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Workplace Breastfeeding and Maternal Employment

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Workplace Breastfeeding and Maternal Employment

Abstract

This paper investigates the impact of workplace breastfeeding laws on the labor supply of mothers. We exploit a unique setting, when throughout 1998-2009 states in the US introduced laws requiring employers to provide break time and a private room for women to express milk or breastfeed. Our results show an increase in breastfeeding initiation and the probability that a child was breastfed at three and six months after birth. We find that workplace breastfeeding significantly increase maternal employment by 4% when children are in breastfeeding age.

JEL-Codes: J080, J130, J160, J180, J220.

Keywords: female labor supply, breastfeeding, workplace policies.

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1 Introduction

Gender differences in the labor market still persist in developed economies and materialize particularly after child birth. Upon parenthood, labor market outcomes differ drastically across gender. Motherhood leads to lower wages, lower employment, and lower full-time employment for women. The differential effect of children on mothers' versus fathers' labor market outcomes also accounts for a large fraction of the gender earnings gap in most developed countries (Cortés and Pan, 2020). Besides short-run gaps, these differences also persist in the long-run. Women cannot catch up to their pre-birth labor market outcomes while similar trends cannot be found for men (Kleven et al., 2019). A possible remedy to address these gender gaps in labor market outcomes are policies that change the compatibility of childcare and working for mothers.

While the impact of family policies on female labor supply are widely explored, the potential of policies affecting the workplace is yet understudied (Olivetti and Petrongolo, 2017). However, family-friendliness of the workplace is an important factor shaping the labor supply decisions of women, as women tend to self-select into more family-friendly firms upon child birth (Kleven, Landais, and Søgaaard, 2019). Prior studies have characterized family-friendliness by more generous parental leave policies, higher share of women with children in management, and more flexibility and scheduling predictability (Nielsen, Simonsen, and Verner, 2004; Flabbi and Moro, 2012; Goldin and Katz, 2016; Kleven, Landais, and Søgaaard, 2019; Ciasullo and Uccioli, 2023). In this paper we explore a dimension of workplace family-friendliness that has received less attention: being able to express milk (or breastfeed) in the workplace. Having this option affects the trade-off between breastfeeding and employment mothers face and can thus impact labor supply decisions.

In this paper, we examine the causal impact of workplace breastfeeding laws on maternal labor market outcomes. We exploit the timing of "workplace breastfeeding laws" that were introduced throughout 1998-2009 at the state level in the US. The laws mandated break time and a separate room for women to breastfeed or express milk at the workplace. We study the impact of these laws on labor market outcomes using data from the Current Population Survey (CPS) and the American Community Survey (ACS) for 1990 to 2009. Further, we provide evidence on the impact of workplace laws on breastfeeding rates based on the National Immunization Survey (NIS-Child) and the Ross Mother Survey (RMS). To identify the effect of workplace breastfeeding laws on mother's labor supply, we use the interaction weighted estimator proposed by Sun and

Abraham (2021) and exploit the temporal and geographic variation in the introduction of the laws. This allows us to gauge the dynamics of the effect breastfeeding laws have on women’s labor market outcomes after child birth, circumventing concerns raised about two-way fixed effects estimates ¹.

Breastfeeding rates in the US are among the lowest compared to other OECD countries, with only 25% of children being exclusively breastfed in the first six months after birth (CDC, 2022a). Over the period from 1998 to 2009, 18 states introduced workplace breastfeeding regulations with the goal to increase breastfeeding rates. The laws mandated employers to provide nursing mothers with break time and a private room to express milk or breastfeed at the workplace. In spite of a federal roll-out of breastfeeding laws in 2010 as part of the Affordable Care Act (ACA) and recent expansions under the Providing Urgent Maternal Protections Act (PUMP), little is known about their impact on mother’s labor supply.

Our results suggest that the workplace breastfeeding laws were successful at increasing breastfeeding rates and also positively impact maternal labor supply. Besides an increase in breastfeeding initiation, the results suggest that the laws particularly increased the continuation of breastfeeding measured as an increase in the probability that a child was breastfed at least three (six) months by 7% (8%). Next, we focus on our main outcome: Our results show that the breastfeeding laws increase the probability of employment for mothers of infants by 3.6 percentage points (pp) two years after the introduction, and by 2.5 pp or 4% (relative to the sample mean) on average over the post period. Fathers of infants do not respond to workplace breastfeeding laws. We further find suggestive evidence for a small positive effect on wage income of mothers which does not seem to be driven by highly educated (high-income) mothers but rather indicates shorter leave periods. Our results further suggest that positive employment responses are limited to mothers of infants and do not persist once children are out of breastfeeding age.

Our heterogeneity analysis suggests that employment responses are most pronounced for non-hispanic and non-black mothers, which is also mirrored in their breastfeeding responses. We further investigate differential responses based on marital status and discuss the difference in breastfeeding and labor market outcomes for heterogeneous groups of mothers. Regarding workplace characteristics, the employment effects seem to be focused in white-collar jobs and gender-equal occupations. To confirm the validity of our identification strategy, we show that the

¹For a discussion of the new econometric literature linked to the estimation of treatment effects under staggered treatment timing, see e.g. Roth et al. (2022).

timing of the introduction of the breastfeeding laws is not correlated with pre-existing differences in our outcome variables. We further show that the employment response of mothers is not due to an overall increasing trend in employment nor that changes in fertility are solely driving our results.

Our paper makes a number of contributions to the literature on the impact of breastfeeding (policies) on maternal outcomes and the determinants of female labor supply after child birth. This paper provides novel evidence on the effects of workplace breastfeeding laws on mother's labor market outcomes. Prior literature on breastfeeding and public policies has mostly focused on either explicit breastfeeding policies or family policies like parental leave and their impact on breastfeeding outcomes, while there is only limited evidence on how breastfeeding policies causally affect women's labor supply (Mandal, Roe, and Fein, 2014; Hamad, Modrek, and White, 2019; Lawler and Yewell, 2023; Del Bono and Pronzato, 2024; Pac et al., 2023). This paper, however, provides causal evidence that breastfeeding policies aiming for higher breastfeeding rates also indirectly affect maternal labor supply. Our paper highlights the interdependence of breastfeeding and work decisions of mothers. As far as we know, the only other work on workplace breastfeeding in the context of the US is a contemporaneous working paper by Hatamyar (2022). Our paper differs from their work along several dimensions. While our results indicate a persistently higher probability of employment after the introduction, their findings indicate a positive but transitory impact on a broad labor force participation outcome. Their analysis is based on the Panel Study of Income Dynamics (PSID), which is only available for a smaller sample, biennially, and does not contain consistent measures of labor market outcomes. We base our analysis on CPS and ACS data, which leaves us with a pooled yearly data set leading to more precise estimates both on impact and over time. We can also differentiate between labor force participation and employment based on detailed labor market information, which highlights the response of mothers with a higher labor market attachment. The enlarged sample further allows us to investigate heterogeneities and compare these outcomes to our heterogeneity analysis on breastfeeding outcomes. In addition, our paper also provides evidence for the impact of workplace breastfeeding laws on breastfeeding outcomes.

We also contribute to the literature on the impact of child birth and parenthood on labor market outcomes (Kleven, Landais, and Sgaard, 2019; Kleven et al., 2019; Corts and Pan, 2020). Recent literature focuses on the determinants of child penalties (Li, 2021; Kleven, Landais, and Sgaard, 2021; Kleven, 2023) as well as potential policy tools to reduce them (Olivetti and

Petrongolo, 2017; Kleven et al., 2024). The role of firms has received less attention, although prior studies show that women value family-friendliness of their employers (Nielsen, Simonsen, and Verner, 2004; Hotz, Johansson, and Karimi, 2018). Importantly, motherhood penalties are lower in more family-friendly firms (Hotz, Johansson, and Karimi, 2018; Garcia-Louzao and Perez-Sanz, 2024). Our paper focuses on a public policy that was introduced at the firm level and thus applies to firms independent of other characteristics - ruling out sorting across firms. Being able to combine breastfeeding and working provides flexibility to mothers for the initial return period and especially in the first year after childbirth. Our findings show that family-friendliness of the workplace matters - mothers respond with a higher probability of employment to the introduction of the breastfeeding laws.

This paper is organized as follows: Section 2 introduces the breastfeeding legislation and the institutional background in more detail. Section 3 and 4 describe the data and method we use. We discuss our findings on breastfeeding and labor market outcomes in Section 5 as well as potential mechanisms at work. Section 6 addresses potential identification challenges and Section 7 concludes.

2 Institutional Background

The World Health Organization (2022) recommends exclusive breastfeeding for the first 6 months. Breastfeeding rates in the US suggest that this recommendation is not met for the majority of infants. Only 25% of children are exclusively breastfed throughout the first 6 months (CDC, 2022a). The US Department of Health and Human Services (2022) has been making efforts to increase breastfeeding rates in the US. Of infants born in 2019, for 83% breastfeeding was at least initiated. In 2000, the breastfeeding initiation rate was at 70% (CDC, 2022b).

In the US, the labor force participation rate of mothers is high. 60.3% of mothers with a child less than one years old are in the labor force, 55.6% are employed with the majority (77.4%) being in full-time employment (US Bureau of Labor Statistics, 2022). In comparison to other developed countries, the US offers little institutional support for mothers. The US is the only OECD country not requiring employers to offer paid parental leave (OECD, 2022). Since 1993, there are 12 weeks of unpaid, job-protected leave available for employees according to federal law. Some states have more generous legislation, also including paid leave – however, paid parental leave is not a federal right.

Employment and breastfeeding are negatively linked, suggesting that women face a trade-off

(Kimbrow, 2006; Bai, Fong, and Tarrant, 2015). There are several reasons why mothers may want to breastfeed their child: the expectation of positive developments for children, allowing to build an intimate connection with the child, wanting to adhere to social expectations around breastfeeding, or economic reasons as breastfeeding is a cheap alternative to formula (Bicchieri et al., 2022). A supportive workplace environment can attenuate the trade-off between breastfeeding and employment for mothers (Johnston and Esposito, 2007).

Several states passed workplace breastfeeding legislation with the goal to increase breastfeeding. Workplace breastfeeding laws require employers to provide (unpaid) break time, to provide a private space other than a bathroom for expressing milk, or and/or prohibit any discrimination against employees who wish to breastfeed or express milk at work. In total, 18 states passed such a law between 1998 and 2009 ². In 2010, workplace breastfeeding regulations were adopted at the federal level as part of the Affordable Care Act (ACA) ³. In 2023, the Providing Urgent Maternal Protections (PUMP) Act further expanded federal requirements of workplace nursing protection. Figure 1 displays the state legislation prior to the federal law. In our identification, we exploit the temporal and geographic variation in the introduction of workplace breastfeeding laws introduced up until 2010. We discuss the institutional details of states enacting workplace breastfeeding laws in appendix A. Workplace breastfeeding laws were enacted under republican and democratic governors, and are not tied to differences in the state-level legal framework on breastfeeding more generally or other state-level family policies.

While additional break time and a private room seem like minor adjustments, they might be valuable for nursing mothers. Workplace breastfeeding laws importantly cover expressing milk in the workplace. Throughout the 1990s breast pumps became a frequently used option. As of the early 2000s, 85% of mothers report using a pump at some point (Labiner-Wolfe et al., 2008). Having the option to express milk in the workplace might matter to mothers who want to breastfeed their child for several reasons: Delays in expressing milk even for a few hours can create discomfort to mothers and even lead to mastitis⁴. Regularly expressing milk is important to maintain the milk supply. Expressed milk can be stored for up to four hours at room temperature and for days if refrigerated.

The additional break time legitimates a mothers' wish to breastfeed or express milk in the

²Additionally, nine states passed laws *encouraging* breastfeeding in the workplace. We exclude these states from the control group for our main results and discuss how their inclusion affects our results in section C.4.

³The federal law enacted in 2010 only provides a lower bound for state legislation. Several states passed more generous laws after 2010, including also a requirement for paid breaks to express milk in some states.

⁴Mastitis is an inflammation of breast tissue.

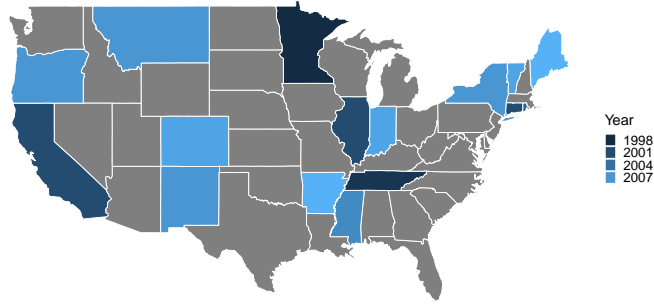


Figure 1: State level breastfeeding laws

Notes: Figure 1 shows the timing of the introduction of workplace breastfeeding laws across states.

workplace. The extra room - other than a bathroom - is not only crucial for privacy and sanitary reasons. It also matters for logistic reasons: breast pumps often require an electrical outlet to pump, which is usually not available in toilet cubicles.

Breastfeeding laws are enforced by the US Department of Labor’s Wage and Hour Division, who have field investigators and where one can file complaints against employers. In the case of discrimination or an employer not offering the required breastfeeding accommodations, employees can also file legal cases against their employers. Although the number of cases where employees sue their employers remains at low levels, they have increased by 800% over the last decade (Calvert, 2016). Employers may also have an incentive to provide breastfeeding accommodations, as it can increase employee retention rates and decrease absenteeism (National Business Group on Health, 2009).

Although breastfeeding laws are primarily aimed at increasing breastfeeding rates, we argue that they mandate a shift in the family-friendliness of firms. Prior literature points to the trade-off between spending time on working or breastfeeding (Albanesi and Olivetti, 2016; Kottwitz, Oppermann, and Spiess, 2016; Whitley, Ro, and Palma, 2021). Workplace breastfeeding laws reduce the cost of combining care of an infant and employment less costly for women, which may affect labor supply decisions.

3 Data

We rely on several datasets to study the impact of workplace breastfeeding laws.

3.1 Data on Breastfeeding Outcomes

To the best of our knowledge, no individual-level breastfeeding data covering our whole observation period from 1990-2009 is available. From 2003-2009, the National Immunization Survey (NIS-Child) provides individual and representative data on breastfeeding ⁵. The NIS-Child is conducted by the Center of Disease Control and Prevention (CDC) and targets parents or guardians of children aged 19 to 35 months. Breastfeeding outcomes are self-reported and available at the extensive margin: the survey provides information on breastfeeding initiation and the duration of breastfeeding. We approximate children's birthyear based on provided age bins at the time of the survey: children aged 19-23 months we assign birthyear as year of survey - 2, children aged 24-29 months or 30-35 months we assign birthyear as survey year - 3 ⁶.

Additionally, we compile state-level breastfeeding rates for 1990-2009. State-level breastfeeding rates prior to 2000 were collected in the Ross Mothers Survey (RMS) ⁷. Since 2000, state-level breastfeeding rates are available from the National Immunization Survey (NIS) ⁸. We compile annual state-level shares of infants who were breastfed at 6 months for the years 2000-2009 from these two sources.

Descriptives. Table 1 shows descriptive statistics for the sample from the NIS-Child. where we observe breastfeeding outcomes. The majority (70%) of all children in the sample were breastfed at some point. The proportion of children who are breastfed decreases with child age: 50% were breastfed for 3 months, 37% were breastfed for 6 months, and 18% were breastfed at 12 months. It should be mentioned here, these children were not necessarily *exclusively* breastfed.

3.2 Main Sample: Data on Labor Market Outcomes

Data on labor market outcomes and demographics characteristics are from the Current Population Survey (CPS) between 1990 and 2009 and the American Community Survey (ACS) between 2000 and 2009 ⁹. We pool these two datasets, which allows us to create a large enough sample of mothers of newborns for statistical analyses. For the CPS data, we rely on the Annual Social and Economic Supplement (ASEC) ("March files") which provides annual data. The ACS is

⁵The data can be obtained from the CDC (US Department of Health and Human Services, 2015)

⁶We adopt this procedure from Lawler and Yewell (2023).

⁷Data from the RMS was collected by the Ross Products Division (US Ross Products Division, 2000)

⁸Data on breastfeeding rates were obtained from the CDC (Centers for Disease Control and Prevention., 2024)

⁹Both datasets are obtained from IPUMS (Flood, Sarah, and King, Miriam and Rodgers, Renae and Ruggles, Steven and Warren, J. Robert and Westberry, Michael, 2022; Ruggles, Steven and Flood, Sarah, and Goeken, Ronald and Schouweiler, Megan and Sobek, Matthew, 2022).

Table 1: Summary Statistics - Breastfeeding Data

	Mean	SD
Ever Breastfed	0.70	0.46
Breastfed 3+ months	0.50	0.50
Breastfed 6+ months	0.37	0.48
Breastfed 12+ months	0.18	0.38
Ever received WIC	0.51	0.50
Hispanic	0.19	0.40
Black	0.16	0.37
Female	0.49	0.50
Age ≤ 19	0.03	0.17
Age 20-29	0.41	0.49
Age 30+	0.56	0.50
College Education	0.31	0.46
Married	0.69	0.46
Number of Observations	146,264	

Table 1 shows summary statistics for the sample used for the analysis of breastfeeding outcomes. It is based on data from the National Immunization Survey for the years 2003 to 2009.

a replacement to the decennial census carried out by the US Census Bureau. Since we are interested in the impact of breastfeeding laws on female labor supply, for our main analysis we restrict the sample to women between 21 and 50 years old with children between zero and one years old. Women in the armed forces are excluded. The pooled dataset consists of roughly 316,000 individuals over the entire period. The CPS and ACS data provide rich information on these women, covering demographic characteristics and economic variables.

Descriptives. Table 2 gives key descriptive statistics for the 316,013 individuals in our sample and for the CPS and ACS sample separately. On average, women in our sample are 30 years old, and the majority of mothers in our sample is married. Further, the average number of children is two. Mothers in both samples display very similar characteristics in terms of labor force participation, employment, age, marital status, racial composition, education, and number of children.

4 Empirical Strategy

4.1 Main Analysis

In our identification strategy, we exploit the temporal and geographic variation in family-friendliness of firms, as required by workplace breastfeeding laws introduced throughout 1998 and 2009.¹⁰

¹⁰In 2010, a federal breastfeeding law was introduced.

Table 2: Summary Statistics

	<i>All</i>		<i>CPS</i>		<i>ACS</i>	
	Mean	SD	Mean	SD	Mean	SD
Labor force participation	0.61	0.49	0.60	0.49	0.62	0.49
Employment	0.56	0.50	0.56	0.50	0.56	0.50
Age	29.88	5.56	29.77	5.45	30.03	5.60
Married	0.76	0.43	0.78	0.42	0.74	0.44
Black	0.14	0.30	0.14	0.35	0.13	0.34
Hispanic	0.11	0.32	0.11	0.31	0.13	0.34
College education	0.58	0.50	0.57	0.50	0.57	0.50
Nr. of children	2.07	1.14	2.07	1.14	2.06	1.13
Number of Observations	316,013		60,492		255,267	

Table 2 shows summary statistics for the sample used for the main analysis. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009 and includes women between 21 and 50 years of age with children aged zero and one years old.

Prior to recent advances in the econometric literature, researchers used event study specifications in order to estimate treatment effects in such a setting, exploiting the staggered treatment of different groups. This approach is also known as a two-way fixed effects regression including lead and lags. However, recent econometric literature shows that such estimates can be biased due to negative weights and treatment heterogeneity within and across groups (e.g. De Chaisemartin and d’Haultfoeuille, 2020; Goodman-Bacon, 2021). Sun and Abraham (2021) propose an interaction weighted (IW) estimator as a consistent estimator: the estimator relies on weighted cohort-specific average treatment effects on the treated ($CATT_{el}$), where e refers to a cohort treated at the same time and l to their relative time periods. Cohorts are formed based on their treatment timing and compared to a never-treated group¹¹. CATTs are averaged and weighted by the share of each cohort in the sample.

Following Sun and Abraham (2021), we estimate the following equation:

$$Y_{ist} = \alpha + \sum_{e \notin C} \sum_{l \neq -1} \delta_{el} (\mathbb{1}\{E_i = e\} \cdot D_{st}^l) + X'_{ist} \beta + X'_{st} \rho + \gamma_s + \theta_t + \epsilon_{ist}, \quad (1)$$

where $\mathbb{1}\{E_i = e\}$ indicates the cohort e treated at the same time, D indicates the treatment status, C refers to the never-treated control group, and l is the relative time indicator. The estimates from equation Equation 1 are $CATT_{el}$ for each cohort e and relative time period l . Y_{ist} refers to our outcome variable for individual i in state s at time t . The vector X_{ist} includes

¹¹In all specifications, we exclude states that passed laws encouraging workplace breastfeeding from the control group. We additionally exclude Tennessee and Minnesota. In these two states, workplace breastfeeding laws are within less than one year of the State Children’s Health Insurance Program, and we want to rule out its potentially confounding effect.

several individual level control variables, and the vector X_{st} includes time-varying state level controls. All specifications further include state (γ_s) and year (θ_t) fixed effects. We cluster standard errors at the state level.

For the IW estimator, a weighted average of cohort-specific average treatment effects on the treated is formed:

$$\hat{\nu}_g = \frac{1}{|g|} \sum_{l \in g} \sum_e \hat{\delta}_{el} \hat{Pr}(E_i = e | E_i \in [-l, T - l]), \quad (2)$$

where $\hat{Pr}(E_i = e | E_i \in [-l, T - l])$ are estimated weights based on the sample shares of each cohort e in each period l . The figures throughout the paper report estimates following Sun and Abraham (2021).¹²

Breastfeeding outcomes. We use four different dummy variables as outcomes for our breastfeeding results: a dummy for initiating breastfeeding, and dummies for breastfeeding for at least 3, 6, or 12 months. On the individual level, we control for hispanic origin, being black, being black hispanic, the child’s gender, mothers’ age, whether a child received WIC, whether the mother is college-educated, and whether the mother is married. On the state level we use the share of the black population, the share of hispanic population, and the share of the population aged 30 or younger. Additionally to state and survey year fixed effects, we include birthyear fixed effects. A detailed description of all variables we employ, can be seen in table B2 in the appendix.

Labor market outcomes. For our main results, we use a dummy for labor force participation and a dummy for employment for a mother as the dependent variable. As individual level controls we use age, age squared, marital status, being black, being hispanic, being black and hispanic, the number of children, having a college degree, and the age of the youngest child. As state level controls, we employ the share of the black population, the share of hispanic population, and the share of the population aged 30 or younger. A detailed description of all variables we employ, can be seen in table B1 in the appendix.

5 Results

Workplace breastfeeding laws reduce the trade-off mothers face between working and breastfeeding their child - as such, we argue that workplace breastfeeding laws increase the family-friendliness of the workplace. Mothers can respond to workplace breastfeeding laws on two margins: by

¹²We show outcomes using two-way fixed effects to estimate the effect of the breastfeeding laws on mothers’ labor supply in figure 12a and 12b.

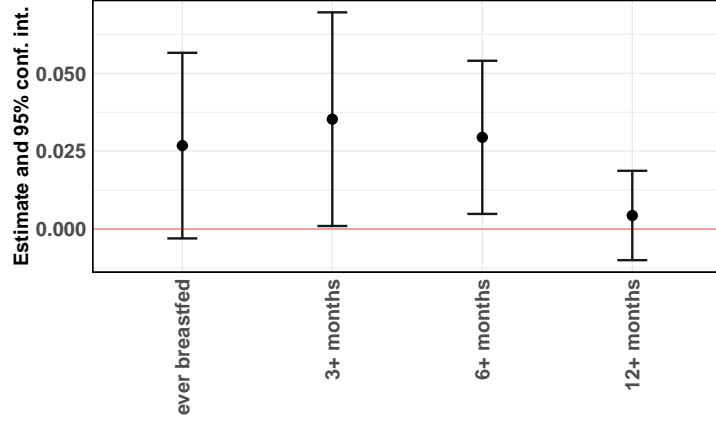


Figure 2: Aggregate Effect of Breastfeeding Laws

Notes: Figure 2 shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the National Immunization Survey (NIS-Child) for the years 2003 to 2009. The dependent variables are dummies for a child ever being breastfed, and dummies for being breastfed at least 3, 6, or 12 months, 0 otherwise. The individual level and state level control variables included are specified in the discussion of equation 1. State, survey year and birth year fixed effects are included in all specifications. Standard errors are clustered at the state level.

increasing employment as well as increasing breastfeeding. In this section, we first discuss the effect of breastfeeding laws on breastfeeding, and then turn to labor market outcomes. Lastly, we provide a heterogeneity analysis for both margins of response.

5.1 Breastfeeding

Our findings suggest that workplace breastfeeding laws increase breastfeeding. Figure 2 displays average treatment effect of workplace breastfeeding laws on different measures for breastfeeding. Our findings suggest increases in breastfeeding initiation, and increases in the probability that a child was breastfed at least three months and in the probability that a child was breastfed at least six months. The estimated coefficient for being breastfed at least 12 months is close to zero and not statistically significant ¹³. Ideally, we would want to see whether employed women drive these increases in breastfeeding - unfortunately the data does not include information on the mother's employment status.

Workplace breastfeeding seems to matter especially for the continuation of breastfeeding. We find the strongest effects for breastfeeding at three and six months, with increases of 3.5pp (7% relative to the sample mean) and 2.9pp (8% relative to the sample mean) respectively. The

¹³The event studies behind the average treatment effects reported in figure 2 are displayed in figure C2. Also the event studies suggest an increase in breastfeeding at three and six months as a consequence of workplace breastfeeding laws, as well as increases in breastfeeding initiation - although no positive effect is seen in period 1.

effect on breastfeeding initiation is smaller with 3.8% relative to the sample mean. Mothers who started to breastfeed now have the option to continue breastfeeding up to three or six months, as it is now possible for them to express milk in the workplace ¹⁴. 12 months after child birth we do not observe higher breastfeeding rates due to workplace breastfeeding legislation. At that time, many women may have stopped using their right to breastfeed or express milk in the workplace which may be explained by weaning one year after childbirth.

Positive effects of workplace breastfeeding laws on breastfeeding are in line with evidence from the literature: Hauck, Miraldo, and Singh (2020) show that states with workplace breastfeeding legislation have breastfeeding rates 3.1pp higher than states without legislation, states with encouraging workplace breastfeeding have 2.3pp higher breastfeeding rates. Similarly, Hawkins, Stern, and Gillman (2013) show that workplace breastfeeding legislation increases breastfeeding initiation rates by 1.7 pp.

The results displayed in Figure 2 use data starting in 2003. We provide graphical evidence on changes in state-level breastfeeding rates throughout 1990 and 2009 in appendix C1. The figure provides suggestive evidence on the passage of workplace breastfeeding laws and corresponding increases in breastfeeding rates.

5.2 Labor Market Outcomes

Our main outcome of interest is mothers' labor supply. In the US, child birth drives a large share of women out of employment (Kleven et al., 2019) - what happens to maternal labor supply once the cost of going to work and taking care of an infant is reduced? We tackle this question by evaluating labor supply responses in a sample of mothers of infants, once workplace breastfeeding laws are introduced. Our main results of mothers' labor supply responses to the breastfeeding laws are presented in figure 3a and figure 3b.

Workplace breastfeeding laws increase the labor supply of mothers of infants: We estimate positive coefficients for women's labor force participation (Figure 3a) - however, they are not statistically significant. Looking at mother's employment, figure 3b reveals a substantial positive effect. Workplace breastfeeding legislation increases the probability of employment for mothers by 3.6 pp two years after their implementation. The positive impact persists over the next years, which indicates a level effect in mothers' employment. This is in line with Hatamyar (2022), who also documents an increase in employment (i.e. has positive wage income) for mothers of

¹⁴They might still supplement with formula, breastfeeding in the data does not mean exclusive breastfeeding.

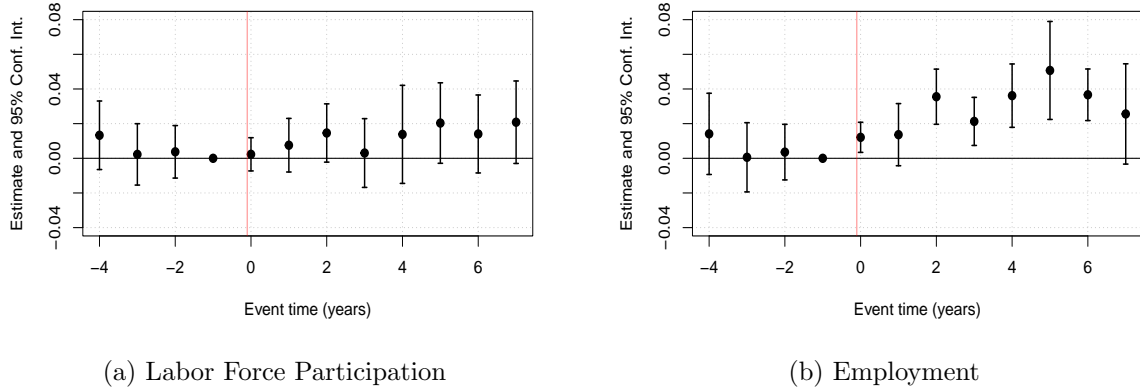


Figure 3: Event study of breastfeeding law: Mothers of infants

Notes: Figure 3a and 3b shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009 and includes women between 21 and 50 years of age with children aged zero and one years old. The dependent variable is a dummy variable taking on the value 1 if an individual is in the labor force (figure 3a)/employed (figure 3b) and 0 otherwise. The individual level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

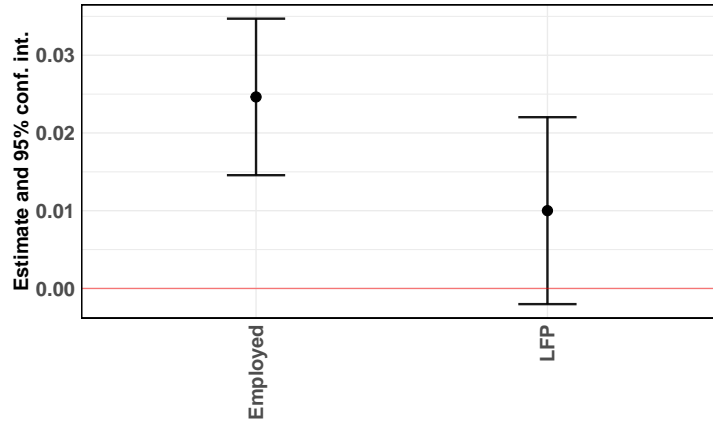


Figure 4: Aggregate Effect of Breastfeeding Laws

Notes: Figure 4 shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. In the left columns, the dependent variable is a dummy variable taking on the value 1 if an individual is employed and 0 if they are not employed. In the right columns, the dependent variable is a dummy variable taking on the value 1 if an individual is in the labor force and 0 if they are not. The individual level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level.

infants using the Panel Survey of Income Dynamics (PSID).

Why are employment responses more clearly pronounced than responses in labor force participation? One explanation would be that workplace breastfeeding laws might matter especially for women with higher labor market attachment. This group of women might still

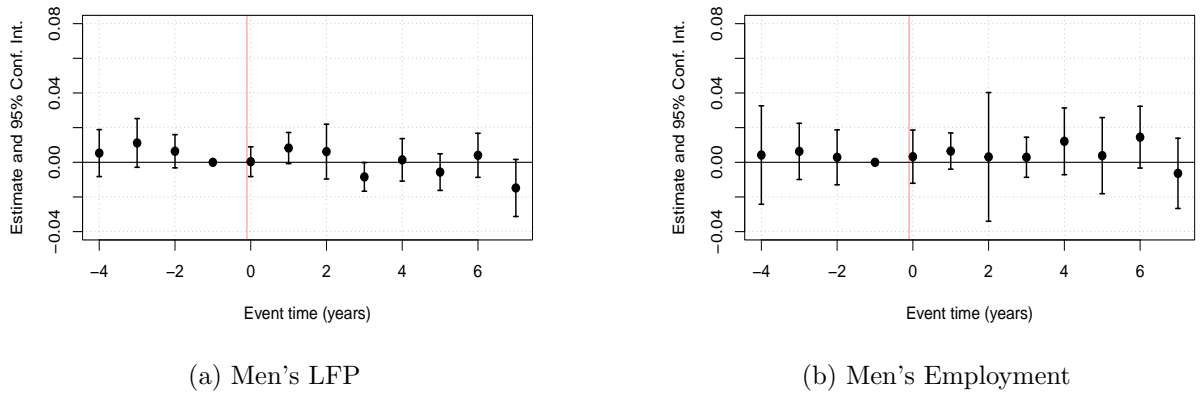


Figure 5: Event study of breastfeeding law: Fathers of infants

Notes: Figure 5a and 5b show estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009. The dependent variable in figure 5a is a dummy variable taking on the value 1 if an individual is in the labor force, 0 otherwise. The dependent variable in figure 5b is a dummy variable taking on the value 1 if an individual is employed, 0 otherwise. We use a sample of men aged 21-50 with children aged zero to one years old. The individual and state level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

want to feed their child breast-milk. Before the workplace breastfeeding laws, it was difficult to reconcile both. Some women may have left employment temporarily (but stayed in the labor force) - potentially to look for a different job where it is easier to combine work and child care. In the US, roughly one fifth of mothers who work after the birth of their first child do not return to their pre-birth employer (Laughlin, 2011). Workplace breastfeeding laws may reduce the need of such temporary employment breaks.

Figure 4 shows the average treatment effect of workplace breastfeeding laws. We obtain it by aggregating event study coefficients for periods 0 to 7. The average treatment effect suggests a 2.5pp (1pp) increase in maternal employment (labor force participation) as a consequence of workplace breastfeeding laws - this translates to 4.4% (1.6%) relative to the sample mean. Only the increase in maternal employment is statistically significantly different from zero.

To understand household reactions to increased maternal employment, we further examine whether fathers react to the introduction of workplace breastfeeding laws. Figure 5a and 5b) show results from re-estimating equation 1 in a sample of fathers of infants (children aged 0-1 years). Fathers of infants do not show any economically or statistically significant employment or labor force participation responses as a consequence of the workplace breastfeeding legislation. Thus,

the lack of employment responses amongst fathers of infants suggests that within households fathers do not react to increased maternal employment.

5.2.1 Hours Worked and Wages

Workplace breastfeeding laws increase employment amongst mothers of infants. Next, we examine whether this also induces changes in wage income or hours worked among employed mothers of infants.

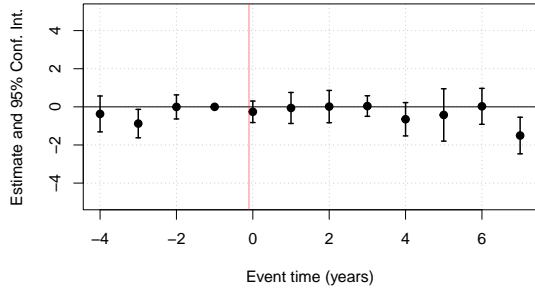
The direction of the impact of workplace breastfeeding on hours worked are not clear *ex ante*: Workplace breastfeeding could have a positive effect on hours worked if women increase their hours as they can stay longer at work and express their milk there. We could also see a positive effect if women with higher hours are the ones driving the extensive margin employment effects and this shifts the average hours worked in the sample upwards. Figures 6a and 6b suggest that workplace breastfeeding laws had no significant effects on hours worked or full-time employment of mothers. This is in line with Kleven et al. (2019) identifying the extensive margin, i.e. women leaving employment once they have a child, as the key driver of the child penalty in the US.

We can only provide limited evidence on the effect of workplace breastfeeding laws on mothers' wages. Wage income is measured on the annual level in our data. Figure 6c suggests small positive effects of the workplace breastfeeding laws on wage income. Taking a shorter (unpaid) leave or not dropping out of employment once workplace breastfeeding is possible could contribute to the positive effect on mothers' annual wage income. Another explanation would be that especially mothers with high (potential) earnings drive the employment responses - we will further examine this in the discussion of our heterogeneity analysis.

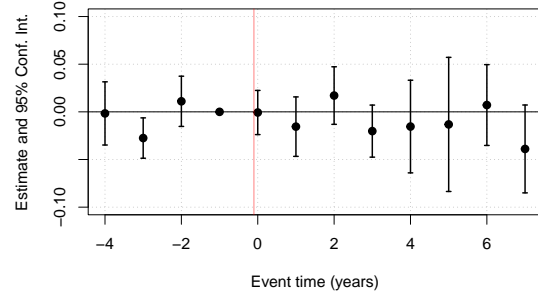
5.2.2 Persistence of the Impact

Our main results describe the impact of the introduction of workplace breastfeeding on labor market outcomes of mothers of infants. While the effect of the policy on these mother's employment is persistently positive also several years after the introduction of the law, we have yet to explore how it evolves dynamically when children are out of breastfeeding age. Since we do not have panel data, we explore the persistence of the impact over the child age in our cross-sectional sample.

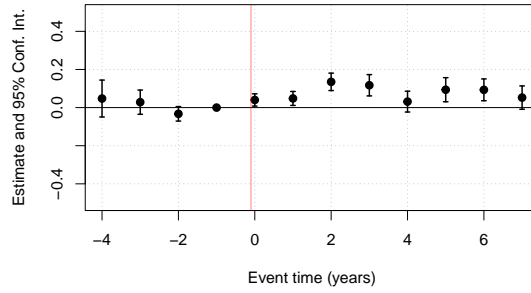
First, we re-estimate equation 1 and shift the sample over the years. For our main results, we estimate employment responses in a sample of working age mothers (age 21-50) of infants (age



(a) Hours worked



(b) Full-Time Employment



(c) Log Wage Income

Figure 6: The effects of workplace breastfeeding laws on hours worked and wages

Notes: Figure 6 shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009 and includes *employed* women between 21 and 50 years of age with children aged zero and one years old. The dependent variable is are the weekly hours worked in figure 6a. The dependent variable in figure 6b is a dummy that takes on the value 1 if a person works at least 35 hours per week, 0 otherwise. The dependent variable in figure 6c is the log annual wage income. The individual level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

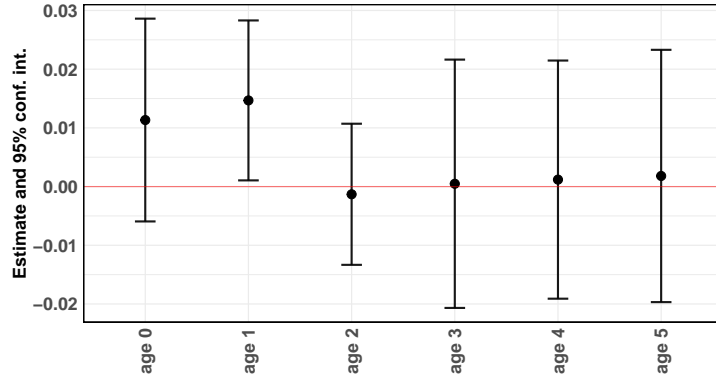


Figure 7: Employment Response in the Medium-Run based on Child Age

Notes: Figure 7 shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS). The coefficient "age 0" includes women aged 21 to 50 with a child aged zero during the years 1990 to 2009. The coefficients "age 1" to "age 5" shift our sample over time and follow the same cohort. The sample used to estimate the coefficient "age 5" relies on mothers aged 26 to 55 with a child aged 5 during the years 1995 to 2014. The dependent variable is a dummy variable taking on the value 1 if an individual is employed and 0 otherwise. The individual level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level.

0-1). To evaluate the persistence of employment responses, we re-estimate the same equation 1 by following the same cohorts of mothers over time as their children grow older, up until the age of 5. For illustration, there we observe mothers of the cohorts included in our main results, but 5 years later - they are now mothers with children aged 5, they themselves being 26-55 years old.

The results are shown in figure 7. Note that the results become noisier as we split our sample by child age. Nevertheless, the positive coefficients for mothers of infants (age 0 and age 1) are in line with our main findings. We do not detect any meaningful differences in employment of the same cohort of mothers, once their children grow older. This result suggests that positive employment responses are limited to the period when children are actually in breastfeeding age.

5.3 Heterogeneity Analysis

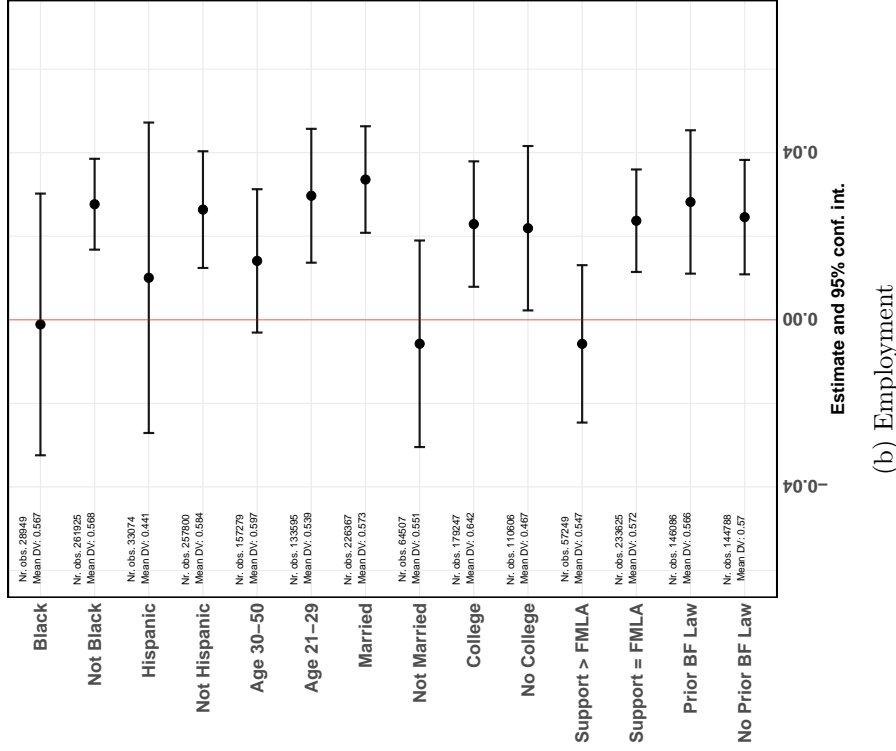
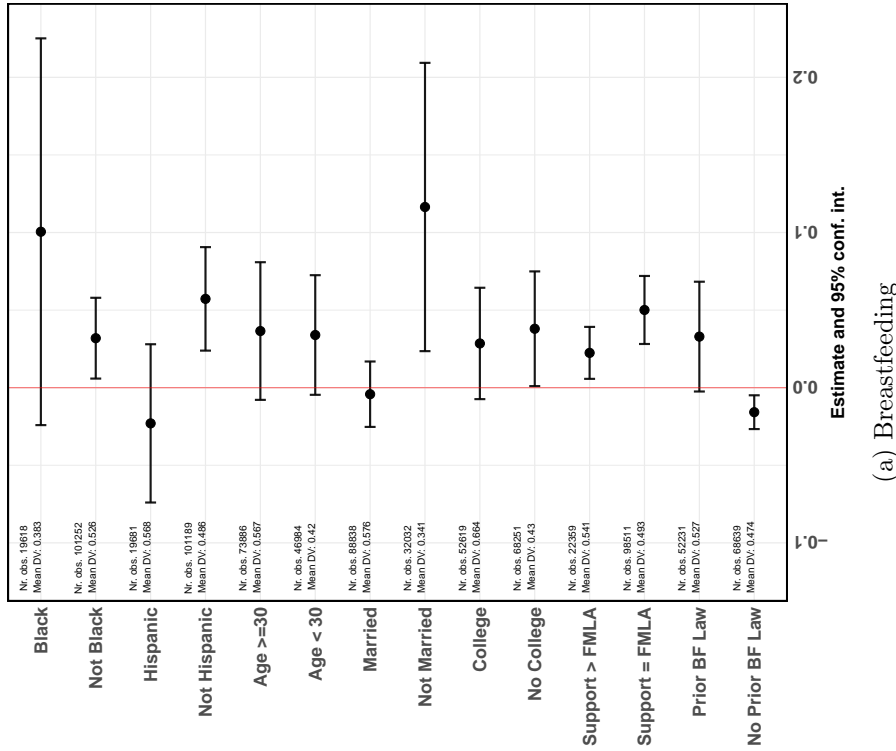


Figure 8: Heterogeneity Analysis

Notes: Figure 8a and figure 8b show estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. Figure 8a is based on data from the National Immunization Survey (NIS-Child) for the years 2003 to 2009. Figure 8b is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009 and includes women between 21 and 50 years of age with children aged zero and one years old. The dependent variable is a dummy for breastfeeding at 3 months in figure 8a, and a dummy for being employed in figure 8b. We split our sample along several dimensions - number of observations and the mean of the dependent variable for each subsample are listed on the left of each plot. The individual level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level.

In figure 8 we show the results from our heterogeneity analysis: Figure 8a shows heterogeneity in the breastfeeding responses and figure 8b shows heterogeneity in employment responses.

By individual characteristics. We split our sample of mothers by race, ethnicity, age, education, and marital status. The overall direction of the coefficients seem similar for most sub-groups, there are some obvious exceptions for both, breastfeeding and employment outcomes. The estimates for black mothers, hispanic mothers, and non-married mothers differ from the remainder of the coefficients. When interpreting these coefficients, it has to be kept in mind that they are extremely noisy due to the small sample size for these groups. If anything, our heterogeneity analysis suggests that employment responses are driven by non-hispanic and non-black mothers. This is in line with heterogeneity we observe in breastfeeding effects ¹⁵.

Employment responses are more pronounced among women below the age of 30, while we do not find differences in breastfeeding responses for different age groups. We identify heterogeneous results for breastfeeding and employment by marital status: Breastfeeding responses are close to zero for married mothers, but their employment responses are large and statistically different from zero. For unmarried mothers we see the opposite: large breastfeeding responses, even though imprecisely estimated, and no significant employment responses. In general, breastfeeding rates are higher for married women (58% of married women breastfeed at 3 months, 34% of unmarried women breastfeed at 3 months.). Married women who want to breastfeed may have had the financial support from their partner to drop out of employment in order to breastfeed, prior to workplace breastfeeding laws. Once it is possible to combine breastfeeding and working, married women return to employment at higher rates. Single mothers may be more inelastic in their labor supply (in line with smaller child penalties for single mothers (Kleven, 2023)) - for them breastfeeding is the only margin of response.

Neither breastfeeding nor employment responses vary by education. This provides additional evidence for the hypothesis that the wage income responses discussed in section 5.2.1 are driven by shorter leave periods, rather than primarily women with high earnings potential returning to work.

By state characteristics. We check for heterogeneity in employment and breastfeeding responses based on two state-level characteristics: (1) whether a state had introduced any policy granting more generous or (partially) paid leave, as opposed to the 12 weeks of job-protected unpaid leave required by the FMLA; (2) whether a state is among the earlier adopters of other

¹⁵The point estimate for black mothers' breastfeeding is large, but not statistically significant.

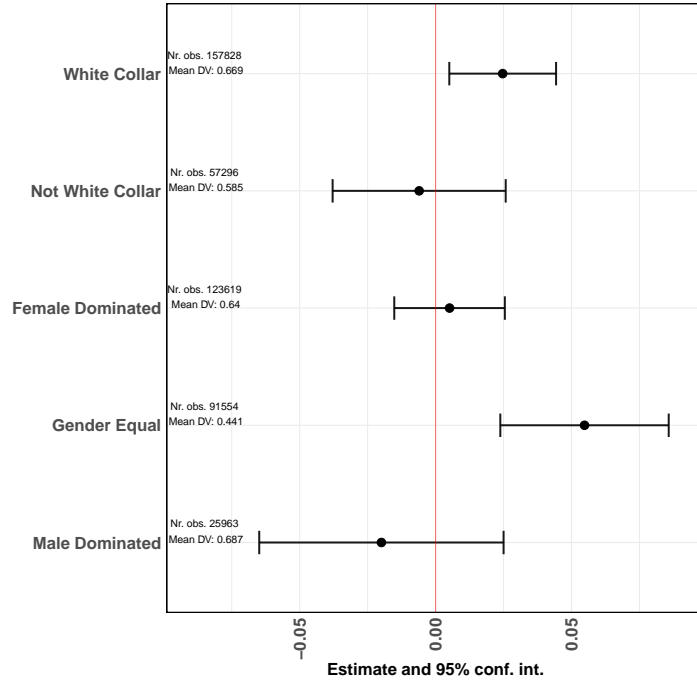


Figure 9: Heterogeneity in Employment by Occupational Characteristics

Notes: Figure 9 shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the American Community Survey (ACS) for the years 2000 to 2009 and includes women between 21 and 50 years of age with children aged zero and one years old. The dependent variable is a dummy for being employed, 0 otherwise. We split our sample along several dimensions - number of observations and the mean of the dependent variable for each subsample are listed on the left of each plot. The individual level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level.

breastfeeding laws, i.e. a state passed a law allowing breastfeeding in all public or private places, or exempting breastfeeding from indecent exposure prior to 2000. We find that breastfeeding responses are larger in states with no institutional support beyond the FMLA. The difference is even more pronounced in the employment responses. This suggests that in absence of institutional support for mothers, already small changes in the family-friendliness of the workplace - such as workplace breastfeeding laws - may trigger considerable employment responses. In contexts where mothers have access to other forms of institutional support, such as extended leave or paid leave, workplace breastfeeding laws may not have the same effect.

We also find that workplace breastfeeding laws might not have a beneficial - if not counter-productive - effect on breastfeeding in states without prior breastfeeding legislation. Assuming that these states are less supportive of breastfeeding in general or outside the home, critical discussion around workplace breastfeeding may deter mothers from breastfeeding. In terms of employment, we do not see heterogeneous responses.

By occupational characteristics. The effectiveness of workplace breastfeeding laws may depend on the workplace characteristics ¹⁶. We find that employment responses are larger in white collar jobs than in blue collar jobs or the service sector - expressing milk at the workplace seems to matter most in regular office jobs, potentially because there it will be more compatible with work routines.

Lastly, we check for heterogeneity by how “female-dominated” a job is. We do that by calculating the share of women working in occupations in 1995 - prior to the introduction of workplace breastfeeding laws. We define occupations where at least two thirds of workers are female as female-dominated, occupations where less than one third of workers are female as male-dominated, and the remainder of occupations as gender-equal. We find that employment responses are driven by gender-equal occupations. In female-dominated occupations, the employment effect is close to zero - this would be consistent with other family-friendly workplace arrangements already being in place in such working environments. In male-dominated industries, we even observe a negative coefficient, even though not estimated precisely. This may suggest, that in male-dominated industries the need to provide a place and break time to express milk in the workplace may lead to backlash for women.

To sum up, our results suggest that women react to the introduction of workplace breastfeeding laws. How do the labor supply responses compare to effects triggered by other related policies? Paid parental leave programs introduced at the state level have received a lot of attention in the literature. Overall, studies indicate that the paid parental leave program lead to take-up of leave and increased maternal labor market attachment and attachment to the pre-birth employer around child birth in the short run (Baum and Ruhm, 2016; Byker, 2016). Similarly, the labor supply responses we present in this paper are short-run labor supply responses amongst mothers of infants. Evidence on more medium-run employment effects as a consequence of paid parental leave is modest: Bailey et al. (2019) focus on medium and longer run effects of paid parental leave in California and detect no overall employment responses. This is line with our findings on no medium-run effect on mothers employment once children are out of breastfeeding age.

¹⁶For our heterogeneity analysis based on occupations, we restrict our sample to ACS data. Occupational information is also collected for individuals who are not currently working or in the labor force - however, the time horizon taken into account in that case differs between ACS and CPS. In the ACS, occupational information is collected for people who had worked within the past five years. In the CPS, if one is not currently in the labor force, occupational info is only collected for people who worked in the last year.

Table 3: Correlation with Pre-Treatment Characteristics

	(1) Timing	(2) Timing	(3) Timing
Employment Rate	-8.04526 (6.29542)		
Labor Force Participation Rate		-5.77365 (6.57703)	
Breastfeeding Rate			-0.06047 (0.11324)
Num. obs.	42	42	42

Table 3 regresses the timing of strict breastfeeding laws on pre-treatment characteristics. It is based on data from the Current Population Survey (CPS) for the years 1995 and state level characteristics are calculated in a sample of women with young children aged between 18 and 40. Column (1) regresses the timing of breastfeeding laws on the employment rate, Column (2) on the labor force participation rate, and Column (3) on the breastfeeding rate. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

6 Identification Challenges

In this section, we address possible identification challenges that come with our identification strategy and provide several robustness checks.

6.1 Timing of Workplace Breastfeeding Laws

Our first identification check refers to the exogeneity of workplace breastfeeding laws. One might be concerned that the introduction of the laws was driven by pre-existing differences in women’s labor market outcomes or breastfeeding rates. To address this potential threat to our identification strategy, we test whether the timing workplace breastfeeding laws is predicted by prior state-level characteristics. We estimate the following equation:

$$Y_s = \alpha + X_s^{1995}\beta + Z_s^{1995}\gamma + \epsilon_s. \quad (3)$$

Y_s is the year in which the workplace breastfeeding law was introduced in a state s . The vector Z_s^{1995} contains collapsed individual level characteristics, such as age, the share of black or Hispanic women, as well as the share of college-educated women. The variable X_s^{1995} represents the labor force participation rate, the employment rate, and the breastfeeding rate in 1995 for state s .

Table 3 shows that there is no correlation between the timing of workplace breastfeeding laws and state-level maternal labor supply nor breastfeeding rates.

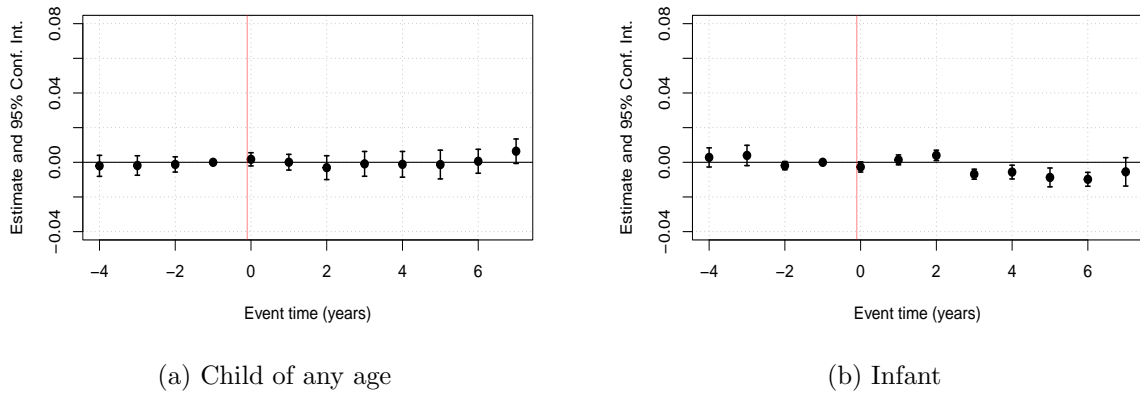


Figure 10: Event study of breastfeeding law

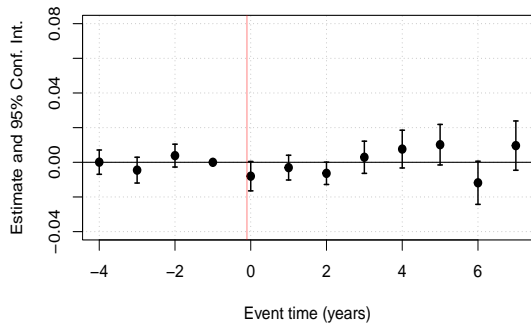
Notes: Figure 10a and 10b shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009 and includes women between 21 and 50 years of age. The dependent variable is a dummy variable taking on the value 1 if an individual has a child (figure 10a)/has an infant (figure 10b) and 0 otherwise. The individual level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

6.2 Fertility

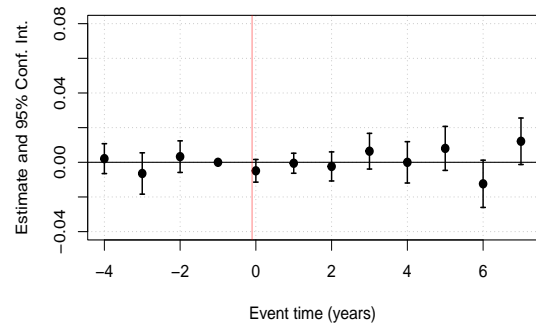
In a next step, evaluate whether workplace breastfeeding laws also entail changes in fertility decisions. We estimate equation 1 using a dependent variable that indicates having a child of any age (figure 10a), and a dependent variable that indicates having an infant (figure 10b). For these regressions, we use a sample of all women aged 21 to 50. While the probability that a woman has a child remains unchanged, we observe a small but statistically significant decrease in the probability that a woman has an infant, starting three years after the introduction of workplace breastfeeding laws. This might indicate that some women delay having children or reduce their number of children. In figure 3b, we see an immediate increase in employment, which makes us confident that changes in fertility are not the main driver of the results we provide. However, it has to be kept in mind that lagged negative fertility effects may contribute to the increase in employment over time. We provide additional checks for changes in the sample composition in table C1.

6.3 Placebo Checks

To ensure that the results we find are not driven by overall changes in employment, we study a group that should be unaffected by workplace breastfeeding laws: We re-estimate equation 1 in



(a) Female LFP, child aged 6+



(b) Female Employment, child aged 6+

Figure 11: Placebo checks: The effects of workplace breastfeeding laws on labor supply

Notes: Figure 11a and 11b show estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009. The dependent variable in figure 11a is a dummy variable taking on the value 1 if an individual is in the labor force, 0 otherwise. The dependent variable in figure 11b is a dummy variable taking on the value 1 if an individual is employed, 0 otherwise. We use a sample of women aged 21-50 with children aged above 5 years. The individual and state level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

a sample of women with children too old for breastfeeding (children aged 6 or older). Figure 11a and 11b display the results from this exercise. Mothers of older children do not show any economically or statistically significant employment responses as a consequence of the workplace breastfeeding legislation. These findings underline that the positive employment responses of mothers of infants are driven by their exposure to more family-friendly workplaces after the introduction of workplace breastfeeding laws, and not by overall trends in employment rates.

6.4 Robustness

Since the breastfeeding laws were introduced across states at different points in time, we exploit this staggered treatment for our identification. However, as discussed in Section 4, with heterogeneous treatment timing the two-way fixed effects estimator may be biased due to the weights assigned to each period estimate. While our main results show estimates using the interaction weighted estimator, we also want to explore the outcomes of traditional two-way fixed effects estimates and a similar other weight estimator. Similar to the Sun and Abraham (2021) estimator, the estimator proposed by Callaway and Sant'Anna (2021) avoids negative weighting and gives a weighted average of cohort-specific average treatment effects on the treated

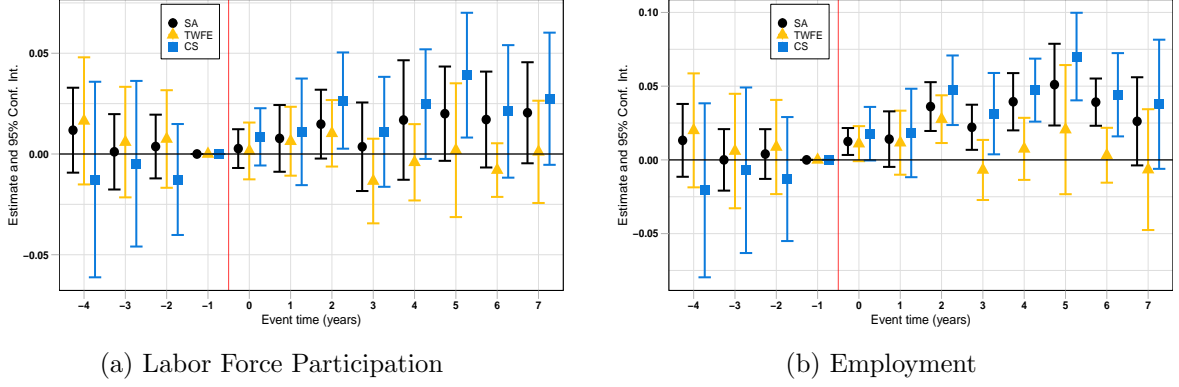


Figure 12: Event study of breastfeeding law

Notes: Figure 12a and 12b show estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator (SA, black dots) compared to the two-way fixed-effect regression estimates (TWFE, yellow triangles) and to the Callaway and Sant’anna regression estimates (CS, blue square dots). It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009 and includes women between 21 and 50 years of age with children aged zero and one years old. The dependent variable is a dummy variable taking on the value 1 if an individual is in the labor force (figure 12a)/employed (figure 12b) and 0 otherwise. The individual level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

(Baker, Larcker, and Wang, 2022). Figure 12a and 12b compare the outcomes using the Sun and Abraham (2021) interaction weighted estimates (SA, black dots) to standard two-way fixed effects estimates (TWFE, yellow triangles) and to the Callaway and Sant’anna regression estimates (CS, blue squares) (Callaway and Sant’Anna, 2021). When we focus on labor force participation responses to workplace breastfeeding laws, our main results with the interaction weighted estimator are further confirmed by the two-way fixed effects estimates as well as the Callaway and Sant’anna regression estimates. For the impact of the workplace breastfeeding laws on the probability of being employed, the interaction weighted estimator shows more pronounced positive effects while the OLS estimates mostly show a flat trend after the treatment (with the exception of period 2 after the treatment). This can be explained by the inclusion of already treated units in the control group for earlier treated units, which can create a downward bias. Similar to our main results, the Callaway and Sant’anna estimator confirms the higher probability of employment as a result of the introduction of the workplace breastfeeding laws and shows qualitatively but also quantitatively similar results.

In the appendix, we show and discuss further robustness checks. To eliminate any selection concerns, we test whether states that introduced the breastfeeding laws attracted female workers. To ensure that the introduction of the breastfeeding laws did not attract families to relocate, we

estimate equation 1 with a new outcome variable that indicates whether a mother has moved from another state in the previous year. Figure C3 confirms that we can rule out selective migration as driving our results. Further, we vary the sample we use for the regressions and include states encouraging workplace breastfeeding in the control group. In addition, we vary control variables we include in the specification: we show regression outcomes without any control variables, and when including additional state-level controls. Corresponding results are displayed and discussed in section C.4 and section C.5 in the appendix. Our findings are robust to both exercises. Lastly, we show results separately for ACS and CPS - results are discussed in section C.6.

7 Conclusion

In this paper, we study the effect of workplace breastfeeding laws on mother’s labor supply. In particular, we exploit the introduction of breastfeeding laws in the US between 1995 and 2009 that mandated employers to provide additional break time and a private room for breastfeeding or expressing milk. While the initial goal of the policy was to increase breastfeeding rates, we are also interested in women’s labor supply responses beyond responses in breastfeeding rates. Our identification relies on the staggered introduction of the law across US states and is based on the interaction weighted estimator by Sun and Abraham (2021).

Our results suggest a higher probability of breastfeeding initiation as well as breastfeeding at three and six months after childbirth. For our main results, we show that mother’s probability to be in the labor force participation is positively affected (although not statistically significant), but their employment probability increases by 4% as a response to the introduction of the breastfeeding laws. Our heterogeneity analysis reveals that responses of mothers vary with marital status, race, and occupational characteristics and are linked to their breastfeeding responses. While our results show positive short-run employment responses, further analysis does not suggest a higher probability of employment when children are out of infant age. Thus, our findings highlight the importance of compatibility of care work and employment to increase maternal labor supply after childbirth.

In light of ongoing expansion of breastfeeding policies and the continued proclaimed policy goal in the US to increase breastfeeding rates, understanding their effect on mother’s labor supply is indispensable in assessing the policies’ full impact. Our results fit into a larger literature highlighting the importance of family-friendliness of the workplace to increase mother’s labor

supply.

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A Additional Details on the Institutional Setting

A.1 Timing of State-Level Workplace Breastfeeding Laws

Table A1 displays the timing of workplace breastfeeding laws enacted up until 2010. In 2010, a federal provision regarding workplace breastfeeding was enacted as part of the Affordable Care Act. In total, 17 states and DC had enacted workplace breastfeeding laws prior to the federal implementation. The introduction of workplace breastfeeding laws is not tied to the political affiliation of the governor, as shown in figure A1.

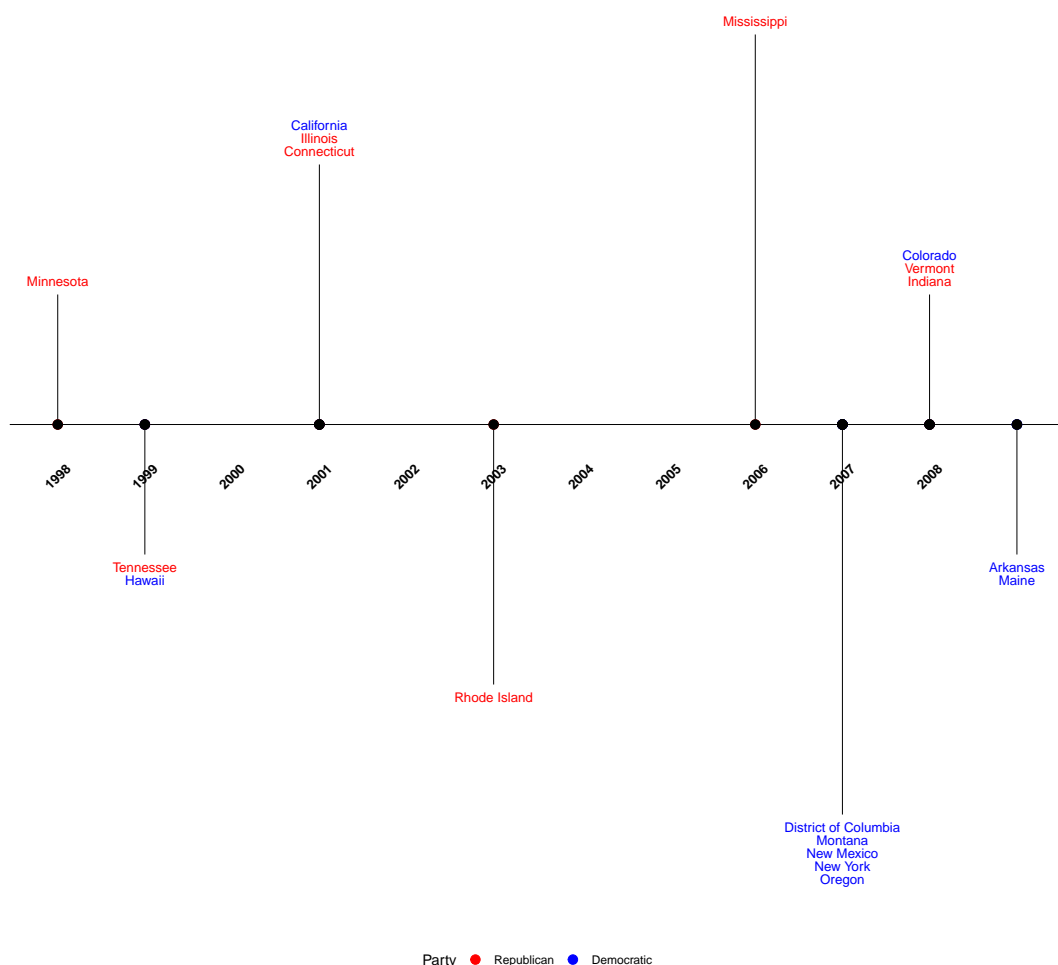


Figure A1: Workplace breastfeeding laws and governors' party

Notes: Figure A1 shows the timing of the introduction of workplace breastfeeding laws across states and the party affiliation of the governor at the time. Blue refers to a democratic governor and red to a republican governor.

Although similar, there are some minor differences in terms of the details of workplace breastfeeding legislation: In 13 states and in the District of Columbia (DC), break-time for breastfeeding or expressing milk in the workplace is required. In Rhode Island, break-time is

Table A1: State-Level Workplace Breastfeeding Legislation (until 2010)

State	Enactment	Statute	(Unpaid) Break-time	Private space	Discr. Provision
Alabama					
Alaska					
Arizona					
Arkansas	2009	Ark. Stat. Ann. § 11-5-116 (2009)	x	x	
California	2001	Cal. Labor Code § 1030-1033 (2001)	x	x	
Colorado	2008	Colo. Rev. Stat. § 8-13.5-102 and § 8-13.5-104 (2008)	x	x	
Connecticut	2001	Conn. Gen. Stat. § 31-40w (2001)	x	x	x
Delaware					
District of Columbia	2007	D.C. Code Ann. § 2-1402.81 et seq. (2007)	x	x	x
Florida					
Georgia					
Hawaii	1999	Hawaii Rev. Stat. § 367-3 (1999)			x
Idaho					
Illinois	2001	Ill. Rev. Stat. ch. 820 § 260 (2001)	x	x	
Indiana	2008	Ind. Code § 5-10-6-2 and § 22-2-14-2 (2008)		x	
Iowa					
Kansas					
Kentucky					
Louisiana					
Maine	2009	Me. Rev. Stat. Ann. tit. 26, § 604 (2009)	x	x	x
Maryland					
Massachusetts					
Michigan					
Minnesota	1998	Minn. Stat. Ann. § 181.939 (1998)	x	x	
Mississippi	2006	Miss. Code Ann. § 71-1-55 (2006)			x
Missouri					
Montana	2007	Mont. Code Ann. § 39-2-215 et seq. (2007)	x	x	
Nebraska					
Nevada					
New Hampshire					
New Jersey					
New Mexico	2007	N.M. Stat. Ann. § 28-20-2 (2007)	x	x	
New York	2007	N.Y. Labor Law § 206-C (2007)	x	x	x
North Carolina					
North Dakota					
Ohio					
Oklahoma					
Oregon	2007	Or. Rev. Stat. § 653.075, § 653.077 and § 653.256 (2007)	x	x	
Pennsylvania					
Rhode Island	2003	R.I. Gen. Laws § 23-13.2-1 (2003)	~	x	
South Carolina					
South Dakota					
Tennessee	1999	Tenn. Code Ann. § 50-1-305 (1999)	x	x	
Texas					
Utah					
Vermont	2008	Vt. Stat. Ann. tit. 21, § 305 (2008)	x	x	x
Virginia					
Washington					
West Virginia					
Wisconsin					
Wyoming					

Table A1 shows the year a state enacted a workplace breastfeeding law. Source: National Conference of State Legislatures (2021).

encouraged. In no instances the breaks are required to be paid, with the only exception of public sector employees in Indiana. In 15 states and in DC, employers are required to provide a private room or location for a mother to express milk. This location cannot be a bathroom, it has to be private, sanitary and in close proximity to the work area. Information leaflets for employers discuss a range of options to provide such a location: using and existing unused office or storage room, sectioning off parts of a room with permanent or portable partitions, or even arranging with close-by public buildings that employees can use lactation rooms there. In six states and in DC, workplace breastfeeding laws include an employment discrimination provision: employers are prohibited to discriminate against breastfeeding activities at work, e.g. use of break time for breastfeeding activities. In Montana, the workplace breastfeeding law only applies to public sector workers.

Several states expanded workplace breastfeeding laws or newly introduced state legislation after 2010 - these statutes are not included in Table A1.

A.2 Other Breastfeeding Legislation

Table A2 displays other breastfeeding legislation states passed. With the goal to raise breastfeeding rates in the US, several legal challenges arose. New York was the first state to exempt breastfeeding from public indecency. Florida was the first state to allow breastfeeding in all public or private location, where a mother is otherwise authorized to be. Since then, all but 3 states passed laws allowing breastfeeding in public, and roughly half of the states passed a law exempting breastfeeding from public indecency ¹⁷. In twelve states, laws were passed to exempt breastfeeding mothers from jury duty.

Some states passed additional legislation to promote breastfeeding: Eight states passed policies to promote breastfeeding as part of postpartum care in the hospital. Breastfeeding promotion in the hospital may include information about breastfeeding, breastfeeding support or lactation consultants. Nine state passed laws encouraging workplace breastfeeding: Six states *encourage* employers to provide breaks or rooms for breastfeeding and expressing milk; Three states label employers supporting breastfeeding in the workplace as "infant-friendly" or "mother-friendly".

We again focus on our observation period and therefore on laws and policies passed 2010 or

¹⁷If a state did not enact such a law, it does not necessarily mean that breastfeeding in public is prohibited: local ordinances could also do that.

Table A2: Timing of other state-level breastfeeding policies (until 2010)

State	Laws allowing breastfeeding in public	Law exempting breastfeeding from public indecency	Breastfeeding initiatives in hospitals	Laws encouraging employer support for breastfeeding	Labels for employers supporting breastfeeding	Breastfeeding mothers exempt from jury duty
Alabama	2006					
Alaska	1998	1998				
Arizona	2006	2006				
Arkansas	2007	2007	1999			
California	1997			1998		2000
Colorado	2004					
Connecticut	1997					
Delaware	1997					
District of Columbia	2007	2007				
Florida	1993	2008				
Georgia	1999		2002	1999		
Hawaii	2000		1992			
Idaho						2002
Illinois	2004	1995				2005
Indiana	2003					
Iowa	2000					1994
Kansas	2006		1986			2006
Kentucky	2006	2006				2007
Louisiana	2001	2001	2007			
Maine	2001					
Maryland	2003		2005			
Massachusetts	2009	2009	1994			
Michigan		1994				
Minnesota	1998	1998				
Mississippi	2006	2006				2006
Missouri	1999					
Montana	1999	1999				2009
Nebraska	2011					2003
Nevada	1995	1995				
New Hampshire	1999	1999				
New Jersey	1997					
New Mexico	1999					
New York	1994	1984	2005			
North Carolina	1993	1993				
North Dakota	2009	2009			2009	
Ohio	2005					
Oklahoma	2004	2004		2006		2004
Oregon	1999					1999
Pennsylvania	2007	2007				
Rhode Island	2008	2008				
South Carolina	2008	2008				
South Dakota		2002				
Tennessee	2006	2006				
Texas	1995				1995	
Utah	1995	1995		2012		
Vermont	2002					
Virginia	2002	1994		2002		2005
Washington	2009	2001			2001	
West Virginia						
Wisconsin	2010	1995				
Wyoming	2007	2007		2003		

Table A2 shows the year other breastfeeding laws and initiatives were enacted - these include exemptions from public indecency, allowing breastfeeding in all public spaces, initiatives to foster breastfeeding in hospitals, and laws encouraging workplace breastfeeding. Source: National Conference of State Legislatures (2021) and Lawler and Yewell (2023).

earlier. Laws and policies passed later are incomplete in Table A2.

A.3 Timing of Workplace Breastfeeding Legislation vs. Other Breastfeeding Legislation

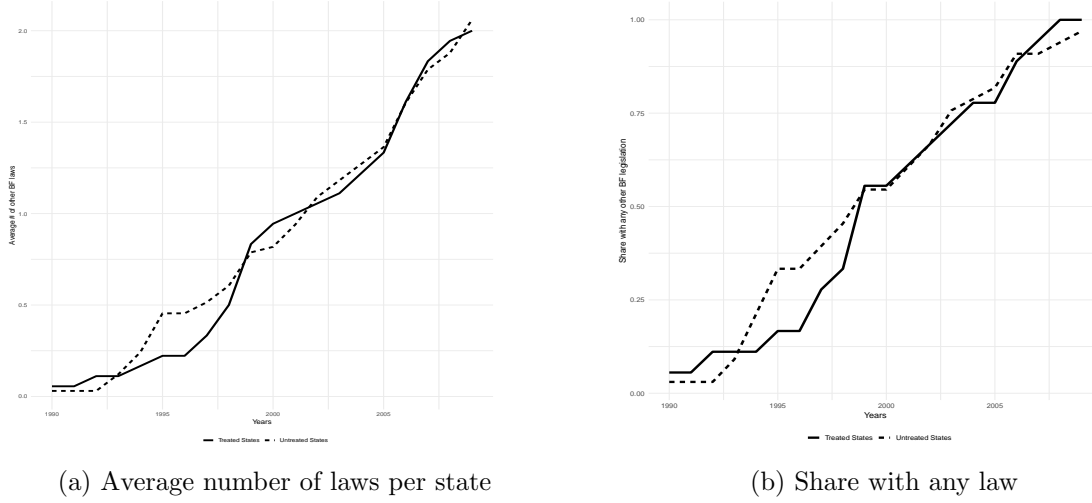


Figure A2: Breastfeeding legislation in treatment and control group

Notes: Figure A2a and A2b show the number of breastfeeding-related laws per states and the share of states with any breastfeeding-related legislation, separately for states in the treatment and in the control group.

Over time, more and more states passed legislation regulating breastfeeding in different contexts. Figure A2 displays trends in breastfeeding legislation (other than the workplace breastfeeding laws we evaluate in the paper) over time. We categorize states into treatment and the control group - i.e. depending on whether they pass a workplace breastfeeding law prior to the federal legislation in 2010. Figure A2a shows the average number of breastfeeding-related laws per state in the control versus the treatment group. Figure A2b shows the share of states that passed at least one breastfeeding law for control and treatment group. Both figures show that breastfeeding-related legislation increased over time and that states in treatment and control group are similar in their passage of breastfeeding-related laws.

A.4 State-Level Parental Leave Policies

In 1993, the Family and Medical Leave Act (FMLA) was enacted at the federal level. It allows eligible employees to take up to twelve weeks of job-protected unpaid leave after childbirth. Several states enacted more generous leave policies or had them already in place during our observation period - their timing is summarized in table A3. In total, nine states along with the District of Columbia provide longer leave duration than the FMLA: Extended leave is part of

Table A3: Timing of parental leave policies (until 2010)

State	Paid Parental Leave	Temporary Disability Insurance (TDI)	Family and Medical Leave Act (FMLA)	Extended Leave Duration
Alabama			1993	
Alaska			1993	
Arizona			1993	
Arkansas			1993	
California	2004	1978	1993	1979
Colorado			1993	
Connecticut			1993	1993
Delaware			1993	
District of Columbia			1993	1991
Florida			1993	
Georgia			1993	
Hawaii		1978	1993	
Idaho			1993	
Illinois			1993	
Indiana			1993	
Iowa			1993	
Kansas			1993	
Kentucky			1993	
Louisiana			1993	1987
Maine			1993	
Maryland			1993	
Massachusetts			1993	
Michigan			1993	
Minnesota			1993	
Mississippi			1993	
Missouri			1993	
Montana			1993	
Nebraska			1993	
Nevada			1993	
New Hampshire			1993	
New Jersey	2009	1978	1993	1989
New Mexico			1993	
New York		1978	1993	
North Carolina			1993	
North Dakota			1993	
Ohio			1993	
Oklahoma			1993	
Oregon			1993	1995
Pennsylvania			1993	
Rhode Island		1978	1993	1987
South Carolina			1993	
South Dakota			1993	
Tennessee			1993	1988
Texas			1993	
Utah			1993	
Vermont			1993	1992
Virginia			1993	
Washington			1993	1989
West Virginia			1993	
Wisconsin			1993	
Wyoming			1993	

Table A3 shows the timing of laws concerning parental and family leave. Sources: Engeman (2018), Women and Families (2012), and Baum II (2003).

pregnancy disability, parental leave, family (and medical) leave provisions. Leave is generally job-protected but unpaid.

Only two states - California and New Jersey - established a paid parental leave program. Five states offer temporary disability insurance (TDI), that partially cover pay during a leave during pregnancy or childbirth. In the five states, the Pregnancy Discrimination Act in 1978 included pregnancy and childbirth in the TDI.

Table A3 only covers laws enacted prior to 2010 - in recent years several states enacted more generous leave policies.

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B Definition of Variables

Table B1: Description of Variables - Main Results

Outcome Variable	
Labor Force Participation	Dummy that takes on the value 1 if in the labor force, 0 otherwise.
Employment	Dummy that takes on the value 1 if employed, 0 otherwise.
Hours Worked	weekly number of hours worked
Full-Time Employment	Dummy that takes on the value 1 if a person worked at least 35 hours per week, 0 otherwise.
Log Wage Income	Log annual wage income
Individual Level Control Variables	
Age	Numeric variable for the age of individuals
Married	Dummy variable that takes on the value 1 if a married, 0 otherwise
Black	Dummy variable that takes on the value 1 if a person is black/African American, 0 otherwise
Hispanic	Dummy variable that takes on the value 1 if a person is Hispanic, 0 otherwise
College	Dummy variable that takes on the value 1 if a person has at least one year of college education, 0 otherwise
Nr. Children	Number of own children currently living in the same household
Youngest Child	Age of youngest own child in the household
(Time-Varying) State Level Control Variables	
Share Black	Share of black individuals in the population
Share Hispanic	Share of hispanic individuals in the population
Share Young	Share of individuals under or equal to 30 in the population

Table B1 shows descriptions of our variables. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009.

Table B2: Description of Variables - Breastfeeding Results

Outcome Variable	
Ever Breastfed	Dummy that takes on the value 1 if a child was ever breastfed, 0 otherwise.
Breastfed 3+ months	Dummy that takes on the value 1 if a child was breastfed at least 3 months, 0 otherwise.
Breastfed 6+ months	Dummy that takes on the value 1 if a child was breastfed at least 6 months, 0 otherwise.
Breastfed 12+ months	Dummy that takes on the value 1 if a child was breastfed at least 12 months, 0 otherwise.
Individual Level Control Variables	
Age (of mother)	Categorical variable: ≤ 19 years, 20-29 years, ≥ 30 years
Married	Dummy variable that takes on the value 1 if the mother is married, 0 otherwise
Black	Dummy variable that takes on the value 1 if a child is black/African American, 0 otherwise
Hispanic	Dummy variable that takes on the value 1 if a child is Hispanic, 0 otherwise
Female	Dummy variable that takes on the value 1 if a child is female, 0 otherwise
College	Dummy variable that takes on the value 1 if the mother was a college degree, 0 otherwise
Ever receiving WIC	Dummy variable that takes on the value 1 if the child ever received WIC (Special Supplemental Nutrition Program for Women, Infants, and Children), 0 otherwise
Youngest Child	Age of youngest own child in the household
(Time-Varying) State Level Control Variables	
Share Black	Share of black individuals in the population
Share Hispanic	Share of hispanic individuals in the population
Share Young	Share of individuals under or equal to 30 in the population

Table B2 shows descriptions of our variables we use in the results for breastfeeding. It is based on data from the NIS for the years 2003 to 2009. State level controls are based on the ACS and CPS for the years 2003-2009.

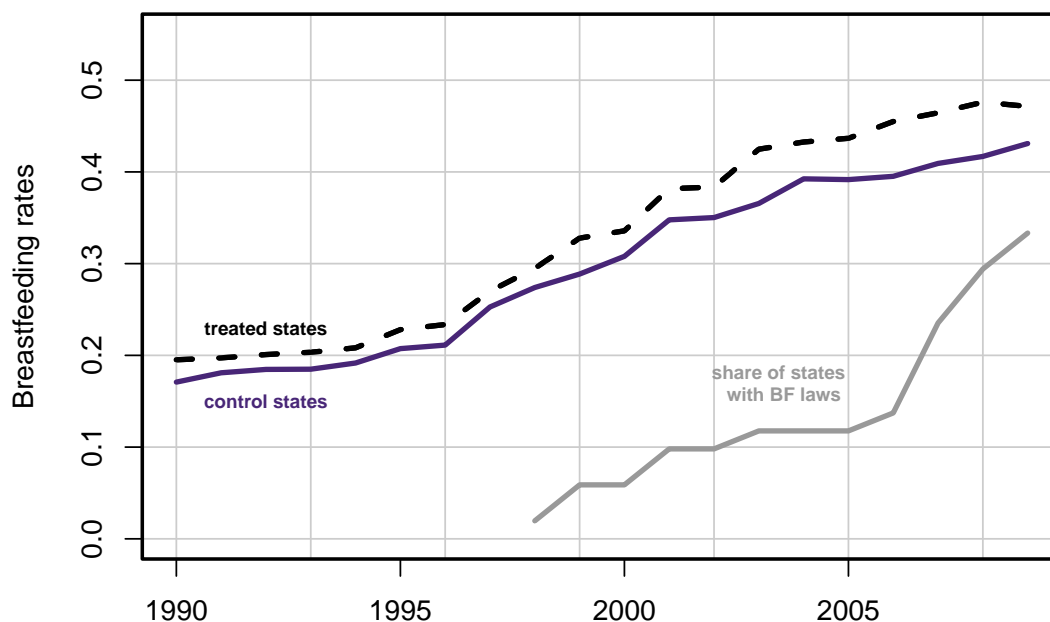


Figure C1: Breastfeeding rates over time

Notes: Figure C1 shows average breastfeeding rates at 6 months separately for treatment and control group. It is based on state-level data from the Ross Mothers Survey for the years 1990 to 2000 and data from the National Immunization Survey for the years 2001 to 2009. The grey line indicates the share of US states with a strict breastfeeding legislation in place.

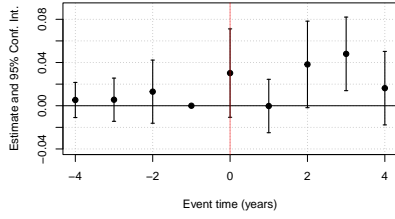
C Additional Results

C.1 Breastfeeding - Event Studies

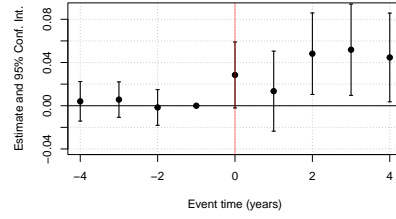
Figure C1 provides graphical evidence that breastfeeding laws lead to an increase in breastfeeding. The figure displays breastfeeding rates at the age of 6 months for states in the treatment versus states in the control group. Prior to the first breastfeeding legislation in 1998, breastfeeding rates in treatment and control states display very similar trends. As soon as the first state in the treatment group implemented a breastfeeding law, trends in breastfeeding rates start to diverge and the gap between control and treatment states widens as more and more states in the treatment group implement a breastfeeding legislation.

C.2 Sample Composition

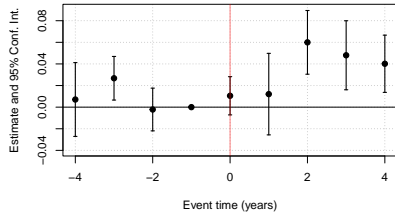
In table C1, we regress individual characteristics of the mothers in our sample on a dummy indicating whether they were "treated" by workplace breastfeeding laws. We do not see any evidence that workplace breastfeeding laws change the composition of our sample in terms of race, ethnicity, age, or marital status (columns 1-4). The statistically significant coefficient



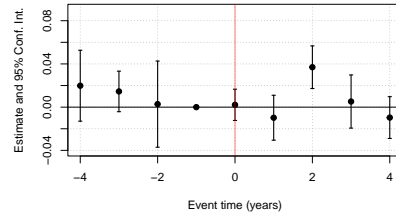
(a) Breastfeeding Initiation



(b) Breastfeeding 3+ months



(c) Breastfeeding 6+ months



(d) Breastfeeding 12+ months

Figure C2: The effects of workplace breastfeeding laws on breastfeeding

Notes: Figure C2 shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the National Immunization Survey (NIS-Child) for the years 2003 to 2009. The dependent variables are: a dummy taking on the value 1 if a child was ever breastfed, 0 otherwise in figure C2a; a dummy taking on the value 1 if a child was breastfed for at least three months, 0 otherwise in figure C2b; a dummy taking on the value 1 if a child was breastfed for at least six months, 0 otherwise in figure C2c; a dummy taking on the value 1 if a child was breastfed for at least twelve months, 0 otherwise in figure C2d; The individual and state level control variables included are specified in the discussion of equation 1. State, survey year and birth year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

Table C1: Changes in Sample Composition

	(1)	(2)	(3)	(4)	(5)
	Black	Hispanic	Age	Married	College
Treated	0.00300 (0.00501)	-0.00992 (0.00534)	-0.00835 (0.07495)	0.00018 (0.00599)	0.02262 ** (0.00788)
State FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
State Controls	Yes	Yes	Yes	Yes	Yes
Num. obs.	289853	289853	289853	289853	289853

Table C1 shows results from a linear regression and is based on a sample from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009 and includes women between 21 and 50 years of age with children aged zero and one years old. The dependent variables are: whether a person is black (column 1), whether a person is hispanic (column 2), a person's age (column 3), whether a person is married (column 4), and whether a person has a college degree (column 5). Same standard errors, fixed effects, state controls as discussed in equation 1. Individual level controls are not included, they are used as dependent variables here. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.5$.

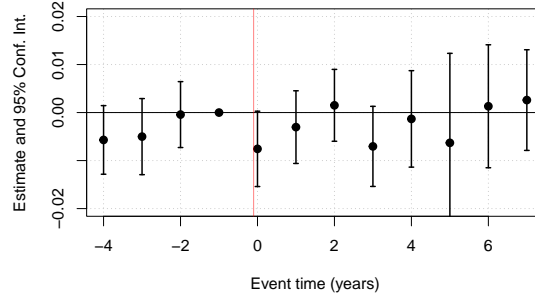


Figure C3: The effect of workplace breastfeeding laws on moving

Notes: Figure C3 shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009 and includes women between 21 and 50 years of age with children aged zero and one years old. The dependent variable is a dummy variable taking on the value 1 if an individual moved between states in the past year, 0 otherwise. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

in column 5 indicates, that workplace breastfeeding laws increase the probability that highly educated mothers (college) are in our sample. As education is positively linked to employment, this may upward bias our estimates.

The heterogeneity analysis reported in figure 8b shows employment responses for a subsample of college-educated and not-college educated mothers. The estimates are very similar, which leads us to conclude that it is not the higher rate of highly educated mothers in our sample who drive the employment responses.

C.3 Moving Decision

In figure C3 we check whether the probability that a person moved to the state within the last year is affected by the workplace breastfeeding laws. One concern might be that the more family-friendly workplace attracts mothers of young children. We do not find evidence that workplace breastfeeding laws increased the probability of moving.

C.4 Including States Encouraging Workplace Breastfeeding

For our main specifications, we exclude states passing legislation that *encourages* workplace breastfeeding during our observation period from the control group. In figure C4, we include them in the control group. Results are very similar to our main findings. If anything, labor force participation effects are stronger in the sample including states with encouraging legislation in

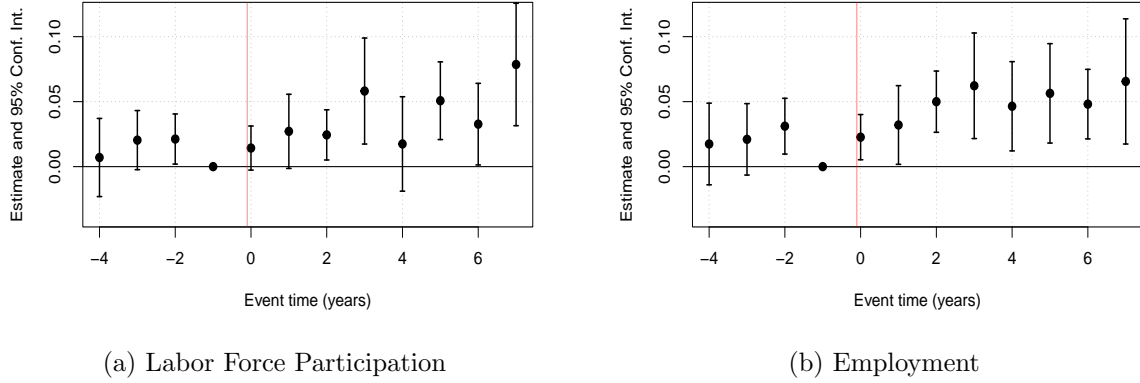


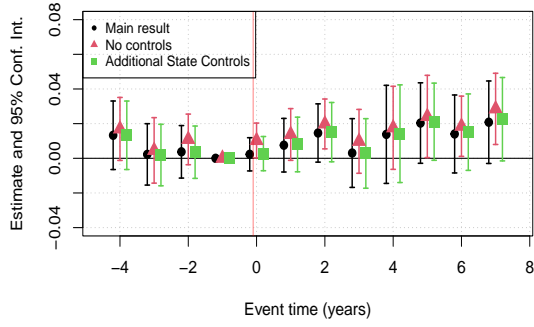
Figure C4: Event study of breastfeeding law - Robustness to including states encouraging workplace breastfeeding

Notes: Figure C4a and C4b shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009 and includes women between 21 and 50 years of age with children aged zero and one years old. The dependent variable is a dummy variable taking on the value 1 if an individual is in the labor force (figure C4a)/employed (figure C4b) and 0 otherwise. The individual level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

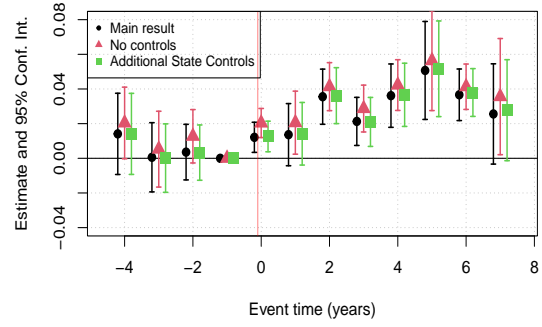
the control group. When we include weak law states in the control group, we also see some slight positive pre-trends in period -2 for labor force participation and employment.

C.5 Changes to the Specification

In figure C5, we vary the control variables included in the regressions. The black coefficients correspond to our main results, as displayed in figure 3b and 3a. The individual level control variables included are specified in the discussion of equation 1. The red coefficients show results when we omit all individual and state level control variables. In the regressions yielding the green coefficients, we include two additional time-varying state-level controls: A dummy indicating whether a state has any other breastfeeding policy (as listed in table A2) in place; and a dummy indicating whether a state has any other parental leave policy (as listed in table A3). All three regressions lead to very similar results and therefore suggest that our findings are not driven the specific control variables we include.



(a) Labor Force Participation



(b) Employment

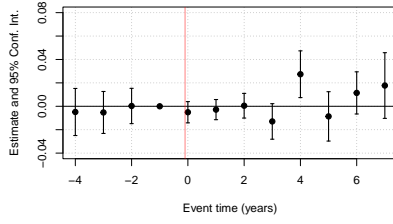
Figure C5: Event study of breastfeeding law - Robustness to additional or no control variables

Notes: Figure C5a and C5b shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. It is based on data from the Current Population Survey (CPS) and the American Community Survey (ACS) for the years 1990 to 2009 and includes women between 21 and 50 years of age with children aged zero and one years old. The dependent variable is a dummy variable taking on the value 1 if an individual is in the labor force (figure C5a)/employed (figure C5b) and 0 otherwise. Results for omitting control variables, using the same control variables as in our main results, and adding additional dummies for state level parental leave policies or other breastfeeding legislation. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

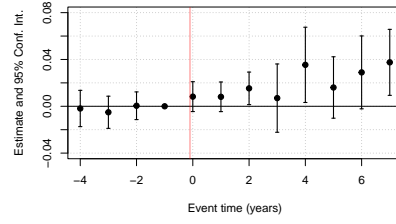
C.6 Separately for ACS and CPS

For our main results, we pool ACS and CPS to increase the sample size. In figure C6, we show results for observations from the CPS and the ACS separately. When interpreting the figures, it has to be kept in mind that the ACS is only available from 2000 onward - the figures for CPS and ACS therefore do not rely on the same time period.

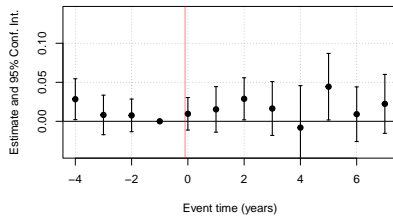
In the ACS, we observe no labor force participation responses, while in the CPS we see a several positive (but not statistically significant) coefficients. We observe positive employment responses in both the ACS and the CPS sample. Even though coefficients are as expected much noisier, employment responses are in line with our main findings reported in figure 3b.



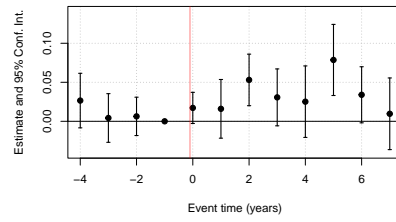
(a) Labor Force Participation - ACS



(b) Employment - ACS



(c) Labor Force Participation - CPS



(d) Employment - CPS

Figure C6: The effects of workplace breastfeeding laws on labor supply - ACS and CPS separately

Notes: Figure C6 shows estimation results from the empirical approach discussed in section 4 using the Sun and Abraham (2021) estimator. Figure C6a and C6b are based on data from the American Community Survey (ACS) for the years 2000 to 2009. Figure C6c and C6d are based on data from the Current Population Survey (CPS) for the years 1990 to 2009. The sample includes women between 21 and 50 years of age with children aged zero and one years old. The dependent variable is a dummy variable taking on the value 1 if an individual is in the labor force (figure C6a and C6c)/employed (figure C6b and C6d) and 0 otherwise. The individual level control variables included are specified in the discussion of equation 1. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level. The period -1 is the reference period. The red vertical line indicates the time of the treatment.

References

Sun, Liyang and Sarah Abraham (2021). “Estimating dynamic treatment effects in event studies with heterogeneous treatment effects”. In: *Journal of Econometrics* 225.2, pp. 175–199.