Appendix to "Measuring the labor market at the onset of the COVID-19 crisis"

Alexander W. Bartik, Marianne Bertrand, Feng Lin, Jesse Rothstein, Matthew Unrath

Data

CPS

We use data from the Current Population Survey public use microdata files for January through June 2020.

To ensure comparability over time, the labor force status questions in the CPS are maintained unchanged from month to month. However, these questions were not designed for a pandemic.[1] In ordinary times, people without jobs are counted as unemployed only if they are available for work and actively engaged in job search, so someone who would like a job but is not actively looking due to shelter-in-place rules would be counted as out of the labor force. Similarly, the coding structure is not designed to measure workers who are sheltering at home due to public health orders, individualized quarantines, or school closures. Consequently, beginning in March, CPS surveyors were given special instructions (Bureau of Labor Statistics 2020c): people who had jobs but did not work at all during the reference week as a result of quarantine or self-isolation were to be coded as out of work due to "own illness, injury, or medical problem," while those who said that they had not worked "because of the coronavirus" were to be coded as unemployed on layoff. Interviewers were also instructed to code as on temporary layoff people without jobs who expected to be recalled but did not know when, a break from ordinary rules that limit the category to those who expect to be recalled within six months. Despite this guidance, many interviewers seem not to have followed these rules, and unusually large shares of workers were classified as employed but not at work for "other reasons," while the share coded as out of the labor force also rose.

[1] The CPS is conducted via a combination of telephone and in-person interviews. In-person interviews were suspended and two call centers were closed mid-way through data collection for the March survey, to avoid virus transmission. Although the Census Bureau attempted to conduct the surveys by telephone, with surveyors working from home, the response rate in March was about ten percentage points lower than in preceding months, and continued to fall in subsequent months. While this may have impacted the accuracy of the survey, BLS's internal controls indicate that data quality is up to the agency's standards.

BLS added several new questions to the May CPS to better probe job loss due to the pandemic (BLS 2020b). At this writing, results from these questions are not yet available.

Our analyses focus on the distinction between employed at work and all other statuses, and do not rely on the classification of those not working as furloughed, on leave, unemployed, or out of the labor force.

A last issue with the CPS concerns seasonal adjustment. Neither multiplicative nor additive seasonal adjustment procedures are appropriate to an unprecedented situation. All CPS statistics that we report are not seasonally adjusted.

Homebase

In our analyses of Homebase data, we focus on Homebase's clients as the unit of analysis. In a few cases, a single client stretches across multiple geographic areas. We separate clients into separate units for each industry, state, and metropolitan statistical area (MSA) in which the client operates, and treat these units as "firms."

All of our analyses of Homebase data consider hours worked as a fraction of hours worked in the base period, January 19-February 1. We construct aggregate hours indexes at the state or industry level, separately for daily and weekly analyses. For daily analyses, we divide hours each day after February 1 by average hours for the same day of the week in the base period. For weekly analyses, we divide by average weekly hours during the base period.

Figures A1-A3 present descriptive statistics for the Homebase data.

We also rely on a survey we conducted of Homebase workers. Table B1 compares the characteristics of survey responses with those of other Homebase workers who did not respond to the survey invitation. Table B2 presents summary statistics for the survey responses. We restrict the sample for this table and all analyses of the survey data to workers who were active users of the Homebase platform during our late January base period and who have not worked at more than one Homebase firm (as defined above) since January 19, 2020. Figure B1 shows the distribution of hours worked during the base period for survey respondents and non-respondents, while Figure B2 shows the time series of daily hours worked for the two groups.

Kronos

We obtained a tabulation of "punches" (daily sign-ins) from Kronos, a firm that offers time-clock and payroll services similar to those provided by Homebase but serves larger businesses. The tabulation reports the total number of shifts worked at firms with more than 100 employees who use the Kronos time-and-attendance service.

Additional analyses

We conducted a number of additional analyses that were not presented in the main paper.

Figure C1 presents monthly employment by industrial sector or aggregate from the Current Employment Statistics firm survey.

Figure C2 shows the distribution of hours worked at Homebase firms, by week, limiting attention to firms that shut down for at least one week by April 4. We divide the total base period hours for each firm into four groups for each subsequent week *w*: Hours worked in the base period by firms that are closed in week *w*, the difference between base-period and week-w hours for firms that have positive hours in week *w*, hours worked in week *w* by workers who had worked with the firm before it shut down, and hours worked in week *w* by workers who were new to the firm after it shut down. These categories are mutually exclusive, and sum to the total base period hours.

Figure C3 provides another look at turnover at Homebase firms. Here, we do not restrict to firms that shut down, but instead measure the share of hours worked on each day by workers who were with the firm in our late January base period. We also compute similar statistics for 2018 and 2019, defining similar base periods in those years.

Figure C4 presents selected percentiles of the distribution of weekly hours among Homebase workers with positive hours in each week.

Figure C5 shows two views of firm survival in the Homebase data. The left panel shows the share of firms that were active in the base period that also showed positive hours in each subsequent week, both for 2020 and for comparable periods in 2018 and 2019. The right panel shows the share of firms that were active in the base period and that had positive hours in *or after* each subsequent week. A firm that shut down in week *w* but subsequently reopened would be counted as surviving in week *w* in the right panel but not in the left.

Figure C6 shows the number of states that were under a shelter-in-place order at each date. We use the same definitions used in the text, counting a reopen order as ending the original shelter-in-place order.

Figure C7 presents an alternative specification for our event study estimates from Figure 5. Figure 5 included state-specific trends; we exclude them here. Note that the time effects presented in the lower panel of Figure 5 were the sum of the pure calendar time effects and the average of the state time trends; there is no such complication in Figure C7.

Figure C8 presents a second alternative to the event study specification. Here, we reincorporate the controls for state-specific trends, but also add a set of event time indicators where the event is a school shutdown.

Figure C9 presents an alternative specification for our analysis of PPP in Figure 6. There, we classified states into quartiles by the amount of small-dollar loans awarded to businesses in Homebase's primary sectors of retail and food services. In C9, we instead rank states by the total volume of PPP loans awarded, divided by total state payroll.

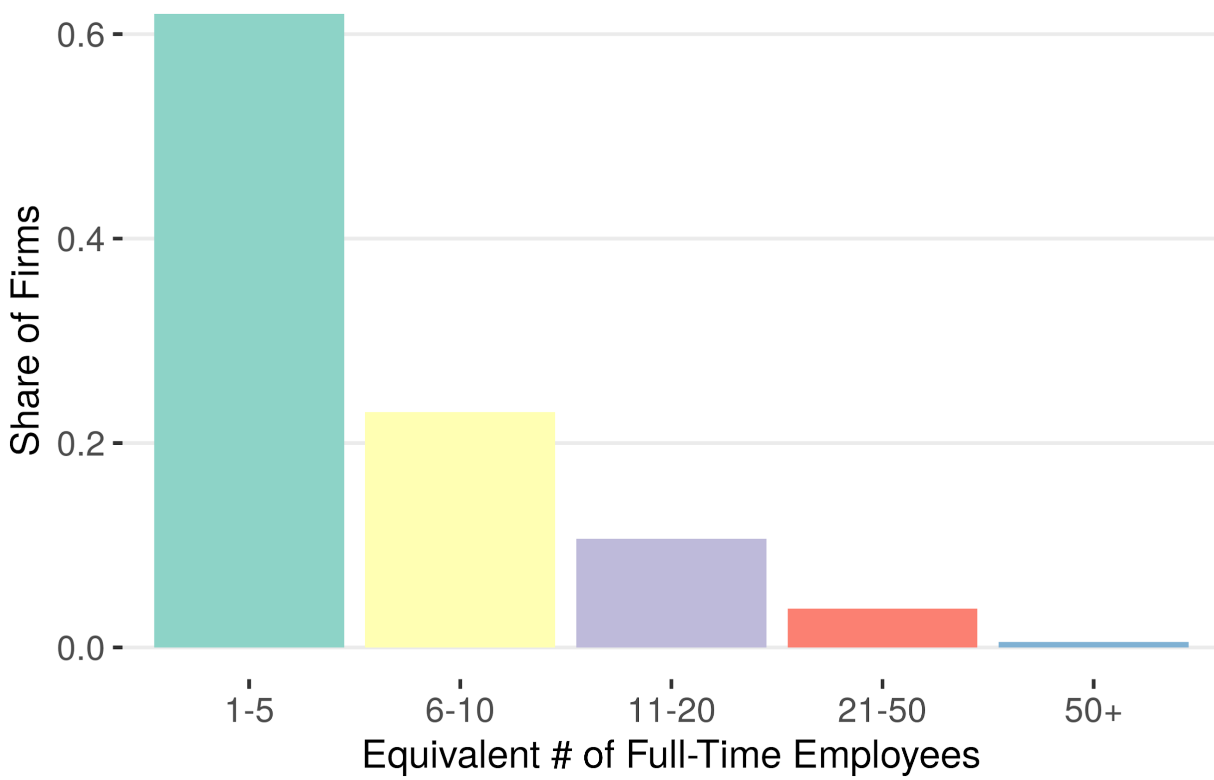
Table C1 presents regression estimates from logit specifications like in Table 1. The state fixed effects from those specifications are removed and replaced by sets of indicators for the state's PPP and UI replacement rate quartiles and, in columns 2 and 4, by census division fixed effects.

Figure C10 illustrates the distribution across states of the timing of initial payments under FPUC and the Pandemic Unemployment Assistance (PUA) program.

Finally, Figure C11 presents event study estimates of the effect of each of those two events.

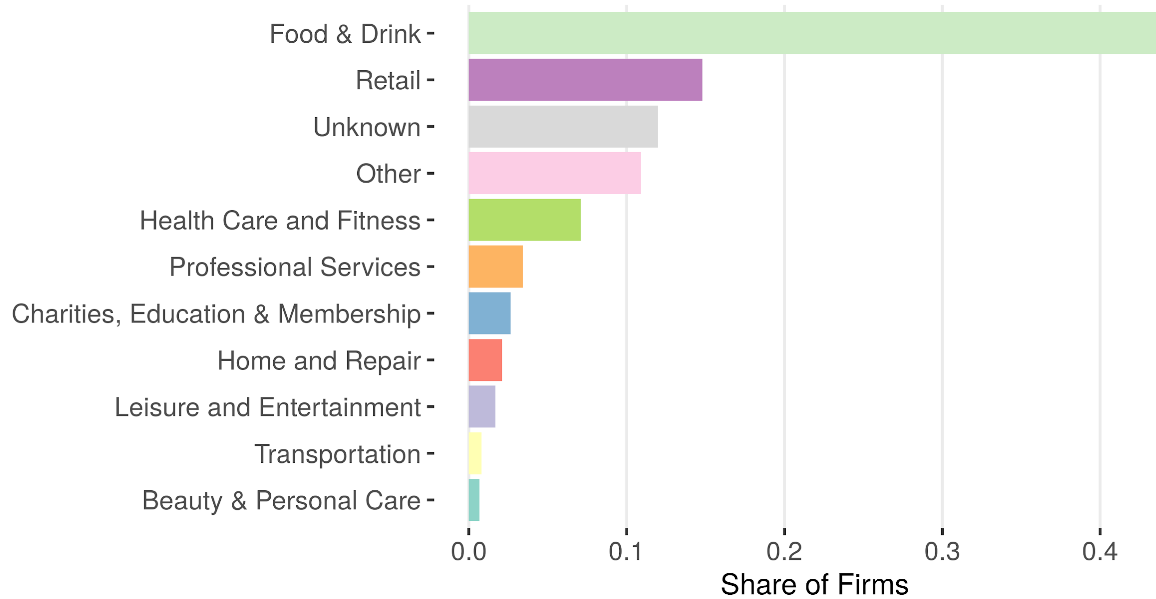
Appendix A. Representativeness of Homebase data

Figure A1: Firm Size Distribution of Homebase Firms



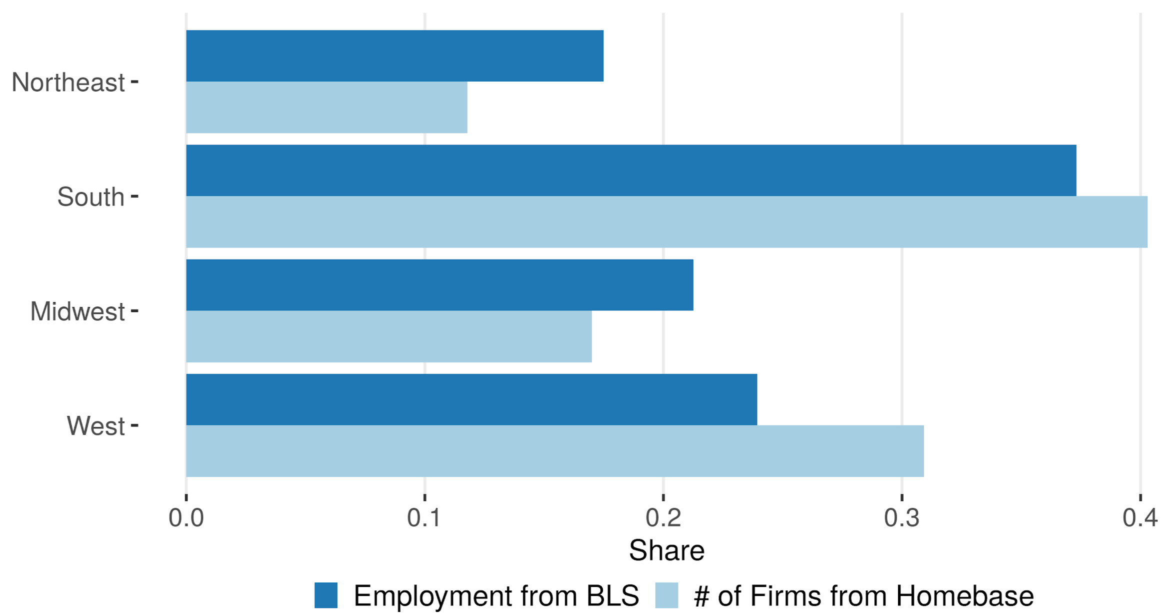
Notes: The full-time equivalent firm size is calculated by dividing total hours worked at the firm in the two-week base period by 80.

Figure A2: Industry Distribution of Homebase Firms



Notes: Industry coding is based on firm self reports.

Figure A3: Comparison of Homebase and BLS Data by Census Region



Notes: BLS data is employment counts by region from the Current Employment Statistics payroll survey, and pertains to January 2020.

Appendix B. Homebase worker survey data

Table B1: Characteristics of Homebase survey respondents

Characteristic	Respondent	Non-Respondent
Industry		
Beauty & Personal Care	0.2%	0.4%
Charities, Education & Membership	3.9%	3.5%
Food & Drink	46%	51%
Health Care and Fitness	5.5%	5.2%
Home and Repair	0.5%	1.3%
Leisure and Entertainment	3.1%	1.9%
Professional Services	3.1%	2.5%
Retail	12%	11%
Transportation	0.8%	0.8%
Other	13%	11%
Unknown	13%	11%
Census Division		
New England	3.2%	3.2%
Middle Atlantic	10%	9.1%
South Atlantic	19%	21%
East South Central	4.3%	4.6%
West South Central	8.6%	12%
East North Central	13%	11%
West North Central	7.3%	6.1%
Mountain	9.1%	9.2%
Pacific	25%	23%
Firm Size		
$[1, 5]$	30%	32%
$(5, 10]$	25%	26%
$(10, 20]$	21%	21%
$(20, 50]$	17%	15%
$(50, Inf]$	6.6%	5.4%
N	1,688	426,043

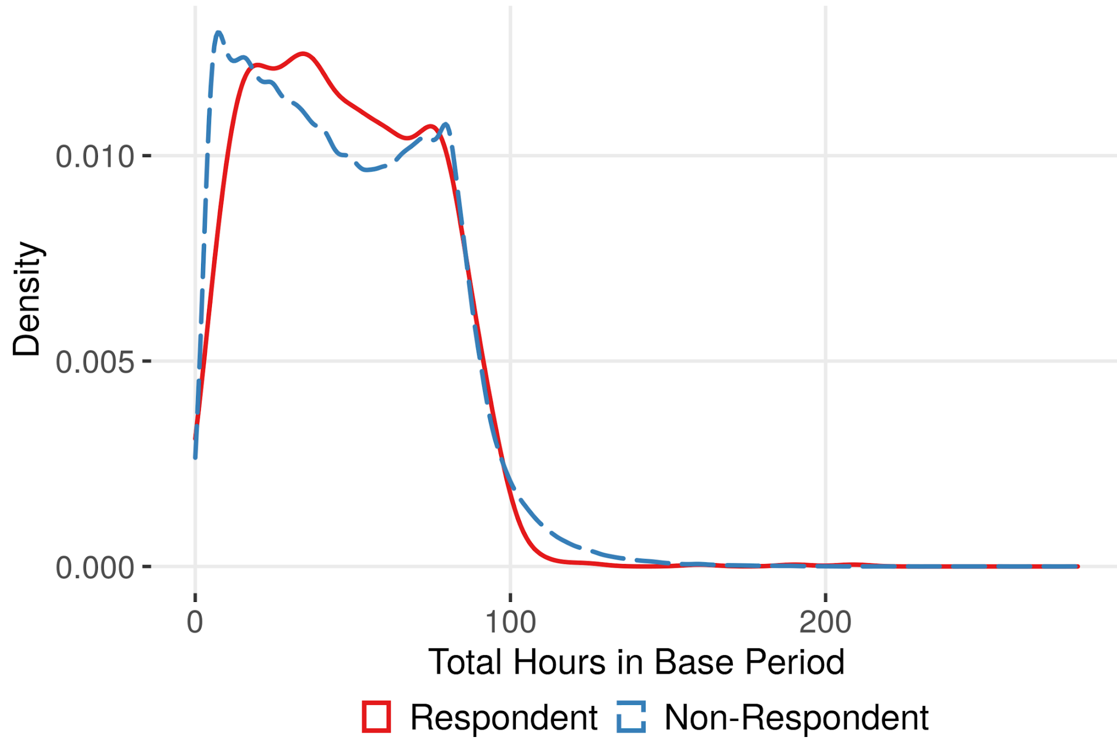
Note: The full sample is all workers who 1) worked at firms in our sample in our late January base period and 2) have worked for only one firm since January 19, 2020. All were invited to participate in the survey. Respondents are the subset of workers who responded to our survey.

Table B2: Demographics of Matched Homebase Survey Respondents

Demographics	Share	Demographics	Share
Gender		**Education**	
Female	67.0%	Some high school	6.9%
Male	30.6%	High school graduate	28.7%
Non-binary	2.4%	Two-year degree/some college	33.8%
Age		Bachelor's degree	23.5%
18-25	36.4%	Master's degree or more	7.1%
26-37	27.3%	**Household Income**	
38-49	16.3%	Less than $15,000	21.3%
50-64	15.4%	$15,000-$24,999	21.9%
65 or above	4.6%	$25,000-$34,999	15.1%
Race		$35,000-$44,999	8.7%
White	80.4%	$45,000-$54,999	7.1%
Black	10.7%	$55,000-$64,999	6.2%
Asian or Pacific Islander	7.7%	$65,000-$74,999	4.6%
American Indian or Alaskan Native	1.1%	$75,000-$84,999	2.7%
Ethnicity		More than $85,000	12.4%
Hispanic	16.4%	**Wage in Jan 2020**	
Non-Hispanic	83.6%	$5-$7.49	7.0%
Marital Status		$7.50-$9.99	15.0%
Single	55.1%	$10-$12.49	26.7%
Married	26.4%	$12.50-$14.99	20.8%
Living with partner	10.0%	$15-$17.49	15.8%
Separated	1.5%	$17.50-$19.99	4.8%
Divorced	5.8%	$20 -$22.49	4.0%
Widowed	1.2%	$22.50-$24.99	1.8%
Have Children		$25 or higher	4.1%
Yes	31.6%	**Job Title**	
No	68.4%	Employee	94.1%
Number of Children (if any)		Manager	5.9%
1	49.3%		
2	28.9%		
3	15.1%		
4	5.3%		
More than 4	1.4%		
N	1,688	N	1,688

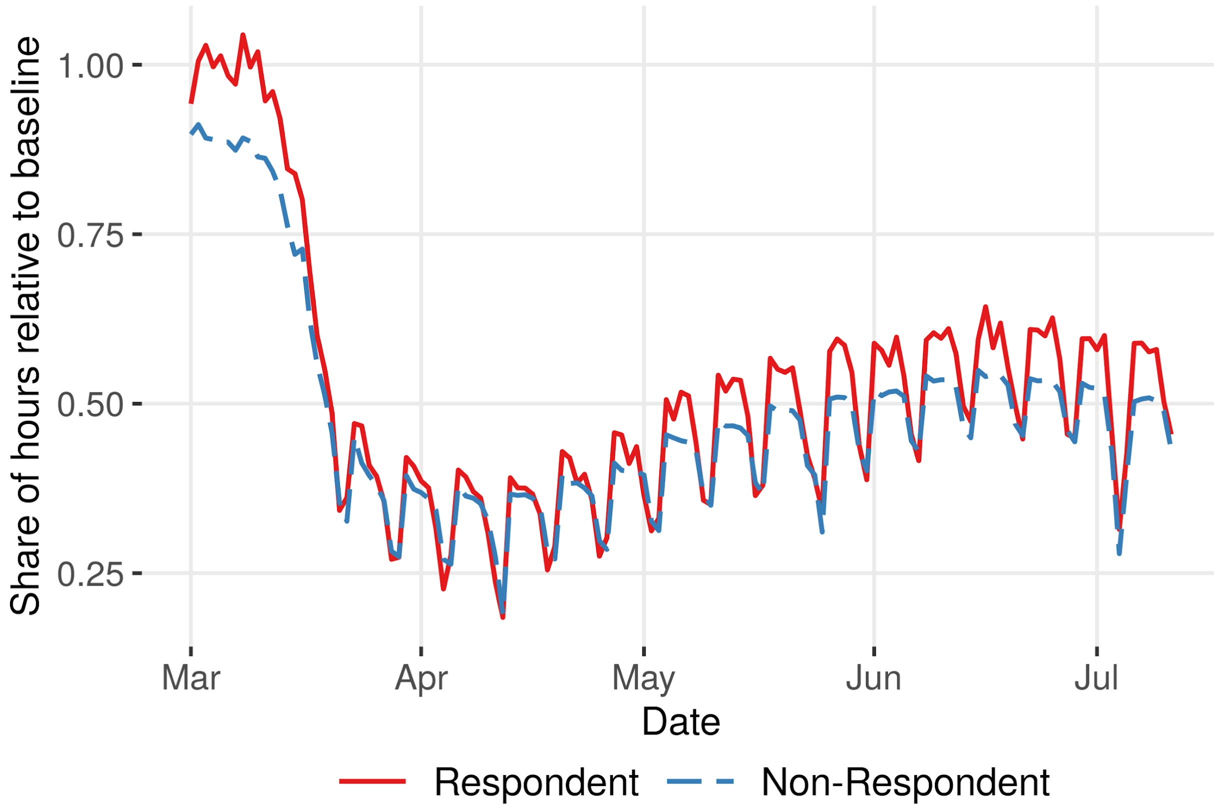
Note: The table reports the demographics of survey respondents who 1) are active workers in our base period and associated with firms in our sample and 2) have worked for only one firm since January 19, 2020.

Figure B1: Distribution of Base Period Hours for All Homebase Workers and for Survey Respondents



Note: The full sample is all workers who 1) worked at firms in our sample in our late January base period and 2) have worked for only one firm since January 19, 2020. Respondents are the subset of workers who responded to our survey.

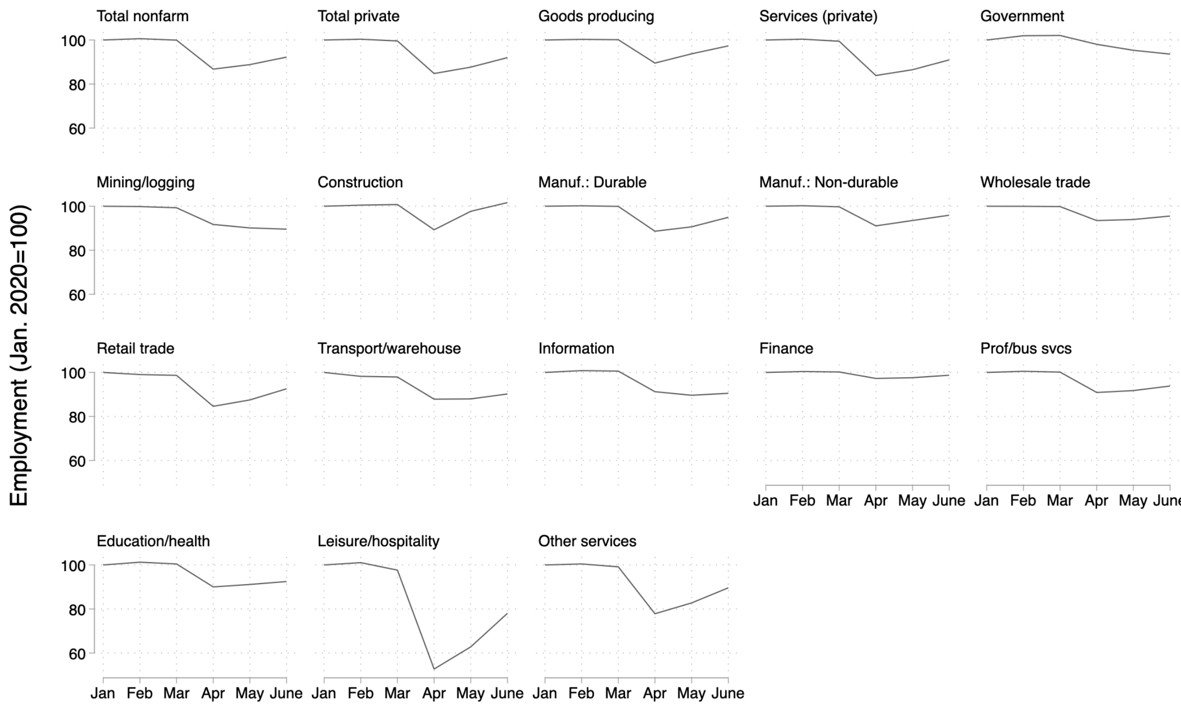
Figure B2: Trends in Hours for Survey Respondents and Non-Respondents



Note: The full sample is all workers who 1) worked at firms in our sample in our late January base period and 2) have worked for only one firm since January 19, 2020. Respondents are the subset of workers who responded to our survey.

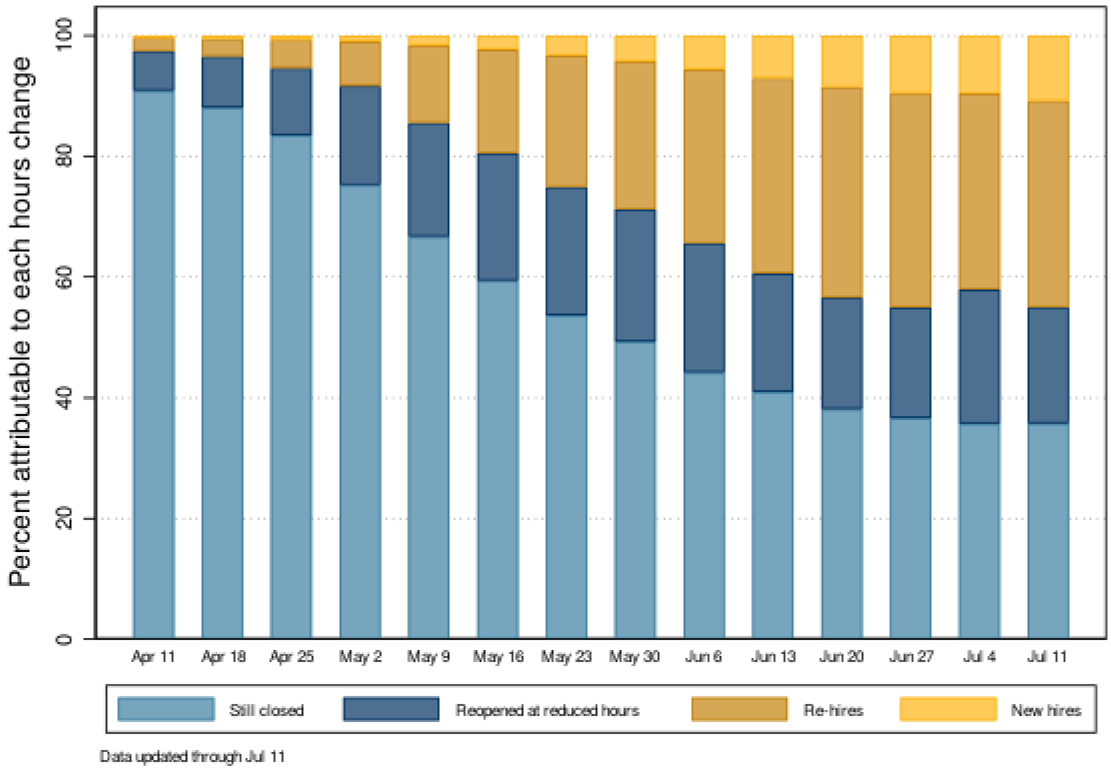
Appendix C. Additional results

Figure C1: Payroll employment by sector and month, 2020



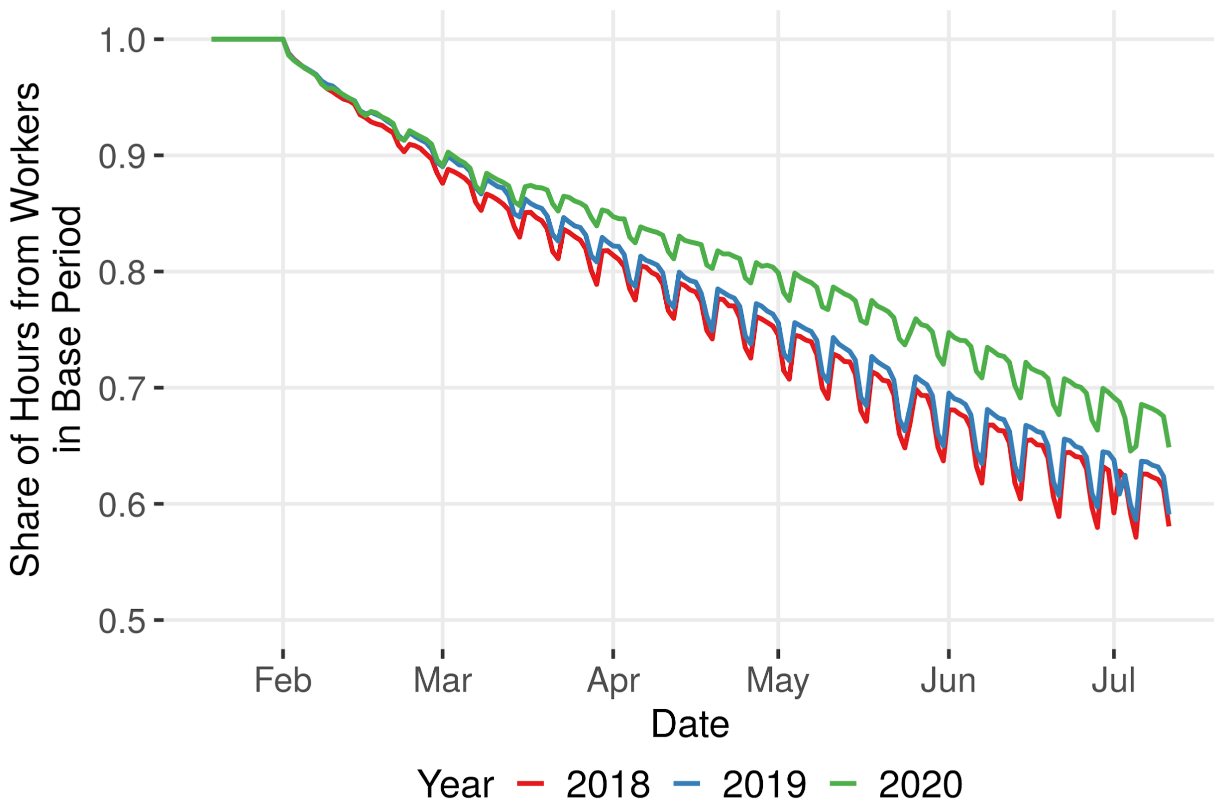
Notes: Payroll employment by industry or aggregate, scaled relative to January 2020, from the official Current Employment Statistics June 2020 release. The first four panels are aggregates that include many of the remaining series. Not seasonally adjusted.

Figure C2: Distribution of hours, relative to Jan 19-Feb 1, among firms that shut down by Apr 4



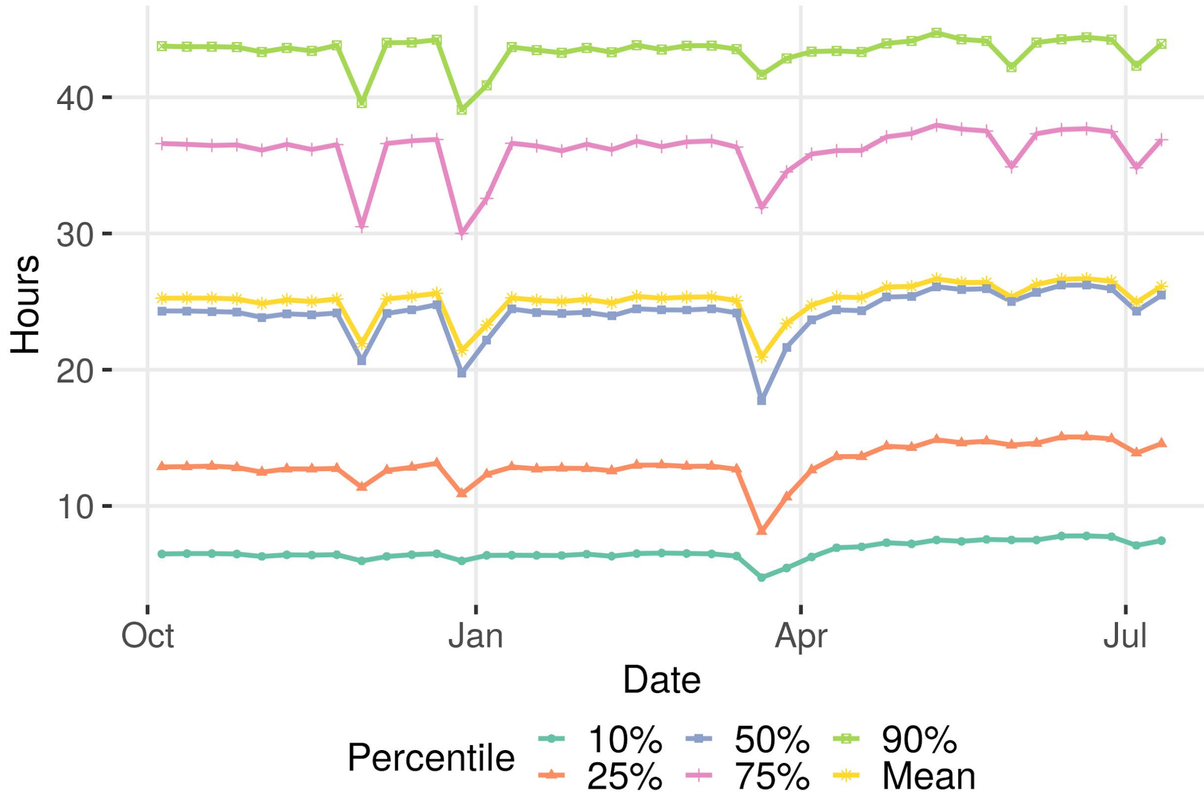
Notes: The sample consists of firms in our baseline Homebase sample that had at least one week of zero recorded hours by April 4. We identify the firms that remain closed through each subsequent week and sum their baseline hours (light blue). Among reopened firms, we distinguish reductions in total hours relative to baseline (dark blue), hours worked by workers who were employed at the firm before the firm shut down (golden) and hours worked by workers who had not previously been seen at the firm (yellow).

Figure C3: Share of hours by workers active in base period



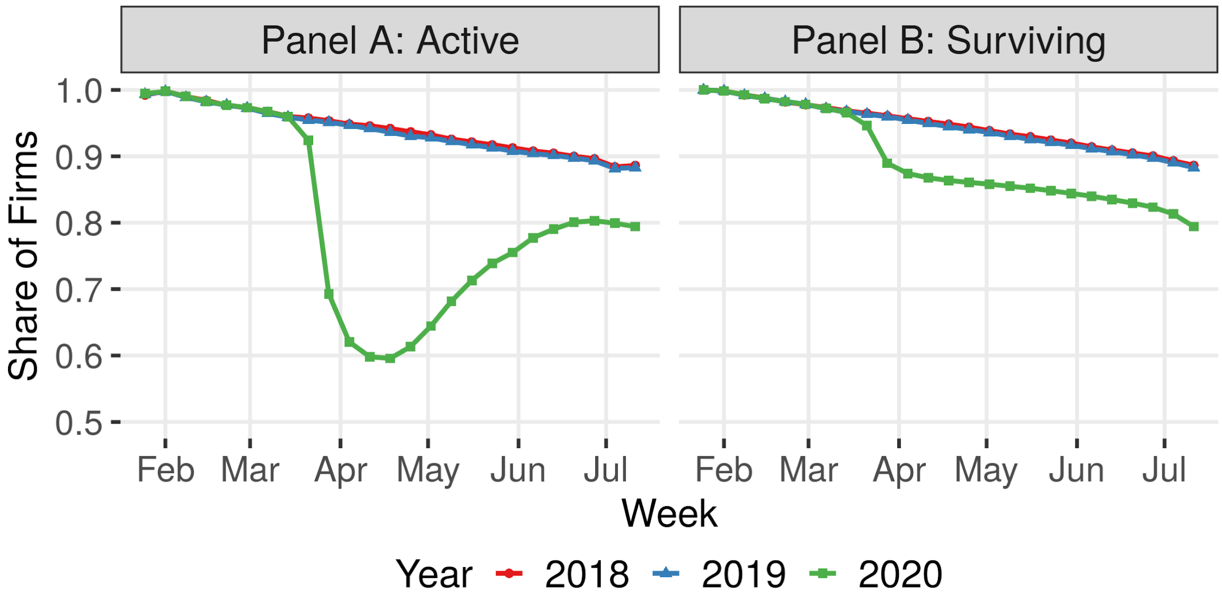
Note: The share shown in the figure is the share of hours worked on a given day coming from workers who appear in the Homebase data in the base period. The base period is two weeks at the end of January; for 2018 it is 1/21-2/3, for 2019 it is 1/20-2/2, and for 2020 it is 1/19-2/1. Firms included in the samples are those with at least 80 hours in the respective base period. The lines for 2018 and 2019 are shifted leftward (by two days and one day, respectively) to align days of the week with 2020.

Figure C4: Distribution of hours worked by active workers in the week



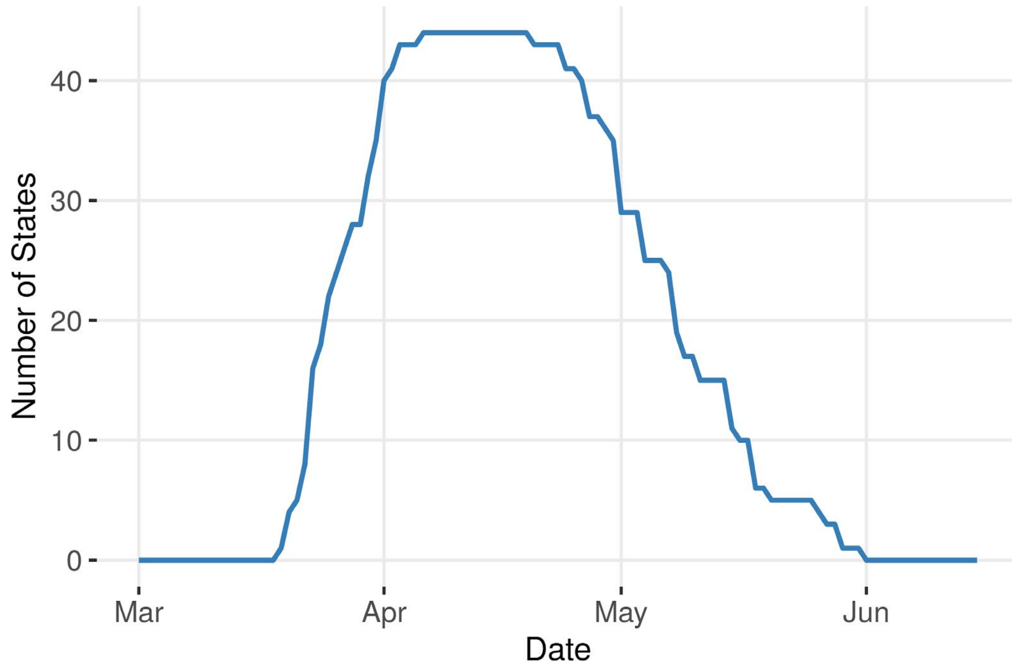
Note: Series show percentiles of weekly hours in October 2019-June 2020, among workers with positive hours that week. Hours are computed at the job level; a worker associated with multiple firms creates multiple observations. The late March blip reflects onset of the coronavirus crisis; also visible are the weeks containing Thanksgiving, Christmas and New Years, Memorial Day, and July 4.

Figure C5: Share of firms with positive hours in or after a given week



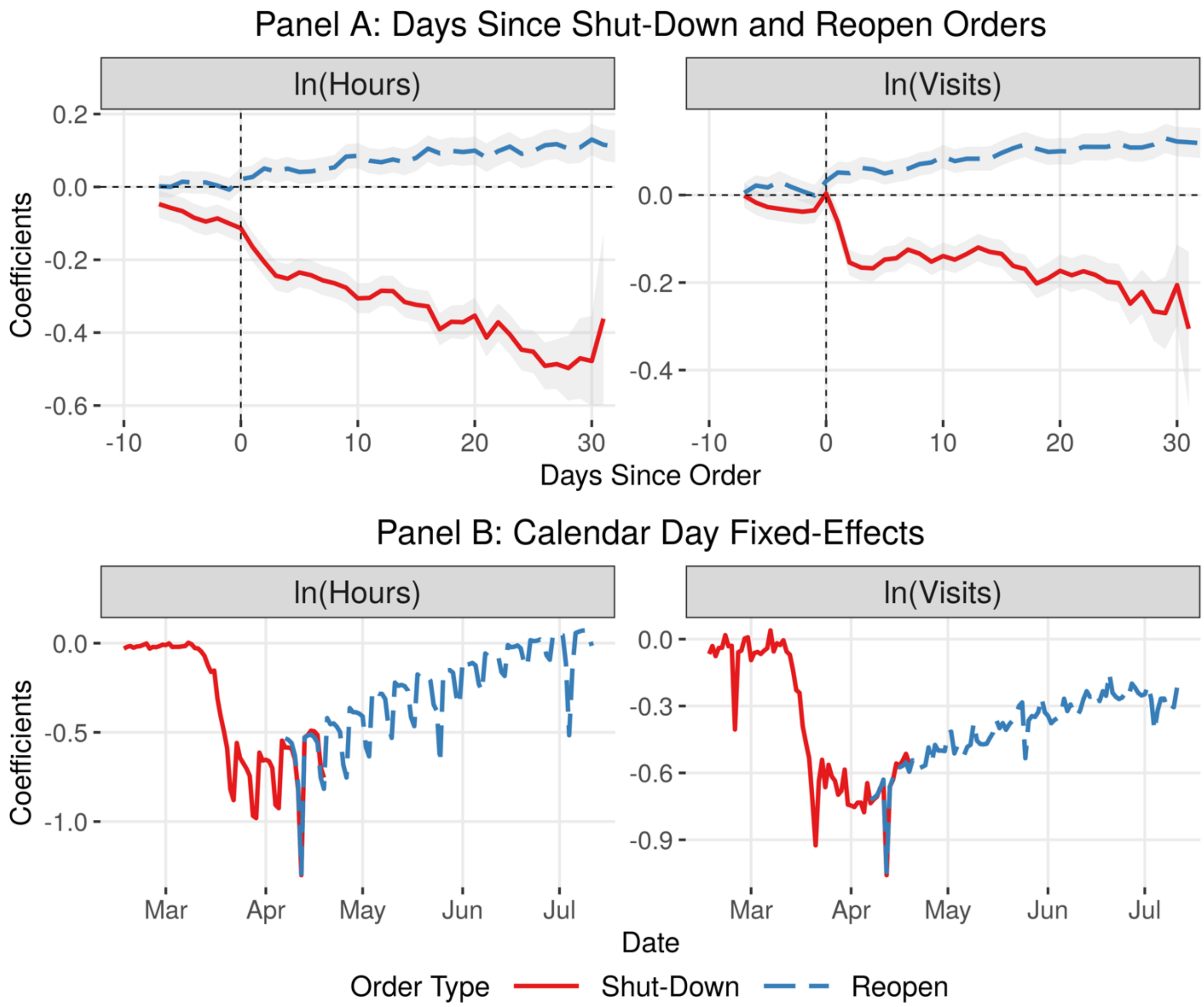
Note: Panel A shows the share of firms present in the base period that show positive hours in each week, while Panel B shows the share of firms with positive hours between the indicated week and the week containing July 11. The base period for each series is two weeks at the end of January; for 2018 it is 1/21-2/3, for 2019 it is 1/20-2/2, and for 2020 it is 1/19-2/1. Firms included in the samples are those with at least 80 hours in the respective base period. The lines for 2018 and 2019 are shifted leftward (by two days and one day, respectively) to align the end of weeks with 2020.

Figure C6: Timing of shelter-in-place and stay-at-home orders



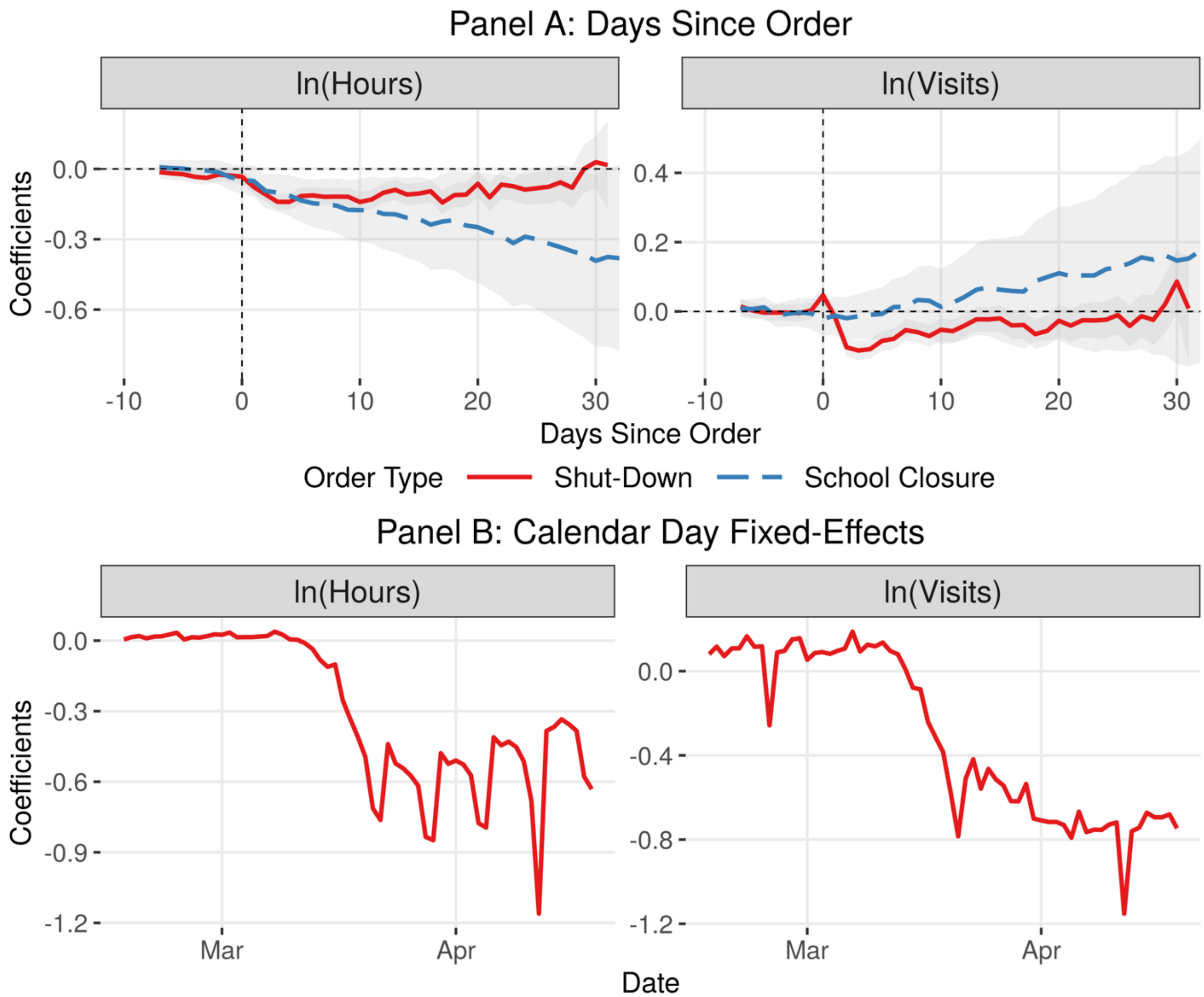
This plot shows the number of states with active shelter-in-place or stay-at-home orders between March 1st and mid-June 2020. We define orders as ceasing to be active on the first date that any business activity restriction is lifted.

Figure C7: Event study estimates of the effect of imposition and lifting of shelter-in-place orders without state-specific trends, with 95% confidence intervals



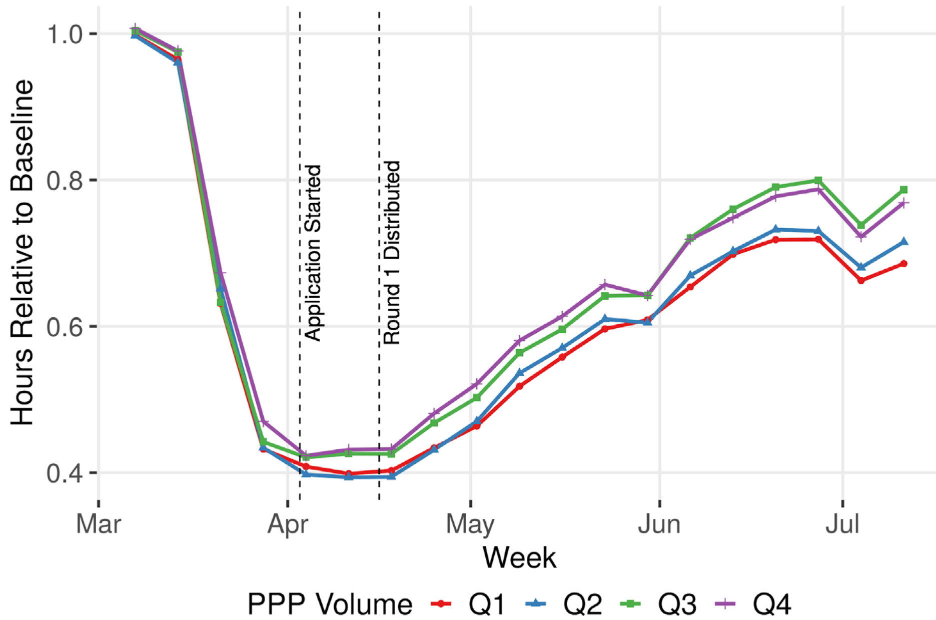
Notes: Samples for shutdown event studies consist of state-by-day observations from February 16 to April 19. Samples for the reopening event studies consist of state-by-day observations from April 6 to July 11; states that never had shelter-in-place orders are excluded. Specifications include full sets of state and calendar date effects. We exclude (normalize to zero) the effects for event times less than -7. The shutdown calendar time effects are normalized to zero on February 16. The reopening effects are normalized to align with the shutdown estimates on April 13. Shaded areas show 95% confidence intervals for the event time effects.

Figure C8: Event study estimates of the effect of shelter-in-place and school closing orders



Notes: We report estimates for a single event study model with two sets of event time indicators, for days relative to shut-down orders and days relative to school closings, along with calendar date effects, state fixed effects, and state-specific trends. Sample consists of state-by-day observations from February 16 to April 19. We exclude (normalize to zero) the effects for event times less than -7. The calendar time effects are normalized to zero on February 16. Shaded areas show 95% confidence intervals for the event time effects. Dates of school closure are from Education Week.

Figure C9: Hours trends by alternative measure of round 1 PPP amount, Homebase data



Notes: Figure reproduces Figure 6, using an alternative measure of PPP volumes. Here, states are ranked by the total volume of PPP loans received by April 16, divided by non-farm payroll in April 2019.

Figure C10: Initiation of Pandemic Unemployment Assistance (PUA) and Federal Pandemic Unemployment Compensation (FPUC) payments

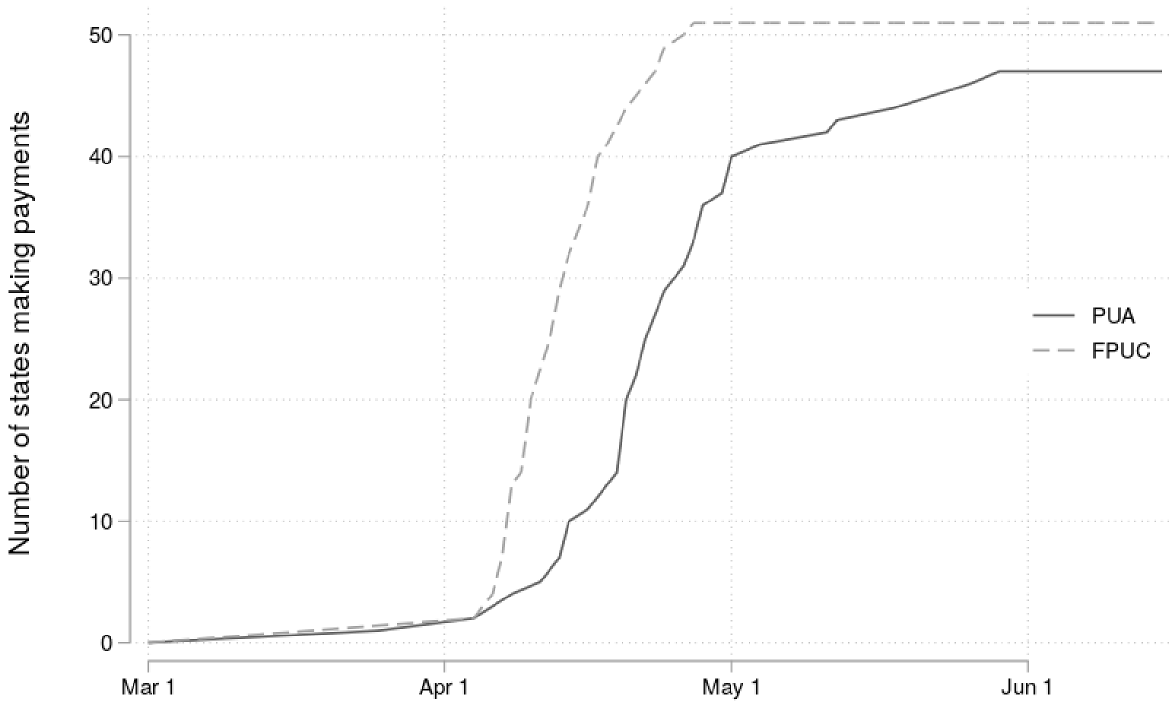
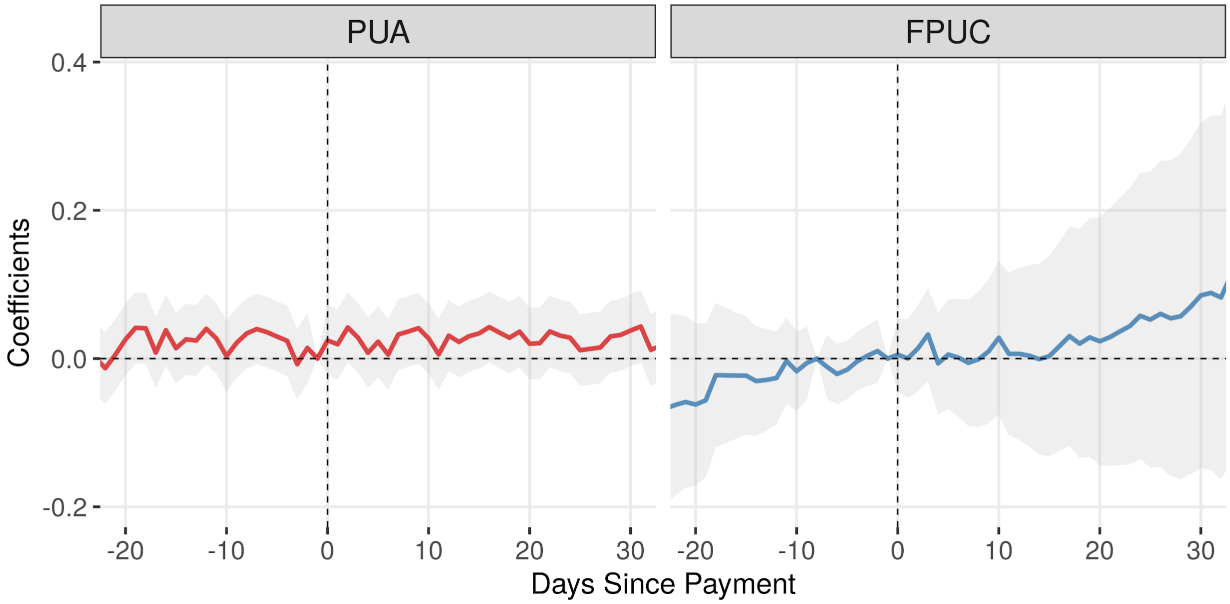


Figure C11: Event-study estimates of effects of PUA and FPUC payment starts on hours worked



Note: Panel PUA (respectively, FPUC) shows estimates from an event study model where the event is the beginning of Pandemic Unemployment Assistance (respectively, Federal Pandemic Unemployment Compensation) payments in the state. The sample is state-by-day observations from 2/16-7/11. Each specification includes an indicator of active stay-at-home order, a full set of state and calendar date effects, and all estimable event time effects. Event time -1 is normalized to 0 for both types of UI, and event time -8 is also normalized to 0 for FPUC.

Table C1: Variation in layoff and rehire probabilities with PPP payouts and UI replacement rates

	Logit: Stopped work in April				Logit: Started work in May or June			
	CPS		Homebase		CPS		Homebase	
PPP volumes								
Quartile 2	**-0.012**	**-0.038**	-0.005	-0.027	**0.041**	**0.044**	**0.124**	**0.137**
	(0.006)	(0.008)	(0.037)	(0.046)	(0.012)	(0.018)	(0.036)	(0.055)
Quartile 3	**-0.029**	**-0.027**	-0.019	-0.026	**0.043**	0.021	**0.154**	**0.189**
	(0.007)	(0.010)	(0.048)	(0.059)	(0.015)	(0.020)	(0.047)	(0.074)
Quartile 4	**-0.053**	**-0.067**	**-0.128**	**-0.193**	**0.044**	0.041	**0.152**	**0.246**
	(0.008)	(0.011)	(0.060)	(0.085)	(0.019)	(0.027)	(0.071)	(0.096)
UI replacement rates								
Quartile 2	**0.026**	**0.043**	-0.019	-0.000	**0.028**	0.018	0.008	0.031
	(0.006)	(0.008)	(0.041)	(0.043)	(0.013)	(0.015)	(0.039)	(0.047)
Quartile 3	-0.003	**0.020**	**-0.093**	-0.006	**0.040**	0.014	0.030	0.002
	(0.007)	(0.007)	(0.045)	(0.047)	(0.015)	(0.017)	(0.046)	(0.056)
Quartile 4	-0.012	0.015	-0.082	0.035	**0.043**	0.012	0.038	-0.048
	(0.007)	(0.010)	(0.056)	(0.057)	(0.018)	(0.023)	(0.057)	(0.074)
N	31,151	31,151	1,629	1,629	11,235	11,235	1,226	1,226
Division FEs	N	Y	N	Y	N	Y	N	Y

Notes: Table reports marginal effects from logit specifications for job leaving and beginning of work, using CPS (columns 1, 2, 5, 6) and Homebase data (3, 4, 7, 8). Samples, specifications and controls are identical to those in Table 1 (first and second specifications), except that we replace state fixed effects with indicators for three quartiles of the volume of PPP loans in a state, as a share of state non-farm payroll in April 2019, three quartiles of the median unemployment insurance replacement rate in the state (from Ganong, Noel, and Vavra, 2020), and, in even-numbered columns, division fixed effects. Washington, DC is excluded, as Ganong et al. (2020) do not report UI data for it.