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Spatial Spillovers and the Effects of Fiscal Stimulus: Evidence from Pandemic-Era Federal Aid for State and Local Governments

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Spatial Spillovers and the Effects of Fiscal Stimulus:
Evidence from Pandemic-Era Federal Aid for State and Local Governments

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Abstract

We analyze whether US federal aid to state and local governments impacted economic activity through either direct or cross-state spillover effects during the COVID-19 pandemic. Deploying an instrumental-variables framework rooted in the funding advantage of states that are over-represented in Congress, we find that federal assistance had significantly less impact on state and local government employment, as well as broader measures of economic activity, than estimates from prior crisis responses would imply. The modest employment impacts we find stem largely from the direct effect of states' own aid allocation, as opposed to spillovers across state lines. These findings indicate that cross-state spillovers are less important when key mechanisms for such spillovers, like robust interjurisdictional supply chains and patterns of consumption, are muted or shut down.

I Introduction

During both the COVID-19 pandemic and the global financial crisis, governments around the world made substantial use of fiscal stimulus measures. In the U.S. context, federal aid to state and local governments constituted a key piece of the fiscal policy picture. The motivation for this intergovernmental fiscal assistance arose in large part from state and local balanced-budget constraints. As revenues decline and spending needs rise, these constraints may, in the absence of federal relief, dictate tax increases and a search for budgetary savings during economic downturns.

During the global financial crisis, the federal government sent roughly $225 billion in fiscal assistance to state and local governments through the American Recovery and Reinvestment Act. A substantial body of evidence has studied the effects of these funds, with typical estimates implying substantial job creation at reasonably low cost (see, e.g., Chodorow-Reich et al., 2012; Wilson, 2012; Conley and Dupor, 2013; Ramey, 2019). The evidence from this period is consistent with a role for both the direct effects of aid and for spillover effects that operate across state lines (Dupor and McCrory, 2018; Chodorow-Reich, 2020).

During the COVID-19 pandemic, state and local governments received roughly $900 billion spread across four major pieces of relief legislation.[1] Contemporaneous policy discussions highlight that this aid was motivated by a desire to limit the severity of public-sector layoffs and stimulate state economies (Driessen and Gravelle, 2020; The White House, 2021; US Department of the Treasury, 2021b). Each piece of legislation also contained significant funding appropriated for purposes other than support for state and local governments, including multiple rounds of stimulus payments to households, forgivable loans to small and medium-sized businesses, and expanded and extended unemployment benefits.

Figure 1 illustrates the context in which these relief packages were legislated. The March 2020 FFCRA and CARES Act arrived just after the onset of dramatic declines in both public and private employment, as triggered by the arrival of substantial COVID-19 caseloads and associated public health responses in March 2020. The December 2020 RRA and March 2021 ARPA arrived later in the pandemic, when real GDP had returned to pre-pandemic levels but both public and private employment remained nontrivially depressed.

To date, few papers have sought to estimate the effects of the unprecedented flow of federal fiscal assistance to subnational governments on either the employment of state and local governments or on overall economic activity. Importantly, that work has yet to consider the role of spillover effects across state lines. In the analysis that follows, we attempt to fill that gap, with an emphasis on the fact that contrasts between the pandemic and the global financial crisis offer an opportunity to shed new light on the mechanisms that underlie both the direct and cross-state spillover effects of fiscal assistance to state and local governments. Figure 2 illustrates why cross-state spillovers may be of potential interest. The midwestern and mid-Atlantic states appear to have been hardest hit with respect to both early-pandemic lows (Panel A) and sluggish recoveries (Panel B), while states in the Mountain West appear to have exhibited resilience.

[1] These four pieces of legislation are the March 2020 Families First Coronavirus Response Act (FFCRA) and Coronavirus Aid, Relief, and Economic Security (CARES) Act, the December 2020 Response and Relief Act (RRA) of 2021, and the March 2021 American Rescue Plan Act (ARPA) of 2021.

Estimating both the direct and spillover effects of fiscal stabilization funds involves standard, substantial challenges. 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). Importantly for our estimation strategy, past work has also shown that the other main components of the relief packages including the distribution of Economic Impact Payments (i.e., stimulus checks), enhancements to Unemployment Insurance benefits, and payments from the Paycheck Protection Program, were not similarly biased, such that our instrument isolates variation specifically in fiscal assistance to state and local governments (Clemens, Hoxie, and Veuger, 2022).

In previous work, two of us examined the effect of federal pandemic fiscal aid within recipient sub-federal jurisdictions (Clemens, Hoxie, and Veuger, 2022). We found that federal aid modestly increased state and local government employment, while impacts on the broader local economy were more limited. These estimates, however, did not account for cross-state spillovers. Because states' economies are highly integrated, measuring the effectiveness of fiscal aid may require estimating the role of inter-jurisdictional spillovers, as changes in the economic conditions in one state can be a boon to neighbors if times are good or an anchor if times are bad. We address that omission here, by analyzing the extent to which federal aid to state and local governments during the COVID-19 pandemic had effects that spilled over across state lines. We do so by extending the earlier paper's instrumental variables strategy so as to instrument for the aid each state's neighbor received based on the extent of each state's resident's representation in the U.S. Congress.

With respect to effects on public-sector employment, which was the outcome most directly targeted by federal aid, we find modestly significant evidence of a moderately sized overall effect. Our estimates imply that this modest overall effect stems largely from the direct effect of a state's own aid allocation as opposed to through cross-state spillover mechanisms. Our analysis of the effects of federal aid on aggregate economic activity finds null effects through either direct or spillover channels. Our analysis of private employment, by contrast, yields our only estimate in which the effect of a state's neighbors' federal aid is statistically distinguishable from zero and positive.

These findings confirm and expand on the results in Clemens et al. (2022). Federal assistance generated fairly small (jobs) multipliers. In that paper, we found that each $855,000 in federal assistance created or preserved one state or local job. We find a similar number here, $878,000, though the current, more comprehensive analysis suggests that about a third of the effect size is driven by spillovers from other states. More important than the point estimate itself, however, are the values we can rule out on the basis of our estimates' confidence intervals. We can rule out an estimate that federal fiscal assistance saved a state or local government job year at a cost of less than $428,000, making fiscal assistance far less effective at supporting employment during the pandemic than during the global financial crisis.

Our analysis contributes to three literatures. First, we contribute to the extensive literature on the macroeconomic and employment effects of federal fiscal assistance in general. There are many papers in the literature. Some examples include Fleck (1999), Chodorow-Reich et al. (2012), Suárez Serrato and Wingender (2016), Corbi et al. (2019), and Pennings (2021). What differentiates our work from these

earlier analyses is both the context and the magnitude of the spending shocks generated by the instrumental variables that are central to our estimation strategy.[2]

Second, we make additional progress in understanding the effects of federal fiscal assistance during the COVID-19 pandemic in the United States. In addition to our work on transfers to state and local governments, this literature has analyzed the other major elements of the COVID-19 relief packages that had the intent of preserving employment or stimulating economic activity, such as the Paycheck Protection Program (Autor et al., 2022a and 2022b; Dalton, 2021; Faulkender et al., 2020; Hubbard and Strain, 2020), the Municipal Liquidity Facility (Haughwout et al., 2021), and the expansions and extension of unemployment insurance benefits (Holzer et al., 2021; Arbogast and Dupor, 2022). To date, the effect of fiscal aid to state and local governments has been understudied in the context of the pandemic relative to earlier historical episodes as well as relative to the Paycheck Protection Program and enhancements to Unemployment Insurance benefits.

Third, we contribute to the literature on regional spillovers of fiscal policy, which attempts to understand both the pervasiveness of regional spillovers and the mechanisms through which they propagate (e.g., Auerbach and Gorodnichenko, 2013; Nakamura and Steinsson, 2014; Chung and Hewings, 2015; Cainelli et al., 2021). A key takeaway from this line of work for our purposes is that cross-state spillovers are less likely to be important when some of the key mechanisms for such spillovers, like robust interjurisdictional supply chains and patterns of consumption, are muted or shut down. Our context allows us to demonstrate this empirically.

The remainder of this paper proceeds as follows. In Section II we describe the data sets used in our analysis. In Section III we present our empirical methodology, while Section IV presents our estimates. We conclude in Section V.

II Data

As in Clemens and Veuger (2021), we focus our analysis on four major pieces of fiscal relief passed 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). These four packages represent approximately $6 trillion distributed to support households, firms, nonprofits, public health efforts, and subnational governments. In this paper, our analysis is focused on the nearly $830 billion in funds allocated to the 48 contiguous states at the state and local level. This aid was delivered in a context of anticipated revenue shortfalls that would ultimately turn out to be much smaller than projected by analyses from the pandemic's early months (Bartik, 2020; Clemens and Veuger, 2020; Auerbach, Gale, Lutz, and Sheiner, 2020).

Data from the Committee for a Responsible Federal Budget (CRFB) (2021) are the foundation for our fiscal assistance variables.[3] We supplement the CRFB data with several additional data sources to

[2] 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.

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

estimate, for example, the distribution of matched Medicaid funds.[4] To avoid potential interactions and inconsistencies in timing, expectations, and behavior, we calculate the total amount of aid distributed to each state across all four major COVID-19 relief bills. We use this to arrive at the total aid per capita distributed to a state in millions of dollars, which is our main independent variable. Geographic differences in total aid per capita can be seen in Figure 3.

We use a state's number of congressional representatives per million residents as an instrument for federal aid per capita.[5] Measures of congressional representation are generated from the House of Representatives and Senate rosters during the 116th and 117th Congresses from Lewis et al. (2021). Because the total number of representatives per state was determined by population counts from the 2010 census, we eliminate the possibility that congressional representation was affected by pandemic-related population variation. As detailed below, we construct a conceptually similar instrument for the aid received by states' neighbors.

Our primary outcome of interest is state and local employment per capita. The US Bureau of Labor Statistics estimates monthly employment levels using several methods. The Quarterly Census of Employment and Wages (QCEW) provides our measure of employment. In addition to employment outcomes, we also assess the potential effect of state and local aid on the broader macroeconomy. State-level wage, output, and personal income data are provided by the Bureau of Economic Analysis.

Throughout our analysis, we take account of additional factors that could have plausibly impacted state and local government employment during the pandemic. A state's official 2020 population count is provided by the US Census Bureau (2021). The share of a state's population living in a local jurisdiction eligible for financing through the Federal Reserve's Municipal Liquidity Facility is estimated from data from the US Census Bureau (2021) and the Federal Reserve Board (2021). We also use the Oxford Stringency Index (OSI) from Hale et al. (2020). We calculate the average share of House and Senate seats for Democrats in each state for 2020 and 2021 based on Lewis et al. (2021). Whitaker (2020) provides a state and local government's predicted per capita tax shortfall. The number of unemployed persons by state during the fourth quarter of 2020 comes from the US Bureau of Labor Statistics (2021). The US Bureau of Economic Analysis (2021) provides the percentage change in personal income between the fourth quarter of 2019 and the fourth quarter of 2020. Data on total direct expenditures of state and local governments per capita come from the US Census Bureau (2019). Vincent et al. (2020) report total acres of federal land by state.

Table 1 presents summary statistics for the main variables of interest.

[4] As in Clemens and Veuger (2021), "[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).

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

Our ability to analyze spatial spillovers is contingent upon identifying state-neighbor pairs. We adopt two approaches. We either (1) follow the classifications of states into economic regions presented by Crone (2004) and as used by Carlino and Inman (2013) or (2) match states to those in closest proximity, in the spirit of Baicker (2005), Suárez Serrato and Wingender (2016), and DeFusco et al. (2018). Appendix Figure 1 showcases the Crone (2004) economic regions. For obvious reasons of geography, we limit our sample to the contiguous United States. Crone's (2004) approach strives to capture economic relationships directly instead of relying on geographic proxies and can be seen as an update of the regional classifications defined by the US Bureau of Economic Analysis and the US Census Bureau (used in modified form by Nakamura and Steinsson, 2014). We implement the second method by linking each state to all states with which it shares a border, as well as to the five closest states in terms of centroid-to-centroid distance (if not already included).

III Empirical Strategy

We seek to identify the economic impact of the COVID-era fiscal relief received by each state as well as of the relief received by a state's neighbors. Equation (1) presents a "naïve" OLS estimator, regressing a state's per capita public-sector employment on our two regressors of primary interest. The regressors of primary interest are the total per capita aid received by the reference state as well as the aid received by one of the reference state's neighbors scaled by the reference state's population. Note that, as described in more detail below, the data are organized for estimation purposes such that each state-month pairing appears in the data multiple times, namely once for each neighbor with which the reference state is paired:

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{TotalAid_s}{Pop_{s,y_{2020}}} + \beta_2 \frac{TotalAid_n}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + \varepsilon_{s,n,m,y} \quad (1)$$

In equation (1), $\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ 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 funding per capita (in millions of dollars) to state and local governments in state *s* between all four COVID-19 relief bills scaled by state *s*'s population, while $\frac{TotalAid_n}{Pop_{s,y_{2020}}}$ is the analogous amount for neighbor *n*. Scaling both variables by state *s*'s population captures the fact that, for example, an additional federal dollar per resident of California implies a much larger amount of spending as a source of potential spillovers to Nevada than does an additional federal dollar per resident of Nevada as a source of potential spillovers to California. In this analysis, it is the scaling of federal dollars per resident of the potential spillover recipient state that matters. $X_{s,m,y}$ and $X_{n,m,y}$ represent vectors of state-level demographic, economic, and political controls for state *s* and neighbor *n,* respectively, and are discussed in further detail later.

In equation (1), estimates of the relationship between aid and public-sector employment are subject to potential bias due to endogeneity: stabilization efforts may be targeted when and where economic conditions, such as employment, are poor, generating a negative correlation. To the extent that a state's economic circumstances are driven by those in neighboring states or are otherwise regionally correlated, reverse causality will bias OLS estimates for the coefficients that describe both the direct effects (β_1) and the cross-state spillover effects (β_2) of federal aid.

Following Clemens, Hoxie, and Veuger (2022) and Clemens et al. (2022), we implement an instrumental-variable approach to address these challenges. Clemens and Veuger (2021) show that a state's per capita representation in Congress is (a) strongly predictive of state-level variations in per capita federal aid allocations and (b) orthogonal to a rich set of controls for pandemic-driven effects on states and health of their population. We extend the estimation strategy from Clemens, Hoxie, and Veuger (2022) to estimate cross-state spillover effects by deploying an equivalently structured instrument for the federal aid received by a reference state's neighboring states. This leads us to estimate the following set of equations:

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2a)$$

$$\frac{TotalAid_n}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2b)$$

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \beta_1 \frac{\widehat{TotalAid_s}}{Pop_{s,y_{2020}}} + \beta_2 \frac{\widehat{TotalAid_n}}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + u_{s,n,m,y} \quad (2c)$$

In the first-stage regressions, (2a) and (2b), $RepsPerMillion_s$ is state s's number of representatives per million, while $RepsPerMillion_n$ is neighbor *n's* number of representatives per million. $X_{s,m,y}$ and $X_{n,m,y}$ are vectors which proxy for state *s's* and neighbor *n*'s pre-pandemic economic trends and their pandemic-era policy environments, respectively.

As equations (2a-c) extend beyond the basic two-stage least-squares construction, we make the estimation process explicit here. We replicate the observations associated with each state as few as three times and as many as nine times, linking each of the replicates to one of the neighbors with which the state is associated under a particular neighbor matching scheme. Because the number of neighbors a state has may vary, not all states will have the same number of replicates. The observations associated with replicates are effectively stacked within the data set, such that the number of times a state appears in the expanded data set equals the state's number of neighbors times the number of observations per state in the original state-by-time-period data set. On this expanded data set, we then estimate the instrumental-variables framework described by equations 2a, 2b, and 2c.

To serve as a valid instrument, congressional representation per resident must satisfy both the relevance and exclusion restrictions. Clemens and Veuger (2021) establish that the relationship between each state's congressional representation and its COVID relief aid per capita is strong. Small states, which are over-represented in Congress relative to their population, received notably more money on a per capita basis than large states did. The first-stage F-statistics reported in Clemens and Veuger (2021), which range from 57.8 to 179.7, illustrate the strength of this relationship.

While a state's own congressional representation is used as an instrument for a state's own total aid per capita, its neighbors' congressional representation serves as an instrument for the neighbors' total aid scaled by the state's own population. As Table 2 shows, scaling neighbor *n*'s aid by state *s*'s population produces a weaker first stage, especially when we use the closest-neighbor approach to matching states to their neighbors. Because of its weaker first stage, we de-emphasize results based on the closest-neighbor matching procedure throughout.

The exclusion restriction requires that, conditional on controls, a state's congressional representation per million residents affects per capita state and local employment either at home or in neighboring states through no factor other than the state's per capita COVID-19 aid. To ensure this, our baseline specification includes two vectors of controls ($X_{s,m,y}$ and $X_{n,m,y}$) which proxy for state *s*'s and neighbor *n*'s pre-pandemic economic trends and their pandemic-era policy environments. In our baseline specification, the vectors $X_{s,m,y}$ and $X_{n,m,y}$ include the log of state *s*'s and neighbor *n*'s official 2020 population counts, the share of population in state *s* or neighbor *n* living in a local jurisdiction eligible for financing through the Federal Reserve's Municipal Liquidity Facility, and arithmetic changes in per capita state and local government employment and per capita private employment in state *s* or neighbor *n* between December 2018 and December 2019. This set of controls also includes the average OSI value for state *s* and neighbor *n* in March 2020 and the average OSI value for state *s* and neighbor *n* in month *m* and year *y,* which provide proxies for the severity of state *s'*s and neighbor *n*'s COVID-related restrictions. Under our null hypothesis, aid to other neighboring states does not have an effect on outcomes and its omission therefore does not bias our estimates.

We present several pieces of evidence to support that equations (2a) and (2b) meet the exclusion restriction required to yield a causal estimate of the effect of COVID relief. First, we emphasize that conditional exogeneity is plausible for both of our instruments. Because 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 voters per million (2 senators and 4 representatives). Short of an unlikely epidemiological relationship between absolute state population numbers and the spread of COVID-19, the number of congressional seats delegated to a state has no direct impact on local employment beyond its influence on the legislative priorities of Congress.

The data also support the general argument that the degree of a state's over- or underrepresentation is largely unrelated to the needs it faced as a consequence of the pandemic. Clemens and Veuger's (2021) analysis of the small-state advantage shows that it is more or less orthogonal to a state's revenue shocks, economic shocks, the size of their public sector, and acreage of federal land. Table 3 shows that neighboring states' small-state advantages behave similarly. That is, for both the reference state and neighboring states, the coefficients that estimate the impact of representation on aid are largely unaffected by the inclusion of a wide range of additional, plausibly relevant covariates.

Finally, before presenting our results we discuss how our estimates of equation (2c) can be most readily interpreted. Our primary coefficient of interest is β_2: the coefficient on a neighbor's aid in equation (2c). In combination with β_1, the coefficient β_2 on a neighbor's aid allows us to summarize the relationship between COVID-19 relief aid and state and local government employment. β_1 and β_2 can also be transformed into an intuitive metric for evaluating the efficacy of fiscal relief: specifically, an estimate of the dollars spent per job-year saved. In equation (2c), the coefficient β_2 identifies the average number of jobs recovered in state *s* from an additional $1 million in federal aid to neighbor *n* across an 18-month (1.5 year) interval. Since $\frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}}$ and $\frac{\widehat{TotalAid}_n}{Pop_{s,y_{2020}}}$ are defined as the amount of aid per capita allocated to state *s* and neighbor *n* in millions of dollars, the ratio $1,000,000/1.5*($\beta_1 + \bar{n} * \beta_2$) is the total number of federal dollars allocated per state or local government job-year saved or recovered in state *s* during the pandemic. In this expression, $\bar{n}$ is the average number of neighbors a state has.

IV Results

The CARES Act, FFCRA, RRA, and ARPA represented an unprecedented transfer of money from the federal government to state and local governments. In this section, we first assess the extent to which this transfer of federal funds helped sustain state and local employment, both directly and via cross-state spillovers, throughout the pandemic. We then turn to estimating the effect of these transfers on the broader measures of macroeconomic activity.

Spillover Effects of Federal Aid on Public and Private Employment

Table 4 presents estimates of the effect of federal aid to state and local governments on state and local employment. Columns 1 and 2 provide estimates using the Crone (2004) "economic regions" neighbor matching scheme, while Columns 3 and 4 provide analogous estimates using the "closest neighbors" matching scheme.

Throughout this analysis, the ratio of \$1,000,000/1.5*($\beta_1 + \bar{n} * \beta_2$) is the total number of federal dollars allocated that were needed to preserve or create one state or local government job-year in state *s* during the pandemic. Under both our economic-regions and closest-neighbors matching schemes, states are paired with an average of roughly 6 neighbors.

Turning first to results from the economic-regions matching scheme, Column 2 provides instrumental-variable estimates of equation (2c), while Column 1 provides the corresponding OLS estimates. In Column 2, the coefficients on a state's own aid and on its neighbor's aid imply that a public-sector job-year was saved for each \$878,000 in federal assistance, with spillovers from neighboring states' aid accounting for approximately 32%.The first-stage F-statistic of 17.9 exceeds the traditional rule-of thumb threshold of 10 commonly used to reject the null hypothesis of weak instruments (Stock and Yogo, 2005). While neither the public-employment effect of own-state aid nor that of a neighboring state's aid is statistically different from zero on its own, we can reject the hypothesis that the aggregate effect of own-state and neighboring states' federal aid on a state's public-sector employment equals zero at the 90% confidence level.

Column 1 provides OLS estimates of equation (1) under the economic-regions matching method. The coefficients on own state's aid and neighbor's scaled aid imply that each job-year was saved at a cost of approximately \$3,060,000, notably higher than what is estimated under the instrumental-variable framework. This suggests that the OLS estimator is negatively biased, as one might expect given the potential for aid to be targeted at the states in greatest economic distress.

We next turn to Column 4, which provides instrumental-variable estimates when state neighbor pairs are determined by our closest-neighbors matching scheme. In Column 4, the coefficients on total aid per capita and neighbor's scaled aid imply that a job-year was saved for each \$750,000 of federal assistance, with spillovers accounting for approximately 11%. Under this approach for matching neighbors, our first-stage F statistic of 6.4 does not exceed the traditional rule-of-thumb threshold value of 10. Given the weakness of the first stage under the closest neighbors matching method, we focus the remainder of our analysis on results from the economic-regions matching method.

Pre-Trends

In addition to examining the first-stage F-statistics for an indication of the strength of the instrument, we also conduct "pre-trend" tests to assess 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 4 shows that under our economic-regions matching scheme, the coefficient on federal aid per capita from estimating equation (2c) with data from January 2020 to March 2020 is statistically insignificant, suggesting there was no strong pre-pandemic relationship between congressional representation and employment trends prior to the pandemic.

Alternative Specifications

We also consider estimates that are not weighted according to a state's population. 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. As shown in Appendix Table 1, unweighted regressions yield substantively smaller estimates of the impact of federal aid on public employment through either direct or spillover-driven mechanisms. This reinforces the overall conclusion that federal aid had at most a modest impact on public employment during the first year and a half of the pandemic.

Readers may also wonder whether our estimates are sensitive to the covariates we have included as controls. To address this concern, we provide a transparent look at the unadjusted data underlying our analysis in the scatterplots presented in Figure 4. In these scatterplots, our instruments are plotted along the x-axis while the change in public employment from the baseline through the end of our analysis sample is plotted along the y-axis. The plots can thus be described as illustrating the unadjusted reduced-form relationship between our instruments and changes in public employment. Consistent with our regression estimates, which find economically and statistically modest effects of federal aid, the slopes of the best-fit lines in both plots are economically and statistically close to zero whether observations are unweighted (panels B and D) or weighted for population (panels A and C).

Implications for the Lower Bound on the Cost of Each State or Local Job-Year Saved

Taken together, our analysis thus far suggests that federal aid to state and local governments had a modest if any impact on the number of workers employed by state and local governments. This raises a key question of how informative our estimates are with respect to the bounds of our confidence intervals. Focusing on our baseline estimates from column 2 of Table 4, recall that our point estimates imply a cost per job-year saved of $878,000. Recall that we obtain this estimate by inserting our estimates of β_1 and β_2 into the formula \$1,000,000/1.5*($\beta_1 + \bar{n} * \beta_2$), where the \$1,000,000 reflects the scaling of our federal spending variable, the 1.5 reflects the fact that there are 18 months (1.5 years) in our sample, and where we additionally plug in the average number of neighboring states ($\bar{n} = 6$) to appropriately scale the coefficient on the aid to a reference state's neighbors.

To obtain a lower bound on this estimate of dollars allocated per job year saved, we first compute the confidence interval on the relevant linear combination of $\beta_1 + \bar{n} * \beta_2$. The point estimate on this linear combination is 0.7591 and the upper bound of the 95 percent confidence interval is 1.5575, as reported towards the bottom of Table 4. The lower bound on our estimate of the dollars allocated per job year saved is thus \$1,000,000/(1.5*1.5575) = $428,000. This lower bound is substantially higher than the typical estimate of the cost of each job created by the American Recovery and Reinvestment Act

(Chodorow-Reich, 2019; Ramey, 2019). As we discuss in the conclusion, this implies that different mechanisms must be at work, or the same mechanisms operating with different degrees of influence, in the pandemic context relative to the context of the global financial crisis.

Macroeconomic Spillovers

There are two main channels through which aid to state and local governments may support broader economic activity. First, supporting public sector employment cushions the incomes of the employees whose jobs are retained. Second, aid to state and local governments may also fortify their abilities to provide basic services, including in the public-health sphere, to sustain their own social insurance and spending programs, and to fund capital investments.

We therefore explore the possible effect of aid to state and local governments on private employment and the broader macroeconomy. It should be noted that forced and voluntary social distancing implemented during the course of the pandemic may limit this propagation mechanism, especially in the context of spatial spillovers.

Table 5 presents estimates of the effects of aid to states and localities on several macroeconomic indicators. Columns 1 and 2 use a state's monthly private employment per capita as the dependent variable. Columns 3 through 8 use quarterly data on a state's real, annualized total wages and salaries (government plus private) per capita (Columns 3 and 4), GDP per capita (Columns 5 and 6), and personal income per capita (Columns 7 and 8) as the dependent variable. Each regression includes the respective outcome variable's pre-pandemic trend as a control for both a state and its neighbor, in addition to our standard list of controls. Estimates in Table 5 rely on the economic-regions matching method, as discussed above.[6]

Our estimates of the effect of state and local aid on a neighboring state's private employment are shown in Columns 1 and 2. Under the instrumental-variable estimates of equation (2c) shown in Column 2, we identify a small yet statistically significant coefficient on the amount of aid allowed to a neighboring state. When taken together, the combination of coefficients on a state's own aid and a neighbor's scaled aid implies that one private sector job-year was saved for each $3 million of federal aid. While the estimates on neighbors' aid in Column 2 may be statistically significant, the standard error is substantial in absolute terms. Additionally, the estimate on a state's own aid comes with even less precision. As a result, the aggregate effect of own-state and neighboring-states' aid on private-sector employment cannot be distinguished from zero at conventional confidence levels.

Columns 3 and 4 examine the effect of aid to state and local governments on annualized total wages per capita. The instrumental-variable estimates in Column 4 imply that an additional $1 in federal aid decreased real wages by $0.06. These results are statistically insignificant at conventional levels. Columns 5 through 8 likewise provide little evidence of spillovers of aid on aggregate economic activity. The instrumental-variable estimations of equation (2c) in Column 6 show that an additional $1 in relief funds predicts a per-year reduction in GDP per capita of $0.18. Columns 7 and 8 use real personal

[6] Supplemental estimates in which states are paired under the closest regions method are shown in Appendix Table 2 for completeness. Similarly, unweighted estimates in which states are paired using the economic-regions method can be found in Appendix Table 3.

income as the outcome variable of interest, and Column 8 implies that an additional $1 of aid predicts an additional $0.27 in aggregate income per capita.

For the instrumental-variable estimates presented in Columns 4, 6, and 8, the coefficients on state's own total aid per capita and neighbor's total scaled aid are not jointly statistically significant and are indistinguishable from zero at traditional levels. Taken together, we interpret the estimates as suggesting a null impact of federal aid, including spillovers to neighboring states, on aggregate income and output.

V Discussion

The outcome most directly targeted by federal aid to state and local governments during the pandemic was state and local government employment. We find that federal assistance had a positive overall effect that stems largely from the direct effect of a state's own aid allocation. To be more precise, we find that each $878,000 in federal assistance created or preserved one state or local job. About a third of that employment effect was driven by cross-state spillovers. This means that our estimate of the own-state multiplier is modestly smaller than in Clemens et al. (2022), where we did not account for spillovers and found that the own-state effect by itself created or preserved one state or local job per $850,000 in federal assistance. Nonetheless, for policy purposes what matters most directly is the joint own- and neighboring-state jobs multiplier, which is essentially unchanged.

Among other outcomes, our analysis of private employment yields our only estimate in which the effect of a neighbor's federal aid is statistically distinguishable from zero and positive. Our analysis of the effects of federal aid on aggregate economic activity finds null effects through either direct or spillover channels.

Several caveats are worth keeping in mind when interpreting our results. First, while our estimates are sufficiently precise to be differentiable from estimates of the effects of fiscal aid during the Great Recession, additional precision would have high value. Second, as emphasized throughout, we would not expect our estimates to generalize across settings. Indeed, variations in the magnitude of the effects of fiscal policy measures across settings are what can enable the literature to develop insights into which models have sufficient features to make sense of the full body of evidence. Third, we appreciate that many complex forces shaped states' economies during the COVID-19 pandemic. While we are encouraged that we see complementary evidence whether we look to our baseline regressions or to the simple reduced form relationships presented in Figure 4, we acknowledge that we are studying a setting in which it may be more difficult than usual to rule out all potential sources of bias.

These caveats notwithstanding, we interpret the pattern of findings we obtain as being consistent with four considerations.

First, the negligible effects we estimate of federal aid on either aggregate income or aggregate output are consistent with intuition about the importance of pandemic-related economic restrictions and voluntary changes in behavior. While we find direct implications for public-sector employment, the usual mechanisms through which stimulus dollars raise economic activity thus appear to have been blunted. This holds true for within-state stimulative effects on income and output as well as for cross-state spillovers affecting those aggregates.

Second, even the public-sector employment effects we estimate are relatively small. The pandemic-era Paycheck Protection Program (PPP), which has itself been criticized for its modest job-preserving impacts, has been estimated to cost much less per job-year saved. In fact, Autor et al. (2022a and 2022b) refer to their estimate of $169,000 and $258,000 in PPP spending per job-year created or preserved, which is significantly higher than other estimates (e.g. Splinter et al., 2023), as indicating a "very substantial cost" and "high costs per job." Our estimates of the cost of each job-year saved, including the implied lower bound of $428,000, exceeds these estimates, and thus imply that federal aid to state and local governments was less cost effective along the job-creation dimension than was the PPP.[7]

Third, the pattern we observe with respect to public relative to private employment is consistent with the view that the mechanisms behind employment spillovers are stronger for the private sector than for the public sector. This, in turn, is consistent with the view that the demand for and supply of state and local government workers stem primarily from internal considerations like a state's budgetary position or the particulars of its citizens' demand for public services. Private-sector employment, by contrast, is driven to a greater degree by economic linkages that are pervasive both across and within states (see, e.g., Cainelli et al., 2021), which makes it possible to observe spillovers in private-sector employment even in the absence of spillovers in public-sector employment.

Finally, this pattern of labor market responses undermines an alternative explanation for the limited evidence we find for spatial spillovers. That explanation, highlighted by Auerbach, Gorodnichenko, and Murphy (2020), is that any positive demand spillovers (for example, through supply chain linkages) were offset by negative spillover effects that operate through factor markets (most obviously, labor market competition). If that were the main operative mechanism here, we should see spillover effects onto aggregate consumption, not private-sector employment. Instead, to the extent that we see evidence of spillover effects at all, we observe the inverse pattern of potential spillovers into private-sector employment but not into GDP.

This set of observations has important implications for policymakers. In contrast to the evidence from the Great Recession, the employment effects of federal aid to state and local governments, either direct or through spillovers onto activity into other states, were relatively small. In other words, relatively large amounts of federal funds had to be allocated in order to preserve or create public-sector employment: our confidence intervals allow us to rule out cost estimates of less than $428,000 per state or local government job per year.

While the federal government arguably allocated too little fiscal assistance in the aftermath of the Global Financial Crisis, federal policymakers thus overdelivered in response to COVID-19. In both cases, the amounts of funds allocated were the product of a hasty and largely discretionary policy process. Clemens and Veuger (2023) draw on these experiences to propose a system of automatic stabilizers that might replace these discretionary transfers. Such stabilizers, which could be implemented as a system of grants, loans, or insurance, offer the promise of timely, appropriately calibrated fiscal assistance. The design and implementation of revenue-stabilization programs of this sort may be productive topics for

[7] Notably, while job preservation was a primary goal of both the PPP and federal aid to state and local governments, both programs targeted additional outcomes as well. A broader analysis of all targeted outcomes, which is beyond this paper's scope, would be needed to arrive at a complete comparison of each program's cost effectiveness.

future research. Estimates of both the direct and spillover effects of federal aid, as well as an understanding of how fiscal policy transmission mechanisms vary across settings, would be key inputs into the design of such programs.

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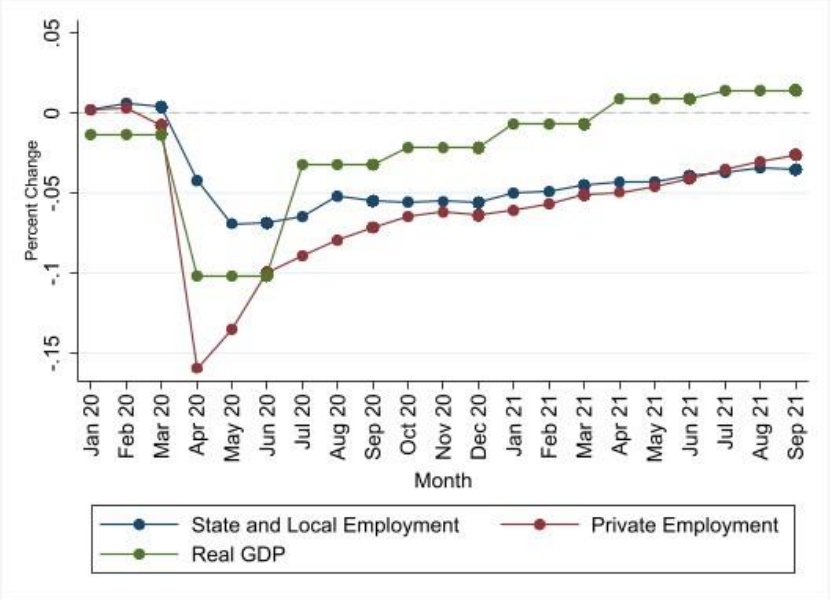
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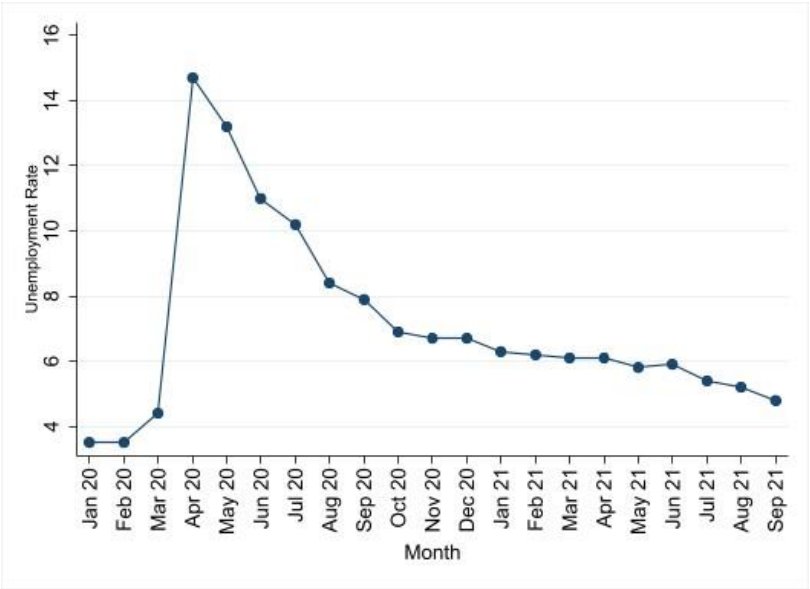
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Figure 1: Changes in Employment, GDP, and Unemployment Over Time

Panel A: Percent Change in Outcome Variables since December 2019



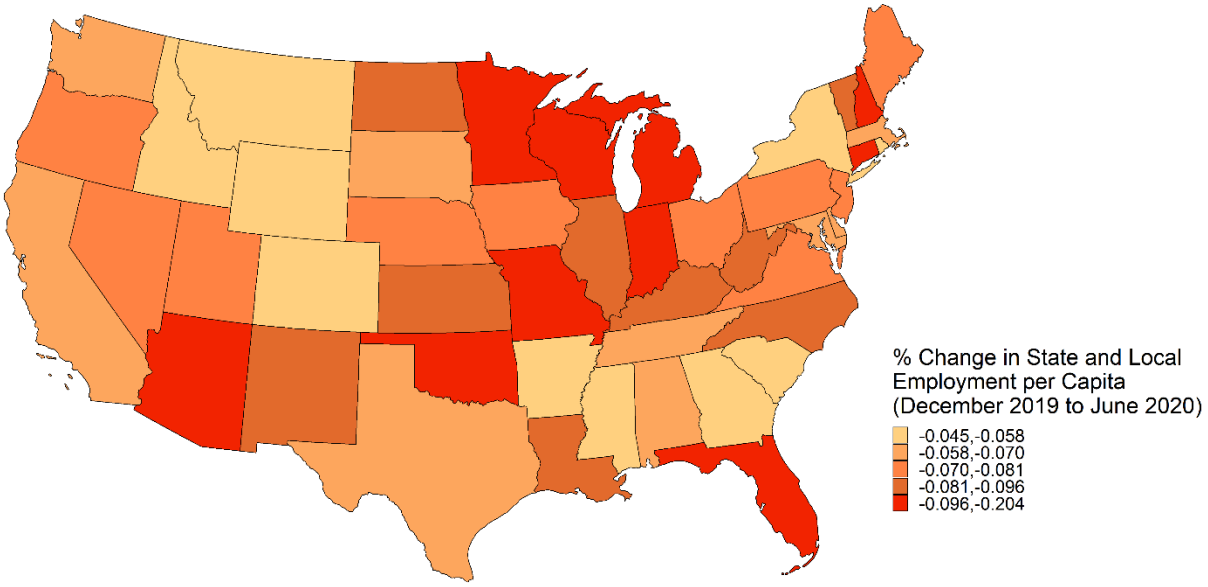
Panel B: National Unemployment Rate (January 2020 – September 2021)



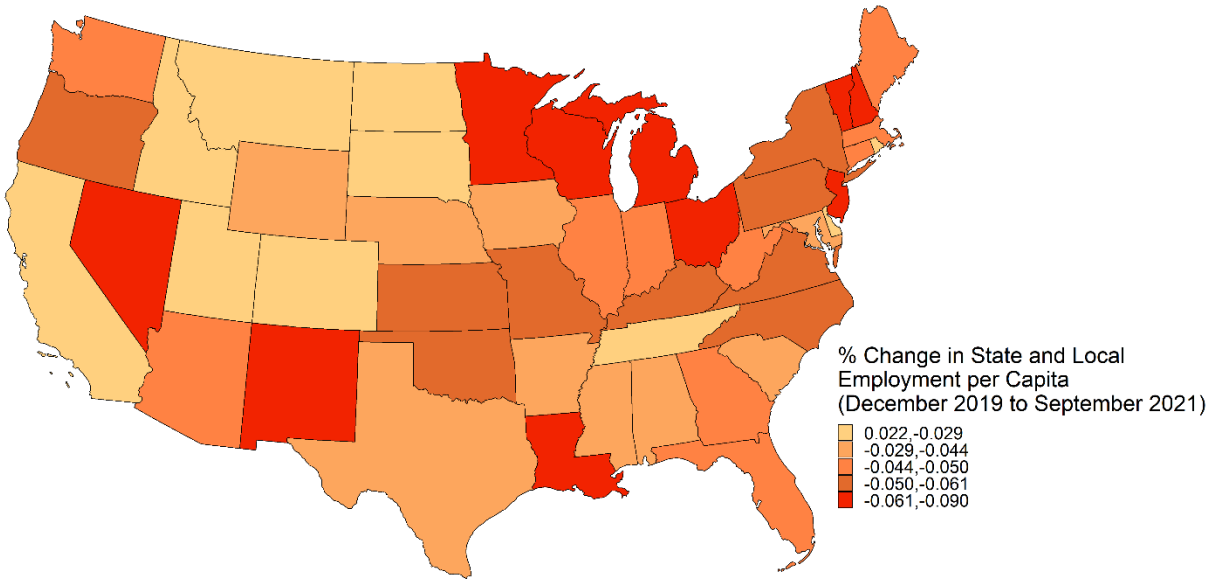
Note: Panel A uses data from Bureau of Labor Statistics (2023b), US Census Bureau (2021), and US Bureau of Economic Analysis (2021) to show the percent change in state and local employment per capita, private employment per capita, and real GDP per capita from December 2019 to each month in our sample. Plotted state and local employment and private employment values are based on seasonally-adjusted national totals as reported by the Bureau of Labor Statistics. Plotted real GDP values are averages of the 48 contiguous states weighted by state population. Panel B uses data from Bureau of Labor Statistic (2023a) to plot the national unemployment rate from January 2020 through September 2021.

Figure 2: Percent Change in State and Local Employment in the Pandemic Era

Panel A: Change in State and Local Employment from December 2019 to June 2020

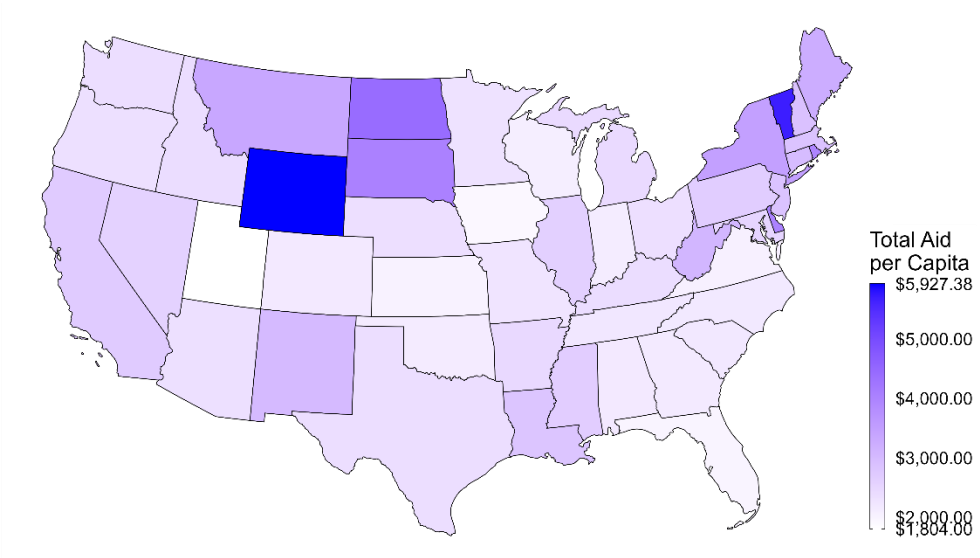


Panel B: Change in State and Local Employment from December 2019 to September 2021



Note: This figure uses data from US Bureau of Labor Statistics (2021b) and US Census Bureau (2021) to show the geographic distribution of changes to state and local employment during the pandemic era. Panel A showcases the percent change in state and local employment between December 2019 and June 2020, the nadir of state and local government employment during the pandemic. Panel B showcases the percent change in state and local employment between December 2019 and September 2021, the last month of our sample.

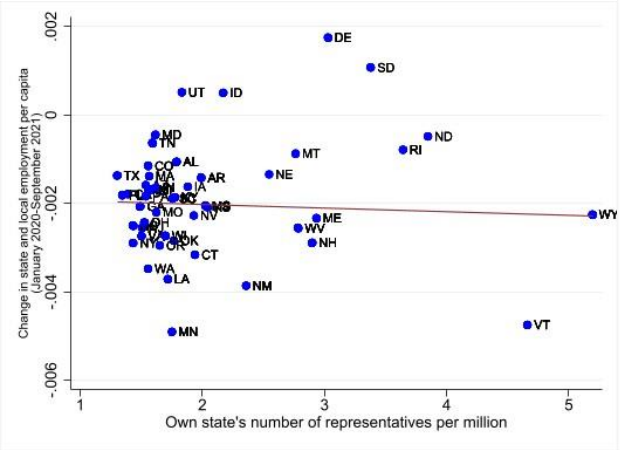
Figure 3: Geographic Distribution of Total State and Local Aid



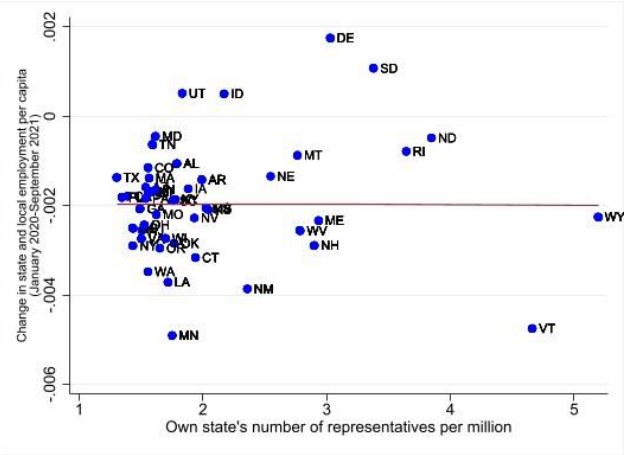
Note: This figure uses data from data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), and US Department of the Treasury (2021a) to show the geographic distribution in total aid per capita to the 48 contiguous United States in USD.

Figure 4: Relationship Between the Own State and Neighbor's Representatives per Million and Changes in State and Local Employment

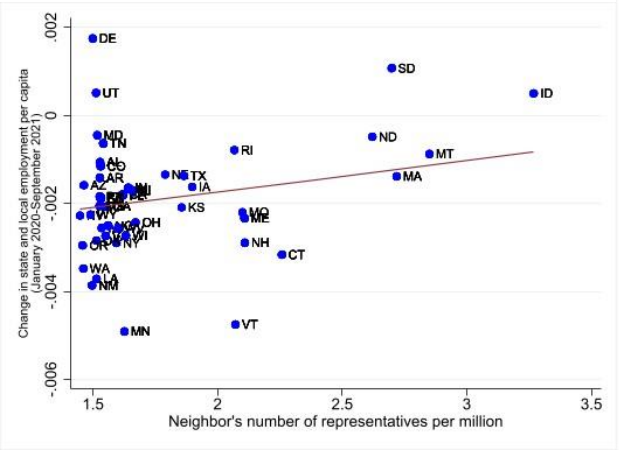
Panel A: Own state's representatives per million, weighted



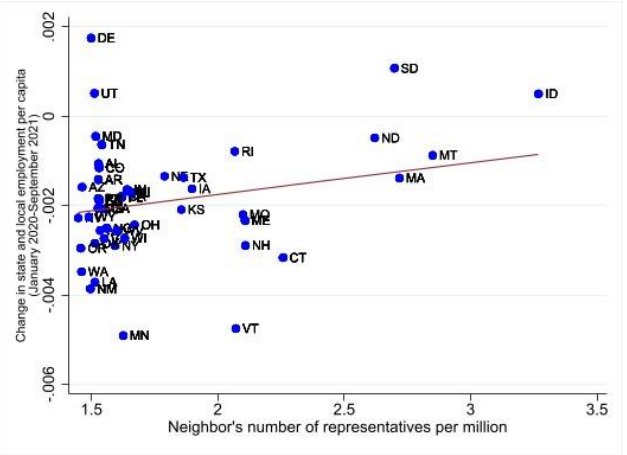
Panel B: Own state's representatives per million, unweighted



Panel C: Neighbor's representatives per million, weighted



Panel D: Neighbor's representatives per million, unweighted



Note: This figure uses data from US Bureau of Labor Statistics (2021b), US Census Bureau (2021), and Lewis et al. (2021), to show the reduced form relationship between representatives per million and changes in state and local employment. Panels A and B show the relationship between state *s*'s representatives per million and state *s*'s per capita change in state and local employment between January 2020 and September 2021. In Panel A, the slope coefficient is equal to -8.69e-05, with a standard error of 0.000256. In Panel B, the slope coefficient is equal to -5.57e-06, with a standard error of 0.000259. Panels C and D show the relationship between neighbor *n*'s representatives per million and state *s*'s per capita change in state and local employment during the same time period. In Panel C, the slope coefficient is equal to 0.000708, with a standard error of 0.000364. In Panel D, the slope coefficient is equal to 0.000714, with a standard error of 0.000440. In Panels C and D, "Neighbor's number of representatives per million" the average representatives per million for neighbor *n,* weighted by the population of neighbor *n.* In panels A and C, bivariate regression lines are weighted by population of state *s,* while panels B and D are unweighted. Standard errors are clustered by recipient state *s*.

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)	4,824	-0.00256	0.001438	-0.00796	0.00282
Change in State and Local Employment per Capita from Dec 2018 to Dec 2019 (QCEW)	4,824	0.000516	0.000527	-0.00053	0.001664
Total Aid to State and Local Governments per Resident (USD Millions)	4,824	0.002674	0.000834	0.001804	0.005927
Senators and Representatives per Million Residents	4,824	2.005498	0.818005	1.302115	5.192836
Log of 2020 State Population	4,824	15.37687	0.939767	13.26684	17.49375
Share of Population in City Eligible for Municipal Liquidity Facility	4,824	0.393155	0.18989	0.147225	0.839294
March 2020 Average Oxford Stringency Index Level	4,824	0.430786	0.053425	0.321377	0.550177
Contemporaneous Oxford Stringency Index Level	4,824	0.532131	0.146254	0.25	0.929333
Change in Real Total Wages per Capita Relative to Same Month in 2019 (USD Millions)	1,608	0.00043	0.001073	-0.00284	0.004655
Change in Real Total Wages per Capita from Q4 2018 to Q4 2019 (USD Millions)	1,608	0.000652	0.000391	-0.00079	0.00171
Change in Real Personal Income per Capita Relative to Same Month in 2019 (USD Millions)	1,608	0.003817	0.002241	-0.00108	0.010508
Change in Real Personal Income per Capita from Q4 2018 to Q4 2019 (USD Millions)	1,608	0.000924	0.000577	-0.00061	0.002325
Change in Real State GDP per Capita Relative to Same Month in 2019 (USD Millions)	1,608	-0.00081	0.002361	-0.00863	0.004563
Change in Real State GDP per Capita from Q4 2018 to Q4 2019 (USD Millions)	1,608	0.001161	0.000745	-0.00077	0.002812
Change in Private Employment per Capita Relative to Same Month in 2019	1,608	-0.02128	0.017004	-0.08755	0.021981
Change in Private Employment per Capita from Dec 2018 to Dec 2019	1,608	0.004067	0.003745	-0.00844	0.011825

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), Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Crone (2004) and the US Bureau of Economic Analysis (2021).

Table 2: First-Stage Results

	Economic Regions		Closest Neighbors	
	(1)	(2)	(3)	(4)
	Total Aid	Neighbor's Total Aid	Total Aid	Neighbor's Total Aid
Own characteristics:				
Representatives Per Million	0.00104***	0.00532***	0.00104***	0.00452**
	(0.0001)	(0.0014)	(0.0001)	(0.0017)
Log(Population)	0.000270***	-0.00106	0.000255***	-0.000918
	(0.0001)	(0.0006)	(0.0001)	(0.0006)
Share of Population Eligible for MLF	0.000257	0.00218	0.000535**	0.00263*
	(0.0002)	(0.0016)	(0.0002)	(0.0013)
Change Public Employment (Q4 2018 - Q4 2019)	-0.144*	0.747**	-0.182**	0.415
	(0.0720)	(0.2827)	(0.0698)	(0.4068)
Change Private Employment (Q4 2018 - Q4 2019)	-0.0223	0.165*	-0.0112	0.0494
	(0.0124)	(0.0703)	(0.0140)	(0.0742)
Average OSI (March 2020)	0.000357	-0.00384	0.000840	-0.00253
	(0.0007)	(0.0026)	(0.0007)	(0.0042)
Average OSI (Current Month)	0.000787***	-0.000809	0.000759**	0.0000385
	(0.0002)	(0.0007)	(0.0003)	(0.0010)
Neighbor's characteristics:				
Representatives Per Million	0.000000424	0.00241***	0.0000403	0.00205***
	(0.0000)	(0.0004)	(0.0000)	(0.0005)
Log(Population)	-0.0000786**	0.00446***	-0.00000730	0.00403***
	(0.0000)	(0.0006)	(0.0001)	(0.0006)
Share of Population Eligible for MLF	0.000512**	0.00388***	0.000250	0.00253**
	(0.0002)	(0.0009)	(0.0001)	(0.0009)
Change Public Employment (Q4 2018 - Q4 2019)	-0.0927*	0.361	-0.199**	0.0908
	(0.0429)	(0.2412)	(0.0611)	(0.2396)
Change Private Employment (Q4 2018 - Q4 2019)	0.00465	-0.153**	-0.00149	-0.0433
	(0.0055)	(0.0501)	(0.0042)	(0.0565)
Average OSI (March 2020)	0.00109**	-0.00143	0.00157**	0.00400
	(0.0004)	(0.0034)	(0.0006)	(0.0040)
Average OSI (Current Month)	-0.000637**	0.00110	-0.000607**	0.000365
	(0.0002)	(0.0007)	(0.0002)	(0.0009)
Observations	4,824	4,824	4,896	4,896
First-Stage F-stat	39.03	17.94	36.01	11.57

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), Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Crone (2004) and the US Bureau of Economic Analysis (2021) to estimate the following equations for all months pooled:

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \text{ (2a)}$$

$$\frac{TotalAid_n}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \text{ (2b)}$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state or county *s* pooled across all four bills and $TotalAid_n$ is the respective amount for a neighboring state *n*. In equations (2a) and (2b), both $TotalAid_s$ and $TotalAid_n$ are scaled by $Pop_{s,y_{2020}}$, state s's 2020 official Census population. Estimates of equation (2a) are shown in Columns 1 and 3. In equation (2a), the first of two first-stage regressions, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$ the number of Representatives and Senators per million residents for a given area and its neighbor in 2020. In the second of two first-stage regressions, expressed by equation (2b), $\frac{TotalAid_n}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_n$. Estimates of equation (2b) are shown in Columns 2 and 4. Included is a set of area-level controls for state *s* $(X_{s,m,y})$ and neighbor *n* $(X_{n,m,y})$. 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 for both the recipient and neighboring states. Observations are weighted by area population of state *s* and standard errors (in parentheses) are clustered by recipient state *s*. Locations are matched by pre-determined economic relationships (Columns 1 and 2) or proximity (Columns 3 and 4). 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

Table 3: Neighbor's Total Aid, Congressional Representation, and Proxies for Funding Needs

	Neighbor's Total Aid per Own-State Resident (USD millions)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own characteristics:								
Congressional Representatives per Million	0.00532***	0.00529***	0.00531***	0.00540***	0.00540***	0.00551***	0.00473***	0.00512***
	(0.00145)	(0.00144)	(0.00129)	(0.00141)	(0.00128)	(0.00140)	(0.00117)	(0.00113)
Average Dem Congressional Share (2020 and 2021)		-0.000281						0.000126
		(0.000457)						(0.000838)
Tax Shortfall per Capita			1.65e-06					2.89e-06
			(1.45e-06)					(2.76e-06)
Average Q4 2020 Unemployment				0.0553				-0.00611
				(0.0376)				(0.0579)
Change in Personal Income (Q4 2019 to Q4 2020)					-0.000278**			-0.000296*
					(0.000121)			(0.000150)
Total State and Local Spending per Capita						-1.84e-08		-2.47e-07
						(9.97e-08)		(2.35e-07)
Acres of Federal Lands per Capita							0.000131	0.000116
							(0.000120)	(0.000108)
Neighbor's characteristics:								
Congressional Representatives per Million	0.00241***	0.00240***	0.00216***	0.00242***	0.00224***	0.00179***	0.00262***	0.00241***
	(0.000405)	(0.000407)	(0.000423)	(0.000410)	(0.000481)	(0.000499)	(0.000760)	(0.000877)
Average Dem Congressional Share (2020 and 2021)		3.52e-05						-0.000512
		(0.00105)						(0.00111)
Tax Shortfall per Capita			2.18e-06**					7.72e-07
			(9.86e-07)					(1.18e-06)
Average Q4 2020 Unemployment				0.0187				0.0550
				(0.0277)				(0.0332)
Change in Personal Income (Q4 2019 to Q4 2020)					-4.27e-05			3.74e-06

					(0.000131)			(0.000189)
Total State and Local Spending per Capita						2.79e-07**		2.91e-07*
						(1.35e-07)		(1.73e-07)
Acres of Federal Lands per Capita							-1.56e-05	-6.69e-05
							(4.22e-05)	(4.01e-05)
Own state controls	Y	Y	Y	Y	Y	Y	Y	Y
Neighbor's controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	4,824	4,824	4,824	4,824	4,824	4,824	4,824	4,824

Note: This table uses data from the Committee for a Responsible Federal Budget (2021), US Federal Transit Administration (2021a), US Census Bureau (2019, 2021), Chidambaram and Musumeci (2021), Medicaid and Chip Payment Access Commission (2021), US Office of Elementary and Secondary Education (2021), Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Crone (2004), Whitaker (2020), Vincent et al. (2020) and the US Bureau of Economic Analysis (2021) to estimate the following equations for all months pooled:

$$\frac{TotalAid_n}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + Z_{s,m,y}\gamma_5 + Z_{n,m,y}\gamma_6 + \varepsilon_{s,n,m,y} \quad \text{(2d)}$$

where $TotalAid_n$ is the total federal aid per resident to state and local governments (USD millions) in neighbor *n* pooled across all four bills. $TotalAid_n$ is scaled by $Pop_{s,y_{2020}}$, state s's 2020 official Census population. In equation (2d), a modified version of equation (2b), $\frac{TotalAid_n}{Pop_{n,y_{2020}}}$ is regressed on $RepsPerMillion_s$ the number of Representatives and Senators per million residents for a given area in 2020 and $RepsPerMillion_n$, the respective number for neighbor *n*. Included is a set of area-level controls for state *s* ($X_{s,m,y}$) and neighbor *n* ($X_{n,m,y}$). 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 for both recipient state *s* and neighbor *n*. An additional set of area-level controls for state *s* ($Z_{s,m,y}$) and neighbor *n* ($Z_{n,m,y}$) are added one by one in Columns 1 through 7, then together in Column 8. This includes the averaged share of state US representatives and US senators that are members of the Democratic Party in a state for 2020 and 2021, the predicted tax shortfall for state and local governments from Whitaker (2020) 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, and the acres of federal lands per capita for state *s*. Analogous measures for neighbor *n* are likewise included. Observations are weighted by population of state *s* and standard errors (in parentheses) are clustered by recipient state *s*. 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

Table 4: Federal Aid and State and Local Employment

	State and Local Employment per Capita			
	Economic Regions		Closest Neighbors	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Own characteristics:				
Total Aid per Resident (USD millions)	-0.00178	0.513	0.228	0.796*
	(0.219)	(0.434)	(0.184)	(0.480)
Log(Population)	0.000361*	0.000472***	0.000287	0.000393*
	(0.000183)	(0.000161)	(0.000180)	(0.000202)
Share of Population Eligible for MLF	-0.000145	-0.000662	-0.000276	-0.000938
	(0.000848)	(0.000916)	(0.000811)	(0.000932)
Change Public Employment (Q4 2018 - Q4 2019)	0.221	0.291	0.303	0.400*
	(0.245)	(0.255)	(0.230)	(0.235)
Change Private Employment (Q4 2018 - Q4 2019)	0.107***	0.129***	0.126***	0.145***
	(0.0370)	(0.0385)	(0.0369)	(0.0376)
Average OSI (March 2020)	-0.00353	-0.00379*	-0.00347	-0.00412*
	(0.00230)	(0.00223)	(0.00223)	(0.00217)
Average OSI (Current Month)	-0.00360***	-0.00405***	-0.00406***	-0.00453***
	(0.000832)	(0.000825)	(0.000693)	(0.000698)
Neighbor's characteristics:				
Neighbor's Total Aid per Own-State Resident (USD millions)	0.0366**	0.0410	0.0180	0.0159
	(0.0172)	(0.0268)	(0.0174)	(0.0449)
Log(Population)	-0.000128**	-8.23e-05	7.50e-05	0.000114
	(5.08e-05)	(8.32e-05)	(7.07e-05)	(0.000140)
Share of Population Eligible for MLF	-0.000554	-0.000778	-0.000588*	-0.000694*
	(0.000392)	(0.000512)	(0.000349)	(0.000390)
Change Public Employment (Q4 2018 - Q4 2019)	0.0644	0.112	0.0661	0.181
	(0.106)	(0.116)	(0.0831)	(0.137)
Change Private Employment (Q4 2018 - Q4 2019)	0.00371	-0.00267	-0.0231**	-0.0252**
	(0.0171)	(0.0172)	(0.0108)	(0.0113)
Average OSI (March 2020)	-0.000705	-0.00120	-0.00180	-0.00264**
	(0.000631)	(0.000745)	(0.00107)	(0.00122)
Average OSI (Current Month)	0.000661	0.00103	0.000814	0.00120*
	(0.000624)	(0.000692)	(0.000518)	(0.000614)
Dep. Var. Mean	-.00241	-.00241	-.00251	-.00251
$ Per Job-Year	$3,060,631	$878,349	$1,984,127	$747,887
Combined Effect	0.2180	0.7591	0.3367	0.8916
Confidence Interval on Combined Effect	(-0.2423, 0.6783)	(-0.0393, 1.5575)	(-0.1299, 0.8034)	(0.1221, 1.6612)
Observations	4,824	4,824	4,896	4,896
R-squared	0.372	0.356	0.355	0.336

First-Stage F-stat	N/A	17.852	N/A	6.435
P-value on Combined Effect	0.346	0.062	0.153	0.023
P-value on Test for Pre-Trends	N/A	0.713	N/A	0.064

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), Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Crone (2004) and the US Bureau of Economic Analysis (2021) to estimate the following equations for all months pooled:

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{TotalAid_s}{Pop_{s,y_{2020}}} + \beta_2 \frac{TotalAid_n}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + \varepsilon_{s,n,m,y} \quad (1)$$

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2a)$$

$$\frac{TotalAid_n}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2b)$$

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 \frac{\widehat{TotalAid}_n}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + u_{s,n,m,y} \quad (2c)$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state or county *s* pooled across all four bills and $TotalAid_n$ is the respective amount for a neighboring state *n*. In equation (1), both $TotalAid_s$ and $TotalAid_n$ are scaled by $Pop_{s,y_{2020}}$, state s's 2020 official Census population. $\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ 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. Estimates of equation (1) are shown in Columns 1 and 3. In equation (2a), the first of two first-stage regressions, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$ the number of Representatives and Senators per million residents for a given area and its neighbor in 2020. In the second of two first-stage regressions, expressed by equation (2b), $\frac{TotalAid_n}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_n$. Estimates of equation (2c) are shown in Columns 2 and 4. The ratio of \$1,000,000/1.5*($\beta_1 + \bar{n} * \beta_2$) is the total number of federal dollars allocated that were needed to preserve or create one state or local government job-year in state *s* during the pandemic, where $\bar{n}$ is the average number of neighbors a state has, specific to the method of neighbor pairing. Included is a set of area-level controls for state *s* ($X_{s,m,y}$) and neighbor *n* ($X_{n,m,y}$). 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 for both the recipient and neighboring states. Observations are weighted by area population of state *s* and standard errors (in parentheses) are clustered by recipient state *s*. Locations are matched by pre-determined economic relationships (Columns 1 and 2) or proximity (Columns 3 and 4). The "P-value on Combined Effect" reports the p-value for a test of the hypothesis that $\beta_1 + \bar{n} * \beta_2 = 0$. 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

Table 5: Federal Aid and Macroeconomic Outcomes

	Private Employment per Capita		Total Wages per Capita (USD millions)		State Real GDP per Capita (USD millions)		Personal Income (USD millions)	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own characteristics:								
Total Aid per Resident (USD millions)	-6.470***	-2.511	-0.343*	0.035	-0.924**	0.0443	0.0223	0.631
	(2.154)	(2.903)	(0.2)	(0.356)	(0.371)	(0.644)	(0.349)	(0.515)
Other characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Neighbor's characteristics:								
Neighbor's Total Aid per Own State Resident (USD millions)	0.223**	0.455**	-0.00434	-0.0153	-0.0116	-0.0381	-0.0202	-0.0598
	(0.0872)	(0.189)	(0.009)	(0.0201)	(0.0133)	(0.045)	(0.015)	(0.042)
Other characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Dep. Var. Mean	-0.02206	-0.02206	0.000554	0.000554	-0.00079	-0.00079	0.004067	0.004067
Observations	4,824	4,824	1,608	1,608	1,608	1,608	1,608	1,608
R-squared	0.726	0.718	0.665	0.652	0.603	0.586	0.137	0.128
First-Stage F-stat	N/A	17.852	N/A	17.971	N/A	16.569	N/A	18.825
P-value on Combined Effect	0.011	0.935	0.039	0.844	0.005	0.739	0.752	0.514
P-value on Test for Pre-Trends	N/A	0.874	N/A	0.102	N/A	0.219	N/A	0.140

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), Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Crone (2004) and the US Bureau of Economic Analysis (2021) to estimate the following equations for all months pooled:

$$\frac{\Delta Y_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{TotalAid_s}{Pop_{s,y_{2020}}} + \beta_2 \frac{TotalAid_n}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + \varepsilon_{s,n,m,y} \quad (1)$$

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2a)$$

$$\frac{TotalAid_n}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2b)$$

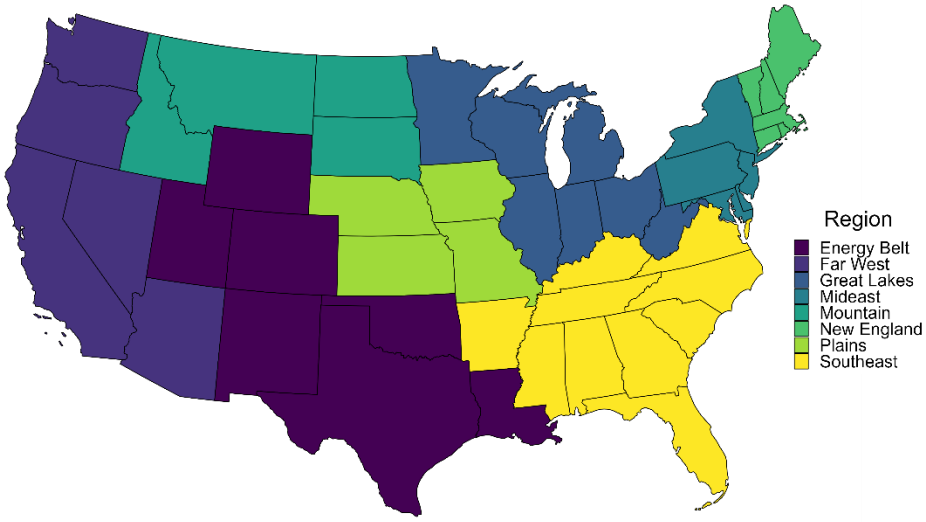
$$\frac{\Delta Y_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 \frac{\widehat{TotalAid}_n}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + u_{s,n,m,y} \quad (2c)$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state or county *s* pooled across all four bills and $TotalAid_n$ is the respective amount for a neighboring state *n*. In equation (1), both $TotalAid_s$ and $TotalAid_n$ are scaled by $Pop_{s,y_{2020}}$, state s's 2020 official Census population. $\frac{\Delta Y_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the same time period in 2019. For example, Columns 1 and 2 uses the change in

state *s*'s private employment per capita, while Columns 3 and 4 use the change in total wages per capita in USD millions relative to the same quarter in 2019. All employment variables use QCEW estimates. Columns 5 and 6 use seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted and Columns 7 and 8 use annualized real personal income per capita in USD millions. OLS estimates of equation (1) are presented in Columns 1, 3, 5, and 7, while IV estimates of equation (2c) are presented in Columns 2, 4, 6, and 8. In equation (2a), the first of two first-stage regressions equation, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$ the number of Representatives and Senators per million residents for a given area and its neighbor in 2020. In the second of two first-stage regressions, expressed by equation (2b), $\frac{TotalAid_n}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_n$. Included is a set of area-level controls for state *s* $(X_{s,m,y})$ and neighbor *n* $(X_{n,m,y})$. 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 for both the recipient and neighboring states. Observations are weighted by area population of state *s* and standard errors (in parentheses) are clustered by recipient state *s*. In all columns, locations are matched by pre-determined economic relationships. The "P-value on Combined Effect" reports the p-value for a test of the hypothesis that $\beta_1 + \bar{n} * \beta_2 = 0$. 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 Figure 1: Economic Regions



Note: This figure shows the economic-regions grouping from Crone (2004).

Appendix Table 1: Federal Aid and State and Local Employment (Unweighted Estimates)

	State and Local Employment per Capita			
	Economic Regions		Closest Neighbors	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Own characteristics:				
Total Aid per Resident (USD millions)	-0.140	-0.0951	-0.0428	-0.168
	(0.150)	(0.186)	(0.138)	(0.224)
Log(Population)	2.55e-05	3.27e-05	-0.000158	4.30e-05
	(0.000193)	(0.000241)	(0.000198)	(0.000257)
Share of Population Eligible for MLF	0.00104	0.00102	0.00104	0.000863
	(0.000852)	(0.000915)	(0.000886)	(0.000937)
Change Public Employment				
(Q4 2018 - Q4 2019)	0.260	0.270	0.267	0.318
	(0.224)	(0.223)	(0.203)	(0.218)
Change Private Employment				
(Q4 2018 - Q4 2019)	0.0622	0.0640*	0.0896**	0.0838**
	(0.0383)	(0.0374)	(0.0394)	(0.0385)
Average OSI (March 2020)	-0.00459*	-0.00468*	-0.00300	-0.00361
	(0.00251)	(0.00256)	(0.00253)	(0.00262)
Average OSI (Current Month)	-0.00364***	-0.00368***	-0.00399***	-0.00384***
	(0.000646)	(0.000666)	(0.000730)	(0.000766)
Neighbor's characteristics:				
Neighbor's Total Aid per Own State				
Resident (USD millions)	0.0171	0.0139	-0.00298	0.0474*
	(0.0134)	(0.0128)	(0.00858)	(0.0244)
Log(Population)	-4.27e-05	-2.19e-05	0.000154	-9.72e-05
	(8.87e-05)	(0.000129)	(0.000106)	(0.000191)
Share of Population Eligible for MLF	-0.000609*	-0.000593	-0.000811**	-0.000976***
	(0.000339)	(0.000368)	(0.000341)	(0.000355)
Change Public Employment				
(Q4 2018 - Q4 2019)	-0.0960	-0.0933	-0.0713	-0.102
	(0.141)	(0.135)	(0.126)	(0.128)
Change Private Employment				
(Q4 2018 - Q4 2019)	0.00743	0.00529	-0.0156	-0.00717
	(0.0151)	(0.0178)	(0.0181)	(0.0194)
Average OSI (March 2020)	-0.000319	-0.000370	-0.000569	-0.00110
	(0.000771)	(0.000792)	(0.00126)	(0.00120)
Average OSI (Current Month)	-9.33e-05	-5.95e-05	-0.000187	-0.000376
	(0.000669)	(0.000691)	(0.000770)	(0.000802)
Dep. Var. Mean	-0.00256	-0.00256	-0.00258	-0.00258
Combined Effect	-0.03804	-0.01141	-0.0607	0.1162
$ Per Job-Year	$-17,825,312	$-56,980,057	$-10,986,596	$5,727,377
Confidence Interval on Combined				
Effect	(-0.3370, 0.2609)	(-0.3959, 0.3731)	(-0.3852, 0.2639)	(-0.3806, 0.6130)
Observations	4,824	4,824	4,896	4,896
R-squared	0.295	0.294	0.287	0.247
First-Stage F-stat	N/A	3.227	N/A	7.532
P-value on Combined Effect	0.799	0.954	0.709	0.647
P-value on Test for Pre-Trends	N/A	0.371	N/A	0.081

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), Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Crone (2004) and the US Bureau of Economic Analysis (2021) to estimate the following equations for all months pooled:

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{TotalAid_s}{Pop_{s,y_{2020}}} + \beta_2 \frac{TotalAid_n}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + \varepsilon_{s,n,m,y} \quad (1)$$

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2a)$$

$$\frac{TotalAid_n}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2b)$$

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \beta_1 \frac{\widehat{TotalAid}_s}{Pop_{s,y_{2020}}} + \beta_2 \frac{\widehat{TotalAid}_n}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + u_{s,n,m,y} \quad (2c)$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state or county *s* pooled across all four bills and $TotalAid_n$ is the respective amount for a neighboring state *n*. In equation (1), both $TotalAid_s$ and $TotalAid_n$ are scaled by $Pop_{s,y_{2020}}$, state s's 2020 official Census population. $\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ 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. Estimates of equation (1) are shown in Columns 1 and 3. In equation (2a), the first of two first-stage regressions, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$ the number of Representatives and Senators per million residents for a given area and its neighbor in 2020. In the second of two first-stage regressions, expressed by equation (2b), $\frac{TotalAid_n}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_n$. Estimates of equation (2c) are shown in Columns 2 and 4. The ratio of \$1,000,000/1.5*($\beta_1 + \bar{n} * \beta_2$) is the total number of federal dollars allocated that were needed to preserve or create one state or local government job-year in state *s* during the pandemic, where $\bar{n}$ is the average number of neighbors a state has, specific to the method of neighbor pairing. Included is a set of area-level controls for state *s* ($X_{s,m,y}$) and neighbor *n* ($X_{n,m,y}$). 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 for both the recipient and neighboring states. Observations are unweighted and standard errors (in parentheses) are clustered by recipient state *s*. Locations are matched by pre-determined economic relationships (Columns 1 and 3) or proximity (Columns 3 and 4). The "P-value on Combined Effect" reports the p-value for a test of the hypothesis that $\beta_1 + \bar{n} * \beta_2 = 0$. 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 2: Federal Aid and Macroeconomic Outcomes (Closest Neighbors Matching Method)

	Private Employment per Capita		Total Wages per Capita (USD millions)		State Real GDP per Capita (USD millions)		Personal Income (USD millions)	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own characteristics:								
Total Aid per Resident (USD millions)	-5.766***	0.807	-0.431**	0.200	-1.051***	0.346	-0.103	0.808
	(2.004)	(3.627)	(0.176)	(0.600)	(0.317)	(1.098)	(0.305)	(0.870)
Other characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Neighbor's characteristics:								
Neighbor's Total Aid per Own State Resident (USD millions)	0.241**	-0.120	0.0143	-0.0564	0.0241	-0.0958	0.00104	-0.0727
	(0.0999)	(0.419)	(0.0110)	(0.0813)	(0.0157)	(0.145)	(0.0162)	(0.117)
Other characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Dep. Var. Mean	-0.02346	-0.02346	0.00055	0.00055	-0.00084	-0.00084	0.004155	0.004155
Observations	4,896	4,896	1,632	1,632	1,632	1,632	1,632	1,632
R-squared	0.710	0.696	0.651	0.594	0.595	0.548	0.158	0.135
First-Stage F-stat	N/A	6.435	N/A	2.896	N/A	3.038	N/A	4.096
P-value on Combined Effect	0.022	0.978	0.037	0.655	0.005	0.712	0.730	0.428
P-value on Test for Pre-Trends	N/A	0.608	N/A	0.356	N/A	0.188	N/A	0.232

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), Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), and the US Bureau of Economic Analysis (2021) to estimate the following equations for all months pooled:

$$\frac{\Delta Y_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{TotalAid_s}{Pop_{s,y_{2020}}} + \beta_2 \frac{TotalAid_n}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + \varepsilon_{s,n,m,y} \quad (1)$$

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2a)$$

$$\frac{TotalAid_n}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2b)$$

$$\frac{\Delta Y_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \beta_1 \frac{\widehat{TotalAid_s}}{Pop_{s,y_{2020}}} + \beta_2 \frac{\widehat{TotalAid_n}}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + u_{s,n,m,y} \quad (2c)$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state or county *s* pooled across all four bills and $TotalAid_n$ is the respective amount for a neighboring state *n*. In equation (1), both $TotalAid_s$ and $TotalAid_n$ are scaled by $Pop_{s,y_{2020}}$, state s's 2020 official Census population. $\frac{\Delta Y_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the same time period in 2019. For example, Columns 1 and 2 uses the change in state *s*'s private employment per capita, while Columns 3 and 4 use the change in total wages per capita in USD millions relative to the same quarter in 2019. All employment variables use QCEW estimates. Columns 5 and 6 use seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted and Columns 7 and 8 use annualized real personal income per capita in USD millions. OLS estimates of equation (1) are presented in Columns 1, 3, 5, and 7, while IV estimates of equation (2c) are presented in Columns 2, 4, 6, and 8. In equation (2a), the first of two first-stage regressions, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$ the number of Representatives and Senators per million residents for a given area and its neighbor in 2020. In the second of two first-stage regressions, expressed by equation (2b), $\frac{TotalAid_n}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_n$. Included is a set of area-level controls for state *s* ($X_{s,m,y}$) and neighbor *n* ($X_{n,m,y}$). 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 for both the recipient and neighboring states. Observations are weighted by area population of state *s* and standard errors (in parentheses) are clustered by recipient state *s*. In all columns, locations are matched by proximity. The "P-value on Combined Effect" reports the p-value for a test of the hypothesis that $\beta_1 + \bar{n} * \beta_2 = 0$. 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: Federal Aid and Macroeconomic Outcomes (Unweighted Estimates)

	Private Employment per Capita		Total Wages per Capita (USD millions)		State Real GDP per Capita (USD millions)		Personal Income (USD millions)	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own characteristics:								
Total Aid per Resident (USD millions)	-5.266***	-5.550***	-0.429**	-0.452**	-0.896**	-0.820*	-0.143	-0.0609
	(1.587)	(1.603)	(0.167)	(0.201)	(0.347)	(0.467)	(0.250)	(0.325)
Other characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Neighbor characteristics:								
Neighbor's Total Aid per Own State Resident (USD millions)	0.0879	0.374**	-0.00356	0.0157	-0.0198**	0.00345	-0.0146**	-0.0395
	(0.0672)	(0.181)	(0.00426)	(0.0117)	(0.00903)	(0.0148)	(0.0072)	(0.0252)
Other characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Dep. Var. Mean	-0.02128	-0.02128	0.00043	0.00043	-0.00081	-0.00081	0.003817	0.003817
Observations	4,824	4,824	1,608	1,608	1,608	1,608	1,608	1,608
R-squared	0.659	0.646	0.597	0.581	0.569	0.563	0.119	0.113
First-Stage F-stat	N/A	3.227	N/A	3.424	N/A	3.239	N/A	3.608
P-value on Combined Effect	0.003	0.046	0.004	0.087	0.002	0.089	0.308	0.168
P-value on Test for Pre-Trends	N/A	0.410	N/A	0.463	N/A	0.256	N/A	0.084

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), Lewis et al. (2021), US Bureau of Labor Statistics (2021b), US Department of the Treasury (2021a), Federal Reserve Board (2021), Hale et al. (2020), Crone (2004) and the US Bureau of Economic Analysis (2021) to estimate the following equations for all months pooled:

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \alpha + \beta_1 \frac{TotalAid_s}{Pop_{s,y_{2020}}} + \beta_2 \frac{TotalAid_n}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + \varepsilon_{s,n,m,y} \quad (1)$$

$$\frac{TotalAid_s}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2a)$$

$$\frac{TotalAid_n}{Pop_{s,y_{2020}}} = \gamma_1 RepsPerMillion_s + \gamma_2 RepsPerMillion_n + X_{s,m,y}\gamma_3 + X_{n,m,y}\gamma_4 + \varepsilon_{s,n,m,y} \quad (2b)$$

$$\frac{\Delta S\&LEmployment_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}} = \beta_1 \frac{\widehat{TotalAid_s}}{Pop_{s,y_{2020}}} + \beta_2 \frac{\widehat{TotalAid_n}}{Pop_{s,y_{2020}}} + X_{s,m,y}\beta_3 + X_{n,m,y}\beta_4 + u_{s,n,m,y} \quad (2c)$$

where $TotalAid_s$ is the total federal aid per resident to state and local governments (USD millions) in state or county *s* pooled across all four bills and $TotalAid_n$ is the respective amount for a neighboring state *n*. In equation (1), both $TotalAid_s$ and $TotalAid_n$ are scaled by $Pop_{s,y_{2020}}$, state s's 2020 official Census population. $\frac{\Delta Y_{s,m,y-y_{2019}}}{Pop_{s,y_{2020}}}$ presents the change in a given macroeconomic variable per capita relative to the same time period in 2019. For example, Columns 1 and 2 uses the change in state *s*'s private employment per capita, while Columns 3 and 4 use the change in total wages per capita in USD millions relative to the same quarter in 2019. All employment variables use QCEW estimates. Columns 5 and 6 use seasonally-adjusted, annualized real state GDP per capita in USD millions and seasonally-adjusted and Columns 7 and 8 use annualized real personal income per capita in USD millions. OLS estimates of equation (1) are presented in Columns 1, 3, 5, and 7, while IV estimates of equation (2c) are presented in Columns 2, 4, 6, and 8. In equation (2a), the first of two first-stage regressions, $\frac{TotalAid_s}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_s$ the number of Representatives and Senators per million residents for a given area and its neighbor in 2020. In the second of two first-stage regressions, expressed by equation (2b), $\frac{TotalAid_n}{Pop_{s,y_{2020}}}$ is instrumented using $RepsPerMillion_n$. Included is a set of area-level controls for state *s* ($X_{s,m,y}$) and neighbor *n* ($X_{n,m,y}$). 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 for both the recipient and neighboring states. Observations are unweighted and standard errors (in parentheses) are clustered by area. In all columns, locations are matched by pre-determined economic relationships. The "P-value on Combined Effect" reports the p-value for a test of the hypothesis that $\beta_1 + \bar{n} * \beta_2 = 0$. 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