

The effect of mandatory child care center closures on women's labor market outcomes during the COVID-19 pandemic

Lauren Russell¹ and Chuxuan Sun²

Date submitted: 3 December 2020; Date accepted: 7 December 2020

The COVID-19 pandemic has had a dramatic effect on women's labor market outcomes. We assess the effects of state-level policies that mandated the closure of child care centers or imposed class size restrictions using a triple-differences approach that exploits variation across states, across time, and across women who did and did not have young children who could have been affected. We find some evidence that both of these policies increase the unemployment rate of mothers of young children in the short term. In the long term, the effects of mandated closures on unemployment become even larger and persist even after states discontinue closures, consistent with a permanent child care supply side effect.

¹ Associate Professor of Practice, Fels Institute of Government, University of Pennsylvania.

² Master's candidate, Fels Institute of Government, University of Pennsylvania.

Copyright: Lauren Russell and Chuxuan Sun

1 Introduction

The economic downturn ushered in by the COVID-19 pandemic stands in stark contrast to previous recessions because it has disproportionately affected women. Alon et al. (2020b) show that for every recession between 1948 and 2009, men's unemployment rates have increased more than women's or the effects have been relatively equal. The 2020 recession is the first recession where the unemployment rate for women has risen significantly more than the unemployment rate for men.

Many have hypothesized that two primary factors are responsible for the dramatic effects on women's employment rates in the US: the concentration of women in sectors and occupations disproportionately impacted by the pandemic and changes in child care availability (Alon et al., 2020b; Dingel et al., 2020; Collins et al., 2020). There are a priori reasons to believe that changes in child care availability will disproportionately affect mothers. Alon et al. (2020a) use time-use data to show that mothers spend more time on childcare than fathers in two-parent households. They also point out using US Census Bureau data that single mother households are much more common than single father households (Alon et al., 2020a). Dingel et al. (2020) document that 32 percent of the US workforce has a child under age 14 and 9.4 percent have a child under age 6. They conclude therefore that child care center closures will affect women's employment much more than men's employment but do not directly quantify the extent to which child care availability drives employment effects.

Estimating worker fixed effects models using US Current Population Survey data, Collins et al. (2020) show that mothers with children aged 13 or younger reduced their work hours by five times as much as father's between March and April 2020. However, it is not clear what portion of this decline is due to differences in the type of occupations chosen by mothers and fathers as opposed to child care responsibilities.

Heggeness (2020) provides some direct evidence on the effects of child care availability on mother's labor market outcomes. Using a differences-in-differences approach, she estimates effects of early public school closures and stay-at-home orders on women's unemployment, labor market attachment, and hours worked. She finds that mothers in early closure states

were significantly more likely to have a job but not be working as a result of early shutdowns but found no immediate impact on labor market detachment or unemployment. Because the analysis focuses on parents of school age children and the effect of school closures, the results do not shed light on loss of child care for parents of young children - those five and under.

Compared to school age children, very young children require more intensive care (Drago, 2009). While school age children may be capable of completing some tasks independently (such getting dressed, retrieving and eating a snack, or entertaining themselves), younger children require around-the-clock supervision and attention. Loss of child care for very young children during hours that would otherwise be used for paid work may have an even more dramatic effect on mothers' labor supply outcomes than loss of public school for a school-age child.

Prior to the pandemic, 24% of children aged 5 and younger received center-based care from a day care center, preschool, prekindergarten or other early childhood program, and 60% participated at least one weekly in some type of non-parental care arrangement including home-based day cares or care arrangements with a relative (U.S. Department of Education, 2016). By mid-March and early April, 16 states had mandated the closure of child care centers, potentially limiting the ability of parents to access child care. Another twenty states imposed class size restrictions, typically allowing classes to contain no more than 10 children.

In this paper, we assess the effects of these mandatory child care center closures and class size limits on mothers' labor supply outcomes, including unemployment, detachment from the labor force, shares of women who are employed but not working, and actual hours worked. In contrast to Heggeness (2020), we are able to estimate longer-term rather than just immediate effects of closures. Specifically, we are able to track employment outcomes six months after closures or class size restrictions were first implemented. Our triple-differences approach exploits variation across states, time, and womens' motherhood status.

Ultimately, we find that state-level mandates that forced closure of child care centers or

imposed class size limits had important effects on unemployment rates of mothers of young children aged 0 to 5. We estimate that in the short-term (the first one to three months at the beginning of the pandemic when closures were actually in effect) closures increased unemployment rates by 2.7 percentage points, on average, with this effect being marginally statistically significant at the 10% level. However, unemployment effects persisted and grew larger in the months after the closures were rescinded. Post-closure, states that reopened child care centers and shifted to class size restrictions had unemployment rates that were 4 percentage points higher than they would have been had closures never been implemented. Similarly, we estimate that post-closure, the three states that reopened child care centers without class size restrictions had unemployment rates were 6.6 percentage points higher than they otherwise would have been.

We also find statistically significant effects of class size restrictions. Our estimates indicate that states that kept centers open but mandated smaller class sizes increased the unemployment rates of mothers of young children by 2 percentage points. States that implemented class size restrictions tended to keep these in place much longer than closures, so we have less precision to estimate effects once class size restrictions were relaxed. The point estimate is similar in magnitude to the effect when class size restrictions were in place, but the confidence interval is very wide and still includes zero.

Though we lack data to directly test how child care availability changed by state, it's plausible that early financial pressures directly caused by mandated closure or class size restrictions caused some centers to close their doors permanently. The Center for American Progress has estimated that meeting pandemic-related state guidelines would increase operating expenses for child care providers by 47%, on average (Jessen-Howard and Workman, 2020b). Most of these increased costs would take the form of personnel costs to comply with reduced class size requirements as well as increased sanitation costs (Jessen-Howard and Workman, 2020a). During mandatory closures, some centers also tried to continue paying staff even when centers were closed, meaning that centers were trying to make payroll when revenues were at best reduced, or at worst, nonexistent. Even if centers could meet budget

shortfalls for a month or two, it's unlikely they would be able to absorb such cost increases in the long term, potentially leading to permanent closures and a contraction in the supply of child care.

A survey by the National Association for the Education of Young Children found that nationally, 18% of child care centers were closed in July 2020 as a result of the pandemic, even though all states had officially allowed child care centers to reopen by that time, which is consistent with this type of permanent supply side response (National Association for the Education of Young Children, 2020). The survey also predicted that closures would become more widespread in the months that followed. Forty percent of respondents said they were certain that they would close permanently within the year without additional public assistance (National Association for the Education of Young Children, 2020). Unfortunately, such support has not materialized.

All of this evidence suggests that as the pandemic stretches on, the supply of child care has become more constrained. Our evidence indicates that this has had the notable downstream effect of increasing unemployment rates for women of young children.

2 Mandatory Child Care Center Closures

A prominent aspect of the COVID-19 crisis is that it has involved stay-at-home orders, some of which forced the closure of child care facilities. In March-April 2020, 16 states issued orders that forced child care businesses to close, though most included an exemption which allowed centers to stay open if they served the children of essential workers.

The other 34 states (plus DC) allowed childcare businesses to stay open, according to Child Care Aware of America, an organization that works with state and local childcare resource and referral agencies (Quinton, 2020). However, among these 34 states, 20 imposed class size limits designed to increase social distancing and reduce the risk of COVID transmission without a classroom. Table 1 identifies the states that ordered the closure of child care businesses, states that allowed child care centers to remain open without class size limits,

and states that allowed child care centers to remain open but imposed class size limits. Even though Alabama initially ordered child care centers to close, this closure remained in effect only for one week between March 19, 2020 and March 27, 2020 at which point the state allowed centers to reopen with a class size limit of 11. Therefore, in our analysis we classify Alabama as a class size limit state rather than a mandated closure state. Note that most states that mandated child care center closures in the early months of the pandemic later transitioned to class size limits once centers were allowed to reopen.

Table 1: States with Mandatory Child Care Center Closures

State	Policy	Date Closures Effective	Date Reopening Allowed	Notes
Alabama	Closed, with option to provide emergency care	March 19, 2020 (modified March 27, 2020 to allow operation with 11 or fewer children in each room)	March 27, 2020	When reopened, group sizes limited to 11. By May 21, 2020, no group size restrictions in place.
Alaska	Option to remain open			Effective April 24, 2020 group sizes limited to 10 children; by May 21, 2020, no group size restrictions in place.
Arizona	Option to remain open			
Arkansas	Option to remain open			Effective July 17, 2020, group sizes limited to 10 people, including staff
California	Option to remain open			Effective August 25, 2020, cohorts limited to no more than 14 children
Colorado	Option to remain open			Required to operate with groups of 10 or fewer from April 1, 2020 - June 4, 2020
Connecticut	Option to remain open			Effective March 16, 2020, limited group sizes to no more than 14 children
Delaware	Closed, with option to provide emergency care	April 6, 2020	June 15, 2020	When reopened, group sizes limited
District of Columbia	Option to remain open			

Covid Economics 62, 18 December 2020: 124-154

Florida	Option to remain open			Effective March 24, 2020, all gatherings of 10 or more people prohibited; Office of Child Care Regulation Guidance for Child Care Providers identified no specific group size restrictions on June 5, 2020
Georgia	Option to remain open			Starting March 23, 2020, centers must limit class sizes to no more than 10 (including staff)
Hawaii	Closed, with option to provide emergency care	March 23, 2020	May 7, 2020	Starting on March 19, 2020, no group could be larger than 10, including the staff person. By June 9, 2020, no group size restrictions in place.
Idaho	Option to remain open			
Illinois	Closed, with option to provide emergency care	March 20, 2020	May 29, 2020	When reopened, class size limits imposed (varied depending on age group)
Indiana	Option to remain open			Effective March 20, 2020 - May 22, 2020, no more than 20 children can reside in a classroom
Iowa	Option to remain open			
Kansas	Option to remain open			
Kentucky	Closed, with option to provide emergency care	March 20, 2020	June 8, 2020 (Family-based care); June 15, 2020 (Center-based care)	Effective June 8, 2020, class sizes limited to 10 children; class size limits relaxed to 15 children for 2 years+ on September 1, 2020
Louisiana	Option to remain open			Effective March 22, 2020, any gatherings of 10 or more prohibited; Child Care Guidelines released on July 13, 2020 that explicitly limited class sizes (varied depending on age group)
Maine	Option to remain open			
Maryland	Closed, with option to provide emergency care	March 26, 2020	May 16, 2020	When centers reopened, no more than 15 total persons per room
Massachusetts	Closed, with option to provide emergency care	March 23, 2020	Effective June 8, reopening plans to be submitted for review beginning June 15, 2020	Centers must apply to re-open; forms first reviewed June 15, 2020; class size limitations imposed upon reopening until July 25, 2020
Michigan	Closed, with option to provide emergency care	March 23, 2020	June 1, 2020	When reopened, highly recommended that group sizes be kept to 10 or fewer children
Minnesota	Option to remain open			
Mississippi	Option to remain open			
Missouri	Option to remain open			

Montana	Option to remain open			Effective April 1, 2020, class sizes limited to 10 children
Nebraska	Option to remain open			Effective March 18, 2020, class sizes limited to 10 children per class; effective May 4, 2020, some child care facilities permitted to have up to 15 children per class
Nevada	Option to remain open			
New Hampshire	Option to remain open			Centers must comply with health and safety guidelines; limited class sizes to 10 or fewer
New Jersey	Closed, with option to provide emergency care	March 25, 2020	June 15, 2020	Effective June 18, 2020, group sizes limited to 10 (not including staff)
New Mexico	Option to remain open			Effective March 23, 2020, gatherings limited to 5 people; effective August 14, 2020, class sizes limited to 10-20 (depending on age group)
New York	Closed, with option to provide emergency care (NYC); Option to remain open (NY State)	NYC: April 3, 2020		Effective June 26, 2020, class sizes limited to 15
North Carolina	Closed, with option to provide emergency care	March 25, 2020	May 8, 2020	
North Dakota	Option to remain open			Effective April 1, 2020, class sizes limited to 9 children and one staff person. Effective July 21, 2020, classes limited to 15 people per room (children plus staff)
Ohio	Closed, with option to provide emergency care	March 26, 2020	May 31, 2020	When reopened, reduced group sizes; effective August 9 returned to normal group sizes
Oklahoma	Option to remain open			Effective March 24, 2020 - June 17, 2020, group sizes limited to 10
Oregon	Closed, with option to provide emergency care	March 25, 2020	May 15, 2020	Effective March 16, 2020, class sizes limited to 10 children (8 for children under 24 months old)
Pennsylvania	Closed, with option to provide emergency care	March 19, 2020	May 8, 2020 (24 northern counties); May 15, 2020 (12 remaining counties)	
Rhode Island	Closed, with option to provide emergency care	March 29, 2020	June 1, 2020	When reopened, group sizes limited to stable groups of 20 children; effective June 29, 2020, programs could seek DHS approval to increase group sizes
South Carolina	Option to remain open			
South Dakota	Option to remain open			

Covid Economics 62, 18 December 2020: 124-154

Tennessee	Option to remain open			Effective March 15, 2020, “all effort should be made to limit congregation of children and class sizes to 10 or less.”
Texas	Option to remain open			Effective May 18, 2020, class sizes limited (varied depending on age)
Utah	Option to remain open			Effective March 25, 2020, class sizes limited to 10; effective April 29, 2020, class sizes limited to 20
Vermont	Closed, with option to provide emergency care	March 17, 2020	June 1, 2020	Effective September 1, 2020, class size restrictions that vary by age group
Virginia	Option to remain open			Effective March 18, 2020, class sizes limited to 10; effective June 2, 2020, class sizes restrictions relaxed (new restrictions varied by age group); effective September 25, 2020, no class size restrictions
Washington	Option to remain open			Effective June 26, 2020, classes could contain no more than 22 children and adults
West Virginia	Closed, with option to provide emergency care	March 25, 2020	May 11, 2020	Effective May 9, 2020, class sizes limited to 10 (including staff)
Wisconsin	Option to remain open			
Wyoming	Closed, with option to provide emergency care	March 19, 2020	April 28, 2020	When reopened, class sizes limited to 10 (including staff); restrictions updated on June 8, 2020 to keep total persons to 10 or less in each room; effective September 16, 2020, class size restrictions removed

Notes: Most information comes from cross-referencing sources from the Hunt Institute (2020), the Food Industry Association (2020), and Child Care Aware of America (2020). State-specific news articles and government orders were also consulted. For more details, see full data appendix.

Even in states that did not officially mandate stay-at-home orders or class size limits, child care centers were deeply affected. Some centers voluntarily closed their doors due to health concerns, and others voluntarily decreased class sizes in accordance with state recommendations to allow for more social distancing. Some parents decided not to send children to child care centers, even if centers were open in their area (Quinton, 2020). Therefore, even the states where childcare businesses technically had the ability to operate as normal during the early months of the pandemic, parents may have experienced decreased child care access.

Between March 21 and April 2020, the Bipartisan Policy Center and Morning Consult

conducted a national survey of 800 parents with children under age 5. They found that 60% of child care programs were fully closed (Bipartisan Policy Center, 2020). Unfortunately, these aggregate data do not report data separately by state, so it is impossible to directly compare the share of child care centers closed in states that mandated closure versus those that did not during the earliest months of the pandemic. The aggregate statistics reported by the the aforementioned National Association for the Education of Young Children survey, which found that 18% of child care centers were closed in July 2020, suggests that some but not all of these centers had reopened once states relaxed their closure policies in April, May, and June.

Though many mandates to close child care centers were sometimes part of a more general stay-at-home order, state-imposed child care center closures are not perfectly correlated with other types of closures such as public school closures (Heggeness, 2020). Some states that closed public schools explicitly allowed child care centers to remain open (Hunt Institute, 2020; Food Industry Association, 2020; Child Care Aware of America, 2020). In the analysis that follows, we investigate the independent effect of mandatory child care center closure policies and class size limit policies on the labor market outcomes of mothers of young children.

3 Data Description

We use three data sources for our analysis: state-level information on child care center closure policies, the Household Pulse Survey, and the Current Population Survey. Our data on child care center closure policies, including dates of announcement/implementation and dates of reopenings, come primarily from cross-checking three sources: Hunt Institute (2020); Food Industry Association (2020); Child Care Aware of America (2020). However, we also consult state-specific news articles and press releases to confirm this information. The online data appendix reports specific language from these orders and a complete list of sources for each state.

The Household Pulse Survey, a survey launched in April 2020 specifically to shed light on COVID-19 related issues, is administered by the US Census Bureau. The short 20-minute survey consists of questions related to employment status, spending patterns, food security, housing, physical and mental health, access to health care, and educational disruptions (US Census Bureau, 2020; Centers for Disease Control and Prevention, 2020). The weekly survey provides a “near real-time snapshot” of COVID-19 experiences because there is only an 8 day lag between when respondents fill out the questionnaire and when the results are reported Centers for Disease Control and Prevention (2020). Although the survey has the advantage of asking questions most relevant to effects of the COVID-19 pandemic, data were first collected only after state-level mandates for child care center closures. Therefore, we are unable to use the Pulse Survey data for our main triple-differences analysis. The data also fail to identify specific ages of children for respondents, so we cannot isolate reporting to parents of children aged 0 to 5, the population for whom child care is relevant.

Instead, we rely on the basic monthly files from the Current Population Survey, a monthly survey of about 60,000 households sponsored by the US Census Bureau and the US Bureau of Labor Statistics (Flood, Sarah and King, Miriam and Rodgers, Renae and Ruggles, Steven and Warren, J. Robert, 2020). Sampled households are in the survey for four consecutive months, are out for eight months, and then return for another four consecutive months before leaving the sample permanently. A new group of respondents starts in each calendar month at the same time another group completes its rotation.

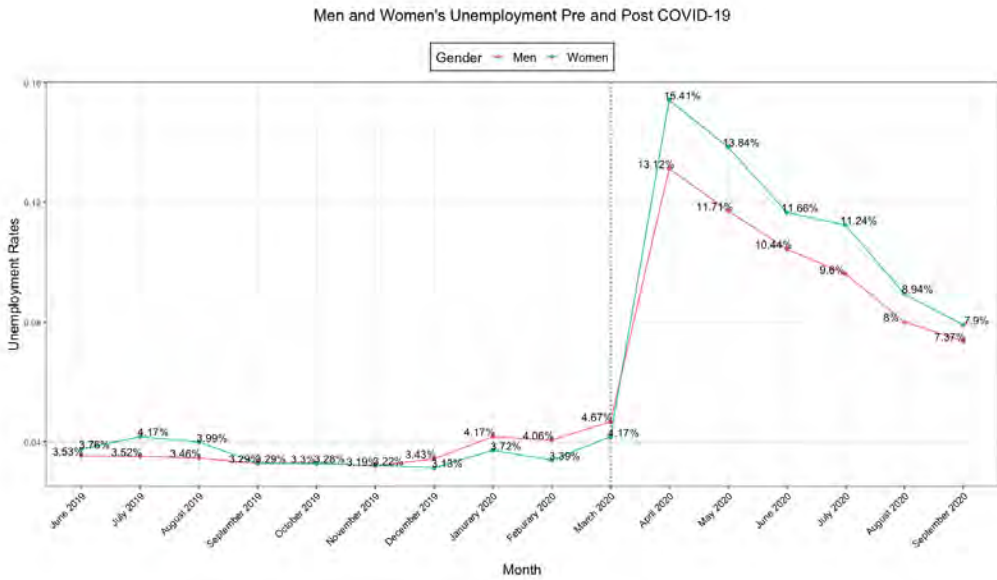
Our microdata correspond to January 2019 to September 2020, though most of our analysis focuses on September 2019 to September 2020. We limit the sample to people aged 18-64, inclusive, to focus analysis on the working-age population. We drop anyone living in group quarters or working in the armed forces. We drop New York from our sample because New York City had a child care center closure policy while the rest of the state did not, so it is impossible to assign either treatment or control status to the state. We also drop any individuals whose reporting of age, sex, and race is inconsistent across the months where they report data to the CPS. Our triple-differences analysis uses the subset of data corresponding

to women with children aged 0 to 5 and women without any children.

4 Aggregate Effects of the Pandemic on Women's Employment and the Importance of Child Care

Before presenting our analysis of the causal effects of state-level child care closure policies, we begin by presenting descriptive statistics on women's unemployment and the reported importance of child care access across all states during the pandemic period. Figure 1 uses CPS data to show unemployment rates of men and women pre and post-pandemic. Prior to the pandemic, unemployment rates of both men and women aged 18-64 hovered around 3-4%. Then unemployment rates increased dramatically between February 2020 and April 2020, peaking at 15.4% for women and 13.1% for men. Consistent with Alon et al. (2020b)'s analysis, we find the increase is much larger for women – an 11.2 percentage point increase – compared to 8.5 percentage points for men between February and April. Unemployment rates for both men and women declined between April 2020 and September 2020 but still remain at very high levels relative to the pre-pandemic period. As of September 2020, the women's unemployment rate still exceeded the men's unemployment rate by 0.5 percentage points.

Figure 1: Men and Women's Unemployment Pre and Post COVID-19



Source: IPUMS-CPS, University of Minnesota, www.ipums.org

Notes: Authors' tabulations. The sample consists of people aged 18-64 in the labor force.

4.1 Importance of Child Care Access

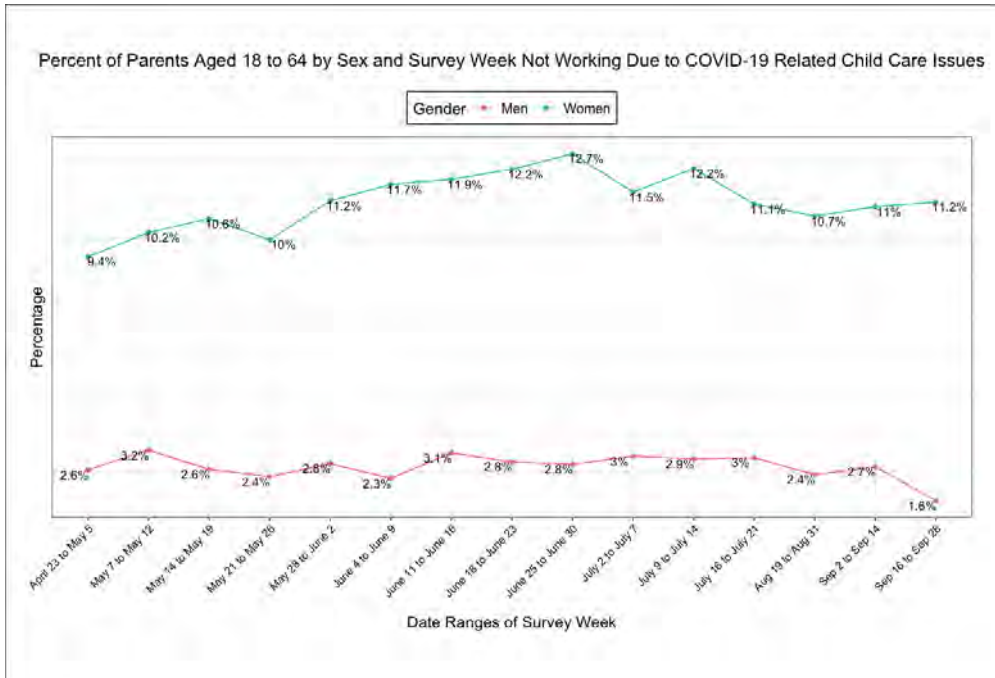
Next, we use the Pulse data to investigate how many women are reporting that child care issues are a significant driver of their unemployment (Figure 2).¹ For these figures, we limit our sample to parents with children aged 18 and under.

Throughout the data collection period of April 23 to September 28, a significant number of parents are reporting that they are not working and that this is due to child care issues. The fraction of mothers reporting not working due to COVID-19 related child care issues is significantly higher than for fathers. For example, in the July 16-July 21 survey, 11% of mothers versus only 3% of fathers were not working due to COVID-19 related child care

¹For more analysis of these data, see Heggeness and Fields (2020).

issues.

Figure 2: Percent of Parents Not Working Due to COVID-19 Related Child Care Issues

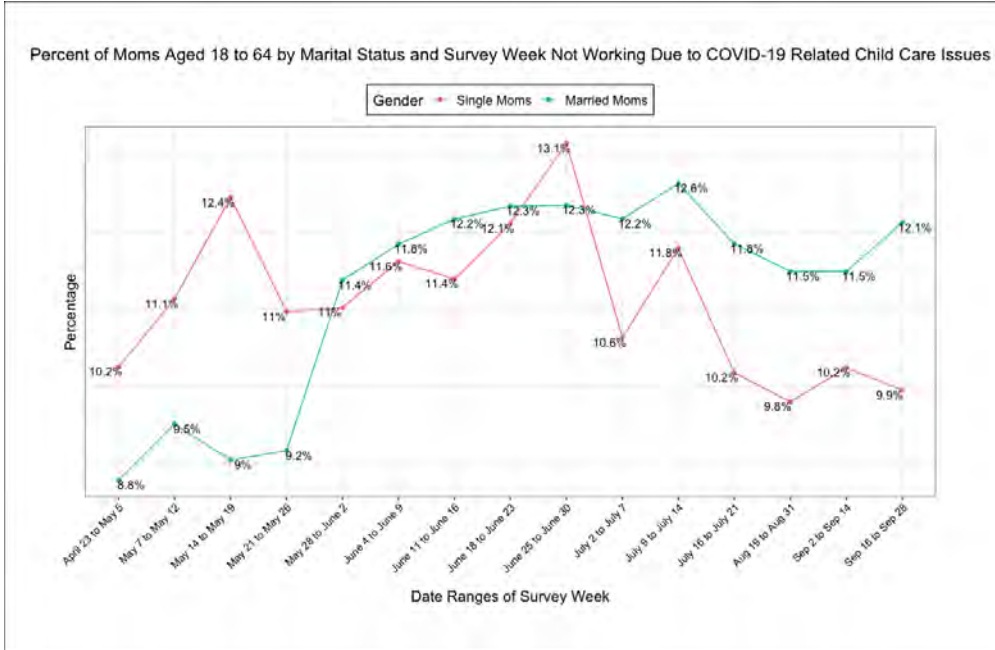


Source: Household Pulse Survey Public Use File, United States Census Bureau, www.census.gov/programs-surveys/household-pulse-survey/

Notes: Figure displays the percent of parents aged 18-64 who have at least one child under 18 and report they are not working due to COVID-19 related child care issues among all respondents to the Pulse Survey. Group quarter observations are dropped, and composite weights are used.

We also extend previous descriptive work by investigating differences by characteristics of these mothers. Figure 3 reports the percent of single and married mothers not working who cited COVID-19 child care issues as the cause. In April and May, single mothers were more likely than married mothers to report not working due to COVID-19 related child care issues. By May and June, single and married mothers were reporting similar rates. By July, August, and September married mothers were more likely than single mothers to report not working due to COVID-19 related child care issues.

Figure 3: Percent of Mothers Not Working Due to COVID-19 Related Child Care Issues



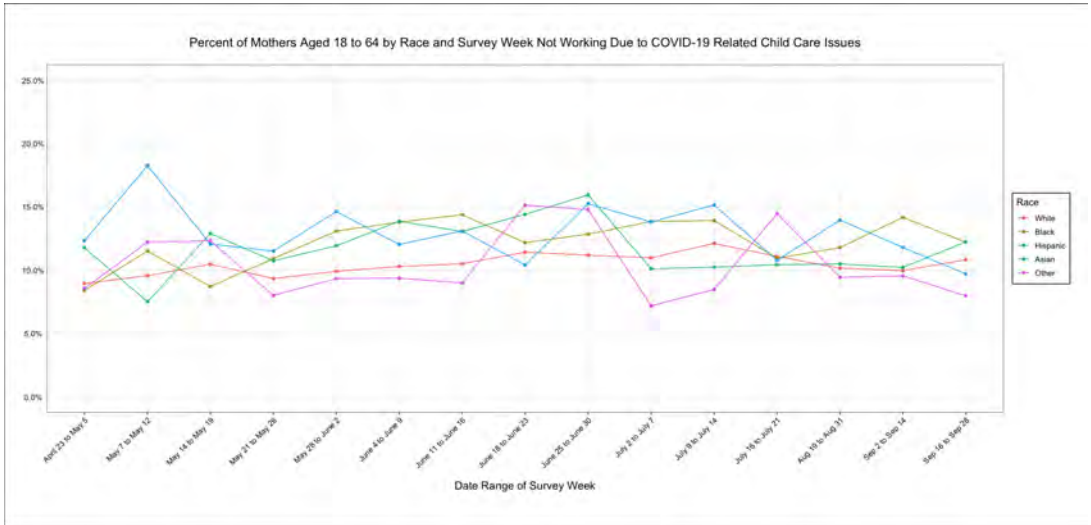
Source: Household Pulse Survey Public Use File, United States Census Bureau, www.census.gov/programs-surveys/household-pulse-survey/

Notes: Sample includes mothers who have at least one child under 18. Group quarter observations are dropped, and composite weights are used.

We also investigated heterogeneity in child care issues as a driver of unemployment by race/ethnicity. We find in Figure 4 that race/ethnicity is not a strong predictor of which mothers report that they are not working due to child care issues.

Covid Economics 62, 18 December 2020: 124-154

Figure 4: Percent of Mothers Not Working Due to COVID-19 Related Child Care Issues



Source: Household Pulse Survey Public Use File, United States Census Bureau, www.census.gov/programs-surveys/household-pulse-survey/

Notes: Sample includes mothers who have at least one child under 18. Group quarter observations are dropped, and composite weights are used.

5 Effects of Mandatory Child Care Center Closures

Though these descriptive statistics reveal that in the aggregate child care access is important for mothers' labor supply, it is not known whether state-level child care closures or class size restrictions, as opposed to voluntary closures of child care centers or loss of home-based care provided by acquaintances, friends, or relatives, had an independent impact on mothers' labor market outcomes.

5.1 Triple-Differences Empirical Strategy

To study the effects of state mandated child care center closures and class size restrictions on the employment of women during the pandemic, we use a triple-differences strategy.²

²For a derivation of the triple-differences estimator and a complete discussion of its identifying assumptions, we refer readers to Olden and Møen (2020).

Our empirical strategy uses three dimensions of variation: cross-state variation in which states implemented mandates, cross-time variation in when mandates were implemented, and cross-worker variation in whether a woman had young children who would potentially need child care.

One challenge in estimating the effect of child care center closures is the decision to close all child care centers may not be quasi-random. While we find evidence that women's employment was on parallel trends prior to the start of the pandemic for states that did and did not implement closures, it is possible that states that mandated the closure of child care centers were hit harder by the pandemic at the time the decision was made to close child care centers. Thus, women's employment could decline more in these states for reasons unrelated to child care availability. For example, prior work has shown that women tend to be over-represented in sectors and occupations that were impacted most severely by the pandemic (Alon et al., 2020a).

If these child care closure mandates are correlated with pandemic severity, a differences-in-differences analysis may conflate impacts of the pandemic on job availability with impacts through child care availability. By including women without children in the analysis, we are able to isolate the child care availability effect. We omit women of older children from the analysis because these mothers also experienced changing family obligations as many schools and universities were closed or switched to remote learning formats.

We start by estimating triple-differences event study models with leads and lags 6 months before and 6 months after closure and class size restrictions implementation:

$$y_{ipst} = \gamma_{st} + \theta_{pt} + \mu_{ps} + \sum_{j=-6}^6 \beta_j Closure_{pst}^j + \sum_{j=-6}^6 \Delta_j Restriction_{pst}^j + X_{ipst} \delta + \omega_i + \varepsilon_{iast} \quad (1)$$

In this regression equation, y_{ipst} is a labor market outcome for woman i in state s and month t who either is or is not a parent (p) of a child aged 0-5. Recall that because we omit parents of older children from the analysis sample, any observation that is not a parent of

a child aged 0-5 is a non-parent. We control for state-specific shocks that vary over time γ_{st} and include interactions for parent and time effects θ_{pt} and parent and state effects μ_{ps} . The matrix X_{ipst} includes a rich set of individual-level controls including age, marital status, education, and occupation fixed effects and a control for whether there is another adult in the household. The panel structure of the CPS also allows us to include person fixed effects (ω_i). We cluster standard errors at the state level.

The CPS survey is conducted on the 19th of each month and asks respondents questions about the previous week. Because all of our closure and restriction policies were effective after March 12, April 2020 is the first month where labor market outcomes in the CPS could have been directly affected by these mandates. Accordingly, for our event studies, the omitted month is March 2020, a month prior to when closures or restrictions could have first impacted labor market outcomes.

It is important to keep in mind that closures were rescinded after one month in Hawaii, North Carolina, West Virginia, and Wyoming, after two months in Illinois, Maryland, Michigan, Ohio, Oregon, Pennsylvania, Rhode Island, and Vermont, and after three months in Delaware, Kentucky, Massachusetts, and New Jersey. Therefore, no state in the +4 to +6 months still had closures in effect, though we still plot these coefficients to investigate whether there were longer-term effects on labor market outcomes that persisted after policies were relaxed.

To account for potentially different effects in months where closures or class size restrictions were in effect vs. time periods where they had been relaxed, our triple-differences regression takes the following form:

$$\begin{aligned}
 y_{ipst} = & \gamma_{st} + \theta_{pt} + \mu_{ps} + \beta \text{ClosureInEffect}_{pst} \\
 & + \Psi \text{ClosureDiscontLimitImposed}_{pst} + \Lambda \text{ClosureDiscontNoLimit}_{pst} \\
 & + \Delta \text{LimitInEffect}_{pst} + \Pi \text{LimitDiscont}_{pst} + \\
 & X_{ipst} \delta + \omega_i + \varepsilon_{iast}
 \end{aligned} \tag{2}$$

Our set of five treatment indicators captures every possible treatment status in the post-

policy period. $ClosureInEffect_{pst}$ equals 1 if person i was a parent of a young child in state s where child care center closures were mandated in month t . $ClosureDiscontLimitImposed_{pst}$ equals 1 for post-closure months once centers were allowed to reopen if class size limits were imposed at that time. $ClosureDiscontNoLimit_{pst}$ equals 1 in post-closure months once the closure policy was discontinued if no class size limits were imposed. Similarly, $LimitInEffect_{pst}$ equals 1 if person i was a parent of a young child in state s where child care centers were subject to class size limits in month t . $LimitDiscont_{pst}$ equals 1 in months after class size limits were discontinued.

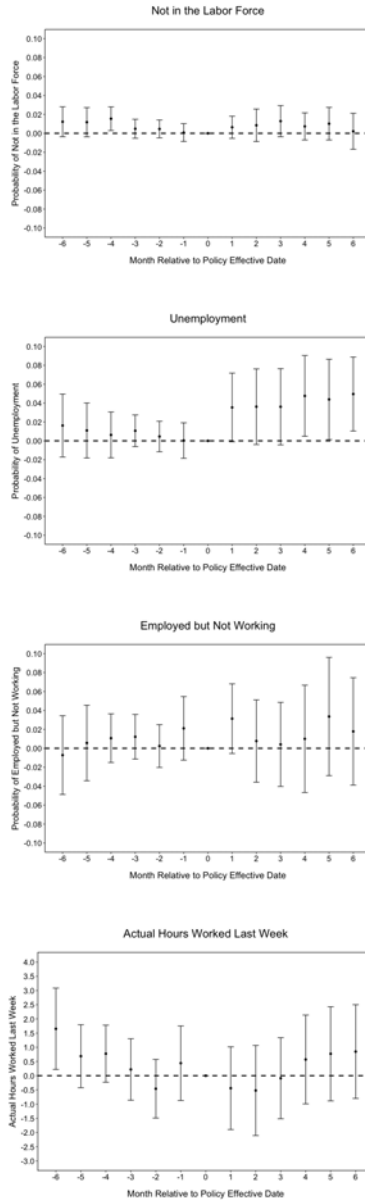
The identifying assumption for our triple-differences estimator is that there is no contemporaneous shock that differentially affects the outcomes of the treatment group (mothers with young children) compared to the control group (women without children) in the same state-months as state-mandated child care center closures or child care class size limits.

5.2 Results

Figures 5 and 6 show the results of the event study specification for four labor market outcomes: labor force detachment, unemployment, being employed but not working, and actual hours worked last week. The plots show evidence of parallel trends, lending credence to the identifying assumption. There are no obvious effects of closures on labor force detachment, being employed but not working, or actual hours worked last week. By contrast, there is an obvious jump in unemployment after closures are implemented, and this effect persists and is statistically significant in the fourth month to sixth after the closure is implemented.

The results for class size limits in Figure 6 show a similar pattern. There are no discernible effects on labor force detachment, being employed but not working, or actual hours worked last week, but there is a statistically significant increase in unemployment at the time class size limits go into effect. Unlike for closures, the negative employment effects seem to dissipate over time and are not statistically significant by three months after implementation.

Figure 5: Triple-Differences Event Studies for Child Care Center Closure Policies

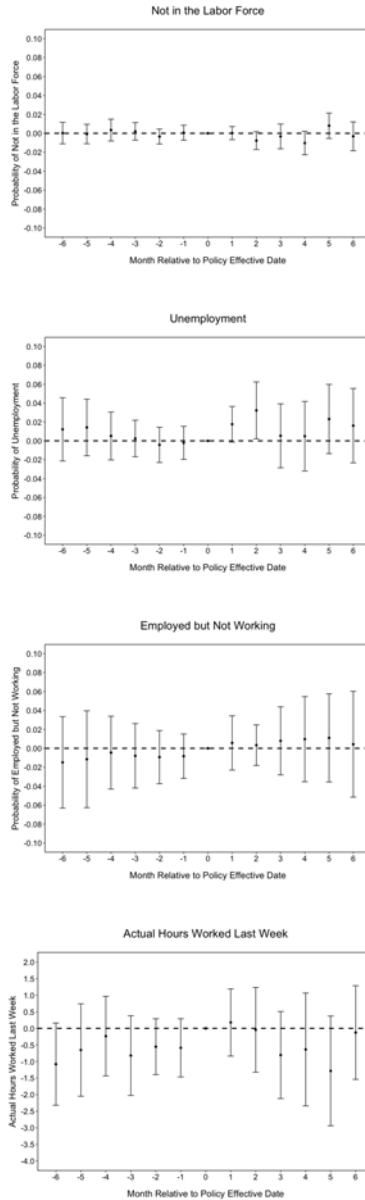


Source: IPUMS-CPS, University of Minnesota, www.ipums.org

Notes: Results from estimating equation 1 as described in text and then plotting the coefficients on the closure policy time relative to implementation indicators: β_j .

Covid Economics 62, 18 December 2020: 124-154

Figure 6: Triple-Differences Event Studies for Class Size Limits



Source: IPUMS-CPS, University of Minnesota, www.ipums.org

Notes: Results from estimating equation 1 as described in text and then plotting the coefficients on the class limit policy time relative to implementation indicators: Δ_j .

Covid Economics 62, 18 December 2020: 124-154

Table 2 shows the triple-differences estimates. The first point estimate in column 2 indicates that closures increased unemployment rates of mothers with young children by 2.7 percentage points in months when a closure was actually in effect. (Note that these were the early months of the pandemic.) The second point estimate indicates that in post-closure months where closures were discontinued but class size limits were imposed (later months of the pandemic), unemployment rates were 4.0 percentage points higher than they otherwise would have been. The third point estimate indicates that in post-closure months where closures were discontinued and no class size limits were imposed, unemployment rates were 6.6 percentage points higher than they would have otherwise been.

Table 2: Effect of Mandated Child Care Center Closures and Class Size Limits on Women's Labor Market Outcomes

	Labor Market Outcome			
	(1) Not In the Labor Force	(2) Unemployed	(3) Employed But Not Working	(4) Actual Hours Worked Last Week
Post Closure with Closure in Effect x Mother of Child 0-5	0.004 (0.005)	0.027* (0.016)	0.001 (0.013)	-0.82 (0.44)
Post Closure with Closure Discontinued But Class Limits x Mother of Child 0-5	-0.000 (0.006)	0.040** (0.017)	-0.015 (0.014)	-0.38 (0.47)
Post Closure with Closure Discontinued & No Limits x Mother of Child 0-5	-0.004 (0.005)	0.066*** (0.016)	0.017 (0.023)	0.41 (0.48)
Post Class Size Limits with Limits in Effect x Mother of Child 0-5	-0.002 (0.004)	0.020** (0.009)	0.004 (0.012)	0.18 (0.48)
Post Class Size Limits x Limits Discontinued x Mother of Child 0-5	-0.002 (0.006)	0.018 (0.023)	0.006 (0.013)	0.04 (0.91)
Number of Individuals	92,956	68,250	64,671	63,194
Number of Observations	275,896	191,204	179,010	170,519

Source: IPUMS-CPS, University of Minnesota, www.ipums.org

Notes: Results from estimation of equation (2) as described in the text. All regressions include occupation fixed effects, age fixed effects, marriage status fixed effects, control for at least one other adult in the household, person fixed effects, and all the double interactions (state by month fixed effects, mother of young child x month fixed effects, and state x mother of young child fixed effects). Standard errors are clustered at the state level.

The estimates also show an effect of class size limits on unemployment rates of mothers of young children: +2.0 percentage points in months where limits were in effect with this effect statistically significant at the 5% level. There is no statistically significant effect in post-class limit months once limits were discontinued, though the confidence interval cannot rule out effects as large as during months where the limits were actually in place.

5.3 Robustness

Because mothers of very young infants may have taken maternity leave and been unaffected by changes in child care center availability, we assessed the robustness of our results to defining mothers of young children as those with children aged 1-5 rather than 0-5. Table 3 shows that our results are robust to this change in the young mothers definition, though the effect of mandated closures in the early months when such policies were actually in effect is similar in magnitude but no longer statistically significant.

Table 3: Robustness Check Dropping Mothers of Infants

	Labor Market Outcome			
	(1) Not In the Labor Force	(2) Unemployed	(3) Employed But Not Working	(4) Actual Hours Worked Last Week
Post Closure with Closure in Effect x Mother of Child 1-5	0.004 (0.005)	0.024 (0.017)	0.012 (0.015)	-0.59 (0.45)
Post Closure with Closure Discontinued But Class Limits x Mother of Child 1-5	-0.002 (0.006)	0.047** (0.018)	-0.005 (0.021)	-0.18 (0.62)
Post Closure with Closure Discontinued & No Limits x Mother of Child 1-5	-0.002 (0.006)	0.063*** (0.017)	0.014 (0.020)	0.64 (0.43)
Post Class Size Limits with Limits in Effect x Mother of Child 1-5	-0.001 (0.004)	0.026*** (0.010)	-0.004 (0.010)	0.41 (0.45)
Post Class Size Limits x Limits Discontinued x Mother of Child 1-5	-0.002 (0.007)	0.013 (0.023)	-0.008 (0.016)	-0.29 (1.03)
Number of Individuals	90,287	66,395	62,915	61,623
Number of Observations	265,562	184,762	172,965	165,710

Source: IPUMS-CPS, University of Minnesota, www.ipums.org

Notes: Results from estimation of equation (2) as described in the text except parents (mothers of young children) are defined as those with a child aged 1 to 5. All regressions include occupation fixed effects, age fixed effects, marriage status fixed effects, control for at least one other adult in the household, person fixed effects, and all the double interactions (state by month fixed effects, mother of young child x month fixed effects, and state x mother of young child fixed effects). Standard errors are clustered at the state level.

We would have liked to directly examine the number of women reporting that they are unemployed because of child care issues, but the CPS does not ask a question with response choices that would allow us to investigate this. The only reasons respondents can cite for being unemployed include (1) looking for first jobs, (2) re-entering after an extended work absence, (3) have left a job, (4) temporary job ended, (5) laid off, or (6) left job for another reason. None of these has a definitive link with child care issues. The Pulse survey is also poorly suited to investigating whether mothers of young children in states with closures or mandates were more likely to report being unemployed due to child care issues as the data cannot be disaggregated to include only mothers with young children.

Instead, we take advantage of a child care question asked on the March 2020 Annual Social and Economic Supplement (ASEC). Specifically, the question asked whether paid child care was needed for each child in the household. We define a mother has requiring paid child care for a child aged 0-5 if there is any child in her household aged 0-5 for whom “paid child care is needed.” We have 4,550 mothers with a child aged 0 to 5 who responded to both the ASEC and appear in the March basic monthly file. Among those mothers, 34% have at least one child who needs child care which is consistent with estimates from the U.S. Department of Education (2016).

A challenge of using this question for our analysis is that it is only asked once per year. We impute whether a mother needs child care in other months where she participates in the CPS panel by carrying this March response forward and backwards in time. Recall that sampled households are in the survey for four consecutive months, so if this household appeared in the CPS in February, March, April, and May, we use the March response and assign that same value to this household (mother) in February, April, and May. Then, we re-run our triple differences analysis, redefining the treatment group as mothers of children aged 0-5 who expressed a need for paid child care. The control group is the same as before - women without any children.

We would expect this analysis to be somewhat less informative than our preferred analysis previously presented. We are not able to look at effects of the closure and limitation

policies past June 2020 because we do not have any treatment group coverage in August or September (more than four months after March). Moreover, though it is reasonable to assume that if a mother required paid child care in March, she also required it in other months, that assumption could be incorrect if there were changes in her outside options (availability of informal child care arrangements). We also have less statistical power due to smaller sample sizes. Nevertheless, if the results are truly driven by child care access, labor market effects of child care policies should be somewhat larger when estimating the triple differences specification on this sample.

In fact, this is generally what we find in Table 4. Though we lose statistical significance of some estimates due to larger standard errors, the point estimates, especially for the effects of class size limits, are somewhat larger than in the main specification. In contrast to the results before, we now find a statistically significant effect on a woman being employed but not working when class size limits are in place, and an increase in actual hours worked last week when closures were discontinued but class size limits were imposed. The latter effect may seem counterintuitive but is actually consistent with Heggeness (2020) who found that for women who continued working, women in early closure states reported working more weekly hours than those in late closure states, perhaps because these women were compensating for reduced hours worked by other household members or because they faced increased work loads due to changing operations during COVID.

Table 4: Robustness Check With Mothers Who Need Paid Child Care as of March 2020

	(1)	Labor Market Outcome		(4)
	Not In the Labor Force	(2) Unemployed	(3) Employed But Not Working	(4) Actual Hours Worked Last Week
Post Closure with Closure in Effect x Mother of Child 0-5	0.002 (0.007)	0.023 (0.030)	0.018 (0.027)	1.17 (1.13)
Post Closure with Closure Discontinued But Class Limits x Mother of Child 0-5	0.049 (0.037)	0.039 (0.033)	-0.040 (0.027)	4.13*** (1.31)
Post Closure with Closure Discontinued & No Limits x Mother of Child 0-5	0.023 (0.024)	0.118* (0.063)	0.012 (0.022)	-0.16 (1.21)
Post Class Size Limits with Limits in Effect x Mother of Child 0-5	0.019* (0.011)	0.044* (0.024)	0.054*** (0.020)	1.23 (0.76)
Post Class Size Limits x Limits Discontinued x Mother of Child 0-5	0.007 (0.030)	0.062 (0.039)	-0.004 (0.044)	4.39* (2.34)
Number of Individuals	74,900	55,435	52,578	51,542
Number of Observations	222,238	155,847	145,887	139,839

Source: IPUMS-CPS, University of Minnesota, www.ipums.org

Notes: Results from estimation of equation (2) as described in the text except parents (mothers of young children) are defined as those with a child aged 0 to 5 who needed paid child care in March 2020. All regressions include occupation fixed effects, age fixed effects, marriage status fixed effects, control for at least one other adult in the household, person fixed effects, and all the double interactions (state by month fixed effects, mother of young child x month fixed effects, and state x mother of young child fixed effects). Standard errors are clustered at the state level.

6 Conclusion

In the aggregate, the COVID-19 pandemic has had a substantial effect on women's labor supply outcomes, especially relative to men's. In this paper, we examine whether state-level policies that forced the closure of child care centers or regulated class sizes specifically had a discernible impact on labor supply outcomes for mothers of young children. We find that these policies did, in fact, increase unemployment rates of mothers of young children in

these states. Unfortunately, the negative effects do not dissipate once states reopen child care centers, consistent with permanent effects on child care supply in these states.

These results underscore the importance of access to reliable child care in promoting equitable labor market outcomes for men and women. Especially at a time when 4.5 million child care slots are at risk of disappearing, emergency funding and longer-term solutions to support child care centers are desperately needed or mothers of young children may continue to experience persistent and permanent employment losses in the future (Jessen-Howard and Workman, 2020a).

References

- Alon, T., Doepke, M., Olmstead-Rumsey, J., and Tertilt, M. (2020a). The impact of COVID-19 on gender equality. *Covid Economics: Vetted and Real-Time Papers*, (4):62–85.
- Alon, T., Doepke, M., Rumsey-Olmstead, J., and Tertilt, M. (2020b). This time it's different: The role of women's employment in a pandemic recession. NBER Working Paper 27660.
- Bipartisan Policy Center (2020). Nationwide survey: Child care in the time of coronavirus. Report. <https://bipartisanpolicy.org/blog/nationwide-survey-child-care-in-the-time-of-coronavirus/>.
- Centers for Disease Control and Prevention (2020). Novel COVID-19 survey takes nation's social, mental "Pulse". <https://www.cdc.gov/coronavirus/2019-ncov/communication/accomplishments/pulse-survey.html>.
- Child Care Aware of America (2020). State by state resources. Accessed 27 August 2020. <https://www.childcareaware.org/resources/map/>.
- Collins, C., Landivar, L. C., Ruppanner, L., and Scarborough, W. J. (2020). COVID-19 and the gender gap in work hours. *Gender Work Organization*, pages 1–12.
- Dingel, J. I., Patterson, C., and Vavra, J. (2020). Childcare obligations will constrain many workers when reopening the us economy. Becker Friedman Institute Working Paper No. 2020-46. https://bfi.uchicago.edu/wp-content/uploads/BFI_WP_202046.pdf.
- Drago, R. (2009). The parenting of infants: A time-use study. *Monthly Labor Review*, 132(10):33–43.
- Flood, Sarah and King, Miriam and Rodgers, Renae and Ruggles, Steven and Warren, J. Robert (2020). Integrated Public Use Microdata Series, Current Population Survey: Version 8.0 [dataset]. Minneapolis, MN: IPUMS. <https://doi.org/10.18128/D030.V8.0>.
- Food Industry Association (2020). Coronavirus emergency state-by-state child care landscape. Accessed 27 August 2020. <https://www.fmi.org/docs/default-source/>

state-affairs/covid19-state-by-state-child-care-landscape.pdf?sfvrsn=461eb9e2_8.

Heggeness, M. L. (2020). Estimating the immediate impact of the COVID-19 shock on parental attachment to the labor market and the double bind of mothers. *Review of Economics of the Household*, Forthcoming.

Heggeness, M. L. and Fields, J. M. (2020). Working moms bear the brunt of home schooling while working during COVID-19. US Census Bureau. <https://www.census.gov/library/stories/2020/08/parents-juggle-work-and-child-care-during-pandemic.html>.

Hunt Institute (2020). COVID-19 resources & policy considerations: Child care state actions. Accessed 27 August 2020. <http://www.hunt-institute.org/covid-19-resources/state-child-care-actions-covid-19/>.

Jessen-Howard, S. and Workman, S. (2020a). Coronavirus pandemic could lead to permanent loss of nearly 4.5 million child care slots. Center for American Progress.

Jessen-Howard, S. and Workman, S. (2020b). The true cost of providing safe child care during the coronavirus pandemic. Center for American Progress.

National Association for the Education of Young Children (2020). Holding on until help comes: A survey reveals child care's fight to survive. Report.

Olden, A. and Møen, J. (2020). The triple difference estimator. Discussion Papers 2020/1, Norwegian School of Economics, Department of Business and Management Science.

Quinton, S. (2020). Will child care be there when states reopen? PEW Trusts Stateline Article. <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2020/04/27/will-child-care-be-there-when-states-reopen>.

US Census Bureau (2020). Measuring household experiences during the coronavirus (COVID-19) pandemic. <https://www.census.gov/data/experimental-data-products/household-pulse-survey.html>.

U.S. Department of Education, N. C. f. E. S. (2016). Early Childhood Program Participation Survey of the 2016 National Household Education Surveys Program. (ECPP-NHES:2016).
https://nces.ed.gov/nhes/tables/ECPP_HoursPerWeek_Care.asp.