

IMPERIAL COLLEGE LONDON
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**INTEGRATING MOTHERHOOD AND EMPLOYMENT:
THE ROLE OF BREASTFEEDING LEGISLATION**

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Submitted in partial fulfilment of the requirements for the degree of Doctor of
Philosophy of Imperial College London

DECLARATION OF ORIGINALITY

I hereby certify that this thesis constitutes my own work. All material that is not my own has been properly acknowledged. All errors remain my own.

Surya Singh

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ABSTRACT

Gender equality is a moral imperative and a key enabler for economic growth and organizational performance. Women make up 40% of the global labour force; however, policies to support women in the workplace are lacking. Workplace policies are important to mitigate career interruptions due to child birth and discriminatory practices that women face more often than men that will ultimately affect women's health and employment outcomes. In this thesis, we study a type of workplace policy that enables a better work environment by encouraging mothers to combine childcare and employment responsibilities—a workplace breastfeeding policy. The United States has implemented workplace breastfeeding policies that allow mothers to express breast milk during the first year of child birth. Policies have been introduced in a selective group of 25 out of 51 states over 1990-2011 in a staggered way where some states encourage and other states require employers to provide facilities and break time. Through robust quasi-experimental methods and rich datasets, we investigate the direct and indirect impacts of the policy. We first find that the policy was successful in its primary objective to increase state-level breastfeeding rates by approximately 5 to 7.1 percentage points. We then study the indirect impacts on mothers' and fathers' absenteeism and the within-couple gender earnings gap through an intra-household perspective. We find that the policy reduces mothers' absenteeism by 10 to 16 days. However, we do not find a spillover effect on fathers. Finally, we find that the policy makes household economic characteristics more balanced and reduces the earnings gap between mothers and fathers by 25%. The findings of this thesis provide several implications for policy makers, firms, and the wider economy. Implementing workplace policies that allow parents to reconcile employment and childcare can be an important avenue to achieve gender equality.

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LIST OF ABBREVIATIONS

ACA Patient Protection and Affordable Care Act of 2010

BMI Body Mass Index

CAH Childhood Adoption and History File

CDC Centres for Disease Control and Prevention

CEM Coarsened Exact Matching

CPI Consumer Price Index

DD Difference-in-Differences

DDD Difference-in-Difference-in-Differences

FMLA Family and Medical Leave Act of 1993

IFPS Infant Feeding Practices Study

NIS National Immunization Survey

NLSY National Longitudinal Survey of Youth

OECD Organisation for Economic Co-operation and Development

OLS Ordinary Least Squares

PSID Panel Study of Income Dynamics

RMS Ross Mother's Survey

UK United Kingdom

UNICEF United Nations International Children's Emergency Fund

US United States of America

USD United States Dollars

USDA United States Department of Agriculture

WHO World Health Organization

WIC Special Supplemental Nutrition Program for Women, Infants, and Children

CHAPTER 1 : INTRODUCTION

Gender equality is not only a moral imperative but a key enabler for economic progress and prosperity. Women make up approximately 40% of the worldwide labour force where in high-income countries, they exceed men in education, labour force participation, and are driving consumer purchasing as labour markets become increasingly globalized and competitive (Chinchilla and Jimenez, 2016; The World Bank, 2017). Therefore, retaining and attracting women into the labour force is crucial for nations to thrive within the current global economy (Chinchilla and Jimenez, 2016). Indeed, evidence has shown that firms with higher gender diversity have profits above the industry mean (Rock and Grant, 2016). However, policies and regulations to support women within the workplace are widely inadequate where the lack of support is apparent through the existing wide gender gaps in pay and employment outcomes.

Policies to support women and mothers are important to mitigate discriminatory practices that women may face in employment affecting their career progression, job opportunities, and earnings (Darity and Mason, 1998; Hultin and Szulkin, 1999; Kleven et al., 2018). Such policies are also key as women are more likely to face career interruptions due to child birth compared to men. The responsibility of childrearing largely falls on mothers due to the unequal distribution of household responsibilities between couples (Angelov et al., 2016; Baum, 2002; Munasinghe et al., 2008; Napari, 2010; Sasser, 2005). As a consequence, having a child affects mother's health and labour market outcomes more negatively compared to fathers. Indeed, by carrying a child, giving birth, and breastfeeding, mothers will inevitably be more absent from the workplace (Angelov et al., 2013; Joshi, 1998).

Therefore, family-friendly workplace policies can play a significant role in alleviating the conflict between childrearing and employment as the burden to combine work and family is often put on women rather than men. Indeed, family-friendly workplace policies can affect parents by contributing to better work environments, reducing discrimination against mothers and creating better opportunities for women to reconcile work with motherhood.

There are two types of family-friendly workplace policies that have been studied in literature. The first type encourages parents to be absent from work such as parental leave policies. While parental leave policies are important, they tend to be largely reserved for mothers rather than fathers, thus generating an additional imbalance within households in regards to childcare responsibilities. Leave policies encourage the split between work and family responsibilities and promote inequality within the household as mothers are more incentivized to take a career interruption after child birth and stay at home. Additionally, intra-household bargaining theory states that the household demand and behaviour will shift in favour of the individual with higher comparative advantage (i.e. measured by income, labour market experience). Therefore, as mothers become more absent from the workplace due to leave and child birth, her earnings and labour market experience will ultimately depreciate resulting in a decrease in her bargaining power within the household. Previous research shows that the intra-household bargaining process between couples is more pronounced in households with young children (Garcia et al., 2009; Goux et al., 2014; Olsson and Thoursie, 2015).

The second type refers to policies that encourage parents to go into work after child birth such as childcare policies and flexible working arrangements. These policies enable a better work environment and promote equality within the workplace and households as mothers are incentivized to go into work after child birth—similar to men. Therefore, these set of policies can have opposite effects on mothers' labour market outcomes such as absenteeism and earnings compared to the first type of policy and thus, may improve mothers' bargaining positions within the household.

While the first type of policy has been extensively studied, evidence is lacking on the effectiveness of the second type of policy, specifically on its impact on labour market outcomes. Previous evidence on workplace family-friendly policies have also failed to consider the intra-household bargaining process where both mothers' and fathers' labour market outcomes may be affected. Family-friendly policies targeted at mothers may also have an effect on their partners through interdependencies in spousal labour supply (Goux et al., 2014; Olsson and Thoursie, 2015).

Therefore, the aim of this thesis is to study one such workplace family-friendly policy that allows mothers to better combine employment and childcare, a workplace breastfeeding policy. We study workplace breastfeeding policies within the context of the United States (US) where such policies allow mothers to express breast milk during the first year of child birth in a private and separate room. Workplace breastfeeding policies have been implemented in 25 out of 51 states (National Conference of State Legislatures, 2016). Texas was the first to implement a workplace breastfeeding policy and the most recent state has been Maine in 2009, during our study period of 1990-2011. There is heterogeneity in state-mandated workplace breastfeeding policies where 21 states require employers to provide a separate and private room to allow mothers to express milk, while 4 states only encourage employers to provide such facilities (National Conference of State Legislatures, 2016). 16 states require employers to provide break time for nursing while 7 states merely encourage employers to provide break time (National Conference of State Legislatures, 2016). Finally, there is heterogeneity in whether the break time provided is paid—only one state, Indiana, specifies that break time should be paid while 10 states specify unpaid breaks (National Conference of State Legislatures, 2016). Such laws were implemented to promote breastfeeding, improve infant's and mother's health, as well as lower medical costs due to diseases prevalent in mothers and children from low breastfeeding rates (National Conference of State Legislatures, 2016).

The context of the US presents an opportunity to study the effects of family-friendly policies as there is a significant lack of support for women and mothers in the workplace compared to other high-income countries. It is the only industrialized nation that has not implemented a paid maternity leave mandate on a federal level, an important step towards supporting women in the workplace. The current federal level mandate, the Family and Medical Leave Act (FMLA) implemented in 1993 guarantees mothers unpaid job-protected leave for 12 weeks (US Department of Labor, 1993). In comparison, European countries have better provisions for maternity leave where in some countries, paternal leave is also included. For example, Sweden offers parents 68 weeks of paid leave that covers 80% of wages, where each parent is entitled to 12 weeks (Swedish Institute, 2018). The United Kingdom (UK) requires mothers to take at least 2 weeks of leave and allows for 52 weeks of maternity leave where mothers are paid 90% of their weekly earnings for the first 6 weeks (UK Government, 2013). Additionally, the US government has failed to ratify

key conventions and treaties focusing on gender discrimination such as the United Nations Convention on the Elimination of All Forms of Discrimination Against Women, the United Nations Convention on the Rights of the Child, and the International Labour Organization's Maternity Protection Convention (Galtry, 2003). These conventions emphasize maternity leave and breastfeeding support as part of gender equality and protection of maternal and child health. It is alarming that the US, as an industrialized high-income nation, has failed to adhere to these international conventions.

I. RESEARCH OBJECTIVES

There are five research objectives of this thesis. The first aim is to identify the determinants and benefits of breastfeeding, current policies that have been implemented to promote breastfeeding, and the direct and indirect impacts of such policies on mothers and fathers through a narrative literature review (Chapter 2). Then taking into consideration the findings of the literature review, we investigate if workplace breastfeeding policies have been successful in their primary objective to promote breastfeeding within the US. Therefore, we start by looking at the direct impacts of state-mandated workplace breastfeeding legislation on state-level breastfeeding rates (Chapter 3). We find that US workplace breastfeeding legislation has been successful in its initial objective to promote breastfeeding for working mothers; however, we also find that strictly enforceable legislation has a larger impact on breastfeeding rates. We then focus on the indirect economic impacts of workplace breastfeeding policies as evidence has shown that family-friendly workplace policies can impact parents' labour market outcomes. Here we expand our focus beyond mothers as workplace policies affect both parents' ability to combine employment and childcare. Therefore, we study the impacts of workplace breastfeeding policies using a household perspective and its impacts on mothers' and fathers' workplace absenteeism (Chapter 4). We hypothesize that the health benefits of breastfeeding extend into economic benefits for mothers and fathers. We find that workplace breastfeeding policies do indeed reduce mothers' absenteeism; however, we do not find any spillover effects on their partners. We additionally substantiate the findings in Chapter 3 and find that strictly enforceable policies have a larger effect on mothers' absenteeism. Our third research objective is to delve deeper into the intra-household bargaining process between couples in the presence of infants. Chapter 5 investigates the impact of the policy on the within-couple

earnings gap through a collective labour supply model. We hypothesize that the reduction of absent days for mothers found in Chapter 4 may translate into higher earnings for mothers reducing the earnings gap between her and her husband; therefore, giving her more bargaining power within the household. We find that US workplace breastfeeding policies reduce the within-couple earnings gap in the first 5 years after child birth; however, the impact diminishes thereafter. We also find an instantaneous impact of the policy where the legislation reduces the earnings gap when the infant is 0-12 months old. The findings of this thesis provide important empirical evidence on the efficacy of workplace family-friendly policies on health and labour market outcomes and provide insight into promoting gender equality within the workplace. Finally, we discuss and conclude with the implications of the main findings of this thesis and extensions for future research (Chapter 6).

The remainder of this dissertation is as follows: Chapter 2 presents the extended literature review; Chapter 3 provides empirical evidence on the impacts of US state-mandated workplace policies on state-level breastfeeding rates; Chapter 4 presents empirical evidence on the impacts of state-mandated policies on mothers' and fathers' workplace absenteeism; Chapter 5 provides empirical evidence on the impacts of workplace breastfeeding policies on the within-couple earnings gap offering insight into the intra-household bargaining process; and finally, Chapter 6 discusses and concludes.

CHAPTER 2 : LITERATURE REVIEW

In light of the motivation presented in the introduction of the thesis, this narrative review aims to identify the determinants and benefits of breastfeeding, current policies that have been implemented to promote breastfeeding, and finally identify the direct and indirect spillover effects of such policies. We conduct a search through Econlit via EBSCO, Web of Science, and PubMed for relevant studies. We first start with previous empirical evidence in the health and economics literature on the determinants of breastfeeding such as health and socio-demographic determinants and highlight the special case of employment in determining breastfeeding behaviour. We find that employment is a significant and key barrier to breastfeeding and that there is a socioeconomic gradient in breastfeeding behaviour as mothers who are older, married, more educated, and of high socioeconomic status are more likely to breastfeed compared to younger, single, less educated mothers of lower socioeconomic status.

We then discuss the direct health and indirect economic benefits of breastfeeding. We find that breastfeeding reduces the prevalence of several diseases and leads to healthier babies and mothers. Breastfeeding also extends into economic benefits as mothers save healthcare costs due to healthier infants and as a result, are less likely to miss work. We additionally find long-term economic benefits for children as breastfeeding is associated to higher cognitive performance, which extends into higher future earnings and educational attainment. Finally, literature shows that breastfeeding is also beneficial to the wider economy where health systems can save millions of dollars from reduced healthcare costs.

Next, we discuss policies that have been implemented in the United States (US) and globally with the objective to promote breastfeeding among mothers such as workplace breastfeeding policies, maternity leave, and policies targeting low-income and at-risk mothers. We find that there is some, however, limited evidence on the effectiveness of workplace breastfeeding policies and evidence of positive effects of maternity leave policies on promoting breastfeeding behaviour. However, we find that policies targeting low-income mothers do little to boost breastfeeding rates.

Finally, we present literature on the indirect impacts of such policies on labour market outcomes and the extent to which these policies affect gender pay gaps. We find that these policies do indeed go beyond their efforts to promote breastfeeding and influence mothers' labour market outcomes such as earnings, absenteeism, and labour force participation. We also present evidence of spillover or cross-over effects of policies on partners' employment outcomes. We conclude with a discussion of the research gap and the main contributions of this thesis to the literature.

I. DETERMINANTS OF BREASTFEEDING

There are several factors associated with breastfeeding that influence breastfeeding initiation and duration including health determinants such as maternal weight, maternal smoking, and labour complications such as caesarean delivery. Socio-demographic factors include age, education, marital status, ethnicity, and socioeconomic status. Finally, employment-related factors include part-time and full-time employment, working hours and timing of returning to work postpartum. We highlight and discuss the special case of employment-related factors on breastfeeding behaviour as employment has been shown to be one of the most significant barriers to breastfeeding. We additionally emphasize employment as a determinant as this dissertation specifically focuses on workplace policies to target this key barrier.

A. Health Determinants

Several studies have found that health determinants such as maternal weight and obesity (Harder et al., 2005; Kitsantas and Pawloski, 2010; Oddy et al., 2006), maternal smoking (Donath and Amir, 2007; Giglia et al., 2006; Kiernan and Pickett, 2006; Oddy et al., 2006; Scott et al., 2006), and caesarean delivery (Häggkvist et al., 2010; Kitsantas and Pawloski, 2010; Takahashi et al., 2017) can predict breastfeeding initiation and duration in mothers.

Being overweight, obese, or underweight during pregnancy can affect breastfeeding duration where mothers who are overweight during pregnancy are associated with shorter durations of breastfeeding (Harder et al., 2005; Kitsantas and Pawloski, 2010; Oddy et al., 2006). Through a cohort study, Oddy et al. (2006) show that mothers with a high body mass index (BMI) during

pregnancy are 18% more likely to cease breastfeeding before 6 months compared to normal weight mothers. Overweight or obese mothers are also more likely to have birth complications that may discourage them from initiating or continuing breastfeeding, compared to normal weight mothers (Kitsantas and Pawloski, 2010; Oddy et al., 2006). Kitsantas and Pawloski (2010) find that underweight and obese mothers with labour complications were approximately 1.4 times less likely to initiate breastfeeding compared to normal weight mothers. Obese and overweight mothers were also 11% more likely to discontinue breastfeeding in each additional month of breastfeeding when compared to those mothers of normal weight (Kitsantas and Pawloski, 2010). Furthermore, mothers who were overweight were also more likely to be Hispanic, African-American, and of lower socioeconomic status (Kitsantas and Pawloski, 2010; Oddy et al., 2006).

Maternal smoking during pregnancy also adversely affects breastfeeding and is associated with the early cessation of breastfeeding (Donath and Amir, 2007; Giglia et al., 2006; Kiernan and Pickett, 2006; Oddy et al., 2006; Scott et al., 2006). Through a cohort study, Donath and Amir (2007) find that women who smoked during pregnancy had a 1.5 lower odds ratio of breastfeeding at 6 months. Donath and Amir (2007) suggest that the relationship between maternal smoking and breastfeeding comes from the intention to breastfeed where mothers who smoke during pregnancy have lower intentions to breastfeed postpartum. Another longitudinal study by Giglia et al. (2006) find that mothers who smoked had a median breastfeeding duration of 11 weeks compared to mothers who did not smoke, who had a median duration of 28 weeks. Mothers who smoked were also 60% more likely to discontinue breastfeeding compared to non-smoking mothers (Giglia et al., 2006). Similarly, Scott et al. (2006) find that mothers who smoked were associated with a breastfeeding duration of only 10 weeks. There are also racial disparities in maternal smoking where Asian and African-American mothers are less likely to smoke (Kiernan and Pickett, 2006).

Finally, delivery through caesarean section was also associated with lower breastfeeding rates (Häggkvist et al., 2010; Kitsantas and Pawloski, 2010; Takahashi et al., 2017). A study by Takahashi et al. (2017) found that exclusive breastfeeding rates were lower among mothers with birth complications and those who delivered through caesarean sections. Similarly, Häggkvist et al. (2010) found that there is an increased risk of breastfeeding cessation associated with caesarean delivery at one and three months postpartum. Kitsantas and Pawloski (2010) find that mothers who

opted for caesarean delivery and had a lower birth weight infant experienced earlier breastfeeding cessation but only if they had labour complications during delivery.

B. Socio-Demographic Factors

In addition to health-related factors, socio-demographic determinants such as age, ethnicity, marital status, education, and socioeconomic status are strong predictors of breastfeeding initiation and duration (Callen and Pinelli, 2004; Dubois and Girard, 2003; Evers et al., 1998; Forste et al., 2001; Gibson-Davis and Brooks-Gunn, 2006; Heck et al., 2006; Li et al., 2004; Rossem et al., 2009; Singh et al., 2007; Thulier and Mercer, 2009; Vogel et al., 2007).

Several studies find that maternal age is a strong predictor and is positively associated with breastfeeding (Callen and Pinelli, 2004; Dubois and Girard, 2003; Ong et al., 2005; Thulier and Mercer, 2009; Vogel et al., 2007). Studies have found that breastfeeding incidence and duration typically increases after the mother is 25 years old. Evers et al. (1998) and Vogel et al. (1999) find that mothers younger than 25 years of age were associated with lower breastfeed duration rates compared to older women. In fact, Ong et al. (2005) find that mothers younger than 19 years of age breastfed only for 2 months or less. In terms of maternal age groups, Dubois and Girard (2003) find that a mother who is 25-29, 30-34, and 35-39 years of age is 3.1 times more likely, 4.7 times more likely, and 5.7 times more likely to breastfeed at four months, respectively, compared to younger mothers.

Ethnicity is another strong determinant of breastfeeding where studies have consistently found that African-American mothers have the lowest rates of breastfeeding compared to other ethnic groups (Forste et al., 2001; Gibson-Davis and Brooks-Gunn, 2006; Heck et al., 2006; Li et al., 2004; Singh et al., 2007; Thulier and Mercer, 2009). For breastfeeding initiation, Singh et al. (2007) find that breastfeeding rates are the highest among Asian and Hispanic women at 89% and 77%, respectively. However, African-American and American Indian women had the lowest breastfeeding rates at 51% and 60%, respectively (Singh et al., 2007). Similarly, according to data released by the CDC, exclusive breastfeeding rates at 6 months are highest among Asian mothers at 16.1%, White mothers at 11.7%, Hispanic mothers at 11.2%, and the lowest among African-

American mothers at only 7.9% (Thulier and Mercer, 2009). Li et al. (2004) use the US National Immunization Survey (NIS) and find that African-American mothers have the lowest breastfeeding rates at six months, at only 17%, and were less likely to initiate breastfeeding when compared to White mothers. Forste et al. (2001) suggest that this racial disparity in breastfeeding may account for racial differences in infant mortality rates within the US. In addition, Gibson-Davis et al. (2006) and Singh et al. (2007) find that immigrant status plays a role in breastfeeding where immigrant mothers are more likely to breastfeed compared to non-immigrant mothers. US-born mothers were 85% less likely to breastfeed compared to foreign-born mothers (Gibson-Davis and Brooks-Gunn, 2006). Notably, Gibson-Davis et al. (2006) find that each year of US residency for foreign-born mothers decreased the odds of breastfeeding by approximately 4%.

Marital status is another predictor of breastfeeding duration where married mothers breastfeed longer compared to unmarried mothers (Callen and Pinelli, 2004; Dubois and Girard, 2003; Evers et al., 1998; Gibson-Davis and Brooks-Gunn, 2006; Singh et al., 2007; Thulier and Mercer, 2009). Furthermore, Dubois and Girard (2003) and Singh et al. (2007) find that the probability of an infant being breastfed is higher in two-parent families compared to infants in single-parent families. Similarly, Gibson-Davis et al. (2006) find that mothers who were unmarried had lower breastfeeding rates compared to mothers who were married.

Several studies have also found that highly educated mothers are more likely to initiate breastfeeding and for longer (Callen and Pinelli, 2004; Dubois and Girard, 2003; Evers et al., 1998; Gibson-Davis and Brooks-Gunn, 2006; Li et al., 2004; Rossem et al., 2009; Thulier and Mercer, 2009). Li et al. (2004) find that those mothers who had college education were 21% more likely to initiate breastfeeding, 22% more likely to continue breastfeeding at 6 months, and 9% more likely to exclusively breastfeed at 6 months, compared to mothers with a high school education. Rossem et al. (2009) also find that the prevalence of breastfeeding is higher among higher educated mothers. Approximately 96% of higher educated mothers initiate breastfeeding compared to 73% of lower educated mothers (Rossem et al., 2009). However, these figures drop to 39% and 15% at six months for higher and lower educated mothers, respectively (Rossem et al., 2009). Dubois and Girard (2003) similarly find that those mothers with a university education were 5 times more likely to breastfeed at four months compared to mothers with no high school education while the

effect is stronger for exclusive breastfeeding. Mothers with higher education were 8 times more likely to exclusively breastfeed for 3 months compared to less educated mothers (Dubois and Girard, 2003).

Finally, there are disparities in breastfeeding behaviour according to socioeconomic status where mothers from lower socioeconomic backgrounds have decreased incidence and prevalence of breastfeeding (Evers et al., 1998; Li et al., 2004; Ong et al., 2005; Singh et al., 2007; Thulier and Mercer, 2009). Singh et al. (2007) find that breastfeeding rates are lower in infants from families of lower socioeconomic status where those mothers in households below the poverty threshold were 87% more likely to never breastfeed and 41% more likely to not breastfeed at six months. Similarly, Callen and Pinelli (2004) and Ong et al. (2005) find that mothers in households of high family incomes were more likely to initiate breastfeeding and for longer. However, Evers et al. (1998) find that perceived financial stress can also explain breastfeeding behaviour. Additionally, Evers et al. (1998) find that demographic factors may mediate the effect of income on breastfeeding for lower income mothers suggesting that if lower income mothers were married and highly educated, they may be as successful in breastfeeding as higher income mothers. Mothers with higher income may be in jobs that offer greater autonomy where they are able to reconcile breastfeeding and employment responsibilities more easily compared to mothers with lower income. Furthermore, mothers who are in higher income households may be able to take more time off for childrearing due to their financial situation compared to those mothers in lower income households.

Therefore, literature has shown that there are disparities in breastfeeding practices where younger, less educated, African-American, and single mothers in lower socioeconomic status have lower breastfeeding initiation and duration rates. Thus, it is important that policies target this group of disadvantaged mothers.

i. The Special Case of Employment

Although the benefits of breastfeeding are well-established for both the mother and the child, mothers sometimes cease to breastfeed before the essential six-month mark. One of the most

common reasons is returning to work postpartum along with the difficulty and stigma associated with breastfeeding in the workplace (Chen et al., 2006; Galtry, 1997; Gatrell, 2007; Gielen et al., 1991; Hawkins et al., 2007; Heymann et al., 2013; Roe et al., 1999; Ryan et al., 2006; Scott et al., 2006; Visness and Kennedy, 1997). According the US Department of Labour Statistics, a third of mothers return to work within three months of child birth while the remaining two thirds return within six months (Ryan et al., 2006). Therefore, there is a need to recognize the importance of employment-related factors that influence breastfeeding behaviour (Galtry, 1997).

We find that studies have focused on five aspects of employment when evaluating breastfeeding duration and initiation: (1) full-time work, (2) part-time work, (3) unemployment, (4) working hours, and (5) the timing of return to work (Fein and Roe, 1998; Gielen et al., 1991; Hawkins et al., 2007; Lindberg, 1996; Mandal et al., 2010; Ong et al., 2005; Piper and Parks, 1996; Roe et al., 1999; Ryan et al., 2006; Scott et al., 2006; Visness and Kennedy, 1997). Working mothers with young children are one of the largest segments of the US labour force where 70% of employed mothers with children under 3 years of age work full-time (Li et al., 2004). Roe et al. (1999) find that there is often competition between breastfeeding and employment. Using data from the US 1993-1994 Infant Feeding Practices Study (IFPS) and simultaneous equations, Roe et al. (1999) find that as mothers increase their working hours, the number of daily feedings decrease. Mothers working full-time at eight hours per day breastfeed their infants 1.5 times less per day compared to unemployed mothers (Roe et al., 1999). However, Roe et al. (1999) do not find a reverse association where the number of daily feedings affects working hours suggesting that working mothers make decisions on their breastfeeding duration based on their situations in the workplace.

Ryan et al. (2006) analyse data from the Ross Mother's Survey (RMS) in the US and find that mothers who were employed full-time had the lowest breastfeeding rates at six months (26.1%) compared to part-time working mothers (36.6%) and unemployed mothers (35%). Ryan et al. (2006) also find that mothers who were unemployed were twice as likely to breastfeed their children at six months compared to mothers working full-time. With regards to breastfeeding initiation, unemployed mothers were approximately 1.3 times more likely to initiate breastfeeding compared to mothers working full-time (Ryan et al., 2006). Ong et al. (2005) confirm these results using a sample of mothers in Singapore with surveys conducted at two- and six-months

postpartum. Although working status had no significant association with breastfeeding initiation, working status was a significant predictor in determining breastfeeding duration (Ong et al., 2005). Employed mothers had a median breastfeeding duration of 8 weeks while unemployed mothers had a median breastfeeding duration of 9 weeks (Ong et al., 2005).

Through the use of panel data, Fein and Roe (1998) also find that working full-time three months after giving birth was associated with a decrease in breastfeeding duration by approximately 9 weeks compared to mothers who were unemployed. Unemployed mothers breastfed an average of approximately 25 weeks while those mothers working up to 19 hours a week breastfed for 24 weeks and those working from 20 to 34 hours per week breastfed for 23 weeks (Fein and Roe, 1998). However, Fein and Roe (1998) find that working less than four hours a day part-time did not have an effect on breastfeeding duration (Fein and Roe, 1998). Therefore, they conclude that part-time work may be an effective avenue to maintain breastfeeding. Gielen et al. (1991) find similar results. Working mothers had lower breastfeeding rates and earlier cessation compared to mothers who were unemployed (Gielen et al., 1991). Being employed was associated with the termination of breastfeeding two to three months postpartum (Gielen et al., 1991). However, Gielen et al. (1991) find that part-time work of less than 20 hours per week was a protective factor for breastfeeding. This finding supports Fein and Roe (1998) that part-time work can be beneficial for mothers who wish to continue breastfeeding. Similarly, Lindberg (1996) find that mothers who work part-time, breastfed longer compared to mothers who work full-time. Indeed, mothers who work part-time can split their time between childrearing responsibilities such as infant feeding and employment responsibilities. Furthermore, as studies have consistently shown, full-time employment is a significant barrier to breastfeeding duration and initiation possibly due to the time constraints where mothers are unable to reconcile working and childcare responsibilities fully.

Hawkins et al. (2007) also find that part-time and self-employed employed mothers were 1.3 and 1.7 times more likely to breastfeed for at least four months, respectively. Furthermore, mothers who delayed return to work were more likely to breastfeed their infants (Hawkins et al., 2007). Similarly, Scott et al. (2006), Piper and Parks (1996), and Visness and Kennedy (1997) find that mothers who returned to work before the infant turned 1 years old were less likely to breastfeed for six and 12 months. Visness and Kennedy (1997) also find that women who were in professional

occupations were more likely to initiate breastfeeding compared to mothers in blue-collar jobs such as manufacturing.

Even when mothers continue to breastfeed while working, they do so with difficulty due to the stigma attached with breastfeeding in the workplace. Through a qualitative study conducted in the United Kingdom (UK) on a sample of 20 mothers, Gatrell (2007) find that mothers who attempted to continue breastfeeding within the workplace were met with stigma from their peers. Therefore, many mothers were either forced to stop breastfeeding early or to conceal expressing milk due to the unsupportive and negative workplace environment (Gatrell, 2007). Similarly, Roe et al. (1999) find a significant negative association where mothers who were embarrassed about breastfeeding stopped nursing their infants approximately 10 weeks earlier suggesting that workplace stigma can, in fact, reduce breastfeeding duration.

II. BENEFITS OF BREASTFEEDING

The benefits of breastfeeding are well-established and clear within the literature. We first present the direct health benefits of breastfeeding for mothers and infants and then present indirect economic benefits for mothers, children, and the wider economy.

A. Direct Health Benefits

Firstly, breastfeeding directly benefits mothers by reducing the risk of several diseases (Bobrow et al., 2013; Chowdhury et al., 2015; Victora et al., 2016). A meta-analysis conducted by Chowdhury et al. (2015) found that there is a strong association with breastfeeding and breast cancer throughout the literature in that breastfeeding reduces the risk of breast cancer by 4.3% per one year of breastfeeding. Mothers who breastfed also had a 37% reduction in the risk of developing ovarian cancer (Chowdhury et al., 2015). Additionally, Bobrow et al. (2013) found that the mean BMI of breastfeeding mothers was 1% lower for every 6 months the mother breastfed her child. Mothers who breastfed also had a 32% reduced risk of developing type 2 diabetes if they breastfed for longer than 12 months (Chowdhury et al., 2015).

Secondly, breastfeeding has direct health benefits for infants. Infants who have been breastfed for longer show markedly lower rates of infant diseases and mortality rates compared to infants who have been breastfed for shorter durations or none at all (Bowatte et al., 2015; Horta and Victora, 2013; Ip et al., 2007; Sankar et al., 2015; Victora et al., 2016; Victora and Barros, 2000). The health benefits of breastfeeding for the infant come directly from the immunological characteristics of human milk. Horta and Victora (2013) find that children who were breastfed had lower risks of diarrhoea and respiratory infections, where this translated to reduced hospital admissions by 72% from diarrhoea and 57% from respiratory infections. Bowatte et al. (2015) also find that breastfeeding reduces the risk of acute otitis media during the first two years of life while Lodge et al. (2015) find that breastfeeding protects from food allergies and allergic rhinitis. The protective effects of breastfeeding also extend to reduced infant mortality rates. Sankar et al. (2015) found that children aged 6 to 11 months and 12 to 23 months who were not breastfed had approximately two times greater risk of mortality compared to those children who were breastfed. The risk of mortality due to infection in infants was also twice as high in children who were never breastfed (Sankar et al., 2015). The risk of infant mortality may also differ with the gender of the child. Victora and Barros (2000) conduct a meta-analysis of studies in low to middle income countries and find that infant girls who were not breastfed had 4.1 times higher mortality compared to those who were breastfed and infant boys had 3.5 times higher mortality. There is also evidence of increased infant mortality in high-income countries. Ip et al. (2007) find that breastfed infants were associated with 36% less risk of sudden infant deaths. Victora et al. (2016) estimate that if breastfeeding rates were increased to 95% globally, approximately 800,000 infant deaths and 20,000 deaths from breast cancer could be avoided.

The benefits of breastfeeding for the child carries on in later-life (Amitay and Keinan-Boker, 2015; Fletcher, 2011; Giugliani et al., 2015; Horta and Victora, 2013; Victora et al., 2016). Children who have been breastfed have lower risks of obesity by 26% (Horta and Victora, 2013) and of being overweight (Armstrong and Reilly, 2002; Giugliani et al., 2015; McCrory and Layte, 2012; Singhal and Lanigan, 2007; Von Kries et al., 1999), have lower risks of type 2 diabetes by 35% (Horta and Victora, 2013), have higher cognitive performance (Fletcher, 2011; Horta et al., 2015; Jacobson et al., 1999), and have lower risks of childhood leukaemia (Amitay and Keinan-Boker, 2015) compared to children who were breastfed for shorter durations or had never been breastfed.

B. Indirect Economic Benefits

The benefits of breastfeeding extend beyond health benefits and into economic benefits for the mother, child, and the wider economy. The economic benefits to mothers come from the reduced costs of buying infant-formula milk as well as time and wages saved from attending to an ill child (Weimer, 2001). Weimer (2001) notes that many mothers typically miss work during the first year after child birth due to the infant being sick while Galtry (1997) and Slavitt (2009) state that breastfeeding can minimize costs associated with women's time away from the labour market. Therefore, the several health benefits for the child can translate into savings for mothers as well (Weimer, 2001). For example, Cohen et al. (1995) find that employed mothers who formula-fed their infants had 1-day absences of 26% while employed mothers who breastfed their infants had 1-day absences of 11%. Furthermore, Cohen et al. (1995) show the possible association between breastfeeding and workplace absenteeism. Breastfeeding mothers reported less severe illnesses for themselves and their infants compared to mothers who formula-fed their infants where illnesses causing 1-day absences occurred in 75% of formula-fed infants (Cohen et al., 1995). Smith et al. (2013) also find that children who were exclusively breastfed had 13% fewer hospitalizations compared to children who were not exclusively breastfed. Although Smith et al. (2013) speculate that breastfeeding mothers may have lower rates of absenteeism due to reduced infant illnesses, they do not find an association between maternal days off and hospitalization. Although no robust empirical evidence exists, Ball and Bennett (2001) speculate in a review that the economic benefits of breastfeeding may result in increased employee productivity, higher retention rates, and reduced employee turnover (Ball and Bennett, 2001).

The economic benefits of breastfeeding for children come from the association of breastfeeding with higher cognitive performance that can positively affect future earnings and educational attainment (Rollins et al., 2016; Victora et al., 2015, 2016). Through a cohort study, Victora et al. (2015) find an association with breastfeeding duration and IQ, educational attainment, and income. Infants who were breastfed for 12 months or more were associated with higher IQ scores of approximately 4 points, educational attainment of 0.91 years of school and higher monthly incomes of 341 Brazilian reals (~USD\$106) compared to infants who were breastfed for less than a month (Victora et al., 2015). Victora et al. (2015) find that breastfeeding attributed to the increase

in monthly income and on cognitive performance where the increase in IQ was responsible for 72% of the effect on children's income. Additionally, Rollins et al. (2016) find that low and middle-income countries lost approximately \$71 billion in 2012 and high-income countries lost approximately \$231 billion due to low breastfeeding rates associated with low cognitive performance. Globally, the cost was \$302 billion in 2012 (Rollins et al., 2016). These losses are due to reduced human capital resulting in lower earnings where low breastfeeding rates are associated with cognitive deficiencies (Rollins et al., 2016).

Several studies have also estimated the impact of breastfeeding on the wider economy, specifically from saved costs due to childhood diseases that are associated with breastfeeding (Bartick and Reinhold, 2010; Mahon et al., 2016; Pokhrel et al., 2015; Walters et al., 2016; Weimer, 2001). Although, many studies have reported various cost savings due to methodological differences, the literature is consistent in showing the vast economic benefits of breastfeeding. Weimer (2001) estimated that the US can save a minimum of \$3.6 billion if breastfeeding rates were increased to 50% from current levels. Weimer (2001) estimated that the costs saved come from childhood diseases associated with breastfeeding such as otitis media, gastroenteritis and necrotizing enterocolitis. Although Weimer (2001) shows that breastfeeding can have large economic benefits, he only estimates the costs saved from three childhood diseases. However, literature has shown that breastfeeding is associated with several other childhood diseases. Therefore, Bartick and Reinhold (2010) provide updated estimates of the economic benefits of breastfeeding.

Using data from the 2005 National Immunization Survey (NIS), Bartick and Reinhold (2010) estimate indirect and direct costs from childhood diseases associated with breastfeeding such as hospital and outpatient visits, parents' absent days off from work, and direct surgical costs. Bartick and Reinhold (2010) estimate the following costs for each childhood disease: necrotizing enterocolitis (\$144,497 per case); otitis media (\$291 per episode), gastroenteritis (\$2,668 per hospitalization); respiratory infections (\$44,680 per case); atopic dermatitis (\$4,263 per case); sudden infant death syndrome (\$11 million total); asthma (\$6,602 per case); leukaemia (\$153,617 per case); type 1 diabetes (\$130,187 per case); and childhood obesity (\$36,040 per case). The highest costs come from pre-mature deaths from sudden infant death syndrome, deaths due to necrotizing enterocolitis, leukaemia, type 1 diabetes, and asthma (Bartick and Reinhold, 2010).

Totalling all costs, Bartick and Reinhold (2010) estimate that if 90% of all American mothers exclusively breastfed their infants for 6 months, as recommended, the US can save \$13 billion per year while also preventing approximately 900 infant deaths annually. Of the \$13 billion per year, approximately 17% come from direct medical costs (~\$2.2 billion) while 9% are indirect costs (~\$1.17 billion) coming from parents' absenteeism from work and personal expenses. Therefore, there can be substantial gains from increased breastfeeding rates within the US.

Rollins et al. (2016) also estimate saved treatment costs from childhood diseases that are associated with breastfeeding such as otitis media, diarrhoea, necrotising enterocolitis, and pneumonia but in a global context. Rollins et al. (2016) find that if exclusive breastfeeding up to 6 months or breastfeeding up to 1-2 years increased by 10 percentage points from current levels, saved treatment costs from childhood diseases can be up to \$312 million in the US, \$7.8 million in the UK, \$30 million in China, and \$1.8 million in Brazil. In the US and the UK, the saved costs are even higher if breastfeeding rates were to increase to 90% (Rollins et al., 2016). The US would save approximately \$2.5 billion while the UK would save up to \$29.5 million (Rollins et al., 2016).

Pokhrel et al. (2015) estimate that three childhood diseases associated with breastfeeding (gastrointestinal infection, lower respiratory tract infection, and acute otitis media) cost the NHS £75.5 million per year. Reducing the incidence of these three diseases by increasing breastfeeding rates at 4 months can translate into savings of £11 million per year (Pokhrel et al., 2015). However, if breastfeeding beyond 6 months were increased, £14 million per year can be saved from reduced incidences of childhood diseases, and an additional £31 million from reduced breast cancer rates (Pokhrel et al., 2015). Similarly, Mahon et al. (2016) estimate the costs saved from reducing the incidence of necrotising enterocolitis, sepsis, sudden infant death syndrome, leukaemia, otitis media, obesity, and neurological impairment within the NHS, however, on pre-mature infants. Mahon et al. (2016) find that if all pre-mature infants were breastfed, the NHS can save £47 million.

In addition to breastfeeding being beneficial to high to middle income countries, breastfeeding can help alleviate poverty in low-income countries where there is high malnutrition among children (Hansen, 2016). Over 12,400 preventable maternal and child deaths per year are attributable to

inadequate breastfeeding rates in Southeast Asia (Walters et al., 2016). However, increased breastfeeding rates can save \$1.6 billion per year only due to the cognitive benefits of breastfeeding for children while \$0.3 billion per year can be saved per year from reduced health care costs (Walters et al., 2016).

Therefore, several studies have shown that the investment returns in supporting breastfeeding are large not only in the US but also globally within low to middle income countries. Due to the several economic benefits outlined in literature, supporting and encouraging breastfeeding should be a top priority within the US and globally.

III. POLICIES TO PROMOTE BREASTFEEDING

As the previous section showed, investing in breastfeeding is not only beneficial for mothers and children but also the wider economy. There have been several ways that policy makers have attempted to increase breastfeeding rates. We focus our review on policies that have been implemented within the US and other high-income countries as the barriers to breastfeeding and therefore, the incentives to promote breastfeeding will differ between low- and high- income countries.

Policies to promote breastfeeding include workplace breastfeeding policies that have been implemented on a state and federal level, maternity leave policies including unpaid and paid leave and finally the Women, Infants, and Children (WIC) program targeting low-income families. In what follows, we will assess: i) the direct effects of these policies in promoting breastfeeding; and ii) their spillover effects.

With regards to the direct effects, we find that although there has been some encouraging evidence of workplace breastfeeding policies on breastfeeding rates, the evidence is relatively weak where studies have shown associations rather than causality. Additionally, previous empirical evidence on workplace breastfeeding policies often omit employment-related factors associated with breastfeeding. Therefore, there is a gap in the literature where workplace breastfeeding policies have been evaluated through robust methods. Furthermore, we find that maternity leave has a

positive effect on breastfeeding rates. However, there are concerns about costs due to mothers' time away from work and lost productivity. Finally, there is contradicting evidence in the literature on WIC's efficacy on breastfeeding rates; however, most studies show that WIC is largely ineffective in alleviating the socioeconomic disparities associated with breastfeeding.

Finally, we find that there are spillover effects of policies to promote breastfeeding on mothers' and fathers' labour market outcomes. Although we do not find studies assessing the impact of workplace breastfeeding policies on labour market outcomes, we find that parental leave policies positively affect mothers' return to work but have negligible or negative effects on wages. We also find that leave policies can have indirect effects on spousal labour market outcomes due to interdependencies in labour supply.

A. Direct Effects on Breastfeeding

i. Workplace Breastfeeding Policies

Through the review of employment-related factors on breastfeeding, it is clear that employment is a significant barrier to breastfeeding. Therefore, it is critical to target working mothers to see an increase in breastfeeding rates and realise economic gains associated with breastfeeding. In this section, we evaluate evidence on workplace breastfeeding policies and their association with breastfeeding rates. Access to breastfeeding facilities at work allows women to reconcile paid work and employment. We find that although previous empirical evidence is encouraging, there is a lack of studies using robust methods to ascertain the causality of such policies, specifically within the US.

Heymann et al. (2013) carry out an international analysis on 182 countries to assess the association between guaranteed paid breastfeeding breaks and exclusive breastfeeding. Heymann et al. (2013) find that paid breaks were guaranteed in 130 countries while 7 countries had unpaid breastfeeding breaks and 41 countries had no policy to allow mothers breaks to breastfeed. However, where national policies guaranteed paid breastfeeding breaks until the infant is 6 months old, the availability of breaks was associated with higher rates of exclusive breastfeeding, suggesting that

expanding national workplace policies to include paid breaks may indeed have an additional effect on breastfeeding rates (Heymann et al., 2013).

Del Bono and Pronzato (2012) assess the association between breastfeeding facilities and breastfeeding for 4 and 6 months through a cohort study using the UK Infant Feeding Survey and bivariate probit regression. Del Bono and Pronzato (2012) find a significant and positive association with the availability of facilities and breastfeeding duration. The availability of breastfeeding facilities is associated with a 16 to 19.5 percentage point increase in breastfeeding at 4 and 6 months while the effect is larger for lower educated mothers (Del Bono and Pronzato, 2012).

Workplace breastfeeding policies studied in literature in the context of the US include state-mandated legislations, although evidence is weak, and the Affordable Care Act of 2010 (ACA). The ACA implemented breastfeeding breaks and facilities for mothers in the workplace through the Fair Labour Standards Act across the US (Patient Protection and Affordable Care Act, 2010). However, the breastfeeding portion of the ACA was not fully implemented until 2012 and we only find three studies assessing the impact of the ACA on breastfeeding (Gurley-Calvez et al., 2018; Kapinos et al., 2017; Kozhimannil et al., 2016).

There have been three small-scale studies looking at workplace breastfeeding programs in the context of specific firms and select states (Dabritz et al., 2009; Dickson et al., 2000; Ortiz et al., 2004). Cohen and Mrtek (1994) conduct a study across two firms of 187 employees to assess participation rates in breastfeeding facilities such as a separate room to pump milk and professional lactation support. Breastfeeding duration was recorded by a lactation professional provided by firms (Cohen and Mrtek, 1994). A survey of program participants found that 75% of mothers who returned to work postpartum continued to breastfeed up to six months and the average duration of breastfeeding was approximately 8 months. Similarly, Ortiz et al. (2004) assess participation in breastfeeding support and duration of breastfeeding in 5 firms through retrospective reviews of 462 women. Workplace breastfeeding support included an educational class on the benefits of breastfeeding, a lactation consultant, and a private room with equipment to express milk (Ortiz et al., 2004). Ortiz et al. (2004) find that initiation rates were as high as 96% but dropped to 58% for

breastfeeding at 6 months and the mean breastfeeding duration was approximately 9.1 months. Additionally, a majority of mothers who pumped milk at work were employed full-time (Ortiz et al., 2004).

Dabritz et al. (2009) analyse breastfeeding duration and initiation using a sample of 201 infants born to mothers who returned to work or school postpartum in Yolo County, California. Although California implemented a workplace breastfeeding mandate in 1998, Dabritz et al. (2009) find that 22% of workplaces and 17% of schools did not provide a separate room for breastfeeding mothers. Dabritz et al. (2009) do not find a significant association with workplace support and breastfeed outcomes but find socio-demographic disparities in access to breastfeeding facilities. White and Hispanic mothers were more likely to be working at an employer with a lactation room while lower educated mothers were less likely to have access to such facilities (Dabritz et al., 2009).

With respect to US state-mandated legislation, there have been four studies assessing impacts on breastfeeding rates. Kogan et al. (2008) analyse the role of workplace breastfeeding policies on breastfeeding initiation and duration within the US. Kogan et al. (2008) use cross-sectional data from the National Survey of Children's Health and logistic regression models. Kogan et al. (2008) find that in states where there were multiple breastfeeding laws, 76% of children were ever breastfed compared to 64% of children in states without any breastfeeding laws. In terms of breastfeeding duration, Kogan et al. (2008) find that 43% of children breastfed for up to 6 months in states with breastfeeding laws compared to states with no breastfeeding laws. Dozier and McKee (2011) analyse the likelihood of workplace breastfeeding policies on breastfeeding duration at 6 months using the National Immunization Survey and logistic regression models. However, Dozier and McKee (2011) fail to find a statistically significant association between workplace breastfeeding legislation and breastfeeding rates. Smith-Gagen et al. (2014) use the National Health and Nutrition Examination Survey as well as logistic regression to find a significant and positive association between workplace breastfeeding legislation and breastfeeding. These three studies, however, fail to control for selection bias and do not control for the employment status of mothers and employment-related factors such as income that have been found to be significantly associated with breastfeeding.

A study by Hawkins et al. (2012) partially overcame these limitations using quasi-experimental methods, namely difference-in-differences (DD) to analyse the impact of state-mandated workplace breastfeeding legislation on breastfeeding rates using the Pregnancy Risk Assessment Monitoring System. Hawkins et al. (2012) find that breastfeeding initiation was 1.7% higher in states with workplace breastfeeding legislation compared to states without legislation. Although Hawkins et al. (2012) find an encouraging result, this study is based on only 7 states that have passed legislation over a short study period of 8 years, thus limiting the ability to capture the full extent of the policy. Furthermore, only including 7 treatment states, when there are indeed more states that have passed legislation, limits generalizability of policy impacts to the whole of the US. Finally, Hawkins et al. (2012) did not limit their treatment group to only ‘eligible’ mothers (i.e. employed mothers) and included unemployed mothers who are not affected by the policy, possibly leading to diluted results.

Through our literature search, we find three studies that have investigated the impact of the ACA on breastfeeding rates. The ACA implemented in 2010 included a mandate where private health insurance plans must cover lactation support, counselling and breastfeeding equipment starting in August 2012 (Kapinos et al., 2017). However, the ACA did not expand existing Medicaid policies to include breastfeeding provisions. Therefore, Kapinos et al. (2017) use DD to compare breastfeeding initiation rates of privately insured mothers to those with other sources of insurance such as Medicaid. Kapinos et al. (2017) use repeated cross-sectional data from the National Vital Statistics System to control for maternal education, ethnicity, marital status, WIC status, parity, mode of delivery (i.e. caesarean section), birth abnormalities, and pre-pregnancy diseases. Kapinos et al. (2017) further assess if the ACA mitigated disparities in disadvantaged mothers. Kapinos et al. (2017) find that the breastfeeding provision included in the ACA increased breastfeeding initiation by 2.5 percentage points and had heterogeneous impacts on disadvantaged groups. African-American mothers and those with a high-school degree were 2 percentage points more likely to initiate breastfeeding after the ACA (Kapinos et al., 2017). Although Kapinos et al. (2017) find encouraging results, they are not able to observe which mothers were already enrolled in programs that allowed them access to workplace breastfeeding facilities before the ACA or at the time of child birth, possibly leading to biased estimates. Furthermore, Kapinos et al. (2017) do not control for state-level breastfeeding policies that have been implemented from 1995 in more than

half of the US as well as employment-related factors such as mother's income and employment status after birth, of which have shown to significantly affect breastfeeding behaviour. Controlling for mother's income is important. In the US, those individuals who have private insurance are typically those who are in higher socioeconomic status compared to individuals who have Medicaid who are generally in lower socioeconomic groups.

Gurley-Calvez et al. (2018) also look at the impact of ACA on breastfeeding outcomes such as initiation and duration through DD using the National Immunization Survey from 2008-2014 on children aged 19 to 24 months. This study uses a similar treatment and control group as Kapinos et al. (2017) where the treatment group includes mothers with private health insurance and the control group includes uninsured mothers or those with Medicaid. Similarly, Gurley-Calvez et al. (2018) control for child's race, WIC status, maternal education, marital status, age, family size, and census region, however, do not control for employment-related factors. Gurley-Calvez et al. (2018) find that the ACA increased breastfeeding duration by 10% and exclusive breastfeeding by 21%, however do not find an effect on breastfeeding initiation. Although this study also finds an encouraging result, Gurley-Calvez et al. (2018) fail to control for employment-related factors and only include children aged 19 to 23 months possibility omitting infants that were breastfed for shorter periods.

Kozhimannil et al. (2016) also analyse whether breastfeeding accommodations offered by the ACA had effects on breastfeeding initiation and duration using data from the third wave of the Listening to Mothers survey in 2012. Kozhimannil et al. (2016) only include mothers who are employed at the time of the survey and control for employment-related factors such as income and socio-demographic factors such as age, ethnicity, education, marital status, census region, WIC status, caesarean delivery, birth weight of the infant, and intentions to breastfeed. Kozhimannil et al. (2016) find that only 40% of women had access to both break time and a private space to express milk. These women were 2.3 times more likely to exclusively breastfeed at 6 months and 1.5 times more likely to continue breastfeeding with each additional month compared to mothers without access to break time and facilities (Kozhimannil et al., 2016). This study overcomes previous evidence by controlling for employment related factors, however, is only able to show association

rather than causality. Therefore, there is a need for further research on the impact of ACA on breastfeeding rates.

In addition to empirical evidence, there have been some qualitative studies on workplace breastfeeding policies (Brown et al., 2001; Libbus and Bullock, 2002). Libbus and Bullock (2002) evaluate interviews from employers and assess their attitudes towards implementing workplace breastfeeding. 35% of employers expressed moderate willingness to support breastfeeding in the workplace, however, only 18% to 25% of employers saw the benefit of promoting breastfeeding in the workplace (Libbus and Bullock, 2002). This study suggests that although breastfeeding benefits are established within the literature, there may be a disconnect where employers are unaware of such benefits including the vast economic benefits. However, Brown et al. (2001) found that even when employers are aware of breastfeeding benefits, they did not prioritize support for breastfeeding mothers suggesting that strictly enforceable workplace policies may be needed.

ii. Maternity Leave

Maternity leave is another type of labour market policy that has been implemented globally to encourage breastfeeding by allowing mothers to stay at home after the birth of a child. Compared to worldwide provisions, the US is markedly behind on maternity leave policies. The FMLA introduced in 1993 required employers to guarantee unpaid leave for 12 weeks including a provision for job-protection (US Department of Labor, 1993). However, maternity leave on a federal level has not been updated since then. European countries have some of the best provisions for maternity leave where in some countries, paternal leave is also included. For example, Sweden offers parents 68 weeks of paid leave that covers 80% of wages, where each parent is entitled to 12 weeks (Swedish Institute, 2018). This mandate also allows parents to legally reduce their working hours by 25% until the child turns 8 years old (Swedish Institute, 2018). The UK requires mothers to take at least 2 weeks of leave and allows for 52 weeks of maternity leave where mothers are paid 90% of their weekly earnings for the first 6 weeks (UK Government, 2013). Studies have shown that maternity leave is an effective policy to encourage mothers to breastfeed by extending their time at home postpartum (Baker and Milligan, 2008; Berger et al., 2005; Chatterji and Frick, 2005; Guendelman et al., 2009; Huang and Yang, 2015; Rossin, 2011; Ruhm, 2000).

Rossin (2011) analyses the impact of FMLA on child health outcomes through the use of difference-in-difference-in-differences (DDD). Although Rossin (2011) does not directly look at breastfeeding, she speculates that maternity leave may reduce infant illness and mortality by encouraging mothers to breastfeed. This study finds that the FMLA is associated with a 0.2% increase in birth weight, 3% decrease in the likelihood of premature birth, and a 16% decrease in infant mortality (Rossin, 2011). However, Rossin (2011) find no effects of FMLA on infant outcomes of less-educated and single mothers suggesting that there are disparities in the take-up of maternity leave where lower socioeconomic status mothers may not be able to afford time away from work, especially if the leave is unpaid. Rossin (2011) concludes that the effect of FMLA on infant health outcomes are due to increased maternal time at home including the time allowed to take care of an ill child.

Berger et al. (2005) analyse the impact of mothers' return to employment within 12 weeks, the period offered by the FMLA, on breastfeeding. This study uses the National Longitudinal Survey of Youth (NLSY) and propensity score matching to find that mothers who returned to work within 12 weeks postpartum were less likely to breastfeed their infants in the first year (Berger et al., 2005). Similarly, Chatterji and Frick (2005) use the NLSY and find that mothers who returned to work within 3 months of child birth had lower probabilities of breastfeeding initiation by 16% to 18%. Additionally, mothers who returned to work within 3 months were associated with shorter durations of breastfeeding by 4 to 6 weeks (Chatterji and Frick, 2005). These findings suggest that paid leave and leave longer than 12 weeks may be more beneficial for mothers.

Huang and Yang (2015) analyse the impact of paid maternity leave benefits on Californian mothers where state-mandated policies have extended the unpaid leave offered by the FMLA to include paid leave in 2002. These new paid leave benefits offered working mothers a 55% replacement on their weekly wages (Huang and Yang, 2015). Through DD and data from IFPS, Huang and Yang (2015) find that the introduction of paid leave increased exclusive breastfeeding by 3 to 5 percentage points and increased breastfeeding at three, six, and nine months by 10 to 20 percentage points. This study highlights the importance of extending leave from unpaid to paid.

Baker and Milligan (2008) analyse paid maternity leave mandates in Canada comparing mothers who gave birth before and after an extension of mandates from 6 months of leave to 12 months. This study specifically evaluates whether allowing mothers more time at home had an impact on breastfeeding rates (Baker and Milligan, 2008). Through the use of DD and a cohort study design, Baker and Milligan (2008) find that the extension of paid leave increased mother's time at home by approximately 2 months and increased the proportion of mothers who exclusively breastfed their infants by 7.7 to 9.1 percentage points.

Ruhm (2000) analyses the impact of paid leave across 16 European countries from 1969 to 1994. He finds that maternity leave entitlements that included paid leave and job protection were associated with a 20% decline in infant deaths and 15% decline in fatalities of children 1-5 years old (Ruhm, 2000). Ruhm (2000) additionally finds that countries with more generous paid leave of longer durations had stronger negative associations with childhood deaths. Although this study does not specifically look at breastfeeding as an outcome, Ruhm (2000) hypothesizes that the reduction in infant and child mortality is due to the increase in breastfeeding rates from the extension of maternity leave.

Therefore, evidence shows that maternity leave mandates may be an effective labour market policy to support breastfeeding mothers by increasing their time at home with the infant. Additionally, studies show that maternity leave is also associated with positive child health outcomes through increased breastfeeding rates. Therefore, the US may be missing an opportunity to promote breastfeeding through its weak maternity leave policies failing to fully support mothers. However, there are high costs to implementing maternity leave programs. Holla-Bhar et al. (2015) find that maternity leave entitlements are one of the costlier policies to implement compared to other family-friendly policies. It is estimated that the FMLA cost approximately \$21 billion to implement in the US due to costs associated with lost productivity and foregone wages (Rossin, 2011). Therefore, additional policies with lower implementation costs are needed to promote breastfeeding.

iii. Special Supplemental Nutrition Program for Women, Infants, and Children

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a federal program in the US that first began in 1972. WIC is a federal grant provided to states to support low-income pregnant, breastfeeding and non-breastfeeding women, infants, and children through food and health assistance including supplemental foods, health care referrals, and nutritional education (USDA, 2017). Individuals who are eligible for WIC must be below 185% of the US poverty line (\$34,873 for a family of 4) and mothers must be at risk for poor pregnancy outcomes such as being underweight or overweight, having a history of labour complications, or have anaemia (USDA, 2017). In 1992, the US government added breastfeeding promotion to WIC to encourage mothers to breastfeed by providing counselling, education, and sometimes a breast pump (Ryan and Zhou, 2006). Therefore, one of the main objectives of WIC is to support breastfeeding among low-income mothers. However, there is contradictory evidence on the efficacy of WIC to promote breastfeeding. Most studies have shown that WIC is ineffective in increasing breastfeeding rates, however, there are some studies showing that WIC may be positively associated with breastfeeding initiation (Bullinger and Gurley-Calvez, 2016; Chatterji and Brooks-Gunn, 2004; Jacknowitz et al., 2007; Joyce et al., 2008; Martin-Anderson, 2013; Ryan and Zhou, 2006).

Ryan and Zhou (2006) use the Ross Mother's Survey (RMS) to analyse breastfeeding rates comparing mothers enrolled in WIC to mothers not in WIC. Ryan and Zhou (2006) find that there is a substantial gap in breastfeeding that has been persistent from 1978 to 2003 where WIC participants had lower breastfeeding initiation rates by approximately 16 percentage points. Additionally, non-WIC mothers were twice as likely to breastfeed at 6 months compared to WIC mothers (Ryan and Zhou, 2006). This study finds that WIC status is one of the most significant determinants associated with breastfeeding initiation (Ryan and Zhou, 2006). Using the Early Childhood Longitudinal Study Birth Cohort, Jacknowitz et al. (2007) find that WIC status is associated with a 5.9 percentage point less likelihood of exclusively breastfeeding for 4 months or more. They also find that WIC status is negatively associated with longer exclusive breastfeeding durations of 6 months or more by 1.9 percentage points (Jacknowitz et al., 2007). However,

Jacknowitz et al. (2007) find that this disparity in breastfeeding diminishes after the infant turns 6 months old.

Martin-Anderson (2013) use the 2005 wave of the IFPS to evaluate WIC program participation and its effect on breastfeeding duration. This study uses a two-step model to analyse selection into WIC by controlling for prenatal attitudes towards breastfeeding and then estimates breastfeeding duration by WIC participation (Martin-Anderson, 2013). Martin-Anderson (2013) finds that mothers who are more committed to breastfeeding have 30% less participation in WIC compared to mothers who are least committed to breastfeeding (Martin-Anderson, 2013). This study then finds a negative association between WIC and breastfeeding duration for multiparous mothers and that mothers who had enrolled in the program previously did not enrol their newborn infants again. Bullinger and Gurley-Calvez (2015) also find a negative association using the 2005 wave of the IFPS. They find that participation in WIC decreases exclusive breastfeeding rates in mothers by approximately 50%.

Joyce et al. (2008) use data from nine US states and the Pregnancy Nutrition Surveillance System to analyse the association with WIC and breastfeeding. Although Joyce et al. (2008) find positive effects of WIC on birth outcomes such as infant weight, they find small effects of WIC on breastfeeding duration for mothers. Joyce et al. (2008) find that for mothers who had enrolled in WIC before their child was born were more likely to initiate breastfeed by 2.6 percentage points compared to mothers who enrolled postpartum. This study also finds that mothers who enrol in WIC in their first trimester are approximately 4 percentage points more likely to initiate breastfeeding compared to mothers who enrol in their third trimester (Joyce et al., 2008). Similarly, Chatterji and Brooks-Gunn (2004) also find some positive effects of WIC on breastfeeding. They analyse the effect of WIC on breastfeeding initiation and duration through the use of the Fragile Families and Child Wellbeing Study. This study finds that WIC participation is positively associated with breastfeeding initiation by 7 percentage points (Chatterji and Brooks-Gunn, 2004). However, there was no association with WIC participation and breastfeeding duration.

Rollins et al. (2016) estimates that the government spends \$210 million on the breastfeeding promotion and counselling component of WIC and an additional \$110 million on nutritional

packages. However, WIC is also the largest buyer of infant formula milk within the US as mothers have free access to infant formula (Weimer, 2001). The large infant formula industry has been shown to be associated with lower rates of breastfeeding (Rollins et al., 2016). Therefore, there needs to be additional improvements within WIC if it is to indeed increase breastfeeding rates among low-income mothers and reduce the socioeconomic disparity in breastfeeding within the US.

B. Spillover Effects of Breastfeeding Policies

Policies to promote breastfeeding may also have spillover effects on labour market outcomes, similar to the health benefits of breastfeeding extending into economic benefits. Majority of studies that have investigated economic outcomes of policies to promote breastfeeding focus on maternity leave. Through our literature search, there were no studies that have assessed the impact of workplace breastfeeding policies on economic outcomes. Therefore, we focus on maternity leave policies and their impact on employment and wages. Finally, we survey the literature where labour force policies have had labour market outcomes on indirectly treated spouses. Again, there were no studies assessing the impact of workplace breastfeeding policies on spousal labour market outcomes; therefore, we focus on parental leave policies and find that there is some evidence of spillover effects on spousal employment and earnings.

i. Direct Labour Market Outcomes on Mothers

Family-friendly policies such as parental leave are intended to retain parents in the labour force by allowing temporary interruptions while offering job-protection after child birth (Olivetti and Petrongolo, 2017). Several studies show that family-friendly policies such as maternity leave are beneficial for mothers' return to work postpartum, however, have negative effects on employment in the long-run and on wages due to the implicit costs of maternity leave for employers being transferred to mothers in the form of reduced wages (Baum, 2003; Berger et al., 2005; Christofides et al., 2013; Cipollone et al., 2013; Dustmann and Schönberg, 2012; Edin and Gustavsson, 2008; Ejrnæs and Kunze, 2013; Gruber, 1994; Heywood et al., 2007; Olivetti and Petrongolo, 2017; Ruhm, 1998; Schönberg and Ludsteck, 2014; Tominey, 2016; Waldfogel, 1998a, 1999).

Tominey (2016) estimates the impact of the FMLA on mothers' return to work in the US using data from the Panel Study of Income Dynamics (PSID). Tominey (2016) looks at the speed of maternal return to work in response to a shock in spouses' employment (i.e. fathers) and how the FMLA mediates this response by following male-female pairs from child birth up until the month the mother returns to work or has another child. Using DD and Cox proportional hazard models, Tominey (2016) exploits a paternal shock where the father has been laid off or fired at a time when the mother is not working due to child birth. Although this study does not find a significant association between this shock and mother's return to work, Tominey (2016) find that mothers with access to FMLA speed up their return to work by 5.6 percentage points compared to mothers without access to FMLA (i.e. defined as being ineligible for FMLA). Additionally, the FMLA increases the probability of being in part-time and full-time work by 2.6 and 2.8 percentage points, respectively, compared to mothers without access to FMLA. Therefore, this study shows that where there is a spousal shock of unemployment within the household, the FMLA helps mothers return to work earlier due to its insurance of job-protection.

Berger and Waldfogel (2003) assess the impact of FMLA on women's return to employment and leave taking one year after child birth. Using the NLSY over the period of 1988 to 1996 and Cox proportional hazard models, Berger and Waldfogel (2003) find that mothers who were employed while pregnant are more likely to return to work postpartum and return to work faster compared to mothers who were unemployed before child birth. This study also finds that those mothers with job-protected leave were more likely to take leave of up to 12 weeks as offered by the FMLA; however, often returned to work before 12 weeks to their pre-birth employers.

Cipollone et al. (2013) assess whether family-friendly labour market policies explain changes in female labour force participation across 15 European countries. Cipollone et al. (2013) finds an association with parental leave policies and the labour market attachment of young and highly educated mothers. This study finds that parental leave policies are attributable for 25% of the increase in labour force participation for young women and 38% of the increase for highly educated women (Cipollone et al., 2013). However, Cipollone et al. (2013) find that labour market policies were marginal in explaining the increase in labour force participation of lower skilled

mothers suggesting that young and highly educated mothers benefited more from the expansions of family-friendly policies across Europe.

Through the use of DD, Dustmann and Schönberg (2012) also look at maternal return to work postpartum and children's long-term educational outcomes but due to an expansion in maternity leave in Germany intended to increase mother's time at home with newborn infants. Although this study does not find a significant association with maternity leave and childhood educational outcomes, they find that an expansion of maternal leave offering higher compensation to mothers lowered maternal employment one year postpartum (Dustmann and Schönberg, 2012). They also find similar results for a 1992 expansion that increased leave from 18 to 36 months on mothers' employment two and three years postpartum (Dustmann and Schönberg, 2012).

Another study by Schönberg and Ludsteck (2014) assessing the impact of several maternity leave reforms in Germany find that leave also has an effect on long-term employment outcomes of mothers. The first reform this study analysed is the 1979 policy change that increased job protection by approximately 4 months while the second and third reforms expanded job protection and benefits by 16 months (Schönberg and Ludsteck, 2014). Schönberg and Ludsteck (2014) find that the first reform reduced maternal employment within the first year of child birth by less than 1 month while the second and third reforms reduced maternal employment by 3 months in the first 6 years after child birth. They also find adverse effects of leave on mother's labour income where the third reform lowered earnings by approximately 8% in the first 6 years after birth and 3% two to six years after birth (Schönberg and Ludsteck, 2014).

Olivetti and Petrongolo (2017) analyse the impact of parental leave entitlements on the female employment rate, the gender gap in employment rates and the gender gap in earnings using national-level data in European countries. This study finds that job-protected leave of up to 50 weeks is associated with an increase in female employment rates by 1.6 percentage points (Olivetti and Petrongolo, 2017). Olivetti and Petrongolo (2017) also find a positive association between paid maternity leave and the gender gap in employment where countries that have longer lengths and paid leave have less of a gap between women's and men's labour supply. They further find an association between parental leave and the gender gap in earnings where the gender gap decreases

in the first 8 months of parental leave (Olivetti and Petrongolo, 2017). Olivetti and Petrongolo (2017) also assess the heterogeneous impacts of parental leave policies by educational groups finding that the beneficial effects of leave are more confined to lower-skilled mothers while higher-skilled mothers experience a reduction in their earnings due to longer lengths of leave.

In addition to the impact on return to work, several studies have also assessed the impact of leave policies on wages. Waldfogel (1998a) evaluate the impact of maternity leave legislation in the US and Britain on mothers and find that leave that protects mothers' jobs postpartum has a positive wage effect for mothers. Waldfogel (1998a) finds that women who have access to leave are more likely to return to their previous employers postpartum. This effect is highest 2 years after child birth, however diminishes 8 years after child birth (Waldfogel, 1998a). For those mothers that take leave and return to the same employer, the wage premium for mothers in the US is 6% (Waldfogel, 1998a). However, several studies find a negative impact of maternity leave on women's wages.

Ruhm (1998) investigates the impact of paid parental leave in nine European countries from 1969 to 1993 on mothers using men as a control group on the gap between male and female labour market outcomes such as employment and earnings. Ruhm (1998) finds that paid parental leave increases women's employment rates, however, decreases wages when mothers take an extended leave. For example, entitlement to short periods of leave of up to 3 months increases employment ratios for women by 3 to 4% and has little effect on wages; however, extended leave decreases women's hourly earnings by 3% (Ruhm, 1998). Similarly, Ejrnæs and Kunze (2013) find that maternity leave decreases wages by 3 to 5.7% per year of leave. Ruhm (1998) attributes these negative wage effects to extended absences of mothers and depreciations in work experience. This is supported by Edin and Gustavsson (2008) who find an adverse effect of work interruptions due to maternity leave on mother's skill depreciation. A year of unemployment results in a skill depreciation of approximately 5% (Edin and Gustavsson, 2008).

Another reason that paid leave has adverse effects for mothers is that paid leave is costly to employers, therefore, mothers face an implicit reduction in their wages (Heywood et al., 2007). For example, Heywood et al. (2007) finds that family-friendly practices in the UK such as job share, leave, flex hours, and time off lowers earnings by approximately 13 to 25% and suggests

that these wage reductions may cover employers' costs to implement such policies. Therefore, offering extended leave may have produced a "system-based glass ceiling" where mothers take longer leaves compared to fathers, mothers select into lower paying jobs in the public sector and therefore, do not reach the highest paid positions (Angelov et al., 2016; Gupta et al., 2008). In fact, Gupta et al. (2008) find that while Nordic countries offer extended paid leave for mothers that increases female labour participation, such leave has negative effects on women's wages producing a "glass ceiling". Christofides et al. (2013) also find that the gender wage gap is higher in countries where there are "glass ceilings" and that the gender pay gap reflects the institutional features and policies offered in each country.

Finally, there have been studies on the impact of FMLA in the US. Although this legislation provides some protection for mothers, the policy is relatively weak as it provides only unpaid leave. Therefore, some mothers may return to work without taking leave as they cannot afford to be out of the labour force (Baum, 2003). Using a DDD framework, Baum (2003) estimates the impact of FMLA to find insignificant and small results on mothers' employment and wages. Using a similar study design, Waldfogel (1999) also finds that the FMLA did not have an effect on women's wages and employment.

ii. Indirect Labour Market Outcomes on Spouses

In addition to affecting women's employment and earnings, family-friendly policies may also have spillover effects on their partners' labour market outcomes through interdependencies in spousal labour supply (Goux et al., 2014). However, there are a limited amount of studies within this area where most studies assessing spillover effects on spouses, evaluate parental leave in the context of Scandinavian countries (Cools et al., 2015; Ekberg et al., 2013; Johansson, 2010; Pylkkänen and Smith, 2009). We do not find any studies on spousal effects for workplace breastfeeding policies.

Johansson (2010) uses fixed-effects models to assess the impact of parental leave on mothers' and fathers' earnings in Sweden. Parental leave reforms in Sweden allow parents to split leave. Johansson (2010) hypothesizes that fathers' take up of leave may affect the distribution of household work between mothers and fathers. Through the use of DD and DDD, Johansson (2010)

find that each month that a mother takes leave, it reduces her earnings by 4.5% while each month that a father takes leave, it reduces his earnings by 7.5%. Maternal leave did not have an effect on father's earnings; however, each month that the father took leave increased mother's earnings by 6.7% suggesting that fathers' time at home allows mothers to go into work (Johansson, 2010). Johansson (2010) also suggests that this finding explains why there is a gender gap in earnings as childcare responsibilities typically falls on mothers through maternity leave.

Pylkkänen and Smith (2003) analyse the effect of career interruptions due to parental leave and child birth on Danish and Swedish women's decision to return to work using longitudinal data. They find that fathers' parental leave is associated with an increase in mothers' job retention by approximately 4% where mothers return to work faster after child birth. However, this result was only found in Sweden. This study supports Johansson (2010) by showing that parental leave can affect spousal labour market outcomes.

Through the use of DD on longitudinal data, Ekberg et al. (2013) also investigate a Swedish reform that allowed fathers to take one month of leave. Ekberg et al. (2013) find that this reform increased fathers' use of leave from 9% to 47%, fulfilling its initial objective to increase fathers' take-up of leave. However, they do not find a significant association between fathers' leave and their share in childcare contradicting previous hypotheses that paternal leave may increase fathers' household responsibilities (Ekberg et al., 2013). Additionally, Ekberg et al. (2013) find significant and positive effects of paternal leave on mothers' employment and earnings. This reform reduced maternal employment by approximately 1% and increased mothers' earnings by less than 1% (Ekberg et al., 2013). Although these effects are relatively small, this study does find some effect suggesting that there may be spillover effects of leave on spousal labour market outcomes. However, Cools et al. (2015) do not find an effect of fathers' take up of leave on mother's employment in Norway using DD and regression discontinuity design. Therefore, there is a need for further research into this area as some studies show that there are spousal spillover effects while other studies show negligible effects.

IV. DISCUSSION AND CONCLUSION

There are several key takeaways from the literature. The health benefits of breastfeeding are well-established where breastfeeding leads to healthier mothers and infants. These benefits extend into economic benefits as mothers save money from not purchasing infant formula, save healthcare costs due to healthier breastfed infants, and are less likely to miss work due to an ill child. There are also long-term economic benefits for the child as studies have shown that breastfed children have higher cognitive performance that extend into higher future earnings and educational attainment. Additionally, several studies have shown that higher breastfeeding rates can save the wider economy millions of dollars from reduced health care costs due to lower rates of infant mortality and prevalence of diseases.

Despite these benefits, the literature shows that there are several factors that impact breastfeeding rates. Indeed, evidence suggests that there is a socioeconomic gradient and disparity in breastfeeding behaviour where mothers who are older, married, more educated, and are of higher socioeconomic status are more likely to breastfeed compared to younger, single, less educated, and lower socioeconomic status mothers. Quite notably, the literature also shows that employment-related factors such as full-time work, part-time work, and high working hours negatively impact breastfeeding behaviour among working mothers. Therefore, an important avenue to promote breastfeeding is through policies that allow mothers to combine work and childcare responsibilities.

While there is some anecdotal evidence, there is currently a gap in the literature showing that workplace breastfeeding policies can causally impact breastfeeding rates and labour market outcomes. With regards to the former, existing studies fail to control for employment-related factors that are significantly associated with breastfeeding and fail to control for sample selection bias. With regards to the latter, while our review shows that policies to promote breastfeeding (e.g. maternity leave) can have indirect labour market outcomes for both mothers and their partners, there are no studies assessing the effects of workplace breastfeeding policies on labour market outcomes.

Therefore, to address these gaps we contribute to the literature in the following ways. We first look at the direct impacts of state-mandated workplace breastfeeding policies on breastfeeding rates through DD allowing us to identify causal impacts rather than associations (Chapter 3). We also control for several economic characteristics associated with breastfeeding. Secondly, we assess the economic impacts of workplace breastfeeding policies on mothers' and fathers' absenteeism (Chapter 4). Indeed, Cohen et al. (1995) and Smith et al. (2013) show that there may be an association between breastfeeding and mothers' absenteeism due to the health benefits of breastfeeding. Therefore, we analyse if state-mandated policies can in fact have an impact on absenteeism rates. We also include employed fathers as studies have shown that there can be spousal spillover effects. Finally, we analyse the impact of state-mandated workplace breastfeeding policies on the within-couple earnings gap (Chapter 5). Studies on maternity leave have shown that policies to promote breastfeeding can impact wages. Therefore, we hypothesize that workplace breastfeeding policies may also impact mothers' wages and thus, affect the wage gap between her and her partner. Such evidence on labour market outcomes is key to promote breastfeeding within the US and in the workplace as employers and policy makers are more likely to implement policies with clear financial incentives.

CHAPTER 3 : IMPACTS OF US WORKPLACE BREASTFEEDING LEGISLATION ON BREASTFEEDING RATES

ABSTRACT

The United States has one of the lowest exclusive breastfeeding rates among high-income countries. One reason may be the lack of mother-friendly workplace policies. Since 1995, 25 states have implemented workplace breastfeeding legislation allowing mothers to express and store breast milk in the workplace. We examine the impact of this policy on state-level breastfeeding rates. We exploit the staggered introduction of the policy where the policy has been introduced in a selective group of states to identify the causal impact of the legislation through difference-in-differences. We further assess the heterogeneity of the policy where some states have weak or strict enforceability, defined as encouraging or requiring facilities and break time. We use the Panel Study of Income Dynamics supplemented with data from the Centre for Disease Control from 1990-2011. We find that states with legislation experienced a 5 percentage point increase in breastfeeding rates compared to states without legislation while states with strict enforceability experienced a 7.1 percentage point increase compared to states with weak legislation and states without legislation. Finally, we find that the policy had a delayed impact of 1-2 years after implementation on breastfeeding rates. The findings suggest that there are significant benefits to tightening workplace breastfeeding legislation across all states.

I. INTRODUCTION

With 830 million working women worldwide, mother-friendly workplace policies are becoming an increasingly important worldwide issue (UNICEF, 2015). The central theme of World Breastfeeding Week 2015 focused on working mothers who breastfeed, reflecting concerns of employment barriers not only in the United States (US) but also globally from top government leaders and pertinent organizations (UNICEF, 2015). Out of the high-income countries, the US has one of the lowest rates of exclusive breastfeeding, defined as giving the child only breast milk for six months. The US national average exclusive breastfeeding rate is 14.1% with California being the highest at 24.7% and Tennessee being the lowest at 4.1% (CDC, 2013). However, low exclusive breastfeeding rates are also a problem in other high-income countries such as the United Kingdom (1%), Italy (5%), Norway (7%) and Austria (10%) (Global Health Observatory, 2017). In comparison to the US and these European countries, other high-income countries such as Canada and Germany have markedly higher rates at 26% and 22%, while middle- and low-income countries such as Brazil and Ghana have even higher rates at 41% and 45.7%, respectively (Global Health Observatory, 2017; Statistics Canada, 2013; UNICEF, 2013a, 2013b). In addition to having low breastfeeding rates, the US has one of the highest percentages of mothers with infants in the workforce at 57.3%, and the least support from labour force policies such as lactation programs and maternity leave (Save the Children, 2012; UNICEF, 2015; US Department of Labor, 2016). In reaction to low breastfeeding rates in the US, the Surgeon General issued a Call to Action in 2011 for employers, researchers, and government leaders to take on a commitment to increase and support breastfeeding by addressing barriers that discourage mothers, including employment (US Department of Health and Human Services, 2011).

Breastfeeding has well-documented health benefits to both infants and mothers, and direct and indirect economic benefits to employers and the economy. Breastfeeding protects infants from infections and several diseases in later life, and enhances psychological and cognitive performance (Fletcher, 2011; Singhal and Lanigan, 2007; Victora et al., 2015; WHO, 2000). For mothers, breastfeeding reduces the risk of postpartum haemorrhage, type 2 diabetes and other diseases (UNICEF, 2015). Employers supporting breastfeeding through policies benefit from higher productivity, lower healthcare costs, and generally minimized costs associated with women's time

away from the labour market (Galtry, 1997; Slavitt, 2009). Governments benefit indirectly with studies showing that the failure to breastfeed costs the worldwide economy \$302 billion each year, while in the US, \$13 billion can be saved through avoidable medical costs if breastfeeding rates increased to 90% (Bartick and Reinhold, 2010; Rollins et al., 2016). Therefore, breastfeeding is considered a very good investment in populations and in economies (Hansen, 2016).

While these benefits are well documented, there are several barriers contributing to low breastfeeding rates, including lack of knowledge, social norms portraying bottle-feeding as “normal”, poor social and family support, and inadequate emphasis on breastfeeding in the health system. However, the most significant barrier to breastfeeding is employment (US Department of Health and Human Services, 2011). Most women experience inflexibility, social stigma, and difficulty expressing milk in the workplace due to lack of facilities and inadequate maternal leave policies (US Department of Health and Human Services, 2011). Therefore, most mothers cease to breastfeed when they return to work postpartum (Galtry, 1997). There is also evidence suggesting these barriers differ with the socioeconomic profile of women. Evidence shows that women from lower socioeconomic groups with less labour income have lower breastfeeding initiation and duration rates, and are more likely to cease breastfeeding earlier compared to mothers of higher socioeconomic status (Mandal et al., 2014; Ong et al., 2005; Thulier and Mercer, 2009).

Therefore, workplace breastfeeding policies with legal requirements to provide facilities for expressing and storing breast milk in the workplace are considered the most promising interventions to encourage breastfeeding and retain mothers in the workforce (CDC, 2005). The first such legislation in the US was implemented in Texas in 1995, followed by 25 states during our study period of 22 years. The state-level legislation as introduced in 25 states directly targets working mothers who are more likely to cease breastfeeding, and is a way of empowering mothers while supporting breastfeeding as a social norm (Kozhimannil et al., 2016). The policy also reconciles mothers’ financial and family responsibilities by allowing mothers and their families to enjoy both the economic and health benefits of breastfeeding and employment, while economies benefit from retaining women in the workforce.

The objective of this study is to estimate the causal impacts of state workplace breastfeeding legislation on breastfeeding rates through a state-level analysis that exploits the staggered introduction of such legislation in a selective group of 25 US states over the past 22 years as a quasi-experiment. We assess the differences in effects related to the enforceability of state workplace breastfeeding policies where some states encourage employers and some states require employers to implement policies. Indeed, there is a need for causal inference in this area (Abdulwadud and Snow, 2012).

The results of this study provide important evidence on the efficacy of workplace policies to promote breastfeeding and offer insight for the support of mothers in the workplace. The remainder of the chapter is structured as follows: section 2 discusses previous literature, section 3 explains the legislation, section 4 explains the methods, section 5 presents the data, section 6 presents results, and section 7 discusses and concludes.

II. RELATED LITERATURE

Only a few studies have investigated the effectiveness of breastfeeding facilities on breastfeeding behaviour in the US and internationally. A country-level cross-sectional study by Heymann et al. (2013) found a positive correlation between the presence of a national policy allowing breaks for mothers to express milk in the workplace and exclusive breastfeeding rates in 137 countries (Heymann et al., 2013). These results have been confirmed by Del Bono et al. (2012) using data from the UK (Del Bono and Pronzato, 2012). With regards to the US, four studies from the public health and clinical literature assessed the specific benefits of US workplace breastfeeding policies upon breastfeeding.

Kogan et al. (2008) analysed the role of breastfeeding legislation, including at the workplace, on breastfeeding initiation and duration using a cross-sectional survey of over 33,121 mother-infant pairs from the National Survey of Children's Health and logistic regression models. They found that in states with multiple laws, more than 76% of children were ever breastfed, compared with 64% of children in states without any laws. Similar disparities were evident for the estimated percentage of children breastfed for at least six months (43% vs. 32%).

Dozier and McKee (2011) used a sample of 16,145 infants from the National Immunization Survey and logistic regression models to determine whether the impact of laws requiring a site and/or break time for breastfeeding increased the likelihood of breastfeeding at six months, controlling for length of time the legislation had been in place, and a range of maternal and infant covariates. The study failed to find a statistically significant impact of living in a state with legislation on the odds of breastfeeding.

Smith-Gagen et al. (2014) used a sample of approximately 3,000 infants pooled from four waves of the National Health and Nutrition Examination Surveys and logistic regression models to assess the association between a total of eight legislations on breastfeeding across different states. The authors found a positive association between breastfeeding at six months and workplace legislation.

The main limitation of these three US studies is that they fail to control for selection bias, i.e. unobservable third factor(s) that may be associated with states' propensity to introduce breastfeeding legislation and higher breastfeeding rates. Moreover, there are no controls for the employment status and the economic situation of mothers and the household she lives in that have been found to correlate with breastfeeding (Mandal et al., 2014; Ong et al., 2005; Thulier and Mercer, 2009). Therefore, it would be problematic to interpret their findings as causal effects of the legislation. Furthermore, these studies treat the policy as a binary intervention and therefore do not assess the possible differential impacts across states with varying enforceability of the policy.

Hawkins et al. (2013) partially overcame these issues by using difference-in-differences (DD) methodology to analyse the impact of legislation that either encouraged or required employers to provide break time and a private space for breastfeeding employees, and laws that permitted breastfeeding in public or private locations. They used data on 326,263 mothers for a selection of states from the Pregnancy Risk Assessment Monitoring System to examine breastfeeding initiation and continuation before and after the introduction of both public and workplace breastfeeding legislation between 2000 and 2008 for 32 states. Breastfeeding initiation was 1.7% higher in states that introduced workplace legislation. Effects on breastfeeding duration were positive, but weaker.

However, the study's findings are based on only seven states that introduced workplace legislation over the relatively short observation period of eight years. This limits the ability to capture the full effect of the policy, specifically in a context where there may be a delayed impact of the policy. Furthermore, only including seven states raises issues of sample selection bias and lack of representativeness of all 25 US states that have introduced legislation. It is problematic to draw conclusions from such a restricted sample. Furthermore, Hawkins et al. (2013) did not restrict their treatment group to the target population of the policy, i.e. only employed mothers with an infant, due to data limitations. Indeed, they also included mothers not in the labour force and who are therefore not affected by the policy and considered mothers six months before giving birth. While the former might simply dilute the impact of the policy, the latter might be suggestive of the violation of parallel trends that is the core assumption behind DD as this study may be capturing additional factors that affect breastfeeding other than the policy.

Therefore, we build on this literature in several ways both in scope of the contribution but also methodologically. In terms of scope of the analysis, we are able to assess how the impact of the policy varies due to its enforceability, where previous studies have not taken into account the heterogeneity of the policy due to data limitations. We are additionally able to assess how long the policy took to have an effect on breastfeeding rates due to our long study period, where previous studies were limited due to shorter study periods.

Furthermore, our analysis comprises data for all US states, a cleaner study design, robust methods, and data that allow us to control for important confounders. The scope of the analysis improves upon previous literature in that we can base our findings on all states that introduced legislation over 22 years, and not just a limited sample of seven states over eight years as Hawkins et al. (2013), thus limiting the likelihood of sample selection bias. We further employ a cleaner study design by only including the targeted population of the workplace policy, employed mothers with infants, rather than including unemployed mothers and mothers before birth, further improving upon Hawkins et al. (2013). Additionally, we improve on three previous studies by Kogan et al. (2008), Dozier and McKee (2011), and Smith-Gagen et al. (2014) methodologically by employing panel data models allowing us to control for a broad range of factors including exogenous time

trends in breastfeeding rates and unobserved heterogeneity across states. Finally, due to the strength of our data, we are able to control for an extensive range of socio-demographic covariates, including maternal and household employment and income, that have been found to be related to breastfeeding and are therefore important confounders in the assessment of the impact of the policy.

III. POLICY BACKGROUND

State-specific workplace breastfeeding policies have been introduced in 25 out of 51 US states between 1995 and 2011 with the objective of encouraging employed women to breastfeed by incentivizing the creation of separate and private rooms for mothers to express breast milk in the workplace (Table 3.1). While sharing the same objective, there is some heterogeneity in the policies across states (Figure 3.1). In particular, policies differ in their levels of enforceability across states and also in the scope of the interventions to be implemented by employers. With regards to the scope, states differ on whether policies include provisions for facilities and break time. A total of 18 states require breaks and 21 require provision of hygienic facilities such as a private room, a fridge to store milk, and a pump. With regards to enforceability of the policy, 17 states have strict enforceability where policies require employers to provide both facilities and break time, and eight states have weak enforceability where policies merely encourage firms to provide facilities and/or break time (Table 3.2). Furthermore, while in the majority of the states the policy applies to all employers, in four states smaller firms are not required to participate. Legislation was first implemented in 1995 in Texas with Maine being the most recent state in 2009. Further detailed characterization of state policies is included in Appendix 1A.

Table 3.1: US states with and without workplace breastfeeding legislation, years 1990-2011

States without legislation	States with legislation (implementation year)
Alabama	Arkansas (2009)
Alaska	California (1998)
Arizona	Colorado (2008)
Delaware	Connecticut (2001)
Florida	District of Columbia (2007)
Idaho	Georgia (1999)
Iowa	Hawaii (1999)
Kansas	Illinois (2001)
Kentucky	Indiana (2008)
Louisiana	Maine (2009)
Maryland	Minnesota (1998)
Massachusetts	Mississippi (2006)
Michigan	Montana (2007)
Missouri	New Mexico (2007)
Nebraska	New York (2007)
Nevada	North Dakota (2009)
New Hampshire	Oklahoma (2006)
New Jersey	Oregon (2007)
North Carolina	Rhode Island (2003)
Ohio	Tennessee (1999)
Pennsylvania	Texas (1995)
South Carolina	Vermont (2008)
South Dakota	Virginia (2002)
Utah	Washington (2001)
West Virginia	Wyoming (2003)
Wisconsin	

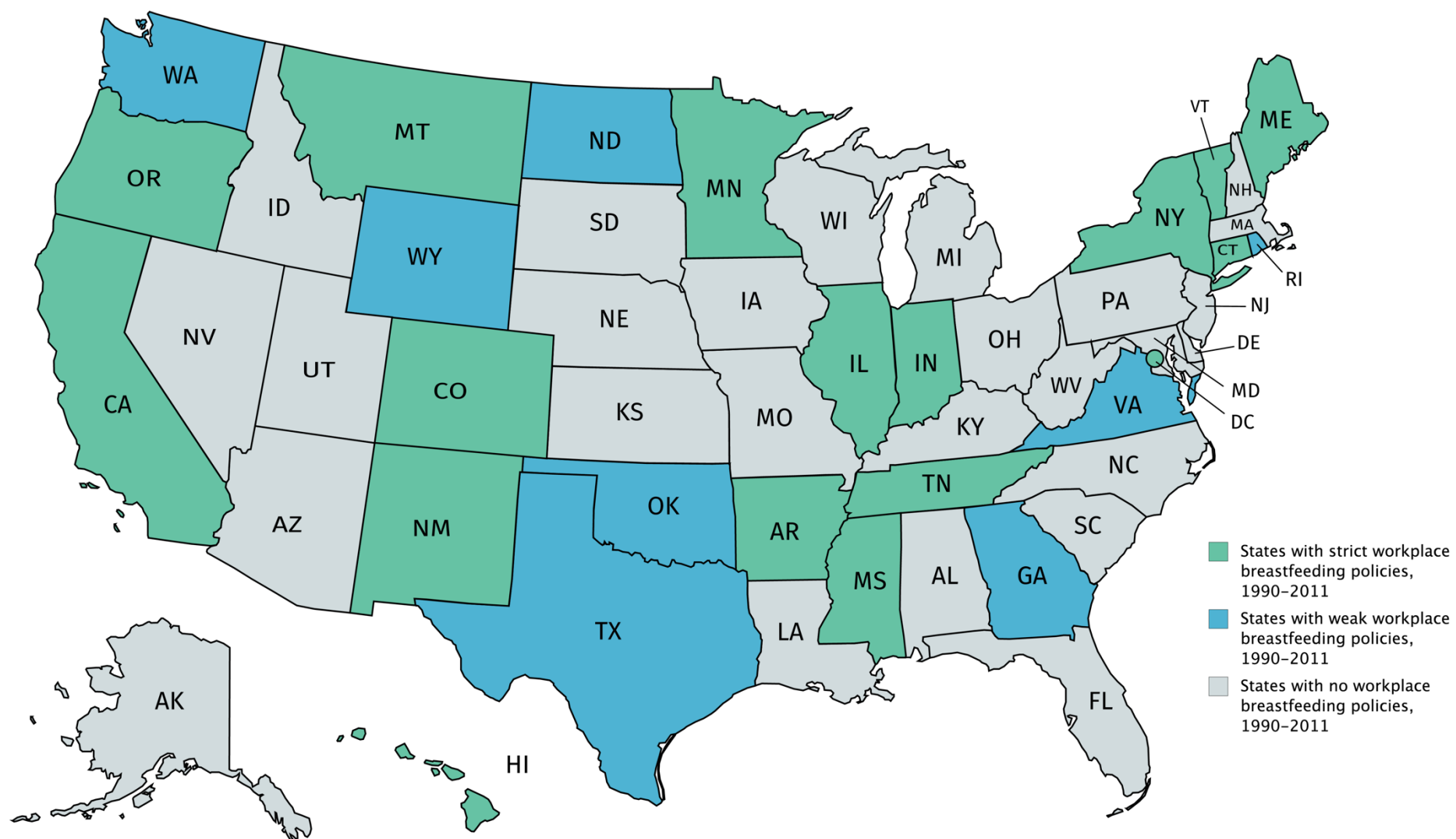
Note: States with legislation require or encourage employers to provide breastfeeding facilities and break time. Break time is unpaid in all states with legislation except for Indiana. For further details, see Appendix 1A. Vermont is not included in analysis due to insufficient observations.

Table 3.2: US states with strict and weak enforceability, years 1990-2011

Enforceability	Treatment States
Strict (i.e. requires both facilities and break time)	Arkansas; California; Colorado; Connecticut; District of Columbia; Hawaii; Illinois; Indiana; Maine; Minnesota; Mississippi; Montana; New Mexico; New York; Oregon; Tennessee; Vermont
Weak (i.e. encourages facilities and/or break time)	Georgia; North Dakota; Oklahoma; Rhode Island; Texas; Virginia; Washington; Wyoming

Note: Vermont is not included in analysis due to insufficient observations.

Figure 3.1: US map of states with strict, weak, and no workplace breastfeeding policies, implemented 1990-2011



IV. METHODS

The state laws have three important features that are crucial to identify the impact of the policy: (1) there is variation across states and years in implementation of the mandates; (2) there is variation across state on the enforceability of policies; and (3) they impact a readily identifiable group—mothers with infants who are employed. Therefore, we investigate the impact of workplace breastfeeding legislation on breastfeeding rates using DD methodology. This allows us to measure the variation in breastfeeding rates attributable to the policy implementation by comparing differences in rates between states without the policy (control states) and states with the policy (treatment states) before policy implementation with differences in rates after the policy has been implemented. We further assess how this impact varies according to enforceability levels of the policy. We run four specifications: (1) a main DD specification (model M1); (2) an alternative specification where we estimate how long after policy introduction the policy started to have an impact upon breastfeeding rates (model M2); (3) a DD specification where we define two treatment groups to assess if the enforceability of policies had a differential impact on breastfeeding rates (model M3); and (4) a robustness check to test the main assumption behind DD, the parallel trends assumption (model M4). There are 24 *treatment states* in which breastfeeding policies have been implemented sometime between 1990 and 2011, and 26 states without such policies that are used as *control states* (Table 3.1).

Our first specification is:

$$y_{jt} = \beta_0 + \beta_1(policy_{jt}) + \sum_j \alpha_j(s_j) + \sum_t \gamma_t(\tau_t) + \Omega'W_{jt} + \varepsilon_{jt},$$

where our outcome variable y_{jt} stands for the number of breastfeeding mothers as a proportion of all mothers who have at least one infant in year t in state j . The DD policy variable, $policy_{jt}$, is one for each time period t after the legislation (i.e. treatment) came into effect in state j , and zero otherwise. Therefore, our coefficient of interest is β_1 , which measures the impact of the policy. We further include state dummies, s_j , which control for time invariant state characteristics that could be associated with our outcome variable, where $j = 1 \dots 49$ states, and a continuous linear time trend τ_t , which captures unobserved factors that influence all states in the same way, in the different years, where $t = 1 \dots 21$ years.

We control for a broad range of state level time-variant (W_{jt}) confounding factors, which may explain differences in breastfeeding rates across states beyond those explained by the policy, and where there is evidence in the literature that they are important predictors such as demographic and economic covariates (Table 3.3). Demographic covariates include average mothers' age (Chen et al., 2006), average number of children per family, average years of mothers' education (Del Bono and Pronzato, 2012), proportion of mothers in excellent, very good, good, fair, and poor health status (Kitsantas and Pawloski, 2010), proportion of mothers whom are of certain race (Kitsantas and Pawloski, 2010), proportion of married mothers (Thulier and Mercer, 2009), and proportion of mothers who are head of households. Economic variables include average mothers' and husbands' labour income (Thulier and Mercer, 2009), mothers' average hours per week on main job (Gielen et al., 1991; Hawkins et al., 2007), proportion of employed husbands (Ong et al., 2005; Ryan et al., 2006), proportion of mothers in white-collar jobs (Chen et al., 2006), and proportion of households paying mortgage. The analyses are run at the state-level from aggregated information on all mothers that gave birth during the year of analysis and were employed at the time of giving birth.

We further run an alternative specification (model M2) where we assess how long after the introduction, the policy started to have an impact on breastfeeding rates. Following Autor (2003), we test the year of introduction, lags of 1-2, 3-4, and 5 years after policy introduction. Note, the first three indicator variables are equal to 1 only in that relevant year and the final indicator is 1 in each year, starting with the fifth year of adoption.

Our third specification (model M3) determines whether the impact on breastfeeding rates differs due to the enforceability of the policy. Out of the 24 treatment states, there are 16 states where the policy requires employers to provide facilities and break time (i.e. strict enforceability), and eight states where the policy encourages employers to provide facilities and/or break time (i.e. weak enforceability) (Table 3.2). Therefore, we split our treatment group into two: (1) states with strict enforceability of policies and (2) states weak enforceability of policies. Our estimation strategy follows a DD model where there are two treatment groups:

$$y_{jt} = \beta_0 + \beta_1(\text{strict enforceability}_{jt}) + \beta_2(\text{weak enforceability}_{jt}) + \Omega'W_{jt} + \sum_j \alpha_j(s_j) + \sum_t \gamma_t(\tau_t) + \varepsilon_{jt},$$

Variables are analogous to the first specification. However, for the first treatment group, *strict enforceability_{jt}* takes the value of 1 for each time period after the treatment (= legislation) started for treatment states that have strict enforceability of policies, and zero otherwise. The coefficient β_1 represents the policy impact for states with strict enforceability compared to states with weak enforceability and control states. Similarly, for the second treatment group, *weak enforceability_{jt}* takes the value of 1 for each time period after the treatment started for treatment states that have weak enforceability of policies, and zero otherwise. The coefficient β_2 represents the policy impact of states with weak enforceability compared to states with strict enforceability and control states.

Finally, we also conduct a robustness check to test the main assumption of DD, the parallel trends assumption (Appendix 1C; Model M4). We run a falsification test by including leads where the policy is switched on before its actual implementation. If parallel trends are not violated, we expect the leads to be non-significant. Full details on the robustness checks can be found in Appendix 1C. All analyses were undertaken in Stata version 14.

V. DATA

We use a panel dataset merged from four surveys for the years 1990-2011: the Panel Study of Income Dynamics (PSID); Childhood Adoption and History File (CAH) (PSID, 2014); Ross Mother's Survey (RMS) (US Ross Products Division, 2000); and the National Immunization Survey (NIS) (CDC, 2017). The CAH includes information for the analysis such as child's birth year and state of birth. The PSID started in 1968 with a nationally representative sample of 4,800 households and has followed individuals and their cohabiters, children, and spouses overtime. PSID collects socio-demographic, economic, and health data on households and individuals. It also provides data for analysis related to mothers' and husbands' employment, health, and socio-demographic factors (Hill, 1991). The unique value of the PSID lies in two features: (1) individuals are followed over extensive time periods and (2) families are tracked across multiple generations

with interviews collected concurrently with multiple generations of the same family (Hill, 1991). Although there is loss to follow-up, studies have shown that there is no significant non-response bias in the PSID (Hill, 1991). Additionally, since our analysis is on state-level, there is no loss to follow up across years. The rich information contained in the PSID makes it one of the most extensively analysed datasets in social science research (Hill, 1991).

The PSID records breastfeeding data for only two years, 1997 and 2002. Therefore, we have merged the PSID with data on state-level breastfeeding rates from the Centre for Disease Control and Prevention (CDC), namely the RMS and NIS for the years 1990-2011. These data contain state-level breastfeeding rates for 22 years and have observations in the years pre- and post-legislation implementation. This is crucial for our quasi-experimental study.

Excluded from this study are women who have no children, are over 65 years of age, or are not employed at the time of giving birth. Separate mother-child pairs are generated for mothers with multiple children. The final dataset includes 3,129 mother and child pairs, averaged on the state and year level giving a total of $n = 1,122$ observations across 51 states and 22 years. Of note, we exclude Vermont from analysis due to zero employed mothers with infants in that state. A full mapping of our inclusion criteria can be found in Appendix 1B. A full list and description of variables used in the analysis can be found in Table 3.3.

Table 3.3: Variable descriptions

Variables	Description
Child breastfed at 6 months	Proportion of children ever breastfed until 6 months
Mothers' age (years)	Average mother's age
Number of children in household	Average number of children in household
Mothers' education (years)	Average number of years of education of mothers
Marital status (1=married)	Proportion of mothers who are married
Health status (1=excellent)	Proportion of mothers in excellent health status
Health status (1=very good)	Proportion of mothers in very good health status
Health status (1=good)	Proportion of mothers in good health status
Health status (1=fair)	Proportion of mothers in fair health status
Female head (1= female head)	Proportion of mothers who are head of households
Race (1=White)	Proportion of mothers who are White
Race (1=Black)	Proportion of mothers who are Black
Mothers' labour income (in \$1,000)	Average mother's labour income
Mothers' average hours per week on main job	Mother's average work hours per week on main job
Mothers' job type (1=white collar)	Proportion of mothers in white collar jobs
Husbands' labour income (in \$1,000)	Average husband's labour income
Husbands' employment status (1=employed)	Proportion of husbands who are employed
Households' childcare cost (in \$1,000)	Average households' childcare cost
Homeowner (1 = homeowner)	Proportion of mothers who are homeowners

Note: We consider only women in the PSID who are eligible for the study meaning at risk of breastfeeding and working. We take their characteristics at the individual-level and then aggregate at the state-level. Therefore, all covariates correspond to when mothers are at risk of breastfeeding and employed. The denominator for all covariates is the proportion of all mothers or husbands with at least one infant. Labour income and childcare costs are adjusted for inflation using the CPI index to 2000 \$USD.

A. Descriptive Statistics

Descriptive statistics suggest that breastfeeding rates are slightly higher among treatment states at 34.6% compared to control states at 32.4% with the difference being statistically significant (Table 3.4). Summary statistics for all variables used in the analyses can be found in tables 3.4 and 3.5.

Table 3.4: Summary statistics for states with and without legislation

	States with legislation (treatment states)	States without legislation (control states)	T-test
	Mean (Standard Deviation)	Mean (Standard Deviation)	P-value
Proportion of children ever breastfed at 6 months	0.346 (0.140)	0.324 (0.133)	0.006
Average mothers' age	28.678 (3.389)	28.574 (3.300)	0.671
Average number of children in family unit	1.650 (0.679)	1.681 (0.612)	0.522
Average years of mothers' education	14.308 (1.496)	14.302 (1.484)	0.956
Proportion of mothers in excellent health status	0.345 (0.303)	0.306 (0.305)	0.047
Proportion of mothers in very good health status	0.425 (0.317)	0.419 (0.321)	0.768
Proportion of mothers in good health status	0.180 (0.229)	0.233 (0.274)	0.001
Proportion of mothers in fair health status	0.037 (0.122)	0.033 (0.113)	0.569
Proportion of mothers in poor health status	0.013 (0.093)	0.009 (0.071)	0.393
Proportion of married mothers	0.846 (0.248)	0.833 (0.253)	0.514
Proportion of single mothers	0.154 (0.248)	0.167 (0.253)	0.514
Proportion of White mothers	0.722 (0.329)	0.703 (0.347)	0.431
Proportion of Black mothers	0.223 (0.310)	0.253 (0.339)	0.196
Proportion of Hispanic, American Indian, Asian, or Multi-racial mothers	0.055 (0.159)	0.044 (0.150)	0.314
Average mothers' labour income (in \$1,000)	\$26,857 (\$19,555)	\$25,751 (\$14,697)	0.509
Average husbands' labour income (in \$1,000)	\$25,316 (\$21,939)	\$29,500 (\$25,433)	0.053
Proportion of employed husbands	0.931 (0.184)	0.939 (0.185)	0.559
Proportion of unemployed husbands	0.069 (0.184)	0.061 (0.185)	0.559
Average mothers' hours per week on main job	29.107 (7.394)	30.274 (8.631)	0.143
Proportion of mothers in white collar jobs	0.748 (0.301)	0.754 (0.304)	0.769
Proportion of mothers in blue collar jobs	0.252 (0.301)	0.246 (0.304)	0.769
Average households' childcare cost (in \$1,000)	\$2,209 (\$2,719)	\$1,667 (\$1,951)	0.015
Proportion of households who are homeowners	0.554 (0.353)	0.604 (0.352)	0.055
Proportion of households who are not homeowners	0.446 (0.353)	0.396 (0.352)	0.055
Observations	528	594	

Note: Standard deviations in parenthesis. Labour income and childcare costs are adjusted for inflation using the CPI index to 2000 \$USD.

Table 3.5: Summary statistics for states with strict enforceability and states with weak enforceability

	States with strict legislation	States with weak legislation	T-test
	Mean (Standard Deviation)	Mean (Standard Deviation)	P-value
Proportion of children ever breastfed at 6 months	0.350 (0.145)	0.338 (0.129)	0.353
Average mothers' age	28.840 (3.356)	28.311 (3.45)	0.188
Average number of children in family unit	1.656 (0.705)	1.639 (0.620)	0.837
Average years of mothers' education	14.322 (1.425)	14.276 (1.652)	0.794
Proportion of mothers in excellent health status	0.338 (0.303)	0.363 (0.302)	0.442
Proportion of mothers in very good health status	0.461 (0.328)	0.329 (0.266)	0.000
Proportion of mothers in good health status	0.178 (0.231)	0.186 (0.224)	0.749
Proportion of mothers in fair health status	0.017 (0.058)	0.091 (0.202)	0.000
Proportion of mothers in poor health status	0.006 (0.065)	0.031 (0.141)	0.014
Proportion of married mothers	0.838 (0.255)	0.864 (0.233)	0.397
Proportion of single mothers	0.162 (0.255)	0.136 (0.233)	0.397
Proportion of White mothers	0.728 (0.328)	0.708 (0.331)	0.602
Proportion of Black mothers	0.219 (0.318)	0.230 (0.291)	0.782
Proportion of Hispanic, American Indian, Asian, or Multi-racial mothers	0.052 (0.144)	0.062 (0.188)	0.588
Average mothers' labour income (in \$1,000)	\$25,780 (\$25,387)	\$29,531 (\$25,387)	0.235
Average husbands' labour income (in \$1,000)	\$25,840 (\$22,023)	\$24,062 (\$21,852)	0.579
Proportion of employed husbands	0.941 (0.164)	0.907 (0.223)	0.143
Proportion of unemployed husbands	0.059 (0.164)	0.093 (0.223)	0.143
Average mothers' hours per week on main job	29.056 (7.226)	29.232 (7.864)	0.883
Proportion of mothers in white collar jobs	0.737 (0.305)	0.774 (0.293)	0.313
Proportion of mothers in blue collar jobs	0.262 (0.305)	0.227 (0.293)	0.313
Average households' childcare cost (in \$1,000)	\$2,303 (\$2,975)	\$1,999 (\$2,043)	0.466
Proportion of households who are homeowners	0.555 (0.352)	0.552 (0.365)	0.946
Proportion of households who are not homeowners	0.445 (0.353)	0.448 (0.356)	0.946
Observations	352	176	

Note: Standard deviations in parenthesis. Labour income and childcare costs are adjusted for inflation using the CPI index to 2000 \$USD.

VI. RESULTS

Table 3.6 presents results for four models of the first specification: a model with all covariates (M1a); a model that adds state-fixed effects (M1b); a model that adds a continuous time trend (M1c); and a model that adds state-specific time trends (M1d). Results are robust to all specifications, and thus we will comment on the most comprehensive model: the main specification (M1d) (Table 3.6). For all specifications, the effect of the policy is our treatment effect and represented by the coefficients on the DD policy variable, shown in the first row (Table 3.6).

Table 3.6: Estimated impact of US workplace breastfeeding legislation on the proportion of children ever breastfed at 6 months

	M1a	M1b	M1c	M1d	M2
DD policy effect	0.162 (0.018)***	0.169 (0.018)***	0.042 (0.009)***	0.050 (0.014)***	
DD policy introduction year					0.024 (0.017)
DD policy lag 1-2 years					0.069 (0.016)***
DD policy lag 3-4 years					0.073 (0.021)***
DD policy 5 years onwards					0.074 (0.022)***
Average mothers' age	-0.003 (0.002)	-0.003 (0.002)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Average number of children in family unit	0.037 (0.008)***	0.033 (0.008)***	-0.001 (0.004)	-0.0001 (0.004)	-0.0003 (0.004)
Average years of mothers' education	0.013 (0.004)***	0.015 (0.004)***	-0.001 (0.002)	-0.002 (0.002)	-0.001 (0.002)
Proportion of married mothers	-0.090 (0.156)	-0.030 (0.158)	-0.043 (0.069)	-0.034 (0.063)	-0.035 (0.062)
Proportion of mothers who are head of household	-0.069 (0.148)	-0.012 (0.149)	-0.057 (0.065)	-0.051 (0.059)	-0.055 (0.058)
Proportion of White mothers	0.015 (0.034)	0.034 (0.037)	0.018 (0.016)	0.012 (0.015)	0.014 (0.015)
Proportion of Black mothers	-0.048 (0.037)	0.013 (0.040)	0.016 (0.017)	0.015 (0.016)	0.018 (0.016)
Proportion of mothers in excellent health status	-0.035 (0.090)	-0.031 (0.094)	0.006 (0.041)	0.008 (0.066)	0.008 (0.067)
Proportion of mothers in very good health status	-0.014 (0.091)	-0.009 (0.096)	0.013 (0.042)	0.008 (0.067)	0.007 (0.066)
Proportion of mothers in good health status	0.009 (0.092)	0.014 (0.096)	0.020 (0.042)	0.010 (0.067)	0.008 (0.066)
Proportion of mothers in fair health status	0.032 (0.110)	0.046 (0.115)	0.038 (0.050)	0.049 (0.073)	0.050 (0.072)
Proportion of employed husbands	0.075 (0.042)*	0.063 (0.042)	-0.015 (0.018)	-0.004 (0.018)	-0.002 (0.018)
Proportion of mothers in white-collar jobs	0.020 (0.020)	0.015 (0.020)	-0.001 (0.009)	0.004 (0.008)	0.003 (0.008)
Average mothers' labour income	0.010 (0.004)***	0.009 (0.004)**	0.002 (0.002)	0.0004 (0.002)	0.0004 (0.002)
Average husbands' labour income	0.006 (0.003)**	0.006 (0.003)*	-0.001 (0.001)	-0.002 (0.001)*	-0.003 (0.001)**
Average mothers' work hours per week	-0.001 (0.001)	-0.0004 (0.001)	-0.0004 (0.0003)	-0.0004 (0.0003)	-0.0004 (0.0003)
Average households' childcare cost	-0.056 (0.022)**	-0.050 (0.022)**	0.010 (0.010)	0.011 (0.010)	0.009 (0.010)
Proportion of mothers who are homeowners	0.014 (0.017)	0.025 (0.017)	-0.001 (0.008)	0.009 (0.007)	0.009 (0.008)
State-fixed effect	No	Yes	Yes	Yes	Yes
Time trend	No	No	Yes	Yes	Yes

State-specific time trends	No	No	No	Yes	Yes
Constant	0.065 (0.193)	-0.114 (0.199)	0.059 (0.087)	0.106 (0.098)	0.105 (0.097)
Overall R ²	0.336	0.639	0.930	0.951	0.952
Observations	374	374	374	374	374

Note: Standard errors in parenthesis. M2 includes the introduction year, and lags of 1-2 years, 3-4 years, and 5 years onwards. The first three indicator variables are equal to 1 only in the relevant year and the last indicator is 1 in each year, starting with 5 years after the year of adoption. Coefficient estimates for state-fixed effects and time trends available upon request to authors. *p<0.10; **p<0.05; ***p<0.01.

The DD policy effect is higher in states with legislation when compared to states without legislation, controlling for demographic and economic covariates (M1d). The legislation causes an average increase of 5 percentage points in breastfeeding rates for treatment states. This increase is over and above a general increase in breastfeeding rates in all states over time, as indicated by the time trend variable, which is positive and significant in all specifications. There are no significant associations between breastfeeding rates and demographic and economic covariates, other than a small and weakly negative association between average husbands' labour income and breastfeeding.

Additionally, Table 3.6 shows the results for the second specification in which we add lags of 1-2, 3-4, and 5 years after the year of policy introduction to assess whether the policy had a delayed impact (M2). We find that the policy did not have an impact until 1-2 years after policy implementation where there is an average increase of 6.9 percentage points in breastfeeding rates. The policy continues to have an impact after 1-2 years and averages to 7.4 percentage points 5 years after policy implementation.

Next, we assess whether the impact of the policy differs according to enforceability through specification 3. Results for four models, specified as before, are presented in Table 3.7 where similarly to Table 3.6, we run four variations: a model with all covariates (M3a); a model adding state-fixed effects (M3b); a model adding a continuous time trend (M3c); and a model adding state-specific time trends (M3d). We will comment on M3d, the most complete model. Results show that in states where there is strict enforceability (i.e. state policies require that firms provide both facilities and break time), the policy impact is 7.1 percentage points. However, in states where there is weak enforceability, the policy impact is much lower at 2.1 percentage points and insignificant. These results suggest that is important to differentiate impact by the enforceability of the policy.

Table 3.7: Estimated impact of strict and weak US workplace breastfeeding legislation on the proportion of children ever breastfed at 6 months

	M3a	M3b	M3c	M3d
DD policy effect strict enforceability	0.169 (0.024)***	0.174 (0.025)***	0.040 (0.011)***	0.071 (0.018)***
DD policy effect weak enforceability	0.155 (0.027)***	0.163 (0.028)***	0.044 (0.012)***	0.021 (0.021)
Average mothers' age	-0.003 (0.002)	-0.003 (0.002)	0.001 (0.001)	0.001 (0.001)
Average number of children in family unit	0.037 (0.008)***	0.034 (0.008)***	-0.001 (0.004)	-0.001 (0.004)
Average years of mothers' education	0.013 (0.004)***	0.015 (0.004)***	-0.001 (0.002)	-0.002 (0.002)
Proportion of married mothers	-0.082 (0.157)	-0.026 (0.159)	-0.044 (0.069)	-0.028 (0.063)
Proportion of mothers who are head of household	-0.062 (0.149)	-0.009 (0.149)	-0.058 (0.065)	-0.047 (0.059)
Proportion of White mothers	0.016 (0.034)	0.034 (0.037)	0.018 (0.016)	0.014 (0.015)
Proportion of Black mothers	-0.046 (0.037)	0.013 (0.040)	0.016 (0.017)	0.018 (0.016)
Proportion of mothers in excellent health status	-0.036 (0.090)	-0.032 (0.094)	0.006 (0.041)	0.010 (0.067)
Proportion of mothers in very good health status	-0.015 (0.091)	-0.010 (0.096)	0.013 (0.042)	0.011 (0.067)
Proportion of mothers in good health status	0.009 (0.092)	0.013 (0.096)	0.020 (0.042)	0.012 (0.067)
Proportion of mothers in fair health status	0.032 (0.011)	0.045 (0.115)	0.038 (0.050)	0.046 (0.073)
Proportion of employed husbands	0.076 (0.042)*	0.064 (0.042)	-0.015 (0.019)	-0.002 (0.018)
Proportion of mothers in white-collar jobs	0.020 (0.020)	0.016 (0.020)	-0.002 (0.009)	0.005 (0.008)
Average mothers' labour income	0.010 (0.004)***	0.009 (0.004)**	0.002 (0.002)	0.001 (0.002)
Average husbands' labour income	0.006 (0.003)**	0.006 (0.003)*	-0.001 (0.001)	-0.003 (0.001)**
Average mothers' work hours per week	-0.001 (0.001)	-0.0004 (0.001)	-0.0004 (0.0003)	-0.0004 (0.003)
Average households' childcare cost	-0.057 (0.022)**	-0.050 (0.022)**	0.010 (0.010)	0.011 (0.010)
Proportion of mothers who are homeowners	0.014 (0.017)	0.024 (0.017)	-0.001 (0.008)	0.008 (0.007)
State-fixed effect	No	Yes	Yes	Yes
Time trend	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Constant	0.055 (0.193)	-0.118 (0.199)	0.060 (0.087)	0.100 (0.097)
Overall R ²	0.336	0.629	0.929	0.952
Observations	374	374	374	374

Note: Standard errors in parenthesis. States where the legislation is of weak enforceability (i.e. only encourage employers to provide facilities and/or break time) include Georgia, North Dakota, Oklahoma, Rhode Island, Texas, Virginia, Washington, and Wyoming. States where the legislation is of strict enforceability (i.e. requires employers to provide facilities and break time) include Arkansas, California, Colorado, Connecticut, District of Columbia, Hawaii, Illinois, Indiana, Maine, Minnesota, Mississippi, Montana, New Mexico, New York, Oregon, and Tennessee. Coefficient estimates for state-fixed effects and time trends available upon request to authors. *p<0.10; **p<0.05; ***p<0.01.

Finally, in specification 4, as a robustness check we run a falsification test in which we switch on the policy variable before the year it was implemented. We do so by adding indicator variables (leads) of 1-2, 3-4, and 5-6 years prior to policy implementation allowing us to test for parallel trends (Autor, 2003), i.e. whether there were already systematic differences prior to policy implementation between treatment and control states that could be driving the results. The sensitivity analyses indicate that there are common trends across states suggesting that in absence of the treatment (workplace breastfeeding policy), treatment and control states follow common trends in the average outcome (breastfeeding rates). This gives us confidence that the parallel trends assumption of DD is fulfilled and that we are identifying the effect of the policy change (Appendix 1C).

VII. DISCUSSION AND CONCLUSION

We have evaluated the impact of workplace breastfeeding policies on breastfeeding rates in the US, controlling for a broad range of confounding factors, a general increase in breastfeeding rates across the country, and time-variant unobserved differences across states with and without legislation. We have shown that workplace breastfeeding legislation has a positive and significant impact upon state breastfeeding rates, has a greater impact on states with strict enforceability, and has a delayed impact on breastfeeding rates. Rates are 5 percentage points higher as a direct effect of breastfeeding legislation while rates in treatment states where there is strict enforceability have an even greater effect at just over 7 percentage points. Additionally, the policy did not have an impact until 1-2 years after policy implementation.

Our findings are approximately three times larger in magnitude compared to the four existing empirical studies on the impact of US workplace breastfeeding legislation (Del Bono and Pronzato, 2012; Hawkins et al., 2013; Heymann et al., 2013; Kogan et al., 2008; Smith-Gagen et al., 2014). Hawkins et al. (2013) estimated a lower impact of workplace legislation for children breastfed for at least four weeks at 1.7 percentage points, possibly due to including mothers not in the labour force who are not affected by the policy and a restricted sample of only seven states. Smith-Gagen et al. (2014) and Kogan et al. (2008) found a lower odds ratio of breastfeeding (i.e. less likely to breastfeed) at six months for states with workplace legislation at 2 and 1.6 percentage points,

respectively, while Dozier and McKee (2011) found no effect. These studies either fail to address sample selection bias, or they are limited due to methodology, data quality, restricted samples and short study periods making it difficult to compare findings with our study.

Our findings underline the importance of implementing strict workplace breastfeeding policies. Simply encouraging implementation does not have any significant effects on breastfeeding rates. More recently, weakly enforced breastfeeding policies have been implemented in all US states under the Affordable Care Act (Patient Protection and Affordable Care Act, 2010). Our results suggest that this legislation may not have a substantial impact on breastfeeding rates. This is clearly an open agenda, where legislators need to work towards strictly enforceable policies.

Our results also suggest that the policy did not have an impact on breastfeeding rates until 1-2 years after policy introduction. This delayed impact could be due to several reasons. Firstly, mothers may not have been aware about workplace breastfeeding policies in the early years after implementation. Secondly, if they were aware about the policy, stigma about breastfeeding may have impeded mothers' intentions to breastfeed in the workplace. Thirdly, employers may have taken some time to fully implement policies due to enforceability issues in the policy design as few states actually enforce fines for employers who do not comply with the requirements of state policies.

The results should be considered in light of the limitations of this research. Namely, while we have assessed the differential effectiveness of the policy due to enforceability, only eight states have weak enforceability while a majority of states have strict enforceability of policies. Therefore, there is low variation across states to account for this heterogeneity. Despite this limitation, we are confident our results provide important empirical evidence for policy makers concerned about increasing breastfeeding rates in the US.

Overall, the positive impact of this policy is encouraging for the long-term health of children born to mothers who return to work shortly after giving birth and who are most at-risk for discontinuing breastfeeding at that time. The World Health Organization and UNICEF recommend that all mothers breastfeed and continue to do so for up to two years (UNICEF, 2015). Although workplace

policies can contribute to reaching the Healthy People breastfeeding goals by 2020 in the US, it may take several years to reach this objective due to already low breastfeeding rates and the significant existing barriers to breastfeeding. Therefore, policies need to be implemented as part of a combination package of interventions aimed at improving take-up of breastfeeding for both employed and unemployed mothers. Our results are encouraging for other countries with low breastfeeding rates where workplace policies can alleviate the key employment barrier to breastfeeding and thus, help mothers reconcile work and motherhood responsibilities.

CHAPTER 4 : IMPACTS OF US WORKPLACE BREASTFEEDING LEGISLATION ON MOTHERS' AND FATHERS' ABSENTEEISM

ABSTRACT

Employee absenteeism costs employers in the US up to \$225.8 billion annually. One of the main drivers of absenteeism can be attributed to the push and pull between work and family responsibilities. Therefore, states have implemented a number of family-friendly policies to reduce employee absenteeism. In this chapter, we assess the impact of one such policy, namely workplace breastfeeding legislation allowing mothers to express milk within the workplace. This policy has been implemented in a selective group of 25 out of 51 states in the US since 1995, enabling a better environment for breastfeeding in the workplace. The staggered introduction of the policy across states allows us to identify the causal impact of the policy using quasi-experimental methods such as difference-in-differences. Additionally, through use of difference-in-difference-in-differences, we exploit within-state variation, as certain individuals are not affected by the policy within states. Exploiting variation across states on the type of legislation, we further assess whether the policy impact varies with its level of enforceability. We use data from the Panel Study of Income Dynamics over the period of 1990-2011, controlling for a broad range of demographic and economic covariates that are associated with workplace absenteeism. We hypothesize that US workplace breastfeeding legislation has an effect on mothers and may also have an effect on fathers due to interdependencies in spousal labour supply and intra-household bargaining with respect to absenteeism. We find that mothers with infants are between 9 to 10 fewer days absent per year as a result of the policy, depending on the control group. This result is mainly driven by states that have strict enforceability of policies. Once we split the treatment group, mothers with infants residing in states with strict enforceability have up to 16 fewer absent days as a result of the policy while there is no impact on absent days for mothers residing in states with weak enforceability. The reduction in absenteeism could translate into savings of \$927 to \$1484 per mother per year. We do not find a spillover effect on fathers. Our findings provide evidence that workplace breastfeeding policies can reduce workplace absenteeism among mothers, alleviate gender inequality within the workplace, and improve gender diversity within firms.

I. INTRODUCTION

According to the United States (US) Department of Labour, approximately 3% of a firm's workforce is absent on any given day (Society for Human Resource Management, 2016). Employee absenteeism costs employers in the US up to \$225.8 billion, or on average \$1,685 per employee annually (CDC Foundation, 2015). Direct costs due to absenteeism include overtime and replacement worker costs and indirect costs include lower productivity from replacement workers, co-workers and supervisors (Society for Human Resource Management, 2016; Workforce Institute, 2005).

Previous studies have found several factors associated with employee absenteeism on both the employee and employer side, including individual socio-demographic and employment-related characteristics, and organisational or institutional features (Barmby et al., 2002; Dionne and Dostie, 2007; Kristensen et al., 2006; Leigh, 1983; Muchinsky, 1977; Ryan et al., 2006; VandenHeuvel, 1995; Vistnes, 1997). Many of these determinants are amenable to interventions that can generate economic benefits for employers and the economy. The Workforce Institute states that a company of 5,000 employees can reduce costs incurred by unscheduled absences by approximately \$7.9 million per year (Workforce Institute, 2005).

There are several types of policies that have been shown to reduce absenteeism, namely: economic incentives such as reduction of sickness leave compensation and wage increases (Paola et al., 2014; Raff and Summers, 1987; Ziebarth and Karlsson, 2010), employer-sponsored health programs including health promotion and employee wellness programs to target obesity, smoking, etc. (Aldana and Pronk, 2001), and family-friendly policies to improve work-life balance such as on-site childcare and flexible working arrangements (Dalton and Mesch, 1990; Goff et al., 1990; Gray, 2002; Heywood and Miller, 2015; Thomas and Ganster, 1995).

Family-friendly policies are increasingly common given the higher prevalence of absenteeism among households with young children (Erickson et al., 2000; Steers and Rhodes, 1978). While the presence of a child affects the household as a whole, the effect tends to be greater for women in comparison to their partners due to childcare responsibilities being unequally distributed within

the household (Angelov et al., 2016; Dionne and Dostie, 2007; Erickson et al., 2000; Statistics, 2016; Vistnes, 1997). Dionne et al. (2007) found that women are 1.3 times more likely than men to be absent while Vistnes (1997) and Leigh (1983) show that mothers with young children are more likely to be absent compared to fathers with young children. Even when resources such as income are distributed equally within the household, mothers are still more likely to do more household work due to gender roles (Angelov et al., 2016; Evertsson and Nermo, 2007). Therefore, the inequality in the distribution of household and childcare responsibilities further contributes to the potential clash of family and work responsibilities for mothers.

Another type of family-friendly workplace policy that has been implemented within states includes workplace breastfeeding policies that allow mothers to express and store milk in the workplace. This is an important policy for working mothers as one in four employed mothers with infants combine breastfeeding and working for at least the first month (Slavit, 2009). Workplace breastfeeding policies are considered promising interventions to encourage breastfeeding, reduce absenteeism and retain women in the labour force through increased job satisfaction, employee loyalty, decreased turnover and health care costs, and increased productivity (CDC, 2005).

The objective of this study is to investigate the impact of state-level workplace breastfeeding legislation on absenteeism of employed mothers and fathers. We identify the causal impact of breastfeeding legislation on absenteeism using a difference-in-differences research design to exploit the staggered introduction of workplace breastfeeding policies across a selective group of 25 US states over 22 years, through 1990-2011. We use individual-level data on parents and infants from the Panel Study of Income Dynamics. Studies by Cohen et al. (1995) and Smith et al. (2013) suggest that there may be an association between breastfeeding and absenteeism. They speculate that the link between breastfeeding and absenteeism may be through the health benefits of breastfeeding reducing the prevalence of illnesses among mothers and infants. Therefore, the role of workplace breastfeeding policies in reducing absenteeism may be attributed to the beneficial short- and long-term health benefits of breastfeeding on mothers and infants, as evidenced by numerous clinical studies. As short-term effects, breastfeeding reduces the risk of postpartum haemorrhage in mothers and protects infants from several types of infections; infants that are exclusively breastfed for the first four months or longer have lower risk of infections in the upper

and lower respiratory tracts, gastrointestinal tracts, and have reduced hospitalization rates due to diarrhoea (Duijts et al., 2010; Fletcher, 2011; Quigley et al., 2007; Singhal and Lanigan, 2007; UNICEF, 2015; Victora et al., 1987, 2015; WHO, 2000). Due to the protective benefits of breastfeeding, infants are less likely to be sick, attend childcare, and therefore, allow mothers and fathers to go into work. Secondly, breastfeeding policies make it easier for mothers to express milk in the workplace and encourage mothers to go into work, thus such policies are likely to have a positive impact in reducing absenteeism.

Workplace breastfeeding policies also have an important economic effect in that they allow mothers and their families to reap the financial benefits of employment, while employers benefit from reduced costs incurred by reducing mothers' time away from work. For example, Cigna reported that participation in their company lactation programs, which included breastfeeding facilities, education for mothers, and lactation counselling, resulted in a 77% reduction in absenteeism due to lower incidences of infant illness, resulting in savings of \$60,000 (US Department of Health and Human Services, 2008). Cigna also reported savings of \$240,000 from reduced healthcare costs of breastfeeding mothers and their children (US Department of Health and Human Services, 2008). Similarly, Mutual of Omaha, found that their lactation program led to higher retention rates of 83% of their maternity workforce and reported savings of \$120,000 annually in healthcare claims from breastfeeding mothers (US Department of Health and Human Services, 2008).

25 out of 51 US states have implemented their own policies to protect breastfeeding and working mothers. State-mandated policies differ in enforceability where policies require or encourage employers to provide a separate and private room to allow mothers to express breast milk in the workplace (National Conference of State Legislatures, 2016). A survey by The Washington Post revealed that mothers often breastfed in public locations such as under desks, storage rooms, toilet stalls, and one nursing mother in the military pumped milk in the woods (Joyce, 2017). Therefore, it is necessary to accommodate nursing mothers and this legislation makes it easier for mothers to express milk in a secure and private location at work (Kozhimannil et al., 2016). Furthermore, approximately 30% of mothers employed during pregnancy return to work within three months, and studies have shown that returning to work is one of the biggest barriers of breastfeeding

(Hawkins et al., 2007; Laughlin, 2011; Mandal et al., 2014; Ryan et al., 2006). There has been some evidence in literature to show that workplace breastfeeding policies may have contributed to the increase in breastfeeding rates in the US (Hawkins et al., 2013; Kogan et al., 2008; Smith-Gagen et al., 2014); however, we are not aware of robust research evidence on the impact of such policies on employment outcomes. Abdulwadud and Snow (2012) have, indeed, highlighted the need for causal inference on the effect of workplace breastfeeding interventions. Such evidence is of key relevance as employers are hesitant to incorporate family-friendly policies without sufficient evidence showing that economic benefits may offset the initial costs of implementation (Erickson et al., 2000; Voydanoff, 1988).

This study adds to the literature in three significant ways. Firstly, while there is evidence of a correlation between breastfeeding and absenteeism, we are the first to assess the causal impact of breastfeeding legislation on absenteeism. Secondly, we are the first to test the possible spousal spillover effects of the policy by measuring the impact on both household members, i.e. mothers and fathers. While the policy directly targets mothers, given that childcare and employment decisions are distributed within the household through a joint decision between mothers and their partners, it is plausible to expect that such a policy might also have an impact on fathers. Finally, we are also the first to assess whether the enforceability of the policy has a differential impact upon mothers' and fathers' absenteeism whereby some states have strict enforceability of policies requiring dedicated facilities and break time while others have weak enforceability of policies which simply 'encourage' employers to provide facilities and break time. The results of this study provide important evidence on the efficacy of workplace breastfeeding policies to reduce absenteeism and offer insight into the economic benefits of encouraging breastfeeding in the workplace while also taking into account interdependencies in spousal labour supply and the heterogeneity of the policy.

II. RELATED LITERATURE

There are several predictors of absenteeism that can be classified into three broad categories: socio-demographic and health determinants such as gender, age, health status, and education (Barmby et al., 2002; Dionne and Dostie, 2007; Kristensen et al., 2006; Leigh, 1983; Muchinsky, 1977;

Ryan et al., 2006; VandenHeuvel, 1995; Vistnes, 1997); employment related factors such as income, past absenteeism, job motivation, and ability to attend work (Berry et al., 2012; Dalton and Perry, 1981; Larson and Fukami, 1985; Mowday and Spencer, 1981); and organisational or institutional features such as the availability of flexible working arrangements, labour market conditions, organizational culture and commitment, and firm size (Dalton and Perry, 1981; Dionne and Dostie, 2007; Muchinsky, 1977; Steers and Rhodes, 1978).

Many of these determinants, however, are amenable to interventions and policies targeting absenteeism. Beyond adjusting screening procedures to hire employees who are less likely to be absent, Allen (1981) notes that there are two types of strategies firms may adopt to reduce employee absenteeism: (1) economic incentives that increase the opportunity cost of absenteeism (e.g. through wage increases and reduction of sickness leave incentives) or decrease the likelihood of absenteeism (e.g. through employer-sponsored health programs); and (2) invest in a more flexible work environment, such as through family-friendly policies.

Reduction of sickness leave compensation reduces absenteeism and saves costs for employers in the long run (Paola et al., 2014; Ziebarth and Karlsson, 2010). Ziebarth and Karlsson (2010) and Paola et al. (2014) find significant negative associations between reductions of sickness leave compensation and absenteeism with costs saved of up to €1.7 billion per year due to the decrease in sick pay levels and reduced employee absenteeism (Paola et al., 2014; Ziebarth and Karlsson, 2010). Similarly, wage increases have been shown to be an effective mechanism to reduce absenteeism. A study by Raff and Summers (1987) showed that a 1914 economic reform, which introduced a five-dollar-a-day minimum wage, thus doubling wages of most workers, reduced absenteeism from 10% to 2.5% per day and increased productivity from 40% to 70% (Raff and Summers, 1987). Finally, employer-sponsored health programs have been found to lower rates of absenteeism due to illness (Aldana and Pronk, 2001; Bertera, 1990).

While evidence shows that economic incentives are effective in reducing absenteeism up to a certain degree, the push and pull between family responsibilities and non-flexible working hours is often cited as one of the major contributors to absenteeism (Dalton and Mesch, 1990; Heywood and Miller, 2015). Therefore, several family-friendly policies have been adopted by organizations

to improve workplace flexibility and allow employees to better coordinate their family and work responsibilities, namely flexible working hours, on-site childcare, and breastfeeding policies. Flexible working hours have been found to reduce absenteeism rates (Dalton and Mesch, 1990; Heywood and Miller, 2015); however, the impact of on-site childcare on absenteeism is ambiguous (Goff et al., 1990; Gray, 2002; Thomas and Ganster, 1995). With regards to workplace breastfeeding policies, there is evidence of a positive impact upon breastfeeding (Del Bono and Pronzato, 2012; Hawkins et al., 2013; Heymann et al., 2013; Kogan et al., 2008), however, evidence of policy impacts on absenteeism is scant.

In this chapter, we assess the impact of state-mandated workplace breastfeeding legislation in the US on households' absenteeism levels. To our knowledge, there have not been any studies assessing the causal impact of state-mandated workplace breastfeeding legislation upon absenteeism of mothers and their partners. However, there have been a number of small-scale studies, which have assessed the correlation of breastfeeding and absenteeism of mothers (Cohen et al., 1995; Smith et al., 2013). Cohen et al. (1995) used a non-randomized observational design to investigate the impact of programs that provide counselling to mothers by lactation professionals and facilities to collect and store milk on a sample of 101 participants, where some mothers breastfed while others fed their infants with formula (commercially produced milk powder). Cohen et al. (1995) found that employed mothers who formula-fed their infants were twice as likely to have 1-day absences compared to employed mothers who continued to breastfeed their infants through a lactation program at their workplace (26% vs. 11%; $p < 0.05$). Cohen et al. (1995) showed that mothers who breastfed reported less severe illnesses for themselves and their infants when compared to mothers whose infants were formula-fed. Cohen et al. (1995) speculated that this might explain the differences in mothers' absenteeism. Although this study shows an encouraging correlation between breastfeeding and absenteeism, it does not allow inferring the impact of incentive policies such as workplace lactation programs on absenteeism due to possible sampling bias arising from the non-random assignment of mothers to breastfeeding and formula-feeding groups. Through a survey administered to female employees in Australia ($n = 304$) from 2010-2011, Smith et al. (2013) showed that where there was workplace support for breastfeeding, more mothers exclusively breastfed for six months. Moreover, children who were exclusively breastfed had 13% fewer hospitalizations compared to children who were not exclusively breastfed (Smith

et al., 2013). However, this study did not find a statistically significant association between maternal days off and hospitalization, although they speculate that mothers who breastfed may have had lower absenteeism due to lower incidences of infant illnesses (Smith et al., 2013). Additionally, this is an observational study, similarly to Cohen et al. (1995), limiting the authors' ability to estimate the impact of breastfeeding on absenteeism. Cohen et al. (1995) and Smith et al. (2013) also do not specifically look at state-enacted workplace breastfeeding policies nor assess the spillover effect of breastfeeding policies on mothers' partners.

The importance of including mothers and fathers within the household as the target population of this breastfeeding policy has been established in the assessment of other work-related reforms. Households where both parents are in the labour force are likely to make work-related decisions through an intra-household bargaining process based on their relative opportunity costs of being absent from work. While individuals with higher income have a higher opportunity cost of being absent and thus are less likely to be absent (Angelov et al., 2016; Bridges and Mumford, 2001; Johansson and Palme, 2002), their absenteeism is positively correlated with their spouse's labour income (Askildsen et al., 2005; Dionne and Dostie, 2007; Leigh, 1983). Therefore, it is possible that reforms targeting a specific group may in fact have cross-over effects on their spouses, even if they are not directly targeted by the policy (Goux et al., 2014; Olsson and Thoursie, 2015). Goux et al. (2014) found that a 1998 French reform reducing work hours had spillover effects on indirectly treated spouses. Although they found weak spillover effects for wives of treated men, the husbands of treated women responded to this reform by reducing their work hours. Another study by Olsson et al. (2015) found no effects on absenteeism due to a Swedish sickness leave reform on the target population but did find negative cross-over effects on spouses' absenteeism and earnings. Olsson et al. (2015) speculate that these negative effects on indirectly treated spouses are a result of interdependencies in spousal labour supply. Olsson et al. (2015) further suggest that outcome measures such as total days absent are more easily adjusted and responsive to spousal changes in labour supply than earnings, suggesting that in our context, it is important to investigate spousal changes in total days absent for unbiased estimates of the overall impact of reforms. This is more likely to be the case in the assessment of breastfeeding legislation because intra-household bargaining has been found to be more salient in households with young children possibly exacerbating the cross-over effects of the policy (Goux et al., 2014).

Therefore, we add to the literature by estimating causal impacts of US state-mandated workplace breastfeeding legislation on absent days of mothers and fathers by exploiting the staggered introduction of such legislation in a selective group of 25 states over the past 22 years from 1990 to 2011. Finally, we are also the first to assess whether the level of enforceability of the policy has a differential impact upon mothers' and fathers' absenteeism. We use a quasi-experimental design and a broad range of controls that enable us to effectively isolate the impact of the policy from other factors that impact upon absenteeism decisions.

III. POLICY BACKGROUND

A total of 25 out of 51 states have introduced workplace breastfeeding legislation during our study period of 1990-2011 (Table 4.1). The legislation was first implemented in Texas in 1995 with Maine being the most recent state in 2009. State mandated policies require or at least encourage employers to provide a separate and private room to allow mothers to express breast milk in the workplace (National Conference of State Legislatures, 2016). Although the objective of policies is similar across states, there is some heterogeneity (Appendix 2A). A total of 17 states require breaks and provisions of hygienic facilities such as a private room, a fridge to store milk, and a pump while eight states merely encourage such facilities and/or break time (Table 4.2). We exploit this heterogeneity and group states into two categories: states with strict enforceability of policies and states with weak enforceability of policies. We have two objectives in assessing the impact of the policy on mothers' and fathers' absenteeism: (1) compare individuals living in states with a policy to those individuals living in states without a policy, combining states that "encourage" and "require" into one treatment group and (2) compare individuals living in states with strictly (i.e. "require") or weakly (i.e. "encourage") enforceable policies to individuals living in states without a policy, i.e. defining in fact two treatment groups.

Table 4.1: US states with and without workplace breastfeeding legislation, years 1990-2011

States without legislation	States with legislation (implementation year)
Alabama	Arkansas (2009)
Alaska	California (1998)
Arizona	Colorado (2008)
Delaware	Connecticut (2001)
Florida	District of Columbia (2007)
Idaho	Georgia (1999)
Iowa	Hawaii (1999)
Kansas	Illinois (2001)
Kentucky	Indiana (2008)
Louisiana	Maine (2009)
Maryland	Minnesota (1998)
Massachusetts	Mississippi (2006)
Michigan	Montana (2007)
Missouri	New Mexico (2007)
Nebraska	New York (2007)
Nevada	North Dakota (2009)
New Hampshire	Oklahoma (2006)
New Jersey	Oregon (2007)
North Carolina	Rhode Island (2003)
Ohio	Tennessee (1999)
Pennsylvania	Texas (1995)
South Carolina	Vermont (2008)
South Dakota	Virginia (2002)
Utah	Washington (2001)
West Virginia	Wyoming (2003)
Wisconsin	

Note: States with legislation require employers to provide breastfeeding facilities and require or encourage employers to provide break time for expressing breast milk. Break time is paid in all states except for Indiana. For further details see Appendix 2A. Vermont is not included in analysis due to insufficient observations.

Table 4.2: US states with strict and weak enforceability, years 1990-2011

Enforceability	Treatment States
Strict (i.e. requires both facilities and break time)	Arkansas; California; Colorado; Connecticut; District of Columbia; Hawaii; Illinois; Indiana; Maine; Minnesota; Mississippi; Montana; New Mexico; New York; Oregon; Tennessee; Vermont
Weak (i.e. encourages facilities and/or break time)	Georgia; North Dakota; Oklahoma; Rhode Island; Texas; Virginia; Washington; Wyoming

Note: States with strict enforceability require both facilities and break time (17 states) while states with weak enforceability encourage facilities and/or break time. (8 states). Vermont is not included in analysis due to insufficient observations.

IV. IDENTIFICATION STRATEGY

We identify the impact of state workplace breastfeeding legislation on absenteeism due to two features of the policy: (1) the policy is meant to impact a readily identifiable group of individuals, breastfeeding and employed mothers with infants and (2) the staggered policy introduction in a selective group of states allows for state and year variation. These two features give rise to an intention to treat type of study and a quasi-experimental design. We isolate the impact of the policy through difference-in-differences (DD) and difference-in-difference-in-differences, or triple differences (DDD) (Meyer, 1995). The main assumption behind DD is the parallel trends assumption; therefore, we run robustness checks in Appendix 2D (Table D1) by including leads where the policy is switched on before its actual implementation. Table D1 shows that the parallel trends assumption is not violated.

We restrict our treatment and control groups to individuals who were employed and who were parent to a newborn infant under the age of 12 months at the time of the survey. We expect the birth of an infant to have a significant impact on absenteeism irrespective of workplace breastfeeding policies. Therefore, it is important to control for this general ‘infant’ effect, otherwise the estimate of the workplace breastfeeding policy impact would be biased. Previous literature has failed to control for this ‘infant’ effect. For example, Baum (2003) and Waldfogel (1999) investigate the effect of maternity leave legislation through DDD, however, compare mothers with infants to women or men without infants. To control for the ‘infant’ effect, we compare employed parents with infants in states where policy has been introduced (henceforth

treatment states) to employed parents with infants in states where there is no policy (henceforth *control states*).

A. Difference-in-Differences

We estimate two specifications of DD models:

(M1): a treated group of employed mothers with infants living in treatment states after policy introduction vs. a control group of employed mothers with infants living in control states and in treatment states before policy introduction;

(M2): a treated group of married/cohabiting fathers with infants whose wives are employed living in treatment states after policy introduction vs. a control group of married/cohabiting fathers with infants and employed wives living in control states and in treatment states before policy introduction.

M2 estimates the spillover effect of the policy on fathers. Although our data does not allow us to assess what mechanisms are specifically at play, we hypothesize that the spillover effect could be due to two possible mechanisms: (1) the policy encourages mothers to breastfeed leading infants to be less sick and able to attend childcare, in turn making mothers and fathers less absent, or (2) the policy may act as a proxy for a family-friendly work environment, which gives mothers a greater opportunity to return to work and also encourages fathers to take part in household activities more often, thus leading fathers to be more absent and making household economic characteristics more balanced within the household. The magnitude of the second effect will depend on economic differences between spouses such as income. If there is a large imbalance in incomes, the opportunity cost associated with absenteeism of the highest earner might reinforce or diminish the balancing effect of the policy. Namely, if a mother's income is significantly lower (higher) than her partner's income, the opportunity cost of his absenteeism is higher (lower) and absenteeism of the partner lower (higher).

The specification for DD models, M1 and M2, is as follows:

$$(1) E(y_{ijt}) = \exp(\beta_0 + \beta_1 X_{it} + \beta_2 Z_{jt} + \beta_3 (policy_{jt}) + \sum_j \alpha_j (state_j) + \sum_t \gamma_t (year_{it})),$$

where i indicates a working mother (M1) or a father (M2) with an infant, t indicates the year from which the observation originates, and j indicates state. Our main outcome variable, y_{ijt} , is the total number of absent days the individual has reported over the past 12 months. This includes days absent due to own illness, illness of others, and time taken off due to vacation. Our policy variable, $policy_{jt}$, is an individual-level variable with the value 1 for treated individuals, i.e. in M1 mothers with infants and, in M2, married/cohabiting fathers with infants whose wives are employed residing in a state where the policy has been enacted for each time period after implementation, and zero for employed parents with infants living in a state with no policy, and for parents with infants living in treatment states but before the policy was enacted. Our coefficient of interest is β_3 , the DD coefficient. We further include state dummies, $state_j$ to control for systematic differences in absenteeism across states that are unrelated to the policy ($state_j$ equals 1 if individual i lives in state j , and zero otherwise; where $j = 1 \dots 49$ states) and year dummies, $year_{it}$ to control for year-specific effects over time ($year_{it}$ is 1 if individual i is observed in year t , and zero otherwise; where $t = 1991 \dots 2011$). We also include state-specific time trends to control for changes in state-specific effects over time to ascertain the robustness of our model. Finally, we control for a broad range of covariates, which may explain the difference in absenteeism across individuals by including a set of individual-level demographic and economic covariates X_{it} , and state-level controls Z_{jt} (see Data Section).

Individuals are only included once in the estimation sample, at the year of the birth of the child, unless they had a second infant over the observation period. Since we have individuals nested within states, we control for serial correlation by following Cameron and Miller (2015) and Bertrand and Mullainathan (2004) by clustering at the state level.

We additionally assess whether the impact of the policy differs due to its enforceability. Out of the 24 treatment states, there are 16 states where the policy requires employers to provide facilities and break time, defined as strict enforceability (Table 4.2). There are 8 states where the policy encourages employers to provide facilities and/or break time, defined as weak enforceability. Therefore, the policy will be labelled as *strict enforceability* for parents living in states that require facilities and break time and *weak enforceability* for parents living in states that encourage facilities and/or break time. Our control group is defined analogous to the first DD specification, as parents

living in states where a policy is not- or not yet- in force. Our estimation strategy follows a DD model where there are two treatment groups:

$$(2) E(y_{ijt}) = \exp(\beta_0 + \beta_1 X_{it} + \beta_2 Z_{jt} + \beta_3(\text{strict enforceability}_{jt}) + \beta_4(\text{weak enforceability}_{jt}) + \sum_j \alpha_j(\text{state}_j) + \sum_t \gamma_t(\text{year}_{it}))$$

Variables are analogous to specification (1). However, for the first treatment group, the variable *strict enforceability_{jt}* takes the value of 1 for individuals residing in strict enforceability states for each time period after the treatment started and zero otherwise. Similarly, for the second treatment group, *weak enforceability_{jt}*, takes the value of 1 for individuals living in states with weak enforceability for each time period after the treatment started and zero otherwise. The coefficients of interest are β_3 and β_4 , which represent the impact of the strict policy on excess days absent compared to no policy and weak policy, and the impact of the weak policy on excess days absent compared to no policy and strict policy, respectively.

We estimate specification (2) for our two treated subsamples leading to models M3 and M4:

(M3): a treated group of mothers with infants residing in strictly or weakly enforceable treatment states after policy introduction vs. a control group of mothers with infants living in control states and in strictly or weakly enforceable treatment states before policy implementation;

(M4): a treated group of married/cohabiting fathers with infants whose wives are employed living in strictly or weakly enforceable treatment states after policy introduction vs. a control group of married/cohabiting fathers with infants and employed wives living in control states and in strictly or weakly enforceable treatment states before policy introduction.

B. Difference-in-Difference-in-Differences

Although DD is a robust method to estimate the causal impact of the policy, we can also take advantage of additional control groups that were not eligible nor exposed to the policy within treated states giving rise to a DDD model. These are married/cohabiting employed fathers with infants whose wives are not employed and single fathers with infants. We expect there to be no spillover effect on the first control group of fathers because their wives are not exposed to the

workplace breastfeeding policy while the second control group of fathers are single with no wives present in the household and therefore also not exposed to the policy.

Introducing an additional within-state control group produces a DDD model with the assumption that there exist no contemporaneous shocks correlated with but not due to the workplace breastfeeding legislation that affect only the treatment group in states with legislation, following Baum (2003), Waldfogel (1999) and Gruber (1994):

$$(3) E(y_{ijt}) = \exp(\beta_0 + \beta_1 X_{it} + \beta_2 Z_{jt} + \beta_3(policy_{jt}) + \beta_4(eligibility_i) + \beta_5(policy_{jt} * eligibility_i) + \sum_j \alpha_j(state_j) + \sum_t \gamma_t(year_{it}))$$

Variables are analogous to DD model (1), except for the addition of the variable *eligibility_i*, a group-specific binary variable equal to 1 if an individual in any state is part of the group that would be eligible for or exposed to the policy (i.e. either (1) mothers with infants or (2) fathers with infants whose wives are employed) and 0 for married or single fathers living in treatment and control states who are not exposed to the policy, either because their wives are not employed or they are single. Our coefficient of interest is β_5 , the DDD coefficient on the interaction of *policy_{jt}* and *eligibility_i*.

Therefore, we estimate the following DDD models for specification (3):

(M5): as M1 for mothers with infants, but married fathers with infants whose wives are unemployed and living in any state before and after policy introduction are added to the control group;

(M6): as M5, but single fathers with infants living in any state before and after policy introduction are added to the control group;

(M7): as M2 for fathers with infants whose wives are employed, but fathers with infants whose wives are unemployed living in any state before and after policy introduction are added to the control group;

(M8): as M7, but single fathers with infants living in any state before and after policy introduction are added to the control group.

Finally, we also run an additional DDD specification to evaluate whether the policy impact differs for states with strict or weak enforceability:

$$(4) E(y_{ijt}) = \exp(\beta_0 + \beta_1 X_{it} + \beta_2 Z_{jt} + \beta_3(\text{strict enforceability}_{jt}) + \beta_4(\text{weak enforceability}_{jt}) + \beta_5(\text{eligibility}_i) + \beta_6(\text{strict enforceability}_{jt} * \text{eligibility}_i) + \beta_7(\text{weak enforceability}_{jt} * \text{eligibility}_i) + \sum_j \alpha_j(\text{state}_j) + \sum_t \gamma_t(\text{year}_{it}))$$

Variables are analogous to DDD specification (3); however, similar to DD specification (2), we have two treatment states: states with strict enforceability and states with weak enforceability. Our coefficients of interest are β_6 , the first DDD coefficient on the interaction of *strict enforceability_{jt}* and *eligibility_i*, and β_7 , the second DDD coefficient on the interaction of *weak enforceability_{jt}* and *eligibility_i*.

We estimate the following DDD models with specification (4):

(M9): as M5, but comparing individuals living in states with strict enforceability or individuals living in states with weak enforceability compared to individuals living in control states and strictly or weakly enforceable treatment states before policy introduction;

(M10): as M6, but comparing individuals living in states with strict enforceability or individuals living in states with weak enforceability compared to individuals living in control states and strictly or weakly enforceable treatment states before policy introduction;

(M11): as M7, but comparing individuals living in states with strict enforceability or individuals living in states with weak enforceability compared to individuals living in control states and strictly or weakly enforceable treatment states before policy introduction;

(M12): as M8, comparing individuals living in states with strict enforceability or individuals living in states with weak enforceability compared to individuals living in control states and strictly or weakly enforceable treatment states before policy introduction.

Models are summarized in Table 4.3.

Table 4.3: Model descriptions

Model (Table)	Subsamples	Description
<i>Difference-in-differences (DD)</i>		
M1a-d (Table 4.8)	Mothers with infants	A treated group of mothers with infants living in treatment states after policy introduction vs a control group of mothers with infants living in control states and in treatment states before policy introduction
M2a-d (Table 4.9)	Fathers with infants whose wives are employed	A treated group of married/cohabiting fathers with infants whose wives are employed living in treatment states after policy introduction vs a control group of married/cohabiting fathers with infants and employed wives living in control states and in treatment states before policy introduction
<i>DD assessing enforceability of policies</i>		
M3a-d (Table 4.10)	Mothers with infants	As M1, but we split the group of individuals residing in treatment states into two: (1) strict enforceability and (2) weak enforceability
M4a-d (Table 4.11)	Fathers with infants whose wives are employed	As M2, but we split the group of individuals residing in treatment states into two: (1) strict enforceability and (2) weak enforceability
<i>Difference-in-difference-in-differences (DDD)</i>		
M5a-d (Table 4.12)	Mothers vs fathers whose wives are unemployed	As M1, but compared to married fathers with infants whose wives are unemployed and living in any state before and after policy introduction are added to the control group.
M6a-d (Table 4.13)	Mothers vs fathers whose wives are unemployed and single fathers	As M5, but single fathers with infants living in any state before and after policy introduction are added to the control group
M7a-d (Table 4.14)	Fathers whose wives are employed vs fathers whose wives are unemployed	As M2, but compared to fathers with infants whose wives are unemployed living in any state before and after policy introduction are added to the control group
M8a-d (Table 4.15)	Fathers whose wives are employed vs fathers whose wives are unemployed and single fathers	As M7, but single fathers with infants living in any state before and after policy introduction are added to the control group
<i>DDD assessing enforceability of policies</i>		
M9a-d (Table 4.16)	Mothers vs fathers whose wives are unemployed	As M5, but there we split the group of individuals residing in treatment states into two: (1) strict enforceability and (2) weak enforceability
M10a-d (table 4.17)	Mothers vs fathers whose wives are unemployed and single fathers	As M6, but we split the group of individuals residing in treatment states into two: (1) strict enforceability and (2) weak enforceability
M11a-d (Table 4.18)	Fathers whose wives are employed vs fathers whose wives are unemployed	As M7, but we split the group of individuals residing in treatment states into two: (1) strict enforceability and (2) weak enforceability
M12a-d (Table 4.19)	Fathers whose wives are employed vs fathers whose wives are unemployed and single fathers	As M8, but we split the group of individuals residing in treatment states into two: (1) strict enforceability and (2) weak enforceability

C. Robustness Checks

Finally, we conduct four types of robustness checks. First, we run falsification tests for the DD specifications by comparing (1) married/cohabiting fathers with infants whose wives are unemployed and (2) single fathers with infants across treatment and control states. The legislation did not apply to these groups and therefore we should find no effect (Appendix 2C). Secondly, we determine if our identification strategy fulfils the main assumption behind DD, the parallel trends assumption, which states that the outcome (i.e. total absent days) must follow the same trend over time in the absence of the treatment (i.e. workplace breastfeeding legislation) for individuals in control and treatment states (Appendix 2D). We do so by running falsification tests introducing leads where the policy is switched on before its actual implementation year (Autor, 2003). If parallel trends are not violated, we expected the leads to be insignificant.

Thirdly, we include an additional variable controlling for state-enacted maternity leave as some states have introduced their own maternity leave policies on top of the federal legislation called The Family and Medical Leave Act (FMLA) implemented in 1993 (National Conference of State Legislatures, 2017). Ten states have implemented a paid family leave policy during our study period of 1990-2011 in a staggered way (Appendix 2E). We include a separate family leave policy variable in our specification as a robustness check to determine if absent days can be explained by the introduction of a paid family leave policy rather than a workplace breastfeeding policy.

Lastly, as a further robustness check, we perform matching through coarsened exact matching (CEM) on state-level characteristics that may affect state selection into the policy. We match on several variables including state-level breastfeeding rates, percent of women in the state legislature, healthcare expenditure per capita, and unemployment rates. Results remain qualitatively similar in significance and magnitude and are included in Appendix 2F.

Full details of all robustness checks can be found in Appendix 2; C, D, E, and F.

All analyses were done in Stata version 14.

V. DATA

We use the Panel Study of Income Dynamics (PSID) for the years 1990-2011. The PSID is a nationally representative household survey starting in 1968 collecting socio-demographic, economic, and health data on households and individuals over time (PSID, 2014). The unique value of the PSID lies in two features: (1) individuals are followed over time in family settings and (2) families are tracked across multiple generations with interviews collected concurrently with multiple generations of the same family (PSID, 2014).

We extract our separate subsamples from the PSID and pool observations for each model. We exclude individuals who are unemployed at the time of the study and are over 65 years of age. We also include demographic and economic covariates to control for individual's characteristics where there is evidence in literature that they are important predictors when assessing absenteeism. Demographic covariates include age (Barmby et al., 2002; Cohen et al., 1995; Muchinsky, 1977), age squared (Muchinsky, 1977), number of children in the household to control for family size (Cohen et al., 1995; Muchinsky, 1977), education (Cohen et al., 1995; Dionne and Dostie, 2007; Muchinsky, 1977), race (Cohen et al., 1995), work experience as a measure of tenure (Barmby et al., 2002; Muchinsky, 1977), and marital status (Barmby et al., 2002; Cohen et al., 1995; Dionne and Dostie, 2007). Economic covariates include labour income (Cohen et al., 1995), partner's labour income, average hours per week on main job (VandenHeuvel, 1995; Vistnes, 1997), partner's average hours per week, job type (i.e. white or blue collar) (Muchinsky, 1977), and childcare cost (Connelly, 1992). Income and childcare costs have been adjusted for inflation in 2000 \$USD using the Consumer Price Index. We further include state unemployment rates to control for economic conditions that may influence absenteeism from the US Bureau of Labour Statistics (Baum, 2003; US Bureau of Labour Statistics, 2016).

A. Descriptive statistics

As Figures B1-B4 in Appendix 2B show, our outcome variable, days absent, is a non-negative count variable with excess zeroes and displays over-dispersion in all four subsamples with the variance being much higher than the mean; therefore, we use a negative binomial model. Tables

4.4-4.7 show descriptive statistics for all subsamples, and separately for all treatment states, treatment states with strict enforceability, treatment states with weak enforceability and control states.

Table 4.4: Descriptive statistics of mothers with infants by state

Variable	Mothers with infants			
	<i>All treatment States</i>	<i>Treatment states with strict enforceability</i>	<i>Treatment states with weak enforceability</i>	<i>Control states</i>
Total days absent	43.662 (39.277)	45.667 (39.119)	39.208 (39.352)	41.224 (37.756)
<i>Demographic covariates</i>				
Age (in years)	28.584 (5.110)	28.646 (5.174)	28.460 (4.984)	28.705 (4.851)
Number of children in household under 18 years	1.624 (0.929)	1.608 (0.878)	1.654 (1.024)	1.678 (0.929)
Education (in years)	14.224 (2.241)	14.226 (2.271)	14.222 (2.184)	14.306 (2.026)
Percentage of Whites (= 1 if White)	0.675 (0.468)	0.629 (0.462)	0.642 (0.480)	0.671 (0.470)
Percentage of Blacks (= 1 if Black)	0.249 (0.432)	0.225 (0.418)	0.296 (0.457)	0.297 (0.457)
Percentage of other race (= 1 if other race)	0.076 (0.265)	0.082 (0.275)	0.063 (0.243)	0.033 (0.178)
Percentage of married (= 1 if married)	0.837 (0.370)	0.840 (0.367)	0.832 (0.374)	0.813 (0.390)
Percentage of single (= 1 if single)	0.163 (0.370)	0.160 (0.367)	0.168 (0.374)	0.187 (0.390)
<i>Economic covariates</i>				
Work experience (in years)	3.596 (3.598)	3.654 (3.576)	3.481 (3.642)	3.659 (3.606)
Annual income* (in 2000 \$USD)	\$26411.450 (\$26086.13)	\$26438.630 (\$25811.680)	\$26350.930 (\$26748.830)	\$25489.930 (\$22281.090)
Annual income of partner* (in 2000 \$USD)	\$28465.840 (\$27821.090)	\$29093.400 (\$27522.010)	\$27088.470 (\$28478.400)	\$30685.220 (\$29946.030)
Average work hours per week	29.606 (10.487)	29.458 (10.342)	29.937 (10.822)	29.878 (11.589)
Average work hours per week of partner	34.833 (17.847)	34.670 (17.416)	35.197 (18.808)	35.212 (19.368)
Percentage of white-collar workers (= 1 if white-collar)	0.736 (0.441)	0.735 (0.442)	0.738 (0.440)	0.752 (0.432)
Percentage of blue-collar workers (= 1 if blue-collar)	0.264 (0.441)	0.265 (0.442)	0.262 (0.440)	0.248 (0.432)
Childcare cost * (in 2000 \$USD)	\$2178.307 (\$4126.566)	\$2304.537 (\$4660.549)	\$1903.842 (\$2601.710)	\$1782.206 (\$2856.198)
State unemployment rate (%)	0.061 (0.018)	0.063 (0.019)	0.057 (0.015)	0.057 (0.019)
Number of observations	1422	944	478	1478

Note: Standard deviations in parenthesis. State and year dummies not presented. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. *Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation.

Table 4.5: Descriptive statistics of married/cohabiting fathers with infants whose wives are employed by state

Variable	Married/cohabiting fathers with infants whose wives are employed			
	<i>All treatment States</i>	<i>Treatment states with strict enforceability</i>	<i>Treatment states with weak enforceability</i>	<i>Control states</i>
Total days absent	13.945 (14.620)	13.882 (14.276)	14.097 (15.456)	14.669 (18.160)
<i>Demographic covariates</i>				
Age (in years)	30.844 (5.458)	30.910 (5.416)	30.705 (5.551)	31.345 (5.521)
Number of children in household under 18 years	1.570 (0.848)	1.550 (0.823)	1.612 (0.898)	1.598 (0.835)
Education (in years)	14.021 (2.311)	13.951 (2.381)	14.168 (2.155)	14.153 (2.102)
Percentage of Whites (= 1 if White)	0.748 (0.434)	0.766 (0.424)	0.714 (0.453)	0.765 (0.424)
Percentage of Blacks (= 1 if Black)	0.178 (0.382)	0.148 (0.355)	0.240 (0.427)	0.206 (0.405)
Percentage of other race (= 1 if other race)	0.074 (0.261)	0.086 (0.281)	0.047 (0.212)	0.028 (0.166)
Percentage of married (= 1 if married)				
Percentage of single (= 1 if single)				
<i>Economic covariates</i>				
Work experience (in years)	4.241 (4.264)	4.325 (4.223)	4.064 (4.349)	4.445 (4.354)
Annual income* (in 2000 \$USD)	\$41566.390 (\$27785.830)	\$41916.830 (\$28557.720)	\$40718.780 (\$2587.900)	\$42296.230 (\$28483.890)
Annual income of partner* (in 2000 \$USD)	\$25118.390 (\$22982.660)	\$26041.720 (\$24919.080)	\$22885.090 (\$17283.720)	\$26631.520 (\$24390.190)
Average work hours per week	42.399 (9.410)	41.975 (9.447)	43.427 (9.264)	43.635 (10.693)
Average work hours per week of partner	27.503 (10.660)	27.557 (10.641)	27.373 (10.729)	28.589 (11.533)
Percentage of white-collar workers (= 1 if white-collar)	0.520 (0.499)	0.515 (0.500)	0.531 (0.4997)	0.522 (0.499)
Percentage of blue-collar workers (= 1 if blue-collar)	0.480 (0.499)	0.485 (0.500)	0.469 (0.4997)	0.478 (0.499)
Childcare cost * (in 2000 \$USD)	\$2274.764 (\$4346.939)	\$2345.612 (\$4872.388)	\$2110.283 (\$2770.118)	\$2004.41 (\$3252.297)
State unemployment rate (%)	0.061 (0.018)	0.063 (0.019)	0.057 (0.016)	0.058 (0.019)
Number of observations	1199	813	386	1209

Note: Standard deviations in parenthesis. State and year dummies not presented. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. *Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation.

Table 4.6: Descriptive statistics of married/cohabiting fathers with infants whose wives are unemployed by state

Variable	Married/cohabiting fathers with infants whose wives are unemployed			
	<i>All treatment States</i>	<i>Treatment states with strict enforceability</i>	<i>Treatment states with weak enforceability</i>	<i>Control states</i>
Total days absent	11.735 (14.962)	12.848 (17.060)	9.476 (8.990)	12.007 (10.925)
<i>Demographic covariates</i>				
Age (in years)	30.283 (6.371)	30.339 (6.246)	30.169 (6.625)	30.351 (6.426)
Number of children in household under 18 years	2.080 (1.177)	2.091 (1.158)	2.056 (1.216)	1.943 (1.136)
Education (in years)	12.920 (2.876)	12.770 (3.053)	13.217 (2.469)	13.715 (2.471)
Percentage of Whites (= 1 if White)	0.674 (0.469)	0.674 (0.469)	0.674 (0.470)	0.794 (0.405)
Percentage of Blacks (= 1 if Black)	0.159 (0.366)	0.145 (0.352)	0.188 (0.391)	0.138 (0.345)
Percentage of other race (= 1 if other race)	0.167 (0.373)	0.182 (0.386)	0.139 (0.346)	0.068 (0.252)
Percentage of married (= 1 if married)				
Percentage of single (= 1 if single)				
<i>Economic covariates</i>				
Work experience (in years)	3.807 (4.015)	3.973 (4.059)	3.472 (3.908)	3.970 (4.381)
Annual income* (in 2000 \$USD)	\$43479.51 (\$49864.120)	\$46134.090 (\$52550.630)	\$38238.420 (\$43770.650)	\$48353.590 (\$48287.68)
Annual income of partner* (in 2000 \$USD)				
Average work hours per week	43.157 (13.107)	43.864 (13.751)	41.761 (11.647)	44.865 (13.749)
Average work hours per week of partner				
Percentage of white-collar workers (= 1 if white-collar)	0.370 (0.483)	0.375 (0.485)	0.358 (0.480)	0.444 (0.497)
Percentage of blue-collar workers (= 1 if blue-collar)	0.630 (0.483)	0.625 (0.485)	0.642 (0.480)	0.556 (0.497)
Childcare cost * (in 2000 \$USD)	\$424.948 (\$2889.554)	\$480.168 (\$3456.026)	\$311.797 (\$996.499)	\$614.617 (\$3618.782)
State unemployment rate (%)	0.064 (0.018)	0.066 (0.020)	0.061 (0.014)	0.058 (0.018)
Number of observations	890	595	295	730

Note: Standard deviations in parenthesis. State and year dummies not presented. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. *Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation.

Table 4.7: Descriptive statistics of single fathers with infants by state

Variable	Single fathers with infants			
	<i>All treatment States</i>	<i>Treatment states with strict enforceability</i>	<i>Treatment states with weak enforceability</i>	<i>Control states</i>
Total days absent	10.247 (11.069)	10.254 (10.139)	10.231 (13.279)	9.327 (15.892)
<i>Demographic covariates</i>				
Age (in years)	28.868 (6.897)	29.527 (6.826)	27.677 (6.921)	27.389 (5.920)
Number of children in household under 18 years	1.196 (0.528)	1.194 (0.502)	1.200 (0.576)	1.271 (0.720)
Education (in years)	12.610 (1.824)	12.636 (1.952)	12.565 (1.585)	12.611 (1.589)
Percentage of Whites (= 1 if White)	0.376 (0.486)	0.396 (0.491)	0.339 (0.477)	0.325 (0.470)
Percentage of Blacks (= 1 if Black)	0.543 (0.499)	0.486 (0.502)	0.645 (0.482)	0.641 (0.481)
Percentage of other race (= 1 if other race)	0.081 (0.274)	0.117 (0.323)	0.016 (0.127)	0.033 (0.180)
Percentage of married (= 1 if married)				
Percentage of single (= 1 if single)				
<i>Economic covariates</i>				
Work experience (in years)	3.125 (3.516)	3.394 (3.722)	2.637 (3.079)	2.905 (3.928)
Annual income* (in 2000 \$USD)	\$29940.200 (38769.040)	\$31198.660 (4466.130)	\$26987.680 (19212.040)	\$22539.700 (13067.300)
Annual income of partner* (in 2000 \$USD)				
Average work hours per week	40.687 (14.848)	39.496 (12.366)	43.481 (17.834)	39.312 (11.890)
Average work hours per week of partner				
Percentage of white-collar workers (= 1 if white-collar)	0.254 (0.437)	0.266 (0.444)	0.233 (0.427)	0.248 (0.433)
Percentage of blue-collar workers (= 1 if blue-collar)	0.746 (0.437)	0.734 (0.444)	0.767 (0.427)	0.752 (0.433)
Childcare cost * (in 2000 \$USD)	\$269.875 (780.437)	\$364.811 (906.151)	\$34.436 (120.552)	\$241.125 (893.827)
State unemployment rate (%)	0.066 (0.019)	0.069 (0.020)	9.961 (0.015)	0.059 (0.020)
Number of observations	174	112	62	211

Note: Standard deviations in parenthesis. State and year dummies not presented. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. *Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation.

Mothers in treatment states with strict enforceability have the highest mean for total days absent when compared to the other groups. Single fathers with infants in control states have the lowest total days absent compared to our two treated groups and our control group of married fathers with infants whose wives are unemployed. Both samples of married fathers have higher annual labour income compared to mothers. Mothers are more likely to be in white-collar jobs than all samples of fathers. Finally, mothers and fathers whose wives are employed have the highest childcare costs and single fathers with infants have the lowest childcare costs.

VI. RESULTS

A. Difference-in-Differences

We first estimate the effects of workplace breastfeeding legislation on absenteeism separately for our two treated groups through difference-in-differences (DD) (Tables 4.8-4.11). Presented throughout are average marginal effects (AMEs), which are interpreted as the averaged impact of the policy on total days absent across all treated individuals, relative to untreated individuals. Table 4.8 presents DD results for M1 (mothers with infants) while Table 4.9 presents results for M2 (married fathers with infants whose wives are employed). Table 4.10 presents DD results for M3 (mothers with infants) splitting mothers who reside in treatment states with strict or weak enforceability while Table 4.11 presents results for M4 (married fathers with infants whose wives are employed) similarly splitting those fathers into two treatment states. Each column (i.e. versions a-d) of the table adds additional variables.¹

¹ For example, M1a (Table 4.8) includes demographic and economic covariates; M1b adds state dummies; M1c adds year dummies; and M1d adds state-specific time trends. In what follows, we comment on the most complete models M1d (Table 4.8), M2d (Table 4.9), M3d (Table 4.10) and M4d (Table 4.11).

Table 4.8: DD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on mothers with infants

Variable	M1a	M1b	M1c	M1d
Workplace breastfeeding policy (DD)	-8.581 (2.146)***	-12.995 (1.801)***	-8.470 (2.881)***	-8.952 (4.817)*
<i>Demographic covariates</i>				
Age (in years)	4.025 (1.827)**	4.342 (1.994)**	4.515 (1.948)**	4.799 (1.980)**
Age ² (in years)	-0.062 (0.030)**	-0.067 (0.033)**	-0.071 (0.033)**	-0.075 (0.034)**
Number of children in household	-4.125 (1.310)***	-4.171 (1.439)***	-4.376 (1.410)***	-4.229 (1.489)***
Education (in years)	1.342 (0.663)**	1.377 (0.723)*	1.430 (0.703)**	1.579 (0.683)**
Race				
Black	6.415 (2.581)**	7.157 (3.272)**	7.801 (3.005)***	7.856 (2.909)***
Other	2.539 (4.480)	1.610 (4.769)	0.012 (4.127)	0.384 (4.397)
Marital Status				
Married	9.956 (3.365)***	9.466 (3.651)**	8.702 (3.894)**	10.889 (3.876)***
<i>Economic covariates</i>				
Work experience (in years)	1.190 (0.350)***	1.202 (0.359)***	1.279 (0.378)***	1.187 (0.394)***
Annual income (in 2000 \$USD)	0.655 (0.989)	0.507 (1.015)	0.722 (1.082)	0.571 (1.145)
Annual income of partner (in 2000 \$USD)	-1.218 (0.506)**	-1.530 (0.537)***	-1.377 (0.539)**	-1.355 (0.556)**
Average work hours per week	-1.263 (0.113)***	-1.213 (0.123)***	-1.217 (0.119)***	-1.219 (0.119)***
Average work hours per week of partner	-0.138 (0.084)	-0.082 (0.085)	-0.072 (0.076)	-0.117 (0.078)
Job type				
Blue Collar	-1.926 (2.991)	-2.156 (2.972)	-2.739 (3.056)	-2.631 (3.029)
Childcare cost (in 2000 \$USD)	5.478 (3.076)*	3.895 (2.954)	4.671 (3.240)	5.169 (3.519)
State unemployment rate (%)	100.798 (55.216)*	-2.450 (85.948)	-9.951 (138.884)	-14.033 (160.645)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	1232	1232	1232	1232

Note: Model 1a includes all covariates; 1b adds state dummies; 1c adds year dummies; and 1d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table 4.9: DD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on married fathers with infants whose wives are employed

Variable	<u>M2a</u>	<u>M2b</u>	<u>M2c</u>	<u>M2d</u>
Workplace breastfeeding policy (DD)	-1.494 (0.920)	-0.520 (1.000)	0.204 (1.316)	0.843 (2.780)
<i>Demographic covariates</i>				
Age (in years)	0.061 (1.092)	0.373 (0.979)	0.501 (0.965)	0.789 (0.838)
Age ² (in years)	-0.001 (0.016)	-0.005 (0.015)	-0.007 (0.014)	-0.011 (0.013)
Number of children in household	-0.114 (0.494)	-0.220 (0.502)	-0.371 (0.525)	-0.434 (0.523)
Education (in years)	0.532 (0.163)***	0.421 (0.158)***	0.423 (0.170)**	0.385 (0.189)**
Race				
Black	0.393 (1.591)	0.267 (1.755)	0.251 (1.652)	0.231 (1.663)
Other	-0.717 (1.693)	0.159 (2.049)	0.115 (2.150)	0.485 (2.140)
Marital Status				
Married				
<i>Economic covariates</i>				
Work experience (in years)	0.503 (0.095)***	0.437 (0.092)***	0.461 (0.084)***	0.490 (0.091)***
Annual income (in 2000 \$USD)	0.412 (0.176)**	0.513 (0.200)***	0.495 (0.201)**	0.566 (0.199)***
Annual income of partner (in 2000 \$USD)	0.063 (0.184)	-0.032 (0.191)	0.026 (0.191)	-0.041 (0.182)
Average work hours per week	-0.311 (0.063)***	-0.307 (0.064)***	-0.293 (0.062)***	-0.311 (0.056)***
Average work hours per week of partner	0.023 (0.039)	0.030 (0.040)	0.024 (0.040)	0.022 (0.041)
Job type				
Blue Collar	-1.249 (0.894)	-1.599 (0.850)*	-1.674 (0.849)**	-1.864 (0.888)**
Childcare cost (in 2000 \$USD)	-0.962 (1.009)	-0.534 (1.079)	-0.151 (1.167)	0.437 (1.145)
State unemployment rate (%)	14.418 (26.707)	16.098 (34.895)	46.721 (50.621)	91.082 (68.221)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	1204	1204	1204	1204

Note: Model 2a includes all covariates; 2b adds state dummies; 2c adds year dummies; and 2d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

DD estimates show that the policy has a negative and significant impact upon mothers with infants (Table 4.8; M1d). We estimate that on average, treated mothers have a difference in total days absent of approximately – 9 days, meaning the policy causes mothers who live in treatment states to be 9 fewer days absent in the workplace per year when compared to mothers in control states. The policy has no effect on married fathers whose wives are employed (Table 4.9; M2d).

When we assess the policy heterogeneity, we estimate that mothers who reside in states with strict enforceability have a difference in total days absent of approximately -16 days on average while there is no policy effect for those mothers who reside in states with weak enforceability (Table 4.10; M3d). Finally, the policy has no effect on married fathers whose wives are employed regardless of whether the legislation is of strict or weak enforceability (Table 4.11; M4d), similar to M2d.

Table 4.10: DD estimates as average marginal effects of the effect of strict and weak workplace breastfeeding legislation on total days absent on mothers with infants

Variable	M3a	M3b	M3c	M3d
Strict workplace breastfeeding policy (DD)	-12.240 (1.492)***	-12.996 (2.997)***	-9.169 (4.061)**	-16.252 (5.222)***
Weak workplace breastfeeding policy (DD)	-4.464 (2.537)*	-12.586 (1.615)***	-7.615 (3.137)**	0.141 (8.567)
<i>Demographic covariates</i>				
Age (in years)	4.096 (1.826)**	4.341 (1.993)**	4.517 (1.946)**	4.915 (1.956)**
Age ² (in years)	-0.063 (0.030)**	-0.067 (0.033)**	-0.071 (0.033)**	-0.077 (0.033)**
Number of children in household	-4.212 (1.271)***	-4.166 (1.420)***	-4.363 (1.393)***	-4.155 (1.466)***
Education (in years)	1.323 (0.658)**	1.276 (0.726)*	1.427 (0.707)**	1.623 (0.680)**
Race				
Black	6.571 (2.533)***	7.160 (3.270)**	7.808 (3.007)***	7.878 (2.938)***
Other	2.085 (4.677)	1.637 (4.855)	0.100 (4.178)	0.678 (4.451)
Marital Status				
Married	10.297 (3.363)***	9.447 (3.699)**	8.634 (3.971)**	10.808 (3.912)***
<i>Economic covariates</i>				
Work experience (in years)	1.190 (0.348)***	1.2012 (0.359)***	1.280 (0.379)***	1.187 (0.395)***
Annual income (in 2000 \$USD)	0.630 (0.987)	0.508 (1.018)	0.724 (1.084)	0.564 (1.154)
Annual income of partner (in 2000 \$USD)	-1.234 (0.514)**	-1.529 (0.537)***	-1.376 (0.539)**	-1.355 (0.553)**
Average work hours per week	-1.259 (0.115)***	-1.213 (0.124)***	-1.217 (0.119)***	-1.216 (0.121)***
Average work hours per week of partner	-0.138 (0.084)*	-0.081 (0.085)	-0.071 (0.078)	-0.114 (0.079)
Job type				
Blue Collar	-1.905 (2.928)	-2.156 (2.972)	-2.738 (3.059)	-2.556 (3.047)
Childcare cost (in 2000 \$USD)	5.343 (2.964)*	3.897 (2.967)	4.683 (3.269)	4.941 (3.507)
State unemployment rate (%)	99.975 (52.096)	-2.629 (86.065)	-11.501 (141.192)	-39.935 (177.112)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	1232	1232	1232	1232

Note: Model 3a includes all covariates; 3b adds state dummies; 3c adds year dummies; and 3d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table 4.11: DD estimates as average marginal effects of the effect of strict and weak workplace breastfeeding legislation on total days absent married fathers with infants whose wives are employed

Variable	<u>M4a</u>	<u>M4b</u>	<u>M4c</u>	<u>M4d</u>
Strict workplace breastfeeding policy (DD)	-1.931 (1.003)*	-0.710 (1.351)	-0.023 (1.648)	-0.003 (3.649)
Weak workplace breastfeeding policy (DD)	-0.979 (1.576)	-0.215 (1.130)	0.558 (1.446)	2.186 (4.569)
<i>Demographic covariates</i>				
Age (in years)	0.071 (1.093)	0.377 (0.981)	0.505 (0.965)	0.789 (0.840)
Age ² (in years)	-0.001 (0.016)	-0.005 (0.015)	-0.007 (0.014)	-0.011 (0.013)
Number of children in household	-0.116 (0.493)	-0.221 (0.502)	-0.374 (0.525)	-0.426 (0.530)
Education (in years)	0.529 (0.163)***	0.419 (0.159)***	0.421 (0.170)**	0.379 (0.191)**
Race				
Black	0.347 (1.543)	0.259 (1.757)	0.246 (1.656)	0.202 (1.671)
Other	-0.646 (1.765)	0.184 (2.052)	0.142 (2.146)	0.487 (2.140)
Marital Status				
Married				
<i>Economic covariates</i>				
Work experience (in years)	0.505 (0.095)***	0.437 (0.092)***	0.461 (0.084)***	0.490 (0.091)***
Annual income (in 2000 \$USD)	0.415 (0.173)**	0.515 (0.200)**	0.496 (0.201)**	0.567 (0.198)***
Annual income of partner (in 2000 \$USD)	0.066 (0.185)	-0.032 (0.191)	0.026 (0.191)	-0.044 (0.183)
Average work hours per week	-0.312 (0.063)***	-0.307 (0.064)***	-0.293 (0.062)***	-0.309 (0.056)***
Average work hours per week of partner	0.024 (0.039)	0.030 (0.040)	0.025 (0.040)	0.023 (0.041)
Job type				
Blue Collar	-1.266 (0.896)	-1.609 (0.851)*	-1.686 (0.857)**	-1.882 (0.884)**
Childcare cost (in 2000 \$USD)	-0.965 (1.010)	-0.538 (1.079)	-0.153 (1.166)	0.440 (1.147)
State unemployment rate (%)	16.020 (26.520)	16.757 (35.055)	47.850 (50.174)	87.112 (67.516)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	1204	1204	1204	1204

Note: Model 4a includes all covariates; 4b adds state dummies; 4c adds year dummies; and 4d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

The covariates age, education, work experience, labour income, being married, and being Black show positive associations while age squared, number of children in household, income of partner, and work hours per week are negatively associated with absent days (Tables 4.8-4.11). Age is positively associated with absenteeism while age squared is negatively associated with absenteeism suggesting a nonlinear association where absenteeism increases as an individual ages but at a decreasing rate, a result also found by Muchinsky (1977). Education is positively correlated with days absent for both mothers and fathers, supported by Dionne et al. (2007) and Muchinsky (1977). Individuals with higher education are likely to have higher labour income and have more autonomy in their working lives. This is supported by the positive and significant association of labour income for fathers with infants with total absent days. Work experience is also positively associated with total days absent for both mothers and fathers as also seen by Askildsen et al. (2005) and Barmby et al. (2002). Both authors suggest that with higher work experience comes higher job security and so individuals are more likely to be absent, the greater their work experience. Being married is also positively correlated to absenteeism as seen in Barmby et al. (2002). The number of children in the household under 18 years old is negatively associated with total days absent, confirming results of Johansson and Palme (1996). Although some studies have noted a positive correlation between family size and absenteeism, parents with multiple children in the household may also allocate childcare duties to older children alleviating the need for parents to take off work if their primary mode of childcare is unavailable. Number of job hours per week is negatively associated with absenteeism. Possibly, those working longer hours may have more demanding jobs with less flexibility to take days off. Furthermore, individuals who work longer hours may be more committed to their organisation (VandenHeuvel, 1995; Vistnes, 1997). Finally, partner's income is negatively associated with total days absent. Although spousal earnings have not been included in many studies assessing absenteeism, there have been conflicting studies showing both positive associations with other family income and non-labour income, which includes spousal income. Allen (1981) and Askildsen et al. (2005) show a positive association with family income and non-labour income while Vistnes (1997) sees a negative association with family income, including spousal income, and absenteeism, similarly to our results.

The results for falsification test on control groups, i.e. fathers whose wives are unemployed and single fathers, are as expected with no significant impact on these groups (Appendix 2C). Results

for falsifications tests to check the main assumption behind DD showed that the policy lead variables are insignificant, fulfilling the parallel trends assumption (Appendix 2D). Additionally, results for DD specifications adding a paid family leave variable did not alter results (Appendix 2E). Finally, results of matching through CEM on state-level variables remain qualitatively similar in significance and magnitude (Appendix 2F).

B. Difference-in-Difference-in-Differences

We now present results of the DDD models with two treated groups, mothers and fathers whose wives are employed and living in states with the policy, compared to mothers and fathers living in states without the policy and two additional control groups, married men with infants whose wives are unemployed and single fathers (Tables 4.12-4.19).

M5 (Table 4.12) compares mothers with infants to a control group of married men with infants whose wives are unemployed while M6 (Table 4.13) adds single fathers with infants as a within-state control group. M5d shows that mothers are approximately 10 days less absent due to the policy, an estimate slightly higher than the DD effect of -9 days (Table 4.8; M1d). When adding single fathers to the control group, M6d shows a slightly lower impact of -9 days, in line with M1d.

M7d (Table 4.14) and M8d (Table 4.15) show that the workplace breastfeeding policy does not have an effect on married fathers whose wives are employed.

Table 4.12: DDD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on mothers with infants differencing with married fathers with infants whose wives are not employed

Variable	<u>M5a</u>	<u>M5b</u>	<u>M5c</u>	<u>M5d</u>
Workplace breastfeeding policy (DDD)	-8.381 (2.037)***	-12.032 (1.745)***	-8.328 (2.444)***	-9.607 (3.992)**
<i>Demographic covariates</i>				
Age (in years)	2.249 (0.685)***	2.176 (0.708)***	2.093 (0.740)***	2.245 (0.766)***
Age ² (in years)	-0.033 (0.011)***	-0.032 (0.011)***	-0.031 (0.012)**	-0.033 (0.012)***
Number of children in household	-1.900 (1.128)*	-1.886 (1.163)	-1.840 (1.119)	-1.784 (1.141)
Education (in years)	1.065 (0.342)***	1.062 (0.366)***	1.272 (0.386)***	1.246 (0.385)***
Race				
Black	2.416 (1.732)	3.344 (2.017)*	3.254 (1.969)*	2.917 (1.941)
Other	1.456 (3.536)	-0.642 (3.093)	-1.058 (2.994)	-1.460 (2.920)
Marital Status				
Married	6.416 (2.413)***	5.478 (2.596)**	4.887 (2.704)*	5.135 (2.763)*
<i>Economic covariates</i>				
Work experience (in years)	1.166 (0.174)***	1.131 (0.176)***	1.148 (0.164)***	1.120 (0.165)***
Annual income (in 2000 \$USD)	0.593 (0.226)***	0.644 (0.239)***	0.662 (0.239)***	0.694 (0.245)***
Annual income of partner (in 2000 \$USD)	-0.777 (0.321)**	-1.069 (0.374)***	-0.996 (0.378)***	-1.006 (0.386)***
Average work hours per week	-0.623 (0.078)***	-0.613 (0.085)***	-0.606 (0.082)***	-0.597 (0.082)***
Average work hours per week of partner	-0.091 (0.059)	-0.033 (0.063)	-0.034 (0.059)	-0.036 (0.060)
Job type				
Blue Collar	-1.585 (1.788)	-1.681 (1.685)	-1.933 (1.774)	-1.979 (1.828)
Childcare cost (in 2000 \$USD)	0.231 (1.713)	-0.285 (1.632)	-0.112 (1.752)	0.071 (1.876)
State unemployment rate (%)	41.799 (42.859)	-43.977 (38.247)	-126.084 (66.008)*	-99.791 (83.625)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	2000	2000	2000	2000

Note: Model 5a includes all covariates; 5b adds state dummies; 5c adds year dummies; and 5d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table 4.13: DDD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on mothers with infants differencing with married fathers with infants whose wives are not employed and single fathers with infants

Variable	M6a	M6b	M6c	M6d
Workplace breastfeeding policy (DDD)	-8.491 (2.160)***	-12.432 (1.984)***	-7.498 (2.607)***	-9.296 (5.030)*
<i>Demographic covariates</i>				
Age (in years)	1.977 (0.697)***	1.944 (0.735)***	1.855 (0.783)**	1.970 (0.796)**
Age ² (in years)	-0.031 (0.010)***	-0.030 (0.011)***	-0.029 (0.012)**	-0.030 (0.0124)**
Number of children in household	-1.714 (1.112)	-1.706 (1.134)	-1.577 (1.060)	-1.530 (1.087)
Education (in years)	1.117 (0.285)***	1.153 (0.325)***	1.367 (0.347)***	1.303 (0.343)***
Race				
Black	1.352 (1.528)	2.012 (1.656)	1.970 (1.628)	1.589 (1.558)
Other	1.085 (3.197)	-1.497 (2.641)	-1.915 (2.542)	-2.320 (2.531)
Marital Status				
Married	7.041 (1.906)***	6.748 (1.977)***	6.344 (1.948)	6.303 (1.991)***
<i>Economic covariates</i>				
Work experience (in years)	1.275 (0.163)***	1.216 (0.162)***	1.223 (0.150)***	1.207 (0.155)***
Annual income (in 2000 \$USD)	0.617 (0.203)***	0.668 (0.224)***	0.703 (0.228)***	0.739 (0.235)***
Annual income of partner (in 2000 \$USD)	-0.763 (0.297)**	-1.011 (0.339)***	-0.927 (0.345)***	-0.941 (0.350)***
Average work hours per week	-0.564 (0.077)***	-0.549 (0.080)***	-0.540 (0.077)***	-0.533 (0.076)***
Average work hours per week of partner	-0.106 (0.069)	-0.071 (0.070)	-0.076 (0.0665)	-0.081 (0.067)
Job type				
Blue Collar	-1.395 (1.645)	-1.405 (1.500)	-1.667 (1.581)	-1.915 (1.623)
Childcare cost (in 2000 \$USD)	0.021 (1.521)	-0.406 (1.462)	-0.340 (1.584)	-0.146 (1.724)
Stat unemployment rate (%)	48.644 (49.979)	-31.020 (42.540)	-121.843 (74.128)	-96.799 (88.769)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	2173	2173	2173	2173

Note: Model 6a includes all covariates; 6b adds state dummies; 6c adds year dummies; and 6d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table 4.14: DDD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on married fathers with infants whose wives are employed differencing with married fathers with infants whose wives are not employed

Variable	<u>M7a</u>	<u>M7b</u>	<u>M7c</u>	<u>M7d</u>
Workplace breastfeeding policy (DDD)	-1.360 (0.919)	-1.045 (0.874)	-0.274 (1.032)	0.048 (2.468)
<i>Demographic covariates</i>				
Age (in years)	0.627 (0.471)	0.848 (0.443)*	0.837 (0.428)*	0.941 (0.401)**
Age ² (in years)	-0.009 (0.007)	-0.012 (0.006)*	-0.012(0.006)**	-0.014 (0.006)**
Number of children in household	-0.293 (0.376)	-0.263 (0.380)	-0.333 (0.363)	-0.296 (0.368)
Education (in years)	0.531 (0.166)***	0.472 (0.161)***	0.521 (0.165)***	
Race				
Black	-0.174 (1.237)	0.111 (1.329)	0.068 (1.277)	-0.067 (1.237)
Other	-0.022 (1.404)	-0.547 (1.030)	-0.540 (1.141)	-0.659 (1.105)
Marital Status				
Married				
<i>Economic covariates</i>				
Work experience (in years)	0.549 (0.062)***	0.524 (0.057)***	0.537 (0.058)***	0.542 (0.060)
Annual income (in 2000 \$USD)	0.297 (0.085)***	0.312 (0.087)***	0.305 (0.086)***	0.335 (0.090)***
Annual income of partner (in 2000 \$USD)	0.082 (0.172)	0.007 (0.173)	0.069 (0.165)	0.058 (0.171)
Average work hours per week	-0.220 (0.040)***	-0.218 (0.040)***	-0.211 (0.039)***	-0.214 (0.037)***
Average work hours per week of partner	0.018 (0.039)	0.026 (0.039)	0.025 (0.038)	0.030 (0.039)
Job type				
Blue Collar	-0.814 (0.740)	-1.273 (0.752)*	-1.289 (0.711)*	-1.366 (0.759)*
Childcare cost (in 2000 \$USD)	-0.980 (0.757)	-0.703 (0.769)	-0.650 (0.810)	-0.382 (0.813)
State unemployment rate (%)	6.974 (20.903)	-6.246 (25.389)	-4.718 (45.551)	14.644 (53.737)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	1972	1972	1972	1972

Note: Model 7a includes all covariates; 7b adds state dummies; 7c adds year dummies; and 7d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table 4.15: DDD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on married fathers with infants whose wives are employed differencing with married fathers with infants whose wives are not employed and single fathers with infants

Variable	<u>M8a</u>	<u>M8b</u>	<u>M8c</u>	<u>M8d</u>
Workplace breastfeeding policy (DDD)	-1.338 (0.924)	-1.160 (0.846)	0.214 (1.011)	0.050 (2.164)
<i>Demographic covariates</i>				
Age (in years)	0.560 (0.417)	0.723 (0.407)*	0.701 (0.413)*	0.765 (0.396)*
Age ² (in years)	-0.009 (0.006)	-0.011 (0.006)*	-0.011 (0.006)*	-0.012 (0.006)**
Number of children in household	-0.296 (0.414)	-0.290 (0.429)	-0.321 (0.395)	-0.266 (0.399)
Education (in years)	0.554 (0.148)***	0.523 (0.141)***	0.582 (0.146)***	0.538 (0.144)***
Race				
Black	-0.405 (1.05)	-0.265 (1.124)	-0.311 (1.078)	-0.419 (1.021)
Other	-0.180 (1.302)	-0.938 (0.933)	-0.939 (1.022)	-1.174 (1.017)
Marital Status				
Married	2.585 (1.443)*	2.605 (1.483)*	2.527 (1.425)*	2.399 (1.466)
<i>Economic covariates</i>				
Work experience (in years)	0.599 (0.057)***	0.579 (0.056)***	0.592 (0.057)***	0.594 (0.059)***
Annual income (in 2000 \$USD)	0.308 (0.083)***	0.316 (0.083)***	0.317 (0.084)***	0.347 (0.087)***
Annual income of partner (in 2000 \$USD)	0.072 (0.178)	-0.002 (0.183)	0.078 (0.180)	0.074 (0.186)
Average work hours per week	-0.210 (0.040)***	-0.205 (0.041)***	-0.196 (0.039)***	-0.197 (0.038)***
Average work hours per week of partner	0.019 (0.038)	0.033 (0.039)	0.030 (0.038)	0.033 (0.037)
Job type				
Blue Collar	-0.797 (0.733)	-1.279 (0.706)*	-1.293 (0.709)*	1.361 (0.700)*
Childcare cost (in 2000 \$USD)	-0.915 (0.733)	-0.667 (0.747)	-0.630 (0.805)	-0.382 (0.828)
State unemployment rate (%)	12.001 (24.121)	0.094 (29.104)	-0.528 (49.271)	17.428 (55.367)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	2145	2145	2145	2145

Note: Model 8a includes all covariates; 8b adds state dummies; 8c adds year dummies; and 8d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

When assessing the enforceability of the policy, results show that mothers residing in states with strict enforceability of policies are 15 days less absent when compared to the control group of married fathers with infants whose wives are unemployed and single fathers with infants (Table 4.16, M9d; Table 4.17, M10d). Finally, we do not find an impact on married fathers with infants whose wives are employed (Table 4.18, M11d; Table 4.19, M12d), similarly to M7 and M8. These results and covariate results are both in line with the DD models.

Table 4.16: DDD estimates as average marginal effects of the effect of strict and weak workplace breastfeeding legislation on total days absent on mothers with infants differencing with married fathers with infants whose wives are not employed

Variable	M9a	M9b	M9c	M9d
Strict workplace breastfeeding policy (DDD)	-4.713 (2.287)**	-13.221 (2.335)***	-9.951 (2.849)***	-15.062 (4.154)***
Weak workplace breastfeeding policy (DDD)	-11.666 (1.466)***	-10.362 (2.074)***	-6.413 (2.876)**	-0.843 (2.552)
<i>Demographic covariates</i>				
Age (in years)	2.242 (0.688)***	2.188 (0.700)***	2.110 (0.729)***	2.332 (0.758)***
Age ² (in years)	-0.033 (0.011)***	-0.032 (0.011)***	-0.031 (0.012)***	-0.034 (0.012)***
Number of children in household	-1.940 (1.109)*	-1.858 (1.163)	-1.819 (1.119)	-1.742 (1.140)
Education (in years)	1.060 (0.343)***	1.061 (0.364)***	1.269 (0.384)***	1.249 (0.377)***
Race				
Black	2.511 (1.708)	3.338 (2.018)*	3.256 (1.970)*	2.948 (1.968)
Other	1.307 (3.616)	-0.569 (3.062)	-0.979 (2.958)	-1.388 (2.77)
Marital Status				
Married	6.630 (2.401)***	5.362 (2.630)**	4.764 (2.73)*	5.060 (2.790)*
<i>Economic covariates</i>				
Work experience (in years)	1.168 (0.175)***	1.128 (0.176)***	1.146 (0.164)***	1.120 (0.165)***
Annual income (in 2000 \$USD)	0.588 (0.226)***	0.648 (0.241)***	0.665 (0.241)***	0.695 (0.248)***
Annual income of partner (in 2000 \$USD)	-0.797 (0.330)**	-1.065 (0.369)***	-0.992 (0.375)***	-1.008 (0.383)***
Average work hours per week	-0.623 (0.079)***	-0.612 (0.085)***	-0.605 (0.082)***	-0.596 (0.083)***
Average work hours per week of partner	-0.090 (0.059)	-0.031 (0.063)	-0.032 (0.060)	-0.033 (0.060)
Job type				
Blue Collar	-1.594 (1.743)	-1.649 (1.698)	-1.884 (1.786)	-1.916 (1.849)
Childcare cost (in 2000 \$USD)	0.144 (1.640)	-0.272 (1.652)	-0.092 (1.779)	0.042 (1.884)
State unemployment rate (%)	40.776 (41.170)	-43.837 (37.954)	-128.054 (65.332)*	-120.100 (81.873)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	2000	2000	2000	2000

Note: Model 9a includes all covariates; 9b adds state dummies; 9c adds year dummies; and 9d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01

Table 4.17: DDD estimates as average marginal effects of the effect of strict and weak workplace breastfeeding legislation on total days absent on mothers with infants differencing with married fathers with infants whose wives are not employed and single fathers

Variable	M10a	M10b	M10c	M10d
Strict workplace breastfeeding policy (DDD)	-4.818 (2.312)**	-13.176 (2.425)***	-8.651 (2.896)***	-15.384 (4.408)***
Weak workplace breastfeeding policy (DDD)	-11.764 (1.486)***	-11.117 (2.336)***	-6.018 (3.148)*	0.679 (4.648)
<i>Demographic covariates</i>				
Age (in years)	1.978 (0.699)***	1.958 (0.729)***	1.876 (0.772)**	2.0355 (0.796)**
Age ² (in years)	-0.031 (0.011)***	-0.030 (0.011)***	-0.029 (0.012)**	-0.031 (0.012)**
Number of children in household	-1.747 (1.098)	-1.693 (1.133)	-1.573 (1.060)	-1.493 (1.086)
Education (in years)	1.111 (0.286)***	1.147 (0.325)***	1.360 (0.347)***	1.309 (0.334)***
Race				
Black	1.417 (1.513)	2.016 (1.654)	1.986 (1.628)	1.641 (1.582)
Other	0.956 (3.262)	-1.460 (2.611)	-1.871 (2.508)	-2.231 (2.482)
Marital Status				
Married	7.155 (1.882)***	6.668 (1.978)***	6.268 (1.946)***	6.294 (1.980)***
<i>Economic covariates</i>				
Work experience (in years)	1.276 (0.164)***	1.213 (0.161)***	1.221 (0.150)***	1.208 (0.154)***
Annual income (in 2000 \$USD)	0.612 (0.203)***	0.671 (0.228)***	0.706 (0.231)***	0.742 (0.239)***
Annual income of partner (in 2000 \$USD)	-0.781 (0.305)**	-1.019 (0.336)***	-0.927 (0.344)***	-0.945 (0.349)***
Average work hours per week	-0.564 (0.078)***	-0.550 (0.081)***	-0.541 (0.078)***	-0.538 (0.077)***
Average work hours per week of partner	-0.104 (0.069)	-0.070 (0.070)	-0.074 (0.066)	-0.078 (0.066)
Job type				
Blue Collar	-1.400 (1.618)	-1.369 (1.513)	-1.620 (1.593)	-1.869 (1.641)
Childcare cost (in 2000 \$USD)	-0.061 (1.449)	-0.389 (1.476)	-0.313 (1.602)	-0.147 (1.742)
State unemployment rate (%)	47.840 (48.022)	-29.333 (41.816)	-122.282 (73.474)*	-116.578 (84.202)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	2173	2173	2173	2173

Note: Model 10a includes all covariates; 10b adds state dummies; 10c adds year dummies; and 10d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table 4.18: DDD estimates as average marginal effects of the effect of strict and weak workplace breastfeeding legislation on total days absent on married fathers with infants whose wives are employed differencing with married fathers with infants whose wives are not employed

Variable	<u>M11a</u>	<u>M11b</u>	<u>M11c</u>	<u>M11d</u>
Strict workplace breastfeeding policy (DDD)	-1.821 (0.100)*	-1.919 (0.985)*	-1.165 (1.168)	-1.113 (3.663)
Weak workplace breastfeeding policy (DDD)	-0.815 (1.622)	0.219 (1.104)	0.962 (1.126)	2.873 (4.149)
<i>Demographic covariates</i>				
Age (in years)	0.629 (0.470)	0.856 (0.443)*	0.844 (0.427)**	0.953 (0.405)**
Age ² (in years)	-0.009 (0.007)	-0.012 (0.006)*	-0.012 (0.006)**	-0.024 (0.006)**
Number of children in household	-0.299 (0.373)	-0.266 (0.376)	-0.337 (0.360)	-0.283 (0.371)
Education (in years)	0.530 (0.166)***	0.468 (0.162)***	0.516 (0.166)***	0.481 (0.169)***
Race				
Black	-0.204 (1.215)	0.086 (1.321)	0.052 (1.274)	-0.099 (1.237)
Other	0.017 (1.431)	-0.454 (1.017)	-0.455 (1.121)	-0.671 (1.103)
Marital Status				
Married				
<i>Economic covariates</i>				
Work experience (in years)	0.551 (0.062)***	0.525 (0.058)***	0.538 (0.058)***	0.542 (0.060)***
Annual income (in 2000 \$USD)	0.298 (0.084)***	0.313 (0.087)***	0.306 (0.086)***	0.334 (0.091)***
Annual income of partner (in 2000 \$USD)	0.086 (0.172)	0.015 (0.176)	0.077 (0.167)	0.051 (0.173)
Average work hours per week	-0.220 (0.040)***	-0.218 (0.040)***	-0.210 (0.039)***	-0.202 (0.038)***
Average work hours per week of partner	0.019 (0.039)	0.028 (0.039)	0.026 (0.038)	0.033 (0.038)
Job type				
Blue Collar	-0.828 (0.740)	-1.286 (0.755)*	-1.295 (0.775)*	-1.388 (0.764)*
Childcare cost (in 2000 \$USD)	-0.984 (0.757)	-0.717 (0.769)	-0.656 (0.807)	-0.363 (0.818)
State unemployment rate (%)	7.933 (21.100)	-4.118 (25.001)	-1.970 (45.251)	6.764 (50.593)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	1972	1972	1972	1972

Note: Model 11a includes all covariates; 11b adds state dummies; 11c adds year dummies; and 11d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table 4.19: DDD estimates as average marginal effects of the effect of strict and weak workplace breastfeeding legislation on total days absent on married fathers with infants whose wives are employed differencing with married fathers with infants whose wives are not employed and single fathers

Variable	M12a	M12b	M12c	M12d
Strict workplace breastfeeding policy (DDD)	-1.851 (0.977)*	-2.025 (0.950)**	-0.739 (1.117)	-1.614 (2.996)
Weak workplace breastfeeding policy (DDD)	-0.730 (1.660)	0.066 (1.092)	1.488 (1.125)	3.742 (3.633)
<i>Demographic covariates</i>				
Age (in years)	0.561 (0.416)	0.732 (0.406)*	0.710 (0.412)*	0.775 (0.399)*
Age ² (in years)	-0.009 (0.006)	-0.011 (0.006)*	-0.011 (0.006)*	-0.012 (0.006)**
Number of children in household	-0.301 (0.409)	-0.296 (0.424)	-0.331 (0.392)	-0.256 (0.400)
Education (in years)	0.552 (0.148)***	0.519 (0.141)***	0.577 (0.147)***	0.532 (0.144)***
Race				
Black	-0.434 (1.022)	-0.276 (1.115)	-0.313 (1.070)	-0.444 (1.015)
Other	-0.137 (1.324)	-0.857 (0.925)	-0.865 (1.008)	-1.170 (1.018)
Marital Status				
Married	2.587 (1.437)*	2.594 (1.481)*	2.513 (1.422)*	2.417 (1.458)*
<i>Economic covariates</i>				
Work experience (in years)	0.601 (0.057)***	0.580 (0.056)***	0.594 (0.058)***	0.595 (0.059)***
Annual income (in 2000 \$USD)	0.309 (0.082)***	0.317 (0.083)***	0.318 (0.084)***	0.345 (0.088)***
Annual income of partner (in 2000 \$USD)	0.077 (0.179)	0.007 (0.184)	0.086 (0.181)	0.067 (0.187)
Average work hours per week	-0.211 (0.040)***	-0.206 (0.041)***	-0.197 (0.039)***	-0.196 (0.038)***
Average work hours per week of partner	0.020 (0.038)	0.034 (0.039)	0.031 (0.038)	0.036 (0.037)
Job type				
Blue Collar	-0.812 (0.738)	-1.288 (0.708)*	-1.297 (0.712)*	-1.389 (0.706)**
Childcare cost (in 2000 \$USD)	-0.920 (0.731)	-0.682 (0.745)	-0.637 (0.798)	-0.367 (0.826)
State unemployment rate (%)	12.770 (24.263)	2.176 (28.703)	2.257 (49.305)	8.400 (52.098)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trends	No	No	No	Yes
Number of observations	2145	2145	2145	2145

Note: Model 12a includes all covariates; 12b adds state dummies; 12c adds year dummies; and 12d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

VII. DISCUSSION AND CONCLUSION

We have assessed the impact of breastfeeding legislation on absenteeism and have shown a substantial reduction in absenteeism of employed mothers with infants. We estimate that the policy reduces absences by approximately 9 to 10 days per year if we group treatment states as one group that require or encourage the policy. When addressing the heterogeneity in treatment states and splitting the treatment states into weak and strict legislation enforceability, we find that strict enforceability reduces mothers' absences by approximately 15 to 16 days per year, while there is no effect of weakly enforceable legislation on absent days. However, we do not find a spillover effect on fathers as hypothesized.

There have been no previous studies evaluating the impact of workplace breastfeeding interventions on absent days in the US, therefore we can only compare our estimates with other interventions targeted at reducing absenteeism. Ziebarth and Karlsson (2010) estimate that a 1996 German sickness leave reform cutting statutory sick pay from 100% to 80% of forgone gross wages reduced overall sickness absenteeism for private sector employees by approximately 30% when only considering industries with strict enforcement. This finding is similar to our estimate of 16 days per year (36% per year) for strict enforceability states. Raff and Summers (1987) show that an economic incentive raising wages to a five-dollar-a-day minimum reduced absenteeism by 7.5% per day or 9 days per year at the Ford Motor Company. The policy had weak enforceability, and is in line with our result of 10 days for the models that do not distinguish level of workplace breastfeeding enforceability. Stearns and White (2016) estimate that a paid sick leave mandate allowing full-time employees to accrue one hour of sick day for every 30-40 hours worked implemented in two US states reduced absenteeism by 18% per year (Stearns and White, 2016). This result is also similar to our result of 10 days per year (21% per year). Bertera (1990) estimate a small impact of 0.7 days for a health promotion program aimed to reduce risky behaviours among employees through counselling, group activities, and introducing facilities such as fitness equipment for weight management; however, many intervention sites did not have such equipment during the time of the study and some control sites initiated parts of the program during the study period. Thus Bertera (1990) note that they may be underestimating the impact of the intervention.

Paola et al. (2014) use a binary measure of absenteeism and Olsson et al. (2015) use measures of absence spell length and sickness incidence. Therefore, their findings are not directly comparable.

While the effects on absenteeism might seem large, it is not surprising given the specific sample we are looking at. The sample mean for total absent days is 44 days in our subsample of mothers with newborn infants in their first year after child birth. The employee samples analysed by previous studies have much lower mean absenteeism of approximately 5 days (Bertera, 1990; Pollak, 2017; Ziebarth and Karlsson, 2010). Mothers with new born infants face high pressure on their time, and are therefore difficult to compare with the sample population of employees used in previous studies.²

The findings of this research should be considered in light of its limitations. Firstly, we do not directly observe breastfeeding in our sample. Although this does not necessarily bias our results, we cannot show the causal pathway by which workplace breastfeeding policy affects absenteeism through breastfeeding; however, we speculate that the policy encourages mothers to breastfeed; therefore, the health benefits of breastfeeding to the mother and the infant decreases the likelihood of the infant falling sick and decreases mothers' absent days. Secondly, we only have eight states that have weak enforceability while a majority of states have strict enforceability of the policy. Although there is low variation across states, we are able to show that our results remain similar when estimating through CEM (Appendix 2F). Thirdly, a possible limitation is that we do not control for variation of holiday entitlements across states as such entitlements are a matter of agreement between the individual employee and his/her employer in the US (US Department of Labor, 2017a). Therefore, our estimated effect may be capturing reduced absenteeism from holiday without taking into account entitlements offered by firms resulting in higher estimates. However, we include a variable that captures the variation across states of paid family leave legislation that offers leave to individuals in addition to the federal legislation, FMLA implemented in 1993.

² As a robustness check, in order to investigate the impact of high outliers with respect to absent days, we estimated an alternate specification where we exclude 2% of observations with highest values of total absent days, following Ziebarth and Karlsson (2010). The magnitude of the observed impact does not change significantly (results available from the authors upon request).

While only ten out of 51 states have improved upon FMLA during our study period, the addition of this variable does not alter our results.³

Despite these caveats, this study provides sound evidence that workplace breastfeeding legislation has an impact upon mothers and has several policy implications. For mothers, our results suggest that the policy seems to have enabled a better coordination of work and family responsibilities. State-enacted workplace breastfeeding legislation contributes to a family-friendly work environment, and normalizes breastfeeding at the workplace and in daily life. This contributes to lowering the stigma surrounding breastfeeding, as called for by the US Department of Health and Human Services (US Department of Health and Human Services, 2011). Furthermore, workplace breastfeeding policies generally foster a family-friendly work environment, and reduce the push and pull mothers may experience between employment and family responsibilities. Our results also seem to suggest that workplace breastfeeding policies may contribute to mitigating gender inequalities by incentivizing mothers to be less absent from work. In the long term, this in itself translates into better career prospects and higher wages for women in the workplace. The US Bureau of Labour Statistics reported that working wives contribute up to 37% of household income (US Bureau of Labour Statistics, 2014). Therefore, this policy also has the potential to increase household income in the US.

Secondly, our findings also have implications for policy makers. States clearly benefit from costs saved by reducing absenteeism among mothers. However, studies have shown that only 40% of working mothers reported having access to facilities and break time to express milk at work (Kozhimannil et al., 2016). The main reasons for a lack of access to breastfeeding facilities are that employees are not aware of workplace breastfeeding policies and employers do not recognize the importance of breastfeeding for working mothers (Kozhimannil et al., 2016). Our results suggest that the effectiveness of these policies is indeed stronger in the context of required interventions. Therefore, policy makers need to additionally tighten policies by mandating compliance or even implementing financial penalties to employers who do not comply with state laws, financial incentives for employers that implement and report benefits of such programs, and

³ Refer to Appendix 2E for full details including results.

educational campaigns targeted at firms to increase awareness of the existence of such laws and the health and economic benefits of breastfeeding.

Finally, the results are also encouraging for firms and have benefits for the wider economy where the cost of workplace absenteeism is estimated to cost the US economy \$225.8 billion (CDC Foundation, 2015). The reduction in absenteeism for mothers may lead to higher productivity among employees in the longer term. Encouraging mothers to work and be less absent may also have positive impacts on firm's performance and morale. For example, reducing absenteeism by approximately 10 days can translate into productivity savings of \$927.2 per mother per year and \$1483.52 per mother per year in states with strict enforceability, where the policy reduces absent days by 16 days.⁴ Therefore, although implementing the policy may initially induce costs for firms, the positive benefits may outweigh the initial costs of the policy. Studies have shown that for every \$1.00 spent on employee health programs, health care costs fell by \$3.27 and absenteeism costs fell by \$2.73 (Baicker et al., 2010). However, further research is needed to accurately measure the overall economic effects of such a policy through a cost-benefit analysis. Furthermore, firms with higher gender diversity have investment returns above the industry mean (Rock and Grant, 2016). Therefore, reducing absenteeism for mothers has implications for firms that can impact the wider economy where the labour force participation rate in the US is approximately 58% female and of those women, mothers with young children make up approximately 61% of the female labour force (US Bureau of Labour Statistics, 2014). Thus, it is important to implement policies such as workplace breastfeeding legislation that can have health and economic benefits for families, firms, and the wider economy.

⁴ We are able to monetize absent days into productivity savings using: productivity savings = employee hourly wage rate * total saved hours. We use the average hourly wage rate of mothers within our sample, which is \$11.59. Total saved hours = total saved days * 8. Total saved days = 10 days for mothers in all treatment states and 16 days for mothers in strict policy states.

CHAPTER 5 : IMPACTS OF US WORKPLACE BREASTFEEDING LEGISLATION ON THE WITHIN-COUPLE EARNINGS GAP

ABSTRACT

Gender pay parity is not only a moral imperative but has also been identified as a key enabler for economic growth and organizational performance. The lack of workplace policies supporting women and mothers has been identified as a barrier to narrow the pay gap. Higher gender pay gaps can be partly attributed to career interruptions due to child birth and the unequal distribution of childcare responsibilities within the household where mothers typically put in more hours of housework and childcare in comparison to their partners. Therefore, mothers have lower incomes compared to their male partners resulting in the lower bargaining positions of mothers within the household. The extent to which maternity and childcare responsibilities affects households is influenced by the intra-household bargaining process and the existence of work-life balance policies. In this chapter, we assess one such policy within the US, state-mandated workplace breastfeeding policies that enable mothers to express milk within the workplace and its short- and long- term impacts on the within-couple earnings gap between matched couples. We hypothesize that the policy has an effect on the within-couple earnings gap by reconciling mothers' employment and childcare responsibilities. The policy has been introduced in 25 out of 51 states in the US since 1995, enabling a better environment for mothers in the workplace. Our main aim is to investigate the impact of the policy on the evolution of the earnings' gap over time. We do so by exploiting variation at three levels: i) across states and time on the introduction of the policy; ii) within states regarding exposure to the policy; iii) and across households on timing of birth. We use the Panel Study of Income Dynamics over the period of 1990-2011 and follow couples two years before child birth up to a maximum of 21 years post birth. We base our study in the collective labour supply model and therefore, include controls to measure the relative bargaining positions of mothers and fathers within the household. We find that the policy reduces the within-couple earnings gap by approximately 25% of the gap present due to child birth. The findings provide evidence that workplace breastfeeding policies effectively reduce the within-couple gender earnings gap thus improve the bargaining positions of mothers as economic characteristics become

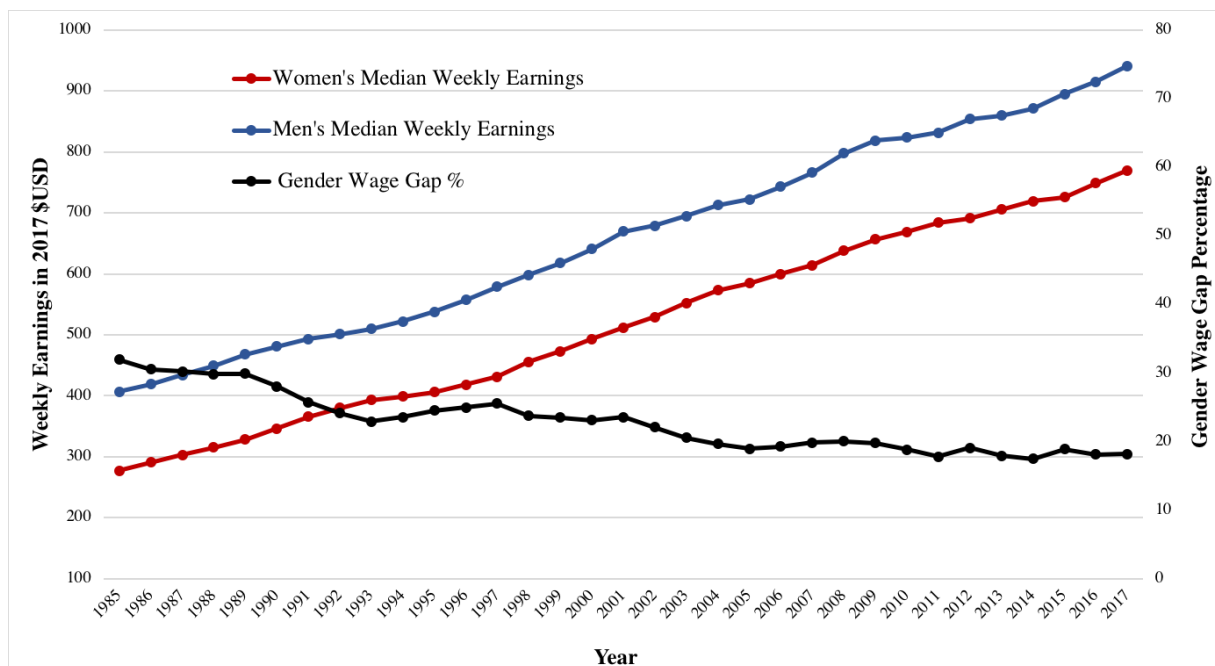
more balanced within the household and that such policies may play a role in alleviating gender inequality in the context of the US.

I. INTRODUCTION

The United States (US) is characterized by a lack of workplace policies supporting women and high gender pay gaps. Women earn approximately 79.6% of men's earnings (US Department of Labor, 2017b). While it is not the largest among high-income countries, it is relatively high compared to its neighbour, Canada, where women earn 87% of men's earnings (Statistics Canada, 2017), as well as Nordic countries where there are mandates for a wide range of family-friendly policies such as Denmark (15% gender gap) and Sweden (14% gender gap) (European Commission, 2017). However, other high-income countries such as the United Kingdom (UK), Germany, and Japan have higher gender pay gaps of 21%, 22%, and 26%, respectively (European Commission, 2017; OECD, 2016).

Although the gender pay gap has decreased in the US from 32% in 1985 to approximately 20% in 2017, women's earnings continue to lag far below men's earnings (Figure 5.1). One of the main reasons for the gender gap in earnings can be largely attributed to the wage penalty due to child birth.

Figure 5.1: Women and men's weekly median weekly earnings in the US from 1985-2017, including the gender wage gap percentage



Note: Data source from the US Department of Labour, 2017.

Having a child can lower parents' wages in several ways: (1) parents may forgo opportunities to gain additional and valuable work experience (2) previous skills from past jobs may depreciate (3) parents may invest less in their jobs if they expect to drop out of the labour force (4) children may have an effect by limiting parents' work effort, where more parents may switch to part-time jobs or lower paying jobs with greater flexibility and (5) the institutional features of the labour market may not align with parents' childcare and employment responsibilities. However, these effects strongly affect women more than men and, therefore, impact on the gender pay gap (Baum, 2002; Becker, 1985; Corcoran and Duncan, 1979; Fernández-Kranz et al., 2013; Mincer and Ofek, 1982; Munasinghe et al., 2008; Sandell and Shapiro, 1980; Waldfogel, 1998b). Indeed, the effect of child birth on mothers' wages is well-established in the literature (Anderson et al., 2002, 2003; Baum, 2002; Beblo et al., 2009; Dias et al., 2018; Fernández-Kranz et al., 2013; Fitzenberger et al., 2013; Gupta and Smith, 2002; Kleven et al., 2018; Millimet, 2000; Napari, 2010; Sasser, 2005; Simonsen and Skipper, 2012; Waldfogel, 1998a, 1998b). Waldfogel (1998a) finds that the wage gap for mothers compared to non-mothers is 20 percentage points while mothers earn on average 70% of men's wages and non-mothers earn 90% of men's wages in the US. Therefore, mothers earn the least compared to other women and all men. In fact, evidence has shown that there is no wage penalty to have children for fathers and some studies find that married fathers with children tend to earn more than other men (Waldfogel, 1998a).

The wage penalty due to child birth largely experienced by mothers can be explained by the unequal distribution of childcare responsibilities within the household where the responsibility largely falls on the mother (Angelov et al., 2016; Baum, 2002; Munasinghe et al., 2008; Napari, 2010; Sasser, 2005) and the existence of inadequate workplace policies. Firstly, the extent to which childcare responsibilities are distributed between parents is determined by the intra-household bargaining process, which is more pronounced in the presence of young children, especially infants (Garcia et al., 2009; Goux et al., 2014). The intra-household bargaining process is determined by household members' bargaining power where each member has a comparative advantage in determining household behaviour and demand (Chiappori, 1988; Chiappori et al., 2002). Therefore, as a mother's wage decreases in comparison to her partner's due to child birth, her bargaining position within the household worsens.

Secondly, workplace environments and practices might also affect mothers more disproportionately compared to fathers and thus affect the extent to which child birth affects mothers' wages. Indeed, women might be more affected due to discriminatory practices in the workplace (Darity and Mason, 1998; Hultin and Szulkin, 1999; Kleven et al., 2018) reducing their career progression and job opportunities that will be ultimately reflected on their earnings. Also by carrying a child, giving birth and breastfeeding, mothers will inevitably be more absent from the workplace (Angelov et al., 2013; Joshi, 1998).

Workplace based policies are therefore particularly important in mitigating discriminatory practices and key instruments to improve mothers' pay and mitigate the pay gap. However, adequate workplace policies to support mothers are lacking and evidence is scant on the efficacy of workplace policies as previous studies have largely focused on the effect of parental leave policies. While parental leave policies are important, they tend to be largely reserved for mothers rather than fathers thus generating an additional imbalance within households with regards to childcare responsibilities. Therefore, leave policies do little to reconcile childcare and employment responsibilities as mothers are encouraged to take a career interruption after child birth and stay at home. Thus, evidence has found that maternity leave mandates do little to boost mothers' wages, mitigate their wage penalty due to child birth, and may be ultimately exacerbating the gender pay gap (Christofides et al., 2013; Edin and Gustavsson, 2008; Ejrnæs and Kunze, 2013; Gupta et al., 2008; Heywood et al., 2007; Joseph et al., 2013; Ruhm, 1998). We hypothesize that policies that allow mothers to better combine employment and childcare may be a better avenue to mitigate the pay gap between mothers and fathers by enabling a better work environment when mothers have children. These policies incentivize mothers to go into work such as childcare subsidies and flexible working arrangements. Such initiatives may better promote equality within the household and workplace; therefore, in principle may reduce the gender pay gap. However, the evidence is limited in regards to their effects on gender pay gaps.

Therefore, the objective of this study is to look at one such policy, a workplace breastfeeding policy, and its short- and long-term impacts on the within-couple gender earnings gap. State-mandated workplace breastfeeding policies have been implemented in a selective group of 25 out of 51 states in the US in a staggered way during our study period of 1990-2011. Workplace

breastfeeding policies require or encourage employers to provide a separate room for mothers to express milk during the workday. Such policies that encourage mothers to combine employment and childcare are an important step towards gender equality in the workplace. A survey by The Washing Post revealed that mothers often breastfeed in public locations such as under desks, toilet stalls, storage rooms, and one mother in the military pumped milk in the woods (Joyce, 2017). Therefore, it is necessary to accommodate mothers who wish to continue nursing and this legislation alleviates the difficulties associated with continued breastfeeding when returning to work postpartum. Furthermore, approximately 30% of mothers employed during pregnancy return to work within only three months, and studies have found that employment is one of the biggest barriers to breastfeeding (Hawkins et al., 2007; Laughlin, 2011; Mandal et al., 2014). There has been some research showing the benefits of workplace breastfeeding policies on breastfeeding rates (Hawkins et al., 2013; Kogan et al., 2008; Smith-Gagen et al., 2014); however, to the best of our knowledge, we are not aware of robust research evidence on the impact of workplace breastfeeding policies on the within-couple gender earnings gap or earnings on household members. In fact, Abdulwadud and Snow (2012) have highlighted the need for causal inference on workplace breastfeeding interventions. Such evidence is of key relevance as alleviating gender inequality in pay can be a driving factor in economic growth and prosperity (World Economic Forum, 2017). Therefore, it is imperative for the wider economy to reduce the gender pay gap.

Workplace policies that encourage parents to work postpartum such as breastfeeding policies may impact the gender pay gap through reductions in absenteeism or by allowing mothers to return to work without a lengthy work interruption (Singh et al., 2018), and therefore, reduce discriminatory behaviour in the workplace by promoting a more family-friendly workplace environment. While we cannot observe these channels, we hypothesize that the reduction in absent days may translate into higher wages for the mother, thus reducing the within-couple earnings gap and improving her bargaining position within the household. A more family-friendly work environment will not only allow mothers a greater opportunity to work but will also encourage fathers to take a larger role in childrearing and household work by spending more time at home while mothers spend more time at work. This would make household economic characteristics more balanced such as earnings between mothers and fathers (i.e. reduce the within-couple earnings gap). Indeed, many studies have found that government policies such as unilateral divorce laws, legalization of abortion, and

the introduction of birth control can improve the bargaining power of women (Altindag and Ziebarth, 2017; Chiappori et al., 2002; Genadek et al., 2015; Gray, 1998; Oreffice, 2007; Stevenson, 2007, 2008; Ward-Batts, 2008).

Although we are unable to determine the specific intra-household bargaining process between couples, we are able to identify the short- and long-term causal impacts of the policy on the within-couple earnings gap. We do so by exploiting variation at three levels: i) across states and time on the introduction of the policy; ii) within states regarding exposure to the policy; iii) and across households on the timing of birth. Through difference-in-difference-in-differences, we exploit the variation of policy introduction across states and years as well as exposure to the policy within states (determined by child birth). Following Angelov et al. (2016) and Hardoy et al. (2017), we further disentangle the effect of the policy from the effect of child birth exploiting variation across couples on the timing of child birth.

This study adds to the literature in two main ways. Firstly, the evidence is scant to the extent of how workplace policies can affect gender pay gaps. While there is some evidence on family-friendly policies and their impacts on the gender pay gap, the evidence is largely limited to policies that disproportionately impact mothers rather than fathers and those that incentivize mothers to stay at home such as parental leave policies. Therefore, we contribute to literature by looking at a different type of workplace policy that incentivizes mothers to do the opposite—stay at work like their male counterparts—and better combine employment and childcare responsibilities and therefore minimize the impact of child birth on their absences from work relative to their partners. We are able to estimate the effect of one such policy, a workplace breastfeeding policy, on the within-couple earnings gap by basing our identification strategy in the collective labour supply model allowing us to look at each household member's earnings while controlling for factors that may increase/decrease their bargaining positions within the household. Previous studies on workplace family-friendly policies such as parental leave fail to control for unobserved and observed attributes of the spouse and the intra-household bargaining process that can affect the take-up of the policy. Secondly, we are also the first to use a robust identification strategy that allows us to isolate the impact of the policy from the impact of having a child where previous studies estimating impacts of family-friendly policies have failed to control for the impact of child

birth that can affect labour market outcomes. Therefore, we contribute to a broader literature that focuses on workplace family-friendly policies and their impact on gender gaps. We estimate causal effects by exploiting a rich dataset that allows us to characterize households and individual member's characteristics as well as exploit variation in the introduction of the policy across states and years, the timing of child birth, and methods to tease out the child birth effect from the policy effect. The results of this study provide important empirical evidence on the efficacy of workplace policies to mitigate the effect of child birth on earnings, the economic benefits of workplace policies, and provide insight into the intra-household bargaining process between mothers and fathers.

The remainder of this chapter is as follows: section two discusses related literature; section three presents the policy background, section four presents the identification strategies used in this study, section five presents the data, section six presents results, and section seven concludes.

II. RELATED LITERATURE

We first discuss previous empirical evidence on the effect of child birth on mother's wages and the gender earnings gap. We then discuss two types of policies that can reduce the gender earnings gap—family friendly policies to support women in the workplace and policies that can improve the bargaining position of women through an increase in labour supply.

A. The Effect of Child Birth on Parents' Labour Market Outcomes

The effect of child birth on parents' labour market outcomes is clear in the literature (Anderson et al., 2002, 2003; Baum, 2002; Beblo et al., 2009; Bertrand et al., 2010; Fernández-Kranz et al., 2013; Fitzenberger et al., 2013; Gupta and Smith, 2002; Millimet, 2000; Napari, 2010; Sasser, 2005; Simonsen and Skipper, 2012; Waldfogel, 1998a, 1998b). Several studies find that there is a “family gap” in income and wages where women with children have significantly lower wages compared to women without children (Anderson et al., 2002, 2003; Budig and England, 2001; Fernández-Kranz et al., 2013; Fitzenberger et al., 2013; Gupta and Smith, 2002; Lundberg and Rose, 2000; Simonsen and Skipper, 2012; Waldfogel, 1998a, 1998b). In the US, this penalty is

approximately 20% for women with children compared to women without children while married men with children often earn more than other men (Waldfogel, 1998a). Therefore, it is especially important in the US context to implement a family-friendly policy that targets specifically mothers.

Previous studies have shown that the estimated wage loss for mothers due to having a first child is approximately 6% within the US (Anderson et al., 2002; Budig and England, 2001; Waldfogel, 1998a). Baum (2002) examine the effect of work interruptions to give birth on women's wages in the US and find that such interruptions reduce wages temporarily for the first two years on average of approximately 2-3% per year of interrupted work; however, Baum (2002) finds that this effect diminishes if mothers return to their pre-birth employers. Similarly, Napari (2010) finds significant effects of work interruptions on women's wages but in the Finnish private sector. Mothers who go on leave due to child birth for less than two years have a significantly smaller wage penalty compared to mothers who are on leave longer (Napari, 2010). Furthermore, for mothers who take leave of less than two years do not experience a "family gap" in wages compared to non-mothers after returning to work (Napari, 2010).

Anderson et al. (2003) and Gupta et al. (2002) find that the penalty of having a child on wages is most prominent when mothers first return to work postpartum and Fernández-Kranz (2013) find that the dip in wages takes an average of nine years to recover to pre-birth wages. Lundberg and Rose (2000) further find that having children not only affects mothers' wages but also their work hours while fathers have an opposite effect, their wages and work hours increase. However, for couples where the mother continues to work without long interruptions due to child birth, there is no decrease in mother's wages, although father's labour supply decreases (Lundberg and Rose, 2000). Fitzenberger et al. (2013) additionally estimate age-specific employment effects of first child birth comparing mothers who had a first birth at a certain age to mothers who delayed a first birth. Fitzenberger et al. (2013) show that there is a pronounced and significant employment loss, defined as dropping out of the labour force, due to having a child during the first year after birth at 81 to 50 percentage points. In the second year after child birth, the employment loss is 30 percentage points and three years after birth, it is 20 percentage points (Fitzenberger et al., 2013). Although the employment loss decreases over the first five years after child birth, it never diminishes to zero (Fitzenberger et al., 2013). Simonsen and Skipper (2012) also find that Danish

mothers earn approximately 4 to 5% less an hour due to having a child and that this effect is driven by mothers' increased absences from the workplace; however, fatherhood increases fathers' wages by approximately 4%. Finally, Bertrand et al. (2010) investigate the divergence in earnings for male and female MBAs and find that at the beginning of their careers, male and female MBAs have similar labour incomes. However, the male MBA advantage in earnings increases to 30 log points after 5 years and doubles to 60 log points after 10 to 16 years, compared to female MBAs (Bertrand et al., 2010). Bertrand et al. (2010) find that 84% of the gender gap can be explained by differences in grades, career interruptions due to children, and differences in weekly hours worked. However, the adverse impact of having children on female earnings is not found for women with lower-earning husbands (Bertrand et al., 2010).

In terms of wage gaps between mothers and fathers, Angelov et al. (2016), Hardoy et al. (2017), Millimet (2000) and Kleven et al. (2018) all find significant impacts of parenthood on the within-couple income gap. Angelov et al. (2016) investigate the impact of parenthood on the within-couple gender wage and income gap comparing within-couple differences in wages and income from two years before birth up to 18 years after birth of the first child on a sample of Swedish couples from 1986 to 2008. Angelov et al. (2016) use covariates measured at two years pre-birth in their outcome variables, and distributional parameters also measured two years pre-birth such as differences in education and age. Angelov et al. (2016) find that during the birth year of the child, the within-couple income gap increases by 135 log points or 284 percentage points compared to the pre-birth income gap with estimates being higher at 237 log points one year after the birth of the child. This study also finds that 15 years after the birth of the first child, there is still an increase in the within-couple income gap of 32 percentage points and 10 percentage points for wages.

Following a similar identification strategy to Angelov et al. (2016), Hardoy et al. (2017) investigate the within-couple gap in management in Norway using the within-couple management gap and distributional parameters such as differences in education, age, and work experience measured at two years pre-birth as controls. Hardoy et al. (2017) similarly find that the within-couple gender gap increases significantly after the birth of the first child and the gap increases by approximately 5 percentage points compared to the pre-birth gap by nine years after child birth. Millimet (2000)

similarly estimate the within-couple wage differential in the US using the Panel Study of Income Dynamics and find that in younger households where the wife is 21 to 30 years old, the effect of having a child increases mothers' time at home and decreases the mother's and father's labour supply. In older households where the wife is 35 to 49 years old, the effect of having a child also increases mothers' time at home, decreases her labour supply and job tenure for both mothers and fathers (Millimet, 2000). Notably, Millimet (2000) finds that if an average household had one less child, the wage gap would be reduced by 9.5%. Kleven et al. (2018) substantiate these findings by showing that the gender gap is largely due to children and mothers face workplace discrimination primarily due to child birth. Kleven et al. (2018) further find that the child penalty for mothers' earnings is approximately 20%. They also find negative impacts of having a child on several other labour market outcomes including labour force participation and hours worked; however, find that fathers are largely unaffected (Kleven et al., 2018).

In summary, previous literature has highlighted the considerable effects of child birth on mothers' labour market outcomes such as wages, employment rates, and hours worked where many studies find that the impact on wages is highest in the first year after child birth.

B. The Effect of Family-Friendly Policies on Wages and the Earnings Gap

Due to the negative effects of child birth on mother's wages and labour market outcomes, there have been several studies looking at the impact of workplace family-friendly policies on wages and the gender wage gap. However, the literature has mainly focused on policies that encourage mothers to be absent from work such as maternity leave policies in the US and Europe. There are some but limited studies on workplace policies that encourage parents to work focusing on childcare and flexible working arrangements.

Waldfogel (1998a) states that maternity leave may increase mothers' wages by increasing women's retention rates and their work experience thus job tenure. Indeed, Waldfogel (1998a) finds that maternity leave reduces the parenthood wage gap for mothers. However, several studies have found an adverse impact of maternity leave on women's wages, which may contribute to exacerbating the gender and family gap in pay for mothers (Christofides et al., 2013; Edin and

Gustavsson, 2008; Ejrnæs and Kunze, 2013; Gupta et al., 2008; Heywood et al., 2007; Joseph et al., 2013; Ruhm, 1998). Finally, studies by Waldfogel (1999) and Baum (2003) find no effect, further confirming that maternity leave may not be a family-friendly policy that is beneficial to mothers.

Waldfogel (1998a) evaluates the impact of maternity leave legislation in the US and Britain and finds that leave protecting mothers' jobs postpartum has a positive wage effect for mothers offsetting the family gap in pay. Waldfogel (1998a) finds that women who have access to leave are more likely to return to their previous employers postpartum and that this effect is highest 2 years after child birth; however, it diminishes to having no effect 8 years after child birth. For those mothers that take leave and return to the same employer, the wage premium for mothers in the US is 6% (Waldfogel, 1998a). However, several studies find a negative impact of maternity leave on women's wages.

Ruhm (1998) investigates the impact of paid parental leave in nine European countries from 1969 to 1993 on mothers using men as a control group on the gap between male and female labour market outcomes such as employment and earnings. Ruhm (1998) finds that paid parental leave increases women's employment rates, however, decreases wages when mothers take an extended leave, supporting Baum (2002) and Napari (2010). For example, entitlement to short periods of leave of up to 3 months increases employment ratios for women by 3 to 4% and has little effect on wages; however, extended leave decreases hourly earnings by 3% (Ruhm, 1998). Similarly, Ejrnæs and Kunze (2013) find that maternity leave decreases wages by 3 to 5.7% per year of leave. Ruhm (1998) attributes these negative wage effects to extended absences of mothers and depreciations in work experience. This is supported by Edin and Gustavsson (2008) who find an adverse effect of work interruptions due to maternity leave on mother's skill depreciation. A year of unemployment results in a skill depreciation of approximately 5% (Edin and Gustavsson, 2008).

Another reason that paid leave has negative effects for mothers is that paid leave is costly to employers, therefore, mothers face an implicit reduction in their wages (Heywood et al., 2007). For example, Heywood et al. (2007) finds that family-friendly practices in the UK such as job share, leave, and time off lower earnings by approximately 13 to 25% and these wage reductions

may cover the employers' costs to implement such practices. Therefore, offering extended leave may have produced a "system-based glass ceiling" where mothers take longer leaves compared to fathers, mothers select into lower paying jobs in the public sector and therefore, do not reach the highest paid positions (Angelov et al., 2016; Gupta et al., 2008). In fact, Gupta et al. (2008) also find that while Nordic countries offer extended paid leave for mothers that increases female labour participation, such leave has negative effects on women's wages producing a "glass ceiling". Christofides et al. (2013) also find that the gender wage gap is higher in countries where there are "glass ceilings" and that the gender pay gap reflects the institutional features and policies offered in each country.

Additionally, there have been many studies on the impact of the Family and Medical Leave Act of 1993 (FMLA) in the US that guarantee unpaid job-protected leave of up to 12 weeks for mothers. Although this legislation provides some protection for mothers, the policy is relatively weak as it provides only unpaid leave and so some mothers may return to work without taking leave as they cannot afford to be out of the labour force (Baum, 2003). For example, Baum (2003) estimates that the FMLA had little and insignificant results on the employment and wages of mothers using a DDD framework. Similarly, Waldfogel (1999) also find that the FMLA did not have an effect on women's wages and employment.

With regards to policies that enable parents to better combine employment and childcare, there have been some studies showing the effect of childcare subsidies on mothers' employment outcomes such as labour force participation and early return to work (Gustafsson and Stafford, 1992; Herbst, 2010; Huffman et al., 2017; Leibowitz et al., 1992; Lokshin, 2004; Tekin, 2007). Gustafsson and Stafford (1992) find that public childcare centres in Sweden are associated with increased market work of mothers with children. Similarly, Herbst (2010) and Tekin (2007) find positive impacts on mother's labour force participation due to childcare subsidies and decreases in the price of childcare, respectively. Lokshin (2004) finds that decreases in childcare costs have a positive effect on mothers' labour force participation and use of formal childcare. Although this study does not specifically look at mothers' earnings as an outcome, Lokshin (2004) speculates that the use of formal childcare and decreased childcare costs can increase mothers' working hours and therefore, her wages. However, Huffman et al. (2017) find that there are differential gains

from childcare policies where employees in lower wage distributions are more likely to benefit compared to higher wage workers.

Finally, there is some but limited evidence that show a positive impact of flexible work schedules and working hours on the earnings of women and men (Gariety and Shaffer, 2001; Johnson and Provan, 1995; Weeden, 2005). Gariety and Shaffer (2001) use the US Current Population Survey and find that flexible work schedules are associated with higher wages for both men and women by approximately 7 percentage points. Similarly, Weeden (2005) finds that flexible working arrangements are associated with an increase in wages for women compared to employees with fixed-schedules. However, there was no significant association for men. Similarly, Johnson and Provan (1995) find that flexible working hours had a positive relationship with women's earnings. Johnson and Provan (1995) hypothesize that flexible working hours may positively affect earnings through reduced work and family conflict resulting in increased productivity. Therefore, although evidence is largely limited in regards to policies that better allow parents to reconcile childcare and employment, there is some encouraging evidence to show that these policies may indeed have a positive impact on parents' earnings.

C. The Effect of Policy Reforms on the Bargaining Positions of Women

Family-friendly policies may also alleviate the gender wage gap by improving women's bargaining positions within the household. Through the use of collective labour supply models, many studies suggest that government reforms that provide transfers or advantages to one spouse can have an impact upon the household bargaining process over the course of marriage (Chiappori et al., 2002; Genadek et al., 2015; Gray, 1998; Nunley and Seals, 2011; Ward-Batts, 2008). The effect of policy reforms on the bargaining positions of household members are typically measured through outcomes such as labour supply and household expenditures. Previous studies estimating changes in intra-household bargaining have focused on exogenous variation from policies such as divorce law changes (Chiappori et al., 2002; Genadek et al., 2015; Gray, 1998; Stevenson, 2007, 2008), legalization of abortion (Oreffice, 2007), and the introduction of oral contraception (Altindag and Ziebarth, 2017).

Chiappori et al. (2002) use a collective labour supply model to examine the impacts of divorce law changes on household labour supply in the US. Chiappori et al. (2002) also use the Panel Study of Income Dynamics and generalized method of moments with state-level sex ratios as a distributional parameter. Chiappori et al. (2002) find that state divorce laws that are favourable to wives reduce wives' labour supply by 46 hours while such laws increase husbands' labour supply by 81 hours. Additionally, a one-point increase in divorce laws results in a transfer of approximately \$4,310 from husbands to wives, providing evidence that policies may have an effect on intra-household bargaining and the distribution of income within the household (Chiappori et al., 2002). Gray (1998) also look at divorce laws comparing women residing in US states where unilateral divorce laws reassigning property rights within the marriage have been introduced to women in states where there was no such change. Gray (1998) finds that women who benefit from the unilateral divorce law increased their labour supply while wives who did not benefit, reduced their labour supply. Changes in labour supply also extended to hours of housework where women decreased their hours of housework if their labour market hours increased (Gray, 1998). Results suggest that this law improved divorced women's economic position, and therefore their the bargaining power, and provided increased incentives for wives to increase their labour supply and reduce hours of housework (Gray, 1998). Genadek et al. (2015) use a difference-in-difference-in-differences (DDD) approach to investigate the impact of a set of US divorce laws passed in the 1970s where some states changed divorce laws based on fault or mutual agreement between husbands and wives to those based on no-fault/unilateral decisions, therefore reducing the cost of divorce, while some states did not. Genadek et al. (2015) estimate the impact of this reform on the labour supply of married women with children compared to married women without children. Genadek et al. (2015) find that married mothers increased their labour force participation rates and weeks worked due to the no-fault divorce laws compared to women without children. Estimates were higher for women with young children compared to women with older children (Genadek et al., 2015). Finally, Stevenson (2007) also estimates the impact of unilateral divorce laws using quasi-experimental methods, however on marriage-specific capital variables such as children, spouse's education, household specialization, and home ownership. Stevenson (2007) finds that the introduction of unilateral divorce laws within US states reduced investment in all marriage-specific capital variables, except for home ownership, and reduced couples' incentives to invest early in their marriage. For example, couples were 8% less likely to have children in the first two

years of marriage and were more likely to be in the labour force, where wives labour force participation increased 5% due to the policy (Stevenson, 2007).

Other types of policies that have been studied are the legalization of abortion and introduction of the pill by Oreffice (2007) and Altindag and Ziebarth (2017), respectively. These policy reforms may also affect the bargaining positions of women within the household. Through the use of a collective labour supply model, Oreffice (2007) finds that wives' labour supply decreased by 83 hours while husbands' labour supply increased by 34 hours due to the legalization of abortion in the US. Similarly, Altindag and Ziebarth (2017) use a collective labour supply and exploit the variation of US laws allowing for oral contraception on shares of income spent on expenditures by women. However, they find that the access to the pill reduced married women's bargaining positions within the household where women without access to oral contraception spent 0.5 percentage points more on food away spending shares, men's clothing, total food expenditures, and on tobacco (Altindag and Ziebarth, 2017). Therefore, previous literature has shown that policies such as government reforms can indeed have an effect on women's bargaining positions within the household.

III. POLICY BACKGROUND

A total of 25 out of 51 states have introduced workplace breastfeeding legislation during our study period of 1990-2011 (Table 5.1). The legislation was first implemented in Texas in 1995 with Maine being the most recent state in 2009. State-mandated policies require or at least encourage employers to provide mothers a separate and private room to express breast milk in the workplace (National Conference of State Legislatures, 2016). Although the objective of policies is similar across states, there is some heterogeneity. A total of 17 states require breaks and provisions of hygienic facilities such as a private room, a fridge to store milk, and a pump while eight states merely encourage such facilities and/or break time. Although there is heterogeneity across the policy, for the purposes of this study, we treat the policy variable as binary where we compare couples residing in states with the policy and those residing in states without the policy.

Table 5.1: US states with and without workplace breastfeeding legislation, years 1990-2011

States without legislation	States with legislation (implementation year)
Alabama	Arkansas (2009)
Alaska	California (1998)
Arizona	Colorado (2008)
Delaware	Connecticut (2001)
Florida	District of Columbia (2007)
Idaho	Georgia (1999)
Iowa	Hawaii (1999)
Kansas	Illinois (2001)
Kentucky	Indiana (2008)
Louisiana	Maine (2009)
Maryland	Minnesota (1998)
Massachusetts	Mississippi (2006)
Michigan	Montana (2007)
Missouri	New Mexico (2007)
Nebraska	New York (2007)
Nevada	North Dakota (2009)
New Hampshire	Oklahoma (2006)
New Jersey	Oregon (2007)
North Carolina	Rhode Island (2003)
Ohio	Tennessee (1999)
Pennsylvania	Texas (1995)
South Carolina	Vermont (2008)
South Dakota	Virginia (2002)
Utah	Washington (2001)
West Virginia	Wyoming (2003)
Wisconsin	

Note: States with legislation require employers to provide breastfeeding facilities, and require or encourage employers to provide break time for expressing breast milk. Break time is paid in all states except for Indiana. For further details see Appendix 3A.

IV. METHODS

We estimate a collective household model as it allows us to identify the intra-household earnings gap between mothers and fathers.⁵ We use the collective household model as the extent to which childcare responsibilities are distributed within the household is dependent on the intra-household bargaining process where each individual's bargaining power depends on a "sharing rule" or a distributional parameter (Chiappori, 1988; Chiappori et al., 2002). Distributional parameters measure the bargaining power of an individual giving the member a comparative advantage within the household in determining household behaviour and demand. For example, if the husband has higher wages than his wife, the household demand will reflect his preferences over his wife's preferences. Therefore, we include multiple distributional parameters that control for the distribution of bargaining power between mothers and fathers. Distributional parameters previously used in literature include household non-labour income (Chiappori, 1988), differences in wages (Bourguignon and Chiappori, 1992; Chiappori, 1988), differences in education (Angelov et al., 2016; Crespo, 2009; Hardoy et al., 2017), differences in work experience (Hardoy et al., 2017), and differences in age (Angelov et al., 2016; Bourguignon and Chiappori, 1992; Hardoy et al., 2017).

A. Identification strategy

We identify the impact of state workplace breastfeeding legislation on the within-couple earnings gap due to three features of the policy: (1) the policy is meant to impact a readily identifiable group of individuals, employed mothers with infants (and their partners) (2) the staggered policy

⁵ There are two main household labour supply theories within the literature: (1) the unitary model and (2) the collective labour supply model. The unitary model has been traditionally applied to analyse household behaviour. The main assumption behind the unitary model is that the family acts as a whole to be a single decision-making unit (Crespo, 2009). The unitary model has been criticized by many authors as it violates the assumption that each individual is defined by his/her own preferences and it limits the scope in analysing intra-household behaviour between individual members within the household (Apps and Rees, 1996; Bourguignon and Chiappori, 1992; Browning and Chiappori, 1998; Chiappori, 1988, 1992; Crespo, 2009; Manser and Brown, 1980). Therefore, an alternative to the traditional unitary model was developed by Chiappori (1988) called the collective labour supply model. The main assumption behind the collective labour supply model is that the household consists of a group of individuals defined by their own preferences where each member will maximize his/her utility yielding a Pareto efficient outcome under symmetric information (Chiappori, 1988). Therefore, each individual member within the household is the unit of analysis rather than the household as a whole.

introduction in a selective group of states allows for state and year variation and (3) the timing of child birth allows for variation within states. These three features give rise to an intention to treat type of study and a quasi-experimental design.

The variation across states and policy implementation across years allows us to identify the policy effect. As our main aim is to investigate the impact of the policy on the evolution of earnings over time, we have considered a panel of couples that have a newborn infant at some stage during the period of analysis. One methodological option would be a difference-in-differences (DD) design where each couple would only enter the data on the year they were exposed to the policy (i.e. the year of birth). However, measuring the impact of the policy through a repeated cross-section DD design only taking individuals at the time of child birth would pose two endogeneity concerns. The first relates to the potential for unobserved heterogeneity that may be associated with state self-selection into the policy. The second potential endogeneity issue relates to household unobserved characteristics that may explain the within-couple gender earnings gap. Therefore, we mitigate these issues through difference-in-difference-in-differences (DDD), where we are also able to compare couples within treatment states.⁶ We use panel data to compare couples with themselves before and after the birth of their child allowing us to determine the short- and long-term impacts of the policy on the within-couple earnings gap. Using panel data also allows us to control for unobserved and observed characteristics of couples.

However, by considering couples in years that they have and do not have children, where couples are exposed to the policy only in the first year of child birth, gives rise to another identification problem where couples experience two shocks at the same time— (1) the birth of the child and (2) the workplace breastfeeding policy as mothers are only “eligible” to breastfeed their infants during the first year of having a baby. Both shocks can affect the within-couple earnings gap over time. Given that couples in our panel give birth at different times during our study period, we follow Angelov et al. (2016) and Hardoy et al. (2017) and exploit this additional layer of variation of timing of birth to control for the child birth effect over time. Therefore, we are able to identify the

⁶ Please note that this is not a DDD in a strict sense as we compare subjects across different points in time before and after having children rather than comparing different subjects. Our identification strategy is however akin to a DDD framework and design similar to Angelov et al. (2016) and Hardoy et al. (2017) who implement specification similar to a DD framework, in which they compare couples with themselves before and after the birth of a child.

pure policy effect from the child birth effect on the within-couple earnings gap. To further control for the child birth effect on the within-couple earnings gap, we need to control for additional factors that are correlated with the decision to have a child as well as factors correlated with the future earnings of mothers and fathers.

Therefore, we are able to control for the effect of child birth on the gender gap in earnings under the following conditions: (1) the decision of having a child is based upon the couple's expectations of future earnings and (2) parents solve their dual career problem by equalizing the marginal utility of time and effort between employment and childcare responsibilities (Angelov et al., 2016; Becker, 1985; Hardoy et al., 2017). The second condition assumes that the couple will only have a child if the utility of having a child is greater than the expected loss of the future income of the household. In this analysis, we condition on couples having a child; therefore, this condition is satisfied. We then consider how the expected earnings loss from having a child is split between a couple. Assuming that the timing of child birth is not based on the within-couple expected difference in earnings in the absence of the child, we can estimate the effect of child birth by controlling for the pre-child birth difference in the earnings of the couple.

B. Yearly Long-term Effect

First, we estimate the yearly long-term impact of the workplace breastfeeding policy. We follow a similar specification to Angelov et al. (2016) and Hardoy et al. (2017) where we follow couples 2 years before child birth until a maximum of 21 years after child birth. We estimate the impact of the policy through panel ordinary least squares (OLS) regression. The DDD specification is as follows:

$$(1) \log(y_{ifct}) - \log(y_{imct}) = \beta_0 + \beta_1 (\log(y_{ifc(-2)}) - \log(y_{imc(-2)})) + \sum_{j=0}^{j=21} \beta_2 1[t = j] + \beta_3(policy_{it}) + \sum_{j=0}^{j=21} \beta_4(1[t = j] * (policy_{it})) + \beta_5(x_{if(-2)} - x_{im(-2)}) + \sum_s \alpha_s(state_s) + \sum_c \gamma_c(year_c) + \varepsilon_{ict}$$

i indexes couples where f is the father and m is the mother; t indexes time relative to child birth measured in years where the range j is $-1, 0, 1 \dots 21$ and $t = 0$ is the year of child birth, therefore t can vary across couples depending on when couple i has a child over the panel; c indexes calendar year from 1990 to 2011 where 1990 is the reference year; and s indexes state. Note, that t will correspond to different calendar years (c) for couples given the variation on the timing of child birth; therefore, we refer to $[t = j]$ as birth-cohort dummies. Our outcome variable is $\log(y_{ifct}) - \log(y_{imct})$ and is a measure of the within-couple differences of earnings in each year of the panel where y_{ifct} is the earnings of the father and y_{imct} is the earnings of the mother in couple i at time t relative to child birth in calendar year c . Since we log transform the outcome variable, we are measuring the gender gap percentage. The estimates of birth-cohort dummies represent semi-elasticities.

We also include $\log(y_{ifc(-2)}) - \log(y_{imc(-2)})$ to control for within-couple differences in the outcome variable measured at two years before child birth as couples should not have adjusted their earnings due to the timing of child birth. $state_s$ controls for state dummies or time-invariant systematic differences between states that may affect the outcome variable for all couples living in that state, where $s = 1 \dots 49$ states. $year_c$ represents calendar year dummies to control for year dummies, where $c = 1991 \dots 2011$. Coefficient β_2 measures the impact of child birth on the within-couple earnings gap from one year before birth up to 21 years after birth on a yearly basis; this is the control for the child birth effect. The reference category is one year before birth. The policy variable $policy_{it}$ takes the value of 1 for couples residing in treatment states after policy introduction and is 0 otherwise (i.e. for couples living in control states and for couples living in treatment states pre-policy introduction).⁷

⁷ For example, for couple i living in a state s (e.g. California) having a child in calendar year c (e.g. 1994) at $t = 0$ (i.e. year of child birth), the $policy_{it}$ variable would take the value of 0 as the workplace breastfeeding policy went into effect in California in 1998, therefore, this couple would be in the control group. Similarly, for a couple i living in a control state s (e.g. Florida), the $policy_{it}$ is always 0 during all t and they are in the control group over the panel. However, for a couple living in California in calendar year 1999 having a child at $t = 0$, the variable $policy_{it}$ would take the value of 1, therefore they would be in the treatment group, but only after the birth of the child up until they are in the dataset.

β_4 is our coefficient of interest on the interaction term between $policy_{it}$ and t . This measures the impact of the policy relative to one year before child birth on the within-couple gender gap in earnings. Finally, $x_{if(-2)} - x_{im(-2)}$ represents within-couple differences of variables measured at $t = -2$ such as differences in age, education, and work experience in years. These variables are also referred to as distributional parameters where they measure the bargaining power of each individual within the household. Such distributional parameters have been used Hardoy et al. (2017), Crespo (2009), Bourguignon and Chiappori (1992), and Angelov et al. (2016). We also include differences in race and job type (i.e. white or blue collar) as these characteristics may also reflect an individual's comparative advantage within the household. Standard errors are clustered on the household level to control for serial correlation similarly to Millimet (2000) as couples may have multiple children over the course of the panel. Each couple is matched upon the unique ID of the child; therefore, our dataset is set using the unique ID of the child and t , time relative to child birth. For example, couples with two children in the panel will have two sets of observations in different calendar years over t .

C. Aggregate Long-term Effect

We run a second specification where we measure the aggregate effect of the policy rather than the impact of the policy per year after child birth:

$$(2) \log(y_{ifct}) - \log(y_{imct}) = \beta_0 + \beta_1 (\log(y_{ifc(-2)}) - \log(y_{imc(-2)})) + \beta_2(childbirth_t) + \beta_3(policy_{it}) + \beta_4(childbirth_t * policy_{it}) + \beta_5(x_{if(-2)} - x_{im(-2)}) + \sum_s \alpha_s(state_s) + \sum_c \gamma_c(year_c) + \varepsilon_{ict}$$

Variables are analogous to specification (1); however, we replace the categorical variable t with a binary variable where $childbirth_t$ takes the value of 1 in years after an infant is born and takes the value of 0 in the pre-child birth year (i.e. $t = -1$). Therefore, the reference category is one year pre-birth similar to specification (1). β_2 measures the aggregate impact of child birth on the within-couple gender gap in the outcome variable where in the previous specification, we see the impact per year after child birth. The coefficient of interest is β_4 on the interaction between $childbirth_t$

and $policy_{it}$. This measures the impact of the policy post-child birth on the within-couple gender gap in earnings where the pre-birth year is the reference.

D. Instantaneous effect

We run a final and third specification to see whether the policy had an instantaneous effect on the within-couple gender gap in earnings. The specification is as follows:

$$(3) \log(y_{ifct}) - \log(y_{imct}) = \beta_0 + \beta_1(\log(y_{ifc(-2)}) - \log(y_{imc(-2)})) + \beta_2(infant_t) + \beta_3(policy_{it}) + \beta_4(infant_t * policy_{it}) + \beta_5(x_{if(-2)} - x_{im(-2)}) + \sum_s \alpha_s(state_s) + \sum_c \gamma_c(year_c) + \varepsilon_{ict}$$

Variables are analogous to specification (1) and (2); however, we include a variable $infant_t$, which takes the value 1 only in the year couple i has an infant and is 0 otherwise. β_2 measures the impact of having an infant on the within-couple gender gap in earnings. β_4 is our variable of interest on the interaction between $infant_t$ and $policy_{it}$ and it measures the instantaneous impact of the policy only during the year the infant is born ($t = 0$).

E. Robustness Checks

Finally, we conduct a robustness check where we only include couples with first births in our dataset. Angelov et al. (2016) and Hardoy et al. (2017) only include couples with first births in their analysis; however, we include these couples as when we exclude multiple births, we lose over 70% of our observations. Full details of robustness checks can be found in Appendix 3B.

V. DATA

We use the Panel Study of Income Dynamics (PSID) for the years 1990-2011. The PSID is a nationally representative household survey starting in 1968 collecting socio-demographic, economic, and health data on households and individuals over time (PSID, 2014). The PSID ran

annually from 1968 until 1997 and biannually after 1997. The unique value of the PSID lies in two features: (1) individuals are followed over time in family settings and (2) families are tracked across multiple generations where interviews are collected concurrently with multiple generations of the same family (PSID, 2014). The rich information in the PSID makes it one of the most extensively used datasets in social science research (PSID, 2014).

We extract our dataset from the PSID and format into a panel. We condition on having a child and match mothers and fathers based upon the unique ID of their newborn infant. Couples may be in the dataset two or more times if they have two or more children over our study period. We exclude repeated observations of couples who have multiple births in one year such as twins/triplets, keeping only one of the children in the analysis. We exclude couples who moved from treatment to control states or vice versa as the policy impact is dependent upon the state the couple is living in. However, if a couple moved from a treatment/control state to another treatment/control state, we do not drop those observations. We further only include couples who are in the labour force and therefore, exclude couples from analysis at time t where the mother or father is not in the labour force. These categories include retired, permanently/temporarily disabled, student, or on workfare/prison/jail. We include couples where the mother or father are in the labour force defined as working now, temporarily laid off, on leave, looking for work and also include those who are keeping house.⁸ Our outcome variable is the within-couple earnings gap. PSID measures earnings annually from 1990-1997 and biannually from 1999-2011. Earnings are adjusted for inflation using the Consumer Price Index into 2000 \$USD. We also adjust earnings to full-time equivalent earnings to account for differences in working hours across the sample, following the labour economics literature. The earnings measure includes wages and salaries, bonuses, overtime, tips, commissions, professional practice or trade, market gardening, and extra job income (PSID, 2014). The measure does not include farm income or the labour portion of business income (PSID, 2014). We include within-couple pre-child birth differences in age, education, and work experience as control variables similar to Hardoy et al. (2017) and Angelov et al. (2016). Education is measured as the number of years of education two years before child birth while work experience is measured

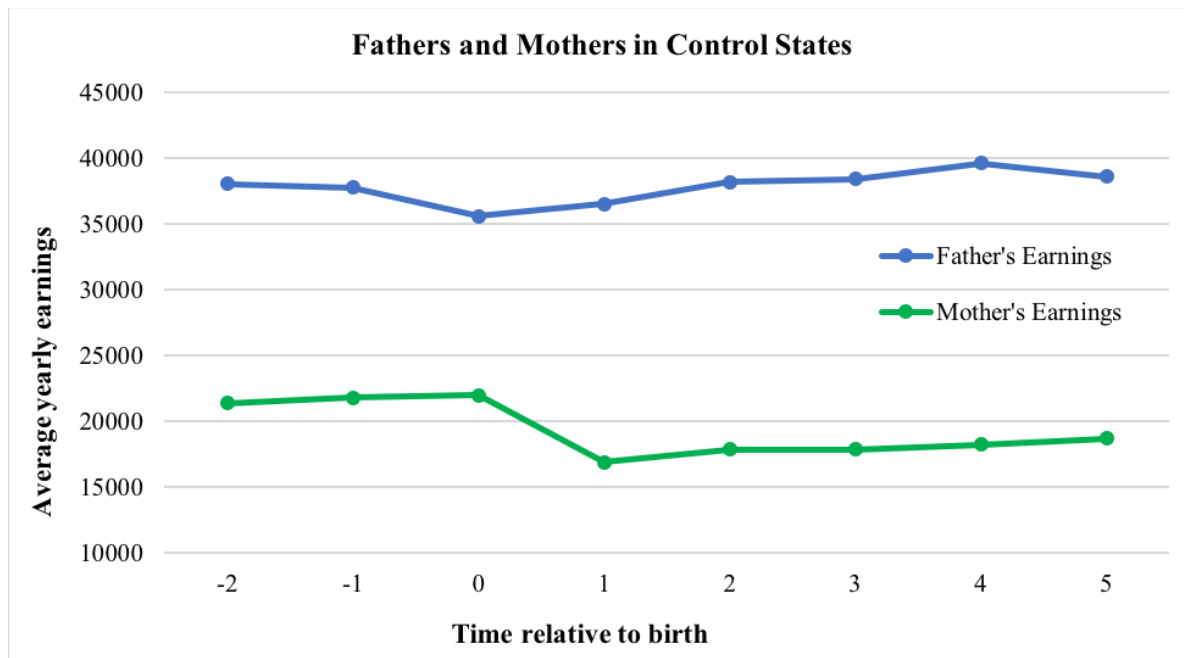
⁸ We include those couples where one is keeping house as approximately 30% of mothers are keeping house in our dataset. Angelov et al. (2016) does not restrict his analysis to only those within the labour force but rather restricts his sample to those with positive income two years before child birth. Individuals who are keeping house have earnings of \$0.

as the number of years in the labour market. We also include differences in race and job-type (i.e. white or blue collar) two years before birth.

A. Graphical Evidence

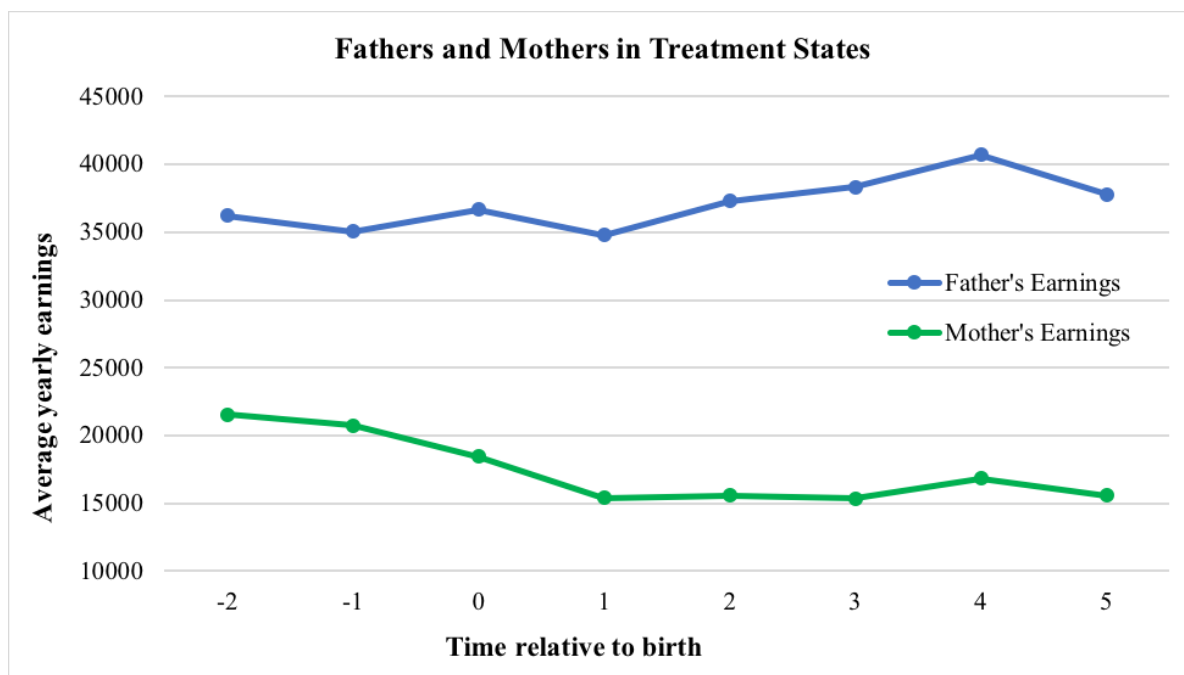
Figures 5.2 and 5.3 show the raw average yearly full-time equivalent earnings in 2000 \$USD for fathers and mothers in control and treatment states, respectively.

Figure 5.2: Average yearly earnings for fathers and mothers within matched couples before and after child birth in control states



Note: Average yearly earnings from PSID and adjusted to 2000 \$USD.

Figure 5.3: Average yearly earnings for fathers and mothers within matched couples before and after child birth in treatment states



Note: Average yearly earnings from PSID and adjusted to 2000 \$USD.

As figures 5.2 and 5.3 show, fathers and mothers follow approximately a parallel trajectory of earnings between two and one year pre-birth suggesting that there is no gender-specific trend before the birth of the child. Fathers have higher earnings over time compared to mothers. After the birth of the child at $t = 0$, mothers in control and treatment states have a drop in their earnings; however, the drop is steeper in control states (Figure 5.2) compared to treatment states (Figure 5.3). This suggests that the workplace policy may have an instantaneous effect during the year the child is born. Furthermore, fathers' earnings slightly decline in treatment states when the child is born where the mothers' earnings decline as well but less than in control states. This suggests that fathers may absorb more of the earnings decline within the household in treatment states whereas in control states, it seems that the decline in earnings is largely experienced by the mother.

B. Descriptive Statistics

Table 5.2 provides descriptive statistics for all couples and separately for control and treated couples. Control couples include those residing in control states and couples in treatment states before the policy introduction while treated couples include those residing in treatment states after policy introduction.

Table 5.2: Descriptive statistics for treatment and control group of couples

	<i>All Couples</i>	<i>Treated Couples</i>	<i>Control Couples</i>
<i>Difference in earnings (father – mother)</i>	\$18,267 (\$72,933)	\$17,836 (\$68,111)	\$17,691 (\$75,595)
Father's earnings	\$40,350 (\$55,299)	\$40,294 (\$63,750)	\$39,931 (\$51,793)
Mother's earnings	\$18,623 (\$45,692)	\$18,300 (\$28,377)	\$19,205 (\$52,415)
<i>Difference in earnings (father₍₀₎ – mother₍₀₎)</i>	\$12,255 (\$53,423)	\$11,367 (\$67,664)	\$12,161 (\$50,110)
Father's earnings	\$36,244 (\$39,286)	\$39,415 (\$59,557)	\$35,499 (\$33,267)
Mother's earnings	\$19,792 (\$37,806)	\$20,864 (\$30,975)	\$19,952 (\$39,519)
<i>Difference in earnings (father₍₅₎ – mother₍₅₎)</i>	\$18,132 (\$44,371)	\$18,084 (\$41,076)	\$17,104 (\$45,245)
Father's earnings	\$38,494 (\$37,025)	\$38,166 (\$42,978)	\$38,193 (\$33,957)
Mother's earnings	\$16,702 (\$28,420)	\$15,548 (\$27,941)	\$17,744 (\$28,931)
<i>Difference in earnings (father₍₋₂₎ – mother₍₋₂₎)</i>	\$12,389 (\$43,767)	\$9,653 (\$53,525)	\$12,825 (\$39,408)
Father's earnings ₍₋₂₎	\$37,991 (\$40,984)	\$37,920 (\$43,403)	\$37,980 (\$39,944)
Mother's earnings ₍₋₂₎	\$22,967 (\$27,172)	\$24,151 (\$34,553)	\$23,041 (\$23,869)
<i>Difference in age (father₍₋₂₎ – mother₍₋₂₎)</i>	2.151 (3.918)	2.022 (3.745)	2.228 (3.997)
Father's age ₍₋₂₎	29.829 (5.448)	29.869 (5.371)	29.873 (5.493)
Mother's age ₍₋₂₎	27.661 (4.67)	27.830 (4.695)	27.639 (4.673)
<i>Difference in education (father₍₋₂₎ – mother₍₋₂₎)</i>	-0.203 (1.936)	-0.255 (1.903)	-0.174 (1.923)
Father's education ₍₋₂₎	13.760 (2.341)	13.752 (2.476)	13.792 (2.242)
Mother's education ₍₋₂₎	13.938 (2.232)	13.947 (2.419)	13.964 (2.107)
<i>Difference in work experience (father₍₋₂₎ – mother₍₋₂₎)</i>	1.258 (4.702)	1.261 (4.810)	1.222 (4.680)
Father's work experience ₍₋₂₎	3.713 (4.361)	3.756 (4.520)	3.723 (4.315)
Mother's work experience ₍₋₂₎	2.339 (3.166)	2.316 (3.129)	2.407 (3.209)
<i>Difference in race (fathers₍₋₂₎ vs. mother₍₋₂₎)</i>			
Same race	0.934 (0.249)	0.905 (0.293)	0.951 (0.216)
Father is White; Mother is not	0.026 (0.159)	0.041 (0.198)	0.017 (0.128)
Mother is White; Father is not	0.032 (0.175)	0.040 (0.196)	0.025 (0.157)
Neither is White	0.009 (0.094)	0.014 (0.116)	0.007 (0.083)
<i>Difference in job Type (fathers₍₋₂₎ vs. mother₍₋₂₎)</i>			
Same job type (both white or blue collar)	0.650 (0.477)	0.663 (0.473)	0.646 (0.478)
Father is white collar; Mother is blue collar	0.062 (0.241)	0.067 (0.250)	0.059 (0.236)
Mother is blue collar; Father is white collar	0.288 (0.453)	0.270 (0.444)	0.295 (0.456)
Number of years parents are followed after child birth	6.137 (5.015)	7.431 (5.337)	5.579 (4.772)
Number of observations	24,100	6,660	17,440

Note: Means with standard deviation in parenthesis. Earnings is full-time equivalent yearly earnings adjusted for all individuals working full-time. Earnings have been adjusted to 2000 \$USD using the Consumer Price Index. In the analysis, earnings have been rescaled to $\log(\text{earnings}_{\text{father}} / \text{earnings}_{\text{mother}})$ following the identification strategy. Treated couples are those couples residing in states after policy introduction while control couples are those couples residing in control states and couples residing in treatment states pre-policy introduction.

Descriptive statistics show that the average within-couple earnings gap is \$18,267 over the panel while it is lower two years pre-child birth at \$12,389. The mean income is higher for fathers than for mothers and is accompanied by larger standard deviations meaning that the variation in income among fathers is greater than that of mothers. Fathers are on average 2 years older than mothers and have approximately 1 more year of work experience; however, are less educated than their partners. A majority of parents are of same race and have the same job type (i.e. both white or blue collar). Finally, couples are followed on average 6 years after child birth, however, can be followed up to a maximum of 21 years if they had an infant during the beginning of the study period.

VI. RESULTS

A. Yearly Long- term Effect

First, we estimate the impact of workplace breastfeeding legislation on the yearly earnings gap between fathers and mothers through DDD.⁹ Table 5.3 presents DDD results with three different versions in each column. For example, M1a includes all covariates, M1b adds state dummies, and M1c adds year dummies. In what follows, we comment on the most complete model M1c.

⁹ We present results in tables as coefficient estimates. However, when discussing results, we transform the coefficient estimates from log-points to percentage points (pp): $pp = 100 \times (e^{\beta} - 1)$.

Table 5.3: DDD yearly long-term estimates of workplace breastfeeding legislation on the within-couple earnings gap

Variable	M1a	M1b	M1c
Workplace breastfeeding policy*Time relative to child birth (DDD)			
Year 0	-2.548 (1.031)**	-2.489 (1.066)**	-2.726 (1.134)**
Year 1	-2.762 (1.388)**	-2.703 (1.389)*	-3.033 (1.406)**
Year 2	-1.516 (1.037)	-1.484 (1.077)	-1.974 (1.141)*
Year 3	-1.605 (1.026)	-1.527 (1.034)	-2.146 (1.085)**
Year 4	-1.295 (1.020)	01.270 (1.059)	-1.997 (1.107)*
Year 5	-1.968 (1.110)*	-1.862 (1.125)*	-2.638 (1.186)**
Year 6	-0.592 (1.023)	-0.556 (1.061)	-1.330 (1.102)
Year 7	-0.339 (1.310)	-0.169 (1.330)	-1.073 (1.388)
Year 8	-0.881 (1.072)	-0.839 (1.107)	-1.584 (1.124)
Year 9	-1.069 (1.264)	-0.951 (1.296)	-1.628 (1.329)
Year 10	-0.017 (1.155)	0.037 (1.178)	-0.641 (1.187)
Year 11	-0.553 (1.229)	-0.426 (1.247)	-1.111 (1.333)
Year 12	-0.919 (1.149)	-0.845 (1.176)	-1.567 (1.201)
Year 13	-0.570 (1.230)	-0.499 (1.264)	-1.269 (1.332)
Year 14	-1.048 (1.260)	-0.956 (1.286)	-1.697 (1.328)
Year 15	-0.869 (1.255)	-0.765 (1.299)	-1.549 (1.348)
Year 16	-1.436 (1.303)	-1.333 (1.334)	-2.092 (1.389)
Year 17	-0.391 (1.474)	-0.292 (1.524)	-1.058 (1.568)
Year 18	-1.296 (1.483)	-1.166 (1.487)	-1.946 (1.531)
Workplace breastfeeding policy Time relative to child birth	0.628 (0.973)	0.524 (1.027)	1.327 (1.066)
Year 0	0.675 (0.198)***	0.669 (0.199)***	1.181 (0.247)***
Year 1	1.333 (0.249)***	1.349 (0.248)***	1.900 (0.294)***
Year 2	0.830 (0.237)***	0.851 (0.236)***	1.645 (0.315)***
Year 3	0.575 (0.310)*	0.601 (0.310)*	1.592 (0.396)***
Year 4	0.653 (0.310)**	0.677 (0.311)**	1.745 (0.419)***
Year 5	0.138 (0.436)	0.095 (0.434)	1.363 (0.516)***
Year 6	0.197 (0.327)	0.218 (0.322)	1.366 (0.434)***
Year 7	-0.136 (0.426)	-0.242 (0.423)	1.026 (0.538)*
Year 8	0.116 (0.377)	0.154 (0.367)	1.305 (0.502)***
Year 9	0.280 (0.405)	0.237 (0.405)	1.391 (0.535)***
Year 10	-0.163 (0.393)	-0.148 (0.374)	1.003 (0.532)*
Year 11	-0.223 (0.407)	-0.228 (0.408)	0.861 (0.553)
Year 12	0.064 (0.455)	0.085 (0.432)	1.245 (0.601)**
Year 13	0.027 (0.508)	0.038 (0.510)	1.250 (0.656)*
Year 14	-0.130 (0.558)	-0.115 (0.534)	1.199 (0.716)*
Year 15	-0.729 (0.473)	-0.737 (0.478)	0.627 (0.662)
Year 16	0.328 (0.621)	0.324 (0.587)	1.784 (0.799)**
Year 17	-0.253 (0.599)	-0.249 (0.612)	1.294 (0.806)
Year 18	-0.430 (0.873)	-0.435 (0.821)	1.255 (1.022)
Covariates ($x_{(-2)}$)			
log(earnings _{f(-2)} / earnings _{m(-2)})	0.352 (0.031)***	0.348 (0.031)***	0.344 (0.031)***
Difference in age ₍₋₂₎	-0.016 (0.034)	-0.008 (0.035)	-0.010 (0.035)

Difference in education ⁽⁻²⁾	0.098 (0.064)	0.109 (0.068)	0.095 (0.069)
Difference in work experience ⁽⁻²⁾	0.085 (0.027)	0.084 (0.027)***	0.085 (0.027)***
Difference in race ⁽⁻²⁾			
Father is White; Mother is not	-0.367 (0.975)	-0.269 (0.998)	-0.190 (1.011)
Mother is White; Father is not	-1.124 (0.603)*	-0.869 (0.708)	-0.802 (0.699)
Neither is White	-2.097 (0.537)***	-1.511 (0.900)*	-1.641 (0.885)*
Difference in job type ⁽⁻²⁾			
Father is white collar; Mother is blue collar	-0.213 (0.551)	-0.053 (0.534)	-0.150 (0.540)
Mother is blue collar; Father is white collar	-0.357 (0.267)	-0.291 (0.274)	-0.347 (0.275)
State dummies	No	Yes	Yes
Calendar year dummies	No	No	Yes
Number of observations	5725	5725	5725
Overall R ²	0.108	0.123	0.126

Note: Model 1a includes all covariates; 1b adds state dummies; and 1c adds year dummies. Standard errors have been clustered on the household level and are in parenthesis. Results on state and year dummies available upon request to authors. All differences are father – mother. The reference category for difference in race is where mothers and fathers are of the same race and for difference in job type is where mothers and fathers have the same job type. Earnings have been adjusted in 2000 \$USD using the Consumer Price Index. *p<0.10; **p<0.05; ***p<0.01.

DDD estimates show that the workplace breastfeeding policy reduces the within-couple earnings gap for couples in treatment states compared to couples in control states. The policy has a negative and significant impact for the first 5 years with the impact turning insignificant and diminishing thereafter (M1c; Table 5.3). During the birth year (year 0), the coefficient estimate is -2.726 ($p < 0.05$) meaning that the policy reduces the gender gap by approximately 93 percentage points. The within-couple earnings gap of treated couples two years pre-child birth is \$9,653 (Table 5.2) increasing to \$11,367 (Table 5.2) during the year of child birth (year 0). The coefficient estimate provides the impact of the policy conditional to the existing pay gap of the couple before child birth. Therefore, to put this into perspective, we turn to the effect of child birth during the birth year (year 0), which is 1.181 ($p < 0.01$) translating to an increased within-couple earnings gap of 226 percentage points due to child birth.¹⁰ The workplace breastfeeding policy reduces the within-couple earnings gap from 226 percentage points to 133 percentage points or by approximately 41%. In monetary terms, this means that the policy reduced the within-couple earnings gap of treated couples from \$11,367 (Table 5.2) to \$6,707 or by \$4,660.

The effect is largest 1 year after birth (year 1). The coefficient estimate is -3.033 ($p < 0.05$) meaning that the policy reduces the within-couple earnings gap by 95 percentage points. The child birth effect on the within-couple earnings gap is also the largest in this year. This may be due to mothers being on maternity leave offered by their firms and therefore, their earnings decline; however, the decrease in the within-couple earnings gap in this year may suggest that the workplace breastfeeding policy encourages mothers to return to work. After the first year after birth, the effect of the policy on the within-couple gap decreases where it is last significant at year 5 at -2.638 ($p < 0.05$) or -93 percentage points. The within-couple earnings gap at year 5 is 1.363 ($p < 0.01$) or 291 percentage points, meaning that the policy reduces the gap from 291 to 198 percentage points or by approximately 32%. In monetary terms, this means that the policy reduced the within-couple earnings gap of treated couples from \$18,084 (Table 5.2) to \$12,297 or by \$5,787.

¹⁰ As table 5.3 shows, the policy impact is not constantly decreasing, instead there is a jump and then a reduction. This is due to the nature of the PSID as after 1997, the survey became biannual and therefore earnings and all variables are reported biannually rather than annually and so it is not surprising that the effects are not constant.

In terms of covariates, the within-couple earnings gap two years before child birth is positively and significantly associated with the within-couple earnings gap, in line with Angelov et al. (2016). The difference in work experience two years before child birth is also positively and significantly associated with the within-couple earnings gap, suggesting that if the father has more work experience and enters the labour market earlier than the mother, the intra-household gender gap is wider. Furthermore, according to intra-household bargaining theory, he will have more bargaining power in the household relative to his wife due to his comparative advantage.

Robustness checks in Appendix 3B estimate the yearly long-term impact of the policy using only couples with first births. We lose over 70% of observations by excluding second, third, and additional births. Results show that the impact of policy on the within-couple earnings gap is higher at -99 percentage points at $t = 0$ (Appendix 3B; Table B1, BM1c) compared to M1c and continues to have an impact on the within-couple earnings gap over the course of the panel. This suggests that the impact of the policy is larger on the gap when only considering first born children. Having a child for the first time may be a larger shock compared to having a child a second or third time, where mothers may have an easier time accommodating childcare and employment responsibilities after first birth.

B. Aggregate Long-term Effect

Secondly, we estimate the aggregate impact of the workplace breastfeeding legislation on the within-couple earnings gap. Table 5.4 presents DDD results similar to Table 5.3. We comment on the most complete model, M2c.

Table 5.4: DDD aggregate long-term estimates of workplace breastfeeding legislation on within-couple earnings gap

Variable	M2a	M2b	M2c
Workplace breastfeeding policy*Childbirth (DDD)	-1.431 (0.931)	-1.394 (0.957)	-1.734 (1.014)*
Workplace breastfeeding policy	0.577 (0.942)	0.464 (0.992)	0.142 (1.043)
Childbirth	0.523 (0.199)***	0.542 (0.194)***	1.457 (0.243)***
<i>Covariates (x₍₋₂₎)</i>			
log(earnings _{f(-2)} / earnings _{m(-2)})	0.350 (0.031)***	0.347 (0.031)***	0.344 (0.031)***
Difference in age ₍₋₂₎	-0.016 (0.034)	-0.009 (0.035)	-0.012 (0.035)
Difference in education ₍₋₂₎	0.102 (0.064)	0.110 (0.068)	0.096 (0.068)
Difference in work experience ₍₋₂₎	0.085 (0.026)***	0.084 (0.027)***	0.083 (0.027)***
Difference in race ₍₋₂₎			
Father is White; Mother is not	-0.291 (0.971)	-0.200 (0.989)	-0.164 (0.998)
Mother is White; Father is not	-1.031 (0.597)*	-0.844 (0.705)	-0.762 (0.696)
Neither is White	-2.053 (0.504)***	-1.548 (0.867)*	-1.616 (0.882)*
Difference in job type ₍₋₂₎			
Father is white collar; Mother is blue collar	-0.186 (0.555)	-0.032 (0.535)	00.105 (0.539)
Mother is blue collar; Father is white collar	-0.345 (0.267)	-0.272 (0.272)	-0.365 (0.273)
State dummies	No	Yes	Yes
Calendar year dummies	No	No	Yes
Number of observations	5725	5725	5725
Overall R ²	0.101	0.118	0.123

Note: Model 2a includes all covariates; 2b adds state dummies; and 2c adds year dummies. Standard errors have been clustered on the household level and are in parenthesis. Results on state and year dummies available upon request to authors. All differences are father – mother. The reference category for difference in race is where mothers and fathers are of the same race and for difference in job type is where mothers and fathers have the same job type. Earnings have been adjusted in 2000 \$USD using the Consumer Price Index. *p<0.10; **p<0.05; ***p<0.01.

DDD estimates show that the workplace breastfeeding policy significantly reduces the aggregate within-couple earnings gap for couples in treatment states compared to couples in control states. The coefficient estimate is -1.734 but is weakly significant (p<0.10), which is expected as instead of looking at the yearly effect of the policy, we are aggregating the effect over all the years after policy introduction, which is an average of 6 years. Additionally, in the previous model M1c, the policy was only significant in the first five years post-child birth; therefore, when we aggregate the policy impact, it is expected that it is weakly significant. The coefficient estimate of -1.734 (p<0.10) translates to a reduction of the within-couple gender gap by 82 percentage points, lower than our estimates from M1c. The coefficient estimate for the aggregate within-couple earnings gap due to child birth is 1.457 (p<0.01) translating to an increased gap of 329 percentage points

due to child birth. Therefore, the policy reduces the aggregate gender gap to 247 percentage points or approximately by 25% of the gap already seen due to child birth. In monetary terms, this suggests that the policy reduced the within-couple earnings gap of treated couples from \$17,836 (Table 5.2) to \$13,377 or by \$4,459.

Results on covariates are in line with M1c.

Appendix 3B estimates the aggregate long-term impact of the policy only using couples with first births. Results show that the impact of policy on the within-couple earnings gap is also higher at -99 percentage points (Appendix 3B; Table B2, BM2c) and is highly significant compared to the policy impact estimated in M2c. This is expected as the coefficient estimates for the yearly long-term impact in model BM1c were highly significant over the course of t .

C. Instantaneous Effect

Finally, we estimate the instantaneous impact of the workplace breastfeeding policy on the within-couple earnings gap. Table 5.5 presents DDD results similar to Tables 5.3 and 5.4. We comment on the most complete model, M3c.

Table 5.5: DDD instantaneous estimates of workplace breastfeeding legislation on the within-couple earnings gap

Variable	M3a	M3b	M3c
Workplace breastfeeding policy*Infant (DDD)	-1.391 (0.441)***	-1.405 (0.450)***	-1.367 (0.459)***
Workplace breastfeeding policy	-0.624 (0.261)**	-0.698 (0.310)**	-0.233 (0.323)
Infant	0.262 (0.166)	0.241 (0.165)	0.050 (0.156)
<i>Covariates (x₍₋₂₎)</i>			
log(earnings _{t(-2)} / earnings _{m(-2)})	0.348 (0.031)***	0.345 (0.031)***	0.342 (0.031)***
Difference in age ₍₋₂₎	-0.016 (0.034)	-0.008 (0.035)	-0.008 (0.035)
Difference in education ₍₋₂₎	0/098 (0.064)	0.108 (0.068)	0.098 (0.069)
Difference in work experience ₍₋₂₎	0.085 (0.026)***	0.085 (0.027)***	0.084 (0.027)***
Difference in race ₍₋₂₎			
Father is White; Mother is not	-0.335 (0.978)	-0.233 (1.001)	-0.237 (1.005)
Mother is White; Father is not	-1.051 (0.602)*	-0.832 (0.709)	-0.755 (0.704)
Neither is White	-2.094 (0.497)***	-1.563 (0.867)*	-1.576 (0.875)*
Difference in job type ₍₋₂₎			
Father is white collar; Mother is blue collar	-0.206 (0.555)	-0.060 (0.538)	-0.142 (0.539)
Mother is blue collar; Father is white collar	-0.347 (0.267)	-0.273 (0.272)	-0.327 (0.273)
State dummies	No	Yes	Yes
Calendar year dummies	No	No	Yes
Number of observations	5725	5725	5725
Overall R ²	0.102	0.118	0.121

Note: Model 3a includes all covariates; 3b adds state dummies; and 3c adds year dummies. Standard errors have been clustered on the household level and are in parenthesis. Results on state and year dummies available upon request to authors. All differences are father – mother. The reference category for difference in race is where mothers and fathers are of the same race and for difference in job type is where mothers and fathers have the same job type. Earnings have been adjusted in 2000 \$USD using the Consumer Price Index. *p<0.10; **p<0.05; ***p<0.01.

DDD estimates show that the policy has a negative and significant instantaneous impact on the within-couple earnings gap for couples in treatment states compared to couples in control states. The effect is highly significant meaning that when mothers return to the workplace postpartum, the policy already has an effect in the year of child birth. This is also supported by Figures 5.2 and 5.3 where mothers in control states have a sharper decline in their earnings compared to mothers in treatment states during the year of child birth, and in M1c where the policy had an effect on the within-couple earnings gap in year 0. The coefficient estimate is -1.367 (p<0.01) meaning that the policy reduced the within-couple earnings gap by 75 percentage points in the year the child was born for couples residing in treatment states compared to control states. Since the infant variable

is insignificant in M3c, we can get an estimate of the instantaneous impact of the policy during the birth of the infant by looking at M1c where the effect of having an infant ($t = 0$) is 1.181 ($p < 0.01$) or 226 percentage points (Table 5.3). Therefore, the policy reduces the infant effect from 226 percentage points to 151 percentage points or approximately 33%. In monetary terms, this means that the policy reduced the within-couple earnings gap for treated couples from \$11,367 (Table 5.2) to \$7,616 or by \$3,751.

Results on covariates are in line with M1c and M2c. Appendix 3B shows the instantaneous policy impact considering only first-born children (Appendix 3B; Table B3, BM3c). The policy impact on the within-couple earnings is higher at -81 percentage points compared to M3c.

VII. DISCUSSION AND CONCLUSION

We have assessed the impact of a type of workplace family-friendly policy that better allows mothers to combine employment and childrearing responsibilities while also taking into account the intra-household bargaining process. Policies that encourage mothers to go into work rather than be absent can improve their bargaining power within the household through an increase in her earnings. We investigate the impact of one such policy, a workplace breastfeeding legislation in the context of the US. Through the use of DDD and controlling for the impact of child birth on earnings, we have evaluated the impacts of workplace breastfeeding legislation on the within-couple earnings gap. We are able to estimate the short- and long-term effect of the policy in three different ways. First, we look at the yearly impact of the policy find that the policy reduces the within-couple earnings gap by 93 percentage points or approximately 32 to 41% of the gap already seen due to the effect of child birth. The policy effect diminishes, however, 5 years after the birth of the child. Second, we aggregate the effects over time and find that the policy reduces the within-couple earnings gap by 82 percentage points or approximately 25% of the gap seen from child birth. Finally, we find that the policy has an instantaneous effect on the within-couple earnings gap during the year of child birth by reducing the effect of having an infant by 75 percentage points or approximately 33% of the gap couples experience due to child birth.

The findings of this research should be considered in light of its limitations. First, we are unable to observe breastfeeding due to data limitations. This means we are unable to determine the mechanism for how the policy reduces the within-couple earnings gap through access to breastfeeding facilities. However, we speculate that the effect is due to the health benefits of breastfeeding where the policy encourages mothers to breastfeed and therefore, mothers and infants are at less likely to get sick allowing mothers to go into work (Singh et al., 2018). Secondly, there may be a concern that we include mothers who are keeping house in our analysis. We decide to include this set of mothers as 30% of mothers are housewives over our panel. Although we may be overestimating the policy impact, we believe that it is important to include these mothers as their earnings may increase above \$0 if these mothers decide to go back into work due to the policy after child birth, which would be reflected in our outcome variable, the within-couple earnings gap. Finally, we do not look at how the policy impact may vary due to the socioeconomic status of couples. Indeed, the policy may vary across education levels, ethnic groups, and professions where not all groups may benefit from the policy in the same way. Also, the average policy effect may be driven by a specific sub-group. However, our main aim is to look at the overall short- and long- term policy impact; therefore, this can be an area for future research. Despite these caveats, we are able to provide robust evidence that state-mandated workplace breastfeeding policy has an impact upon the within-couple earnings gap.

Our findings have a number of policy implications for mothers and households, firms, and the wider US economy. Firstly, literature has shown that employers transfer the implicit costs of implementing family-friendly policies such as maternity leave to women in the form of reduced wages (Heywood et al., 2007). However, workplace breastfeeding policy may be one such policy that does not transfer the costs of implementation to employees. This may be due to the nature of the policy, as the policy encourages mothers to go into work rather than be absent from work (i.e. maternity leave). Considering the several channels through which mother's wages are lowered due to child birth, this policy may help mothers reconcile childcare responsibilities, such as breastfeeding and employment, without a need for a lengthy career interruption. Indeed, in Chapter 4, we find that state-mandated policies decrease mothers' absences from the workplace. Furthermore, by reducing the within-couple earnings gap, the policy may improve the bargaining positions of mothers within the household. Collective labour supply theory states that if a

household member experiences an exogenous increase in his/her income (i.e. through a workplace breastfeeding policy), the household demand will shift to reflect that member's preferences (Gray, 1998).

Secondly, firms can also benefit from workplace breastfeeding policies. Firms are being increasingly scrutinized for the pay they offer to women compared to men. In fact, an Executive Order 13665 implemented in January 2016 in the US increased transparency in pay in many firms by 20% (i.e. 28 million workers) of the labour force (Trotter et al., 2017). Therefore, alleviating the gender gap in pay is of social interest to firms. Implementing a workplace breastfeeding policy may initially cost firms; however, the costs may be offset by attracting more women to those family-friendly firms. Increasing gender diversity among firms has been shown to be beneficial as firms with higher gender diversity have profits above the industry mean (Rock and Grant, 2016).

Finally, research has shown that there is a strong association between a country's progress, such as its economic competitiveness, and the gender wage gap (World Economic Forum, 2017). Women are driving consumer purchasing and labour markets are becoming increasingly globalized and competitive (Chinchilla and Jimenez, 2016). Therefore, attracting women to the labour force is crucial. Thus, for the US to remain competitive within the global economy, it must also implement policies to accommodate women and mothers within the workforce such as workplace breastfeeding policies. Although we have found an encouraging effect of workplace breastfeeding policies on the gender pay gap, the US needs to implement additional policies that encourage women to go into work postpartum if it is to achieve gender equality in pay.

CHAPTER 6 : CONCLUDING REMARKS

Having a child can be a big shock on parents. Child birth can affect parents in several ways as they struggle to reconcile employment and childcare responsibilities. However, the shock is greater for mothers as the responsibility of childcare largely falls on mothers rather than fathers, thus child birth ultimately affects mothers' health and labour market outcomes. Therefore, workplaces have implemented family-friendly policies to mitigate this child birth effect. Two types of policies have been studied in literature: one that encourages the split of employment and childcare responsibilities such as leave policies and one that encourages the reconciliation of such responsibilities such as flexible working arrangements. While the former is important, policies that encourage the split of employment and childcare can generate an additional imbalance within households. However, the latter type of policies can bring a balance within households as parents are encouraged to go into work rather than be absent. Therefore, this thesis investigates the second type of policy by studying state-mandated workplace breastfeeding policies within the US that have been implemented in 25 out of 51 states. We investigate the direct health and indirect labour market outcomes of this policy on mothers and fathers.

Through robust quasi-experimental methods, we find sound evidence that state-mandated workplace breastfeeding policies have been successful in their initial objective to increase state-level breastfeeding rates by approximately 5 percentage points (Chapter 3). However, we find that strictly enforceable policies requiring employers to provide a separate and private room to express milk have a larger impact of 7.1 percentage points. Secondly, we find that the health benefits of breastfeeding do indeed extend into economic benefits for mothers where we find that state-mandated workplace breastfeeding policies reduce mothers' absenteeism by 10 days; however, we find a larger impact on mother's absenteeism in strictly enforceable states of 16 days (Chapter 4). Finally, we find evidence that the reduction of absenteeism extends into effects on the earnings gap between couples (Chapter 5). Couples residing in treatment states see a decrease in their earnings gap due to the policy by approximately 25% compared to couples residing in control states. We also find an instantaneous policy impact of 33% during the year of child birth.

There are a number of strengths and contributions of this thesis. We overcome several limitations of previous studies by controlling for employment-related factors associated with breastfeeding behaviour such as income, employment status, job type (i.e. white or blue collar) as well as the economic characteristics of the spouse. Previous studies have failed to control for economic factors related to breastfeeding (Dozier and McKee, 2011; Gurley-Calvez et al., 2018; Hawkins et al., 2013; Kapinos et al., 2017; Smith-Gagen et al., 2014). We also employ a household perspective within our analyses in Chapters 4 and 5, where we do not limit our focus on directly treated individuals (i.e. mothers) but also their partners who may be indirectly affected through interdependencies in labour supply. Several previous studies have ignored the intra-household bargaining process when evaluating impacts of workplace family-friendly policies and fail to control for the observed and unobserved characteristics of the spouse. Indeed, policy impacts can be biased without considering the intra-household bargaining process and the possible indirect impacts on spouses (Goux et al., 2014). We additionally overcome endogeneity issues using robust quasi-experimental methods such as DD and DDD. We contribute to the broad literature on workplace policies to support parents with newborn infants by underlining the importance of implementing workplace policies that enable a better environment for parents to combine employment and childcare duties.

The findings of this thesis have several implications for policy makers, firms, and the wider economy. We find that simply encouraging employers to implement workplace support for breastfeeding does not have any significant effects on breastfeeding rates or mothers' absenteeism. Such weakly enforceable policies have been enacted in all US states under the Affordable Care Act in 2010 (Patient Protection and Affordable Care Act, 2010). Although a step in the right direction, our results suggest that this federal level legislation may not have a measurable impact directly on breastfeeding rates or indirectly on mothers' labour market outcomes unless tightened. Furthermore, our results suggest that state-mandated workplace policies may contribute to the breastfeeding targets outlined in the Healthy People Goals by 2020 in the US. However, it may take several years to reach these objectives due to already low breastfeeding rates and the existing significant barriers to breastfeeding including employment where several states do not have strictly enforceable workplace breastfeeding policies. Indeed, studies have shown that only 40% of working mothers report having access to breastfeeding facilities as employers are not aware of

such policies and the benefits of breastfeeding (Kozhimannil et al., 2016). Therefore, policy makers need to tighten the enforceability and expand the scope of workplace breastfeeding policies by mandating compliance. Policy makers may also implement financial incentives for employers who report health and economic benefits of programs and educational campaigns to increase awareness of the existence of workplace breastfeeding policies and the benefits to firms.

Additionally, our results suggest that the policy seems to have enabled a better coordination of work and family responsibilities reducing the push and pull mothers may experience between the two obligations. Although other family-friendly policies have been implemented within the workplace, leave policies seem to be the most popular to promote a family-friendly work environment and help parents combine work and family. However, studies have shown that employers transfer the implicit costs of implementing leave policies to women in the form of reduced wages (Heywood et al., 2007). Therefore, workplace breastfeeding policies may be one such policy that does not transfer the costs of implementation to employees in the long run as the policy incentivizes women to go into work rather than be absent. However, there is a need for more studies that analyse the impacts of family-friendly policies that encourage parents to work after child birth. Such evidence is key to push legislation and incorporate policies within firms. A better family-friendly environment may lead to higher productivity and morale among employees and thus have an impact on firm's performance. Therefore, although implementing a breastfeeding policy may initially cost firms, the benefits can outweigh the costs in the long run.

The results are also reassuring for the wider economy of the US. Literature has shown that the US can save \$3.6 billion if breastfeeding rates were increased to 50% (Weimer, 2001). Absenteeism also costs the US economy \$225.8 billion per year (CDC Foundation, 2015). Therefore, workplace breastfeeding policies can save health- and employment- related costs through the increase of breastfeeding rates and the reduction of mothers' absenteeism. Furthermore, workplace breastfeeding policies can contribute to alleviating gender inequality in the workplace and in the household, which is evident through our findings on the within-couple earnings gap. Research has shown that there is a strong association between a country's progress such as its economic competitiveness and the gender wage gap (World Economic Forum, 2017). Therefore, our findings have implications that can impact the wider US economy where the labour force participation rate

is approximately 58% female and of those women, mothers with young children make up 61% of the female labour force (US Bureau of Labour Statistics, 2014).

Finally, this thesis provides insight beyond the context of the US. Although we find encouraging evidence of US workplace breastfeeding policies, we may not find similar strong effects for other high-income countries as the policy environment is different. For example, Canada and European countries have provisions to support mothers and fathers in the workplace such as extended paid parental leave. Evidence has shown that paid maternity leave policies are already effective in increasing breastfeeding rates among mothers (Baker and Milligan, 2008; Berger et al., 2005; Chatterji and Frick, 2005; Guendelman et al., 2009; Huang and Yang, 2015; Rossin, 2011; Ruhm, 2000). Therefore, we may not see a strong impact of policies on breastfeeding rates but rather a marginal impact in other high-income countries. However, with regards to labour market outcomes, leave policies encourage parents to be absent from the workplace rather than stay at work. Evidence has shown that career interruptions due to child birth can negatively impact parents' labour market outcomes such as earnings (Baum, 2002; Becker, 1985; Corcoran and Duncan, 1979; Fernández-Kranz et al., 2013; Mincer and Ofek, 1982; Munasinghe et al., 2008; Sandell and Shapiro, 1980; Waldfogel, 1998b). Therefore, we may see a positive effect of workplace breastfeeding policies on the within-couple earnings gap and absenteeism in other high-income contexts. With regards to low- to middle-income countries, breastfeeding rates are significantly higher compared to the US. However, employment may become a more significant barrier to breastfeeding as more women participate in the labour force and gender roles are broken down within traditional household contexts. Therefore, these countries may also see gains in breastfeeding rates, absenteeism, and the within-couple earnings gap through the implementation of workplace breastfeeding policies.

The findings of this thesis should be considered in light of its limitations. Firstly, we do not observe the specific mechanisms through which state-mandated workplace breastfeeding policies reduce absenteeism and the within-couple earnings gap. Although this is primarily due to data limitations, we hypothesize that the effect of workplace breastfeeding policies to influence labour market outcomes is through the health benefits of breastfeeding. Indeed, it is well-established that breastfeeding has direct health benefits for the mother and the infant through reduced incidence

and prevalence of several diseases (Duijts et al., 2010; Fletcher, 2011; Quigley et al., 2007; Singhal and Lanigan, 2007; UNICEF, 2015; Victora et al., 1987, 2015; WHO, 2000). Secondly, we focus our analysis in this thesis to only working mothers as mothers are only “eligible” for the policy if they are employed. Therefore, we do not specifically look at the impacts of the policy on mothers’ labour force participation. However, this can be an area for future research. Thirdly, we do not look at the socioeconomic gradient of breastfeeding where there is evidence that there are disparities in breastfeeding behaviour according to socioeconomic status, ethnicity, and other demographic factors (Callen and Pinelli, 2004; Dubois and Girard, 2003; Evers et al., 1998; Forste et al., 2001; Gibson-Davis and Brooks-Gunn, 2006; Heck et al., 2006; Li et al., 2004; Rossem et al., 2009; Singh et al., 2007; Thulier and Mercer, 2009; Vogel et al., 2007). Indeed, the impacts of the policy can differ according to the socioeconomic profile of individuals. Additionally, the policy gains may also vary according to different industry sectors. Therefore, this can be an additional opportunity for future research. Despite these limitations, this thesis provides sound evidence of the direct and indirect impacts of workplace breastfeeding policies in the context of the US and poses avenues for future research.

This thesis also provides additional extensions where prospective studies may assess the impacts of workplace breastfeeding policies on children’s outcomes such as cognitive scores or health outcomes, where sibling data may be used to control for unobserved characteristics within households. Future research can also focus on assessing the impact of workplace breastfeeding policies on the division of household work between couples. We find that the policy affects household economic characteristics between couples such as the within-couple earnings gap. Therefore, the policy may also influence how household responsibilities are distributed between couples. Using firm-level data can be an additional possibility for future research where in some states, firms with less than a certain number of employees may be exempt from implementing the policy. These firms can be used as controls within states and offer another source of variation. The impacts of the ACA can also be studied by using states without state-mandated workplace breastfeeding policies as treatment states and those with state-mandated policies as control states as the ACA is unlikely to have an impact on states with previously implemented workplace breastfeeding policies. Lastly, studies can analyse bundles of policies that allow parents to

reconcile employment and childcare duties as certain policies may interact to have mediating or moderating effects on parents' health and labour market outcomes.

In conclusion, this thesis provides sound evidence of the effectiveness of workplace policies that allow parents to combine work and employment. Implementing such policies are not only important for parents but also for firms and the wider economy where we can be one step closer to achieving gender equality.

BIBLIOGRAPHY

- Abdulwadud OA and Snow ME (2012) Interventions in the workplace to support breastfeeding for women in employment. *Cochrane Database of Systematic Reviews*. DOI: 10.1002/14651858.CD006177.pub3.
- Aldana SG and Pronk NP (2001) Health promotion programs, modifiable health risks, and employee absenteeism. *Journal of Occupational and Environmental Medicine* 43: 36–46. DOI: 10.1097/00043764-200101000-00009.
- Allen SG (1981) An Empirical Model of Work Attendance. *The Review of Economics and Statistics* 63(1): 77–87.
- Altindag DT and Ziebarth NL (2017) *Women's Bargaining Power and the Pill*. Available at: http://www.auburn.edu/~dza0013/pill_bargaining.pdf (accessed 25 January 2018).
- Amitay EL and Keinan-Boker L (2015) Breastfeeding and childhood leukemia incidence: A meta-analysis and systematic review. *JAMA Pediatrics*. DOI: 10.1001/jamapediatrics.2015.1025.
- Anderson DJ, Binder M and Krause K (2002) The Motherhood Wage Penalty: Which Mothers Pay It and Why? *American Economic Review* 92(2): 354–358. DOI: 10.1257/000282802320191606.
- Anderson DJ, Binder M and Krause K (2003) The Motherhood Wage Penalty Revisited: Experience, Heterogeneity, Work Effort, and Work-Schedule Flexibility. *Industrial and Labor Relations Review* 56(2): 273–294.
- Angelov N, Johansson P and Lindahl E (2013) Gender differences in sickness absence and the gender division of family responsibilities. *Working paper IFAU*.
- Angelov N, Johansson P and Lindahl E (2016) Parenthood and the Gender Gap in Pay. *Journal of Labor Economics* 34(3): 545–579. DOI: 10.1086/684851.
- Angrist JD and Pischke J (2008) *Mostly Harmless Econometrics: An Empiricist's Companion*. Massachusetts Institute of Technology and The London School of Economics.
- Apps PF and Rees R (1996) Labour supply, household production and intra-family welfare distribution. *Journal of Public Economics* 60(2): 199–219. DOI: 10.1016/0047-2727(95)01524-8.
- Armstrong J and Reilly JJ (2002) Breastfeeding and lowering the risk of childhood obesity.

- Lancet* 359(9322): 2003–2004. DOI: 10.1016/S0140-6736(02)08837-2.
- Askildsen JE, Bratberg E and Nilsen ØA (2005) Unemployment, labor force composition and sickness absence: a panel data study. *Health Economics* 14: 1087–1101. DOI: 10.1002/hec.994.
- Autor DH (2003) Outsourcing at Will: The Contribution of Unjust Dismissal Doctrine to the Growth of Employment Outsourcing. *Journal of Labor Economics* 21(1): 1–42. DOI: 10.1086/344122.
- Baicker K, Cutler D and Song Z (2010) Workplace wellness programs can generate savings. *Health affairs (Project Hope)* 29(2): 304–311. DOI: 10.1377/hlthaff.2009.0626.
- Baker M and Milligan K (2008) Maternal employment, breastfeeding, and health: Evidence from maternity leave mandates. *Journal of Health Economics* 27(4): 871–887. DOI: 10.1016/j.jhealeco.2008.02.006.
- Ball TM and Bennett DM (2001) The economic impact of breastfeeding. *Pediatric clinics of North America* 48(1): 253–262. DOI: 10.1016/S0031-3955(05)70298-4.
- Barmby T a, Ercolani MG and Treble JG (2002) Sickness absence: An international comparison. *Economic Journal* 112(480): F315–F331. DOI: 10.1111/1468-0297.00046.
- Bartick M and Reinhold A (2010) The Burden of Suboptimal Breastfeeding in the United States: A Pediatric Cost Analysis. *Pediatrics* 125(5): e1048–e1056. DOI: 10.1542/peds.2009-1616.
- Baum CL (2002) The Effect of Work Interruptions on Women’s Wages. *Labour* 16(1): 1–37. DOI: 10.1111/1467-9914.00185.
- Baum CL (2003) The Effect of State Maternity Leave Legislation and the 1993 Family and Medical Leave Act on Employment and Wages. *Labour Economics* 10(5): 573–596. DOI: 10.1016/S0927-5371(03)00037-X.
- Beblo M, Bender S and Wolf E (2009) Establishment-level wage effects of entering motherhood. *Oxford Economic Papers* 61(SPEC. ISS.). DOI: 10.1093/oep/gpn040.
- Becker GS (1985) Human Capital, Effort, and the Sexual Division of Labor. *Journal of Labor Economics* 3(1, Part 2): S33–S58. DOI: 10.1086/298075.
- Berger LM, Hill J and Waldfogel J (2005) Maternity leave, early maternal employment and child health and development in the US. *The Economic Journal* 115(October 2015): F29–F47. DOI: 10.1111/j.0013-0133.2005.00971.x.
- Berry CM, Lelchook AM and Clark MA (2012) A meta-analysis of the interrelationships

- between employee lateness, absenteeism, and turnover: Implications for models of withdrawal behavior. *Journal of Organizational Behavior* 33(5): 678–699. DOI: 10.1002/job.778.
- Bertera RL (1990) The Effects of Workplace Health Promotion on Absenteeism and Employment Costs in a Large Industrial Population. *American Journal of Public Health* 80(9): 1101–1105.
- Bertrand M, Goldin C and Katz LF (2010) Dynamics of the gender gap for young professionals in the financial and corporate sectors. *American Economic Journal: Applied Economics* 2(3): 228–255. DOI: 10.1257/app.2.3.228.
- Besley T and Case A (2000) Unnatural Experiments? Estimating the Incidence of Endogenous Policies. *The Economic Journal* 110(467): F672–F694.
- Blackwell M, Iacus S, King G, et al. (2009) Cem: Coarsened exact matching in Stata. *Stata Journal* 9(4): 524–546.
- Bobrow KL, Quigley MA, Green J, et al. (2013) Persistent effects of women's parity and breastfeeding patterns on their body mass index: Results from the Million Women Study. *International Journal of Obesity* 37(5): 712–717. DOI: 10.1038/ijo.2012.76.
- Bourguignon F and Chiappori P-A (1992) Collective models of household behavior: An introduction. *European Economic Review* 36(2–3): 355–364. DOI: 10.1016/0014-2921(92)90091-A.
- Bowatte G, Tham R, Allen KJ, et al. (2015) Breastfeeding and childhood acute otitis media: a systematic review and meta-analysis. *Acta paediatrica* 104(467): 85–95. DOI: 10.1111/apa.13151.
- Bridges S and Mumford K (2001) Absenteeism in the UK: A Comparison Across Genders. *The Manchester School*. DOI: 10.1111/1467-9957.00248.
- Brown CA, Poag S and Kasprzycki C (2001) Exploring Large Employers' and Small Employers' Knowledge, Attitudes, and Practices on Breastfeeding Support in the Workplace. *Journal of Human Lactation* 17(1): 39–46. DOI: 10.1177/089033440101700108.
- Browning M and Chiappori P (1998) Efficient Intra-Household Allocations: A General Characterization and Empirical Tests. *Econometrica* 66(6): 1241. DOI: 10.2307/2999616.
- Budig MJ and England P (2001) The Wage Penalty for Motherhood. *American Sociological Review* 66(2): 204. DOI: 10.2307/2657415.

- Bullinger LR and Gurley-Calvez T (2016) WIC participation and maternal behavior: Breastfeeding and work leave. *Contemporary Economic Policy* 34(1): 158–172. DOI: 10.1111/coep.12123.
- Callen J and Pinelli J (2004) Incidence and duration of breastfeeding for term infants in Canada, United States, Europe, and Australia: A literature review. *Birth* 31(4): 285–292. DOI: 10.1111/j.0730-7659.2004.00321.x.
- CDC (2005) Support for Breastfeeding in the Workplace. Available at: https://www.cdc.gov/breastfeeding/pdf/bf_guide_2.pdf.
- CDC (2013) Breastfeeding Report Cards. Available at: <http://www.cdc.gov/breastfeeding/data/reportcard.htm> (accessed 14 August 2014).
- CDC (2017) Breastfeeding Rates. Available at: https://www.cdc.gov/breastfeeding/data/nis_data/index.htm (accessed 12 March 2018).
- CDC Foundation (2015) CDC Healthy Workforce. Available at: <http://www.cdcfoundation.org/businesspulse/healthy-workforce-infographic> (accessed 27 February 2017).
- Chatterji P and Brooks-Gunn J (2004) WIC participation, breastfeeding practices, and well-child care among unmarried, low-income mothers. *American Journal of Public Health* 94(8): 1324–1327. DOI: 10.2105/AJPH.94.8.1324.
- Chatterji P and Frick KD (2005) Does returning to work after childbirth affect breastfeeding practices? *Review of Economics of the Household* 3(3): 315–335. DOI: 10.1007/s11150-005-3460-4.
- Chen YC, Wu YC and Chie WC (2006) Effects of work-related factors on the breastfeeding behavior of working mothers in a Taiwanese semiconductor manufacturer: a cross-sectional survey. *BMC public health* 6(October): 160. DOI: 10.1186/1471-2458-6-160.
- Chiappori P (1988) Rational Household Labor Supply. *Econometrica* 56(1): 63–90. DOI: 10.2307/1911842.
- Chiappori P (1992) Collective Labor Supply and Welfare. *Journal of Political Economy* 100(3): 437–467. DOI: 10.1086/261825.
- Chiappori P, Fortin B and Lacroix G (2002) Marriage Market, Divorce Legislation, and Household Labor Supply. *Journal of Political Economy* 110(1): 37–72. DOI: 10.1086/324385.

- Chinchilla N and Jimenez E (2016) Helping Women Thrive in Your Company: Women Mean Business. *Harvard Business Review*. Available at: <https://hbr.org/product/helping-women-thrive-in-your-company-women-mean-business/IIR167-PDF-ENG> (accessed 27 January 2018).
- Chowdhury R, Sinha B, Sankar MJ, et al. (2015) Breastfeeding and Maternal Health Outcomes: A Systematic Review and Meta-Analysis. *Acta Paediatrica*. DOI: 10.1111/apa.13102.
- Christofides LN, Polycarpou A and Vrachimis K (2013) Gender wage gaps, ‘sticky floors’ and ‘glass ceilings’ in Europe. *Labour Economics* 21: 86–102. DOI: 10.1016/j.labeco.2013.01.003.
- Cipollone A, Vallanti G and Patacchini E (2013) Women Labor Market Participation in Europe : Novel Evidence on Trends and Shaping Factors. *IZA Journal of European Labor Studies* (7710).
- Cohen R and Mrtek MB (1994) The Impact of Two Corporate Lactation Programs on the Incidence and Duration of Breast-feeding by Employed Mothers. *American Journal of Health Promotion* 8(6): 436–441. DOI: 10.4278/0890-1171-8.6.436.
- Cohen R, Mrtek MB and Mrtek RG (1995) Comparison of Maternal Absenteeism and Infant Illness Rates Among Breast-feeding and Formula-feeding Women in Two Corporations. *American Journal of Health Promotion* 10(21): 148–53.
- Connelly R (1992) The effect of child care costs on married women’s labour force participation. *Review of Economics and Statistics* 74(1): 83–90. DOI: 10.2307/2109545.
- Cools S, Fiva JH and Kirkebøen LJ (2015) Causal Effects of Paternity Leave on Children and Parents. *Scandinavian Journal of Economics* 117(3): 801–828. DOI: 10.1111/sjoe.12113.
- Corcoran M and Duncan GJ (1979) Work History, Labor Force Attachment, and Earnings Differences between the Races and Sexes. *The Journal of Human Resources* 14(1): 3–20. DOI: 10.2307/145535.
- Crespo L (2009) *Estimation and Testing of Household Labour Supply Models: Evidence from Spain*.
- Dabritz H, Hinton B and Babb J (2009) Evaluation of lactation support in the Workplace or school environment on 6-month breastfeeding outcomes in Yolo County, California. *Journal of Human Lactation* 25(2): 182–193. DOI: 10.1177/0890334408328222.
- Dalton D and Perry J (1981) Absenteeism and the Collective Bargaining Agreement: an

- Empirical Test. *Academy of Management Journal* 24(2): 425–431. DOI: 10.2307/255853.
- Dalton DR and Mesch DJ (1990) The Impact of Flexible Scheduling on Employee Attendance and Turnover. *Administrative Science Quarterly* 35(2): 370–387. DOI: 10.2307/2393395.
- Darity WA and Mason PL (1998) Evidence on Discrimination in Employment: Codes of Color, Codes of Gender. *Journal of Economic Perspectives* 12(2): 63–90. DOI: 10.1257/jep.12.2.63.
- Del Bono E and Pronzato CD (2012) *Does breastfeeding support at work help mothers and employers at the same time?* Available at: <https://www.iser.essex.ac.uk/research/publications/working-papers/iser/2012-06.pdf> (accessed 7 March 2016).
- Dias MC, Joyce R and Parodi F (2018) *Wage Progression and the Gender Wage Gap: The Causal Impact of Hours of Work. IFS Briefing Note.* Available at: <https://www.ifs.org.uk/uploads/publications/bns/BN223.pdf> (accessed 28 February 2018).
- Dickson V, Hawkes C, Slusser W, et al. (2000) The positive impact of a corporate lactation program on breastfeeding initiation and duration rates. In: *Annual Seminar for Physicians on Breastfeeding*, 2000.
- Dionne G and Dostie B (2007) New evidence on the determinants of absenteeism using linked employer- employee data. *Industrial and Labor Relations Review* 61(1): 108–120.
- Donath S and Amir L (2007) The relationship between maternal smoking and breastfeeding duration after adjustment for maternal infant feeding intention. *Acta Paediatrica* 93(11): 1514–1518. DOI: 10.1111/j.1651-2227.2004.tb02639.x.
- Dozier AM and McKee KS (2011) State breastfeeding worksite statutes....breastfeeding rates...and..... *Breastfeeding medicine : the official journal of the Academy of Breastfeeding Medicine* 6: 319–24. DOI: 10.1089/bfm.2011.0082.
- Dubois L and Girard M (2003) Social determinants of initiation, duration and exclusivity of breastfeeding at the population level - The results of the Longitudinal Study of Child Development in Quebec (ELDEQ 1998-2002). *Canadian Journal of Public Health* 94(4): 300–305.
- Duijts L, Jaddoe VW V., Hofman A, et al. (2010) Prolonged and Exclusive Breastfeeding Reduces the Risk of Infectious Diseases in Infancy. *Pediatrics* 126(1): e18–e25. DOI: 10.1542/peds.2008-3256.

- Dustmann C and Schönberg U (2012) Expansions in maternity leave coverage and children's long-term outcomes. *American Economic Journal: Applied Economics* 4(3): 190–224. DOI: 10.1257/app.4.3.190.
- Edin PA and Gustavsson M (2008) Time out of work and skill depreciation. *Industrial and Labor Relations Review* 61(2): 163–180. DOI: 10.1177/001979390806100202.
- Ejrnæs M and Kunze A (2013) Work and wage dynamics around childbirth. *Scandinavian Journal of Economics* 115(3): 856–877. DOI: 10.1111/sjoe.12025.
- Ekberg J, Eriksson R and Friebel G (2013) Parental leave - A policy evaluation of the Swedish 'Daddy-Month' reform. *Journal of Public Economics* 97(1): 131–143. DOI: 10.1016/j.jpubeco.2012.09.001.
- Erickson RJ, Nichols L and Ritter C (2000) Family Influences on Absenteeism: Testing an Expanded Process Model. *Journal of Vocational Behavior* 57(2): 246–272. DOI: <http://dx.doi.org/10.1006/jvbe.2000.1730>.
- European Commission (2017) Gender pay gap statistics - Statistics Explained. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Gender_pay_gap_statistics (accessed 27 January 2018).
- Evers S, Daran L and Schellenberg K (1998) Influences on breastfeeding rates in low income communities in Ontario. *Canadian Journal of Public Health* 89(3): 203–207.
- Evertsson M and Nermo M (2007) Changing resources and the division of housework: A longitudinal study of Swedish couples. *European Sociological Review* 23(4): 455–470. DOI: 10.1093/esr/jcm018.
- Fein SB and Roe B (1998) The effect of work status on initiation and duration of breast-feeding. *American journal of public health* 88(7): 1042–6. DOI: 10.2105/AJPH.88.7.1042.
- Fernández-Kranz D, Lacuesta A and Rodríguez-Planas N (2013) The Motherhood Earnings Dip Evidence from Administrative Records. *The Journal of Human Resources* 48(1): 169–197. DOI: 10.1353/jhr.2013.0007.
- Fitzenberger B, Sommerfeld K and Steffes S (2013) Causal effects on employment after first birth - A dynamic treatment approach. *Labour Economics* 25: 49–62. DOI: 10.1016/j.labeco.2013.05.003.
- Fletcher JM (2011) Long-term effects of health investments and parental favoritism: The case of breastfeeding. *Health Economics* 20(11): 1349–1361. DOI: 10.1002/hec.1675.

- Forste R, Weiss J and Lippincott E (2001) The Decision to Breastfeed in the United States: Does Race Matter? *Pediatrics* 108(2): 291–296. DOI: 10.1542/peds.108.2.291.
- Galtry J (1997) Lactation and the labor market: Breastfeeding, labor market changes, and public policy in the united states. *Health Care for Women International* 18(5): 467–480. DOI: 10.1080/07399339709516301.
- Galtry J (2003) The impact on breastfeeding of labour market policy and practice in Ireland, Sweden, and the USA. *Social Science and Medicine* 57(1): 167–177. DOI: 10.1016/S0277-9536(02)00372-6.
- Garcia I, Molina JA and Montuenga VM (2009) Intra-Household Time Allocation: Gender Differences in Caring for Children. *IZA Discussion Paper Series* (4188). Available at: <http://ftp.iza.org/dp4188.pdf> (accessed 25 January 2018).
- Gariety BS and Shaffer S (2001) Wage Differentials Associated with Flextime. *Monthly Labor Review*.
- Gatrell CJ (2007) Secrets and lies: Breastfeeding and professional paid work. *Social Science and Medicine* 65(2): 393–404. DOI: 10.1016/j.socscimed.2007.03.017.
- Genadek KR, Stock WA and Stoddard C (2015) The Board of Regents of the University of Wisconsin System No-Fault Divorce Laws and the Labor Supply of Women with and without Children. *The Journal of Human Resources* 42(1): 247–274.
- Gibson-Davis CM and Brooks-Gunn J (2006) Couples' immigration status and ethnicity as determinants of breastfeeding. *American Journal of Public Health* 96(4): 641–646. DOI: 10.2105/AJPH.2005.064840.
- Gielen AC, Faden RR, O'Campo P, et al. (1991) Maternal employment during the early postpartum period: effects on initiation and continuation of breast-feeding. *Pediatrics* 87(3): 298–305.
- Giglia R, Binns C and Alfonso H (2006) Maternal cigarette smoking and breastfeeding duration. *Acta Paediatrica* 95(11). Blackwell Publishing Ltd: 1370–1374. DOI: 10.1080/08035250600771474.
- Giugliani ERJ, Horta BL, de Mola CL, et al. (2015) Effect of breastfeeding promotion interventions on child growth: A systematic review and meta-analysis. *Acta Paediatrica* 104(Suppl 467): 20–29. DOI: 10.1111/apa.13160.
- Global Health Observatory (2017) Exclusive Breastfeeding Under 6 Months - Data by Country.

- Goff SJ, Mount MK and Jamison RL (1990) Employer Supported Childcare, work/family conflict, and absenteeism: A field of study. *Personnel Psychology* 43(4): 793–809. DOI: 10.1111/j.1744-6570.1990.tb00683.x.
- Goux D, Maurin E and Petrongolo B (2014) Worktime regulations and spousal labor supply. *American Economic Review* 104(1): 252–276. DOI: 10.1257/aer.104.1.252.
- Gray H (2002) Family-friendly working: What a performance! An analysis of the relationship between the availability of family-friendly policies and establishment performance. *Centre for Economic Performance - London School of Economics and Political Science* 3(December): 1–43. Available at: <http://eprints.lse.ac.uk/20082/> (accessed 24 January 2017).
- Gray JS (1998) Divorce-Law Changes, Household Bargaining, and Married Women's Labor Supply. *American Economic Review*. DOI: <http://www.jstor.org/stable/116853>.
- Gruber J (1994) The incidence of mandated maternity benefits. *American Economic Review* 84(3): 622–641. DOI: 10.2307/2118071.
- Guendelman S, Kosa JL, Pearl M, et al. (2009) Juggling Work and Breastfeeding: Effects of Maternity Leave and Occupational Characteristics. *Pediatrics* 123(1): e38–e46. DOI: 10.1542/peds.2008-2244.
- Gupta N and Smith N (2002) Children and career interruptions: The family gap in Denmark. *Economica* 69(276): 609–629. DOI: 10.1111/1468-0335.00303.
- Gupta N, Smith N and Verner M (2008) The impact of Nordic countries' family friendly policies on employment, wages, and children. *Review of Economics of the Household* 6(1): 65–89. DOI: 10.1007/s11150-007-9023-0.
- Gurley-Calvez T, Bullinger L and Kapinos KA (2018) Effect of the Affordable Care Act on Breastfeeding Outcomes. *American Journal of Public Health* 108(2): 277–283. DOI: 10.2105/AJPH.2017.304108.
- Gustafsson S and Stafford F (1992) Child Care Subsidies and Labor Supply in Sweden. *The Journal of Human Resources* 27(1): 204–230. DOI: 10.2307/145917.
- Häggkvist A-P, Brantsæter AL, Grjibovski AM, et al. (2010) Prevalence of breast-feeding in the Norwegian Mother and Child Cohort Study and health service-related correlates of cessation of full breast-feeding. *Public Health Nutrition* 13(12): 2076–2086. DOI: 10.1017/S1368980010001771.

- Hansen K (2016) Breastfeeding: A smart investment in people and in economies. *The Lancet*. DOI: 10.1016/S0140-6736(16)00012-X.
- Harder T, Bergmann R, Kallischnigg G, et al. (2005) Duration of Breastfeeding and Risk of Overweight: A Meta-Analysis. *American Journal of Epidemiology* 162(5). Oxford University Press: 397–403. DOI: 10.1093/aje/kwi222.
- Hardoy I, Schøne P and Østbakken KM (2017) Children and the gender gap in management. *Labour Economics* 47: 124–137. DOI: 10.1016/j.labeco.2017.05.009.
- Hawkins S, Griffiths L, Dezateux C, et al. (2007) The impact of maternal employment on breastfeeding duration in the UK Millennium Cohort Study. *Public Health Nutrition* 10(9): 891–896.
- Hawkins S, Stern AD and Gillman MW (2013) Do state breastfeeding laws in the USA promote breast feeding? *Journal of Epidemiology and Community Health* 67(3): 250–6. DOI: 10.1136/jech-2012-201619.
- Heck KE, Braveman P, Cubbin C, et al. (2006) Socioeconomic status and breastfeeding initiation among california mothers. *Public Health Reports* 121(1): 51–59. DOI: 10.1177/003335490612100111.
- Herbst CM (2010) The Labor Supply Effects of Child Care Costs and Wages in the Presence of Subsidies and the Earned Income Tax Credit. *Review of Economics of the Household* 8(2): 199–230. DOI: 10.1007/s11150-009-9078-1.
- Heymann J, Raub A and Earle A (2013) Breastfeeding policy: A globally comparative analysis. *Bulletin of the World Health Organization* 91(6): 398–406. DOI: 10.2471/BLT.12.109363.
- Heywood JS and Miller LA (2015) Schedule Flexibility, Family Friendly Policies and Absence. *The Manchester School* 83(6): 652–675. DOI: 10.1111/manc.12079.
- Heywood JS, Siebert WS and Wei X (2007) The implicit wage costs of family friendly work practices. *Oxford Economic Papers* 59(2): 275–300. DOI: 10.1093/oep/gpm006.
- Hill M (1991) *The Panel Study of Income Dynamics: a users guide*. Newbury Park California/London England Sage Publications 1992.
- Horta BL and Victora CG (2013) Long-term health effects of breastfeeding. *World Health Organization* 129(8–9): 57–64. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/20960419>.
- Horta BL, Loret De Mola C and Victora CG (2015) Breastfeeding and intelligence: A systematic

- review and meta-analysis. *Acta Paediatrica, International Journal of Paediatrics*. DOI: 10.1111/apa.13139.
- Huang R and Yang M (2015) Paid maternity leave and breastfeeding practice before and after California's implementation of the nation's first paid family leave program. *Economics and Human Biology* 16: 45–59. DOI: 10.1016/j.ehb.2013.12.009.
- Huffman ML, King J and Reichelt M (2017) Equality for whom? Organizational policies and the gender gap across the German earnings distribution. *Industrial and Labor Relations Review* 70(1): 16–41. DOI: 10.1177/0019793916673974.
- Hultin M and Szulkin R (1999) Wages and Unequal Access to Organizational Power: An Empirical Test of Gender Discrimination. *Administrative Science Quarterly* 44(3): 453. DOI: 10.2307/2666958.
- Ip S, Chung M, Raman G, et al. (2007) *Breastfeeding and maternal and infant health outcomes in developed countries. USA: Agency for Healthcare Research and Quality*. DOI: 10.1542/gr.18-2-15.
- Jacknowitz A, Novillo D and Tiehen L (2007) Special Supplemental Nutrition Program for Women, Infants, and Children and infant feeding practices. *Pediatrics* 119(2): 281–289. DOI: 10.1542/peds.2006-1486.
- Jacobson S, Chiodo L and Jacobson J (1999) Breastfeeding effects on intelligence quotient in 4- and 11-year-old children. *Pediatrics* 103(71).
- Johansson EA (2010) The effect of own and spousal parental leave on earnings. *IFAU - Institute for Labour Market Policy Evaluation Working Paper* 4: 1–32.
- Johansson P and Palme M (2002) Assessing the Effect of Public Policy on Worker Absenteeism. *The Journal of Human Resources* 37(2): 381. DOI: 10.2307/3069652.
- Johnson NB and Provan KG (1995) The relationship between work/family benefits and earnings: A test of competing predictions. *Journal of Socio-Economics* 24(4): 571–584. DOI: 10.1016/1053-5357(95)90003-9.
- Joseph O, Pailhé A, Recotillet I, et al. (2013) The economic impact of taking short parental leave: Evaluation of a French reform. *Labour Economics* 25: 63–75. DOI: 10.1016/j.labeco.2013.04.012.
- Joshi H (1998) The Opportunity Costs of Childbearing: More than Mothers' Business. *Journal of Population Economics* 11(2): 161–183. DOI: 10.1007/s001480050063.

- Joyce A (2017) Workplaces must give moms space to pump breast milk. Women share what it's really like. *The Washington Post*, 3 August. Available at: https://www.washingtonpost.com/graphics/2017/lifestyle/on-parenting/mothers-experiences-pumping-at-work/?utm_term=.15c50fa695d3.
- Joyce T, Racine A and Yunzal-Butler C (2008) Reassessing the WIC effect: Evidence from the pregnancy nutrition surveillance system. *Journal of Policy Analysis and Management* 27(2): 277–303. DOI: 10.1002/pam.20325.
- Kapinos KA, Bullinger L and Gurley-Calvez T (2017) Lactation Support Services and Breastfeeding Initiation: Evidence from the Affordable Care Act. *Health Services Research* 52(6): 2175–2196. DOI: 10.1111/1475-6773.12598.
- Kiernan K and Pickett KE (2006) Marital status disparities in maternal smoking during pregnancy, breastfeeding and maternal depression. *Social Science & Medicine* 63(2). Pergamon: 335–346. DOI: 10.1016/J.SOCSCIMED.2006.01.006.
- Kitsantas P and Pawloski LR (2010) Maternal obesity, health status during pregnancy, and breastfeeding initiation and duration. *The Journal of Maternal-Fetal and Neonatal Medicine* 23(2): 135–41. DOI: 10.3109/14767050903118270.
- Kleven HJ, Landais C and Sogaard JE (2018) Children and Gender Inequality: Evidence from Denmark. *Working Paper*. DOI: 10.3386/w24219.
- Kogan MD, Singh GK, Dee DL, et al. (2008) Multivariate analysis of state variation in breastfeeding rates in the United States. *American Journal of Public Health* 98(10): 1872–1880. DOI: 10.2105/AJPH.2007.127118.
- Kozhimannil KB, Jou J, Gjerdingen DK, et al. (2016) Access to Workplace Accommodations to Support Breastfeeding after Passage of the Affordable Care Act. *Women's Health Issues* 26(1): 6–13. DOI: 10.1016/j.whi.2015.08.002.
- Kristensen K, Juhl HJ, Eskildsen J, et al. (2006) Determinants of absenteeism in a large Danish bank. *International Journal of Human Resource Management* 17(9): 1645–1658. DOI: 10.1080/09585190600878527.
- Larson EW and Fukami C V. (1985) Employees absenteeism: the role of ease of movement. *Academy of Management Journal* 28(2): 464–471. DOI: 10.2307/256211.
- Laughlin L (2011) Maternity Leave and Employment Patterns of First-Time Mothers: 1961–2008. *Current Population Reports* (October): 70–128. Available at:

- <https://www.census.gov/prod/2011pubs/p70-128.pdf> (accessed 15 October 2017).
- Leibowitz A, Klerman JA and Waite LJ (1992) Employment of New Mothers and Child Care Choice: Differences by Children's Age. *The Journal of Human Resources* 27(1): 112–133.
- Leigh J (1983) Sex Differences in Absenteeism. *Industrial Relations* 22(3): 349–361.
- Li R, Darling N, Maurice E, et al. (2004) Breastfeeding Rates in the United States by Characteristics of the Child, Mother, or Family: The 2002 National Immunization Survey. *Pediatrics*. DOI: 10.1542/peds.2004-0481.
- Libbus MK and Bullock LFC (2002) Breastfeeding and Employment: An Assessment of Employer Attitudes. *Journal of Human Lactation* 18(3): 247–251. DOI: 10.1177/089033440201800306.
- Lindberg LD (1996) Women's Decisions about Breastfeeding and Maternal Employment. *Journal of Marriage and the Family* 58(1): 239. DOI: 10.2307/353392.
- Lokshin M (2004) Household Childcare Choices and Women's Work Behavior in Russia. *The Journal of Human Resources* 39(4): 1094. DOI: 10.2307/3559040.
- Lundberg S and Rose E (2000) Parenthood and the earnings of married men and women. *Labour Economics* 7(6): 689–710. DOI: 10.1016/S0927-5371(00)00020-8.
- Mahon J, Claxton L and Wood H (2016) Modelling the cost-effectiveness of human milk and breastfeeding in preterm infants in the United Kingdom. *Health Economics Review* 6(1). Springer: 54. DOI: 10.1186/s13561-016-0136-0.
- Mandal B, Roe BE and Fein SB (2010) The differential effects of full-time and part-time work status on breastfeeding. *Health Policy* 97(1): 79–86. DOI: 10.1016/j.healthpol.2010.03.006.
- Mandal B, Roe BE and Fein SB (2014) Work and breastfeeding decisions are jointly determined for higher socioeconomic status US mothers. *Review of Economics of the Household* 12(2): 237–257. DOI: 10.1007/s11150-012-9152-y.
- Manser M and Brown M (1980) Marriage and Household Decision-Making: A Bargaining Analysis. *International Economic Review*. DOI: 10.2307/2526238.
- Martin-Anderson S (2013) Prenatal attitudes and parity predict selection into a U.S. child health program: A short report. *Social Science & Medicine* 95: 128–132. DOI: 10.1016/j.socscimed.2013.03.013.
- McCrory C and Layte R (2012) Breastfeeding and risk of overweight and obesity at nine-years of age. *Social Science and Medicine* 75(2): 323–330. DOI:

- 10.1016/j.socscimed.2012.02.048.
- Meyer B (1995) Natural and Quasi-Natural Experiments in Economics. *Journal of Business and Economic Statistics* 13(2): 151–161.
- Millimet DL (2000) The Impact of Children on Wages, Job Tenure, and the Division of Household Labour. *Economic Journal* 110(462): C139–C157. DOI: 10.1111/1468-0297.00526.
- Mincer J and Ofek H (1982) Interrupted Work Careers: Depreciation and Restoration of Human Capital. *The Journal of Human Resources* 17(1): 3. DOI: 10.2307/145520.
- Mowday RT and Spencer DG (1981) The influence of task and personality characteristics on employee turnover and absenteeism incidents. *Academy of Management Journal* 24(3): 634–642. DOI: 10.2307/255582.
- Muchinsky PM (1977) Employee absenteeism: A review of the literature. *Journal of Vocational Behavior*. DOI: 10.1016/0001-8791(77)90066-5.
- Munasinghe L, Reif T and Henriques A (2008) Gender gap in wage returns to job tenure and experience. *Labour Economics* 15(6): 1296–1316. DOI: 10.1016/j.labeco.2007.12.003.
- Napari S (2010) Is there a motherhood wage penalty in the finnish private sector? *Labour* 24(1): 55–73. DOI: 10.1111/j.1467-9914.2010.00471.x.
- National Conference of State Legislatures (2016) Breastfeeding State Laws. Available at: <http://www.ncsl.org/research/health/breastfeeding-state-laws.aspx> (accessed 27 June 2014).
- National Conference of State Legislatures (2017) State Family and Medical Leave Laws. Available at: <http://www.ncsl.org/research/labor-and-employment/state-family-and-medical-leave-laws.aspx> (accessed 8 December 2017).
- Nunley JM and Seals RA (2011) Child-custody reform, marital investment in children, and the labor supply of married mothers. *Labour Economics* 18(1): 14–24. DOI: 10.1016/j.labeco.2010.08.002.
- Oddy WH, Li J, Landsborough L, et al. (2006) The association of maternal overweight and obesity with breastfeeding duration. *The Journal of Pediatrics* 149(2): 185–91. DOI: 10.1016/j.jpeds.2006.04.005.
- OECD (2016) OECD Gender Wage Gap. OECD Employment Outlook. OECD Publishing. DOI: 10.1787/empl_outlook-2016-en.
- Olivetti C and Petrongolo B (2017) *The Economic Consequences of Family Policies: Lessons*

- from a Century of Legislation in High-Income Countries*. DOI: 10.3386/w23051.
- Olsson M and Thoursie P (2015) Sickness insurance and spousal labour supply. *Labour Economics* 33: 41–54. DOI: 10.1016/j.labeco.2015.02.005.
- Ong G, Yap M, Foo LL, et al. (2005) Impact of working status on breastfeeding in Singapore: Evidence from the National Breastfeeding Survey 2001. *European Journal of Public Health* 15(4): 424–430. DOI: 10.1093/eurpub/cki030.
- Oreffice S (2007) Did the legalization of abortion increase women's household bargaining power? Evidence from labor supply. *Review of Economics of the Household* 5(2): 181–207. DOI: 10.1007/s11150-007-9009-y.
- Ortiz J, McGilligan K and Kelly P (2004) Duration of breast milk expression among working mothers enrolled in an employer-sponsored lactation program. *Pediatric Nursing* 30(2): 111–119.
- Paola M De, Scoppa V and Pupo V (2014) Absenteeism in the Italian Public Sector: The Effects of Changes in Sick Leave Policy. *Journal of Labor Economics* 32(2): 337–360.
- Patient Protection and Affordable Care Act (2010).
- Piper S and Parks PL (1996) Predicting the duration of lactation: evidence from a national survey. *Birth* 23(1): 7–12. DOI: 10.1111/j.1523-536X.1996.tb00454.x.
- Pokhrel S, Quigley MA, Fox-Rushby J, et al. (2015) Potential economic impacts from improving breastfeeding rates in the UK. *Archives of Disease in Childhood* 100(4): 334–340. DOI: 10.1136/archdischild-2014-306701.
- Pollak C (2017) The impact of a sick pay waiting period on sick leave patterns. *European Journal of Health Economics* 18(1): 13–31. DOI: 10.1007/s10198-015-0755-0.
- PSID (2014) Panel Study of Income Dynamics. DOI: 10.1080/19485560903382304.Socioeconomic.
- Pylkkänen E and Smith N (2009) *Career Interruptions due to Parental Leave: A Comparative Study of Denmark and Sweden*. OECD Social, Employment and Migration Working Papers.
- Quigley MA, Kelly YJ and Sacker A (2007) Breastfeeding and Hospitalization for Diarrheal and Respiratory Infection in the United Kingdom Millennium Cohort Study. *Pediatrics* 119(4): e837–e842. DOI: 10.1542/peds.2006-2256.
- Raff D and Summers L (1987) Did Henry Ford Pay Efficiency Wages? *Journal of Labor Economics* 5(4): 57–86. DOI: 10.2307/2534911.

- Rock D and Grant H (2016) Why Diverse Teams Are Smarter. *Harvard Business Review*.
- Roe B, Whittington LA, Fein SB, et al. (1999) Is There Competition between Breast-Feeding and Maternal Employment? *Demography* 36(2): 157. DOI: 10.2307/2648105.
- Rollins N, Bhandari N, Hajeebhoy N, et al. (2016) Why invest, and what it will take to improve breastfeeding practices? *The Lancet* 387(10017): 491–504. DOI: [http://dx.doi.org/10.1016/S0140-6736\(15\)01044-2](http://dx.doi.org/10.1016/S0140-6736(15)01044-2).
- Rossem L, Oenema A, Steegers EAP, et al. (2009) Are Starting and Continuing Breastfeeding Related to Educational Background? The Generation R Study. *Pediatrics* 123(6): e1017–e1027. DOI: 10.1542/peds.2008-2663.
- Rossin M (2011) The Effects of Maternity Leave on Children's Birth and Infant Health Outcomes in the United States. *Journal of Health Economics* 30(March). DOI: 10.1016/j.jhealeco.2011.01.005.
- Ruhm CJ (1998) The Economic Consequences of Parental Leave Mandates: Lessons from Europe. *The Quarterly Journal of Economics* 113(1): 285–317. DOI: 10.1162/003355398555586.
- Ruhm CJ (2000) Parental leave and child health. *Journal of Health Economics*. DOI: 10.1016/S0167-6296(00)00047-3.
- Ryan AS and Zhou W (2006) Lower breastfeeding rates persist among the Special Supplemental Nutrition Program for Women, Infants, and Children participants, 1978-2003. *Pediatrics* 117(4): 1136–46. DOI: 10.1542/peds.2005-1555.
- Ryan AS, Zhou W and Arensberg MB (2006) The effect of employment status on breastfeeding in the United States. *Women's Health Issues* 16(5): 243–251. DOI: 10.1016/j.whi.2006.08.001.
- Sandell S and Shapiro D (1980) Work expectations, human capital accumulation, and the wages of young women. *Journal of Human Resources*: 335–353. DOI: 10.2307/145287.
- Sankar MJ, Sinha B, Chowdhury R, et al. (2015) Optimal breastfeeding practices and infant and child mortality: a systematic review and meta-analysis. *Acta Paediatrica* 104: 3–13. DOI: 10.1111/apa.13147.
- Sasser AC (2005) Gender Differences in Physician Pay. *Journal of Human Resources* 40(2): 477–504.
- Save the Children (2012) *Nutrition in the First 1,000 Days. The State of the World's Children*.

- Schönberg U and Ludsteck J (2014) Expansions in Maternity Leave Coverage and Mothers' Labor Market Outcomes after Childbirth. *Journal of Labor Economics* 32(3): 469–505. DOI: 10.1086/675078.
- Scott JA, Binns CW, Oddy WH, et al. (2006) Predictors of Breastfeeding Duration: Evidence From a Cohort Study. *Pediatrics* 117(4). DOI: 10.1542/peds.2005-1991.
- Simonsen M and Skipper L (2012) The family gap in wages: What wombmates reveal. *Labour Economics* 19(1): 102–112. DOI: 10.1016/j.labeco.2011.08.006.
- Singh GK, Kogan MD and Dee DL (2007) Nativity/Immigrant Status, Race/Ethnicity, and Socioeconomic Determinants of Breastfeeding Initiation and Duration in the United States, 2003. *Pediatrics* 119(Supplement 1): S38–S46. DOI: 10.1542/peds.2006-2089G.
- Singh S, Miraldo M and Hauck K (2018) *The Impact of US Workplace Breastfeeding Legislation on Mother's and Father's Absenteeism*.
- Singhal A and Lanigan J (2007) Breastfeeding, early growth and later obesity. *Obesity Reviews*. DOI: 10.1111/j.1467-789X.2007.00318.x.
- Slavit W (2009) Investing in Workplace Breastfeeding Programs and Policies: An Employers Toolkit. Available at: <https://www.businessgrouphealth.org/pub/?id=f2ffe4f0-2354-d714-5136-79a21e9327ed> (accessed 19 January 2017).
- Smith-Gagen J, Hollen R, Tashiro S, et al. (2014) The association of state law to breastfeeding practices in the US. *Maternal Child Health Journal* 18(9): 2034–2043. DOI: 10.1007/s10995-014-1449-4.
- Smith JP, McIntyre E, Craig L, et al. (2013) Workplace support, breastfeeding and health. *Family Matters* 93: 58–73.
- Society for Human Resource Management (2016) Managing Employee Attendance. Available at: <https://www.shrm.org/resourcesandtools/tools-and-samples/toolkits/pages/managingemployeeattendance.aspx> (accessed 27 February 2017).
- Statistics UB of L (2016) *Household Data Annual Averages 46. Absences from work of employed full-time wage and salary workers by age, sex, race, and Hispanic or Latino ethnicity*. US Department of Labor. Available at: <http://www.bls.gov/cps/cpsaat46.pdf> (accessed 27 February 2017).
- Statistics Canada (2013) Health at a glance: Breastfeeding trends in Canada. (82). Available at: <http://www.statcan.gc.ca/pub/82-624-x/2013001/article/11879-eng.htm#a1> (accessed 21

- November 2015).
- Statistics Canada (2017) *Women in Canada, a gender-based statistical report*. Statistics Canada. Available at: <http://www.statcan.gc.ca/pub/89-503-x/2015001/article/14694-eng.htm> (accessed 27 January 2018).
- Stearns J and White C (2016) Can Paid Sick Leave Mandates Reduce Leave-Taking? *SSRN Electronic Journal*: 1–39. DOI: 10.2139/ssrn.2865904.
- Steers RM and Rhodes SR (1978) Major influences on employee attendance: A process model. *Journal of Applied Psychology* 63(4): 391–401. DOI: 10.1037/0021-9010.63.4.391.
- Stevenson B (2007) The Impact of Divorce Laws on Marriage-Specific Capital. *Journal of Labor Economics* 25(1): 75–94. DOI: 10.1086/508732.
- Stevenson B (2008) Divorce Law and Women's Labor Supply. *Journal of Empirical Legal Studies* 5(4): 853–873. DOI: 10.1111/j.1740-1461.2008.00143.x.
- Swedish Institute (2018) 10 things that make Sweden family-friendly. Available at: <https://sweden.se/society/10-things-that-make-sweden-family-friendly/> (accessed 5 February 2018).
- Takahashi K, Ganchimeg T, Ota E, et al. (2017) Prevalence of early initiation of breastfeeding and determinants of delayed initiation of breastfeeding: Secondary analysis of the WHO Global Survey. *Scientific Reports*. DOI: 10.1038/srep44868.
- Tekin E (2007) Childcare subsidies, wages, and employment of single mothers. *The Journal of Human Resources* 42(2): 453. DOI: <http://www.ssc.wisc.edu/jhr/home.html>.
- The World Bank (2017) Labor force, female (% of total labor force). Available at: <https://data.worldbank.org/indicator/SL.TLF.TOTL.FE.ZS> (accessed 14 March 2018).
- Thomas LT and Ganster DC (1995) Impact of family-supportive work variables on work family conflict and strain: A control perspective. *Journal of Applied Psychology* 80(1): 6–15. DOI: 10.1037//0021-9010.80.1.6.
- Thulier D and Mercer J (2009) Variables Associated With Breastfeeding Duration. *Journal of Obstetric, Gynecologic, & Neonatal Nursing* 38(3): 259–268. DOI: 10.1111/j.1552-6909.2009.01021.x.
- Tominey E (2016) Female labour supply and household employment shocks: Maternity leave as an insurance mechanism. *European Economic Review* 87: 256–271. DOI: 10.1016/j.eurocorev.2016.04.006.

- Trotter R, Zacur S and Stickney L (2017) The New Age of Pay Transparency. *Harvard Business Review*. Available at: <https://hbr.org/product/the-new-age-of-pay-transparency/BH830-PDF-ENG> (accessed 27 January 2018).
- UK Government (2013) Maternity pay and leave. Available at: <https://www.gov.uk/maternity-pay-leave/pay> (accessed 5 February 2018).
- UNICEF (2013a) Brazil Statistics. Available at: http://www.unicef.org/infobycountry/brazil_statistics.html (accessed 21 November 2015).
- UNICEF (2013b) Ghana Statistics. Available at: http://www.unicef.org/infobycountry/ghana_statistics.html (accessed 15 November 2015).
- UNICEF (2015) Breastfeeding. Available at: http://www.unicef.org/nutrition/index_24824.html (accessed 13 January 2015).
- US Bureau of Labour Statistics (2014) *Women in the Labor Force: A Databook*. Available at: <https://www.bls.gov/cps/wlf-databook-2013.pdf> (accessed 16 November 2017).
- US Bureau of Labour Statistics (2016) Local Area Unemployment Statistics.
- US Department of Health and Human Services (2008) *The Business Case for Breastfeeding*. Available at: <https://www.womenshealth.gov/files/assets/docs/breastfeeding/business-case/business-case-for-breastfeeding-for-business-managers.pdf>.
- US Department of Health and Human Services (2011) *The Surgeon General's Call to Action to Support Breastfeeding 2011*. Washington DC: U.S. Department of Health and Human Services, Office of the Surgeon General. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/21452448>.
- US Department of Labor (1993) The Family and Medical Leave Act of 1993. Available at: <https://www.dol.gov/whd/regs/statutes/fmla.htm>.
- US Department of Labor (2016) Women of Working Age.
- US Department of Labor (2017a) Employment laws assistance for workers and small businesses. Available at: <http://webapps.dol.gov/elaws/faq/esa/flsa/006.htm> (accessed 7 December 2017).
- US Department of Labor (2017b) *Women's Earnings and the Gender Wage Gap*. Available at: https://www.dol.gov/wb/resources/Womens_Earnings_and_the_Wage_Gap_17.pdf (accessed 26 January 2018).
- US Ross Products Division (2000) Breastfeeding Trends Through 2000.: 1–16.

- USDA (2017) USDA Food and Nutrition Service, Women, Infants, and Children (WIC). Available at: <https://www.fns.usda.gov/wic/women-infants-and-children-wic> (accessed 5 February 2018).
- VandenHeuvel A (1995) Do Explanations of Absenteeism Differ for Men and Women? *Human Relations* 48(11): 1309–1329. DOI: 10.1177/001872679504801104.
- Victora CG and Barros AJD (2000) Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: A pooled analysis. *Lancet* 355(9202): 451–455. DOI: 10.1016/S0140-6736(00)82011-5.
- Victora CG, Vaughan JP, Lombardi C, et al. (1987) Evidence for protection by breast-feeding against infant deaths from infectious diseases in Brazil. *The Lancet* 330(8554): 319–322. DOI: 10.1016/S0140-6736(87)90902-0.
- Victora CG, Horta BL, de Mola CL, et al. (2015) Association between breastfeeding and intelligence, educational attainment, and income at 30 years of age: a prospective birth cohort study from Brazil. *The Lancet Global Health* 3(4): e199–e205. DOI: 10.1016/S2214-109X(15)70002-1.
- Victora CG, Bahl R, Barros AJD, et al. (2016) Breastfeeding in the 21st century: Epidemiology, mechanisms, and lifelong effect. *The Lancet*. DOI: 10.1016/S0140-6736(15)01024-7.
- Visness CM and Kennedy KI (1997) Maternal employment and breast-feeding: Findings from the 1988 national maternal and infant health survey. *American Journal of Public Health* 87(6): 945–950. DOI: 10.2105/AJPH.87.6.945.
- Vistnes JP (1997) Gender differences in days lost from work due to illness. *Industrial and Labor Relations Review* 50(2): 304–323. DOI: 10.2307/2525088.
- Vogel AM, Hutchison BL and Mitchell EA (2007) Factors associated with the duration of breastfeeding. *Acta Paediatrica* 88(12): 1320–1326. DOI: 10.1111/j.1651-2227.1999.tb01044.x.
- Von Kries R, Koletzko B, Sauerwald T, et al. (1999) Breast feeding and obesity: Cross sectional study. *British Medical Journal* 318(7203): 147–150. DOI: 10.1136/bmj.319.7203.147.
- Voydanoff P (1988) Work role characteristics, family structure demands, and work/family conflict. *Journal of Marriage and Family* 50(3): 749–761. DOI: 10.2307/352644.
- Waldfogel J (1998a) The Family Gap for Young Women in the United States and Britain: Can Maternity Leave Make a Difference? *Journal of Labor Economics* 16(3): 505–545. DOI:

10.1086/209897.

- Waldfogel J (1998b) Understanding the ‘Family Gap’ in Pay for Women with Children. *Journal of Economic Perspectives* 12(1): 137–156. DOI: 10.1257/jep.12.1.137.
- Waldfogel J (1999) The Impact of the Family and Medical Leave Act. *Journal of Policy Analysis and Management* 18(2): 281–302.
- Walters D, Horton S, Siregar AYM, et al. (2016) The cost of not breastfeeding in Southeast Asia. *Health Policy and Planning* 31(8): 1107–1116. DOI: 10.1093/heapol/czw044.
- Ward-Batts J (2008) Out of the Wallet and into the Purse: Using Micro Data to Test Income Pooling. *Journal of Human Resources* 43(2): 325–351. DOI: 10.1353/jhr.2008.0005.
- Weeden KA (2005) Is there a flexiglass ceiling? Flexible work arrangements and wages in the United States. *Social Science Research* 34(2): 454–482. DOI: 10.1016/j.ssresearch.2004.04.006.
- Weimer J (2001) *The Economic Benefits of Breastfeeding: A Review and Analysis*. Food Assistance and Nutrition Research Report.
- WHO (2000) Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: a pooled analysis. *The Lancet* 355(9202): 451–455. DOI: 10.1016/S0140-6736(00)82011-5.
- Workforce Institute (2005) Absenteeism : Why Should You Be Concerned ? Lexington, Massachussets: 13.
- World Economic Forum (2017) *The Global Gender Gap Report 2017*. Available at: http://www3.weforum.org/docs/WEF_GGGR_2017.pdf (accessed 26 January 2018).
- Ziebarth NR and Karlsson M (2010) A natural experiment on sick pay cuts, sickness absence, and labor costs. *Journal of Public Economics* 94(11–12): 1108–1122. DOI: 10.1016/j.jpubeco.2010.09.001.

APPENDICES

I. APPENDIX 1: CHAPTER 3

A. Background

Out of 51 states in the US, 25 states have workplace breastfeeding policies protecting breastfeeding working mothers while 26 have no such legislation. Table A1 shows states and the corresponding years state mandates were implemented. Furthermore, state laws vary across states not only with the time in which the states passed legislation but also with the characteristics of the legislation. Table A2 classifies the 25 states with various laws and groups them into state characteristics according to break time and breastfeeding facilities.

Table A1: States and years of implementation of legislation (National Conference of State Legislatures, 2016)

State	Year	State	Year	State	Year
Arkansas	2009	Maine	2009	Rhode Island	2003
California	1998	Minnesota	1998	Texas	1995
Colorado	2008	Mississippi	2006	Tennessee	1999
Connecticut	2001	Montana	2007	Vermont	2008
District of Columbia	2007	New Mexico	2007	Virginia	2002
Georgia	1999	New York	2007	Washington	2001
Hawaii	1999	North Dakota	2009	Wyoming	2003
Illinois	2001	Oklahoma	2006		
Indiana	2008	Oregon	2007		

Table A2: States with laws supporting breastfeeding in the workplace classified into categories (National Conference of State Legislatures, 2016)

State policy characteristics	States
<i>Facilities</i>	
Require employers to provide facilities	Arkansas; California; Colorado; Connecticut; District of Columbia; Georgia; Hawaii; Illinois; Indiana; Maine; Montana; Minnesota; Mississippi; New Mexico; New York; North Dakota; Oregon; Tennessee; Vermont; Virginia; Washington
Do not require employers to provide facilities	Oklahoma; Rhode Island; Texas; Wyoming
<i>Break time</i>	
Require employers to provide break time	Arkansas; California; Colorado; Connecticut; District of Columbia; Hawaii; Illinois; Indiana; Maine; Minnesota; Mississippi; Montana; New Mexico; New York; Oklahoma; Oregon; Tennessee; Vermont
Encourage employers to provide break time	Georgia; North Dakota; Rhode Island; Texas; Virginia; Washington; Wyoming
<i>Paid/Unpaid breaks</i>	
Specify paid breaks	Indiana
Specify unpaid breaks	Arkansas; District of Columbia; Georgia; Illinois; Montana; Minnesota; New Mexico; New York; Oregon; Rhode Island; Tennessee; Virginia
Do not specify unpaid or paid breaks	California; Colorado; Connecticut; Hawaii; Maine; Mississippi; North Dakota; Oklahoma; Rhode Island; Texas; Vermont; Washington; Wyoming

B. Eligibility Criteria

Our selection criteria are as follows:

- (1) Woman is in the main dataset (PSID) with no children. **Exclude.**
- (2) Woman is in the main dataset with one or more children but no birth information through CAH. **Exclude.** She may have breastfed one or all of them but we do not know.
- (3) Woman is in main dataset with one child, and breastfeeding information in CAH. **Include.**
- (4) Woman is in main dataset with more than one child, all with information in CAH. **Include.**
- (5) Woman is in main dataset with more than one child, one in the CAH, the others not. **Include.**
- (6) Father is in main dataset and answers questions for the woman and/or child and one or more of his children have information in CAH. **Include.**
- (7) Child is adopted or is a foster child. **Exclude.**
- (8) Woman is over 65 years of age. **Exclude.**
- (9) Woman is not working at the time she is eligible to breastfeed. **Exclude.**

C. Robustness Checks

The following table C1 present results from robustness checks including leads analysis to test for anticipatory effects. As mentioned in the main text, DD is based upon the main assumption of parallel trends. Angrist and Pischke (2008) suggest testing for parallel trends through a leads analysis (Angrist and Pischke, 2008). Introducing leads allows testing for anticipatory effects, namely whether states have anticipated the introduction of the policy before implementation due to systematic differences, therefore influencing breastfeeding outcomes before the policy is implemented. The specification below follows Angrist and Pischke (2008) for leads analysis:

$$y_{jt} = \beta_0 + \sum_{\tau=1}^q \beta_1(policy_{j(t+\tau)}) + \sum_j \alpha_j(s_j) + \sum_t \gamma_t(\tau_t) + \Omega'W_{jt} + \varepsilon_{jt}$$

The variables in the model are the same as in our first DD specification, however, including q leads ($policy_{j(t+1)}, policy_{j(t+2)}, \dots, policy_{j(t+q)}$). Following Autor (2003), we include leads of 1-2 years, 3-4 years, and 5-6 years and our main policy variable. Note, the first 2 indicator variables are equal to one only in that relevant year and the final indicator is 1 in each year, starting with the year of adoption. If the coefficients on the leads are insignificant, we can rule out anticipatory effects. However, if the coefficients are significant, there may be anticipatory effects thus failing to fulfil the parallel trends assumption, which would need to be further controlled for to obtain precise results.

The DD policy lead variables for anticipatory effects 1-2 years, 3-4 years, and 5-6 years before policy implementation are all insignificant thus fulfilling the parallel trends assumption and suggest that states did not anticipate the introduction of the policy (Table C1).

Table C1: Estimated impact of US workplace breastfeeding legislation on the proportion of children ever breastfed at 6 months with leads. Model controls for state and economic covariates

	M4a	M4b
DID policy _{lead 5-6 years}	-0.012 (0.010)	-0.008 (0.011)
DID policy _{lead 3-4 years}	-0.009 (0.010)	-0.003 (0.013)
DID policy _{lead 1-2 years}	0.012 (0.013)	0.011 (0.016)
DID policy	0.038*** (0.011)	0.050 (0.022)**
State-fixed effect	Yes	Yes
Time trend	Yes	Yes
State-specific time trends	No	Yes
Overall R ²	0.931	0.952
Observations	374	374

Note: Standard errors in parentheses. *p<0.10; **p<0.05; ***p<0.01.

II. APPENDIX 2: CHAPTER 4

A. Background

State laws vary across states not only with regards to timing of implementation but also with the characteristics of the legislation. Table A1 below classifies the 25 states with various laws and groups them into state characteristics according to break time and breastfeeding facilities according to the National Conference of State Legislatures (2016).

Table A1: States with laws supporting breastfeeding in the workplace classified into categories

State policy characteristics	States
<i>Facilities</i>	
Require employers to provide facilities	Arkansas; California; Colorado; Connecticut; District of Columbia; Georgia; Hawaii; Illinois; Indiana; Maine; Minnesota; Mississippi; Montana; New Mexico; New York; North Dakota; Oregon; Tennessee; Vermont; Virginia; Washington
Do not require employers to provide facilities	Oklahoma; Rhode Island; Texas; Wyoming
<i>Break time</i>	
Require employers to provide break time	Arkansas; California; Colorado; Connecticut; Hawaii; Illinois; Indiana; Minnesota; Mississippi; Montana; New Mexico; New York; Oklahoma; Oregon; Tennessee; Vermont
Encourage employers to provide break time	Georgia; North Dakota; Rhode Island; Texas; Virginia; Washington; Wyoming
<i>Paid/Unpaid breaks</i>	
Specify paid breaks	Indiana
Specify unpaid breaks	Arkansas; Georgia; Illinois; Minnesota; New Mexico; New York; Oregon; Rhode Island; Tennessee; Virginia
Do not specify unpaid or paid breaks	California; Colorado; Connecticut; District of Columbia; Hawaii; Maine; Mississippi; Montana; North Dakota; Oklahoma; Rhode Island; Texas; Vermont; Washington; Wyoming

B. Data

As Figures B1-B4 show, our outcome variable, days absent is a non-negative count variable showing excess zeroes and over-dispersion in all four subsamples, prompting us to use a Negative Binomial regression rather than OLS, as mentioned in the methods section.

Figure B1: Histogram of total days absent for mothers with infants

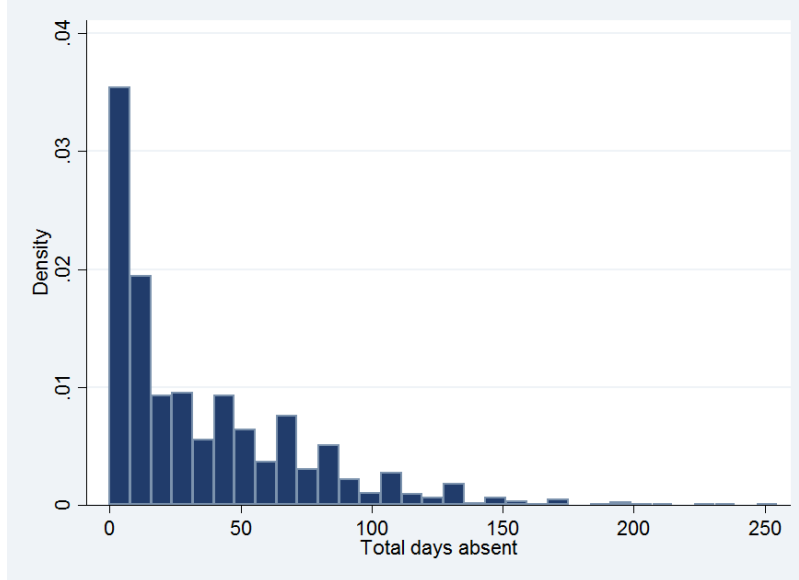


Figure B2: Histogram of total days absent for married men with infants with employed wives

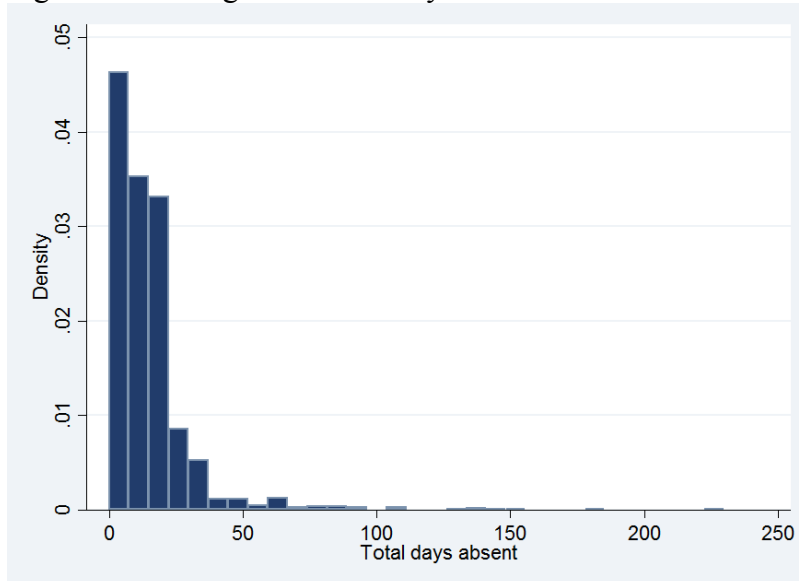


Figure B3: Histogram of total days absent for married men with infants with unemployed wives

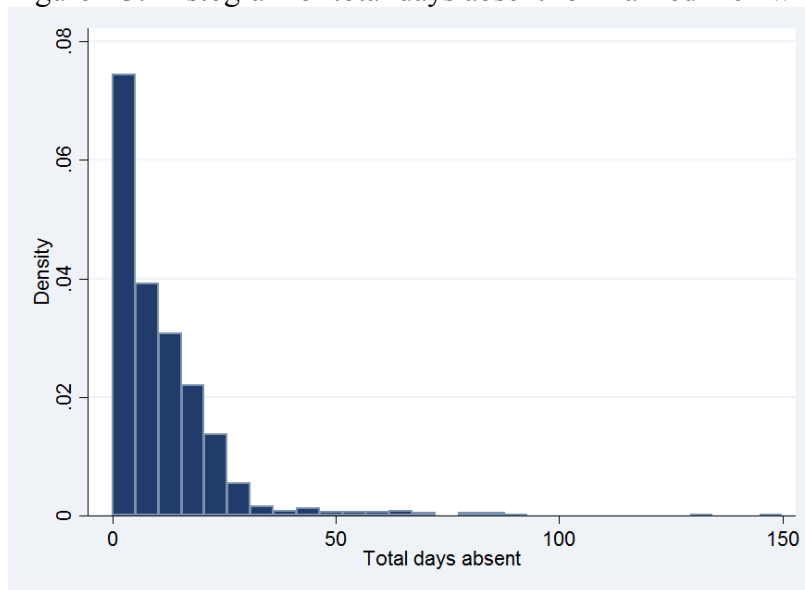
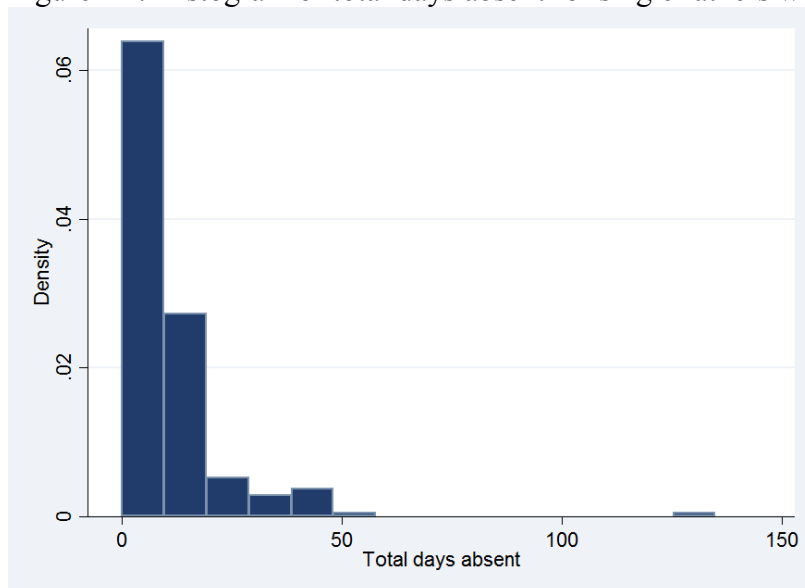


Figure B4: Histogram of total days absent for single fathers with infants



C. Falsification Tests On Control Groups

Table C1: Falsification DD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on control group of married fathers with infants whose wives are not employed

Variable	CM1a	CM1b	CM1c
Workplace breastfeeding policy (DD)	-1.066 (0.935)	-1.659 (1.079)	-0.404 (1.070)
<i>Demographic covariates</i>			
Age (in years)	0.827 (0.462)*	0.789 (0.445)*	0.869 (0.463)*
Age ² (in years)	-0.012 (0.006)*	-0.011 (0.006)*	-0.013 (0.007)*
Number of children in household	-0.459 (0.445)	-0.469 (0.450)	-0.318 (0.419)
Education (in years)	0.513 (0.202)**	0.518 (0.243)**	0.610 (0.268)**
Race			
Black	-1.112 (1.372)	-1.141 (1.516)	-1.064 (1.440)
Other	0.489 (2.082)	-1.133 (1.415)	-1.178 (1.478)
Marital Status			
Married			
<i>Economic covariates</i>			
Work experience (in years)	0.588 (0.096)***	0.636 (0.102)***	0.609 (0.102)***
Annual income (in 2000 \$USD)	0.220 (0.060)***	0.241 (0.077)**	0.233 (0.078)***
Annual income of partner (in 2000 \$USD)			
Average work hours per week	-0.130 (0.051)**	-0.128 (0.056)**	-0.124 (0.055)**
Average work hours per week of partner			
Job type			
Blue Collar	-0.486 (1.146)	-1.162 (1.249)	-1.263 (1.301)
Childcare cost (in 2000 \$USD)	-1.579 (1.240)	-1.710 (1.294)	-1.851 (1.281)
State unemployment rate (%)	4.464 (30.791)	-37.015 (34.278)	-82.555 (87.620)
State dummies	No	Yes	Yes
Year dummies	No	No	Yes
Number of observations	768	768	768

Note: Model CM1a includes all covariates; CM1b adds state dummies; and CM1c adds year dummies. We are not able to add state-specific time trends as the number of observations is insufficient for convergence of the negative binomial model. Clustered standard errors in parenthesis. Results on state and year dummies available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table C2: Falsification DD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on control group of married fathers with infants whose wives are not employed and single fathers

Variable	CM2a	CM2b	CM2c	CM2d
Workplace breastfeeding policy (DD)	-0.513 (0.853)	-1.255 (1.009)	0.869 (1.808)	-0.239 (3.654)
<i>Demographic covariates</i>				
Age (in years)	0.592 (0.377)	0.580 (0.417)	0.621 (0.459)	0.680 (0.481)
Age ² (in years)	-0.010 (0.005)*	-0.010 (0.006)	-0.011 (0.007)	-0.012 (0.007)
Number of children in household	-0.426 (0.499)	-0.419 (0.510)	-0.241 (0.458)	-0.153 (0.449)
Education (in years)	0.548 (0.159)***	0.594 (0.190)***	0.706 (0.207)***	0.676 (0.208)***
Race				
Black	-1.261 (0.867)	-1.285 (1.134)	-1.349 (1.044)	-1.605 (0.931)*
Other	0.173 (1.844)	-1.633 (1.217)	-1.724 (1.241)	-2.554 (1.202)**
Marital Status				
Married	1.988 (1.338)	2.043 (1.365)	1.645 (1.283)	1.642 (1.320)
<i>Economic covariates</i>				
Work experience (in years)	0.683 (0.084)***	0.681 (0.093)***	0.669 (0.091)***	0.701 (0.107)***
Annual income (in 2000 \$USD)	0.241 (0.070)***	0.277 (0.085)***	0.272 (0.089)***	0.338 (0.106)***
Annual income of partner (in 2000 \$USD)				
Average work hours per week	-0.128 (0.052)**	-0.121 (0.053)**	-0.113 (0.050)**	-0.116 (0.050)**
Average work hours per week of partner				
Job type				
Blue Collar	-0.701 (0.935)	-0.944 (0.960)	-1.064 (0.967)	-1.508 (1.045)
Childcare cost (in 2000 \$USD)	-1.603 (1.170)	-1.487 (1.182)	-1.664 (1.165)	-2.018 (1.151)*
State unemployment rate (%)	13.197 (37.652)	-21.381 (43.418)	-70.504 (89.513)	-70.116 (109.133)
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trend	No	No	No	Yes
Number of observations	941	941	941	941

Note: Model CM2a includes all covariates; CM2b adds state dummies; CM2c adds year dummies; and CM2d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. Those individuals who are in the “other” category of race include: American Indian/Aleut/Eskimo, Asian/Pacific Islander, Latino, and individuals who mention another race. The reference category for marital status is single; for race is White, and for job type is white collar. Income and childcare costs have been adjusted in 2000 \$USD using the Consumer Price Index and have been rescaled for estimation. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

D. Falsification Tests For Parallel Trends

The following table D1 present results from robustness checks including leads analysis to test for anticipatory effects. DD is based upon the main assumption of parallel trends. Angrist and Pischke (2008) suggest testing for parallel trends through a leads analysis (Angrist and Pischke, 2008). Introducing leads allows testing for anticipatory effects, whether individuals have anticipated the introduction of the policy before implementation due to systematic differences, therefore influencing absenteeism before the policy is implemented. The specification below follows Angrist and Pischke (2008) for leads:

$$E(y_{ijt}) = \exp(\beta_0 + \beta_1 X_{it} + \beta_2 Z_{jt} + \sum_{\tau=1}^q \beta_3 (policy_j)_{t+\tau} + \sum_j \alpha_j (state_j) + \sum_t \gamma_t (year_{it}))$$

The variables in the model are the same as in our regular DD specification, however, including q leads $((policy_i)_{t+1}, (policy_i)_{t+2}, \dots, (policy_i)_{t+q})$. Following Autor (2003), we include leads of 1-2 years, 3-4 years, and 5-6 years, and our main policy variable. Note that the first three indicator variables are equal to one only in that relevant year and the final indicator is 1 in each year, starting with the year of adoption (Autor, 2003). If the coefficients on the leads are insignificant, we can rule out anticipatory effects. However, if the coefficients are significant, there may be anticipatory effects thus failing to fulfil the parallel trend assumption, which would need to be further controlled for to obtain precise results.

The policy lead variables for anticipatory effects 1-2 years, 3-4 years, and 5-6 years before policy implementation are all insignificant thus fulfilling the parallel trends assumption and suggesting that our treated subsample of mothers did not anticipate the introduction of the policy (Table D1).

Table D1: DD estimates of the effect of workplace breastfeeding legislation on total days absent for mothers with infants including policy leads

Variables	Mothers with infants
Workplace breastfeeding policy lead 5-6 years	-3.010 (15.078)
Workplace breastfeeding policy lead 3-4 years	3.630 (11.077)
Workplace breastfeeding policy lead 1-2 years	-1.630 (13.228)
Workplace breastfeeding policy	-8.829 (4.580)*
State dummies	Yes
Year dummies	Yes
State-specific time trends	Yes
Observations	1232

Note: Estimates presented as average marginal effects. Clustered standard errors in parenthesis. Model includes all demographic and economic covariates including state and year dummies, and state-specific time trends. Policy estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01

E. Robustness Check—Family Leave

The following table E1 shows states that have implemented their own family leave policy on top of the 1993 FMLA that guarantees 12 weeks of unpaid leave for mothers when they have a newborn infant in firms with 50 employees or more. The states in E1 have expanded upon this legislation either by expanding the classes of persons eligible, the amount of leave offered, or if the leave is paid (National Conference of State Legislatures, 2017).

Table E1: States with family leave including years implemented and availability of workplace breastfeeding legislation, years 1990-2011

States	Year workplace breastfeeding implemented	Year family leave implemented
California	1998	2002
Connecticut	2001	1997
District of Columbia	2007	1991
Hawaii	1999	1991
Maine	2009	2005
Massachusetts	Control state	1998
Minnesota	1998	2004
New Jersey	Control state	2008
Oregon	2007	1995
Wisconsin	Control state	1988

As the table shows, 10 states have implemented their own paid family leave policy during our study period of 1990-2011. Note, Washington had passed a paid family leave law to be effective in 2009 but it was never implemented (National Conference of State Legislatures, 2017). Also, Vermont had passed a legislation expanding on FMLA; however, Vermont is not included in our analysis due to insufficient observations.

We run the following DD model on our treated group of mothers with infants including the family leave policy:

$$(1) E(y_{ijt}) = \exp(\beta_0 + \beta_1 X_{it} + \beta_2 Z_{jt} + \beta_3 (\text{breastfeeding policy}_{jt}) + \beta_4 (\text{family leave policy}_{jt}) + \sum_j \alpha_j (\text{state}_j) + \sum_t \gamma_t (\text{year}_{it})),$$

Variables are analogous to DD specification (1) in the main text; however, we include a family leave policy variable that captures the across state and year variation of the family leave legislation. This is defined the same as our workplace breastfeeding policy. $\text{family leave policy}_{it} = 1$ for

individuals living in states with a family leave policy after policy introduction and = 0 for individuals living in states without a family leave policy and for individuals living in states with a family leave policy before implementation. β_4 is the DD coefficient of interest for the family leave policy. We include the family leave policy variable for a robustness check to determine whether some of the reduction in absent days can be explained by the availability of a paid family policy where mothers live. However, by including state-specific time trends in the models in the main text, we are already able to capture variation across states in different years.

We further include this variable in our second DD specification where we split our treated states into weakly and strictly enforceable states where some states only encourage employers to offer breastfeeding facilities and/or break time (i.e. weak enforceability) and some states require employers to offer facilities and break time (i.e. strict enforceability).

$$(2) E(y_{ijt}) = \exp(\beta_0 + \beta_1 X_{it} + \beta_2 Z_{jt} + \beta_3(\text{strict enforceability}_{jt}) + \beta_4(\text{weak enforceability}_{jt}) + \beta_5(\text{family leave policy}_{jt}) + \sum_j \alpha_j(\text{state}_j) + \sum_t \gamma_t(\text{year}_{it}))$$

Variables are analogous to DD specification (2) in the main text but with the addition of the family leave policy variable. In this specification, β_5 is the coefficient of interest for the family leave policy.

Table E2 shows results for mothers with infants with the inclusion of the family leave variable. We run four different models for specification (1): E1a with demographic and economic covariates; E1b adds state dummies; E1c adds year dummies; and E1d adds state-specific time trends. All specifications include demographic and economic covariates, similar to the models in the main text. We will comment on the most complete model, E1d. Model E1d shows that the workplace breastfeeding legislation reduced mothers with infants' absent days by approximately 9 days while the family leave legislation did not have an effect. Results for workplace breastfeeding legislation are in line with M1d.

Table E2: DD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on mothers with infants with the addition of family leave legislation

Variable	<u>E1a</u>	<u>E1b</u>	<u>E1c</u>	<u>E1d</u>
Workplace breastfeeding policy (DD)	-8.238 (2.442)***	-11.803 (2.165)***	-8.116 (2.833)***	-9.114 (4.846)*
Family leave policy (DD)	-3.181 (2.231)	-9.596 (2.884)***	-3.253 (5.286)	-10.275 (8.901)
<i>Demographic covariates</i>	Yes	Yes	Yes	Yes
<i>Economic covariates</i>	Yes	Yes	Yes	Yes
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trend	No	No	No	Yes
Number of observations	1232	1232	1232	1232

Note: Model E1a includes all covariates; E1b adds state dummies; E1c adds year dummies; and E1d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. All models include demographic and economic covariates similar to models in the main text. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Similarly, table E3 below shows the effect of the breastfeeding policy for weakly and strictly enforceable states with the addition of the family leave legislation. We run four different models but comment on the most complete model E2d. Model E2d shows that the for mothers residing in strictly enforceable workplace breastfeeding policy states, the policy reduces mothers' absent days by approximately 17 days, an effect slightly higher than M3d. However, the significance and magnitude are in line with M3d. Workplace breastfeeding policy has no effect on mothers residing in states with weakly enforceable policies. The family leave policy also does not have an effect on mother's absent days.

Table E3: DD estimates as average marginal effects of the effect of strict and weak workplace breastfeeding legislation on total days absent on mothers with infants with the addition of family leave legislation

Variable	<u>E2a</u>	<u>E2b</u>	<u>E2c</u>	<u>E2d</u>
Strict workplace breastfeeding policy (DD)	-3.165 (3.194)	-10.299 (3.977)**	-8.362 (4.304)*	-16.822 (5.127)***
Weak workplace breastfeeding policy (DD)	-12.407 (1.544)***	-12.748 (1.632)***	-7.771 (3.176)**	0.394 (8.516)
Family leave policy (DD)	-4.916 (2.744)*	-10.221 (2.993)***	-3.074 (5.616)	-11.316 (8.566)
<i>Demographic covariates</i>	Yes	Yes	Yes	Yes
<i>Economic covariates</i>	Yes	Yes	Yes	Yes
State dummies	No	Yes	Yes	Yes
Year dummies	No	No	Yes	Yes
State-specific time trend	No	No	No	Yes
Number of observations	1232	1232	1232	1232

Note: Model E2a includes all covariates; E2b adds state dummies; E2c adds year dummies; and E2d adds state-specific time trends. Clustered standard errors in parenthesis. Results on state and year dummies, and state-specific time trends available upon request to authors. All models include demographic and economic covariates similar to models in the main text. All estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Therefore, results remain unaltered suggesting that the reduction of absenteeism is due to the workplace breastfeeding policy and is not confounded by state-level family leave policies.

F. Coarsened Exact Matching

We present DD results upon matching through coarsened exact matching (CEM), a matching procedure established by Blackwell et al. (2009). CEM is meant to improve the estimation of causal effects where imbalance between treated and control groups are reduced by matching on certain covariates thought to be related with selection into the treatment (Blackwell et al., 2009). Therefore, we match treatment and control states on several state-level covariates such as breastfeeding rates, health care expenditures per capita, percent of women in the state legislature, and unemployment rates. We match on breastfeeding rates as states with low breastfeeding rates may self-select into the treatment to encourage higher breastfeeding rates among mothers. Secondly, we match on health care expenditures per capita as breastfeeding is associated with lower incidences of several diseases among children and mothers. Thirdly, we match on percent of women in state legislature as studies have shown that there are significant differences between priorities of men and women in making policy decisions where women in senate are more likely to vote for health issues compared to men in senate (Besley and Case, 2000). Finally, we match on unemployment rates as if a state has high unemployment, policy makers in that state may be more likely to pass legislation related to the workplace. Results remain qualitatively similar in significance and magnitude. Table F1 presents variable descriptions and data sources.

Table F1: Variable Descriptions and Data Sources of State-level Covariates for CEM

Variable	Description	Data Source
Breastfeeding Rates	Proportion of children ever breastfed until 6 months	Ross Mother's Survey (1990-1999) and National Immunization Survey (2000-2011)
Health Care Expenditures Per Capita	Spending for all privately and publicly funded personal health care services, hospital care, physician services, nursing home care, and prescription drugs	Centres for Medicare and Medicaid Services (1991-2011); adjusted for inflation using CPI index for 2000 USD
Percent of Women in State Legislature	Proportion of women in state's lower and upper houses	US Centre for American Women and Politics (1990-2011)
Unemployment Rates	Proportion of individuals unemployed in the labour force	US Bureau of Labour Statistics (1990-2011)

The following Tables F2—F4 present DD results of matching on our treated group of mothers with infants while Tables F5—F7 present results on our treated group of married fathers with infants whose wives are employed. All tables include the most complete model including economic and demographic covariates, state fixed-effects, year fixed-effects, and state-specific time trends. We present three models in each table where, Model F1a matches upon breastfeeding rates and unemployment rates, Model F1b matches upon percent of women in state legislature and unemployment rates and Model F1c matches upon health care expenditures per capita and percent of women in state legislature. CEM does not allow to have more than one treated group, therefore, we estimate effects for strict and weak workplace policies separately and present results in separate tables.

Table F2: DD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on mothers with infants with CEM

Variable	<u>F1a</u>	<u>F1b</u>	<u>F1c</u>
Workplace breastfeeding policy (DD)	-9.913 (4.185)**	-10.528 (4.904)**	-9.672 (4.677)**
Demographic covariates	Yes	Yes	Yes
Economic covariates	Yes	Yes	Yes
State dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
State-specific time trend	Yes	Yes	Yes
Number of observations	1159	1162	1122

Note: Model F1a matches upon breastfeeding rates and unemployment rates, Model F1b matches upon percent of women in state legislature and unemployment rates and Model F1c matches upon health care expenditures per capita and percent of women in state legislature. Policy estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table F3: DD estimates as average marginal effects of the effect of strict workplace breastfeeding legislation on total days absent on mothers with infants with CEM

Variable	<u>F2a</u>	<u>F2b</u>	<u>F2c</u>
<i>Strict</i> workplace breastfeeding policy (DD)	-18.078 (4.131)***	-14.902 (6.268)**	-16.313 (5.816)***
Demographic covariates	Yes	Yes	Yes
Economic covariates	Yes	Yes	Yes
State dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
State-specific time trend	Yes	Yes	Yes
Number of observations	1111	1094	1024

Note: Model F2a matches upon breastfeeding rates and unemployment rates, Model F2b matches upon percent of women in state legislature and unemployment rates and Model F2c matches upon health care expenditures per capita and percent of women in state legislature. Policy estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table F4: DD estimates as average marginal effects of the effect of weak workplace breastfeeding legislation on total days absent on mothers with infants with CEM

Variable	<u>F3a</u>	<u>F3b</u>	<u>F3c</u>
<i>Weak</i> workplace breastfeeding policy (DD)	-0.228 (8.542)	-5.653 (5.257)	6.640 (12.529)
Demographic covariates	Yes	Yes	Yes
Economic covariates	Yes	Yes	Yes
State dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
State-specific time trend	Yes	Yes	Yes
Number of observations	1062	934	839

Note: Model F3a matches upon breastfeeding rates and unemployment rates, Model F3b matches upon percent of women in state legislature and unemployment rates and Model F3c matches upon health care expenditures per capita and percent of women in state legislature. Policy estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table F5: DD estimates as average marginal effects of the effect of workplace breastfeeding legislation on total days absent on married fathers with infants whose wives are employed with CEM

Variable	<u>F4a</u>	<u>F4b</u>	<u>F4c</u>
Workplace breastfeeding policy (DD)	1.660 (3.408)	1.182 (3.370)	2.190 (3.747)
Demographic covariates	Yes	Yes	Yes
Economic covariates	Yes	Yes	Yes
State dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
State-specific time trend	Yes	Yes	Yes
Number of observations	1095	1125	1078

Note: Model F4a matches upon breastfeeding rates and unemployment rates, Model F4b matches upon percent of women in state legislature and unemployment rates and Model F4c matches upon health care expenditures per capita and percent of women in state legislature. Policy estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table F6: DD estimates as average marginal effects of the effect of strict workplace breastfeeding legislation on total days absent on married fathers with infants whose wives are employed with CEM

Variable	<u>F5a</u>	<u>F5b</u>	<u>F5c</u>
<i>Strict</i> workplace breastfeeding policy (DD)	2.668 (5.729)	-0.588 (4.328)	0.129 (4.520)
Demographic covariates	Yes	Yes	Yes
Economic covariates	Yes	Yes	Yes
State dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
State-specific time trend	Yes	Yes	Yes
Number of observations	1047	1066	1009

Note: Model F5a matches upon breastfeeding rates and unemployment rates, Model F5b matches upon percent of women in state legislature and unemployment rates and Model F5c matches upon health care expenditures per capita and percent of women in state legislature. Policy estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

Table F7: DD estimates as average marginal effects of the effect of weak workplace breastfeeding legislation on total days absent on married fathers with infants whose wives are employed with CEM

Variable	<u>F6a</u>	<u>F6b</u>	<u>F6c</u>
<i>Weak</i> workplace breastfeeding policy (DD)	2.419 (5.468)	2.888 (6.604)	-0.266 (3.780)
Demographic covariates	Yes	Yes	Yes
Economic covariates	Yes	Yes	Yes
State dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
State-specific time trend	Yes	Yes	Yes
Number of observations	944	895	744

Note: Model F6a matches upon breastfeeding rates and unemployment rates, Model F6b matches upon percent of women in state legislature and unemployment rates and Model F6c matches upon health care expenditures per capita and percent of women in state legislature. Policy estimates are presented as AMEs. *p<0.10; **p<0.05; ***p<0.01.

III. APPENDIX 3: CHAPTER 5

A. Background

State laws vary across states not only with the timing of implementation but also with the characteristics of the legislation. Table A1 below classifies the 25 states with various laws and groups them into state characteristics according to break time and breastfeeding facilities from the National Conference of State Legislatures (2016).

Table A1: States with laws supporting breastfeeding in the workplace classified into categories

State policy characteristics	States
<i>Facilities</i>	
Require employers to provide facilities	Arkansas; California; Colorado; Connecticut; District of Columbia; Georgia; Hawaii; Illinois; Indiana; Maine; Minnesota; Mississippi; Montana; New Mexico; New York; North Dakota; Oregon; Tennessee; Vermont; Virginia; Washington
Do not require employers to provide facilities	Oklahoma; Rhode Island; Texas; Wyoming
<i>Break time</i>	
Require employers to provide break time	Arkansas; California; Colorado; Connecticut; Hawaii; Illinois; Indiana; Minnesota; Mississippi; Montana; New Mexico; New York; Oklahoma; Oregon; Tennessee; Vermont
Encourage employers to provide break time	Georgia; North Dakota; Rhode Island; Texas; Virginia; Washington; Wyoming
<i>Paid/Unpaid breaks</i>	
Specify paid breaks	Indiana
Specify unpaid breaks	Arkansas; Georgia; Illinois; Minnesota; New Mexico; New York; Oregon; Rhode Island; Tennessee; Virginia
Do not specify unpaid or paid breaks	California; Colorado; Connecticut; District of Columbia; Hawaii; Maine; Mississippi; Montana; North Dakota; Oklahoma; Rhode Island; Texas; Vermont; Washington; Wyoming

B. Robustness Check—Birth Order

Table B1: DDD yearly long-term estimates of workplace breastfeeding legislation on yearly full-time equivalent income gap between fathers and mothers using only first-born children

Variable	BM1a	BM1b	BM1c
Workplace breastfeeding policy*Time relative to child birth (DDD)			
Year 0	-5.118 (1.113)***	-6.345 (1.107)***	-6.465 (1.242)***
Year 1	-2.366 (1.683)	-3.034 (1.460)**	-3.564 (1.454)**
Year 2	-3.531 (1.316)***	-4.883 (1.328)***	-4.849 (1.430)***
Year 3	-2.589 (1.477)*	-3.581 (1.469)**	-3.500 (1.654)**
Year 4	-4.348 (1.337)***	-5.649 (1.344)***	-5.986 (1.446)***
Year 5	-4.800 (1.626)***	-6.107 (1.506)***	-6.546 (1.582)***
Year 6	-4.413 (1.417)***	-5.741 (1.365)***	-5.953 (1.478)***
Year 7	-4.675 (1.672)***	-5.832 (1.489)***	-6.415 (1.574)***
Year 8	-3.802 (1.362)***	-5.132 (1.335)***	-5.347 (1.445)***
Year 9	-5.313 (1.562)***	-6.436 (1.363)***	-6.342 (1.451)***
Year 10	-2.755 (1.344)**	-4.105 (1.219)***	-4.175 (1.345)***
Year 11	-3.659 (1.313)***	-4.593 (1.209)***	-4.769 (1.344)***
Year 12	-5.249 (1.556)***	-6.618 (1.476)***	-6.597 (1.575)***
Year 13	-3.427 (1.826)*	-4.382 (1.732)**	-4.631 (1.835)**
Year 14	-5.326 (1.817)***	-6.560 (1.735)***	-6.581 (1.776)***
Year 15	-4.457 (1.526)***	-5.639 (1.524)***	-6.001 (1.626)***
Year 16	-4.834 (1.574)***	-5.792 (1.454)***	-6.045 (1.530)***
Year 17	-2.202 (2.795)	-3.471 (2.841)	-3.724 (2.907)
Year 18	-5.618 (2.623)**	-6.578 (2.519)***	-6.805 (2.563)***
<i>Covariates (x₍₋₂₎)</i>			
log(earnings _{f(-2)} / earnings _{m(-2)})	0.169 (0.079)**	0.166 (0.084)**	0.170 (0.083)**
Difference in age ₍₋₂₎	-0.005 (0.059)	0.025 (0.059)	0.030 (0.061)
Difference in education ₍₋₂₎	0.107 (0.111)	0.057 (0.122)	0.043 (0.124)
Difference in work experience ₍₋₂₎	0.047 (0.050)	0.037 (0.053)	0.034 (0.054)
Difference in race ₍₋₂₎			
Father is White; Mother is not	-0.978 (0.962)	-0.280 (1.196)	-0.330 (1.236)
Mother is White; Father is not	-2.795 (0.996)***	-2.437 (1.219)**	-2.562 (1.115)**
Neither is White	2.516 (0.841)***	3.421 (1.398)**	2.703 (1.442)*
Difference in job type ₍₋₂₎			
Father is white collar; Mother is blue collar	-0.098 (0.954)	0.719 (1.008)	0.725 (1.028)
Mother is blue collar; Father is white collar	-0.168 (0.440)	-0.083 (0.431)	-0.082 (0.435)
State dummies	No	Yes	Yes
Calendar year dummies	No	No	Yes
Number of observations	1785	1785	1785
Overall R ²	0.036	0.092	0.097

Note: Model B1a includes all covariates; B1b adds state dummies; and B1c adds year dummies. Standard errors have been clustered on the household level and are in parenthesis. Results on state and year dummies available upon request to authors. All differences are father – mother. The reference category for difference in race is where mothers and fathers are of the same race and for difference in job type is where mothers and fathers have the same job type. Earnings have been adjusted in 2000 \$USD using the Consumer Price Index. *p<0.10; **p<0.05; ***p<0.01.

Table B2: DDD aggregate long-term estimates of workplace breastfeeding legislation on within-couple full-time equivalent income gap using only first-born children

Variable	<u>BM2a</u>	<u>BM2b</u>	<u>BM2c</u>
Workplace breastfeeding policy*Childbirth (DDD)	-4.085 (0.956)***	-5.104 (0.813)***	-5.279 (0.945)***
<i>Covariates (x₍₋₂₎)</i>			
log(earnings _{f(-2)} / earnings _{m(-2)})	0.174 (0.077)**	0.173 (0.082)**	0.179 (0.082)**
Difference in age ₍₋₂₎	-0.010 (0.058)	0.016 (0.058)	0.021 (0.059)
Difference in education ₍₋₂₎	0.112 (0.109)	0.060 (0.121)	0.051 (0.123)
Difference in work experience ₍₋₂₎	0.045 (0.048)	0.037 (0.052)	0.032 (0.053)
Difference in race ₍₋₂₎			
Father is White; Mother is not	-1.063 (0.896)	-0.267 (1.164)	-0.380 (1.195)
Mother is White; Father is not	-2.793 (0.988)***	-2.283 (1.228)*	-2.329 (1.139)**
Neither is White	2.315 (0.818)***	3.330 (1.404)**	2.811 (1.472)*
Difference in job type ₍₋₂₎			
Father is white collar; Mother is blue collar	-0.037 (0.962)	0.715 (1.021)	0.779 (1.026)
Mother is blue collar; Father is white collar	-0.178 (0.428)	-0.100 (0.422)	-0.087 (0.424)
State dummies	No	Yes	Yes
Calendar year dummies	No	No	Yes
Number of observations	1785	1785	1785
Overall R ²	0.027	0.078	0.083

Note: Model B2a includes all covariates; B2b adds state dummies; and B2c adds year dummies. Standard errors have been clustered on the household level and are in parenthesis. Results on state and year dummies available upon request to authors. All differences are father – mother. The reference category for difference in race is where mothers and fathers are of the same race and for difference in job type is where mothers and fathers have the same job type. Earnings have been adjusted in 2000 \$USD using the Consumer Price Index. *p<0.10; **p<0.05; ***p<0.01.

Table B3: DDD instantaneous estimates of workplace breastfeeding legislation on within-couple full-time equivalent income gap using only first-born children

Variable	BM3a	BM3b	BM3c
Workplace breastfeeding policy*Infant (DDD)	-1.320 (0.594)**	-1.295 (0.649)**	-1.679 (0.633)***
<i>Covariates (x_{t-2})</i>			
log(earnings _{ft(-2)} / earnings _{m(-2)})	0.172 (0.077)**	0.172 (0.084)**	0.174 (0.085)**
Difference in age ₍₋₂₎	-0.004 (0.057)	0.020 (0.058)	0.026 (0.059)
Difference in education ₍₋₂₎	0.100 (0.108)	0.049 (0.122)	0.057 (0.123)
Difference in work experience ₍₋₂₎	0.044 (0.048)	0.039 (0.052)	0.035 (0.053)
Difference in race ₍₋₂₎			
Father is White; Mother is not	-1.081 (0.905)	-0.123 (1.170)	-0.460 (1.177)
Mother is White; Father is not	-2.714 (1.013)***	-1.870 (1.299)	-1.905 (1.159)
Neither is White	1.946 (0.827)**	3.248 (1.443)**	3.449 (1.456)**
Difference in job type ₍₋₂₎			
Father is white collar; Mother is blue collar	-0.119 (0.965)	0.550 (1.019)	0.706 (1.023)
Mother is blue collar; Father is white collar	-0.208 (0.428)	-0.159 (0.423)	-0.101 (0.425)
State dummies	No	Yes	Yes
Calendar year dummies	No	No	Yes
Number of observations	1785	1785	1785
Overall R ²	0.025	0.072	0.081

Note: Model B3a includes all covariates; B3b adds state dummies; and B3c adds year dummies. Standard errors have been clustered on the household level and are in parenthesis. Results on state and year dummies available upon request to authors. All differences are father – mother. The reference category for difference in race is where mothers and fathers are of the same race and for difference in job type is where mothers and fathers have the same job type. Earnings have been adjusted in 2000 \$USD using the Consumer Price Index.

*p<0.10; **p<0.05; ***p<0.01.