THE EFFECT OF PAID FAMILY LEAVE POLICY IN CALIFORNIA ON LOW BIRTH WEIGHT OUTCOMES

By

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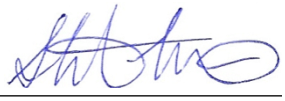

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Abstract

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Objective This study examined the relationship between Paid Family Leave (PFL) Policy in California and low birth weight outcomes. PFL is considered as an extension of the existing Temporary Disability Insurance (TDI) Policy in California which provides an additional 6 weeks of paid leave to new mothers. *Methods* I used birth data recorded on the National Vital Statistics System from 2001 to 2007 and collapsed it to obtain low birth weight birth percentage in each state by a specific month-year. I employed Difference-in-Difference framework with state and time fixed effects to estimate the treatment effect of the policy in California. *Result* Compared to California contiguous states, low birth weight birth instances in California decreased by more than 2.39% after the implementation of PFL. A similar result was found when states without a TDI policy were used as the control group. However, for states with a TDI policy in place, the effect of PFL was smaller. In all three models, the coefficients were statistically insignificant. *Conclusion* There was no evidence that PFL had a significant impact on low birth weight. Future research on this subject should consider incorporating mother's income and neighboring characteristics in the model.

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I. OVERVIEW

The United States is one of only few countries in the world where paid maternity leave is not mandated nationwide. Despite the fact that many companies in the private sector offer short term disability insurance with a paid maternity leave provision, private plans are often limited to "salaried employees" or "hourly employees who work more than 20 hours per week", depending on the policy purchased. According to the Bureau of Labor Statistics, only 42 percent of workers in private industry had access to short-term disability insurance plans in 2018.

As of 2019, California, Hawaii, New Jersey, New York and Rhode Island are the five states in the United States that require companies to provide employees with a temporary disability insurance plan (TDI). In addition to that, excluding Hawaii, four states have implemented Paid Family Leave (PFL) program, which provides wage replacement for family members who take time off to take care of qualified family members who are seriously ill, or to bond with a new child. In California, TDI offers new mothers up to 4 weeks of paid antenatal leave, and up to 6 weeks of benefits after the birth of a child through normal delivery and up to 8 weeks of benefits if a cesarean section was performed. California was the first state to carry out the PFL policy in July 2004, which provides an additional 6 weeks of benefits within a 12-month period for new parents to care for or bond with the new child. PFL is considered as a policy extension to TDI. New mothers may apply for PFL benefits after the TDI benefits are exhausted, for a total of up to 12 weeks after delivery through normal delivery and up to 14 weeks for cesarean section. However, PFL is different from TDI in which new fathers are also eligible for paid leave benefits. Effective July 2020, California is going to increase their PFL benefits from a maximum of 6 weeks to 8 weeks of partially paid leave. Washington, Massachusetts, Connecticut, Oregon and District of Columbia are set to enact mandatory Paid Family Leave

policy in early 2020s. These plans are either funded by employers, or by employees through payroll deductions depending on the state.

The purpose of this paper is to examine the effect of the PFL policy in California on the share of low birth weight births. A methodology similar to that in Stearns (2015) is adopted. Stearns (2015) examined the effect of statewide TDI programs on infant health outcomes using birth data 1972 to 1985 from the National Vital Statistic System. Using a difference-in-difference (DD) model, she estimated the policy effect on the share of low birth weight prior to and after the implementation of the Pregnancy Discrimination Act in 1978. Stearns argued that paid maternity leave could impact birth outcomes by reducing physical and mental stress from working and eliminating the income effect (both indirectly though maternal stress and directly though the choices made regarding prenatal care, postnatal care and frequency of doctor visits). Each of the 5 states with TDI were matched with a synthetic control group based on the same statistical information including percentage of low birth weight births, percentage of women in each race group, etc.; and one optimal control group was selected for the combined TDI states. Overall, the result indicated a 3.2% decrease in the share of low birth weight births in states with paid maternity leave, with statistically significant DD estimate reported in all states but Rhode Island. Similar results were found when using contiguous states as control groups and including state-year trends to avoid biased selection of specified characteristics when selecting synthetic control groups.

Low birth weight has been found to be correlated with adverse health outcomes both earlier and later in life. In the medical literature, low birth weight may be categorized as extremely low birth weight (less than 1000g), very low birth weight (1000g to 1499g), and moderately low birth weight (1500g to 2499g). Moderately low birth weight children have

significantly higher risks of requiring special care needs and suffering from learning disability or attention-deficit disorder compared to normal birth weight children (Stein et al.,2006). A study of 9 to 11 year old children of Danish speaking mothers, born between January 1990 and June 1992, showed that children who weighted below 2500g at birth had twice the risk of reading and spelling difficulties, and greater than 4 times of arithmetic difficulties compared to children whose birth weight ranged from 3500g to 4000g (Kirkegaard et al., 2006). When maternal and environmental factors were taken into account using twin birth data at 9 months old and 2 years old, low birth weight was found to have small impact on mental and motor development, but had significant impact on children early physical development (Datar et al., 2009). A longitudinal research on extremely low birth weight young adults in Canada at the mean age of 23 years old indicated a higher reported prevalence of chronic health problems and functional limitations (seeing, hearing, dexterity, clumsiness and learning difficulties) (Saigal et al.,2007). Women born under 6lbs (2721.55g) had higher risk of physical disability later in life compared to women born within the normal birth weight range, measured by physical functioning score (Spracklen et al., 2017).

II. LITERATURE REVIEW

Paid maternity leave has been found to significantly improve maternal and children health in the United States. Utilization of paid maternity leave, whether partially or fully paid leave, decreases the probability of re-hospitalization of both mothers and infants compared to women without any paid leave (Jou et al., 2017). It increases the chances of doing exercise and managing stress "very well" or "extremely well" after birth when compared to women taking unpaid leave only (Jou et al., 2017). Women who received some amount of paid leave have improved mental conditions after returning to work, and a longer leave is associated with healthier mental outcomes (Mandal, 2018). Accessibility to paid maternity leave through state regulated TDI, with a limitation to working mothers, lowers share of underweight births by 3.2 percent and probability of preterm birth by 6.6 percent (Stearns, 2015).

California was the first state to mandate PFL in 2004, and this implementation has been associated with an increase in overall health of infants in the state compared to other states (Bullinger, 2019). Huang and Yang's research in 2014 indicated a rise in exclusive breastfeeding rate by 3 to 5 percentage points in the first three to six months in California relative to other states after the PFL implementation. They also found that PFL increased breastfeeding through the first three, six and nine months by 10 to 20 percentage point. Exclusive breastfeeding for the first 6 months is recommended by The American Academy of Pediatrics, as breastfed infants are shown to have lower risks of acute otitis media, asthma, diabetes (type 2) and many other diseases, while mothers who breastfeed their children also have reduced risk of breast and ovarian cancer, diabetes (type 2) and hypertension (Centers for Disease Control and Prevention). PFL was associated with improved parental reported health outcomes for children in

kindergarten/early elementary school, especially for children from disadvantaged backgrounds (Lichtman-Sadot et al., 2017).. There was evidence that PFL lowered the chances of overweight, attention-deficit/hyperactivity disorder and hearing problems (Lichtman-Sadot et al., 2017).

Infant mortality rate is negatively correlated with paid leave, with a 2.5% to 3.4% decrease in mortality rate for a 10-week increase in paid leave in data from 16 European countries from 1969 to 1994 (Ruhm, 2000). A quasi-experimental study of 20 low and middle-income countries from 2000 to 2008 shows a reduction of 7.9 infant deaths per 1,000 live births given that paid maternity is extended for an additional month (Nandi et al., 2016). Using the same data set from 2001 to 2008, Hajizadeh et al. (2015) found that every extra full-time-equivalent week of maternity leave benefit corresponds to an increase in the uptake of diphtheria, tetanus, and pertussis (DTP, 3 doses) vaccines by 1.38, 1.62 and 2.17 percentage points, respectively.

PFL is expected to lower low birth weight share in California by reducing maternal distress of having a baby. The pressure of having a baby, especially the first child, can be overwhelming, both emotionally and financially. The knowledge that new mothers may take an additional 6 weeks of paid leave during the first year to take care of their newborns could mitigate the stress (Stearns, 2015). Prenatal stress from life events significantly affect birth weight, with a 1.32 increase in odds ratio of having a low birth weight infants for one unit increase in stress score measured during the third trimester (Wadhwa et al., 1993). A study of 856 pregnant women, mainly low-income, in Brazil showed a positive correlation between maternal psychological distress during the 20th to 26th week of pregnancy and the likelihood of low birth weight (Rondó et al., 2003). A similar result was found on a study of low-income

women in Illinois, when women receiving welfare in 1998 were randomly selected for participation in the Illinois Family Study, which aimed at analyzing the effects of welfare reform on families in Illinois (Borders et al., 2007). High stress was the only psychological characteristic among trait anxiety, self-esteem, mastery and depression to have significant impact on low birthweight births with an odd ratio of 1.08 ($p=0.02$) for each point increase on the stress level (Copper et al., 1996). The percentage of women who responded that they "almost always" felt stress during their pregnancy is highest in the very low birth weight category, with 25%, 21% and 16% among very low, moderately low and normal birth weight groups respectively (Sable and Wilkinson, 2000). Even if stress did not have a direct impact on birth weight, economic stressors: public assistance, employment and number of dependents were found to have an indirect impact on birth weight through its correlation with no social support and family stress. Economic stress, no social support, and family stress constituted about 30% of variation in addictive behaviors such as drinking and smoking, which significantly increased the risk of having low birth weight infants (Sheehan, 1998).

III. SUMMARY STATISTICS

Birth data were obtained from the National Vital Statistics System from the National Center for Health and Statistics (NCHS). I used data from 2001 to 2007 to estimate the effect of the 2004 Paid Family Leave policy in California on low birth weight outcomes. The revision of the U.S certificate of Live Birth in 2003 made substantial adjustments to the birth certificates and how data were collected. Modifications of existing questions were made on mother's race, levels of smoking, history of prenatal care, etc. Some news items were also added to the 2003 birth certificate including receipt of WIC Food, receipt of fertility therapy, maternal morbidity, etc. Washington and Pennsylvania were the first two states to implement the new revision in 2003, and a full nationwide implementation was carried out over several years. If data were not comparable after the 2003 revision, unrevised data were also provided based on the last revision in 1989. I used data based on the 1989 revision of birth certificate for consistency across the years.

Plural births were excluded from the data set. Mothers from 10 to 15 years old were excluded from the data because of a higher risk associated with having a low birth weight infant. Mother who were 50 to 54 years old at the time of giving birth were recorded as 50 years old. Data on tobacco and alcohol were not available in California for all the years, and in Washington State and Pennsylvania since 2003. Therefore, they were omitted from the analysis. Independent variables in the model include mother's age, mother's education, marital status, mother's race, order of birth and gestational age. Finally, a composition variable called 'medical risk factors in the pregnancy' is included which has three categories based on whether mother suffered from

Table 1. Descriptive Statistics.

	Mean (SD) and Percentage			
Variables	Total (N = 27,896,121)	California (N = 3,693,981)	Non - TDI States (N = 21,544,199)	Other TDI States (N = 2,657,941)
Percent of low birth weight births	6.28%	5.14%	6.49%	6.16%
Detailed birth weight (gram)	3317.04	3354.67	3309.91	3322.49
	(568.53)	(549.73)	(571.51)	(567.88)
Mother's age	27.38	27.98	27.09	28.87
	(6.09)	(6.25)	(6.02)	(6.16)
Father's age	30.47	30.87	30.20	32.04
	(6.87)	(7.15)	(6.78)	(6.94)
Mother's education (years)	12.93	12.35	12.98	13.27
	(2.86)	(3.35)	(2.76)	(2.87)
Married	63.87%	64.88%	63.67%	64.01%
Mother's race:				
White, non-Hispanic	55.96%	29.76%	61.17%	49.92%
Black, non-Hispanic	14.26%	5.73%	15.51%	15.89%
Others, non-Hispanic	6.31%	12.71%	4.60%	11.32%
Hispanic	23.47%	51.80%	18.72%	22.87%
Order of birth	2.43	2.34	2.43	2.58
	(1.58)	(1.48)	(1.58)	(1.74)
Gestational age (weeks)	38.73	38.90	38.69	38.86
	(2.44)	(2.28)	(2.46)	(2.45)
Medical risk factors in the pregnancy				
0 risk factors	92.08%	95.17%	91.63%	91.43%
1 risk factor	7.36%	4.56%	7.76%	7.99%
2 or more risk factors	0.56%	0.27%	0.61%	0.58%

Other TDI States are Hawaii, New Jersey, New York and Rhode Island.

none, one or two or more of the four gestational risks of diabetes, chronic hypertension, pregnancy associated hypertension, and eclampsia.

The percentage of low birth weight outcomes was 1.35 percentage-point higher in non-TDI states compared to California. While less prevalent than non-TDI states, rate of low birth weight outcomes was higher in other TDI states, by 1.02 percentage-point, than in California. Prevalence of medical risk factors during pregnancy was lower in California compared to other TDI and non TDI-states. Parents' education, mother's age, marital status, order of birth and gestational age were similar across the three groups. Overall, the percentage of Hispanic mothers in California was higher compared to other states, while percentage of white non-Hispanic population was higher in non-TDI states.

IV. EMPIRICAL STRATEGY

I examined the impact of PFL in California on low birthweight birth percentage using the difference-in-difference estimator with state and time fixed effects. The treatment group was California, and California's contiguous states were the control group: Arizona, Nevada and Oregon because of the assumption that bordering states could share similarity in geographical factors. The estimating regression equation is:

$$Y_{imy} = \beta_0 + \beta_1 CA * Post_{my} + \beta_2 X_{imy} + \delta_i + \gamma_{my} + \varepsilon_{imy}$$

where, Y_{imy} is the percentage of low birthweight births in state *i* in month *m* and year *y*. X_{imy} are the independent variables that could affect birthweight including mother's age, education, marital status, race, order of birth, gestational age, and medical risks associated with pregnancy. δ_i and γ_{my} indicated the state and month-year fixed effects to control for unobserved attributes within states and over time. The impact of PFL policy is measured by the coefficient β_1 of the interaction term $CA * Post_{my}$, where CA is a dummy variable equal to 1 for California, and 0 otherwise; and $Post_{my}$ indicates the policy effect, which is equal to 1 if since July 2004, and 0 otherwise. CA and $Post_{my}$ dummy variables are not shown in the equation because they were incorporated in the state and month-year fix effects.

I collapsed the data by state, month, and year of birth to obtain the percentage of low birthweight births in each state in a specific month-year. This resulted in a total of 336 observations for the four states from 2001 to 2007. Similarly, the independent variables are aggregated at the state and month-year level. Mother's age was missing for California, Arizona and Oregon in 2003, and mother's education was missing for California in 2006 for all 12 months. I imputed mother's age for each state-month in 2003 using corresponding data from the

state-month values in 2002, and mother's education for each month in California in 2006 using data from 2005.

Asides from the comparison between CA and its contiguous states, I performed two additional tests using the same DD approach: (1) CA compared to all other non-TDI states, and (2) CA compared to other TDI states. I expect the second test to reveal any incremental impact of the PFL policy where a TDI policy already exists.

V. RESULTS

Table 2 presents the results from the three DD regression models. The first regression using CA contiguous states shows a decrease in the percentage of low birthweight births by 0.123 percentage point, which is equivalent to a treatment effect of 2.39% decrease in low birth weight birth percentage in California after the policy was enacted. The treatment effect is similar when CA is compared to all others non-TDI states, with a decrease of 0.121 percentage point (2.35%) in low birth weight birth percentage. However, the effects are statistically insignificant in both groups ($p = 0.154$ and $p = 0.236$ for CA contiguous states and Non-TDI states, respectively). As expected, the impact of PFL was much smaller when using TDI-states as the control group. Low birth weight birth in California decreased by only 0.039 percentage point (0.76%) after the policy was enacted, and the coefficient was not significant ($p = 0.755$). In all three models, gestational age consistently showed a large impact on low birth weight, with 64.05%, 60.62% and 60.25% decrease in low birth weight birth percentage for each additional week of pregnancy for CA contiguous states, Non-TDI states and other TDI states model respectively. The results were statistically significant at 99% confidence interval.

Table 2. Result of the difference-in-difference regression with two-way fixed effect.

Independent Variables	CA Contiguous States (N = 336)	Non - TDI States (N = 3948)	Other TDI States (N = 420)
Treatment Effect	-0.123	-0.121	-0.039
	(0.086)	(0.102)	(0.126)
Mother's age	0.196	-0.059	-0.208
	(0.225)	(0.059)	(0.240)
Mother's education (years)	0.392	-0.044	-0.451
	(0.447)	(0.1)	(0.391)
Married	-0.136	-1.268*	-0.388
	(2.680)	(0.664)	(2.764)
White, non-Hispanic	0.684	-0.413	-1.069
	(2.658)	(0.841)	(2.929)
Black, non-Hispanic	0.284	1.894*	1.111
	(5.605)	(1.07)	(4.756)
Others, non-Hispanic	-2.320	-0.686	-3.303
	(5.076)	(1.338)	(3.321)
Order of birth	-2.286***	-0.183	0.085
	(0.622)	(0.124)	(0.226)
Gestational age (weeks)	-3.292***	-3.116***	-3.097***
	(0.442)	(0.117)	(0.413)
Medical risk factors in the pregnancy	2.799	1.538**	3.863
	(3.817)	(0.723)	(3.740)

Other TDI States are Hawaii, New Jersey, New York and Rhode Island.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

VI. DISSCUSION

The findings above indicated that, while PFL in California lowered the percentage of low birth weight birth, the impact was statistically insignificant. The effect of PFL on low birth weight was smaller when TDI states were used as the control group, compared to when non-TDI states were used as the control group.

The statistically insignificant impact of PFL on low birth weight could be explained though several channels. First of all, since PFL acted as an extension of the existing TDI, it was more likely that the impact was larger for postnatal period by allowing new mothers and fathers to spend more time with the child. On average, mothers in California took an additional 3.1 to 3.3 weeks of leave after PFL became effective, with relatively less advantaged mothers who took less time off than the more advantaged groups prior to PFL experiencing a larger increase (Rossin-Slater et al., 2013). Baum (2016) found that mothers utilized an average of almost five weeks of additional leave, with approximately one week of antenatal leave, as the result of PFL implementation. He also showed that PFL increased leave taken by fathers by 2 to 3 days, with a majority of leave taken during the first three weeks after birth. Days of leave offered by employers were significantly associated with the actual duration of leave. Women who were offered less than 6 weeks of leave and 6 to 12 weeks of leave had 5.63 and 5.07, respectively, higher odds of returning to work within 12 weeks compared to women who were offered more than 12 weeks of leave, regardless of the payment status (Guendelman et al., 2014).

Second, while expectation of future compensation mitigated stress during pregnancy, it is possible that the reduction in stress was insufficient to influence low birth weight. In addition to that, many of the studies that showed a negative correlation between maternal stress and birth weight outcomes came from low-income and less advantaged sample groups. 79% of Brazilian

women in Rondó et al., study had monthly per capita income less than $73 between September 1997 and August 2020. Borders et al., (2007) used data from a longitudinal study between 1999 and 2004 of families who received Temporary Assistance for Needy Family in Illinois in 1998. Neighborhood factors could play a significant role in modifying the relationship between maternal stress and low birth weight. The likelihood of having a low birth weight child is higher among mothers from disadvantaged neighborhoods, classified as having a high poverty rate, low education, many crowded households, and a large percent of African American households (Nkansah-Amankra et al., 2009). Unfortunately, I was unable to identify low-income and less advantaged mothers from the total population.

Finally, public awareness of PFL could be low, especially among low income families and employees without paid leave programs, who were more likely to benefit from the program. A screening survey of people with PFL experience between 2009 and 2010 showed that 54.3% of employees who had paid sick days/vacation provided at their job knew about the existence of PFL, compared to only 35.5% of employees whose jobs did not provide paid sick days/vacation (Appelbaum et al., 2011). Employees from households with annual income over $80,000 were almost twice as likely than households with annual income less than $30,000 to be aware of PFL (Appelbaum et al., 2011). Participation rate in PFL policy was particularly low for mothers who made less than $24,000 a year compared to other groups, even though 47% of bonding claims in 2014 were from mother whose wages were under $36,000 a year (California Employment Development Department, 2015). New parents can file for PFL bonding claims when they take time off to bond with the new child, whether from birth, adoption or foster care.

To the best of my knowledge, no other study has examined the relationship between PFL in California and low birth weight. I found one paper from Louisiana State University

Department of Economics Working Paper Series that is closely related to my research subject. Oloomi (2016) used birth data from the National Vital Statistics system between 2000 and 2010 to study the effect of PFL on delayed childbearing and infant health outcomes, but she restricted her sample to first childbirths only. She found that PFL constituted to a 1% decrease in low birth weight occurrences for mothers of 35 years and older by encouraging earlier childbearing by 2 years. However, there was no significant impact of PFL on low birth weight for mothers of normal childbearing age under 35 years old. The finding is consistent with my finding that PFL has minimal impact on reducing low birth weight births overall. Future research on this topic should consider looking at a broader time frame after the implementation of PFL and incorporating mothers' income and neighboring factors into the model.

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