The Impact of School and Childcare Closures on Labor Market Outcomes during the COVID-19 Pandemic

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Motivation

School closures have been controversial.

- "Schools aren't super spreaders." (Oster, 2020)
- Carry substantial costs to health and learning outcomes (e.g. Azevedo, Hasan, Goldemberg, Geven, and Iqbal (2021), Kuhfeld et al. (2020), Engzell, Frey, and Verhagen (2021), Larsen, Helland, and Holt (2021), Halloran, Jack, Okun, and Oster (2021), Fuchs-Schündeln et al. (2021), Goldhaber et al. (2022))
- Anectodal evidence suggests negative impact of school closures on parental labor supply (e.g. Brodeur (2020), Leonhardt (2020), Tedeschi (2020), Musaddiq, Stange, Bacher-Hicks, and Goodman (2021))

Research Question

- How have school and childcare closures affected parental labor market outcomes during the COVID-19 pandemic?

Literature Review

- COVID impacts on employment across gender and parental status
  - Albanesi and Kim (2021); Couch, Fairlie, and Xu (2022)
- What explains gaps for women/mothers?
  - Heggeness (2020); Alon, Coskun, Doepke, Koll, and Tertilt (2021); Furman, Kearney, and Powell (2021); Lofton, Petrosky-Nadeau, and Seitelman (2021); Barkowski, McLaughlin, and Dai (2021)
- School/Childcare (un)availability and parental labor supply
  - Gelbach (2002); Baker, Gruber, and Milligan (2008); Amuedo-Dorantes, Marcén, Morales, and Sevilla (2020); Russell and Sun (2020); Heggeness (2020); Collins, Ruppanner, Christin Landivar, and Scarborough (2021); Koppa and West (2022); Hansen, Sabia, and Schaller (2022)

Our Contribution

- We use county-level school and childcare closures data from Parolin and Lee (2021) and Lee and Parolin (2021).
- We analyze school and childcare closures together on parents of children of various ages as well as non-parents.
- We cover a later and longer time frame (August 2020 to April 2021) that includes the height of the pandemic (November 2020 to January 2021) in the United States, and first academic year (2020-2021) when schools were often closed at various points and for varying lengths of time.

Data - Labor Outcomes & Individual Characteristics

- Sample includes individuals aged 21 years old and over surveyed in the Basic Monthly Current Population Survey (CPS) from August 2020 to April 2021.
- Analysis is restricted to the subset of the sample with county identifiers (about 40% of the full CPS sample)

Data - School Closures

- From Parolin and Lee (2021)
  - Tracks in-person visits to the vast majority of K-12 public schools in the U.S.
  - Covers 94% of school districts spanning 98% of counties in the country

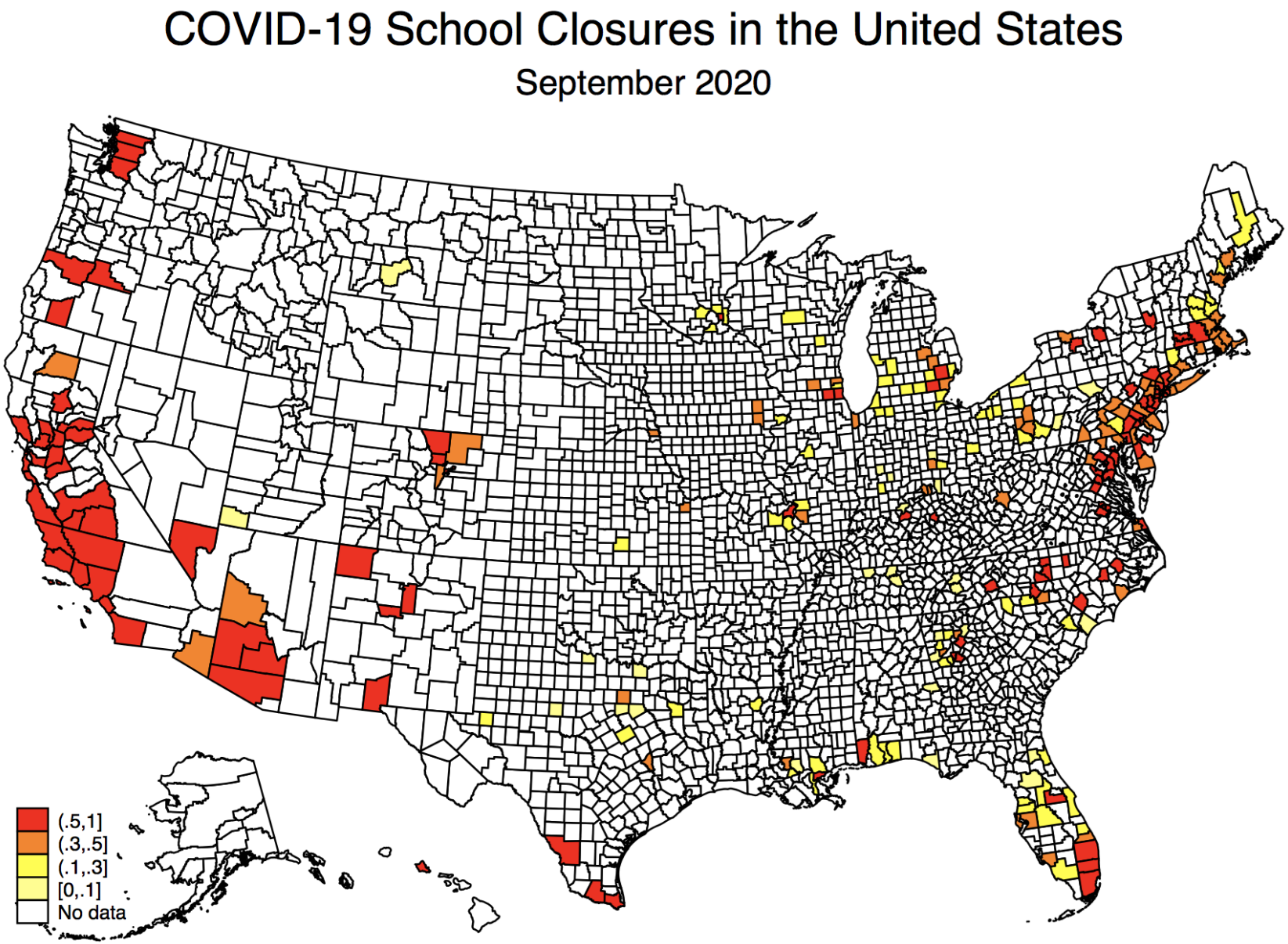
Data - Childcare Closures

- From Lee and Parolin (2021)
  - Tracks in-person visits in about 78 percent of the 109,414 total licensed child care institutions in the U.S.
  - The child care centers belong to NAICS code 62441, which identifies all centers that are "primarily engaged in providing day care of infants or children. These establishments generally care for preschool children, but may care for older children when they are not in school and may also offer pre-kindergarten and/or kindergarten educational programs."

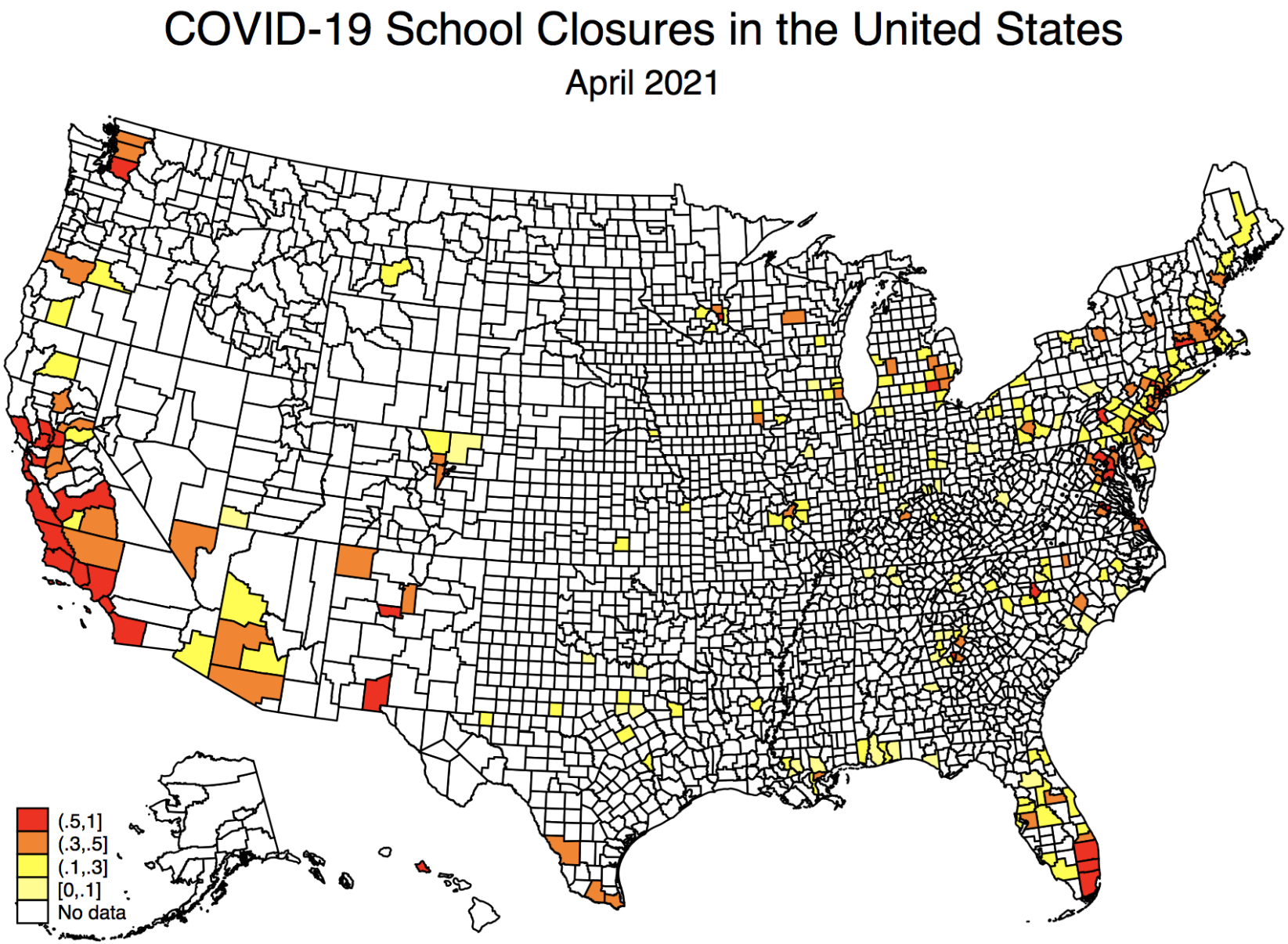
Data - School and Childcare Closures

- To measure school or childcare closures, the authors use aggregated and anonymized mobile phone data from SafeGraph.
- They track year-over-year changes in the number of visitors to each individual school or childcare facility in each month.
- Estimates for 2021 are compared to visit counts in the same month in 2019.
- Schools are considered "closed" if there is at least a 50 percent year-over-year decline in the number of visits.

School closures



School closures



Data - COVID-19 Controls

- The number of confirmed COVID-19 cases and deaths at the county-level are acquired from the database maintained by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (CSSE, 2020).
- COVID state policies come from the Kaiser Family Foundation database.

Estimation Strategy

To measure the impact of school closures on employment outcomes using the repeated cross-sectional CPS data, we use the following base specification:

$$Y_{ict} = X_{ict}\alpha + \beta_1(schoolagechild_{ict} * schoolclosure_{ct}) + \omega_t + \theta_c + \varepsilon_{ict} \quad (1)$$

where:

- Y_{ict} refers to an employment-related outcome for individual i in county c in month t.
- $schoolagechild_{ict} = 1$ if the individual has at least one child age 5-17 years old, 0 otherwise
- $schoolclosure_{ct}$ is the percentage of schools in a county that had at least 50% year-over-year reduction in in-person visits relative to pre-pandemic baseline (2019)

We separate regressions for females and males in all specifications.

Estimation Strategy

- We exploit the within-county variation in school closures for the identification of effects.
- β_1 is the coefficient of interest that tells us how school closures impact the employment outcomes of individuals with child(ren) ages 5-17.
- School closures may be endogenous. But closures should disproportionately affected parents of school-age children, while it seems unlikely that other COVID-related variables would do so.

Estimation Strategy

If school closures had no effect on the labor supply of parents of young children (age<5), it would provide more evidence that any measured effect of closures on parents of school-age children is causal. Thus, we also run the following specification:

$$\begin{aligned} Y_{ict} = X_{ict}\alpha + \beta_1(schoolagechild_{ict} * schoolclosure_{ct}) \\ + \beta_2(youngchild_{ict} * schoolclosure_{ct}) + \omega_t + \theta_c + \varepsilon_{ict} \end{aligned} \tag{2}$$

Hypothesis: If the outcome variable is hours worked, for example, then $\beta_1 < 0$ and $\beta_2 = 0$.

Estimation Strategy

Lastly, we augment the previous two models with the childcare closures data as follows:

$$\begin{aligned} Y_{ict} = X_{ict}\alpha &+ \beta_1(schoolagechild_{ict} * schoolclosure_{ct}) \\ &+ \beta_2(youngchild_{ict} * schoolclosure_{ct}) \\ &+ \beta_3(schoolagechild_{ict} * careclosure_{ct}) \\ &+ \beta_4(youngchild_{ict} * careclosure_{ct}) + \omega_t + \theta_c + \varepsilon_{ict} \end{aligned} \tag{3}$$

Hypothesis: If the outcome variable is hours worked, for example, then $\beta_1 < 0$ and $\beta_2 = 0$; $\beta_3 = 0$ and $\beta_4 < 0$.

Results

Table 1: Summary Statistics by survey month

Variable	September 2020	April 2021
In labor force	0.64	0.64
At work	0.57	0.58
Absent from work	0.02	0.02
Unemployed	0.05	0.04
Work Hours last week	21.30	22.79
Stay-at-home order	0.37	0.05
Non-essential business closure	0.99	0.71
Restaurant limit	0.89	0.62
Bar Closure	0.76	0.62
Percentage of school facilities closed in county	0.56	0.42
Percentage of childcare facilities closed in county	0.38	0.39
Presence of young children (age < 5)	0.05	0.05
Presence of school-age children (age $5 - 17$)	0.21	0.21
Observations	33,668	33,841

All numbers displayed are means weighted with final basic CPS person weights.

Results

Table 2. OLS Regressions on "At Work", "Full-time", "Part-time", and "Hours Worked", Female

	(1) At Work	(2) At Work	(3) At Work	(4) Full-time	(5) Full-time	(6) Full-time	(7) Hours Worked	(8) Hours Worked	(9) Hours Worked
School Closure	-0.002	0.000	-0.001	0.017	0.017	0.016	0.146	0.185	0.300
	(0.009)	(0.009)	(0.009)	(0.013)	(0.013)	(0.015)	(0.446)	(0.445)	(0.469)
Presence of school-age children	0.014*	0.001	-0.002	0.015*	-0.000	-0.002	0.725**	0.009	-0.132
	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.011)	(0.334)	(0.338)	(0.386)
School Closure x Presence of school-age children	-0.014	-0.015	-0.027	-0.038**	-0.037**	-0.043*	-1.317**	-1.271**	-1.815**
	(0.010)	(0.011)	(0.017)	(0.015)	(0.015)	(0.024)	(0.536)	(0.550)	(0.874)
Young children		X	X		X	X		X	X
Childcare closures			X			X			X
R-squared	0.767	0.767	0.767	0.502	0.502	0.502	0.668	0.669	0.669

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. N=157,993. School (childcare) closures refer to the share of all schools (childcare centers) in each county that had at least 50 percent year-on-year decline in in-person visits.

Results

Table 2 (cont.). OLS Regressions on "At Work", "Full-time", "Part-time", and "Hours Worked", Female

	(1) At Work	(2) At Work	(3) At Work	(4) Full-time	(5) Full-time	(6) Full-time	(7) Hours Worked	(8) Hours Worked	(9) Hours Worked
Presence of young children only		-0.033***	-0.028*		-0.051***	-0.034*		-2.311***	-1.991***
		(0.012)	(0.014)		(0.015)	(0.018)		(0.539)	(0.631)
School Closure x Presence of young children only		-0.034	-0.014		-0.014	0.048		-0.638	0.567
		(0.021)	(0.037)		(0.026)	(0.049)		(0.929)	(1.800)
Childcare Closure			0.006			0.002			-0.318
			(0.018)			(0.026)			(0.917)
Childcare Closure x Presence of school-age children			0.023			0.012			1.075
			(0.026)			(0.040)			(1.424)
Childcare Closure x Presence of young children only			-0.039			-0.123			-2.414
			(0.060)			(0.078)			(2.807)
R-squared	0.767	0.767	0.767	0.502	0.502	0.502	0.668	0.669	0.669

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. N=157,993. School (childcare) closures refer to the share of all schools (childcare centers) in each county that had at least 50 percent year-on-year decline in in-person visits.

Results

Table 3. OLS Regressions on "At Work", "Full-time", "Part-time", and "Hours Worked", Male

	(1) At Work	(2) At Work	(3) At Work	(4) Full-time	(5) Full-time	(6) Full-time	(7) Hours Worked	(8) Hours Worked	(9) Hours Worked
School Closure	0.006	0.007	-0.006	0.021	0.022	0.015	0.453	0.511	-0.282
	(0.009)	(0.009)	(0.011)	(0.014)	(0.014)	(0.015)	(0.524)	(0.532)	(0.600)
Presence of school-age children	0.008	0.008	0.006	0.026***	0.025**	0.016	1.422***	1.503***	1.440**
	(0.007)	(0.007)	(0.008)	(0.010)	(0.010)	(0.011)	(0.385)	(0.404)	(0.460)
School Closure x Presence of school-age children	-0.004	-0.005	-0.011	-0.025*	-0.027*	-0.060***	-1.470**	-1.530**	-1.746*
	(0.010)	(0.010)	(0.018)	(0.014)	(0.014)	(0.023)	(0.584)	(0.594)	(0.981)
Young children		X	X		X	X		X	X
Childcare closures			X			X			X
R-squared	0.723	0.723	0.723	0.513	0.513	0.513	0.622	0.622	0.622

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. N=141,683. School (childcare) closures refer to the share of all schools (childcare centers) in each county that had at least 50 percent year-on-year decline in in-person visits.

Results

Table 3 (cont.). OLS Regressions on "At Work", "Full-time", "Part-time", and "Hours Worked", Male

	(1) At Work	(2) At Work	(3) At Work	(4) Full-time	(5) Full-time	(6) Full-time	(7) Hours Worked	(8) Hours Worked	(9) Hours Worked
Presence of young children only		0.004	0.005		0.008	0.004		0.698	0.612
		(0.011)	(0.012)		(0.017)	(0.020)		(0.677)	(0.788)
School Closure x Presence of young children only		-0.010	-0.010		-0.021	-0.036		-0.979	-1.274
		(0.019)	(0.058)		(0.028)	(0.056)		(1.184)	(2.190)
Childcare Closure			0.047**			0.038			2.836**
			(0.018)			(0.027)			(1.069)
Childcare Closure x Presence of school-age children			0.014			0.067*			0.450
			(0.029)			(0.036)			(1.592)
Childcare Closure x Presence of young children only			-0.010			0.030			0.610
			(0.058)			(0.091)			(3.493)
R-squared	0.723	0.723	0.723	0.513	0.513	0.513	0.622	0.622	0.622

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. N=141,683. School (childcare) closures refer to the share of all schools (childcare centers) in each county that had at least 50 percent year-on-year decline in in-person visits.

Results

We also examine how our results vary across two dimensions that might influence how school closures affect parental labor supply:

1. Marital status: married parents with a present spouse may respond differently to school closures by dividing responsibilities differently between labor-market and household production relative to single or cohabitating individuals.
2. Parental education: other studies have found a strong relationship between education and labor-market outcomes during the COVID pandemic owing to differences in the ability to perform work responsibilities from home (e.g. Mongey, Pilossoph, and Weinberg (2021)), propensity to be in "essential" occupations, and industry-specific shocks associated with the pandemic and the public health response (e.g. Montenovo et al. (2020)).

Results

Table 4. OLS Regressions on "At Work", "Full-time", "Part-time", and "Hours Worked", Married

	Female				Male			
	(1) At Work	(2) Full-time	(3) Part-time	(4) Hours Worked	(5) At Work	(6) Full-time	(7) Part-time	(8) Hours Worked
School Closure	0.002	0.041**	-0.038**	0.688	0.011	0.043**	-0.032**	1.043*
	(0.013)	(0.017)	(0.014)	(0.624)	(0.010)	(0.017)	(0.013)	(0.627)
Presence of school-age children	0.024***	0.031**	-0.007	1.220***	0.012*	0.036***	-0.025***	1.710***
	(0.006)	(0.012)	(0.011)	(0.407)	(0.007)	(0.010)	(0.009)	(0.433)
School Closure x Presence of school-age children	-0.015	-0.046**	0.031*	-1.470**	-0.009	-0.043***	0.034***	-1.830***
	(0.010)	(0.020)	(0.018)	(0.638)	(0.010)	(0.016)	(0.012)	(0.664)
R-squared	0.795	0.520	0.221	0.690	0.774	0.554	0.121	0.658

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. Columns 1-4 are for females, and columns 5-8 are for males. N=79,020 for females and N=78,051 for males. School (childcare) closures refer to the share of all schools (childcare centers) in each county that had at least 50 percent year-on-year decline in in-person visits.

Results

Table 5. OLS Regressions on "At Work", "Full-time", "Part-time", and "Hours Worked", Unmarried

	Female				Male			
	(1) At Work	(2) Full-time	(3) Part-time	(4) Hours Worked	(5) At Work	(6) Full-time	(7) Part-time	(8) Hours Worked
School Closure	-0.001	0.003	-0.003	0.082	0.004	0.004	0.001	0.088
	(0.012)	(0.016)	(0.014)	(0.536)	(0.016)	(0.022)	(0.017)	(0.798)
Presence of school-age children	-0.001	0.005	-0.006	0.214	0.014	-0.008	0.022	0.689
	(0.014)	(0.015)	(0.014)	(0.543)	(0.018)	(0.022)	(0.016)	(0.864)
School Closure x Presence of school-age children	-0.019	-0.060***	0.041*	-1.742**	-0.032	0.008	-0.040	-1.964
	(0.022)	(0.022)	(0.023)	(0.860)	(0.029)	(0.036)	(0.027)	(1.514)
R-squared	0.749	0.508	0.203	0.662	0.680	0.486	0.156	0.595

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. Columns 1-4 are for females, and columns 5-8 are for males. N=78,973 for females and N=63,632 for males. School (childcare) closures refer to the share of all schools (childcare centers) in each county that had at least 50 percent year-on-year decline in in-person visits.

Results

Table 6. OLS Regressions on "At Work", "Full-time", "Part-time", and "Hours Worked", College degree or more

	Female				Male			
	(1) At Work	(2) Full-time	(3) Part-time	(4) Hours Worked	(5) At Work	(6) Full-time	(7) Part-time	(8) Hours Worked
School Closure	-0.015	0.026	-0.041**	0.083	0.006	0.025	-0.019	0.109
	(0.013)	(0.022)	(0.018)	(0.733)	(0.013)	(0.023)	(0.018)	(0.771)
Presence of school-age children	0.022**	0.024	-0.002	0.942*	0.006	0.041***	-0.035***	1.397***
	(0.008)	(0.015)	(0.014)	(0.487)	(0.008)	(0.013)	(0.012)	(0.527)
School Closure x Presence of school-age children	-0.012	-0.017	0.004	-0.560	0.016	-0.034*	0.050***	-0.244
	(0.012)	(0.027)	(0.024)	(0.780)	(0.012)	(0.019)	(0.018)	(0.786)
R-squared	0.764	0.499	0.181	0.647	0.756	0.530	0.142	0.627

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. Columns 1-4 are for females, and columns 5-8 are for males. N=65,446 for females and N=56,863 for males. School (childcare) closures refer to the share of all schools (childcare centers) in each county that had at least 50 percent year-on-year decline in in-person visits.

Results

Table 7. OLS Regressions on "At Work", "Full-time", "Part-time", and "Hours Worked", less than College degree

	Female				Male			
	(1) At Work	(2) Full-time	(3) Part-time	(4) Hours Worked	(5) At Work	(6) Full-time	(7) Part-time	(8) Hours Worked
School Closure	0.009	0.012	-0.003	0.405	0.005	0.014	-0.009	0.350
	(0.012)	(0.016)	(0.012)	(0.565)	(0.012)	(0.017)	(0.013)	(0.680)
Presence of school-age children	0.011	0.017	-0.006	0.785*	0.012	0.018	-0.006	1.363**
	(0.009)	(0.011)	(0.010)	(0.408)	(0.009)	(0.012)	(0.009)	(0.499)
School Closure x Presence of school-age children	-0.019	-0.059***	0.040***	-1.898***	-0.019	-0.023	0.004	-2.176***
	(0.014)	(0.015)	(0.015)	(0.593)	(0.015)	(0.019)	(0.014)	(0.786)
R-squared	0.763	0.495	0.233	0.675	0.708	0.509	0.137	0.622

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. Columns 1-4 are for females, and columns 5-8 are for males. N=92,547 for females and N=84,820 for males. School (childcare) closures refer to the share of all schools (childcare centers) in each county that had at least 50 percent year-on-year decline in in-person visits.

Sensitivity Analyses

Our analyses thus far have relied on measuring school closure as the percentage of schools with at least a 50% year-over-year reduction in phone traffic in a county using Safegraph data. There are two potential issues with this:

- 50% cutoff is arbitrary and schools may erroneously appear to be closed if significant numbers of parents chose to remove their children from a particular public school
- Such removals are *endogenous*

Hence, we check the sensitivity of our results to other measures of school closures:

- Use Safegraph data with a more stringent 75% cutoff
- Use Burbio data that documents school closures from administrative sources

Sensitivity Analyses

Table 8. OLS Regressions on "At Work", "Full-time", "Part-time", and "Hours Worked" using 75% closure cutoff

	Female				Male			
	(1) At Work	(2) Full-time	(3) Part-time	(4) Hours Worked	(5) At Work	(6) Full-time	(7) Part-time	(8) Hours Worked
School Closure	-0.002	0.021	-0.023*	0.222	0.002	0.035*	-0.033**	1.145
	(0.012)	(0.017)	(0.014)	(0.630)	(0.016)	(0.019)	(0.015)	(0.841)
Presence of school-age children	0.012**	0.004	0.008	0.432*	0.009*	0.020***	-0.011**	1.134***
	(0.005)	(0.007)	(0.006)	(0.249)	(0.005)	(0.007)	(0.006)	(0.274)
School Closure x Presence of school-age children	-0.027	-0.042*	0.015	-2.017**	-0.015	-0.041*	0.026*	-2.458***
	(0.016)	(0.022)	(0.018)	(0.842)	(0.014)	(0.022)	(0.015)	(0.821)
R-squared	0.767	0.502	0.193	0.668	0.723	0.513	0.121	0.622

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. Columns 1-4 are for females, and columns 5-8 are for males. N=157,993 for females and N=141,683 for males. School (childcare) closures refer to the share of all schools (childcare centers) in each county that had at least 50 percent year-on-year decline in in-person visits.

Sensitivity Analyses

Table 9. OLS Regressions on "At Work", "Full-time", "Part-time", and "Hours Worked" using Burbio School Closures

	Female				Male			
	(1) At Work	(2) Full-time	(3) Part-time	(4) Hours Worked	(5) At Work	(6) Full-time	(7) Part-time	(8) Hours Worked
School Closure	0.001	0.015**	-0.014**	0.399**	-0.005	0.001	-0.006	-0.286
	(0.005)	(0.006)	(0.006)	(0.201)	(0.005)	(0.007)	(0.005)	(0.266)
Presence of school-age children	0.010*	0.013	-0.003	0.492	0.003	0.019**	-0.016**	0.776**
	(0.006)	(0.008)	(0.007)	(0.308)	(0.006)	(0.008)	(0.006)	(0.321)
School Closure x Presence of school-age children	-0.006	-0.026***	0.020***	-0.681**	0.004	-0.010	0.014**	-0.208
	(0.006)	(0.009)	(0.008)	(0.324)	(0.005)	(0.008)	(0.006)	(0.351)
R-squared	0.767	0.502	0.193	0.668	0.723	0.513	0.121	0.622

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. Columns 1-4 are for females, and columns 5-8 are for males. N=157,993 for females and N=141,683 for males. School (childcare) closures refer to the share of all schools (childcare centers) in each county that had at least 50 percent year-on-year decline in in-person visits.

Conclusion

- We find that parents of school-age children are less likely to work full-time and reduce their hours per week in response to school closures.
- With more time to adjust schedules and anticipate closures starting in Fall 2020, we find that the additional childcare burden brought on by school closures was more balanced across gender.
- We also find that parents without a college degree were significantly more affected in terms of work hours than college graduates.

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