorities of Congress.

Importantly, the data support the general argument that the degree of a state's over- or under-representation was largely unrelated to the needs it faced as a consequence of the pandemic. Clemens and Veuger's (2021a) analysis of the small-state advantage shows that it is more or less orthogonal to an extensive set of proxies for dimensions of state and local government funding needs, including states' revenue shocks, economic shocks, the size of their public sector, and acreage of federal land. Appendix Table 2, a version of Clemens and Veuger's (2021a) Appendix Table 5 with the sum of federal funds across all four bills taking the place of the funds in each individual bill as the dependent variable, illustrates this for the current setting. Controlling for various dimensions of perceived need does not qualitatively affect the relationship between our instrument and the amount of federal funds allocated.

[12] Access to the Federal Reserve's Municipal Liquidity Facility (MLF) has been described as a major contributor to settling municipal bond markets during the coronavirus's initial outbreak (Haughwout et al., 2021). Based on Federal Reserve Board (2021) guidance, we estimate the share of states' 2020 populations residing in a municipality eligible for local MLF financing (in addition to state MLF financing, which was accessible to all).

[13] Information on the stringency of government restrictions comes from Oxford's COVID-19 Government Response Tracker (OxCGRT). This source provides daily index values of government restrictions for all 50 states since January 6, 2020. OxCGRT averages policy stringency across eight dimensions: school closures; workplace closures; public event cancellations; gathering restrictions; public transportation closures; stay-at-home orders; restrictions on internal movement; and international travel bans. This variable ranges from 0 (no restrictions) to 100 (the highest possible level of restrictions across all eight dimensions). In all regressions, OSI is rescaled by dividing by 100 so that it ranges from 0 to 1.

Even with this initial supporting evidence, however, the exogeneity assumption requires further justification. It is possible, for example, that small states may have been differentially impacted by the pandemic, which may thus have differentially impacted their employment. A larger outbreak of COVID-19 will cause more people to limit mobility either voluntarily or due to health reasons. Social distancing necessarily translates into less spending on services, the taxation of which provides the revenues many state and local governments use to pay employees. Another possibility is that small states may have adopted a different set of policy responses to the pandemic, and that those policy responses may have exerted independent influence on economic activity. On this point, it is useful to note that, as shown by Clemens and Veuger (2021a), the over-representation of small states is less correlated with political partisanship than is commonly assumed. We provide additional evidence on a number of these issues by exploring our results' robustness to altering the sets of covariates we include in $X_{s,m,y}$. In particular, we implement specifications that include covariates that are associated with the pandemic's health effects, with the stringency of states' policy responses to the pandemic, with states' political leanings, and with additional proxies for states' pre-pandemic economic trends.

An additional potential concern is that the fiscal assistance that is predicted by our instrument might be correlated with other elements of the federal government's pandemic relief packages. This is a natural concern in light of the fact that fiscal relief for state and local governments accounts for roughly one sixth (or $1 out of $6 trillion in total relief spending) of the federal relief packages. We are able to provide direct evidence on this potential concern with respect to three of the largest programs through which the federal government provided relief to business and households, namely the PPP, the Economic Impact Payments (EIP, or "stimulus checks"), and federal funding for enhanced UI benefits. In Appendix Table 3, we report results from an analysis in which we put the per capita spending from each of these programs on the left-hand side of Equation (2b). The point estimate on $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ thus tells us how many dollars in spending through these major programs are correlated with each dollar in fiscal relief of states and localities as predicted by our instrument. The estimates in Panel A reveal that in our baseline specification there is no significant relationship between the spending predicted by our instrument and the federal spending through PPP, EIP, and UI. Indeed, the sum of the three coefficients is remarkably close to 0. In Appendix Table 4, we place the PPP, EIP, and UI spending variables on the left-hand side of Equation (2a). The results show directly that our instrument is uncorrelated with spending through these programs in our first-stage regression.

A final potential concern is that small and large states may simply have been on different pre-pandemic trends. Indeed, because the data provide reason to worry that this was the case, our baseline specifications include pre-pandemic trends in the dependent variables as controls. An exploration of the robustness of our estimates to alternative approaches to controlling for this potential concern will be an important component of our analysis.

We present further evidence, discussed in more detail below, in the form of "pre-trend tests." That is, we confirm that the spending variations that are isolated by our instrument do not predict changes in employment over the months that preceded the pandemic's onset and the first pieces of legislation that we analyze.

Equations (2a) and (2b) can be described as pooled panel regressions. To recover impulse response functions, we also estimate sets of horizon-specific estimates at the monthly level for our employment

data and at the quarterly level for our data on macroeconomic aggregates. These period-by-period regressions are described by equations (3a) and (3b):

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \, RepsPerMillion_s + \beta_2 X_{s,m,y} + \varepsilon_{s,m,y} \tag{3a}$$

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid_s}}{Pop_{s,y_{2020}}} + \beta_2 X_{s,m,y} + u_{s,m,y}. \tag{3b}$$

In equations (3a) and (3b), *m* and *y* iterate over the month-year pairs from January 2020 to September 2021. In this specification, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is still the total amount of aid per capita allocated to a state since the beginning of the pandemic. This change in methodology has two main advantages. First, for the set of regressions estimated from April 2020 onwards we are able to establish a time series of the effect that relief aid has had on employment. It is unlikely that money allocated in March would have its full effect by April, so estimating equations (3a) and (3b) month by month enables us to examine if and when COVID-19 aid significantly cushioned employment. Second, our estimates for months that precede the pandemic provide tests for the presence of divergent pre-trends. Instrumented COVID-19 relief aid should not be related to employment outcomes in any month before money was actually legislated. Figure 4, analyzed further in the Results section, presents this pre-trend test.

The coefficient β_1 estimated in equations (2b) and (3b) is the primary object of economic interest. In addition to summarizing the relationship between COVID-19 relief aid and state and local government employment, β_1 can be transformed into an intuitive metric for evaluating the efficacy of fiscal relief. Specifically it can be transformed into an estimate of the dollars spent per job-year saved. In equation (2b), the coefficient β_1 identifies the average number of jobs recovered for an additional $1 million in federal aid across an 18-month (1.5 year) interval. Since $\frac{\widehat{TotalAid_s}}{Pop_{s,y_{2020}}}$ is defined as the amount of aid per capita in millions of dollars, the ratio \$1,000,000/$(\beta_1 * 1.5)$ is the number of federal dollars needed to recover one state or local government job-year during the pandemic.[14] If β_1 is large, the government will have spent relatively little money to preserve or create each job-year.

IV Results: State and Local Employment

Together, the CARES Act, FFCRA, RRA, and ARPA represent an unprecedented transfer of money from the federal government to state and local governments. We focus first on assessing the extent to which this transfer helped sustain state and local employment through the crisis, before turning to broader macroeconomic impacts in the next section.

[14] Since the CES data extend to December 2021, the amount of money spent for each job-year saved is equivalent to \$1,000,000/$(\beta_1 * 21/12)$ using the regression results found in the appendix.

State and Local Government Employment During the Pandemic

We begin by describing the declines in state and local government employment that occurred during the pandemic. Figure 1 provides time series evidence on the magnitude of the COVID-19 shock's initial impact on state and local government employment, as well as on the evolution of that impact over time. It uses QCEW data to summarize per capita changes in state government employment, local government employment, and state and local government employment combined. The changes are calculated relative to the same calendar month in 2019 (e.g., the first value is a change calculated from January 2019 to January 2020, while the final value is a change calculated from September 2019 to September 2021). Appendix Figure 1 summarizes these changes using employment data from the CES. Both sources identify the same general trend: a sharp decline in government employment during the spring that was partially undone during the summer of 2020, followed by additional, but much slower, recovery through late 2021. Appendix Figure 2 presents the same data in percent change terms, echoing the significance of the contraction in employment and the lagging pace of the recovery.

Figure 1 shows that local employment has been durably affected by the COVID-19 shock. By June 2020, local government employment had shrunk by 7.6 percent nationally; it remained 3.2 percent below its 2019 level as of September 2021. State government employment suffered a smaller initial shock and was 2.1 percent below its 2019 levels as of September 2021. By June 2020, combined state and local government employment had shrunk by over 1.2 million nationally (6.4 percent below 2019 levels); in September 2021 it remained 500,000 jobs (or 3.0 percent) below its 2019 levels.[15] As in the general labor market, impediments to full employment in the state and local government sector continued to linger through the 2021 calendar year.

First-Stage Relationship Between Federal COVID-19 Relief and Congressional Representation

The first-stage relationship between state and local aid and relative congressional representation is strong, as shown earlier in Figure 2. Panels A and B in Figure 3 present coefficients on $RepsPerMillion_s$ as in equation (3a). In Panel A the dependent variable is, in each month, the cumulative total of per capita aid to state and local governments across the four major pieces of relief legislation. In Panel B the dependent variable is the running total, rather than the cumulative total, of federal aid per capita. In all months after March 2020, the coefficient on the instrumental variable is both economically substantial and statistically significant at the 1 percent level. In Panel B, estimates for months extending from April 2020 through March 2021 are around $650 per capita and primarily reflect the small-state bias embedded in the CARES Act. The coefficients rise to roughly $1,000 beginning in April 2021, reflecting the additional small-state bias embedded in the ARPA. The estimates in Panel A are consistently at roughly $1,000, reflecting that the dependent variable is the cumulative total of fiscal assistance regardless of the month in the sample.

Our baseline first-stage F-statistic of 57.79 exceeds the traditional rule-of-thumb threshold value of 10 used to reject a null hypothesis of weak instruments (Stock and Yogo, 2005). Montiel Olea and Pflueger (2013) propose a test for weak instruments that allows for errors that are not conditionally homoscedastic and serially uncorrelated. Based on the routine introduced by Pflueger and Wang (2015),

[15] Appendix Figure 1 replicates Figure 1 with CES estimates and tells a very similar story.

our baseline F-statistic also allows us to reject at the 95% confidence level the null hypothesis that the approximate asymptotic bias of our 2SLS estimator exceeds 10% (23.11), or even 5% (37.42) of the bias in our OLS estimator. Similarly reassuring are the results of Angrist and Kolesár (2022, Figure 2), which suggest that the median bias in our 2SLS estimator is negligible relative to the bias in our OLS estimator. The strength of our instrument also bears on the potential relevance of violations of the monotonicity assumption (i.e., the "no defier" assumption, which in our setting requires that states with higher values of our instrument are never made less likely to be exposed to the treatment of greater federal fiscal assistance). As noted by Angrist, Imbens, and Rubin (1996), "the stronger the instrument, the less sensitive the IV estimand is to violations of the monotonicity assumption." All of this is particularly reassuring given the (justified) concerns over weak instruments in this literature, as discussed by Ramey (2016).

Our first-stage is also robust to the combination of baseline controls included in the regression, as evidenced by Appendix Table 5. The estimated F-statistic remains large with the separate addition of each control shown.

Federal COVID-19 Relief and State and Local Government Employment

Column 2 of Table 2 presents the second stage of our 2SLS baseline specification using QCEW data from April 2020 through September 2021. The coefficient on total aid per capita, 0.780, implies that the federal government had to allocate nearly $855,000 per job-year saved. That amount corresponds to over 12 times median household income.[16]

While our baseline estimate of federal dollars allocated per job-year saved is high, our estimate nonetheless implies a substantial number of job-years saved due to the historically large quantity of aid provided. A back-of-the-envelope calculation using $837 billion as the total amount of aid disbursed and $855,000 as the cost to save one job-year implies that 980,000 public-sector job-years were saved in aggregate. For reference, roughly 1.9 million state and local workers lost their jobs in the initial stages of the pandemic. Our estimates suggest that, in the absence of federal aid, additional public sector job losses would have occurred during the summer of 2020. Instead, public-sector employment commenced its slow recovery.

Alternative Specifications

Based on our discussion of the statistical issues associated with estimating equation (1), we would expect the OLS estimate to be attenuated towards zero. Column 1 of Table 2 presents the OLS estimates of equation (1), again using QCEW data from April 2020 through September 2021. As expected, the coefficient on aid per resident using the 2SLS specification is substantially more positive than the OLS estimate, confirming that the OLS estimate is biased downward.

Our baseline estimates of equation (2b) may be biased if our instrument, representatives per million residents, is correlated with related state characteristics such as pre-pandemic macroeconomic

[16] This also exceeds the 2020 average annual salary of federal, state, and local government workers of $62,765 by a factor of close to 14 (US Bureau of Labor Statistics 2021b).

performance or the severity of COVID-19 outbreaks. We present several robustness checks to investigate whether our estimates are sensitive to the addition of controls for such factors. Columns 3 through 7 of Table 2 show estimates with additional sets of controls to account for such variables as the outbreak of COVID-19, the state political environment, and variations in voluntary and involuntary social distancing.[17] Column 3 adds as controls the share of votes won by Donald Trump in a given state during the 2020 presidential election, the average OSI value during the last week of March 2020, and the percentage change in mobility in retail and recreational areas as measured by Google. In Column 4, we add the total and new number of per capita COVID-19 cases and deaths in the previous month. In Column 5, we add the arithmetic change in a state's real output per capita from Q4 2018 to Q4 2019 as an additional economic control. Column 6 combines all of these controls in one regression. Column 7 presents a specification in which the log of population is the only covariate in $X_{s,m,y}$.

Across the specifications in Table 2, the coefficient on total federal aid per capita remains modest and either statistically indistinguishable from zero or marginally statistically distinguishable from zero. The smallest 2SLS estimate is from the "Simple" specification in column 7, which is biased downward because it incorporates no measure to account for variations in employment growth that pre-date the pandemic. We emphasize that even the largest estimate in Table 2 is modest in magnitude. The estimate from Column 4 implies that $640,000 was required to save a full-year government job. In our most aggressively controlled specification (Column 5), the price for each job-year saved is nearly $1.5 million.

As additional robustness checks, we present estimates in which we do not weight states according to population and in which we estimate state and local employment using CES data rather than QCEW data. Weighted and unweighted specifications have different interpretations. Unweighted specifications are more appropriately interpreted as shedding light on the experience of a typical state, while population-weighted estimates are more appropriately interpreted as shedding light on the typical impact of each dollar spent. In analyses of federal fiscal assistance from the ARRA, for example, Ramey (2019) takes issue with Chodorow-Reich (2020)'s attempts to estimate the aggregate impact of the ARRA using unweighted regressions. Ramey argues that while Chodorow-Reich (2020)'s unweighted approach is satisfactory to analyze cross-state differences, the approach is not sufficient to comment on the overarching impact of federal stimulus. As shown in Appendix Table 7, unweighted estimates tend to be closer to zero in our setting.[18] Appendix Table 8 shows that we similarly obtain smaller estimates when analyzing CES employment data rather than QCEW employment data. The CES data and unweighted estimates thus imply employment impacts smaller than the already modest impacts we estimate in our baseline specification.

Finally, we test the robustness of our results by relying on an instrument that is similar in spirit to ours but constructed differently. We again estimate equation (2b), but this time with the interaction between a small-state indicator and state population as the instrument, as in Green and Loualiche (2020). Appendix Figure 5 summarizes the results of this specification using the QCEW estimates of

[17] The additional sets of controls are described in detail in Appendix Table 1. Appendix Table 6 is the first-stage counterpart to Table 2.

[18] Appendix Figure 4 presents the coefficient plot for unweighted regressions using QCEW state and local government employment data. Aside from observations not being weighted by state population, the baseline regressions used for Figure 4 and Appendix Figure 4 are otherwise identical. Note that the coefficient plot still does not show a positive impact of the COVID-19 relief aid to state and local governments.

employment. As in Figure 4, the point estimates average modestly under 1, indicating that each $1 million in aid preserved modestly less than 18 public sector job-months across the 18 months in our sample. This provides reassuring evidence that our findings are not sensitive to the functional form we use to instrument for fiscal assistance with variations in states' political representation.

Pre-Trends

In addition to examining the first-stage F-statistics for an indication of the strength of the instrument, it is also prudent to conduct "pre-trend" tests to provide additional evidence on the plausibility of the exclusion restriction. If the exclusion restriction is satisfied, the instrument ought not to be correlated with employment trends prior to the onset of the pandemic. The bottom row of Table 2 shows that the coefficient on federal aid per capita from regressing equation (2b) with data from January to March 2020[19] (our 'pre-pandemic' period) is statistically insignificant and practically small, suggesting there is no14 uncontrolled trend prior to April 2020.[20] The near-zero and insignificant pre-trend coefficients suggest the lack of a strong relationship between over-represented states and employment prior to the COVID-19 shock.

Evolution of Employment Effects over the Course of the Pandemic

Timely delivery of funds has been a central issue for the federal government's COVID-19 response. As there is a delay between the announcement of funding allocations, the disbursement to state treasuries, and the actual spending by state and local governments, it may be useful to examine the coefficient on federal aid per capita over the course of the pandemic in order to identify any trends over time. This timing component is an important aspect of the overall policy landscape.

Figure 4 shows the local-projection impulse response of state and local government employment to total federal aid per capita in millions of dollars, with equation (3b) estimated month by month. While the coefficient on the aid variable is generally positive, indicating that more federal support translated into jobs saved, the effect is economically modest and tends, in most months, to be statistically indistinguishable from zero. An important takeaway from Figure 4 is the lack of a discernible impact of the relief aid until June 2020. State and local governments may react to federal decisions with a lag, and it was not clear if it was safe to bring employees back until summer 2020.[21] Since summer 2020, and through the third quarter of 2021, the coefficient has settled around one.

[19] As the QCEW is surveyed during the second week of each month, March 2020 employment figures are estimated prior to the large-scale shutdowns that shocked normal business conditions.
[20] These estimates are presented in greater detail in Appendix Table 9. The magnitudes of the coefficients are roughly one-fifth of those in Table 2, which are already quite low in practical terms, and present negative signs.
[21] This stands in interesting contrast with the practically immediate impact of federal relief on municipal credit markets observed by Haughwout et al. (2021).

V Results: The Macroeconomy

Aid to state and local governments may support broader economic activity in two ways. First, supporting employment in the public sector buoys incomes among those employees who retain their jobs. The money they continue to spend can support employment in the private sector. It should be noted that the forced and voluntary social distancing experienced during the pandemic may limit this transmission mechanism. Second, more aid to state and local governments may also fortify their abilities to provide basic services, health-related relief, and investment that contain the economic damage of the pandemic.

Table 3 presents estimates of the effects of aid to states and localities on several macroeconomic indicators. Columns 1 and 2 apply our baseline model to public and private employment using monthly data. Columns 3, 4, and 5 examine the broader economy at a quarterly frequency using real, annualized total wages and salaries (government plus private) per capita, state GDP per capita, and personal income per capita from the Bureau of Economic Analysis (2021).[22] In each instance, the regression includes the outcome variable's pre-pandemic trend as a control variable.[23]

The estimate of the impact on private employment in Column 2 is similar in size to our estimate for public-sector employment, but very imprecisely estimated. We take this as not providing strong evidence for an effect in either direction. Our findings in Column 3 indicate that an additional $1 in aid to state and local governments decreased annualized real wages and salaries per capita by $0.05. This result is insignificant at traditional confidence levels. Columns 2 and 3 thus provide little evidence of meaningful spillovers from state and local government aid to the overall labor market.

Columns 4 and 5 analyze two broader measures of aggregate economic activity. First, Column 4 uses annualized, seasonally-adjusted state real GDP per capita (in millions of chained 2012 dollars). The estimate in column 4 suggests that an additional $1 in relief funds predicts a per-year reduction in GDP per capita of $0.23, while the estimate in Column 5 shows that an additional $1 in relief funds predicts a per-year increase in aggregate income per capita of $0.44. These results are statistically indistinguishable from zero at traditional confidence levels, and we interpret them in combination as suggesting a null impact on aggregate income and output.

We subject the full set of results in Table 3 to a set of robustness checks that gauge the potential relevance of the covariates we include, of the functional form in which we include those covariates, and the potential role of either the largest or smallest states in driving our results. In Appendix Table 10, we replace the log of states' populations with an indicator for whether a state was "small" in the sense that it benefited from the CARES Act's floor function. In Appendix Table 11, we consider a more saturated specification in which the covariates include cubic polynomials in all baseline covariates other than population.[24] In Appendix Table 12 we reduce the control set to include solely the log of each state's

[22] We convert nominal wages and salaries and nominal personal income from the Bureau of Economic Analysis into real terms with the national seasonally-adjusted personal consumption expenditure deflator, with a base year of 2012 equal to 100.

[23] The personal income regression in column 5, for example, includes as a control the change in real personal income per capita from the fourth quarter of 2018 through the fourth quarter of 2019. It excludes as controls the pre-pandemic trends in public and private employment. The inclusion of these additional controls has a modest impact on the estimated effect of federal fiscal assistance.

[24] This specification also serves to address concerns raised by Blandhol et al. (2022) regarding the interpretation of instrumental-variables estimators.

population, as in the "simple" specification from Column 7 of Table 2. The results in Appendix Tables 10, 11, and 12 provide evidence that our overall conclusions are not sensitive to the covariates we have included or their functional form. Point estimates for the macroeconomic indicators we analyze tend to change only modestly across this full set of specifications. The point estimate for state and local government employment is more sensitive in that the estimates in Appendix Tables 10 and 12 are negative and near 0. On balance, the estimates thus reinforce the conclusion that federal fiscal assistance had little economic impact during the pandemic.

In Panel A of Appendix Table 13 we drop the three most and least represented states from the sample, while in Panel B we drop the five most and least represented states from the sample. The results in Panel A reveal that the point estimates are little changed by dropping the three most and least represented states. Additionally, the first stage F-statistic declines only moderately from when we remove these most extreme states from the sample. The results in Panel B reveal that after removing the five most and least represented states from the sample, our first stage F-statistics decline substantially. The second stage point estimates differ only moderately from their counterparts in Table 3, but the precision of the estimates is reduced substantially by dropping 10 states that contribute substantially to the variation in our instrument from the sample.

Appendix Table 14 presents results in which we moderately change the construction of our outcome variables. Specifically, for the regressions reported in Appendix Table 14, we define the changes in each outcome relative to a base period of either December 2019 or the fourth quarter of 2019. Calculating changes relative to a common month conforms more closely with the conventional approach to estimating local-projection impulse response functions (Ramey, 2016). This contrasts with our baseline approach in that it will not net out seasonal effects. As shown in columns 3 through 5, this change has very little effect on the estimates we obtain for outcomes we construct using seasonally adjusted data from the BEA. By contrast, columns 1 and 2 reveal that the standard errors on our estimates rise for outcomes constructed using QCEW data, which are not seasonally adjusted. Qualitatively, these estimates reinforce the overall impression that federal fiscal assistance dollars had at most a moderate effect on employment by state and local governments, an imprecisely estimated effect on private employment and a modest if any stimulative impact on the overall economy.

In a final robustness check, Appendix Table 15 presents estimates in which we augment the set of controls with an additional lag in the dependent variable. For our estimates of the effect on state GDP, for example, we add the growth in per capita state GDP from the fourth quarter of 2017 to the fourth quarter of 2018 as a supplement to the baseline control set, which included growth from the fourth quarter of 2018 to the fourth quarter of 2019. This robustness check is motivated by insights from Ramey (2022) regarding the desirability of controlling for more rather than fewer lags when estimating local-projection impulse response functions. Ramey (2022) draws in part on econometric advances from Montiel Olea and Plagborg-Møller (2021), who show that lag-augmented local projections have attractive inference properties. The results in Appendix Table 15 show that the inclusion of an additional lag has essentially no effect on either the point estimates of interest or the estimated standard errors. Additionally, the earlier lags in the dependent variables have very little predictive power, in particular when compared with the more recent lags. In our setting, our baseline specification's inclusion of a

single lag thus appears to be sufficient to capture the information available from the history of the dependent variable.[25]

Evolution of Macroeconomic Effects over the Course of the Pandemic

Figure 5 presents evidence on the impulse response of macroeconomic outcomes to federal fiscal assistance. Panels A through Panel D present local-projection estimates of the effect of federal aid on private employment, on wage and salary earnings, on real personal income, and on real GDP. In all cases, the impact of the federal aid to sub-national governments remains small and statistically indistinguishable from zero over time.

VI Discussion

In this section, we evaluate the fiscal aid to state and local governments as a component of the broader COVID-19 relief effort, place our results in the context of the literature on fiscal multipliers, and discuss some of the caveats typical of our empirical strategy.

Job Creation

In the release of the final rule on State and Local Fiscal Recovery Funds, Deputy Secretary of the Treasury Wally Adeyemo said, "[the COVID-19 relief funds] ensure that governments across the country have the flexibility they need to vaccinate their communities, keep schools open, support small businesses, prevent layoffs, and ensure a long-term recovery." In this paper, we show that the unprecedented level of transfers from the federal government to the sub-national level has had a modest impact on government employment and has not translated into detectable gains for private businesses or for states' overall economic recoveries.

Our baseline results imply that $855,000 in federal spending was needed to preserve a state or local government job-year during the pandemic. The confidence intervals on our estimates are sufficiently precise to rule out estimates of less than $433,000, while we do not find significant additional effects in the broader labor market.

These estimates do not compare favorably with estimates for the other major element of the COVID-19 relief packages that had the intent of preserving employment or stimulating economic activity. The PPP, which has itself been criticized for having a modest job-preserving impacts per dollar spent, has been estimated to cost much less per job year saved. Autor et al. (2022a and 2022b), for example, refer to their estimate that the PPP cost between $169,000 and $258,000 per worker-year retained as reflecting a "very substantial cost" and "high costs per job." Autor et al. (2022b) describe their estimates as being "broadly similar" to estimates from Chetty et al. (2020) and Hubbard and Strain (2020), who analyzed

[25] The apparent sufficiency of a single lag may relate to the fact that our estimation relies on cross-sectional variation in federal fiscal assistance. Insights from Ramey (2016 and 2022) and from Montiel Olea and Plagborg-Møller (2021) are developed with a primary emphasis on time series variation.

the Paycheck Protection Program using complementary data sources. Faulkender et al. (2020) present even lower estimates of between $50,000 and $75,000 per job preserved by the PPP.

The employment effects of other elements of the pandemic relief bills have been less widely studied than those of the Paycheck Protection Program. Haughwout et al. (2021) study the Municipal Liquidity Facility (MLF) and estimate that while the program had desirable effects on secondary market yields and primary issuance, its implications for employment were overshadowed by those of the type of direct federal aid analyzed in this paper. Early on in the pandemic, Chetty et al. (2020) assessed that the Economic Impact Payments or "stimulus checks" had been so ineffective in sustaining or raising employment levels that it "raise[d] the specter of a jobless recovery."

Minimizing expenditures per job created or preserved is of course not the be all and end all of even explicitly countercyclical policies.[26] Unemployment insurance benefits are a particularly salient demonstration of this, and the policy response to the COVID-19 pandemic included dramatic expansions and extensions of such benefits. These were, inter alia, the Federal Pandemic Unemployment Compensation (FPUC) and Pandemic Unemployment Assistance (PUA) programs. Estimates by Holzer et al. (2021), who analyzed the termination of enhanced unemployment benefits in the summer of 2021, which varied in timing across states, imply that these programs reduced employment by one job-year for each $125,000 in spending. The effects of enhanced unemployment benefits were likely smaller during the pandemic's initial months, when pandemic restrictions would have rendered workers' labor supply preferences a less binding constraint.

A comparison with past fiscal relief efforts can be obtained by looking to research on the effects of the American Recovery and Reinvestment Act (ARRA). Ramey (2019) provides a range of ARRA employment multiplier estimates from $50,000 to $112,000 per job-year. The estimation approach, an instrumental-variables approach that relies on Medicaid formulas, Department of Transportation formulas, and a combination of multiple agency formulas, as well as the specific estimate of $50,000 come from Chodorow-Reich (2020); an estimate as low as $26,000 can be found in Chodorow-Reich et al. (2012). Wilson (2012) follows a similar formula-based approach and arrives at an estimate of $125,000 per job. Conley and Dupor (2013) use variation in states' budget positions and ARRA highway funding to estimate that the Act's implied cost of creating a job-year was $202,000. Our estimates of the dollars spent per job-year preserved by COVID-19 era federal support for state and local governments thus far exceed those from the ARRA context.

Fiscal Multipliers

Turning to our results for output and income, we estimate that relief funds had little if any effect on GDP and income across the six quarters that extend from Q2 of 2020 through Q3 of 2021. There is an extensive literature drawing on a wide range of methodological approaches and historical episodes that provides context for our estimate of these spending multipliers. In a review of estimates of government spending multipliers using national data, Ramey (2019) reports that most macroeconomic analyses find a multiplier between 0.5 and 0.8, including for the ARRA. Chodorow-Reich (2020), on the other hand, in

[26] We study the extent to which federal aid to state and local governments affected testing and vaccine delivery during the pandemic in Clemens, Hoxie, Kearns, and Veuger (2022).

a review of multipliers estimated using cross-sectional approaches, argues the findings in that literature translate into national multipliers between 1.5 and 2. Our estimates are most similar to Pennings' (2021) estimated multipliers for temporary household transfer payments financed by the federal government and to Dupor et al.'s (2022) estimates of local consumption multipliers for the ARRA. Below, we discuss several conceptual considerations that are relevant for interpreting our estimates and comparing them with estimates from other contexts.

A first set of factors relates to the fact that our estimates are of subnational multipliers as opposed to aggregate multipliers. As Ramey (2019) points out: "In some instances, the subnational multipliers are expected to be higher than the aggregate multipliers, whereas in other instances they are expected to be lower. There is no general rule."

The relevant spending in this case is financed by (future) national taxpayers. Whether and how taxpayers in states and localities differ in how they take account of these (future) tax liabilities compared to a situation in which the spending is financed at the state and local level is an open question. To the extent that such differences exist, our setting is probably more similar to one of open-ended deficit financing than one with offsetting (scheduled) tax increases or Ricardian equivalence dynamics. Within a New Keynesian framework, Pennings (2022) finds that the difference between locally and externally financed multipliers are smaller than commonly presumed, in particular when the government spending shock is temporary rather than persistent.

A second set of factors relate to the macroeconomic and public health context. Our estimates do not come from an era of secular stagnation or rampant demand shortfalls (Eichengreen, 2015; Summers, 2015; Eggertsson et al., 2019). This contrasts with papers set in the period immediately following the Global Financial Crisis (e.g. Chodorow-Reich et al., 2012). Our estimates may therefore be lower (cf. Ramey, 2019).

Additionally, the effects of federal fiscal relief may not yet have been fully realized, as the pandemic is not over and the monies had not all been spent within the time periods we analyze. As state and local governments continue to use federal transfers to raise their spending, effects on output and income may begin to accumulate. While effects may begin to accumulate, however, it is relevant to emphasize that our analysis extends beyond the period in which it was plausible to think states were in financial dire straits (Clemens and Veuger, 2021b), and into a period of elevated inflation. To the extent that stimulative effects accumulate in subsequent quarters, they will likely affect prices in addition to quantities and will presumably be offset to a degree by monetary policy.[27] This would imply that their aggregate, national effect will be smaller than it would be if monetary policy remained passive, as illustrated by Dupor et al.'s (2022) modeling exercise.[28] They find that a local consumption multiplier of 0.20 translates into an aggregate multiplier of 0.41 at the zero lower bound, but that the aggregate multiplier turns negative if the monetary authority responds to inflationary pressures.

It is also relevant to note that COVID-19 mitigation measures were in place throughout the period we analyze, though their intensity varied across place and time. Maximizing broader economic activity was

[27] This counterproductive time delay is at the heart of a classic critique of fiscal policy as countercyclical policy (Anderson and Jordan, 1968; Friedman and Heller, 1969; Auerbach, 2002). It is also an argument for keeping state and local fiscal assistance linked to formulaic automatic stabilizers less vulnerable to excess.
[28] See also Jo and Zubairy (2022).

thus not necessarily the only or even main goal policymakers had in mind when designing pandemic relief. That said, even conditions of restricted supply may call for demand stimulus, which can then have its normal desirable effects (as in Guerrieri et al., 2022). Additionally, as we have noted above, preventing layoffs and stimulating the economic recovery were explicitly stated goals of the fiscal relief studied here. The assessment presented here is thus a key component of any overall appraisal of the federal government's response to the COVID-19 crisis.

References

Anderson, Leonall C., and Jerry L. Jordan (1"68) "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization," *Review* (Federal Reserve Bank of St. Louis) November: 11-23.

Angrist, Joshua D., Guido W. Imbens, and Donald B. Rubin (1996) "Identification of Causal Effects Using Instrumental Variables,"" *Journal of the American Statistical Association* 91(434): 444-455.

Angrist, Joshua, and Michal Kolesár (2022) "One Instrument to Rule Them All: The Bias and Coverage of Just-ID IV," Mimeo: MIT and Princeton.

Auerbach, Alan (2002) "Is There a Role for Discretionary Fiscal Policy?" in: *Rethinking Stabilization Policy: A Symposium Sponsored by the Federal Reserve Bank of Kansas City*: 109-150. Federal Reserve Bank of Kansas City.

Auerbach, Alan, Bill Gale, Byron Lutz, and Louise Sheiner (2020) "Fiscal Effects of COVID-19," *Brookings Papers on Economic Activity* Fall: COVID-19 and the Economy.

Autor, David, David Cho, Leland D. Crane, Mita Goldar, Byron Lutz, Joshua K. Montes, William B. Peterman, David D. Ratner, Daniel Villar Vallenas, and Ahu Yildirmaz (2022a) "An Evaluation of the Paycheck Protection Program Using Administrative Payroll Microdata," NBER Working Paper 29972.

Autor, David, David Cho, Leland D. Crane, Mita Goldar, Byron Lutz, Joshua K. Montes, William B. Peterman, David D. Ratner, Daniel Villar Vallenas, and Ahu Yildirmaz (2022b) "The $800 Billion Paycheck Protection Program: Where Did the Money Go and Why Did it Go There?" *Journal of Economic Perspectives* 36(2): 55-80.

Bartik, Timothy J. (2020) "An Updated Proposal for Timely, Responsive Federal Aid to State and Local Governments During the Pandemic Recession," W.E. Upjohn Institute for Employment Research, May 22. https://www.upjohn.org/research-highlights/updated-proposal-timely-responsive-federal-aid-state-and-local-governments-during-pandemic-recession.

Blandhol, Christine, John Bonney, Magne Mogstad, and Alexander Torgovitsky (2022) "When is TSLS Actually LATE?" NBER Working Paper 29709.

Chernick, Howard, David Copeland, and Andrew Reschovsky (2020) "The Fiscal Effects of the COVID-19 Pandemic on Cities: An Initial Assessment," *National Tax Journal* 73(3): 699-732.

Chetty, Raj, John N. Friedman, Nathaniel Hendren, Michael Stepner, and the Opportunity Insights Team (2020) "How Did COVID-19 and Stabilization Policies Affect Spending and Employment? A New Real-Time Economic Tracker Based on Private Sector Data," NBER Working Paper 27431.

Chidambaram, Priya and MaryBeth Musumeci. 2021. "Potential Impact of Additional Federal Funds for Medicaid HCBS for Seniors and People with Disabilities," Kaiser Family Foundation, March 15. https://www.kff.org/medicaid/issue-brief/potential-impact-of-additional-federal-funds-for-medicaid-hcbs-for-seniors-and-people-with-disabilities/.

Chodorow-Reich, Gabriel. 2020. "Regional Data in Macroeconomics: Some Advice for Practitioners." *Journal of Economic Dynamics and Control* 115: 103875.

Chodorow-Reich, Gabriel, Laura Feiveson, Zachary Liscow, and William Gui Woolston (2012) "Does State Fiscal Relief during Recessions Increase Employment? Evidence from the American Recovery and Reinvestment Act," *American Economic Journal: Economic Policy* 4(3): 118-45.

Clemens, Jeffrey, Philip Hoxie, John Kearns, and Stan Veuger (2022) "How Did Federal Aid to States and Localities Affect Testing and Vaccine Delivery?" Mimeo: American Enterprise Institute and UC-San Diego.

Clemens, Jeffrey, Benedic Ippolito, and Stan Veuger (2021) "Medicaid and Fiscal Federalism During the COVID-19 Pandemic," *Public Budgeting & Finance* 41(4): 94-109.

Clemens, Jeffrey, and Stephen Miran (2012) "Fiscal Policy Multipliers on Subnational Government Spending," *American Economic Journal: Economic Policy* 4(2): 46-68.

Clemens, Jeffrey, and Stan Veuger (2020a) "Implications of the Covid-19 Pandemic for State Government Tax Revenues." *National Tax Journal* 73(3): 619–644.

Clemens, Jeffrey, and Stan Veuger (2020b) "The COVID-19 Pandemic and the Revenues of State and Local Governments: An Update," *AEI Economic Perspectives* 2020-07.

Clemens, Jeffrey, and Stan Veuger (2021a) "Politics and the distribution of federal funds: Evidence from federal legislation in response to COVID-19," *Journal of Public Economics* 204: 104554.

Clemens, Jeffrey, and Stan Veuger (2021b) "The Economy Is Still in Pandemic Shock. But Some State Governments Are Flush with Cash," *Washington Post*, December 15.

Committee for a Responsible Federal Budget (2021) *COVID-19 Money Tracker*. Accessed on August 19, 2021. https://www.covidmoneytracker.org/.

Conley, Timothy G., and Bill Dupor (2013) "The American Recovery and Reinvestment Act: Solely a Government Jobs Program?" *Journal of Monetary Economics* 60(5): 535-549.

Corbi, Raphael, Elias Papaioannou, and Paolo Surico (2019) "Regional Transfer Multipliers," *The Review of Economic Studies* 86(5): 1901–1934.

Dong, Ensheng, Hongru Du, and Lauren Gardner (2020) "An Interactive Web-Based Dashboard to Track COVID-19 in Real Time," *The Lancet Infectious Diseases* 20(5): 533-5334.

Driessen, Grant A., and Jane G. Gravelle (2020) "State and Local Fiscal Conditions and COVID19: Lessons from the Great Recession and Current Projections." Congressional Research Service Insight, Updated December 7.

Dupor, Bill, Marios Karabarbounis, Marianna Kudlyak, and M. Saif Mehkari (2022) "Regional Consumption Responses and the Aggregate Fiscal Multiplier," IZA Discussion Paper 15255.

Eggertsson, Gauti B., Neil R. Mehrotra, and Jacob A. Robbins (2019) "A Model of Secular Stagnation: Theory and Quantitative Evaluation," *American Economic Journal: Macroeconomics* 11(1): 1-48.

Eichengreen, Barry (2015) "Secular Stagnation: The Long View," *American Economic Review* 105(5): 66-70.

Faulkender, Michael, Robert Jackman, and Stephen I. Miran (2020) "The Job-Preservation Effects of Paycheck Protection Program Loans," U.S. Department of the Treasury Office of Economic Policy Working Paper 2020-01.

Federal Reserve Board (The Board of Governors of the Federal Reserve System) (2021) "Municipal Liquidity Facility," August 11.

Fishback, Price (2017) "How Successful Was the New Deal? The Microeconomic Impact of New Deal Spending and Lending Policies in the 1930s," *Journal of Economic Literature* 55 (4): 1435-1485.

Fleck, Robert K. (1999) "The Marginal Effect of New Deal Relief Work on County-Level Unemployment Statistics," *Journal of Economic History* 59 (3): 659–87.

Friedman, Milton, and Walter W. Heller (1969) *Monetary vs. Fiscal Policy*. W.W. Norton.

Google LLC (2021) *Google COVID-19 Community Mobility Reports*. Accessed on October 19, 2021.

Gordon, Tracy, Lucy Dadayan, and Kim Rueben (2020) "State and Local Government Finances in the COVID-19 Era," *National Tax Journal* 73(3): 733-757.

Gordon, Nora, and Sarah Reber (2020) "Federal Aid to School Districts during the COVID-19 Recession," *National Tax Journal* 73(3): 781-804.

Green, Daniel, and Erik Loualiche (2020) "State and Local Government Employment in the COVID-19 Crisis," *Journal of Public Economics* 193: 104321.

Guerrieri, Veronica, Guido Lorenzoni, Ludwig Straub, and Iván Werning (2022) "Macroeconomic Implications of Covid-19: Can Negative Supply Shocks Cause Demand Shortages?" *American Economic Review* 112(5): 1437-1474.

Hale, Thomas, Sam Webster, Anna Petherick, Toby Phillips, and Beatriz Kira (2020) *Oxford COVID-19 Government Response Tracker*. Blavatnik School of Government, Oxford University.

Haughwout, Andrew, Benjamin Hyman, and Or Shachar (2021) "The Option Value of Municipal Liquidity: Evidence from Federal Lending Cutoffs During Covid-19," Mimeo: Federal Reserve Bank of New York.

Holzer, Harry J., R. Glenn Hubbard, and Michael R. Strain (2021) "Did Pandemic Unemployment Benefits Reduce Employment? Evidence from Early State-Level Expirations in June 2021," NBER Working Paper 29575.

Inman, Robert P. (2010) "States in Fiscal Distress," *Regional Economic Development* 6(1): 65-80.

Jo, Yoon J., and Sarah Zubairy (2022) "State Dependent Government Spending Multipliers: Downward Nominal Wage Rigidity and Sources of Business Cycle Fluctuations," NBER Working Paper 30025.

Jordà, Òscar (2005) "Estimation and Inference of Impulse Responses by Local Projections," *American Economic Review* 95(1): 161-182.

Lewis, Jeffrey B., Keith Poole, Howard Rosenthal, Adam Boche, Aaron Rudkin, and Luke Sonnet (2021) *Voteview: Congressional Roll-Call Votes Database*. https://voteview.com/.

Medicaid and Chip Payment Access Commission (2021) "Annual Analysis of Disproportionate Share Hospital Allotments to States," US Department of Health and Human Services, March.

MIT Election Data and Science Lab (2017) "U.S. President 1976–2020", Harvard Dataverse, V6.

McNichol, Elizabeth, Michael Leachman, and Joshua Marshall (2020) "States Need Significantly More Fiscal Relief to Slow the Emerging Deep Recession," Center on Budget and Policy Priorities, April 14.

Montiel Olea, José Luis, and Mikkel Plagborg-Møller (2021) "Local Projection Inference Is Simpler and More Robust Than You Think," *Econometrica* 89(4): 1789-1823.

Montiel Olea, José Luis, and Carolin Pflueger (2013) "A Robust Test for Weak Instruments," *Journal of Business and Economic Statistics* 31(3): 358-369.

Nakamura, Emi, and Jón Steinsson (2014) "Fiscal Stimulus in a Monetary Union: Evidence from US Regions," *American Economic Review* 104(3): 753-92.

National Association of State Budget Officers (2021) *The Fiscal Survey of the States: Fall 2021. An Update of State Fiscal Conditions.* National Association of State Budget Officers.

Pennings, Steven (2021) "Cross-Region Transfer Multipliers in a Monetary Union: Evidence from Social Security and Stimulus Payments," *American Economic Review* 111(5): 1689-1719.

Pennings, Steven (2022) "Locally Financed and Outside Financed Regional Fiscal Multipliers," *Economics Letters*, doi: https://doi.org/10.1016/j.econlet.2022.110389.

Pflueger, Carolin E., and Su Wang (2015) "A Robust Test for Weak Instruments in Stata," *The Stata Journal* 15(1): 216-225.

Ramey, Valerie (2016) "Macroeconomic Shocks and Their Propagation," in Taylor, John B., and Harald Uhlig (eds.) *Handbook of Macroeconomics* 2: 71-162.

Ramey, Valerie (2019) "Ten Years After the Financial Crisis: What Have We Learned from the Renaissance in Fiscal Research?" *Journal of Economic Perspectives* 33(2): p. 89-114.

Ramey, Valerie (2022) "Postscript to "Macroeconomic Shocks and Their Propagation"," Mimeo: UC-San Diego. Accessed on June 12, 2022.
https://econweb.ucsd.edu/~vramey/research/HOM_Ramey_Postscript.pdf

Romer, Christina D., and David H. Romer (2022) "A Social Insurance Perspective on Pandemic Fiscal Policy: Implications for Unemployment Insurance and Hazard Pay," *Journal of Economic Perspectives* 36(2): 3-28.

Shoag, Daniel (2013) "Using State Pension Shocks to Estimate Fiscal Multipliers since the Great Recession," *American Economic Review* 103(3): 121-24.

Shoag, Daniel (2016) " The Impact of Government Spending Shocks: Evidence on the Multiplier from State Pension Plan Returns," Mimeo: Harvard Kennedy School.

Stock, James H., and Motohiro Yogo (2005) "Testing for Weak Instruments in Linear IV Regression." In: Andrews, Donald W.K. (ed.) *Identification and Inference for Econometric Models*. Cambridge UP.

Suárez-Serrato, Juan Carlos, and Philippe Wingender (2016) "Estimating Local Fiscal Multipliers," NBER Working Paper 22425.

Summers, Lawrence H. (2015) "Demand Side Secular Stagnation," *American Economic Review* 105(5): 60-65.

The White House (2021) “American Rescue Plan Fact Sheet.” March. https://www.whitehouse.gov/wp-content/uploads/2021/03/American-Rescue-Plan-Fact-Sheet.pdf.

US Bureau of Economic Analysis (2021) “State Quarterly Personal Income,” US Department of Commerce.

US Bureau of Labor Statistics (2021a) “Current Employment Statistics: State and Metro Area Employment, Seasonally Adjusted,” US Department of Labor.

US Bureau of Labor Statistics (2021b) “Quarterly Census of Employment and Wages,” US Department of Labor.

US Bureau of Labor Statistics (2021c) “Quarterly Census of Employment and Wages: Concepts,” US Department of Labor, August 18.

US Census Bureau (2021) “2020 Census Apportionment Results,” April 16. Accessed on September 14, 2021.

US Department of Labor (2020) “2020 Comparison of State Unemployment Insurance Laws.”

US Department of the Treasury (2021a) “Allocations for States, District of Columbia, and Puerto Rico,” August.

US Department of the Treasury (2021b) “Coronavirus State and Local Fiscal Recovery Funds.” Interim Final Rule. *Federal Register* 86(93): 26786-26824.

US Federal Transit Administration (2021a) “Fiscal Year 2021 American Rescue Plan Act Supplemental Public Transportation Apportionments and Allocations,” US Department of Transportation.

US Federal Transit Administration (2021b) “Fiscal Year 2021 CRRSAA Act Supplemental Public Transportation Apportionments and Allocations,” US Department of Transportation.

US Office of Elementary and Secondary Education (2021) “Emergency Assistance for Non-Public Schools,” US Department of Education.

US Small Business Administration (2022) “PPP FOIA,” US Small Business Administration, Washington, D.C., April 3. https://data.sba.gov/dataset/ppp-foia

Walzcak, Jared and Savanna Funkhouser (2021) “States Have $95 Billion to Restore their Unemployment Trust Funds – Why Aren’t They Using It?” Tax Foundation, September 22. https://taxfoundation.org/state-unemployment-trust-funds-2021/

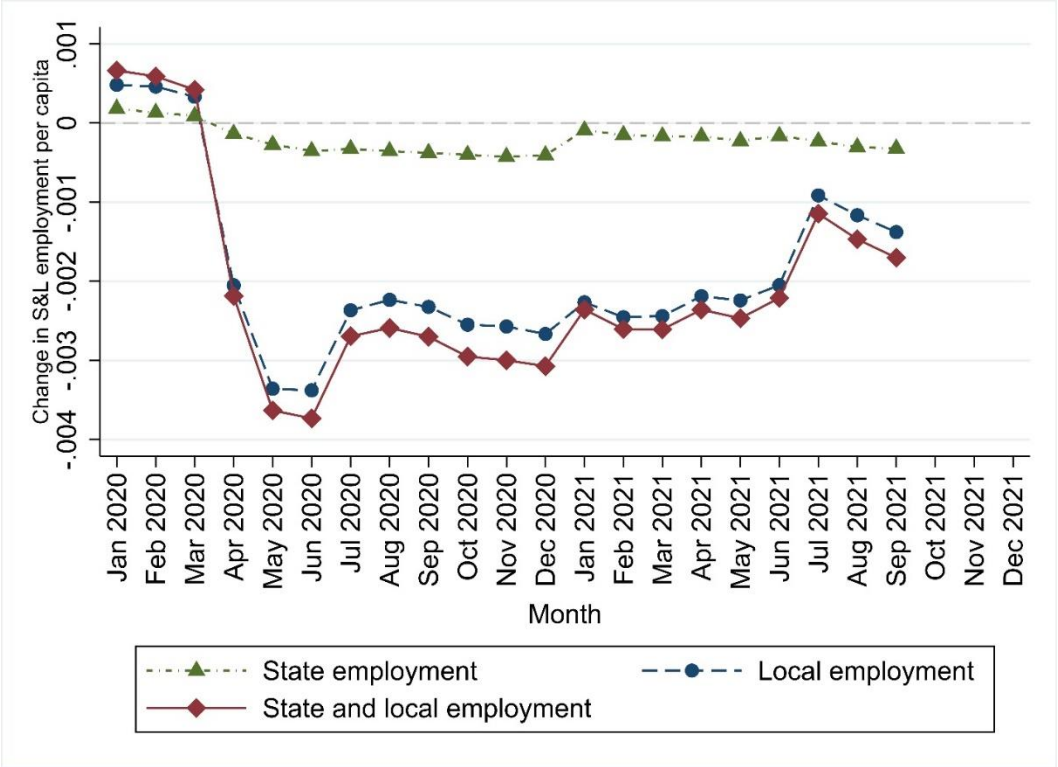
Whitaker, Stephan D. (2020a) “Estimates of State and Local Government Revenue Losses from Pandemic Mitigation,” Cleveland Fed District Data Brief, Cleveland, OH, May 13.

Whitaker, Stephan D. (2020b) “How Much Help Do State and Local Governments Need? Updated Estimates of Revenue Losses from Pandemic Mitigation,” Cleveland Fed District Data Brief, Cleveland, OH, June 29.

Wilson, Daniel J. (2012) “Fiscal Spending Jobs Multipliers: Evidence from the 2009 American Recovery and Reinvestment Act,” *American Economic Journal: Economic Policy* 4(3): 251-282.

Zandi, Mark (2020) “Written Testimony of Mark Zani, Chief Economist, Moody’s Analytics, Before the Congressional Oversight Committee.”
https://www.economy.com/getlocal?q=b4795ae9022fe6514328164843e54c42&app=eccafile.

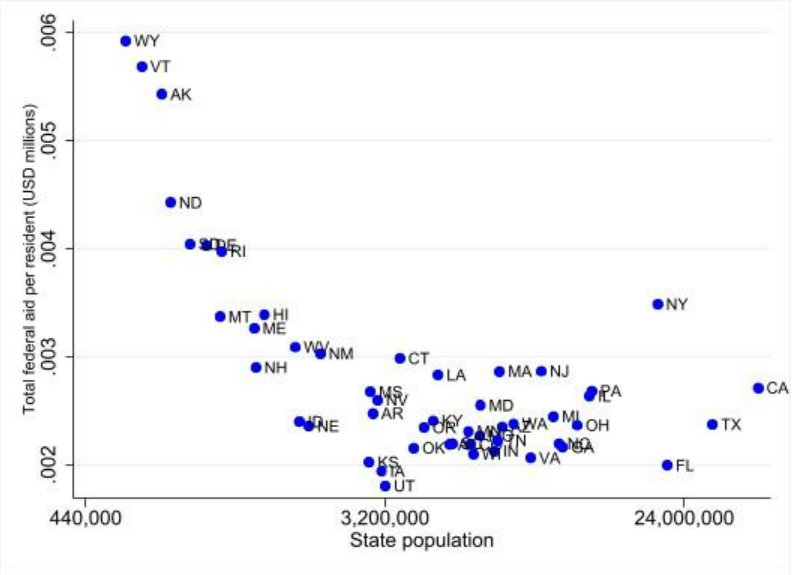
Figure 1: Change in State and Local Government Employment per Capita



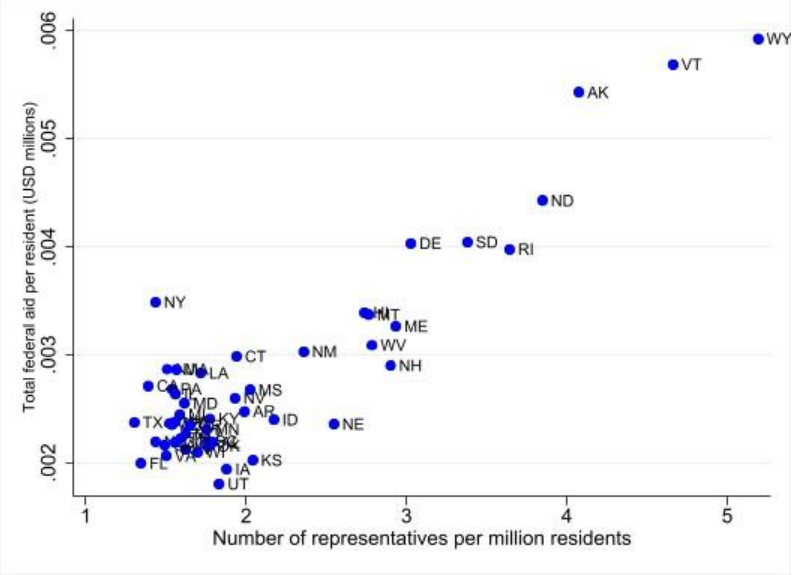
Note: This figure shows the change in national state and local government employment per capita relative to the same month in 2019 over the course of the pandemic. Each variable shown is calculated as the arithmetic difference in employment in a given month and the same month in 2019 divided by 2020 population. The employment data come from the Quarterly Census of Employment and Wages (QCEW). State, local, and state plus local employment are shown separately. This figure uses data from the US Bureau of Labor Statistics (2021b) and US Census Bureau (2021).

Figure 2: Distribution of COVID-19 Relief Funds per Resident

Panel A: Total Federal Aid to State and Local Governments per Resident and Population



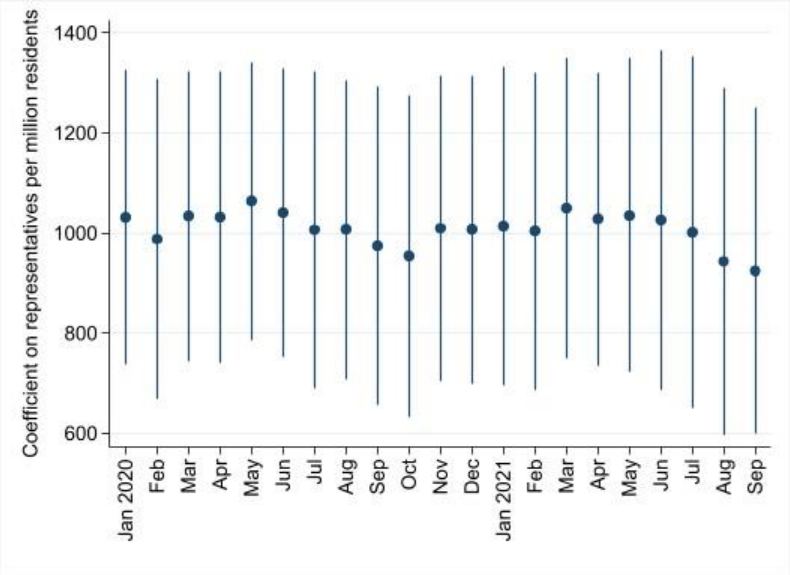
Panel B: Total Federal Aid to State and Local Governments per Resident and Congressional Representation



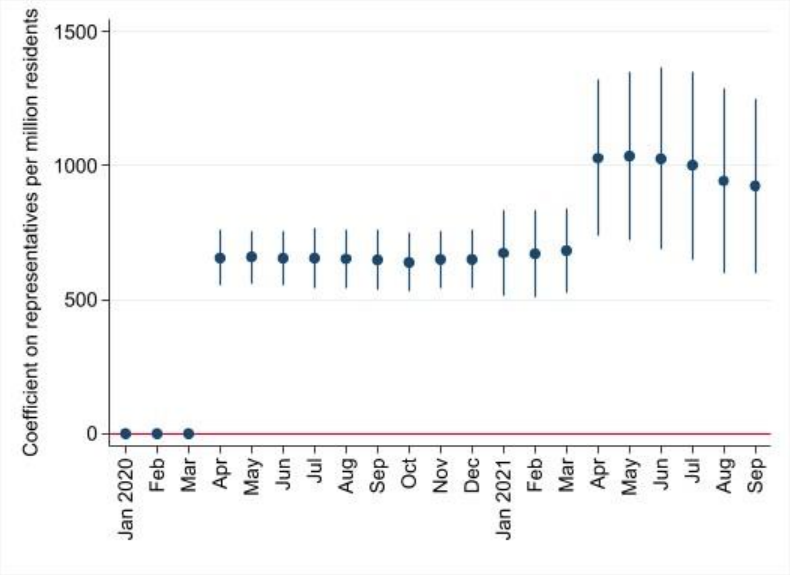
Note: This figure shows the appropriation of COVID-19 relief funds to state and local governments by state. Funds are calculated as the sum across the CARES Act, Families First Coronavirus Response Act, Response and Relief Act, and American Rescue Plan Act on a per resident basis. Panel A displays the total federal aid to state and local governments per resident in USD millions on the y-axis and state population (on a log scale) on the x-axis. Note that any state with a population less than Connecticut is a 'small state,' a state that received the floor level of funding mandated in the CARES Act. Panel B displays total federal aid to state and local governments per resident in USD millions on the y-axis and the number of congressional representatives per million residents in 2020 on the x-axis. This figure uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a, 2021b), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021).

Figure 3: Relationship Between Federal Aid to State and Local Governments per Resident and Representatives Per Million Residents

Panel A: Aggregate Total Aid to State and Local Governments



Panel B: Running Total Aid to State and Local Governments



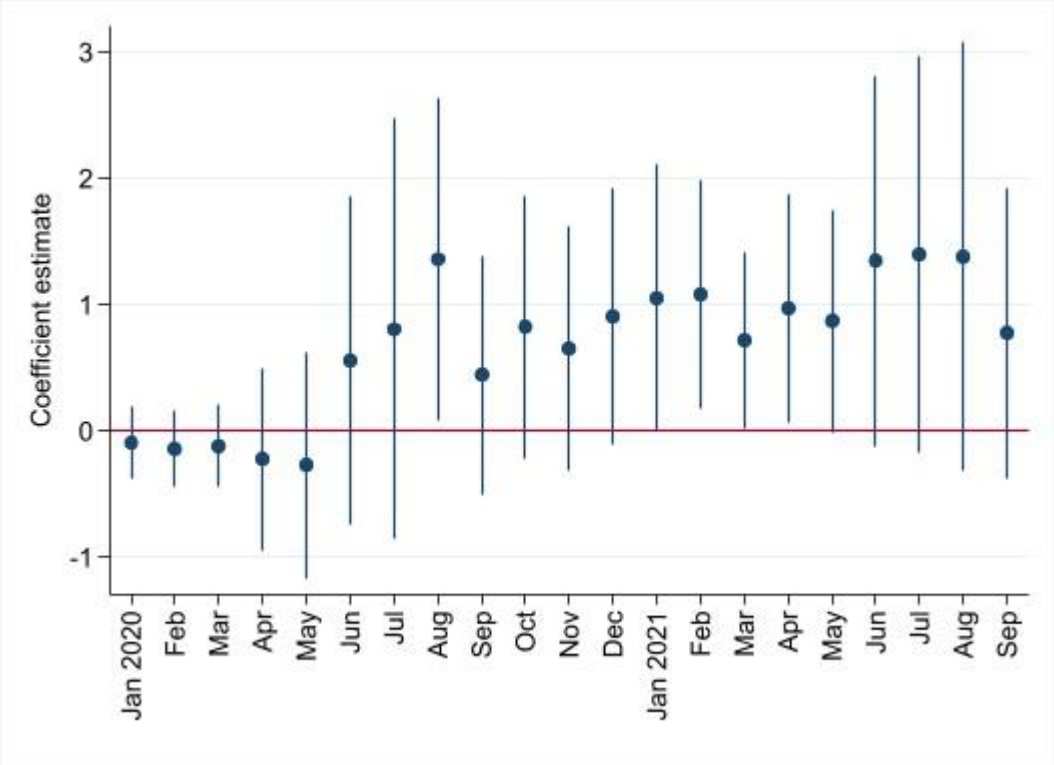
Note: This figure displays the regression coefficient (and its 95% confidence interval) on representatives per million residents in 2020 from a variation of the first stage used to estimate equation (2a):

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \, RepsPerMillion_s + \beta_2 X_{s,m,y} + \varepsilon_{s,m,y}$$

where $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is the total of federal aid to state and local governments per resident in state *s* pooled across all four bills. $RepsPerMillion_s$ is the number of Representatives and Senators per million residents in 2020. Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. Note that unlike for our baseline regressions, the dependent variables is not scaled in USD millions. Panel A uses the total

amount of aid given by September 2021, while Panel B uses the running total of aid given through each month. The passage of the CARES Act and ARPA can be seen in the coefficients for April 2020 and April 2021, respectively. The national appropriation of funds is summarized in Appendix Figure 3. The regressions are weighted by state population and clustered at the state level. Between April 2020 and September 2021, the minimum first stage F-statistic is 30.10 (October 2021) and the maximum is 59.05 (May 2020). This figure uses data from the Committee for a Responsible Federal Budget (2021), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), and Hale et al. (2020).

Figure 4: Local-Projection Impulse Response of State and Local Government Employment to COVID-19 Relief Aid

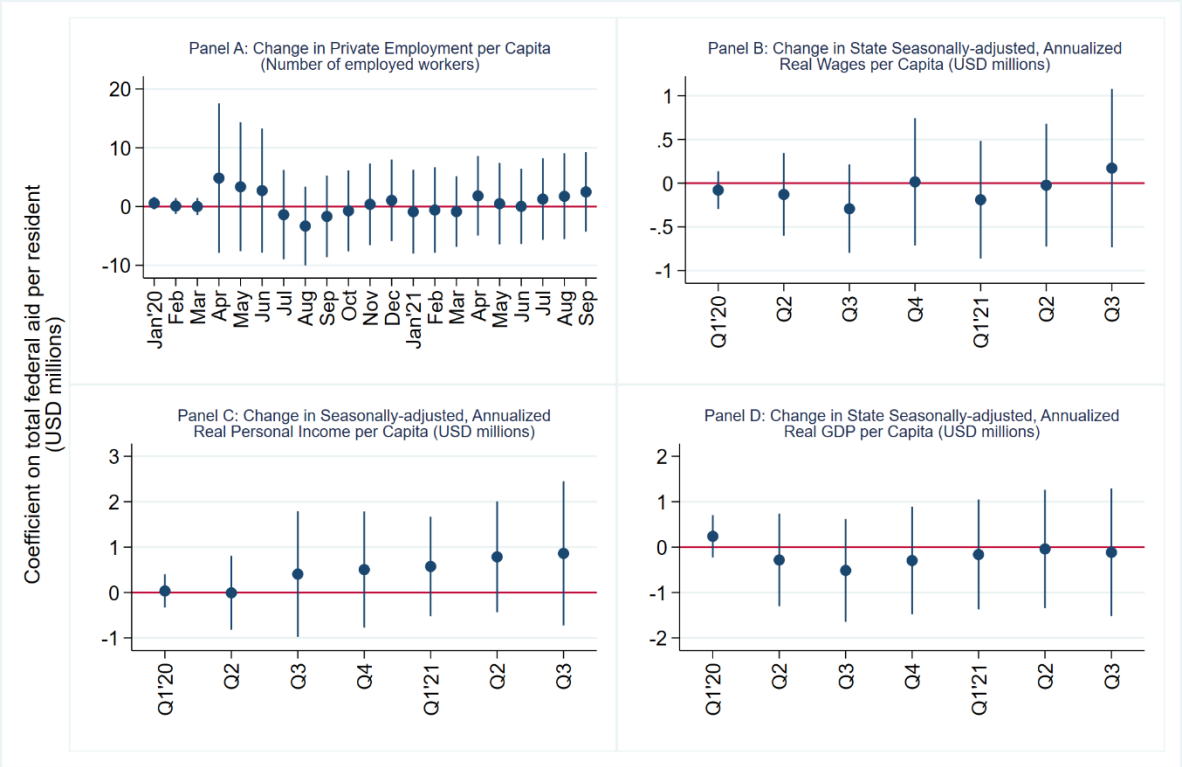


Note: This figure displays the coefficient (and the 95% confidence interval) on predicted total federal aid to state and local governments per resident (USD millions) in the regression outlined in equation (3b):

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,m,y} + u_{s,m,y}$$

where *m* and *y* iterate over the month-year pairs from January 2020 to September 2021. $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is the total amount of federal aid allocated to a state per resident in USD millions since the pandemic began. $\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ is the arithmetic change in state and local government employment per capita in state *s* relative to the same month in 2019. Estimates use the QCEW employment data for the dependent variable. The ratio \$1,000,000/$(\beta_1 * [\frac{MonthsSincePandemic}{12}])$ represents the amount of money spent to save one state or local government job-year. Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. Observations are weighted by state population and standard errors (in parentheses) are clustered by state. Table 2 shows pooled regressions run using data from April 2020 to September 2021. The figure uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a, 2021b), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), and Hale et al. (2020).

Figure 5: Local-Projection Impulse Response of Macroeconomic Outcomes to COVID-19 Relief Aid



Note: This figure displays the coefficient (and the 95% confidence interval) on predicted total federal aid per resident (USD millions) in a variation of the regression outlined in equation (3b):

$$\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,t,y} + u_{s,t,y.}$$

where *t* and *y* iterate over the month-year (quarter-year) pairs from January (Q1) 2020 to September (Q3) 2021. $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is the total amount of federal aid to state and local governments per resident (USD millions) allocated to a state *s* since the pandemic began. $\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the same time period in 2019. Equation (3b) is modified to reflect the wider range of outcome variables. Panel A presents the change in private employment per capita relative to the same month in 2019, as measured by the QCEW. Panel B presents the change in annualized real, seasonally-adjusted total wages for all employees per capita relative to the same quarter in 2019, as recorded by the BEA. Panels C and D present the changes relative to the same quarter in 2019 in seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted, annualized real personal income per capita in USD millions, respectively. $X_{s,t,y}$ denotes a vector of controls. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index, and the change in the dependent variable between the end of 2018 and 2019. The private employment regressions include both the pre-trends for public and private employment. Observations are weighted by state population and standard errors are clustered at the state level. Pooled regression results are presented in Table 3. The figure uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a, 2021b), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021a, 2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), and Hale et al. (2020).

Table 1: Summary Statistics

	N	Mean	Std. Dev.	Min	Max
Change in State and Local Employment per Capita Relative to Same Month in 2019 (QCEW)	1050	-0.0022	0.0018	-0.0090	0.0028
Change in State Employment per Capita Relative to Same Month in 2019 (QCEW)	1050	-0.0003	0.0008	-0.0085	0.0030
Change in Local Employment per Capita Relative to Same Month in 2019 (QCEW)	1050	-0.0019	0.0016	-0.0077	0.0019
Change in State and Local Employment per Capita Relative to Same Month in 2019 (CES)	1200	-0.0029	0.0021	-0.0103	0.0023
Percent Change in State and Local Employment per Capita Relative to Same Month in 2019 (QCEW)	1050	-0.0367	0.0213	-0.0645	0.0116
Percent Change in State and Local Employment per Capita Relative to Same Month in 2019 (CES)	1200	-0.0026	0.0013	-0.0040	0.0007
Total Aid to State and Local Governments per Resident (USD Millions)	1200	0.0028	0.0009	0.0018	0.0059
Senators and Representatives per Million Residents	1200	2.1368	0.8849	1.3021	5.1928
Log of 2020 State Population	1200	15.2183	1.0138	13.2668	17.4938
Share of Population in City Eligible for Municipal Liquidity Facility	1200	0.4232	0.1897	0.1472	0.8393
Change in State and Local Employment per Capita from Dec 2018 to Dec 2019 (QCEW)	1200	0.0004	0.0005	-0.0008	0.0017
Change in Private Employment per Capita from Dec 2018 to Dec 2019 (QCEW)	1200	0.0039	0.0037	-0.0073	0.0119
March 2020 Average Oxford Stringency Index Level	1200	0.4339	0.0520	0.3214	0.5502
Contemporaneous Oxford Stringency Index Level	1200	0.4588	0.2014	0	0.9293
Share of Votes Won by Donald Trump in 2020 Election	1200	0.5003	0.1026	0.3038	0.6950
Final Two Weeks of March 2020 Average Oxford Stringency Index Level	1200	0.7302	0.0830	0.4907	0.8519
Percent Change in Retail Mobility Relative to February 2020 Baseline (Previous Month)	1200	-0.0888	0.1292	-0.6053	0.3223
New COVID-19 Deaths per 100,000 (Previous Month)	1200	9.3721	11.2599	0	112.0507
Total COVID-19 Deaths per 100,000 (Previous Month)	1200	97.9668	89.5351	0	346.6714
New COVID-19 Cases per 100,000 (Previous Month)	1200	630.0612	698.3465	0	4617.22
Total COVID-19 Cases per 100,000 (Previous Month)	1200	5834.311	5453.198	0	21206.34
Change in Real State GDP per Capita from 2018 to 2019	1200	1162.88	773.44	-768.45	2812.25
Change in Private Employment per Capita Relative to Same Month in 2019 (QCEW)	1050	-0.0197	0.0201	-0.0990	0.0231
Change in Real State GDP per Capita Relative to Same Month in 2019 (USD Millions)	350	-0.0008	0.0024	-0.0086	0.0046
Change in Real State GDP per Capita from Q4 2018 to Q4 2019 (USD Millions)	350	0.0012	0.0008	-0.0008	0.0028
Change in Real Personal Income per Capita Relative to Same Month in 2019 (USD Millions)	350	0.0034	0.0024	-0.0011	0.0105

Change in Real Personal Income per Capita from Q4 2018 to Q4 2019 (USD Millions)	350	0.0009	0.0006	-0.0006	0.0023

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021a, 2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021).

Table 2: State and Local Government Employment Impact of COVID-19 Relief Aid

	OLS	Baseline	Political	COVID-19	Economic	Combined	Simple
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total Aid per Resident (USD millions)	0.176	0.780**	0.562	0.532*	1.040*	0.452	-0.0619
	(0.241)	(0.387)	(0.345)	(0.296)	(0.534)	(0.327)	(0.274)
Log(Population)	0.000314*	0.000467**	0.000539***	0.000439**	0.000578**	0.000545***	0.000214
	(0.000182)	(0.000194)	(0.000163)	(0.000195)	-0.000246	(0.000174)	(0.000216)
Share of Population Eligible for MLF	-0.000513	-0.00131	0.000129	-0.000855	-0.00136	0.000323	
	(0.000776)	(0.000975)	(0.000759)	(0.000783)	(0.00108)	(0.000731)	
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	0.398	0.559**	0.171	0.325	0.751**	0.104	
	(0.243)	(0.265)	(0.219)	(0.253)	(0.299)	(0.216)	
Change Private Employment per Resident (Dec 2018 – Dec 2019)	0.110***	0.134***	0.140***	0.104***	0.203**	0.130***	
	(0.0377)	(0.0424)	(0.0318)	(0.0391)	(0.0803)	(0.0493)	
Average OSI (March 2020)	-0.00425*	-0.00528**	-0.000946	-0.00506**	-0.00453*	-0.000554	
	(0.00251)	(0.00230)	(0.00259)	(0.00244)	(0.00233)	(0.00301)	
Average OSI (Current Month)	-0.00353***	-0.00373***	-0.00104***	-0.00251***	-0.00364***	0.000226	
	(0.000553)	(0.000479)	(0.000315)	(0.000494)	(0.000526)	(0.000509)	
Political and Mobility Controls	N	N	Y	N	N	Y	N
COVID-19 Controls	N	N	N	Y	N	Y	N
Economic Controls	N	N	N	N	Y	Y	N
Dep. Var. Mean	-0.0026	-0.0026	-0.0026	-0.0026	-0.0026	-0.0026	-0.0026
Aggregate Impact Coef.	**0.264**	**1.17****	**0.843**	**0.798***	**1.56***	**0.678**	**-0.0929**
Observations	900	900	900	900	900	900	900
R^2	0.352	0.326	0.473	0.374	0.321	0.503	0.032
First-Stage F-Statistic	N/A	57.79	49.01	215.15	21.81	104.01	140.62
P-value on Test for Pre-Trends	0.513	0.416	0.616	0.372	0.063	0.137	0.435

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{\Delta S\&L Employment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,m,y} + u_{s,m,y}$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state *s* pooled across all four bills. In a first stage regression, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$, the number of Representatives and Senators per million residents in 2020, according to equation (2a). $\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ is the arithmetic change in state and local government employment per capita in state *s* relative to the same month in 2019, as measured by the QCEW. The ratio \$1,000,000/$(\beta_1 * [\frac{MonthsSincePandemic}{12}])$ represents the amount of money spent to save one state or local government job-year. Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. Observations are weighted by state population and standard errors (in parentheses) are clustered by state. This table shows pooled regressions run using data from April 2020 to September 2021, the period during which the federal government appropriated money to state and local governments. The first column presents the "naïve" OLS specification according to equation (1). $X_{s,m,y}$ additionally denotes a vector of robustness controls as indicated immediately following the coefficients of interest. Political and mobility controls include Donald Trump's vote share in the 2020 presidential election, the average Oxford Stringency Index level during the last week of March 2020, and the change in retail mobility relative to early 2020. COVID-19 controls include the total and new number of cases and deaths per 100,000 recorded during the previous month. Economic controls include the change in state real GDP per capita between 2018 and 2019. The aggregate impact coefficient denotes the total impact over the pandemic implied by the annualized coefficient (scaled by $[\frac{MonthsSincePandemic}{12}]$ as described above).

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Macroeconomic Impact of COVID-19 Relief Aid

	State and Local Govt Employment per Capita	Private Employment per Capita	Total Wages per Capita (USD millions)	State Real GDP per Capita (USD Millions)	State Real Personal Income (USD Millions)
	(1)	(2)	(3)	(4)	(5)
Total Aid per Resident (USD millions)	0.780**	1.008	-0.0452	-0.229	0.442
	(0.387)	(3.367)	(0.319)	(0.592)	(0.520)
Log(Population)	0.000467**	5.90e-05	-6.78e-05	-0.000140	0.000234
	(0.000194)	(0.00220)	(0.000173)	(0.000334)	(0.000270)
Share of Population Eligible for MLF	-0.00131	-0.0140	-0.000470	-0.00138	0.000198
	(0.000975)	(0.0102)	(0.000499)	(0.00105)	(0.000751)
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	0.559**	5.185**			
	(0.265)	(2.445)			
Change Private Employment per Resident (Dec 2018 – Dec 2019)	0.134***	1.512***			
	(0.0424)	(0.416)			
Change in Dependent Variable (End-2018 – End-2019)			1.589***	0.976***	0.994***
			(0.240)	(0.224)	(0.307)
Average OSI (March 2020)	-0.00528**	-0.0255	0.00219	0.00503	0.00223
	(0.00230)	(0.0211)	(0.00228)	(0.00367)	(0.00348)
Average OSI (Current Month)	-0.00373***	-0.0880***	-0.00572***	-0.0134***	0.00294***
	(0.000479)	(0.00385)	(0.000605)	(0.00113)	(0.000632)
Political and Mobility Controls	N	N	N	N	N
COVID-19 Controls	N	N	N	N	N
Economic Controls	N	N	N	N	N
Frequency	Monthly	Monthly	Quarterly	Quarterly	Quarterly
Dep. Var. Mean	-0.0026	-0.0234	0.0004	-0.0010	0.0039
Aggregate Impact Coef.	**1.17****	**1.512**	**-0.0678**	**-0.344**	**0.663**
Observations	900	900	300	300	300
R^2	0.326	0.665	0.612	0.558	0.133
First-Stage F-Statistic	57.78	57.78	59.51	56.27	61.27
P-value on Test for Pre-Trends	0.416	0.692	0.472	0.318	0.853

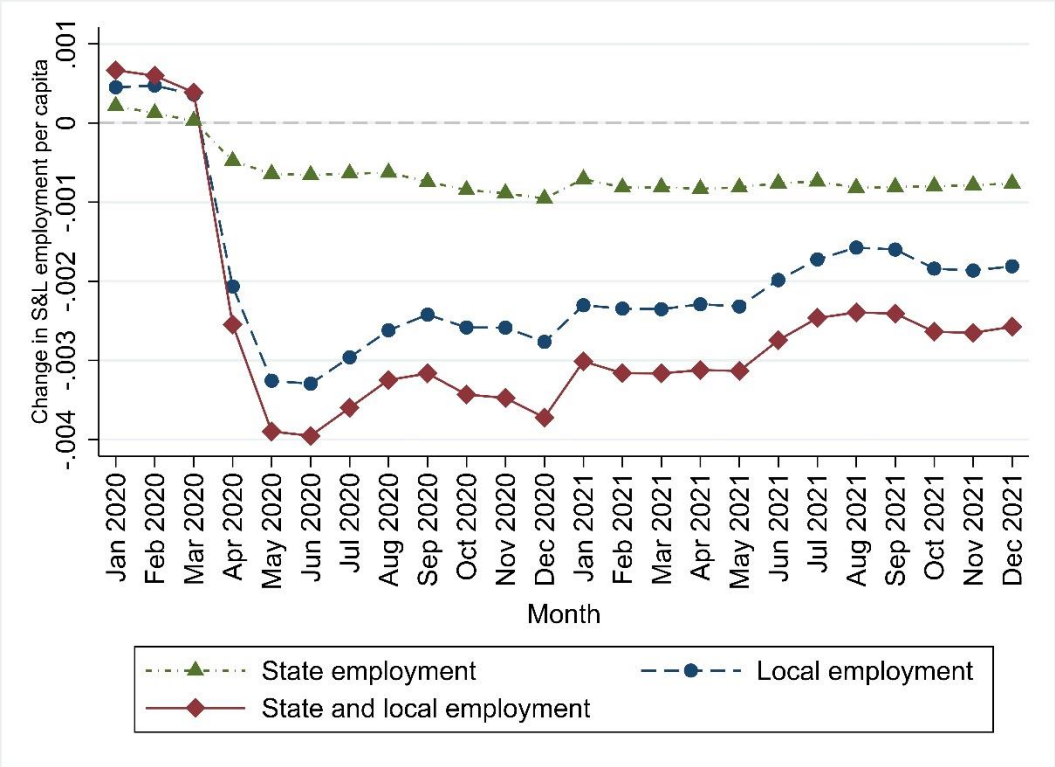
Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,t,y} + u_{s,t,y}$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state *s* pooled across all four bills. Equation (2b) is modified to reflect the wider range of outcome variables. In a first stage regression, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$, the number of representatives and senators per million residents in 2020, according to equation (2a). $\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the same time period in

2019. For example, Column 1 uses the change in state and local government employment per capita, identical to Table 2 Column 2, while Column 4 uses the change in annualized state GDP per capita in USD millions relative to the same quarter in 2019. All employment variables use QCEW estimates. Column 3 uses the annualized real total wages in USD millions, for all employees, as measured by the BEA. Columns 4 and 5 use seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted, annualized real personal income per capita in USD millions. Included is a set of state-level controls $X_{s,t,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019 (for employment regressions), the March 2020 and contemporaneous month/quarter averages of a state's Oxford Stringency Index, and the change in the dependent variable between the end of 2018 and 2019 (if not already included). The aggregate impact coefficient denotes the total impact over the pandemic implied by the annualized coefficient (scaled by $[\frac{MonthsSincePandemic}{12}]$ as described above). This table shows pooled regressions run using data from April 2020 to September 2021 for monthly dependent variables or Q2 2020 to Q3 2021 for quarterly variables, the periods during which the federal government appropriated money to state and local governments.
*** p<0.01, ** p<0.05, * p<0.1

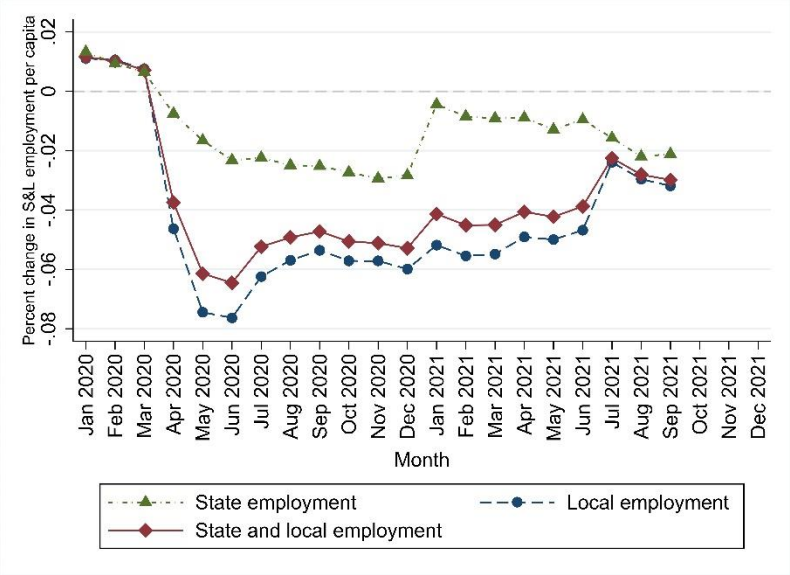
Appendix Figure 1: Change in State and Local Employment per Capita: CES Data



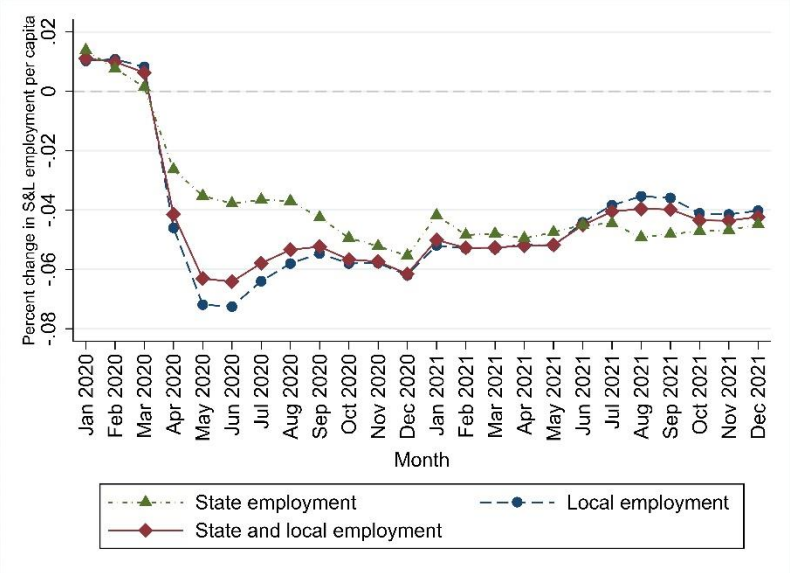
Note: This figure shows the change in national state and local government employment per capita relative to the same month in 2019 over the course of the pandemic. The variable shown is calculated for a given job category as the arithmetic difference in employment in a given month and the same month in 2019 divided by 2020 population. This figure displays Current Employment Statistics (CES) estimates. State, local, and state plus local employment are shown separately. This figure uses data from the US Bureau of Labor Statistics (2021a) and US Census Bureau (2021).

Appendix Figure 2: Percent Change in State and Local Employment per Capita, QCEW and CES

Panel A: Percent Change in State and Local Government Employment per Capita Relative to Same Month in 2019, QCEW

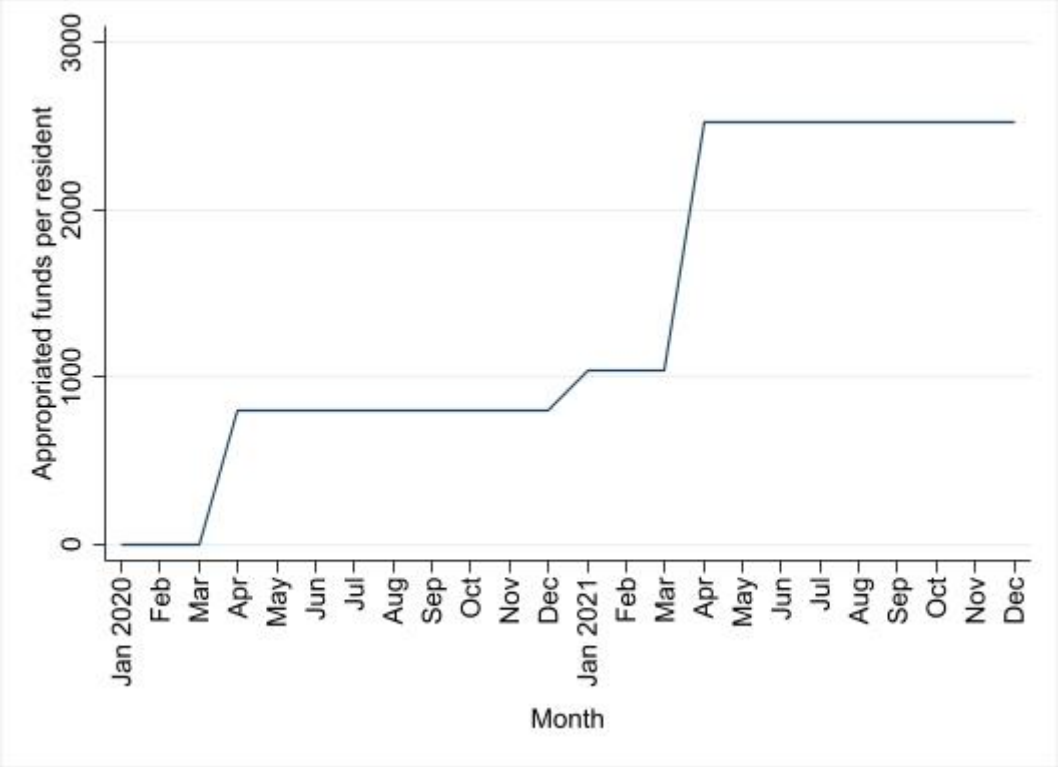


Panel B: Percent Change in State and Local Government Employment per Capita Relative to Same Month in 2019, CES



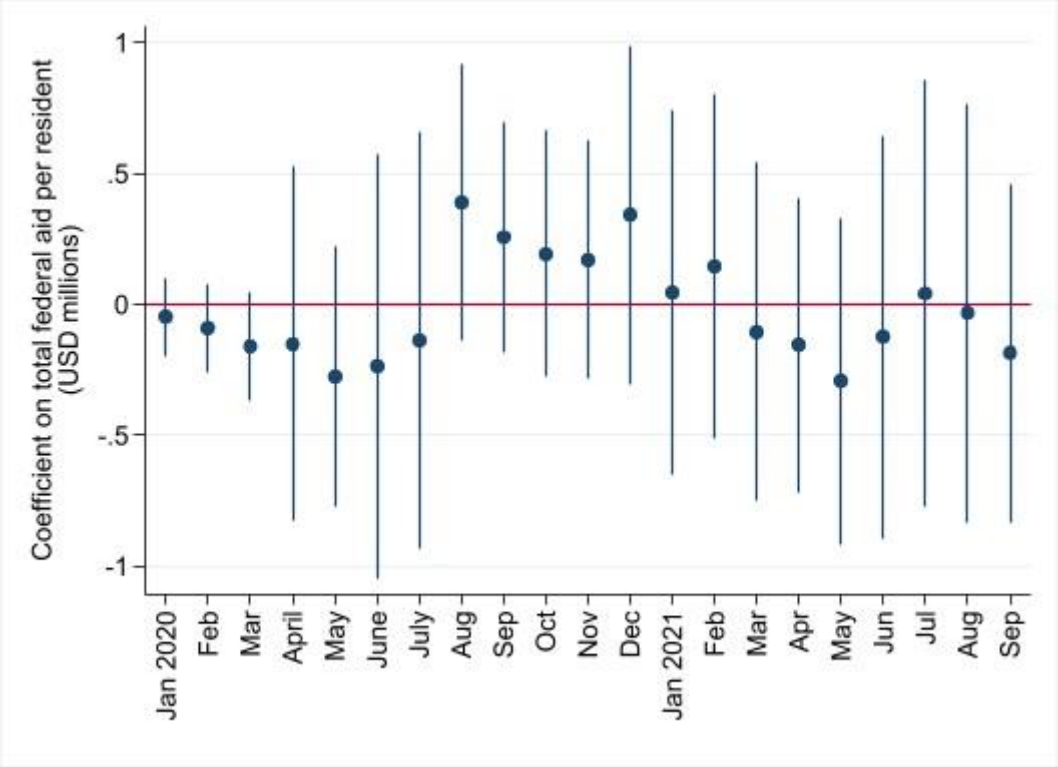
Note: This figure shows the percent change in national state and local government employment per capita relative to the same month in 2019 over the course of the pandemic. Panel A shows this variable using the QCEW estimates of employment while Panel B displays the CES estimates. State, local, and state plus local employment are shown separately. This figure uses data from the US Bureau of Labor Statistics (2021a, 2021b) and US Census Bureau (2021).

Appendix Figure 3: Federal Funds to State and Local Governments Appropriated per Resident Nationally Over Time



Note: This figure shows the appropriation of COVID-19 relief funds to state and local governments over time. Funds are shown for the CARES Act, Families First Coronavirus Response Act, Response and Relief Act, and American Rescue Plan Act on a per resident basis. The charts displays the national average aid per resident over the course of the pandemic. Increases in funds are matched with the first QCEW sample period following the passage of a COVID-19 relief bill. For instance, since the CARES Act was passed in late March 2020, the first observed employment data since its passage is during the second week of April 2020. Unlike the variable used in our baseline regressions, the variable in the figure is not scaled in USD millions.

Appendix Figure 4: Local-Projection Impulse Response of State and Local Government Employment to COVID-19 Relief Aid, Unweighted

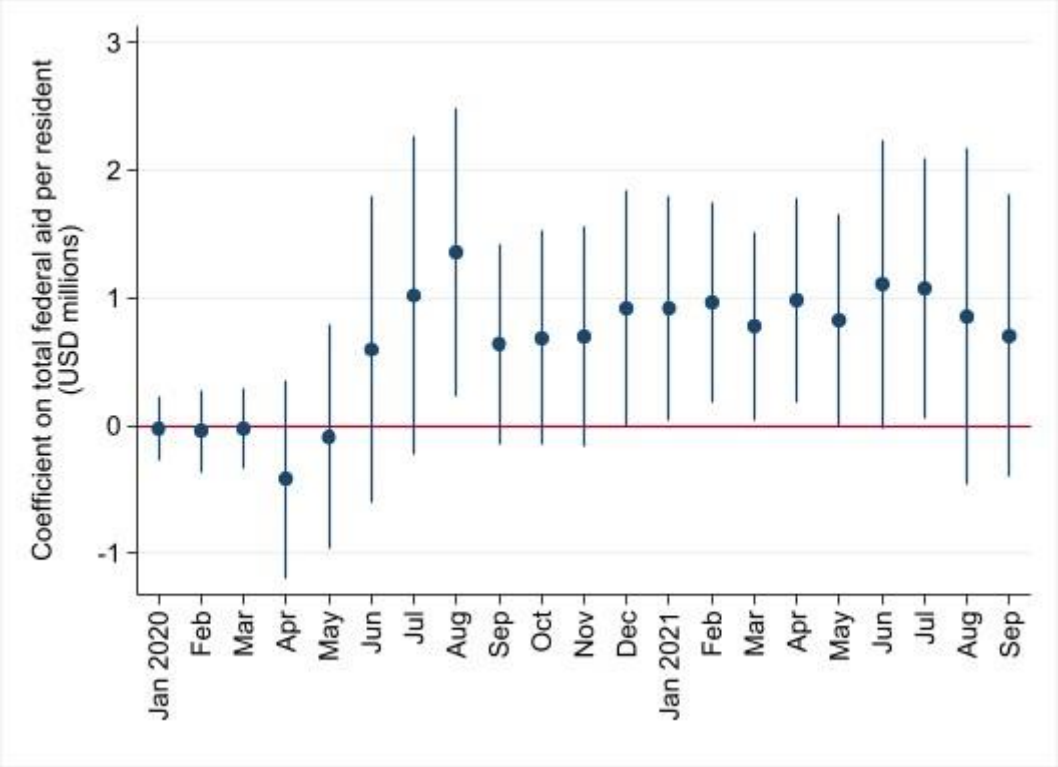


Note: This figure displays the coefficient (and the 95% confidence interval) on predicted total federal aid to state and local governments per resident (USD millions) in the regression outlined in equation (3b):

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid_s}}{Pop_{s,y_{2020}}} + \beta_2 X_{s,m,y} + u_{s,m,y}$$

where *m* and *y* iterate over the month-year pairs from January 2020 to September 2021. $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is the total amount of federal aid to state and local governments per resident (USD millions) allocated to state *s*. $\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ is the arithmetic change in state and local government employment per capita in state *s* relative to the same month in 2019, as measured by the QCEW. Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. Observations are not weighted by population, and standard errors are clustered at the state level. The ratio \$1,000,000/$(\beta_1 * [\frac{MonthsSincePandemic}{12}])$ represents the amount of money spent to save one state or local government job-year. The figure uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), and Hale et al. (2020).

Appendix Figure 5: Local-Projection Impulse Response of State and Local Government Employment to COVID-19 Relief Aid: Green and Loualiche (2020) Specification



Note: This figure displays the coefficient (and the 95% confidence interval) on predicted total federal aid to state and local governments per capita (USD millions). The instrument used in the first stage presented below (equation A) differs from the method outlined in equation (3a); federal aid to state and local governments per capita is instrumented using the interaction between the log of 2020 state population and an indicator for state size, akin to the strategy employed in Green and Loualiche (2020):

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \left(ln(Pop)_{s,y_{2020}} * SmallState_s\right) + \beta_2 X_{s,m,y} + \varepsilon_{s,m,y} \quad \text{(A)}$$

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,m,y} + u_{s,m,y} \quad \text{(B)}$$

where *m* and *y* iterate over the month-year pairs from January 2020 to September 2021. $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is the total amount of federal aid to state and local governments per resident (USD millions) allocated to state *s*. $SmallState_s$ equals 1 for state *s* if it received the minimum CARES Act funding and 0 otherwise. $\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ is the arithmetic change in state and local employment per capita in state *s* relative to the same month in 2019 as measured by the QCEW. Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. The regressions are weighted by state population and clustered at the state level. The ratio \$1,000,000/$(\beta_1 * [\frac{MonthsSincePandemic}{12}])$ represents the amount of money spent to save one state or local government job-year. The figure uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), and Hale et al. (2020).

Appendix Table 1: Variable Descriptions and Sets of Control Variables

Variable	Description	Source
Change in State and Local Employment per Capita Relative to Same Month in 2019	The arithmetic change in state and local government employment between a given month in 2020 or 2021 and the same month in 2019, divided by the 2020 state population.	US Bureau of Labor Statistics (2021a, 2021b); US Census Bureau (2021)
Total Aid to State and Local Governments per Resident (USD Millions)	Funds appropriated to each state by Congress in COVID-19 relief bills divided by the 2020 state population, in nominal USD millions.	Committee for a Responsible Federal Budget (2021); US Federal Transit Administration (2021a, 2021b); US Census Bureau (2021); Chidambaram and Musumeci (2021); Medicaid and Chip Payment Access Commission (2021); US Office of Elementary and Secondary Education (2021)
Senators and Representatives per Million Residents	Number of House plus the number of Senate seats per 1,000,000 people in each state, according to the 2020 estimate of population and Congressional seats.	US Census Bureau (2021); Lewis et al. (2021)
Log of 2020 State Population	The natural logarithm of 2020 state population	US Census Bureau (2021)
Share of Population in City Eligible for Municipal Liquidity Facility	The share of a state's 2020 population living in a city or town deemed eligible for financing through the Federal Reserve's Municipal Liquidity Facility.	US Census Bureau (2021); Federal Reserve Board (2021)
Change in State and Local Employment per Capita from Dec 2018 to Dec 2019	The arithmetic difference in state and local government employment between December 2018 and December 2019, divided by the 2020 state population.	US Bureau of Labor Statistics (2021a, 2021b); US Census Bureau (2021)
Change in Private Employment per Capita from Dec 2018 to Dec 2019	The arithmetic difference in state and local government employment between a given month in 2020 or 2021 and the same month in 2019, divided by the 2020 state population.	US Bureau of Labor Statistics (2021a, 2021b); US Census Bureau (2021)
March 2020 Average Oxford Stringency Index Level	The monthly average level of a state's Oxford Stringency Index during March 2020, divided by 100.	Hale et al. (2021)
Contemporaneous Oxford Stringency Index Level	The monthly average level of a state's Oxford Stringency Index, divided by 100.	Hale et al. (2021)
Share of Votes Won by Donald Trump in 2020 Election	The percentage of votes cast in a state for Donald Trump in the 2020 US Presidential election. Proxy for attitudes toward COVID-19.	MIT Election and Data Science Lab (2017)
Final Two Weeks of March 2020 Average Oxford Stringency Index Level	The monthly average level of a state's Oxford Stringency Index during the final fourteen days in March, divided by 100. Proxy for seriousness with which states initially responded to COVID-19.	Hale et al. (2021)
Percent Change in Retail Mobility Relative to February	Monthly-average percentage change in foot traffic in retail and recreation areas relative to the median level of traffic during the January 3, 2020 to February 6, 2020 baseline period	Google LLC (2021)

2020 Baseline (Previous Month)		
New COVID-19 Cases/Deaths per 100,000 (Previous Month)	The number of reported COVID-19 cases and deaths, divided by state population in hundred-thousands.	Dong, Du, and Gardner (2020)
Total COVID-19 Cases/Deaths per 100,000 (Previous Month)	The number of cumulative COVID-19 cases and deaths, divided by state population in hundred-thousands.	Dong, Du, and Gardner (2020)
Change in Real State GDP per Capita from 2018 to 2019	The arithmetic change in real gross state product per capita from Q4 2018 to Q4 2019, in 2012 US dollars.	US Bureau of Economic Analysis (2021)
Change in Private Employment per Capita Relative to Same Month in 2019	The arithmetic change in private employment between a given month in 2020 or 2021 and the same month in 2019, divided by the 2020 state population.	US Bureau of Labor Statistics (2021b); US Census Bureau (2021)
Change in Real State GDP per Capita Relative to Same Month in 2019 (USD Millions)	The arithmetic change in real, seasonally-adjusted and annualized gross state product between a given quarter in 2020 or 2021 and the same month in 2019 divided by the 2020 state population, in 2012 USD millions.	US Bureau of Economic Analysis (2021); US Census Bureau (2021)
Change in Real State GDP per Capita from Q4 2018 to Q4 2019 (USD Millions)	The arithmetic change in real, seasonally-adjusted and annualized gross state product between Q4 2018 and Q4 2019 divided by the 2020 state population, in 2012 USD millions.	US Bureau of Economic Analysis (2021); US Census Bureau (2021)
Change in Real Personal Income per Capita Relative to Same Month in 2019 (USD Millions)	The arithmetic change in real, seasonally-adjusted and annualized real personal income between a given quarter in 2020 or 2021 and the same month in 2019 divided by the 2020 state population, in 2012 USD millions.	US Bureau of Economic Analysis (2021); US Census Bureau (2021)
Change in Real Personal Income per Capita from Q4 2018 to Q4 2019 (USD Millions)	The arithmetic change in real, seasonally-adjusted gross state product between Q4 2018 and Q4 2019 divided by the 2020 state population, in 2012 USD millions.	US Bureau of Economic Analysis (2021); US Census Bureau (2021)
Change in Real Total Wages per Capita Relative to Same Month in 2019 (USD Millions)	The arithmetic change in real, seasonally-adjusted and annualized total wages for all employees in a state between a given quarter in 2020 or 2021 and the same month in 2019 divided by the 2020 state population, in 2012 USD millions.	US Bureau of Economic Analysis (2021); US Census Bureau (2021)
Change in Real Total Wages per Capita from Q4 2018 to Q4 2019 (USD Millions)	The arithmetic change in real, seasonally-adjusted and annualized total wages for all employees in a state between Q4 2018 and Q4 2019 divided by the 2020 state population, in 2012 USD millions.	US Bureau of Economic Analysis (2021); US Census Bureau (2021)

Appendix Table 2: Total State and Local Funds per Resident, Congressional Representation, and Proxies for Funding Needs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Representatives and Senators per Million Residents	1,334***	995.1***	1,105***	1,367***	902.0***	1,286***	1,417***	992.2***
	(112.5)	(175.9)	(130.8)	(133.2)	(154.6)	(113.3)	(134.0)	(120.9)
Log(Population)	419.5***	262.0***	165.1	443.6***	153.5	411.2***	366.8***	101.9*
	(90.19)	(94.08)	(98.90)	(112.6)	(104.7)	(90.22)	(66.10)	(53.60)
Tax Shortfall per Capita		0.853**						-0.424
		(0.345)						(0.272)
Average Q4 2020 Unemployment per Capita			37,186***					19,019***
			(10,451)					(5,362)
Percent Change in Personal Income Q4 2019 to Q4 2020				-42.48				-62.90***
				(49.07)				(20.67)
Total State and Local Spending per Capita					0.104***			0.107***
					(0.0249)			(0.0246)
Acres of Federal Land per Capita						2.574***		1.680
						(0.729)		(1.342)
Log Population Density							166.6**	69.78*
							(65.36)	(39.45)
Political and Mobility Controls	N	N	N	N	N	N	N	N
COVID-19 Controls	N	N	N	N	N	N	N	N
Economic Controls	N	N	N	N	N	N	N	N
Dep. Var. Mean	2826.21	2826.21	2826.21	2826.21	2826.21	2826.21	2826.21	2826.21
Observations	900	900	900	900	900	900	900	900
R^2	0.496	0.635	0.709	0.518	0.758	0.501	0.572	0.872
First-Stage F-Statistic	140.62	32.00	71.34	105.36	34.04	128.80	111.81	67.39

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \, RepsPerMillion_s + \beta_2 X_{s,m,y} + \varepsilon_{s,m,y}$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD) in state *s* pooled across all four bills. $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is regressed on $RepsPerMillion_s$, the number of Representatives and Senators per million residents in 2020, according to equation (2a). Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020

official Census population, the predicted tax shortfall for state and local governments divided by the state population, the average number of unemployed persons each month in the fourth quarter of 2020 per capita, the percentage change in personal income between the fourth quarter of 2019 and the fourth quarter of 2020, the total direct expenditures from state and local governments per capita in 2019, the acres of federal lands per capita, and the log of population density for state *s*. These controls are inspired by the analysis in Clemens and Veuger (2021a). Observations are weighted by state population and standard errors (in parentheses) are clustered by state. This table shows pooled regressions run using data from April 2020 to September 2021, the period during which the federal government appropriated money to state and local governments.
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 3: COVID-19 Relief Aid and Other Federal Stimulus Efforts

	PPP Funds per Resident (USD Millions)	UI Funds per Resident (USD Millions)	EIP Funds per Resident (USD Millions)
	(1)	(2)	(3)
Total Aid per Resident (USD millions)	0.0498	-0.116	0.0672
	(0.158)	(0.261)	(0.0583)
Frequency	Monthly	Monthly	Monthly
Observations	1050	1050	1050
R^2	0.487	0.531	0.285
First-Stage F-Statistic	57.69	57.69	57.69

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), the US Bureau of Economic Analysis (2021), Walczak and Funkhouser (2021), the US Small Business Administration (2022) to estimate an equation of the following form for all months pooled:

$$\frac{Y_s}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,t,y} + u_{s,t,y.}$$

Where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state *s* pooled across all four bills. Equation (2b) is modified to reflect the wider range of outcome variables. In a first stage regression, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$, the number of representatives and senators per million residents in 2020, according to equation (2a). $\frac{Y_s}{Pop_{s,y_{2020}}}$ presents the total amount allocated per resident in millions USD through the Paycheck Protection Program (column 1), Unemployment Insurance (column 2), and Economic Impact Payments (column 3). Included is a set of state-level controls $X_{s,t,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, the March 2020 and contemporaneous month/quarter averages of a state's Oxford Stringency Index. Observations are weighted by state population and standard errors (in parentheses) are clustered by state. This table shows pooled regressions run using data from April 2020 to December 2021.
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 4: Reduced Form Relationship Between Congressional Representation and Other Federal Aid

	Federal Aid per Resident (USD Millions)		
	PPP	UI	EIP
	(1)	(2)	(3)
Representatives per Million Residents	5.12e-05	-0.000120	6.92e-05
	(0.000168)	(0.000268)	(5.79e-05)
Log(Population)	-4.71e-06	0.000139	8.71e-07
	(9.45e-05)	(0.000214)	(3.93e-05)
Share of Population Eligible for MLF	0.000756*	0.00144*	-0.000308*
	(0.000387)	(0.000809)	(0.000170)
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	-0.268**	-0.709***	0.0804*
	(0.103)	(0.258)	(0.0419)
Change Private Employment per Resident (Dec 2018 – Dec 2019)	-0.0317	-0.0252	0.00129
	(0.0207)	(0.0514)	(0.00811)
Average OSI (March 2020)	0.00156	0.00589**	-0.000143
	(0.000973)	(0.00255)	(0.000388)
Average OSI (Current Month)	8.25e-05	0.000615**	-7.99e-05**
	(5.25e-05)	(0.000238)	(3.56e-05)
Political and Mobility Controls	N	Y	N
COVID-19 Controls	N	N	Y
Economic Controls	N	N	N
Dep. Var. Mean	0.0028	0.0028	0.0028
Obs	1,050	1,050	1,050
R^2	0.474	0.560	0.385
F-Statistic	0.09	0.20	1.43

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), the US Bureau of Economic Analysis (2021), Walczak and Funkhouser (2021), the US Small Business Administration (2022) to estimate an equation of the following form for all months pooled:

$$\frac{Y_s}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \, RepsPerMillion_s + \beta_2 X_{s,m,y} + \varepsilon_{s,m,y}$$

where $\frac{Y_s}{Pop_{s,y_{2020}}}$ presents the total amount allocated per resident in millions USD through the Paycheck Protection Program (column 1), Unemployment Insurance (column 2), and Economic Impact Payments (column 3). $RepsPerMillion_s$ is the number of Representatives and Senators per million residents in 2020. Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. Observations are weighted by state population and standard errors (in parentheses) are clustered by state. Regressions are run using data spanning April 2020 to December 2021. These regressions are analogous to those found in Appendix Table 6.

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 5: First-Stage Robustness to One-By-One Addition of Baseline Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Representatives and Senators per Million Residents	1,334***	1,198***	1,333***	1,277***	1,172***	1,315***	1,031***
	(112.5)	(116.7)	(99.42)	(109.5)	(122.2)	(108.9)	(135.6)
Log(Population)	419.5***	299.3***	441.4***	438.3***	288.1***	406.2***	219.6***
	(90.19)	(85.83)	(81.61)	(88.92)	(72.19)	(84.09)	(78.03)
Share of Population Eligible for MLF		461.7					568.5**
		(281.1)					(259.1)
Change S&L Employment per Resident (Dec 2018 – Dec 2019)			-318,035**				-281,784**
			(135,911)				(111,361)
Change Private Employment per Resident (Dec 2018 – Dec 2019)				-31,571*			-17,734
				(18,530)			(17,904)
Average OSI (March 2020)					2,430*		1,370
					(1,302)		(1,081)
Average OSI (Current Month)						507.8**	299.7**
						(202.0)	(123.8)
Political and Mobility Controls	N	N	N	N	N	N	N
COVID-19 Controls	N	N	N	N	N	N	N
Economic Controls	N	N	N	N	N	N	N
Dep. Var. Mean	2826.21	2826.21	2826.21	2826.21	2826.21	2826.21	2826.21
Observations	900	900	900	900	900	900	900
R^2	0.496	0.516	0.583	0.532	0.563	0.519	0.668
First-Stage F-Statistic	140.62	105.44	179.71	136.01	91.98	145.95	57.79

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \, RepsPerMillion_s + \beta_2 X_{s,m,y} + \varepsilon_{s,m,y}$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD) in state *s* pooled across all four bills. $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is regressed on $RepsPerMillion_s$, the number of Representatives and Senators per million residents in 2020, according to equation (2a). Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. Observations are

weighted by state population and standard errors (in parentheses) are clustered by state. This table shows pooled regressions run using data from April 2020 to September 2021, the period during which the federal government appropriated money to state and local governments.
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 6: First-Stage Robustness (April 2020 – September 2021)

	Total Federal Aid to State and Local Governments per Resident					
	Baseline	Political	COVID-19	Economic	Combined	Simple
	(1)	(2)	(3)	(4)	(5)	(6)
Representatives per Million Residents	1,031***	1,059***	1,257***	838.1***	1,124***	1,334***
	(135.6)	(151.3)	(85.68)	(179.4)	(110.2)	(112.5)
Log(Population)	219.6***	232.6**	290.2***	98.08	215.3***	419.5***
	(78.03)	(89.95)	(39.46)	(106.5)	(57.35)	(90.19)
Share of Population Eligible for MLF	568.5**	353.7	242.7**	493.9**	202.3	
	(259.1)	(245.4)	(116.5)	(244.8)	(160.2)	
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	-281,784**	-198,351*	-84,844	-367,334***	-150,940**	
	(111,361)	(115,011)	(60,733)	(99,669)	(64,116)	
Change Private Employment per Resident (Dec 2018 – Dec 2019)	-17,734	-22,880	4,640	-64,589**	-26,384	
	(17,904)	(16,643)	(10,954)	(26,478)	(17,840)	
Average OSI (March 2020)	1,370	1,062	961.3	574.5	-330.2	
	(1,081)	(1,874)	(613.6)	(779.9)	(793.4)	
Average OSI (Current Month)	299.7**	223.6*	792.0***	182.0***	585.9***	
	(123.8)	(132.2)	(231.5)	(59.73)	(142.3)	
Political and Mobility Controls	N	Y	N	N	Y	N
COVID-19 Controls	N	N	Y	N	Y	N
Economic Controls	N	N	N	Y	Y	N
Dep. Var. Mean	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028
Obs	900	900	900	900	900	900
R^2	0.668	0.696	0.830	0.748	0.865	0.496
F-Statistic	57.79	49.01	215.15	21.81	104.01	140.62

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \, RepsPerMillion_s + \beta_2 X_{s,m,y} + \varepsilon_{s,m,y}$$

where $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is the total of federal aid to state and local governments per resident (USD) in state *s* pooled across all four bills. $RepsPerMillion_s$ is the number of Representatives and Senators per million residents in 2020. Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. Observations are weighted by state population and standard errors (in parentheses) are clustered by state. Regressions are run using data spanning April 2020 to September 2021. $X_{s,m,y}$ additionally denotes a vector of robustness controls as indicated immediately following the coefficients of interest. Political and mobility controls include Donald Trump's vote share in the 2020 presidential election, the average Oxford Stringency Index level during the last week of March 2020, and the change in retail mobility relative to early 2020. COVID-19 controls include the total and new number of cases and deaths per 100,000 recorded during the previous month. Economic controls include the change in state GDP per capita between Q4 2018 and Q4 2019.

Appendix Table 7: Change in State and Local Government Employment per Capita and Federal Relief Aid: Unweighted Regressions

(April 2020-September 2021)

	OLS	Baseline	Political	COVID-19	Economic	Combined	Simple
	(1)	(2)	(3)	(5)	(6)	(7)	(8)
Total Aid per Resident (USD millions)	-0.0626	-0.0513	-0.127	-0.0863	-0.0610	-0.159	-0.211
	(0.147)	(0.213)	(0.201)	(0.199)	(0.256)	(0.218)	(0.227)
Log(Population)	0.000739	0.000727	0.00151*	0.000834	-4.59e-05	0.000162	-6.81e-05
	(0.000924)	(0.000985)	(0.000888)	(0.000945)	(0.000260)	(0.000237)	(0.000214)
Share of Population Eligible for MLF	0.000739	0.000727	0.00151*	0.000834	0.000718	0.00155*	
	(0.000924)	(0.000985)	(0.000888)	(0.000945)	(0.000963)	(0.000860)	
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	0.391**	0.394**	0.241	0.335*	0.377*	0.182	
	(0.178)	(0.171)	(0.201)	(0.179)	(0.198)	(0.203)	
Change Private Employment per Resident (Dec 2018 – Dec 2019)	0.0682*	0.0685*	0.0626*	0.0545	0.0630	0.0359	
	(0.0367)	(0.0362)	(0.0343)	(0.0393)	(0.0526)	(0.0535)	
Average OSI (March 2020)	-0.00272	-0.00276	0.00162	-0.00290	-0.00283	0.000420	
	(0.00276)	(0.00291)	(0.00434)	(0.00288)	(0.00267)	(0.00411)	
Average OSI (Current Month)	-0.00451***	-0.00452***	-0.00136***	-0.00254***	-0.00452***	0.000962	
	(0.000444)	(0.000431)	(0.000410)	(0.000676)	(0.000439)	(0.000704)	
Political and Mobility Controls	N	N	Y	N	N	Y	N
COVID-19 Controls	N	N	N	Y	N	Y	N
Economic Controls	N	N	N	N	Y	Y	N
Dep. Var. Mean	-0.0026	-0.0026	-0.0026	-0.0026	-0.0026	-0.0026	-0.0026
Aggregate Impact Coef.	**-0.0939**	**-0.0770**	**-0.1905**	**-0.1295**	**-0.0915**	**-0.2385**	**-0.3165**
Observations	900	900	900	900	900	900	900
R^2	0.290	0.290	0.386	0.319	0.297	0.432	0.020
First-Stage F-statistic	N/A	294.31	280.59	420.47	211.59	256.16	161.81
P-value on Test for Pre-Trends	0.337	0.182	0.180	0.171	0.022	0.018	0.293

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate equations of the following form for each all months pooled:

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,m,y} + u_{s,m,y}$$

where $TotalAid_s$ is the total federal aid to state and local governments per resident (USD millions) in state *s* pooled across all four bills. In a first stage regression, $TotalAid_s$ is instrumented using $RepsPerMillion_s$, the number of Representatives and Senators per million residents in 2020, according to equation (2a). $\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ is the arithmetic change in state and local employment per capita in state *s* relative to the same month in 2019, as measured by the QCEW. The ratio \$1,000,000/$(\beta_1 * [\frac{MonthsSincePandemic}{12}])$ represents the amount of money spent to save one state or local government job-year. Included are a set of state-level controls $X_{s,m,y}$. These include the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. Observations are *not* weighted by state population and standard errors (in parentheses) are clustered by state. This table shows pooled regressions run using data from April 2020 to September 2021, the period during which the federal government appropriated money to state and local governments. The first column presents the "naïve" OLS specification according to equation (1). $X_{s,m,y}$ additionally denotes a vector of robustness controls as indicated immediately following the coefficients of interest. Political and mobility controls include Donald Trump's vote share in the 2020 presidential election, the average Oxford Stringency Index level during the last week of March 2020, and the change in retail mobility relative to early 2020. COVID-19 controls include the total and new number of cases and deaths per 100,000 recorded during the previous month. Economic controls include the change in state real GDP per capita between Q4 2018 and Q4 2019. The p-value of the pre-pandemic (January 2020 to March 2020) trend coefficients on total aid per capita are presented as indicators of the robustness of the empirical strategy. The aggregate impact coefficient denotes the total impact over the pandemic implied by the annualized coefficient (scaled by $[\frac{MonthsSincePandemic}{12}]$ as described above).

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 8: State and Local Government Employment and COVID-19 Relief Aid: CES Employment Data (April 2020-December 2021)

	OLS	Baseline	Political	COVID-19	Economic	Combined	Simple
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total Aid per Resident (USD millions)	0.0802	-0.101	-0.430	0.0134	0.326	0.0901	-0.908*
	(0.379)	(0.582)	(0.488)	(0.456)	(0.706)	(0.390)	(0.539)
Log(Population)	0.000541**	0.000496	0.000519*	0.000499	0.000665*	0.000655***	0.000157
	(0.000244)	(0.000316)	(0.000266)	(0.000307)	(0.000345)	(0.000233)	(0.000375)
Share of Population Eligible for MLF	-0.000284	-4.92e-05	0.00138	-0.000284	-0.000114	0.00110	
	(0.000954)	(0.00107)	(0.000878)	(0.00100)	(0.00118)	(0.000797)	
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	0.517	0.492	0.267	0.509	0.639*	0.343	
	(0.351)	(0.352)	(0.306)	(0.339)	(0.364)	(0.262)	
Change Private Employment per Resident (Dec 2018 – Dec 2019)	0.0555	0.0462	0.0334	0.0680	0.152	0.161***	
	(0.0465)	(0.0577)	(0.0580)	(0.0489)	(0.103)	(0.0574)	
Average OSI (March 2020)	-0.00914***	-0.00893***	-0.00593	-0.00923***	-0.00749**	-0.00523	
	(0.00303)	(0.00310)	(0.00493)	(0.00311)	(0.00307)	(0.00447)	
Average OSI (Current Month)	-0.00253***	-0.00248***	-0.000331	-0.00165***	-0.00240***	0.000995	
	(0.000368)	(0.000393)	(0.000405)	(0.000548)	(0.000423)	(0.000634)	
Political and Mobility Controls	N	N	Y	N	N	Y	N
COVID-19 Controls	N	N	N	Y	N	Y	N
Economic Controls	N	N	N	N	Y	Y	N
Dep. Var. Mean	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034
Aggregate Impact Coef.	**0.1404**	**-0.1768**	**-0.7525**	**0.0235**	**0.5705**	**0.1577**	**-1.5890***
Obs	1,050	1,050	1,050	1,050	1,050	1,050	1,050
R^2	0.348	0.346	0.414	0.356	0.379	0.486	0.094
First-Stage F-statistic	N/A	51.26	54.81	195.93	16.27	98.41	140.66
P-value on Test for Pre-Trends	0.903	0.820	0.891	0.763	0.299	0.437	0.027

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021b), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021a), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the Bureau of Economic Analysis (2021) to estimate an equation of the following form:

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,m,y} + u_{s,m,y}$$

where $TotalAid_s$ is the total federal aid to state and local governments per capita (USD millions) in state *s* pooled across all four bills. In a first stage regression, $TotalAid_s$ is instrumented using $RepsPerMillion_s$, the number of Representatives and Senators per million residents in 2020, according to equation (2a). $\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ is the arithmetic change in state and local employment per capita in state *s* relative to the same month in 2019, as measured by the CES. The ratio \$1,000,000/($\beta_1 * [\frac{MonthsSincePandemic}{12}]$) represents the amount of money spent to save one state or local government job-year. Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (CES) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. Observations are weighted by state population and standard errors (in parentheses) are clustered by state. This table shows pooled regressions run using data from April 2020 to December 2021, the period during which the federal government appropriated money to state and local governments. The first column presents the "naïve" OLS specification according to equation (1). $X_{s,m,y}$ additionally denotes a vector of robustness controls as indicated immediately following the coefficients of interest. Political and mobility controls include Donald Trump's vote share in the 2020 presidential election, the average Oxford Stringency Index level during the last week of March 2020, and the change in retail mobility relative to early 2020. COVID-19 controls include the total and new number of cases and deaths per 100,000 recorded during the previous month. Economic controls include the change in state real GDP per capita between Q4 2018 and Q4 2019. The p-value of the pre-pandemic (January 2020 to March 2020) trend coefficients on total aid per capita are presented as indicators of the robustness of the empirical strategy. The aggregate impact coefficient denotes the total impact over the pandemic implied by the annualized coefficient (scaled by $[\frac{MonthsSincePandemic}{12}]$ as described above).

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 9: Pre-trend Test for QCEW Employment and COVID-19 Relief Aid (January-March 2020)

	OLS	Baseline	Political	COVID-19	Economic	Combined	Simple
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total Aid per Resident (USD millions)	0.0799	-0.117	-0.0735	-0.126	-0.333*	-0.282	-0.105
	(0.121)	(0.145)	(0.143)	(0.142)	(0.179)	(0.190)	(0.135)
Log(Population)	9.87e-05*	4.85e-05	5.65e-05	4.84e-05	-4.41e-05	-3.62e-05	9.93e-05
	(5.57e-05)	(5.70e-05)	(5.09e-05)	(5.53e-05)	(6.34e-05)	(6.15e-05)	(6.2e-05)
Share of Population Eligible for MLF	-8.04e-05	0.000180	-5.42e-05	0.000165	0.000218	8.28e-05	
	(0.000290)	(0.000327)	(0.000253)	(0.000298)	(0.000326)	(0.000255)	
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	0.589***	0.535***	0.619***	0.540***	0.377***	0.420***	
	(0.0724)	(0.0991)	(0.0929)	(0.102)	(0.120)	(0.140)	
Change Private Employment per Resident (Dec 2018 – Dec 2019)	0.00644	-0.00105	-0.00180	-0.00602	-0.0590**	-0.0523**	
	(0.0168)	(0.0168)	(0.0139)	(0.0144)	(0.0246)	(0.0238)	
Average OSI (March 2020)	-0.000612	-0.000243	-0.00241*	-0.000423	-0.000901	-0.00384***	
	(0.000936)	(0.00111)	(0.00144)	(0.00105)	(0.000872)	(0.00114)	
Average OSI (Current Month)	-0.000492***	-0.000488***	-0.000549***	-0.000551***	-0.000491***	-0.000412***	
	(4.83e-05)	(4.69e-05)	(0.000157)	(7.84e-05)	(4.75e-05)	(0.000158)	
Political and Mobility Controls	N	N	Y	N	N	Y	N
COVID-19 Controls	N	N	N	Y	N	Y	N
Economic Controls	N	N	N	N	Y	Y	N
Dep. Var. Mean	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Observations	150	150	150	150	150	150	150
R^2	0.567	0.535	0.616	0.558	0.601	0.678	0.089
First-Stage F-statistic	N/A	55.98	45.68	52.93	20.49	19.83	139.04

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form:

$$\frac{\Delta S\&L Employment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,m,y} + u_{s,m,y}$$

where $TotalAid_s$ is the total federal aid to state and local governments per resident (USD millions) in state *s* pooled across all four bills. In a first stage regression, $TotalAid_s$ is instrumented using $RepsPerMillion_s$, the number of Representatives and Senators per million residents in 2020, according to equation (2a). $\frac{\Delta S\&L Employment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ is the arithmetic change in state and local employment per capita in state *s* relative to the same month in 2019, as measured by the QCEW. The ratio \$1,000,000/(β_1 *

$[\frac{MonthsSincePandemic}{12}]$) represents the amount of money spent to save one state or local government job-year. Included is a set of state-level controls $X_{s,m,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019, and the March 2020 and contemporaneous month averages of a state's Oxford Stringency Index. Observations are weighted by state population and standard errors (in parentheses) are clustered by state. This table shows pooled regressions run using data from January 2020 to March 2020, the period before which the federal government appropriated money to state and local governments. The first column presents the "naïve" OLS specification according to equation (1). $X_{s,m,y}$ additionally denotes a vector of robustness controls as indicated immediately following the coefficients of interest. Political and mobility controls include Donald Trump's vote share in the 2020 presidential election, the average Oxford Stringency Index level during the last week of March 2020, and the change in retail mobility relative to early 2020. COVID-19 controls include the total and new number of cases and deaths per 100,000 recorded during the previous month. Economic controls include the change in state real GDP per capita between Q4 2018 and Q4 2019.

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 10: Macroeconomic Impact of COVID-19 Relief Aid – Small State Indicator

	State and Local Govt Employment per Capita	Private Employment per Capita	Total Wages per Capita (USD millions)	State Real GDP per Capita (USD Millions)	State Real Personal Income (USD Millions)
	(1)	(2)	(3)	(4)	(5)
Total Aid per Resident (USD millions)	-0.291	-1.026	-0.134	-0.533	-0.108
	(0.259)	(2.650)	(0.211)	(0.369)	(0.316)
=1 if 'small state'	0.000165	0.00234	0.000302	0.000740*	0.000128
	(0.000331)	(0.00435)	(0.000195)	(0.000420)	(0.000330)
Share of Population Eligible for MLF	0.000413	-0.0125*	-0.000556	-0.00153*	0.00101
	(0.000845)	(0.00684)	(0.000501)	(0.000864)	(0.000801)
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	0.257	4.490*			
	(0.229)	(2.316)			
Change Private Employment per Resident (Dec 2018 – Dec 2019)	0.111***	1.469***			
	(0.0430)	(0.401)			
Change in Dependent Variable (End-2018 – End-2019)			1.605***	0.946***	0.885***
			(0.226)	(0.200)	(0.286)
Average OSI (March 2020)	-0.00233	-0.0195	0.00277	0.00628*	0.00411
	(0.00278)	(0.0203)	(0.00212)	(0.00358)	(0.00307)
Average OSI (Current Month)	-0.00340***	-0.0874***	-0.00580***	-0.0133***	0.00320***
	(0.000573)	(0.00358)	(0.000593)	(0.00108)	(0.000581)
Political and Mobility Controls	N	N	N	N	N
COVID-19 Controls	N	N	N	N	N
Economic Controls	N	N	N	N	N
Frequency	Monthly	Monthly	Quarterly	Quarterly	Quarterly
Dep. Var. Mean	-0.0026	-0.0234	0.0004	-0.0010	0.0039
Aggregate Impact Coef.	**-0.437**	**-1.512**	**-0.201**	**-0.780**	**-0.162**
Observations	900	900	300	300	300
R^2	0.423	0.675	0.625	0.566	0.148
First-Stage F-Statistic	50.59	50.59	59.51	61.51	64.44
P-value on Test for Pre-Trends	0.336	0.885	0.472	0.318	0.853

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,t,y} + u_{s,t,y}$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state *s* pooled across all four bills. Equation (2b) is modified to reflect the wider range of outcome variables. In a first stage regression, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$, the number of representatives and senators per million residents in 2020, according to equation (2a). $\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the same time period in 2019. For example, Column 1 uses the change in state and local government employment per capita, identical to Table 2 Column 2, while Column 4 uses the change in annualized state GDP per capita in USD millions relative to the same quarter in

2019. All employment variables use QCEW estimates. Column 3 uses the annualized real total wages in USD millions, for all employees, as measured by the BEA. Columns 4 and 5 use seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted, annualized real personal income per capita in USD millions. Included is a set of state-level controls $X_{s,t,y}$. This includes an indicator for if state s is considered a 'small state,' the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019 (for employment regressions), the March 2020 and contemporaneous month/quarter averages of a state's Oxford Stringency Index, and the change in the dependent variable between the end of 2018 and 2019 (if not already included). The aggregate impact coefficient denotes the total impact over the pandemic implied by the annualized coefficient (scaled by $[\frac{MonthsSincePandemic}{12}]$ as described above). This table shows pooled regressions run using data from April 2020 to September 2021 for monthly dependent variables or Q2 2020 to Q3 2021 for quarterly variables, the periods during which the federal government appropriated money to state and local governments.
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 11: Macroeconomic Impact of COVID-19 Relief Aid – Saturated Specification

	State and Local Govt Employment per Capita	Private Employment per Capita	Total Wages per Capita (USD millions)	State Real GDP per Capita (USD Millions)	State Real Personal Income (USD Millions)
	(1)	(2)	(3)	(4)	(5)
Total Aid per Resident (USD millions)	0.769*	-1.664	-0.299	-0.418	-0.0348
	(0.416)	(2.747)	(0.232)	(0.544)	(0.370)
Log(Population)	0.000514*	-0.00168	-0.000126	-0.000221	0.000238
	(0.000278)	(0.00164)	(0.000140)	(0.000314)	(0.000212)
Share of Population Eligible for MLF	-0.00329	-0.0186	0.00611	0.00405	0.0162**
	(0.0121)	(0.0857)	(0.00543)	(0.0110)	(0.00683)
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	0.188	8.828			
	(0.429)	(5.618)			
Change Private Employment per Resident (Dec 2018 – Dec 2019)	0.108	1.274*			
	(0.0678)	(0.667)			
Change in Dependent Variable (End-2018 – End-2019)			0.814***	0.989	-0.0648
			(0.258)	(0.637)	(0.519)
Average OSI (March 2020)	0.124	-3.363	-0.284***	-0.739***	-0.390***
	(0.273)	(2.072)	(0.106)	(0.257)	(0.135)
Average OSI (Current Month)	0.0370**	0.0731	0.00684	0.0358	0.0306*
	(0.0166)	(0.171)	(0.0178)	(0.0410)	(0.0183)
Political and Mobility Controls	N	N	N	N	N
COVID-19 Controls	N	N	N	N	N
Economic Controls	N	N	N	N	N
Saturated Controls	Y	Y	Y	Y	Y
Frequency	Monthly	Monthly	Quarterly	Quarterly	Quarterly
Dep. Var. Mean	-0.0026	-0.0234	0.0004	-0.0010	0.0039
Aggregate Impact Coef.	**1.154***	**-2.496**	**-0.443**	**-0.627**	**-0.0522**
Observations	900	900	300	300	300
R^2	0.406	0.757	0.709	0.678	0.194
First-Stage F-Statistic	56.25	56.25	96.21	68.74	71.76
P-value on Test for Pre-Trends	0.454	0.396	0.038	0.240	0.368

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,t,y} + \beta_3 X_{s,t,y}^2 + \beta_4 X_{s,t,y}^3 + u_{s,t,y}$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state *s* pooled across all four bills. Equation (2b) is modified to reflect the wider range of outcome variables. In a first stage regression, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$, the number of representatives and senators per million residents in 2020. $\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the same time period in 2019. For example, Column 1 uses the change in state and local government employment per capita, identical to Table 2 Column 2, while Column 4

uses the change in annualized state GDP per capita in USD millions relative to the same quarter in 2019. All employment variables use QCEW estimates. Column 3 uses the annualized real total wages in USD millions, for all employees, as measured by the BEA. Columns 4 and 5 use seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted, annualized real personal income per capita in USD millions. Included is a set of state-level controls $X_{s,t,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019 (for employment regressions), the March 2020 and contemporaneous month/quarter averages of a state's Oxford Stringency Index, and the change in the dependent variable between the end of 2018 and 2019 (if not already included). $X_{s,t,y}^2 \; and \; X_{s,t,y}^3$ denote the squared and cubed terms of the variables contained in $X_{s,t,y}$. The aggregate impact coefficient denotes the total impact over the pandemic implied by the annualized coefficient (scaled by $[\frac{MonthsSincePandemic}{12}]$ as described above). This table shows pooled regressions run using data from April 2020 to September 2021 for monthly dependent variables or Q2 2020 to Q3 2021 for quarterly variables, the periods during which the federal government appropriated money to state and local governments.

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 12: Macroeconomic Impact of COVID-19 Relief Aid – Simple Specification

	State and Local Govt Employment per Capita	Private Employment per Capita	Total Wages per Capita (USD millions)	State Real GDP per Capita (USD Millions)	State Real Personal Income (USD Millions)
	(1)	(2)	(3)	(4)	(5)
Total Aid per Resident (USD millions)	-0.0619	-7.894***	-0.0510	-0.203	0.606
	(0.274)	(2.360)	(0.334)	(0.422)	(0.584)
Log(Population)	0.000214	-0.00227	0.000227	0.000126	0.000555
	(0.000216)	(0.00169)	(0.000202)	(0.000225)	(0.000355)
Share of Population Eligible for MLF					
Change S&L Employment per Resident (Dec 2018 – Dec 2019)					
Change Private Employment per Resident (Dec 2018 – Dec 2019)					
Change in Dependent Variable (End-2018 – End-2019)					
Average OSI (March 2020)					
Average OSI (Current Month)					
Political and Mobility Controls	N	N	N	N	N
COVID-19 Controls	N	N	N	N	N
Economic Controls	N	N	N	N	N
Frequency	Monthly	Monthly	Quarterly	Quarterly	Quarterly
Dep. Var. Mean	-0.0026	-0.0234	0.0004	-0.0010	0.0039
Aggregate Impact Coef.	**-0.093**	**-11.84**	**-0.077**	**-0.305**	**0.909**
Observations	900	900	300	300	300
R^2	0.032	0.136	0.038	0.017	0.043
First-Stage F-Statistic	140.62	140.62	139.99	139.99	139.99
P-value on Test for Pre-Trends	0.435	0.686	0.998	0.166	0.858

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,t,y} + u_{s,t,y}$$

Wwhere $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state *s* pooled across all four bills. Equation (2b) is modified to reflect the wider range of outcome variables. In a first stage regression, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$, the number of representatives and senators per million residents in 2020, according to equation (2a). $\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the same time period in 2019. For example, Column 1 uses the change in state and local government employment per capita, identical to Table 2 Column 7, while Column 4 uses the change in annualized state GDP per capita in USD millions relative to the same quarter in

2019. All employment variables use QCEW estimates. Column 3 uses the annualized real total wages in USD millions, for all employees, as measured by the BEA. Columns 4 and 5 use seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted, annualized real personal income per capita in USD millions. Included is a set of state-level controls $X_{s,t,y}$. This includes only the log of the population of state s. The aggregate impact coefficient denotes the total impact over the pandemic implied by the annualized coefficient (scaled by $[\frac{MonthsSincePandemic}{12}]$ as described above). This table shows pooled regressions run using data from April 2020 to September 2021 for monthly dependent variables or Q2 2020 to Q3 2021 for quarterly variables, the periods during which the federal government appropriated money to state and local governments. *** p<0.01, ** p<0.05, * p<0.1

Appendix Table 13: Macroeconomic Impact of COVID-19 Relief Aid – Drop Most- & Least-Represented States

	State and Local Govt Employment per Capita	Private Employment per Capita	Total Wages per Capita (USD millions)	State Real GDP per Capita (USD Millions)	State Real Personal Income (USD Millions)
	(1)	(2)	(3)	(4)	(5)
	Panel A: Drop 3 Most- & Least-Represented States				
Total Aid per Resident (USD millions)	0.972**	-4.930	-0.273	-0.299	0.180
	(0.469)	(4.486)	(0.339)	(0.574)	(0.379)
Political and Mobility Controls	N	N	N	N	N
COVID-19 Controls	N	N	N	N	N
Economic Controls	N	N	N	N	N
Frequency	Monthly	Monthly	Quarterly	Quarterly	Quarterly
Dep. Var. Mean	-0.0027	-0.0229	0.0004	-0.0009	0.0039
Aggregate Impact Coef.	**1.458****	**-7.395**	**-0.410**	**-0.449**	**0.270**
Observations	792	792	264	264	264
R^2	0.253	0.664	0.635	0.575	0.093
First-Stage F-Statistic	25.69	25.69	35.63	40.50	31.60
P-value on Test for Pre-Trends	0.601	0.578	0.364	0.632	0.776
	Panel B: Drop 5 Most- & Least-Represented States				
Total Aid per Resident (USD millions)	1.448	-1.035	0.211	0.558	1.006
	(1.000)	(7.570)	(0.502)	(0.908)	(0.801)
Political and Mobility Controls	N	N	N	N	N
COVID-19 Controls	N	N	N	N	N
Economic Controls	N	N	N	N	N
Frequency	Monthly	Monthly	Quarterly	Quarterly	Quarterly
Dep. Var. Mean	-0.0027	-0.0220	0.0004	-0.0008	0.0039
Aggregate Impact Coef.	**2.172**	**1.553**	**0.3165**	**0.837**	**1.509**
Observations	720	720	240	240	240
R^2	0.234	0.621	0.656	0.555	0.105
First-Stage F-Statistic	8.88	8.88	16.19	19.35	15.30
P-value on Test for Pre-Trends	0.760	0.717	0.291	0.936	0.946

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,t,y} + u_{s,t,y}$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state *s* pooled across all four bills. Equation (2b) is modified to reflect the wider range of outcome variables. In a first stage regression, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$, the number of representatives and senators per million residents in 2020, according to equation (2a). $\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the same time period in 2019. For example, Column 1 uses the change in state and local government employment per capita, while Column 4 uses the change in annualized state GDP per capita in USD millions relative to the same quarter in 2019. All employment variables use

QCEW estimates. Column 3 uses the annualized real total wages in USD millions, for all employees, as measured by the BEA. Columns 4 and 5 use seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted, annualized real personal income per capita in USD millions. Included is a set of state-level controls $X_{s,t,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019 (for employment regressions), the March 2020 and contemporaneous month/quarter averages of a state's Oxford Stringency Index, and the change in the dependent variable between the end of 2018 and 2019 (if not already included). The aggregate impact coefficient denotes the total impact over the pandemic implied by the annualized coefficient (scaled by $[\frac{MonthsSincePandemic}{12}]$ as described above). This table shows pooled regressions run using data from April 2020 to September 2021 for monthly dependent variables or Q2 2020 to Q3 2021 for quarterly variables, the periods during which the federal government appropriated money to state and local governments. Panel A excludes observations for the three most over-represented and under-represented states (Wyoming, Vermont, Alaska; Texas, Florida, California), while Panel B excludes the five most over- and under-represented states (Wyoming, Vermont, Alaska, North Dakota, Rhode Island; Texas, Florida, California, New York, North Carolina).
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 14: Macroeconomic Impact of COVID-19 Relief Aid – Relative to End-2019

	State and Local Govt Employment per Capita	Private Employment per Capita	Total Wages per Capita (USD millions)	State Real GDP per Capita (USD Millions)	State Real Personal Income (USD Millions)
	(1)	(2)	(3)	(4)	(5)
Total Aid per Resident (USD millions)	1.113	4.471	-0.0384	-0.393	0.359
	(0.732)	(4.030)	(0.300)	(0.573)	(0.480)
Log(Population)	0.000810***	-0.000175	-6.13e-05	-0.000193	0.000189
	(0.000296)	(0.00239)	(0.000169)	(0.000329)	(0.000263)
Share of Population Eligible for MLF	-0.00220	-0.0227**	-0.000478	-0.00137	9.53e-05
	(0.00189)	(0.0107)	(0.000462)	(0.00106)	(0.000747)
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	1.092**	6.547**			
	(0.489)	(2.786)			
Change Private Employment per Resident (Dec 2018 – Dec 2019)	0.166**	1.308***			
	(0.0682)	(0.447)			
Change in Dependent Variable (End-2018 – End-2019)			1.277***	0.686***	0.748***
			(0.211)	(0.198)	(0.290)
Average OSI (March 2020)	-0.00801**	-0.0114	0.00277	0.00706*	0.00311
	(0.00407)	(0.0239)	(0.00220)	(0.00372)	(0.00343)
Average OSI (Current Month)	0.000747	-0.0945***	-0.00579***	-0.0136***	0.00294***
	(0.000630)	(0.00457)	(0.000641)	(0.00114)	(0.000620)
Political and Mobility Controls	N	N	N	N	N
COVID-19 Controls	N	N	N	N	N
Economic Controls	N	N	N	N	N
Frequency	Monthly	Monthly	Quarterly	Quarterly	Quarterly
Dep. Var. Mean	-0.0046	-0.0252	0.0001	-0.0014	0.0036
Aggregate Impact Coef.	**1.670**	**6.707**	**-0.058**	**-0.590**	**0.539**
Observations	900	900	300	300	300
R^2	0.054	0.672	0.589	0.129	0.586
First-Stage F-Statistic	57.78	57.78	59.51	56.27	61.27
P-value on Test for Pre-Trends	0.385	0.106	0.297	0.777	0.443

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,t,y} + u_{s,t,y}$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state *s* pooled across all four bills. Equation (2b) is modified to reflect the wider range of outcome variables. In a first stage regression, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$, the number of representatives and senators per million residents in 2020, according to

equation (2a). $\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the last measured value in 2019. For example, Column 1 uses the change in state and local government employment per capita relative to December 2019, while Column 4 uses the change in annualized state GDP per capita in USD millions relative to Q4 2019. All employment variables use QCEW estimates. Column 3 uses the annualized real total wages in USD millions, for all employees, as measured by the BEA. Columns 4 and 5 use seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted, annualized real personal income per capita in USD millions. Included is a set of state-level controls $X_{s,t,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019 (for employment regressions), the March 2020 and contemporaneous month/quarter averages of a state's Oxford Stringency Index, and the change in the dependent variable between the end of 2018 and 2019 (if not already included). The aggregate impact coefficient denotes the total impact over the pandemic implied by the annualized coefficient (scaled by $[\frac{MonthsSincePandemic}{12}]$ as described above). This table shows pooled regressions run using data from April 2020 to September 2021 for monthly dependent variables or Q2 2020 to Q3 2021 for quarterly variables, the periods during which the federal government appropriated money to state and local governments.

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 15: Macroeconomic Impact of COVID-19 Relief Aid – Adding Additional Lags

	State and Local Govt Employment per Capita	Private Employment per Capita	Total Wages per Capita (USD millions)	State Real GDP per Capita (USD Millions)	State Real Personal Income (USD Millions)
	(1)	(2)	(3)	(4)	(5)
Total Aid per Resident (USD millions)	0.780**	1.304	-0.0474	-0.122	0.406
	(0.378)	(3.536)	(0.322)	(0.639)	(0.508)
Log(Population)	0.000467**	4.25e-05	-6.29e-05	-9.21e-05	0.000218
	(0.000195)	(0.00218)	(0.000189)	(0.000343)	(0.000288)
Share of Population Eligible for MLF	-0.00131	-0.0127	-0.000488	-0.00163	-0.000213
	(0.000971)	(0.00957)	(0.000524)	(0.00120)	(0.000986)
Change S&L Employment per Resident (Dec 2018 – Dec 2019)	0.558**	6.898**			
	(0.261)	(3.490)			
Change Private Employment per Resident (Dec 2018 – Dec 2019)	0.134***	1.921***			
	(0.0426)	(0.643)			
Change in Dependent Variable (End-2018 – End-2019)			1.416***	0.821***	0.924***
			(0.257)	(0.261)	(0.281)
Change in Dependent Variable (End-2017 – End-2018)	-0.00122	-0.694	0.406	0.265	0.489
	(0.136)	(0.706)	(0.376)	(0.332)	(0.321)
Average OSI (March 2020)	-0.00527**	-0.0294	0.00314	0.00498	0.00425
	(0.00228)	(0.0214)	(0.00210)	(0.00366)	(0.00297)
Average OSI (Current Month)	-0.00373***	-0.0881***	-0.00578***	-0.0134***	0.00318***
	(0.000494)	(0.00382)	(0.000631)	(0.00112)	(0.000583)
Political and Mobility Controls	N	N	N	N	N
COVID-19 Controls	N	N	N	N	N
Economic Controls	N	N	N	N	N
Frequency	Monthly	Monthly	Quarterly	Quarterly	Quarterly
Dep. Var. Mean	-0.0026	-0.0234	0.0004	-0.0010	0.0039
Aggregate Impact Coef.	**1.17****	**1.956**	**-0.0711**	**-0.183**	**0.609**
Observations	900	900	300	300	300
R^2	0.326	0.667	0.552	0.153	0.625
First-Stage F-Statistic	59.53	55.62	67.40	41.37	64.54
P-value on Test for Pre-Trends	0.554	0.714	0.257	0.962	0.441

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Google LLC (2021), MIT Election and Data Science Lab (2017), Dong, Du, and Gardner (2020), and the US Bureau of Economic Analysis (2021) to estimate an equation of the following form for all months pooled:

$$\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 X_{s,t,y} + u_{s,t,y}$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state *s* pooled across all four bills. Equation (2b) is modified to reflect the wider range of outcome variables. In a first stage regression, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$, the number of representatives and senators per million residents in 2020, according to equation (2a). $\frac{\Delta Y_{s,t,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the same time period in

2019. For example, Column 1 uses the change in state and local government employment per capita, identical to Table 2 Column 2, while Column 4 uses the change in annualized state GDP per capita in USD millions relative to the same quarter in 2019. All employment variables use QCEW estimates. Column 3 uses the annualized real total wages in USD millions, for all employees, as measured by the BEA. Columns 4 and 5 use seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted, annualized real personal income per capita in USD millions. Included is a set of state-level controls $X_{s,t,y}$. This includes the log of 2020 official Census population, the share of a state's population living in a town eligible for financing through the MLF, the change in state and local and private employment per capita (QCEW) between December 2018 and December 2019 (for employment regressions), the March 2020 and contemporaneous month/quarter averages of a state's Oxford Stringency Index, and two annual lags in the dependent variable spanning from 2017 to 2019 (if not already included). The aggregate impact coefficient denotes the total impact over the pandemic implied by the annualized coefficient (scaled by $[\frac{MonthsSincePandemic}{12}]$ as described above). This table shows pooled regressions run using data from April 2020 to September 2021 for monthly dependent variables or Q2 2020 to Q3 2021 for quarterly variables, the periods during which the federal government appropriated money to state and local governments.
*** p<0.01, ** p<0.05, * p<0.1