The Unintended Effects of California's Paid Family Leave Program on Children's Birth Outcomes

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Abstract

California is the first state to provide paid family leave program, which offers 6 weeks postnatal paid leave to employed mothers. The evidence from the Survey of Income and Program Participation shows that mothers in California take 3.7% more prenatal paid leave after the program. I use natality data from the National Vital Statistics System and a Difference-in-Difference method to evaluate the impacts of the paid family leave program of California on children's birth outcomes. The results show that California's paid family leave decreases the premature birth rate by 0.29 percentage points or 2.8 percent, and these effects are particularly large among the children of African American mothers or mothers without a high school degree, who are likely cannot afford to the unpaid prenatal leave and to substitute their paid postnatal leave for prenatal leave. One possible mechanism for the improvements in birth outcomes is that the increased prenatal leave decreases the share of mothers with inadequate prenatal care.

1. Introduction

Reducing low birth weight and preterm births is a national public health priority. Low birth weight rates and preterm birth rates decreased from 2007 to 2014. Despite this success, the preterm birth rate continued to rise until recently. Prenatal care is thought to be essential to the health of newborn babies. The paid family program is designed to provide compensated time off from work so that mothers can prepare for and recover from childbirth and improve the welfare of their infants.

The federal government and some states have taken different measures to help working mothers balance work and family obligations. Family leave policies are one such measure. The Family and Medical Leave Act (FMLA) of 1993 provides 12 weeks of unpaid, job-protected leave to qualified workers. Most recently, California, New Jersey, Rhode Island, New York state, Washington state, the District of Columbia, and Massachusetts have started or will soon start paid family leave programs. California's new law, the New Parent Leave Act, which took effect in 2019, allows some employees to take leave for up to 12 weeks to take care of a new child.

The United States still lags behind to other industrialized countries in terms of length and wage replacement of paid family leave policies. The U.S. has no national-level paid family leave policy, and the only federal-level family law –FMLA offers 12 weeks of unpaid job-protected leave to qualifying workers. In contrast, 25 of 34 OECD countries guarantee at least 6 months of paid leave for mothers, which supports breastfeeding for the length recommended by the World Health Organization. The wage replacement rate[1] is around 60% for the states in the U.S. with the paid family leave policy, whereas 25 of 34 OECD countries have a wage replacement rate of 80% or higher. (RAUB et al. 2018)

[1] The wage replacement rate is the percentage of a worker's income that is paid out by the family leave policies.

One goal of the Paid Family Leave (PFL) policy is to provide mothers with compensated time off from work to prepare for and recover from childbirth and care for their infants. The paid time off increases parent-child interactions, prolongs breastfeeding, better monitoring children's health status, and more timely vaccinations (Berger, Hill, and Waldfogel 2005). There are also arguments about income effects, as more family income increases the expenditure on educational material, nutrition, and health care (Danzer and Lavy 2018).

Much of related work focus on the combined effects of leave before and after birth, less work focus on the prenatal leave which is also independently important. Rossin (2011) evaluates the effects of 1993 FMLA on children's birth outcomes and finds that the prenatal leave led to small increases in birth weight and decreases in the likelihood of premature birth. Stearns (2015) investigates the impacts of Temporary Disability Insurance (TDI) paid maternity leave on birth outcomes and concludes that it reduces the share of low birth weight births by 3.2 percent and decreases the likelihood of early-term birth by 6.6 percent.

This paper evaluates the impact of California' Paid Family Leave (CA-PFL) program on children's birth outcomes. CA-PFL is the first PFL programs in the United States. Understanding the consequences of it is important because it provides a model for potential proposals in other states or at the federal level. Even though CA-PFL can only be applied after childbirth, evaluating the effects of CA-PFL on children's birth outcomes is also justified since empirical evidence shows that CA-PFL also has effects on prenatal leave-taking (Baum and Ruhm 2016).

I evaluate the effects of CA-PFL on birth outcomes using natality data from the National Vital Statistics System (NVSS) with the Difference-in-Difference (DD) framework. The effects suggest that the policy reduces the premature birth rate by 2.8 percent. The effects are

particularly large on children of African American mothers and on mothers without a high school degree.

Several mechanisms could explain why CA-PFL can affect children's birth outcomes. First, the time taking off from work before childbirth can reduce maternal physical and mental stress which has been shown to have adverse effects on birth outcomes (Mulligan et al. 2012, Copper et al. 1996). Second, mothers who take prenatal leave tend to begin prenatal care earlier or have more doctor visits to reduce the risk of adverse birth outcomes. Finally, the partial wage replacement can relax family financial constraint, which means more nutrition and health expenditures can be spent before and after childbirth.

The paper is organized as follows: Section 2 reviews the related literature. Section 3 provides background on family leave programs in the United States and the CA-PFL program particularly. Section 4 discusses potential mechanisms by which the PFL affects birth outcomes. Section 5 describes the data used to evaluate the effects of this policy and presents summary statistics. Section 6 introduces the empirical strategy, and results are discussed in Section 7. Section 8 verifies the effects of CA-PFL on prenatal leave-taking, and Section 9 presents some robustness checks. Finally, Section 10 provides concluding remarks.

2. Literature Review

There is growing research on the effects of paid parental leave on the maternal labor market and child health and cognitive. Studies in 1990s or earlier in this century mostly focus on OECD cross-nation analysis, and consistently find that longer paid leaves are associated with lower infant and child mortality, higher fertility rates and the increased labor-force participation of young women (Winegarden and Bracy 1995, Ruhm 1998, Ruhm 2000, Tanaka 2005, Waldfogel 1998, Waldfogel, Higuchi, and Abe 1999). Since last decade, economists show growing interest

in single country policy evaluation. For instance, Baum II (2003), Berger and Waldfogel (2004), Berger, Hill, and Waldfogel (2005), Rossin (2011) study the effects of job-protected maternity leave provided by the US 1993 FLMA, they find that the length of maternity leave-taking is related to leave coverage, and more leave-taking increases breastfeeding and immunizations, and decreases infant mortality. Baker and Milligan (2008a, 2008b, 2010), Hanratty and Trzcinski (2009) study the prolonged family leave of Canada in 2000, and they find that it increases job continuity with the pre-birth employer, no evidence of a decrease in back to work for mothers of children age one and a weak positive impact on indicators of child development.

Most recently, studies of paid maternity leave focus on the effects on child health outcomes. Most studies on the impact of extended maternity leave find positive effects on child health outcomes. For example, Berger, Hill, and Waldfogel (2005) examine the effects of the FMLA and conclude that the FMLA is associated with a reduction of early back to work and hence increases in breastfeeding and immunizations. Rossin (2011) reports that the FMLA led to small increases in birth weight, decreases in the likelihood of premature birth, and substantial decreases in infant mortality. Similarly, Stearns (2015) find that TDI paid maternity leave reduces the low birth weight rate by 3.2 percent, decreases the likelihood of early-term birth by 6.6 percent. Jia, Dong, and Song (2018) estimate the effect of paid maternity leave on breastfeeding duration in urban China during the year 1988 to 2008, and the results show that the length of paid leave increases by 30 days causes the probability of breastfeeding for at least 6 months increases by 12 percentage points. In contrast, Baker and Milligan (2008b) focus on the increase in maternity leave mandates from 25 weeks to 50 weeks in Canada in 2000 and find that extended maternity leave does not have a consistent, robust effect on the health measures.

California's first family leave law came into effect 15 years ago, and there are many studies that examined its impact on parental leave-taking, maternal labor market, and child health outcomes. There are some empirical studies suggesting that the CA-PFL indeed increased parental leave-taking. For instance, Rossin-Slater, Ruhm, and Waldfogel (2013) use data from March Current Population Survey (CPS) to find an increase of postnatal leave-taking from an average of 3 to 6 weeks for new mothers. Baum and Ruhm (2016) use data from National Longitudinal Survey of Youth (NLSY) and find similar results: the policy raised postnatal leave use by almost 5 weeks for the average covered mother and 2 to 3 days for the corresponding father. Bartel et al. (2018) report that fathers of infants in California are 46% more likely to be on leave when CA-PFL is available based on the data from the American Community Survey. There is also some literature focus on the labor market effects, and the results suggest that leave-taking increased the usual weekly work hours of employed mothers of 1- to 3-year-old children (Rossin-Slater, Ruhm, and Waldfogel 2013, Baum and Ruhm 2016). No evidence suggests that leave-taking leads to adverse future labor market outcomes (Mark Curtis, Hirsch, and Schroeder 2016, Bana, Bedard, and Rossin-Slater 2018). For the health-related outcomes, Huang and Yang (2015) use the data from Infant Feeding Practices Study and find an increase of 3–5 percentage points for exclusive breastfeeding. Lichtman-Sadot and Bell (2017) also find evidence of improvements in health outcomes among California elementary school children, and the improvements are driven by children from less advantaged backgrounds. Bullinger (2019) use data from the National Survey of Children's Health and find improvements in parent-reported overall child health and suggestive improvements in maternal mental health status. Pihl and Basso (2019) report a decline in infant admissions to hospital and conclude that this may be due to more breastfeeding.

Up to now, there is no study about the impact of CA-PFL on children's birth outcomes. It is time to fill in this gap.

3. Institutional Background

A. Family Leave Policies in the U.S.

The United States is the only developed country in the world that does not offer a national level of paid family leave. The only federal level family law is the 1993 FMLA, which requires that employers provide 12 weeks of unpaid job-protected leave to qualifying workers with a newborn or a sick child, personal or family illness. To be eligible for FMLA, one must have worked at least 1,250 hours over the 12 months for a firm which employs at least 50 workers within 75 miles of its physical establishment. A survey in 2000 suggests that fewer than 60% of employees in the U.S. were eligible for FMLA (Rossin 2011).

The Pregnancy Discrimination Act (PDA) of 1978 requires employers to provide the same leave to a woman related to medical conditions associated with pregnancy and childbirth as that provided to any employee with a medical condition or temporary disability, such as a broken leg or a heart attack. Since the passage of the PDA, five states which provide Temporary Disability Insurance (TDI) or State Disability Insurance (SDI) program (California (SDI), Hawaii, New Jersey, New York, and Rhode Island) must also provide it for medical conditions related to pregnancy and childbirth. In 2004, all the five states provided up to 4 weeks paid leave before the birth and 4–8 weeks paid leave immediately after birth. Most recently, California, New Jersey, Rhode Island, New York, Washington, District of Columbia, and Massachusetts have started or will start paid family leave programs. A summary of family leave programs in the U.S. is shown in Table 1.

Table 1 Family Leave Programs in the United States

Year	State	Law/Program	Length of leave
2004	California	California Paid Family Leave	6 weeks
2009	New Jersey	New Jersey Paid Family Leave	6 weeks
2014	Rhode Island	Rhode Island Paid Family Leave	4 weeks
2018	New York	New York State Paid Family Leave	8 to 12 weeks
2020	Washington	Washington State Family Leave Act	12 to 18 weeks
2020	District of Columbia	District of Columbia Paid Family Leave	8 weeks
2021	Massachusetts	Massachusetts Paid Family and Medical Leave	12 weeks

Source: National Conference of State Legislatures: State Family and Medical Leave Laws.

B. California's Paid Family Leave Program

CA-PFL is an extension of SDI and is the first paid family leave program in the U.S. The law passed in the California State Senate on September 23, 2002, and took effect on July 1, 2004. Workers who participate in the SDI Program are eligible for PFL and are entitled to a maximum of 6 weeks of partial pay each year while taking time off from work to bond with a newborn baby, newly adopted or foster child, or to care for a seriously ill parent, child, spouse or registered domestic partner. Unlike FMLA, California's PFL is nearly universal in its coverage: apart from some self-employed persons, virtually all private-sector and nonprofit sector workers are included, regardless of the size of their employer. California public-sector employees may be covered if the agency or unit that employs them opts into the program. Workers need not have been with their current employer for any specific period to be eligible for PFL; they need only to have earned at least $300 in an SDI-covered job during any quarter in the "base period," which is 5 to18 months before filing a PFL claim. The program is funded by an employee-paid payroll tax and provides the same benefits as the SDI program. The 6 weeks leave can be taken all at one time or intermittently, and the wage replacement rate was 55% of their weekly earnings, capped at a maximum weekly benefit of $728 as of 2004 ($987 as of 2012, $1,173 as of 2017, $1,216 as of 2018). The law gives an employer the option to require an employee to take up to two weeks of earned, but unused, vacation leave when the employee is requesting PFL. However,

employees are not required to use vacation leave when receiving SDI benefits. Employees can choose to take unused sick leave and receive PFL benefits at the same time, and the combined benefits cannot exceed 100 percent of his/her regular earnings, or the PFL benefits will be reduced by the amount of sick leave wages received. Table 2 summaries length of paid maternity leave in California before and after July 1, 2004.

Table 2 The Length of Paid Leave Before and After July 1, 2004

	Before July 1, 2004	After July 1, 2004
Paid maternity leave program	SDI	SDI & PFL
Length of prenatal paid leave	4 weeks from SDI + paid sick leave + paid vacation leave	
Length of postnatal paid leave	6 weeks from SDI + paid sick leave + paid vacation leave	6 weeks from SDI **+ 6 weeks from PFL** + paid sick leave + paid vacation leave

Source: California Employment Development Department.

4. Conceptual Framework

This section analyses why CA-PFL may impact prenatal leave-taking, and hence affect children's birth outcomes.

The precautionary saving theory states that people may delay consumption and save in the current period due to the lack of completeness of insurance markets (Hubbard and Judd 1987). This theory can also be applied to leave-taking. Pregnant women may delay leave-taking and save their paid leave before childbirth due to limited paid leave after the childbirth. Before the implementation of CA-PFL, the maximum paid maternity leave that an SDI eligible worker in California can take is 4 weeks before childbirth and 6 weeks after birth (8 weeks for cesarean delivery) plus other paid leave provided by the employer. With the availability of CA-PFL, eligible mothers can take an additional 6 weeks of paid leave after childbirth, which makes postnatal leave double than before. According to the precautionary saving theory, mothers with

their paid leave constraint may take more prenatal paid leaves (sick leave or vacation leave) since they no longer need to be saved due to the availability of an extra 6 weeks PFL. Baum and Ruhm (2016) using data from survey NLSY97 finds that mothers in California with the availability of paid family leave take around one extra week of leave in their quarter before birth. Stearns (2015) studies the effects of TDI on childbirth outcomes and mention that paid maternity leave had a significant effect on prenatal leave-taking. In this paper, I use data from the Survey of Income and Program Participation (SIPP) and verify that pregnant mothers in California take more prenatal paid vacation leave after the CA-PFL program.

CA-PFL can affect children's birth outcomes through several mechanisms. First, the availability of paid leave could reduce the mental stress level of working women during pregnancy, and taking prenatal leave also reduce physical stress for women in jobs that require activities such as prolonged standing, repeated lifting, or long commutes. Maternal stress during pregnancy has been shown to have adverse effects on birth outcomes, such as low birth weight (McAnarney and Stevens-Simon 1990, Mulligan et al. 2012) and preterm birth (Wadhwa et al. 2001, Pike 2005, Copper et al. 1996). Further, prenatal leave also affects birth outcomes by increasing the amount of time that mothers spent on prenatal care. Mothers take more prenatal leave are more likely to begin prenatal care earlier or have more doctor visits, and therefore reduce potential risks that adverse to birth outcomes. Finally, there might also be some income effects. As precautionary saving theory suggests, family in their financial constraints are more likely to increase their expenditure before childbirth since the paid leave would provide wage replacement after childbirth. The expenditure could be used for additional nutrition and health care to improve birth outcomes.

5. Data

This paper utilizes natality data from July 2001 to June 2008 from the National Vital Statistics System (NVSS) of the National Center for Health Statistics[2]. This data contains information about all births in the United States during this period. These individual-level records contain demographic information about the mother, including her age, race, marital status, state of residence, and educational attainment. The records also contain childbirth information such as birth weight, gestational age, birth order, month prenatal care began, and the number of prenatal visits.

This paper uses birth weight, low birth weight (<2500 grams)[3], gestational age, and premature birth (fewer than 37 weeks gestation)[4] rate as birth outcomes. To further explore the potential mechanism, I also use inadequate prenatal care as an outcome variable to investigate the potential channel that the CA-PFL may influence birth outcomes. I establish the dummy of inadequate prenatal care based on two methods. First, I adopt the widely used Kessner index, in which a woman's prenatal care is classified as "inadequate" if it begins in the third trimester (month 7 to month 9 of pregnancy) or includes four or fewer visits for a pregnancy of 34 or more weeks.[5] The second method is based on the Adequacy of Prenatal Care Utilization Index, in which a woman's prenatal care is classified as "inadequate" if it begins later than the fourth

[2] The policy took effect on July 1, 2004, and I choose 3 rolling calendar years before and after the effective year as sample periods.
[3] Low birth weight is defined by the World Health Organization as a birth weight of an infant of 2,500 g or less.
[4] Preterm birth is defined by the American College of Obstetricians and Gynecologists as birth occurs less than 37 weeks of pregnancy.
[5] Institute of Medicine (US) Committee to Study Outreach for Prenatal Care; Brown SS, editor. Prenatal Care: Reaching Mothers, Reaching Infants. Washington (DC): National Academies Press (US); 1988. Chapter 1, Who Obtains Insufficient Prenatal Care? Available from: https://www.ncbi.nlm.nih.gov/books/NBK217693/

month of pregnancy or if the proportion of prenatal care visits to expected visits[6] is less than 50% (Kotelchuck 1994).

The control variables that are used are children's sex, birth order; mother's age, race, ethnicity, education, marriage status at childbirth. Mother's education is in 4 categories (some high school or less , high school degree, some college, college degree or more), mother's race is in 3 categories (white, black, other), mother's ethnicity is in 2 categories (Hispanic, other), mother's age is in 5 categories (less than 20 years, 20-24 years, 25-34 years, 35-44 years, and 45 or more years). The data does not reveal whether a woman is employed at the time of birth or if she takes prenatal leave. To control for labor market conditions that affect the decision to be employed and trends in the female labor force, I merge the natality data with state-month level labor force participation rates and the employment rates of women aged 16–48 from the CPS. Also, to control for family income that affects the decision of taking the leave or not, I merge the natality data with state-year level family income data form March CPS.

I use states that have TDI as control states, and for the rest of the paper, the TDI states refer to Hawaii, New Jersey, New York, and Rhode Island. I use TDI states as the control group for two reasons. First, both California's and the four TDI states offer paid prenatal leave through state temporary disability insurance[7] and other states do not have a state-level policy with paid prenatal leave. Second, New Jersey, Rhode Island, and New York also offered PFL that similar to that of California afterward, which indicates that TDI states have the similar political climate to California, and political climate is hard to measure and control in most cases. Additionally, I

[6] The American College of Obstetricians and Gynecologists recommended prenatal care visits are one visit per month through 28 weeks, one visit every 2 weeks through 36 weeks, and one visit per week thereafter.

[7] Workers in California and New Jersey can claim benefits for up to four weeks before the expected delivery date and six weeks after birth (eight weeks for Caesarean sections). The other TDI states provide six to eight weeks of leave that can be used on either side of birth.

also the Non-TDI states as control states for robustness check (in Section 9). Table 3 presents the summary statistics of the outcome and control variables.

Table 3 Summary Statistics

Variable	Whole sample		CA(Pre-Treat)		TDI(Pre-Treat)	
	Mean	S. D.	Mean	S. D.	Mean	S. D.
Birth weight (in grams)	3,304	5871	3,341	577	3,294	608
Gestational Age (in weeks)	38.75	2.48	38.86	2.42	38.77	2.59
Low birth weight (<2500 grams)	0.07	0.26	0.06	0.24	0.08	0.27
Premature birth (<37 weeks)	0.11	0.32	0.1	0.3	0.12	0.32
Inadequate prenatal care (Utilization Index)	0.13	0.34	0.1	0.3	0.16	0.37
Inadequate prenatal care (Kessner Index))	0.08	0.27	0.06	0.23	0.1	0.3
Male	0.51	0.5	0.51	0.5	0.51	0.5
White	0.76	0.43	0.81	0.39	0.71	0.45
Black	0.11	0.32	0.06	0.24	0.18	0.38
Hispanic	0.4	0.49	0.5	0.5	0.22	0.42
Married	0.64	0.48	0.67	0.47	0.66	0.47
Mother's age <21	0.12	0.33	0.13	0.34	0.11	0.31
Mother's age (21-25)	0.22	0.42	0.24	0.42	0.2	0.4
Mother's age (26-30)	0.27	0.44	0.26	0.44	0.26	0.44
Mother's age (31-35)	0.25	0.43	0.23	0.42	0.27	0.45
Mother's age (36-40)	0.12	0.33	0.11	0.31	0.13	0.34
Mother's age >40	0.02	0.15	0.02	0.15	0.02	0.15
Mother < HS education	0.25	0.44	0.3	0.46	0.18	0.38
Mother has HS degree	0.27	0.44	0.28	0.45	0.29	0.45
Mother has some college	0.19	0.39	0.19	0.39	0.21	0.41
Mother has college degree or more	0.29	0.46	0.24	0.43	0.32	0.47
First born child	0.4	0.49	0.39	0.49	0.41	0.49
Second born child	0.32	0.47	0.32	0.47	0.33	0.47
Third born child	0.16	0.37	0.17	0.38	0.16	0.36
Employment rate	0.94	0.01	0.93	0.01	0.94	0.01
Labor force participation rate	0.69	0.02	0.69	0.01	0.71	0.02
Family income	70,375	8,527	63,471	856	69,949	8,608
Obs	6,438,972		1,496,710		1,195,686	

Notes: The table presents the summary statistics of outcome variables and control variables for the whole sample, California pre-treatment sample, and TDI states pre-treatment sample from July 2001 to June 2008. Pre-treatment means birth occurred before July 2004. TDI refers to Hawaii, New Jersey, New York, and Rhode Island. Data source: National Vital Statistics System.

Table 3 shows that for the whole sample period, 7.2% of babies are born with low birth weight, and 11.2% of all births are considered premature; 13.3% mothers are classified as

inadequate in prenatal care if measured by the Utilization Index, while it is 8.1% if measured by the Kessner Index. Most mothers are between 21 and 35 years old and have at least a high school degree. Nearly 35% of all mothers are unmarried at the time of giving birth.

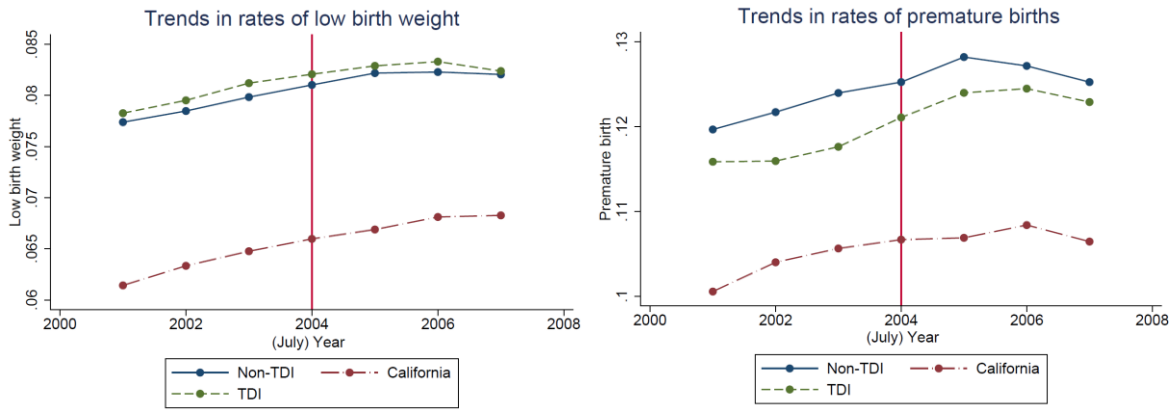

Figure 1 Trends for the rate of low birth weight and premature birth rate

Notes: These figures plot the yearly (rolling calendar year from July to next June) trends of the rate of low births weight and the premature birth rate of California, TDI states (Hawaii, New Jersey, New York, and Rhode Island), and Non-TDI states from July 2001 to June 2008. Data source: National Vital Statistics System.

To have a visual impression of the key birth outcome variables, I plot the yearly (rolling calendar year from July to next June) trends of the rate of low birth weight and premature birth rate of California, TDI states, and Non-TDI states from July 2001 to June 2008.

Figure 1 shows that trends in all 3 birth weights increased steadily until 2006, then began to decrease. Premature birth rates show a similar pattern to the rates of low birth weight, except that the trends began to decrease earlier and more dramatically. Both California rates remain lower than those of TDI states and Non-TDI states. In contrast, for TDI states, the rate of low birth weight is a little bit higher but the premature rate is lower than that of Non-TDI states. It may be surprising that the trends for the rate of low birth weight and premature birth rate are rising during most of the sample period. According to the National Center for Health Statistics, the

preterm birth rate rose by more than 20 percent in the United States between 1990 and 2006[8]. The preterm birth rates decreased from 2007 to 2014 but rose for the third year in a row in 2017[9]. Similarly, according to Child Trends (2018), the percentage of infants born with low birthweight increased slowly but steadily from 1980 to a peak in 2006[10]. The low birth weight rate increased in 2015 and 2016, after declining from 2006 to 2014[11].

This paper also uses data from the U.S. Census Bureau's Survey of Income and Program Participation (SIPP) to verify the effects of CA-PFL on prenatal leave-taking. SIPP is a household-based survey designed as a continuous series of national panels. Each panel features a nationally representative sample interviewed over a multi-year period lasting approximately four years. SIPP collects data and measures change for many topics, including economic well-being, family dynamics, education, assets, health insurance, childcare, fertility, and food security. The analysis primarily uses retrospective fertility and maternity leave data from the year 1996, 2001, 2004, and 2008 Panel of SIPP Wave 2 Topical Module. These individual-level records contain demographic information about the mother, including her age, race, marital status, and state of residence. The survey also has rich information about prenatal leave-taking, for example, if pregnant mothers take paid maternity leave, paid sick leave, and paid vacation leave before childbirth, which is essential for me to verify if the CA-PFL affects prenatal leave-taking or not. The analysis results are presented in Section 8.

[8] Martin JA, Hamilton BE, Sutton PD, et al. Births: Final data for 2006. National vital statistics reports; vol 57 no 7. Hyattsville, MD: National Center for Health Statistics. 2008.
[9] https://www.cdc.gov/reproductivehealth/features/premature-birth/index.html
[10] https://www.childtrends.org/indicators/low-and-very-low-birthweight-infants
[11] https://www.cdc.gov/nchs/products/databriefs/db306.htm

6. Identification Strategy

To identify the effects of CA-PFL on birth outcomes, I employ a DD design that compares outcomes of children born in California and children born in TDI states before and after PFL's implementation.

I estimate the effects based on the following equation.

$$Y_{imys}=\alpha+ \beta_1 Treat_s*Post_{my} + \beta_2 X_{imys}+\rho_s*Timetrend + \mu_s+ \theta_m+ \lambda_y+ \varepsilon_{imys}$$

Y_{imys} is the measure for the birth outcome of child *i* born in moth *m* year *y* in state *s*. *Treat* is a dummy indicator for child resident in the treated state. *Post* is a dummy indicator for the child born after PFL's implementation. X_{imys} are control variables that including child's sex, birth order; mother's age, race, ethnicity, education, marriage status at birth; family income; state-year employment rate, labor force participation rate. β_1 is the coefficient of interest which measures the change of birth outcome for children in California who were born after PFL's implementation in comparison to children in TDI states. ρ_s*Timetrend is the state-specific time trend. μ_s is the state-level fixed effect. θ_m is the month-of-birth fixed effect. λ_y is the year-of-birth fixed effect.

Since the data do not contain information on who is eligible and take the PFL, the estimated effect will represent the Intention-to-Treat (ITT) effect of the PFL. This ITT will be a lower bound estimate of the effect.

One fact that should draw our attention is that the CA-PFL was announced on September 23, 2002, but is effective on July 1st, 2004. Some may concern that the 21 months prior announcement may induce some selection problems, either from pregnant women in other states move to California or from prospect mothers deliberately postpone their fertility decisions or delivery date to the day after the effective date. Some arguments could address these concerns.

First, the maximum weekly benefit of the CA-PFL is $728 before the year 2012, or $ 4,368 for 6 weeks, which is less than the average move between states costs $5,630[12], let alone the opportunity cost. So, the financial incentive is not sufficient for pregnant women in other states to move to California. Second, the CA-PFL do not need to take consecutively, as long as within one year after childbirth, which means mothers who gave birth in early 2004 can also take PFL after the effective date of CA-PFL, so mothers that expected to be delivered in early 2004 do not have the incentive to manipulate their delivery date. Recent empirical evidence suggests that only 1% percentage of California births were more likely in 2004 during the second half of the year as opposed to the first half of the year (Lichtman-Sadot 2014). To further evaluate how the 1% changes of birth will influence the results, I present robustness check in Section 9 using sample excluding the year 2004, and the results are generally consistent.

7. Empirical Results

Table 4 presents the DD estimates of the effect of CA-PFL on birth weight, rate of low birth weight, gestational age, and premature birth rate. The DD regressions compare birth outcomes in California and TDI states (Hawaii, New Jersey, New York, and Rhode Island), before and after the treatment (July 2004) from July 2001 to June 2018. I do not need to include sample weight here since the sample is the population with all new births in these states. The state-specific linear time trend is included in all specifications, and robust standard errors are clustered by state.

[12] According to the American Moving & Storage Association, the average move between states costs $5,630.

Table 4 Effects of CA-PFL on Birth Outcomes

Outcome Variable	Birth weight		Low birth weight	
CA*Post	1.4666	2.2446	0.0006	0.0001
	(0.7535)	(1.4521)	(0.0005)	(0.0009)
Mean	3,341		0.063	
Observations	6,438,972	6,438,972	6,438,972	6,438,972
Outcome Variable	Gestational age		Premature birth	
CA*Post	0.0286***	0.0298***	-0.0024***	-0.0029***
	(0.0032)	(0.0051)	(0.0004)	(0.0005)
Mean	38.863		0.103	
Observations	6,438,972	6,438,972	6,438,972	6,438,972
Individual characteristics	Y	Y	Y	Y
State characteristics	N	Y	N	Y
State-specific time trend	Y	Y	Y	Y

Notes: The results presented here list the Difference-in-Difference estimates of the effects of CA-PFL on the birth weight, rate of low birth weight, Gestational age, and premature birth rate. The DD regressions compare birth outcomes in California and TDI states (Hawaii, New Jersey, New York, and Rhode Island), three rolling calendar years before and after the treatment (July 2004). Mean is California's pre-treatment sample mean of the outcome variable. Individual characteristics include mother's age, education, race, ethnicity, marital status at the time of childbirth; and child sex, birth order. State characteristics include state-year level family income, state-month-level employment rate and labor force participant rate; state fixed effects, year fixed effects, and month fixed effects. State-specific time trend is included in all specifications. Robust standard errors in parentheses are clustered by state. Significance levels: *p < 0.10, **p < 0.05, ***p < 0.01. Data source: National Vital Statistics System from July 2001 to June 2008.

As Table 4 presents, the DD estimates coefficients of the birth weight and the rate of low birth weight are not statistically significant for any specifications. However, there are significant effects of CA-PFL on gestational age, and the premature birth rate. Specifically, the policy increases the gestational age by 0.03 weeks; reduces the premature birth rate by 0.29 percentage points when both individual characteristics and state characteristics are controlled in the regression, which is a 2.8 percent decline from the sample mean.

To further investigate the mechanism by which CA-PFL affect birth outcomes, I estimate the effect of CA-PFL on the inadequacy of prenatal care, and two dummies using the Utilization Index and the Kessner Index to measure the inadequacy of prenatal care are used as outcome variables, and the results are presented in Table 5.

All estimated coefficients are negative with similar magnitude and significant level across different specifications. Specifically, compared with mothers in TDI states, California's mothers reduce the inadequacy of prenatal care by 2.3 percentage points (Utilization Index) or 2.4 percentage points (Kessner Index) when both individual and state characteristics are controlled in the regression. These results suggest a possible channel by which the CA-PFL increases the gestational age and reduces the premature birth rate.

Table 5 Effects of CA-PFL on the Inadequacy of Prenatal Care

Inadequate prenatal care	Utilization Index		Kessner Index	
CA*Post	-0.0265***	-0.0232***	-0.0341***	-0.0244**
	(0.0017)	(0.0044)	(0.0028)	(0.0062)
Mean	0.102		0.055	
Observations	6,438,972	6,438,972	6,438,972	6,438,972
Individual characteristics	Y	Y	Y	Y
State characteristics	N	Y	N	Y
State-specific time trend	Y	Y	Y	Y

Notes: The results presented here list the Difference-in-Difference estimates of the effects of CA-PFL on the inadequacy of prenatal care. Utilization Index and Kessner Index are used separately to establish the dummy of inadequate prenatal care. The DD regressions compare inadequate prenatal care in California and TDI states (Hawaii, New Jersey, New York, and Rhode Island), three rolling calendar years before and after the treatment (July 2004). Mean is California's pre-treatment sample mean of the outcome variable. Individual characteristics include mother's age, education, race, ethnicity, marital status at the time of childbirth; and child sex, birth order. State characteristics include state-year level family income, state-month-level employment rate and labor force participant rate; state fixed effects, year fixed effects, and month fixed effects. State-specific time trend is included in all specifications. Robust standard errors in parentheses are clustered by state. Significance levels: *p < 0.10, **p < 0.05, ***p < 0.01. Data source: National Vital Statistics System from July 2001 to June 2008.

As mentioned before, the precautionary saving theory suggests that mothers in leave constraint (cannot afford to the unpaid prenatal leave) tend to substitute their paid postnatal leave for prenatal leave. To further test if this hypothesis is correct or not, I estimate the heterogeneous effects of CA-PFL on African American mothers and mothers without a high school degree since mothers in these two groups are more likely in leave constraints. The results are presented in Table 6.

Table 6 Heterogeneous Effects of CA-PFL on Birth Outcomes and Prenatal Care

Outcome Variable	Low birth weight	Premature birth	Utilization Index	Kessner Index
Panel A: African Americans				
CA*Post	-0.0052**	-0.0106***	-0.0300**	-0.0364**
	(0.0014)	(0.0005)	(0.0088)	(0.0109)
Mean	0.115	0.150	0.130	0.074
Observations	733,890	733,890	733,890	733,890
Panel B: Some High School or Less				
CA*Post	-0.0036*	-0.0073***	-0.0361***	-0.0331***
	(0.0015)	(0.0005)	(0.0061)	(0.0070)
Mean	0.062	0.112	0.161	0.092
Observations	1,634,762	1,634,762	1,634,762	1,634,762
Individual characteristics	Y	Y	Y	Y
State characteristics	Y	Y	Y	Y
State-specific time trend	Y	Y	Y	Y

Notes: The results presented here list the Difference-in-Difference estimates of the effects of CA-PFL on the rate of low birth weight, premature birth rate, and two measures of inadequate prenatal care. The DD regressions compare the outcomes in California and TDI states (Hawaii, New Jersey, New York, and Rhode Island), three rolling calendar years before and after the treatment (July 2004). Panel A restrict the sample to mothers of African Americans, and Panel B restricts the sample to mothers with some high school education or less. Mean is California's pre-treatment sample mean of the outcome variable. Individual characteristics include mother's age, education, race, ethnicity, marital status at the time of childbirth; and child sex, birth order. State characteristics include state-year level family income, state-month-level employment rate and labor force participant rate; state fixed effects, year fixed effects, and month fixed effects. State-specific time trend is included in all specifications. Robust standard errors in parentheses are clustered by state. Significance levels: *p < 0.10, **p < 0.05, ***p < 0.01. Data source: National Vital Statistics System from July 2001 to June 2008.

As Table 6 suggests, mothers from less advantaged families benefit more from this policy, with more reduction in the rate of low birth weight, premature birth rate, and rate of inadequate prenatal care. Specifically, for the African Americans mothers, the policy reduces the rate of low birth weight and the premature birth rate by 0.52 and 1.06 percentage points respectively, which are 4.5 and 7 percent decline from the sample means accordingly. This may be driven by the fact that the policy reduces the rate of inadequate prenatal care by 3 (Utilization Index) or 3.6 (Kessner Index) percentage points. Similarly, for mothers without a high school degree, the policy reduces the rate of low birth weight and the premature birth rate by 0.36 and 0.73 percentage points respectively, which are 5.8 and 6.5 percent decline from the sample means accordingly. This

may also be driven by the fact that the policy reduces the rate of inadequate prenatal care by 3.6 (Utilization Index) or 3.3 (Kessner Index) percentage points.

The above results suggest that CA-PFL has larger effects on children from disadvantaged families. One possible explanation is that mothers in disadvantaged families cannot afford the unpaid leave and more likely in leave constraint. So, they may substitute their paid postnatal leave for prenatal leave, and hence increase their prenatal care and improve their babies' birth outcomes.

8. The Effects of CA-PFL on Prenatal Leave-taking

In this section, I use data from the SIPP to verify if the CA-PFL has effects on prenatal leave-taking. To be consistent with the main analysis, I also divide the mother's age into 5 categories: less than 20 years, 20-24 years, 25-34 years, 35-44 years, and 45 or more years. Table 7 presents the DD estimates of the effect of CA-PFL on mothers' prenatal leave-taking. Controls include mother's age, race, ethnicity, marital status; child sex, birth order; state fixed effects, and year fixed effects. Robust standard errors are clustered on the state. Panel A use TDI states as the control group, and Panel B use the Non-TDI States as the control group.

SIPP collects information if mothers take prenatal leave in the following catalogs: paid/unpaid maternity leave, paid/unpaid sick leave, paid/unpaid vacation leave, and paid/unpaid other leave. Based on the above information, I establish three dummies, if the mother takes paid prenatal leave, unpaid prenatal leave, paid or unpaid prenatal leave. As Panel A presents, the policy has positive and significant effects on paid prenatal leave-taking, which is a 1.1 percentage points increase, or a 3.7 percent increase from the sample mean. I then look further at the effects of CA-PFL on all kinds of paid prenatal leave, and results suggest that the increase of paid prenatal leave are from paid maternity leave and paid vacation leave. Specifically, there are 3 percentage

points and 2 percentage points increase for paid maternity leave and paid vacation leave respectively, or 10 percent and 60 percent increase from sample means accordingly.

Table 7 Effects of CA-PFL on Prenatal Leave-taking

Leave	All leave			Paid leave		
	Paid	Unpaid	Total leave	Maternity	Sick	Vacation
Panel A: California vs. TDI States						
CA*Post	0.011**	0.009	0.029	0.030*	-0.013	0.020***
	(0.0037)	(0.0240)	(0.0165)	(0.0118)	(0.0076)	(0.0029)
Mean	0.295	0.182	0.456	0.292	0.05	0.033
Observations	3,960	3,960	3,960	2,915	2,915	2,915
Panel B: California vs. the Non-TDI States						
CA*Post	0.046***	0.008	0.059***	0.056***	-0.008	0.012***
	(0.0068)	(0.0085)	(0.0107)	(0.0135)	(0.0058)	(0.0033)
Mean	0.295	0.182	0.456	0.292	0.05	0.033
Observations	22,074	22,074	22,074	14,096	14,096	14,096

Notes: The results presented here list the Difference-in-Difference estimates of the effects of CA-PFL on Prenatal leave-taking. The DD regressions compare prenatal leave-taking of mothers in California and control states (TDI states or the Non-TDI States), before and after July 2004. Controls include mother's age, race, ethnicity, marital status; child sex, birth order; state fixed effects, and year fixed effects Robust standard errors in parentheses are clustered by state. All the regressions are weighted by the sample weight. Significance levels: *p < 0.10, **p < 0.05, ***p < 0.01. Data source: the year 1996, 2001, 2004, and 2008 Panel of Survey of Income and Program Participation Wave 2 Topical Module.

For Panel B, the effects are even larger, a 4.6 percentage point increase for paid prenatal leave and a 5.9 percentage point increase for paid or unpaid prenatal leave. Similarly, the effects on paid prenatal leave are from paid maternity leave and paid vacation leave. Specifically, there is a 5.6 percentage point and a 1.2 percentage point increase for paid maternity leave and paid vacation leave respectively, or 19.2 percent and 36.4 percent increase from sample means accordingly.

The results are consistent with the precautionary saving theory which suggests that pregnant women may not need to delay leave-taking and save their paid prenatal leave since they will have an extra 6 weeks of paid postnatal leave.

9. Robustness Checks

The CA-PFL was announced on September 23, 2002, and took effect on July 1, 2004. The more than 21 months prior announcement induced a 1% percentage increase in California births in 2004 during the second half of the year (Lichtman-Sadot 2014). To further evaluate how the 1% changes in births will influence the results, I present results using the sample excluding the year 2004, and the results are presented in Table 8.

Table 8 Effects of CA-PFL on Birth Outcomes and Prenatal Care (without the year 2004)

Outcome Variable	Low birth weight	Premature birth	Utilization Index	Kessner Index
CA*Post	0.0007	-0.0031*	-0.0255**	-0.0211*
	(0.0016)	(0.0013)	(0.0078)	(0.0096)
Mean	0.063	0.102	0.102	0.055
Observations	5,535,286	5,535,286	5,535,286	5,535,286
Individual characteristics	Y	Y	Y	Y
State characteristics	Y	Y	Y	Y
State-specific time trend	Y	Y	Y	Y

Notes: The results presented here list the Difference-in-Difference estimates of the effects of CA-PFL on the rate of low birth weight, premature birth rate, and two measures of inadequate prenatal care. The DD regressions compare the outcomes in California and TDI states (Hawaii, New Jersey, New York, and Rhode Island), two and a half rolling calendar years before and after the treatment (July 2004) without the calendar year 2004. Mean is California's pre-treatment sample mean of the outcome variable. Individual characteristics include mother's age, education, race, ethnicity, marital status at the time of childbirth; and child sex, birth order. State characteristics include state-year level family income, state-month-level employment rate and labor force participant rate; state fixed effects, year fixed effects, and month fixed effects. State-specific time trend is included in all specifications. Robust standard errors in parentheses are clustered by state. Significance levels: *p < 0.10, **p < 0.05, ***p < 0.01. Data source: National Vital Statistics System from July 2001 to June 2008 without the calendar year 2004.

Generally speaking, the magnitudes of significant levels of coefficients for all outcome variables are consistent with the results using the sample that including the year 2004. Specifically, there is also no significant effect of CA-PFL on the rate of low birth weight, and again, there are significant effects of CA-PFL on premature birth rate and inadequacy of prenatal care. For example, the policy reduces the premature birth rate by 0.31 percentage points when both individual characteristics and state characteristics are controlled in the regression, or a 3 percent decline from the sample mean. This is similar to our results in Table 4, which is a 0.29

percentage points reduction or a 2.8 percent decline. The consistent results indicate that the effects found in Table 4 are not driven by the 1% changes in births in the year 2004.

Table 9 Effects of CA-PFL on Birth Outcomes and Prenatal Care (California vs. the Non-TDI states)

Outcome Variable	Low birth weight	Premature birth	Utilization Index	Kessner Index
CA*Post	-0.0005	-0.0020***	-0.0351***	-0.0392***
	(0.0004)	(0.0007)	(0.0076)	(0.0100)
Mean	0.063	0.103	0.102	0.055
Observations	28,855,128	28,855,128	28,855,128	28,855,128
Individual characteristics	Y	Y	Y	Y
State characteristics	Y	Y	Y	Y
State-specific time trend	Y	Y	Y	Y

Notes: The results presented here list the Difference-in-Difference estimates of the effects of CA-PFL on the rate of low birth weight, premature birth rate, and two measures of inadequate prenatal care. The DD regressions compare the outcomes in California and the Non-TDI States, three rolling calendar years before and after the treatment (July 2004). Mean is California's pre-treatment sample mean of the outcome variable. Individual characteristics include mother's age, education, race, ethnicity, marital status at the time of childbirth; and child sex, birth order. State characteristics include state-year level family income, state-month-level employment rate and labor force participant rate; state fixed effects, year fixed effects, and month fixed effects. State-specific time trend is included in all specifications. Robust standard errors in parentheses are clustered by state. Significance levels: *p < 0.10, **p < 0.05, ***p < 0.01. Data source: National Vital Statistics System from July 2001 to June 2008.

I then use the Non-TDI states as control states to conduct another robustness check and present the results in Table 9. The DD estimates results are consistent with the results using TDI states as the control group. Specifically, there is also no significant effect of CA-PFL on the rate of low birth weight, and again, there are significant effects of CA-PFL on premature birth rate and inadequacy of prenatal care. For example, the policy reduces the premature birth rate by 0.20 percentage points when both individual characteristics and state characteristics are controlled in the regression, or a 1.9 percent decline from the sample mean. This is similar to our results in Table 4, which is a 0.29 percentage points reduction or a 2.8 percent decline. The consistent results indicate that the CA-PFL still has some effects on birth outcomes not only compared with TDI states but also compared with all other states.

10. Conclusions and Discussion

Paid family leave policies aim to help working mothers to balance their career and family. This has been shown to increase maternal labor force participation rates as well as maternal health and well-being. There is less conclusive evidence on the effects of CA-PFL on child outcomes, especially on birth outcomes. This paper is the first study is to estimate the impact of CA-PFL on birth outcomes. The evidence from SIPP suggests that mothers in California take 3.7% more paid prenatal leave before childbirth due to the availability of CA-PFL. The main results suggest that CA-PFL reduces the share of premature births by 0.29 percentage points or about 2.8 percent. These estimates are intention-to-treat effects. The treatment-on-the-treated effects should be even larger. One possible mechanism for these effects is that mothers who take more prenatal leave are more likely to begin prenatal care earlier, increase their doctor visits, and hence reduce potential risks that adversely affect birth outcomes. Heterogeneous analysis indicates that the effects are particularly large on children of African American mothers and on mothers without a high school degree, who are more likely cannot afford to the unpaid prenatal leave and substitute their postnatal paid leave for prenatal leave.

Premature births cost society too much. In 2007, the Institute of Medicine reported that the cost associated with premature births in the United States was $26.2 billion per year[13]. Furthermore, premature babies are more likely to have learning and behavior problems throughout childhood, and some adults who were born prematurely may have long-term health conditions that prevent or limit them from working. If the federal government were to implement a PFL policy similar to the CA-PFL, the cost associated with premature birth could be reduced by up to $76 million per year. This is especially urgent since the rate of premature birth is continuing to rise in recent years.

[13] https://www.marchofdimes.org/mission/the-economic-and-societal-costs.aspx

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