

# Following the Money Trail: The Geographic Distribution of PPP Loans

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## Overview

The federal government's Paycheck Protection Program (PPP), authorized by the CARES Act and administered by the U.S. Small Business Administration (SBA), sought to mitigate adverse economic effects of the COVID-19 pandemic on small businesses and their employees.<sup>1</sup> The PPP offered loans to help maintain workers on the payroll, facilitate rehiring as conditions improve, and keep businesses intact. The program incentivized businesses to retain workers by forgiving loans if the business maintains its average employee count and compensation, and if the money is used for payroll, rent, mortgage interest, or utilities.

The PPP opened for applications on April 3, 2020, and ended on August 8, disbursing 5.2 million loans totaling \$525 billion with the participation of nearly 5,500 lending institutions. On July 6, the SBA released detailed loan-level data regarding the 4.9 million PPP loans that had been allocated up to that point.<sup>2</sup> In this research note, we use these loan-level data merged with county-level data from other sources to examine the geographic distribution of PPP funds.

Congress included the PPP in the CARES Act stimulus package because of the large concentration of small businesses within industry sectors most negatively exposed to the pandemic and the difficulties small businesses often have in accessing outside financing. Although it appears that more than enough PPP funds were made available (with untapped funds remaining when the program closed on August 8) and numerous anecdotes tell how small firms were helped by the PPP (for instance, see [here](#) and [here](#)), the effectiveness of the program has been called into question by some analysts and academics. For instance, [it has been asserted](#) that PPP funds were allocated to geographic areas not much affected by the pandemic and the "first-come, first-served" design [created a disadvantage](#) for the smallest of small businesses.

This research note presents new analysis, based on new data, which contradicts these assertions. Examining the allocation of PPP loan dollars per small business employee across U.S. counties, we find that the program effectively channeled loans to counties most affected by the COVID-19 pandemic. The nation's largest banks—categorized as those with more than \$50 billion in total assets—were particularly active in the areas hardest hit by the pandemic.

Specifically, a larger share of PPP dollars per small business employee flowed toward areas more affected by COVID-19 (as indicated by a decline in Google's workplace mobility index.) Applying a multivariate regression model, we estimate that a county that experienced a 40-percent decline in mobility (near the upper end of the range of this variable) received \$760 more per small business employee compared with a locality with a 10-percent decline (near the lower end of the range).

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<sup>1</sup> See <https://www.sba.gov/funding-programs/loans/coronavirus-relief-options/paycheck-protection-program#section-header-0> for details, including eligibility criteria and a list of participating lenders.

<sup>2</sup> See <https://www.sba.gov/about-sba/sba-newsroom/press-releases-media-advisories/sba-and-treasury-announce-release-paycheck-protection-program-loan-data>

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PPP dollars per employee also are positively associated with the share of local, small business employees at firms with fewer than 20 employees, contrary to the popularized notion that smaller firms faced less access to PPP funds. The analysis also indicates that more highly populated counties received more PPP funds per employee. This association may reflect either greater availability of, or more demand for, PPP funds in these communities.

The remainder of this note is organized as follows. The next section presents further institutional background on the PPP program, along with a discussion of other studies that have looked at quantitative aspects of the PPP. This is followed by a section devoted to describing our data sources, two sections that develop and present our analysis, and then a final concluding section.

## **Institutional Background and Literature Update**

### ***Eligibility Requirements and Legislative Timeline***

As established by the CARES Act, eligibility for the PPP program was based on business size and on declared need resulting from the economic impact of COVID-19.<sup>3</sup> Size eligibility aligned with existing SBA size standards, with the exception that “any business with a NAICS Code that begins with 72 (Accommodation and Food Services) that has more than one physical location and employs less than 500 per location” qualifies for the program. Because of this override, some sizeable hotel and restaurant chains became eligible. Sole proprietors, independent contractors, and self-employed persons were also eligible for PPP loans.<sup>4</sup>

Applicants could request loan amounts up to 10 weeks of payroll costs, subject to a maximum size of \$10 million.<sup>5</sup> Applications were required to be considered on a first-come, first-served basis (without guidance from the agencies regarding prioritization related to underserved markets), as specified in the [interim final rule](#) (IFR) for the PPP program that was issued on April 2 by the Treasury and SBA.<sup>6</sup>

The first phase of the program, funded to \$349 billion, commenced on April 3. Based on statements from the Treasury, expectations were that Congress would replenish the program when the first round of funding was depleted, so that those still in the queue would not be left unfunded.

This first tranche of funding was fully depleted by April 16, leaving many applications unfulfilled. A second round of the program commenced on April 27, after Congress had replenished it with another \$310 billion.

The CARES Act stipulates that for a PPP loan to be fully forgivable, the borrowers must document that the number of full-time equivalent employees and their salaries and wages were maintained at pre-pandemic levels during the 8-week period following disbursement of the loan, deemed the “covered” period. In lieu of this requirement, borrowers may demonstrate that they have restored their employee counts and salaries and wages to pre-pandemic levels by June 30, 2020. Otherwise, the loan forgiveness amount is to be reduced based on reductions in

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<sup>3</sup> Borrowers must self-certify that “current economic uncertainty makes this loan request necessary to support the ongoing operations of the Applicant.”

<sup>4</sup> Also eligible is “any business, 501(c)(3) non-profit organization, 501(c)(19) veterans’ organization, or Tribal business concern (sec. 31(b)(2)(C) of the Small Business Act) with no more than 500 employees or that meets the SBA industry size standard if more than 500.”

<sup>5</sup> Payroll costs include wage and salary compensation up to an annual rate of \$100,000, plus health insurance and other benefit costs. Businesses may choose to calculate payroll costs and average employment (including both full- and part-time employees) over the previous 12 months; over the 2019 calendar year; or, for firms that rely on seasonal employees, a comparable seasonal period from 2019.

<sup>6</sup> Because it is not preceded by a public comment period, an interim final rule is subject to alteration if warranted on the basis of subsequent public comments. See [https://www.federalregister.gov/uploads/2020/04/the\\_rulemaking\\_process.pdf](https://www.federalregister.gov/uploads/2020/04/the_rulemaking_process.pdf).

full-time equivalent employees or in employee salary and wages during the covered period, proportionate to the reduction in employee pay.

The IFR issued on April 2 specified that not more than 25 percent of the loan forgiveness amount may be attributable to non-payroll costs.<sup>7</sup> In addition, the IFR stated that PPP funds could be used only for covering payroll costs, covered mortgage interest payments, covered rent payments, and covered utilities incurred during the 8-week covered period.

On May 22, a new IFR was issued that made an exception to the employee retention requirement regarding employees who had turned down good-faith offers to be rehired.<sup>8</sup> Those employees were to be considered as retained for the purpose of calculating the loan forgiveness amount.

On June 5, Congress passed the Paycheck Protection Flexibility Act, which eased the statutory requirements for full loan forgiveness. The new flexibilities included expansion of the period for calculating covered expenses to 24 weeks from 8 weeks, and reduction of the proportion of proceeds that must be spent on payroll costs from 75 percent to 60 percent. The legislation also allowed for additional circumstances under which borrowers would be granted full loan forgiveness without fully restoring their employee counts. Retention requirements were eased for businesses that could not find qualified employees or were unable to fully restore business operations due to COVID-19–related operating restrictions.<sup>9</sup>

### ***Studies Addressing PPP’s Effectiveness***

The massive scale, economic importance, and novelty of PPP have attracted the interest of researchers seeking to assess its functioning and effectiveness. Calem and Covas (2020) examine the geographic distribution of PPP loans using data on PPP lending through May 8 (well into the second phase of the program), focusing on dollars disbursed per small business employee. The analysis indicates a strong positive correlation between the states that received the most PPP loans per small business employee and economic disruption in the state, as measured by decline in workplace visits using the Google work mobility index.<sup>10</sup>

Barrios and colleagues (2020) demonstrate that PPP funds were primarily allocated across states based on total payroll, reflecting how the PPP was essentially designed. Moreover, deviations from the expected allocation during the first round were largely offset during the second round of the program. The study concludes that the extent to which other possible objectives were not met (such as targeting specific firm sizes or particular industries more intensively) is likely the result of how the program was initially designed, rather than how it was carried out.

The PPP’s success depends not only on effective targeting of loans to areas experiencing in relation to economic need, but also on achieving favorable outcomes for employee retention and business survival. Several studies examine the program’s near-term outcomes along these dimensions.

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<sup>7</sup> As stated in the IFR, “the Administrator has determined that the non-payroll portion of the forgivable loan amount should be limited to effectuate the core purpose of the statute and ensure finite program resources are devoted primarily to payroll. The Administrator has determined in consultation with the Secretary that 75 percent is an appropriate percentage in light of the Act’s overarching focus on keeping workers paid and employed.”

<sup>8</sup> See <https://home.treasury.gov/system/files/136/PPP-IFR-Loan-Forgiveness.pdf>. This exception had already been incorporated into the loan forgiveness application form released on May 15.

<sup>9</sup> These changes were incorporated into a new IFR released by the SBA on June 10 and a new application form released on June 12. See <https://home.treasury.gov/system/files/136/PPP-IFR-Revisions-to-First-Interim-Final-Rule.pdf>

<sup>10</sup> Granja and colleagues (2020) and Liu and Volker (2020) analyze data from the first round of the PPP and find little association between the fraction of small businesses receiving PPP loans in a local area and the severity of local economic shocks.

Autor and colleagues (2020) analyze payroll data from a broad population of small businesses.<sup>11</sup> The analysis compares the evolution of payroll employment between firms of reasonably similar size based on program eligibility (firms marginally above and below the PPP's size-eligibility threshold), controlling for firm location using county fixed effects. The study finds a material effect of the PPP on job retention, with estimates suggesting retention of 1.4 million to 3.2 million jobs through the first week of June.<sup>12</sup>

Bartik and colleagues (2020) examine the dynamics and sectoral composition of the collapse and subsequent partial rebound of the U.S. labor market between February and June 2020, including a brief analysis of the role of the PPP. The study finds that job losses were concentrated among low-wage services, particularly in the retail and leisure and hospitality sectors, and that much of the job loss among small businesses was tied to firm closings. By mid-June, many small businesses had reopened and rehired former employees. States that received more PPP loans had milder employment declines and faster recoveries, consistent with mitigating effects of the program, although this relationship also might reflect greater demand for PPP loans among businesses better positioned to survive.

Bartlett and Morse (2020) assemble and analyze a unique combination of data from small businesses in Oakland, California, to explore the how small businesses with 0 to 50 employees have responded to the economic disruption of the pandemic, particularly in relation to firm size.<sup>13</sup> The analysis finds comparatively resilient revenue flow among microbusinesses (1–5 employees); relatively high labor flexibility (adaptability via layoffs) among larger firms (6–50) employees; and relatively high survival ability of non-employer firms, reflecting a low overall cost of operating. The study also briefly examines the association between receiving a PPP loan and self-reported survival probability, observing a comparatively strong association for microbusinesses.

Neilson, Humphries, and Ulysea (2020) develop evidence that information constraints and the first-come, first-served design of the PPP program skewed its resources toward larger firms within the 0-to-50 employee size range, using data from a national survey. The study demonstrates that the smallest businesses were less aware of the PPP and less likely to apply. Those that did apply tended to do so later than larger businesses, faced comparatively lengthy processing times, and were less likely to have their applications approved. The study concludes that these frictions may have reduced the overall effectiveness of the PPP, since businesses that received aid report fewer layoffs and had improved expectations about the future.

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<sup>11</sup> The study relies on administrative data from ADP, one of the world's largest payroll processing firms.

<sup>12</sup> Chetty and colleagues (2020) gather high-frequency data from a variety of nontraditional sources to construct statistics on consumer spending, employment rates, business revenues, job postings, and other indicators, and use these to analyze economic impacts of the pandemic. The study includes a brief assessment of effects of the PPP based on data from a fintech company that offers a form of payday advances, via a mobile application that tracks their customers' weekly or biweekly paychecks. This sample is limited to the population of primarily low-wage earners who have signed on to use this service. The study finds that the PPP has had little impact on re-employment for this population, as indicated by resumption of regular pay schedules that had terminated.

<sup>13</sup> The assembled data include special surveys conducted by the City of Oakland, California, in March and June 2020; data hand collected from local businesses in April 2020; consumer visitation and foot-traffic data from SafeGraph; and employment and payroll data from HomeBase.

## Data Used in PPP Analysis

### *Government Data Sources and Sample Construction*

Our analysis uses the loan-level data made available by the SBA on the 4.9 million PPP loans originated as of July 6, 2020, to measure cumulative PPP loan volume at the county level. For loans smaller than \$150,000, the data include the precise dollar amount loaned, along with the geographic location (state and ZIP Code) of the recipient business. For larger loans, the name and address of each business is also reported, but loan size is identified only within ranges. We map each loan to a county location based on the reported ZIP Code and state.<sup>14</sup>

Specifically, larger loans in the data are slotted to ranges \$150,000 to under \$350,000, \$350,000 to under \$1 million, \$1 million to under \$2 million, \$2 million to under \$5 million; and \$5 million to \$10 million. To calculate total loan volumes by county, we set the amount of each loan of size \$150,000 or greater equal to the average loan amount in the corresponding range, based on the SBA's July 10 published aggregate report.<sup>15</sup>

Given that the primary objective of the PPP is employee retention, our measure of program performance by locality is dollars disbursed per small business employee in the locality. Total employee counts and payroll amounts by company size range and state and county location as of 2016 (the most recent data available) are obtained from the U.S. Census Bureau's Statistics of U.S. Businesses (SUSB).<sup>16</sup> We apply a size limit of 500 employees to define small businesses, consistent with the primary criterion for PPP eligibility.

The SUSB data are reported for 1,796 individual counties within Core Based Statistical Areas (CBSA) and for another 1,338 counties outside of a CBSA. Of the CBSA counties, 1,143 are located in metropolitan statistical areas and 653 are in smaller micropolitan areas.<sup>17</sup>

Salary and wage levels can vary across localities due to cost-of-living differentials or to variation in the types of local small businesses, which in turn affect PPP loan sizes. Therefore, we also use the SUSB data to calculate average pay rates by county, at businesses with fewer than 500 employees, as a control variable for our analysis of PPP lending patterns.

Demand for PPP loans might vary by the nature of the business. The SUSB also presents employee counts by industry classification by CBSA and business size range, which we use to control for regional variation in the industry composition of the small business sector.

For examining PPP lending patterns in relation to the disruption in economic activity caused by COVID-19 and the associated containment actions imposed by the government (e.g., social distancing), we use a worker mobility index generated by [Google](#). The index measures the percentage decrease in visits to the workplace relative to a pre-pandemic baseline.

We calculate the daily average percentage decline in the index. Our cutoff date for this calculation is May 1, after which point mobility trends begin to shift, though most PPP funds had been dispersed. We believe this measure offers a meaningful proxy for economic disruption, preferring it to alternatives such as COVID-19 cases per capita,

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<sup>14</sup> We use the ZIP Code to county mapping made available by the U.S. Department of Housing and Urban Development, at [https://www.huduser.gov/portal/datasets/usps\\_crosswalk.html#data](https://www.huduser.gov/portal/datasets/usps_crosswalk.html#data)

<sup>15</sup> See page 6 of [https://www.sba.gov/sites/default/files/2020-07/PPP\\_Report%20-%202020-07-1945-508.pdf](https://www.sba.gov/sites/default/files/2020-07/PPP_Report%20-%202020-07-1945-508.pdf).

<sup>16</sup> SUSB 2016 data are available at <https://www.census.gov/data/tables/2016/econ/susb/2016-susb-annual.html>. Technical documentation is available at <https://www.census.gov/programs-surveys/susb/technical-documentation.html>.

<sup>17</sup> Micropolitan areas are included in the definition of rural communities by U.S. government agencies.

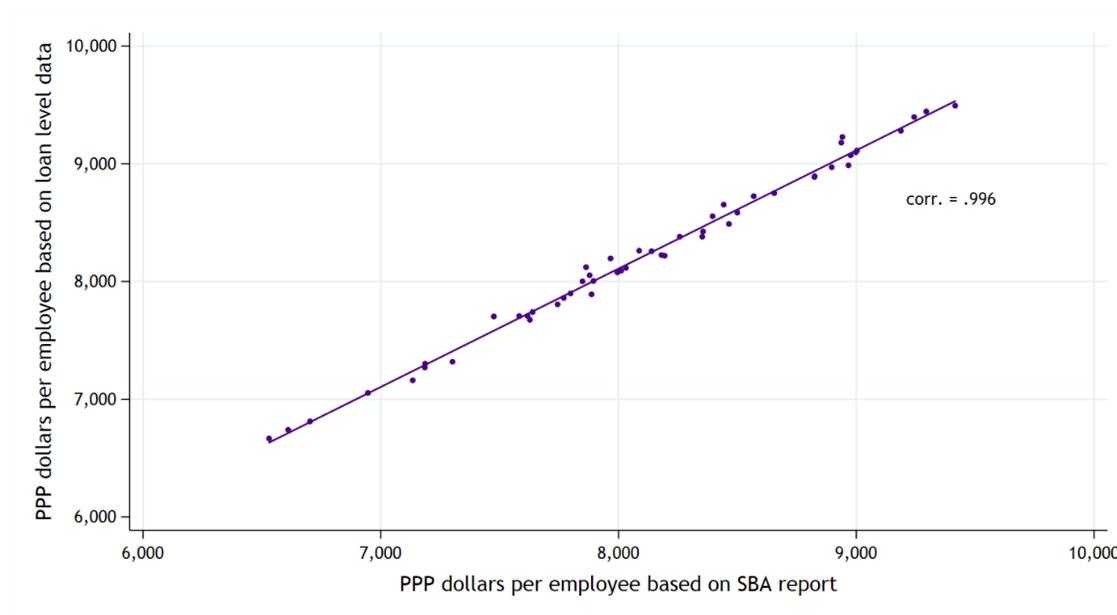
since many states imposed strict lockdowns and thus forced small businesses to shut down despite low average cases.

PPP lending patterns may also vary in relation to local area population, for a variety of reasons. For instance, the economic disruption caused by COVID-19 might vary with city population in ways not captured by the workplace mobility measure. Or, for example, more populated areas might benefit from economies of scale in the processing of PPP loan applications. More efficient application processing in turn would lead to fewer applications being withdrawn, fewer errors, and therefore fewer applications being denied by the SBA.<sup>18</sup> We obtain county population size from the 2010 U.S. Census.<sup>19</sup>

As a check on the representativeness and reliability of the SBA loan-level data, we compare PPP loan amount per small business employee as calculated from the loan-level data to total PPP loan amount per employee from the SBA's July 10 published report, by state. The corresponding scatterplot comparing PPP dollars per employee between the two data sources by state, along with a trendline and diagonal, are shown in Figure 1.

This plot confirms the reliability of using the loan-level data for the purposes of our analysis. Although loan dollars per employee based on the loan-level data systematically exceed dollars per employee based on the SBA report, the gaps between the two measures are small and the correlation between them is 99.6 percent.<sup>20</sup>

**Figure 1: PPP Loan Volume per Employee by State Based on July 10 SBA Report versus Loan-Level Data**



<sup>18</sup> More populated areas also might benefit from more widespread transmission of information about the PPP program, through networking.

<sup>19</sup> We also took county population estimates from the 2018 American Community Survey. Use of these in place of 2010 populations does not materially affect our empirical findings.

<sup>20</sup> These gaps are consistent with news reports indicating that the loan-level data included some large loans that had not been accepted or had been immediately repaid by the recipients. Moreover, the SBA's published July 10 report shows fewer loans in the higher ranges than in earlier published reports from May and June. So another possible explanation is that the loan-level data had not been updated to exclude these observations.

We exclude non-CBSA counties from our study, due to high frequency of missing data for explanatory variables, and to avoid concerns about measurement error or omitted variables associated with these less-populated areas. With exclusion of non-CBSA counties, about 4.5 million loans remain in the SBA loan-level dataset.

After merging the SBA data, SUSB data, Census population data, and Google mobility data by county and CBSA, we further restrict the sample to counties that belong to a CBSA for which Google mobility data and employee shares by industry are available.<sup>21</sup> In addition, we restrict the sample to counties for which PPP dollars per small business employee fall in the range of \$1,250 to \$15,000.<sup>22</sup> After these exclusions, the resulting dataset comprises 1,713 counties, with mean and median values of PPP dollars per employee both equal to \$7,166. Table 1 reports summary statistics for this dataset.

**Table 1: Sample Summary Statistics for PPP**

Variable	Mean	Median	St. Dev.
Total PPP loan amount (\$000s)	286,371	62,115	858,809
Small business employment	32,940	8,916	89,066
PPP loan dollars per small business employee	7,166	7,116	1,754
Small business total annual payroll (\$000s)	1,493,385	314,837	4,861,155
Small business average annual payroll (\$000s)	36.4	35.3	6.8
Mobility	22.3	21.5	5.4
Log population	11.1	10.9	1.2
% SB employment: Construction	8.6	8.6	2.4
% SB employment: Prof., Scientific, & Technical Services	6.6	6.0	3.1
% SB employment: Healthcare & Social Assistance	15.8	15.1	4.0
% SB employment: Accommodation & Food Services	14.8	14.0	3.6
% SB employment: Retail Trade	10.6	10.4	2.4
% SB employment: Arts, Entertainment, & Recreation	2.2	2.1	1.1
% SB employment: firms with 0–19 employees	39.1	37.8	8.0
% SB employment: firms with 20–99 employees	34.1	34.9	5.6
% SB employment: firms with 100–499 employees	27.1	27.6	7.9

<sup>21</sup> Industry composition of small business employees are reported in the SUSB at the CBSA (metropolitan or micropolitan statistical area) level, while other data are from the county level.

<sup>22</sup> Shares by industry classification are unavailable for 40 counties, and Google mobility data are unavailable for 36 counties. The restriction on loan amount per small business employee excludes 6 apparent outlier counties.

## Categorizing Large Banks

In general, the nation's largest banks have different capacities and processes for small business lending compared with smaller regional and community banks and nonbank lenders. According to the [FDIC Small Business Lending Survey](#), larger banks have the resources to meet the demand for credit from borrowers with larger small businesses without having concerns about taking on excessive risk. They can also foster economies of scale and use substantial amounts of quantifiable information to support a high volume of small-business loans and customers.

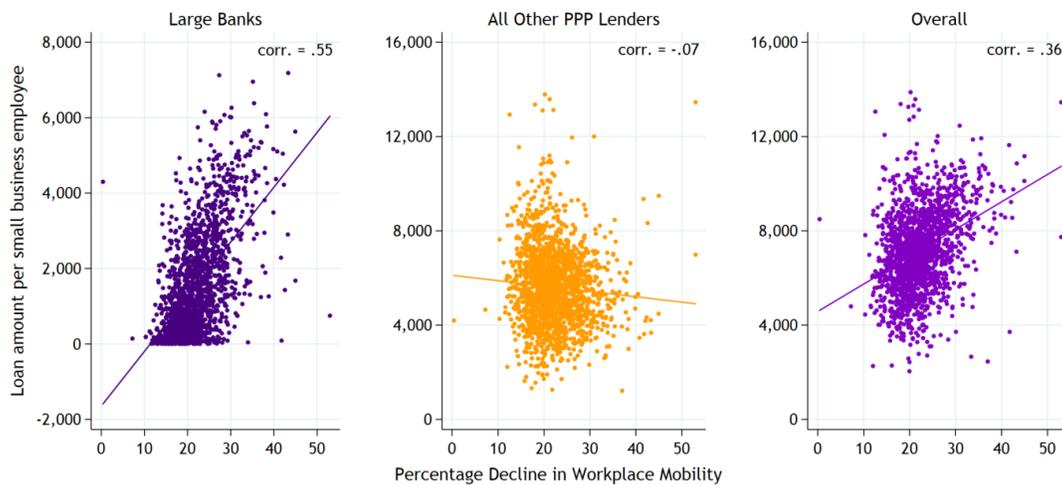
Therefore, we also conduct a separate analysis of PPP lending by large banks. For this purpose, we focus on the group of banks with at least \$50 billion in total assets as of the first quarter of 2020.

In the SBA loan-level data, 34 banks belong to this category. They originated 1.6 million individual loans for a total calculated loan amount of \$182.4 billion, corresponding to 35.6 percent of the total loan count and 37.2 percent of total dollars in the dataset.<sup>23</sup> At least one of these banks is present (had extended loans) in all but 22 of the 1,713 counties from our overall sample. The sample mean of county-level PPP loan dollars per employee from the group of large banks is \$1,580.

## PPP Loans Made to the Most Pandemic-affected Localities

Figure 2 displays scatterplots of counties positioned by PPP loan amounts per small business employee (y-axis) and percentage decline in workplace mobility (x-axis) for our regression sample. The left panel shows loans originated by large banking organizations (exceeding \$50 billion in total assets); the middle panel shows loans originated by all other lenders; and the right panel shows all PPP loans.

**Figure 2: PPP Loan Volume per Employee versus Economic Disruption in Counties**



Source: U.S. Small Business Administration, Paycheck Protection Program Report; U.S. Census Bureau; Google.

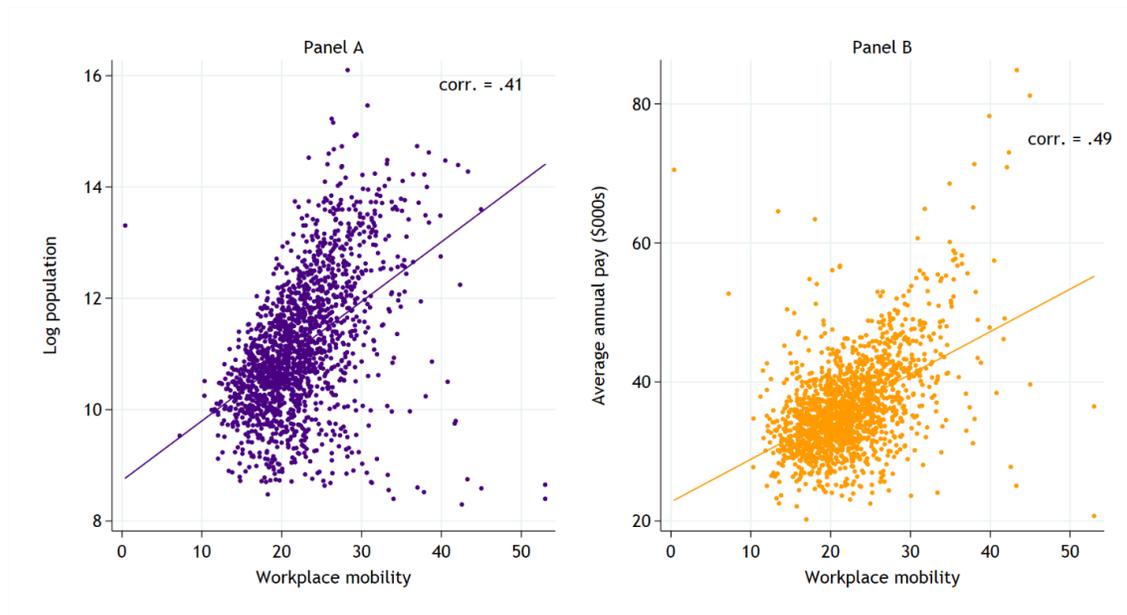
Note: The series plotted in the x-axis is the average percent decline in visits to the workplace relative to Google's baseline between February 15 and May 1, 2020.

<sup>23</sup> In comparison, the [SBA's aggregate report](#) published on July 10 shows that lenders over \$50 billion originated 1.64 million individual loans for a total loan amount of \$188.3 billion, corresponding to 33.4 percent of the total loan count and 36.4 percent of total dollars. The slightly higher share of these lenders in our dataset reflects our exclusion of non-CBSA counties.

The left panel shows strong positive correlation (55.1 percent) between PPP dollars per small business employee and decline in workplace mobility. This demonstrates that large banks dispersed more PPP loans to localities that experienced the highest economic disruption as a result of the pandemic. In contrast, the middle panel shows essentially no relationship—a slight negative correlation (–7.3 percent)—between the decrease in visits to the workplace and the PPP loans per employee made by other lenders. For the full sample, there is a positive correlation (35.6 percent) reflecting the lending behavior of large firms. The program thus appears to have allocated a larger share of funds to employees in counties more disrupted by the pandemic. Large banks were particularly active in this regard.

The association depicted in Figure 2 between PPP loan volume per small business employee and decline in workplace mobility across counties may reflect shared correlation with other factors. Panels A and B in Figure 3 present scatterplots of counties positioned by log of total population (y-axis in panel A) or average pay rates (y-axis in panel B) and percentage decline in workplace mobility (x-axis).

**Figure 3: County Population and Average Annual Pay per Employee versus Workplace Mobility**



Both log of county population and average pay are correlated with decline in workplace mobility (41.0 and 48.6 percent, respectively.) To sort out the independent relationships between these various factors and PPP loan volume, we turn now to a multivariate analysis.

### **Multivariate Regression Analysis**

The variation in PPP lending activity across localities reflects not only COVID-19 economic impacts but other key determinants for the demand of PPP loans, such as the size distribution of small businesses around the country. To disentangle the various factors, we estimate regression equations of PPP loan volume per small business employee in each county in relation to various potential explanatory variables from our data. This analysis is conducted both for the aggregate of all lenders and specifically for large banks.

We estimate two alternative regression equation specifications. The more parsimonious specification of the model incorporates decline in workplace mobility, log of population size, average pay, and industry mix of small businesses as explanatory variables. A second specification also includes share of local, small business employees who are at firms with fewer than 20 employees. This additional measure indirectly controls for a potential effect of differential access to PPP funds between smaller and larger firms, but it is correlated with city size and workplace mobility.

Industry mix is controlled for by share of small business employment in certain two-digit NAICS sector codes. We include employee shares for the following sector classifications in our baseline specification, because we view them as economically meaningful in the COVID-19 context and because they are indicated to be statistically significant: Construction (NAICS code 23); Professional, Scientific, and Technical Services (“Professional Services”, 54); Health Care and Social Assistance (62); and Accommodation and Food Services (72).

We employ robust standard errors to control for heteroskedasticity. Estimation results for the full sample are shown in Table 2.

The estimated equation confirms a positive, statistically significant relationship between PPP dollars per employee and decline in workplace mobility (decline in visits to the workplace.) Controlling for other important factors, the program therefore aligned with its objective of countering the economic disruption caused by COVID-19, by allocating more dollars per employee to harder-hit areas.

The regression also indicates that counties with larger populations tended to receive more PPP funds per employee. This association may reflect unobserved factors related to either demand or supply across localities of different size.<sup>24</sup>

In addition, we observe a positive and statistically significant coefficient on share of small business employees at firms with fewer than 20 employees in the column (2) specification in Table 2. This relationship is consistent with these smaller firms receiving more benefit from the PPP program than their larger counterparts, after controlling for other important factors. Given concerns that smaller firms may have had more difficulty accessing the program, this is an important finding.

Three of the four industry sector share measures included in the regression exhibit a negative and statistically significant relationship to PPP loan volume per employee. This indicates that these sectors are underrepresented among recipients of PPP funds, as measured by dollars per employee. These sectors are Professional Services, Healthcare and Social Assistance, and Accommodation and Food Services.

Plausibly, business continuity might explain the negative estimated coefficients for Professional Services and in Healthcare and Social Assistance; these businesses may have been less likely to discontinue operations. The negative estimated coefficient for Accommodation and Food Services may reflect relatively low pay rates for employees in this sector.<sup>25</sup>

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<sup>24</sup> It may be that PPP did not reach smaller and rural communities as effectively, consistent with previous [studies](#) that suggest that small businesses in rural areas may be underserved. Alternatively, rural small businesses may have lower funding needs, as suggested by findings from the Federal Reserve’s [2016 Small Business Credit Survey](#).

<sup>25</sup> The Accommodation and Food Services sector is characterized by substantially [lower average hourly earnings](#) compared with other sectors. Alternatively, businesses in this sector may have forecast less of a chance of survival at their current employee headcount, inducing many of them to protractedly reduce employee count and payroll or to permanently close.

The positive sign on share of small business employment in Construction may reflect expectations on the part of businesses in this sector—i.e., that the business disruption will be near-term and temporary. Consistent with this interpretation, a survey of construction businesses conducted in April 2020 by the [U.S. Chamber of Commerce](#) found that, despite widespread project delays due to the pandemic, more than 8 in 10 contractors say their revenue will increase or remain about the same in the next year.<sup>26</sup>

**Table 2: Estimation Results from County-Level Regressions**

	PPP loan dollars per small business employee	
	(1)	(2)
Decline in Workplace Mobility	29.45** (13.58)	25.20* (13.45)
Average Pay	122.7*** (10.21)	128.2*** (10.24)
Log Population	170.1*** (47.47)	213.9*** (51.12)
% Employment: Construction	51.36*** (15.04)	42.68*** (15.24)
% Employment: Professional Services	-39.53*** (14.60)	-46.44*** (14.86)
% Employment: Healthcare & Social Assistance	-24.78** (9.721)	-24.03** (9.690)
% Employment: Accommodation & Food Services	-17.24* (10.14)	-18.92* (10.17)
% of Small Business Employees at Firms with 0-19 employees		15.67** (6.893)
Observations	1,713	1,713
Adjusted R <sup>2</sup>	0.364	0.367

<sup>26</sup> In addition, most contractors (60 percent) report having at least 6 months of backlog projects, and three in four report having “moderate or high confidence that the next year will bring sufficient new business opportunities.”

Finally, the estimated equation indicates that PPP dollars per employee increase with the average pay of small business employees, confirming the importance of controlling for average wage levels across localities. This relationship is as expected, since the maximum permitted loan amount is based on a company's payroll costs.

### **Robustness Analysis**

We confirm robustness of the regression results along several dimensions. First, we test for relationships to share of small business employment for other NAICS sectors, such as share of small business employment in Retail Trade (NAICS codes 44 and 45). None of these additional variables are statistically significant, and we observed no material impact on other estimated coefficients from including them.

In addition, the results are robust to re-including six apparent outlier observations of the dependent variable that we had excluded from the sample (by restricting to observations with PPP dollars per employee in the range between \$1,250 and \$15,000). The adjusted R-squared value of the regressions declines somewhat (for instance, to 32.7 from 36.4 percent for the first specification), but estimated coefficients are not materially affected.

Finally, we check robustness to deleting loans of amounts \$5 million or more to businesses identified as belonging to the Accommodation and Food Services industry classification (NAICS code 72). Recall that the CARES Act exempts these businesses from the general size eligibility requirements of the PPP program, if they have more than one physical location and no more than 500 employees at any one location. Therefore, the (headquarters) location associated with a large loan to a business in this industry sector may differ from the locations where many of the employees are found, contributing to measurement error in the dependent variable of the regression model. We find that dropping these loans from the sample has no material impact on the estimation results.

**Large Bank Regressions.** Estimation results for the large bank sample are shown in Table 3. The primary relationships of interest are qualitatively similar to those for the full sample. Consistent with the scatterplots in Figure 2, we observe a strong association between PPP dollars per small business employee and decline in workplace mobility, as indicated by the larger size estimated coefficient and significance levels compared with Table 2.

We also observe a comparatively strong association between local area population and PPP dollars per employee from large banks. This comparative relationship is consistent with previous [studies](#) that find that small businesses in rural areas tend to rely on community banks for their financing needs.

The estimated relationships to industry sector shares shown in Table 3 are different from those for the full sample from Table 2. These changes might reflect different specializations by type of lending across lender categories.

**Table 3: Estimation Results from County-Level Regressions for Large Banks**

	PPP loan dollars per small business employee	
	(1)	(2)
Decline in Workplace Mobility	66.40*** (6.45)	62.09*** (6.67)
Average Pay	26.62*** (4.87)	32.37*** (4.94)
Log Population	443.97*** (28.35)	486.77*** (30.50)
% Employment: Construction	-15.79 (10.73)	-24.75** (10.69)
% Employment: Professional Services	41.48*** (9.19)	34.48*** (9.34)
% Employment: Healthcare & Social Assistance	-5.52 (6.84)	-4.48 (6.85)
% Employment: Accommodation & Food Services	-15.95** (6.76)	-17.73*** (6.79)
% of Small Business Employees at Firms with 0-19 employees		15.94*** (3.83)
Observations	1,691	1,691
Adjusted $R^2$	0.482	0.487

### Quantitative Relationships from the Estimated Regression Equations

The materiality of the relationships implied by the estimated regression equation can be inferred from applying the estimated coefficients to hypothetical differences in area characteristics. Table 4 presents results from such an exercise, calculating the increase in PPP dollars per employee associated with differences in the explanatory variables. These incremental amounts are shown both in total dollars and in relation to (as a percent of) dollars-per-employee in the average county.

As shown in the first row of Table 4, a county with a 40-percent decline in visits to the workplace thus received an additional \$756 per employee compared with a county with a 10-percent decline in visits to the workplace. The

additional PPP funds represent a 10½ -percent increase relative to the sample average. A steeper relationship is observed for large banks. A county with a 40-percent decline in visits to the workplace receives an extra \$1,863 in PPP loan per employee from large banks relative to a county with a 10-percent decline. These additional PPP funds represent a 118-percent increase relative to the sample average for large banks.

As we have noted, the regression estimates indicate that counties with larger populations tended to receive more PPP funds per employee. For instance, a county with a population of 1 million received 7 percent more PPP dollars per employee compared with a county with a population of 100,000.

PPP loan amount per employee is also positively associated with the share of local small business employees at firms with fewer than 20 employees. Again, this association is relatively strong for large banks. Specifically, we find that a county with twice the share of smaller firms receives 25 percent more PPP loans per employee from large banks compared with another county.

**Table 4: Estimated Relationships to PPP Dollars per Employee**

	All PPP lenders		Large Banks	
	Increase in PPP \$ per Employee	As % of \$7,166 Sample Average	Increase in PPP \$ per Employee	As % of \$1,580 Sample Average
<b>Decline in mobility</b> 40 versus 10 percent	\$ 756	10.5%	\$ 1,863	117.9%
<b>Population</b> 1 million versus 100,000	\$ 493	6.9%	\$ 1,121	70.9%
<b>Small-firm share</b> 50 versus 25 percent	\$ 392	5.5%	\$ 399	25.2%

**Conclusion**

Summing up, the predominant determinant of the volume of PPP lending in a county is total employee count and payroll amount at small businesses in that county (Barrios et al. 2020). However, PPP tended to offer a larger volume of loans per small business employee in areas more affected by COVID-19. We find that large banks were particularly active in areas hardest hit by the pandemic.

In addition, the analysis indicates that more highly populated counties received more PPP funds per employee. Firms in smaller and rural communities may have had less success accessing the program, or they may have had lower financing needs. For instance, population size may control for differing characteristics of small businesses that affected the demand for PPP funds across localities.

And finally, we find that PPP loan amount per employee is positively associated with the share of local, small business employees at firms with fewer than 20 employees, contrary to the notion that smaller firms had less access to PPP funds. This relationship is also relatively strong for large banks.

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