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## Article

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IZA Journal of Labor Policy

## Provided in Cooperation with:

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*Suggested Citation:* Bass, Brittany (2020) : Does an introduction of a paid parental leave policy affect maternal labor market outcomes in the short run? Evidence from Australia's paid parental leave scheme, IZA Journal of Labor Policy, ISSN 2193-9004, Sciendo, Warsaw, Vol. 10, Iss. 1, pp. 1-21, <https://doi.org/10.2478/izajolp-2020-0004>

This Version is available at:

<https://hdl.handle.net/10419/298747>

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Brittany Bass\*

# Does an Introduction of a Paid Parental Leave Policy Affect Maternal Labor Market Outcomes in the Short Run? Evidence from Australia's Paid Parental Leave Scheme

## Abstract

This paper studies how an introduction of paid parental leave (PPL) affects maternal labor market outcomes in the short run. Using a reform in Australia, the PPL scheme, that gave the primary caregiver of a child born or adopted on or after January 1 2011, \$672.70 a week for a maximum of 18 weeks, this paper develops theoretical predictions of the effect of PPL on maternal labor market outcomes, and tests these predictions using confidential data from the Australian Pregnancy and Employment Transitions Survey. The theoretical results imply that after the introduction of PPL, hours of work in the pre-birth period should decrease for mothers who will qualify for PPL, and increase for mothers who are attempting to qualify for PPL. Post birth, the theoretical results imply that more mothers are out of work and on leave than would have been in the absence of PPL. The empirical results suggest that the PPL scheme had no significant effect on labor market outcomes pre birth or post birth.

**Current version:** October 01, 2019

**Keywords:** paid parental leave; maternity leave; maternal employment

**JEL codes:** J13, J16, J20


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 Cite as: Brittany Bass. *IZA Journal of Labor Policy* (2020) 10:4.

<https://doi.org/10.2478/izajolp-2020-0004>

# 1 Introduction

As of 2010, the United States and Australia were the only two Organization for Economic Cooperation and Development (OECD) countries that did not have a comprehensive paid family leave program (International Labour Organization 2014). Family leave programs are typically designed to provide new mothers time off of work to prepare for, or recover from, childbirth, and provide parents with time to care for their newborn or newly adopted children (Rossin-Slater 2017). These policies aim to increase maternal employment, promote child health and development, and improve the work–family balance (Kunze 2016). Family leave policies differ substantially across the globe, with some countries providing short, unpaid leave as in the United States, or more generous, paid family leave as in most European countries and Canada. Paid family leave is an important policy tool that can have considerable impacts on child outcomes, and maternal labor market outcomes.

Prior literature studying the effects of family leave on child outcomes and mothers' labor market outcomes is mixed, possibly due to the substantial heterogeneity in parental leave policies across the globe. Previous studies analyzing the effect of an introduction of paid family leave find positive labor market effects for the children affected by such a policy, and generally positive effects on maternal labor market outcomes. Carneiro et al. (2015) study the implementation of a 4-month paid maternity leave policy in Norway in 1977, where the previous policy only granted 3 months of unpaid leave. The authors find that the introduction of the policy led to a 2% point decline in high school dropout rates and a 5% increase in earnings at age 30 for the children affected by the policy. The authors also attempt to disentangle the potential mechanisms leading to these results by examining the effect of the reform on maternal labor market outcomes, and they find no long-term effects of the reform on mothers' employment 2 and 5 years after implementation or on their earnings 5 years after (Carneiro et al. 2015). Additionally, Rossin-Slater et al. (2013) examine the effect of the introduction of California's paid family leave program on leave-taking by mothers after childbirth and subsequent labor market outcomes using a difference-in-difference approach. The authors find that the overall use of maternity leave increased, and the paid family leave increased the number of usual weekly work hours. On the other hand, previous studies examining the extension of a previous family leave policy tend to find more mixed evidence on maternal labor market outcomes and child outcomes (Baker and Milligan 2008, Kluve and Tamm 2013, Schönberg and Ludsteck 2014, Liu et al. 2009, Rasmussen 2010). See Rossin-Slater (2017) for a review on recent empirical research related to introductions and expansions of global family leave policies.

Given the substantial positive impacts paid family leave may have on child and maternal outcomes, more research on the causal effect of paid family leave on these outcomes is needed. This paper aims to shed additional light on the impact of introducing a paid family leave policy on maternal labor market outcomes by analyzing the effect of an introduction of a paid parental leave (PPL) scheme in Australia.

In early 2010, the Australian Government began ironing out the details for their forthcoming paid parental leave (PPL) scheme for new parents who are the primary caregivers of a child born or adopted on or after January 1 2011. An eligible primary caregiver would receive taxable PPL payments of the national minimum wage each week (currently \$719.20), for a maximum of 18 weeks. This policy change creates variation in the receipt of paid family leave that

allows me to assess how introducing a parental leave payment scheme after a child is born affects the mother's labor supply decisions. The PPL scheme is work contingent, and requires women to be in paid work and have worked continuously prior to the birth or adoption of a new child. The scheme aims to increase the average length of leave taken by employed women after childbirth by around 10 weeks and encourage increased workforce participation for women prior to having children and between pregnancies (Australian Government 2009).

The introduction of Australia's PPL scheme is similar to the Norwegian policy, but differs in the time of implementation, financing, length of leave, and benefit payments. This paper differs from the Carneiro et al.'s (2015) analysis and contributes to the existing paid family leave literature in several important ways. First, I develop theoretical predictions of the effect of an introduction of a paid leave scheme on mothers' labor supply decisions pre and post birth. I then estimate the effect of the mother's pre- and post-birth labor market outcomes using a regression discontinuity design (RDD), since PPL eligibility was based on the child's date of birth. Importantly, I test the hypothesis that the introduction of PPL impacts the labor supply decisions of mothers pre birth – an effect that has not yet been estimated in the family leave literature. Next, I estimate the effect of the mother's post-birth labor market outcomes in the short run, roughly 11 months after the policy passed. Finally, I am able to shed more light on the potential mechanisms leading to the significant effects on child outcomes (Carneiro et al. 2015) found by estimating the effect of PPL not only on employment status but also on hours worked, and the length of leave taken for the birth of the child.

The theoretical results imply that after the introduction of PPL, hours of work in the pre-birth period should decrease for mothers who will qualify for PPL, and increase for mothers who are attempting to qualify for PPL. Post birth, the theoretical results imply that more mothers are out of work and on leave than would have been in the absence of PPL. The empirical results suggest that the PPL had no significant effect on the average number of hours or weeks worked pre birth, the average age of the child when the mother returned to work, or the average number of hours worked post birth. The empirical results appear at odds with the theoretical results, and this conflict could be due to three reasons.

First, the data used in this paper to estimate the impact of the PPL on maternal labor market outcomes are group-level data, provided as cell means for the respective variable (e.g., hours worked), instead of individual counts. Differential effects of the PPL scheme across subgroups of mothers, such as the age of the mother, race, etc., may be masked in the aggregate data. Second, using a RDD to estimate the effect of PPL on pre birth outcomes may not necessarily be the ideal empirical strategy. That is, mothers who are not certain if they will give birth before or after the January 1 2011, cut point may not alter their behavior. A difference-in-difference design would likely yield more credible estimates, but pretreatment data on the pre-birth outcomes under study is not available. Third, regarding the lack of an effect on leave taking post birth, mothers could be deciding pre birth how much leave they will take, regardless of the leave being financed through the previous family assistance scheme or PPL scheme, and they will take as much leave as they would have in the absence of PPL.

The remainder of this paper is organized as follows. In Section 2, I provide background information on Australia's family assistance policy prior to the introduction of PPL, and more detail on the current PPL policy. In Section 3, I discuss the theoretical framework. In Section 4, I describe the empirical strategy and data used in the analysis. In Section 5, I present the

empirical results. Finally, in Section 6, I present a discussion of the main findings and my conclusions.

## 2 Institutional setting

### 2.1 Prior to PPL introduction

Prior to the paid PPL implemented on January 1 2011, employed women in Australia were entitled to 12 months of unpaid, job-protected maternity leave. All employees in Australia were eligible for the unpaid parental leave if they had completed at least 12 months of continuous service with their employer up until the time of birth. Some employers may have granted additional paid/unpaid maternity leave to their employees. Additionally, women who gave birth to a child from July 1, 2004 until December 31, 2013 and had a family adjusted taxable income of \$75,000 or less in the 6 months after childbirth automatically received a non-taxable cash payment ranging between \$3,000 and \$5,000 (i.e., the Baby Bonus). When the Baby Bonus was introduced in 2004, it was worth \$3,000. The Baby Bonus increased to \$5,000 in July 2008.

Furthermore, families may have also been eligible to receive the family tax benefit (FTB). FTB Part A is a per child payment dependent upon the family's circumstances. Eligible families included those who cared for a dependent child age 0–19 years old, and who met income and residence requirements, and cared for the dependent child at least 35% of the time. The maximum rate per fortnight of the FTB Part A for each child aged 0–12 years of age was \$182.84. For each child aged 13–19 years in full-time secondary study, the FTB Part A fortnight maximum was \$237.86, and for children aged 0–19 years in an approved care organization was \$58.66. Single parents and families with one main income were also eligible for FTB Part B as a supplement to FTB Part A. FTB Part B is an income tested fortnightly payment that depends on the age of the youngest child. The maximum rate per fortnight for a child aged 0–5 years was \$155.54, and \$108.64 for children aged 5–18 years.

### 2.2 Introduction of PPL

To be eligible for PPL, and receive taxable PPL payments of \$672.70 a week (the Federal minimum wage level in Australia), for a maximum of 18 weeks, an individual must meet a number of requirements: they must be the primary caregiver of a child born or adopted on or after January 1 2011, be in paid work and have been engaged in work continuously for at least 10 out of the last 13 months prior to the birth or adoption of the child, worked at least 330 hours in the 10-month period, not have worked between the date of birth or adoption of the child and their requested start date for PPL, and have an adjusted taxable income of \$150,000 or less in the financial year prior to the date of birth or adoption of the child or the date of their claim, whichever is earlier.

PPL must be taken after the birth of the child and within 12 months of the birth or adoption of the child. Parents who meet the eligibility requirements for PPL can choose to receive the Baby Bonus and other family assistance under the usual criteria instead of receiving PPL. In the case of multiple births (twins, triplets, etc.), the parent can claim PPL for one child and the Baby Bonus for the other child/children. Parents are not eligible to change their claim to

the Baby Bonus after PPL payments have begun. If eligible, families can still receive FTB Part A during receipt of PPL, but not FTB Part B. If the primary caregiver's employer provides employer-funded parental leave through an industrial agreement, they cannot withdraw the entitlement for the life of the agreement. Thus, the primary caregiver can receive PPL before, during, or after the employer-provided paid leave.

The Australian Government estimated that more than 85% of families will be better off receiving PPL, and, on average, will receive roughly \$2,000 more than if they chose the benefits under the previous scheme. Acknowledging that family circumstances tend to differ, the Government provides an online estimator simulating benefit amounts under the Baby Bonus, and under PPL to help families make the best family assistance decision (Australian Government 2009).

To provide an example of how entitlements changed after the introduction of PPL, Figure 1 calculates benefits provided to a working couple under the previous benefit system, and under the new system with PPL. This example is drawn from the Australian Government's "Paid Parental Leave – Information for Parents" booklet, and uses 2008–2009 rates. Let us assume a working couple, Jane and John, will birth their first child on August 5, 2011. Prior to the birth of their child, Jane and John each earned \$52,000 a year. Jane is not eligible for paid maternity leave from her employer, but is entitled to 12 months of unpaid, job-protected leave. She is also eligible for PPL, and will receive taxable payments of \$543.78 per week (the 2008–2009 minimum wage) for a maximum of 18 weeks, or a total of \$9,788. Jane will care full-time for her child, and not return to work until July 1, 2012. In the financial year of their child's birth, Jane and John will receive \$2,335 more in net family assistance and PPL than they would have without PPL. Figure 1 provides these calculations. Under the previous system without PPL, Jane

**Figure 1** Family assistance example.

<b>Family Income Information</b>		
	Usual annual Salary	Annual salary in the financial year of the birth
Jane	\$52,000	\$4,986
John	\$52,000	\$52,000
<b>Total Family Income</b>	<b>\$104,000</b>	<b>\$56,986</b>

<b>Family Assistance Calculations</b>		
Type of Assistance	Previous System without PPL	New System with PPL
Paid Parental Leave (taxable)*	\$0	\$9,788
Baby Bonus (non taxable)	\$5,000**	\$0
Family Tax Benefit A	\$1,759	\$1,759
Family Tax Benefit B***	\$3,256	\$919
<i>Total Assistance before tax</i>	<i>\$10,015</i>	<i>\$12,466</i>
Net tax paid on PPL	na	\$116
<b>Total assistance (net of tax)</b>	<b>\$10,015</b>	<b>\$12,350</b>

Notes: \*PPL counts as income for determining eligibility for Family Tax Benefit; \*\*When the Baby Bonus was introduced in 2004, it was worth \$3,000. The Baby Bonus increased to \$5,000 in July 2008. \*\*\*Families are precluded from receiving FTB-B during the 18 week period of PPL. Source: Australian Government "Paid Parental Leave Scheme - Information for Parents" 2010.

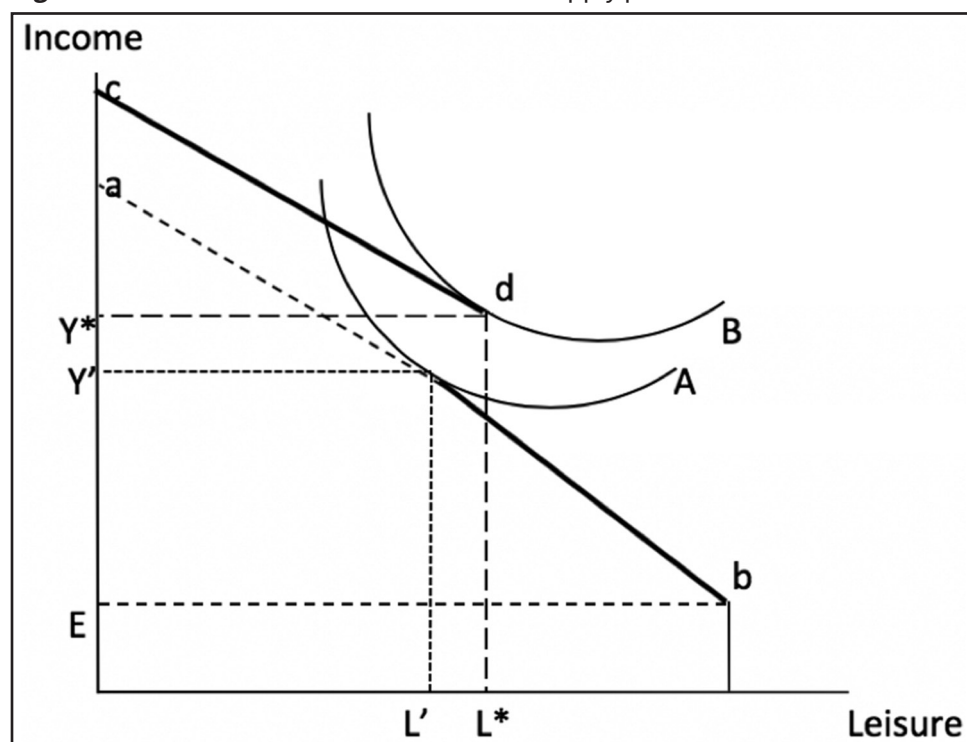


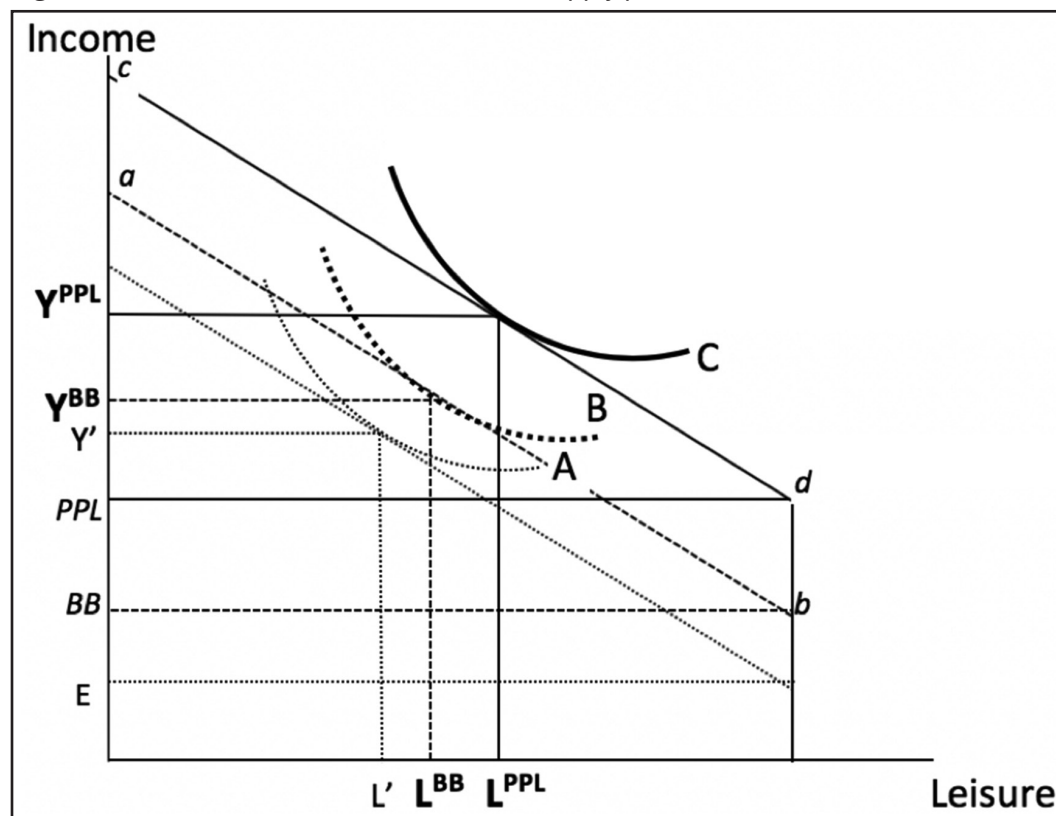
and John will receive the Baby Bonus, FTB Part A, and FTB Part B, totaling \$10,015. Under the new system with PPL, Jane and John will receive PPL, FTB Part A, and partial FTB Part B (which will resume after 18 weeks of PPL have been exhausted), totaling \$12,350.

### 3 Theoretical framework

Once the PPL scheme was introduced, eligible mothers could receive 18 weeks of paid leave at the Australian minimum wage in addition to the 12 months of unpaid, job-protected leave. The introduction of PPL could impact the labor market decisions of mothers who are eligible and choose to take the PPL at two different stages: pre-birth and post-birth. Figures 2 and 3 summarize the predicted effects of the PPL scheme on labor market decisions pre and post birth. To begin, Figure 2 shows the labor supply figure in income-leisure space (where hours of work are decreasing on the horizontal axis) for employed mothers' labor supply decision pre birth, where  $E$  is the initial endowment (e.g., husband's income),  $L$  is the hours of leisure, where leisure can be interpreted as time spent with the new child, and  $Y$  is the consumption. As in the standard static labor supply model, the mother's budget constraint can be written as follows:  $Y = w(T - L) + E$ . This specification of the budget constraint assumes that the mother does not save, and the mother spends all of her income in the period under analysis. Also note that the FTB Part A is available to eligible families regardless of Baby Bonus or PPL receipt, and this increase in non-labor income is omitted from the figures since it is available under both regimes. In Figure 2, the basic static labor supply graph is illustrated by line segment "ab" and indifference curve A. Under both family assistance regimes (i.e., with and without PPL), there is no effect on the labor supply decision of the mother in the pre-birth period. However, we can also consider the mother's intertemporal choice of labor supply in the pre-birth period.

**Figure 2** Predicted effect of maternal labor supply pre birth.



**Figure 3** Predicted effect of maternal labor supply post birth.

Recall that women are required to be employed for 10 of the last 13 months prior to the birth or adoption of the child, and have worked at least 330 hours in the 10-month period. Figure 2 also shows the intertemporal decision of the mother in the pre-birth period. The budget constraint will now kink once the mother works 330 hours. Once the mother works 330 hours in the 10-month period and qualifies for PPL, the budget constraint shifts up (represented by line segment “cd”), since she will now receive the PPL, and the mother moves from indifference curve A to indifference curve B. At indifference curve A, the mother was previously working  $L'$  hours (e.g., 350 hours) and already had qualified for the PPL. At indifference curve B, the mother is now working only  $L^*$  (e.g., 330 hours) hours, but still qualifies for the PPL. Thus, hours of work in the pre-birth period should decrease for mothers who will qualify for the PPL. Alternatively, mothers working only 320 hours before the introduction of the PPL could increase their pre-birth work hours to qualify for the PPL (not pictured). Once their pre-birth work hours hit 330, their budget constraint will kink, and they will move to indifference curve B.

Figure 3 shows the labor supply decision of employed mothers post birth. Post birth, mothers can decide to take leave and return to work at some date in the future, or quit their job. If mothers value their job protection and prefer to return to work at their pre-birth employer, then they should return to work within the permitted length of leave, which is likely 12 months (given the 12 months of unpaid, job-protected leave). However, mothers also have the option to quit their job, and re-enter the labor market at a lower reservation wage. In the discussion that follows, I assume mothers choose to take leave and return to their pre-birth employer at some date in the future. See Klerman and Leibowitz (1995) for a detailed discussion of post-birth dynamic labor supply effects. In Figure 3, I first illustrate the predicted labor supply effect before the introduction of the PPL, and upon receipt of the Baby Bonus. Mothers’ non-labor



income increases from receipt of the Baby Bonus, and her budget constraint shifts up by the amount BB (represented by line segment “ab”). Mothers’ leisure hours and consumption increase, and her utility maximizing choice of leisure and consumption will occur at  $(L^{BB}, Y^{BB})$ , implying that Baby Bonus receipt increases the amount of time mothers spend out of work and on leave with the child.

Next, in Figure 3, I also illustrate the predicted labor supply effect after the introduction of PPL. Non-labor income increases from receipt of PPL, and the budget constraint shifts up by the amount PPL (represented by line segment “cd”). It is important to note that the increase in non-labor income from PPL is larger than the increase in non-labor income from the Baby Bonus. This is the case because PPL provides 18 weeks of paid leave at the national minimum wage each week for 18 weeks, whereas the Baby Bonus provides a one-time payment of \$5,000. Mothers who receive PPL increase their leisure hours more than mothers who receive the Baby Bonus, since the marginal rate of substitution between work hours and leisure hours is higher. Thus, mothers who receive PPL spend more time out of work and on leave post birth than mothers who receive the Baby Bonus, and their utility maximizing choice of leisure and consumption occurs at point  $(L^{PPL}, Y^{PPL})$ .

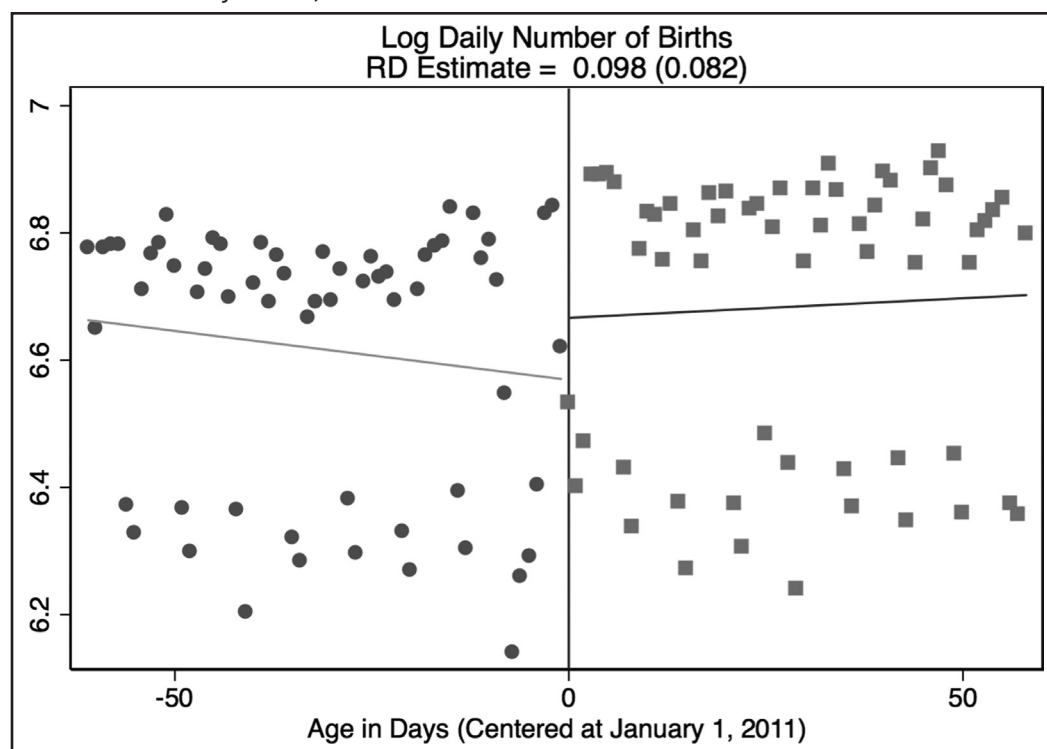
## 4 Empirical strategy and data

### 4.1 Empirical strategy

My empirical strategy exploits the January 1 2011, date-of-birth eligibility cutoff to identify the effect of PPL using a regression discontinuity design (RDD). In order for the effect to be identified via an RDD, it is assumed that mothers who give birth right before January 1 2011, and mothers who give birth right after January 1 2011, have similar characteristics in every dimension except for PPL receipt (Lee and Lemieux 2010). The crucial identification issue is to what extent mothers could have influenced the date of birth of the current child in anticipation of the policy change. There are two reasons that would suggest mothers could not have influenced their child’s birth date. First, the conception of a child is an event that cannot be perfectly timed by parents. Second, if parents could perfectly plan a conception and birth, this would require them to have been informed of the January 1 2011, change at the time of conception. According to the Australian Government’s Introduction to the PPL, full information for parents, employers, and the community about how the scheme will operate, including guidelines for the program, was not available until October 2010 (Australian Government 2009). Therefore, births occurring around January 1 2011, could not have been influenced by anticipation of the PPL scheme. However, it is possible that mothers could have influenced the timing of a birth by postponing induced births or planned caesarean sections. Gans and Leigh (2009) find evidence that mothers delayed their births in response to the Baby Bonus – an Australian reform that changed fertility incentives.

Figure 4 displays the daily number of births in Australia from November 1, 2010 to February 28, 2011 (2 months on each side of the cutoff), with linear fits on each side of the threshold. Daily birth count data were provided by the Australian Bureau of Statistics Customized Data and Information team. Although visually there appears to be a slight discontinuity in births at the threshold, the estimated jump is not statistically significant. The gap in birth counts on each side of threshold is driven by more births occurring during the weekdays rather than on the

**Figure 4** Births discontinuity. Notes: The log of the number of children born to mothers from November 1 2010 to February 28 2011, and separate linear fits on each side of the January 1 2011 cutoff. The vertical line denotes the PPL cutoff of January 1 2011, normalized to 0.



**Table 1** Discontinuity in births at the January 1 2011, threshold

	2-2 m	2-2 m	2-2 m	1-1 m	1-1 m	1-1 m
Births	0.098 (0.082)	0.055 (0.125)	0.120 (0.166)	0.127 (0.120)	0.043 (0.168)	-0.047 (0.189)
N (number of days)	120	120	120	62	62	62
Linear term in <i>m</i>	Yes	Yes	Yes	Yes	Yes	Yes
Quadratic term in <i>m</i>	No	Yes	Yes	No	Yes	Yes
Cubic term in <i>m</i>	No	No	Yes	No	No	Yes

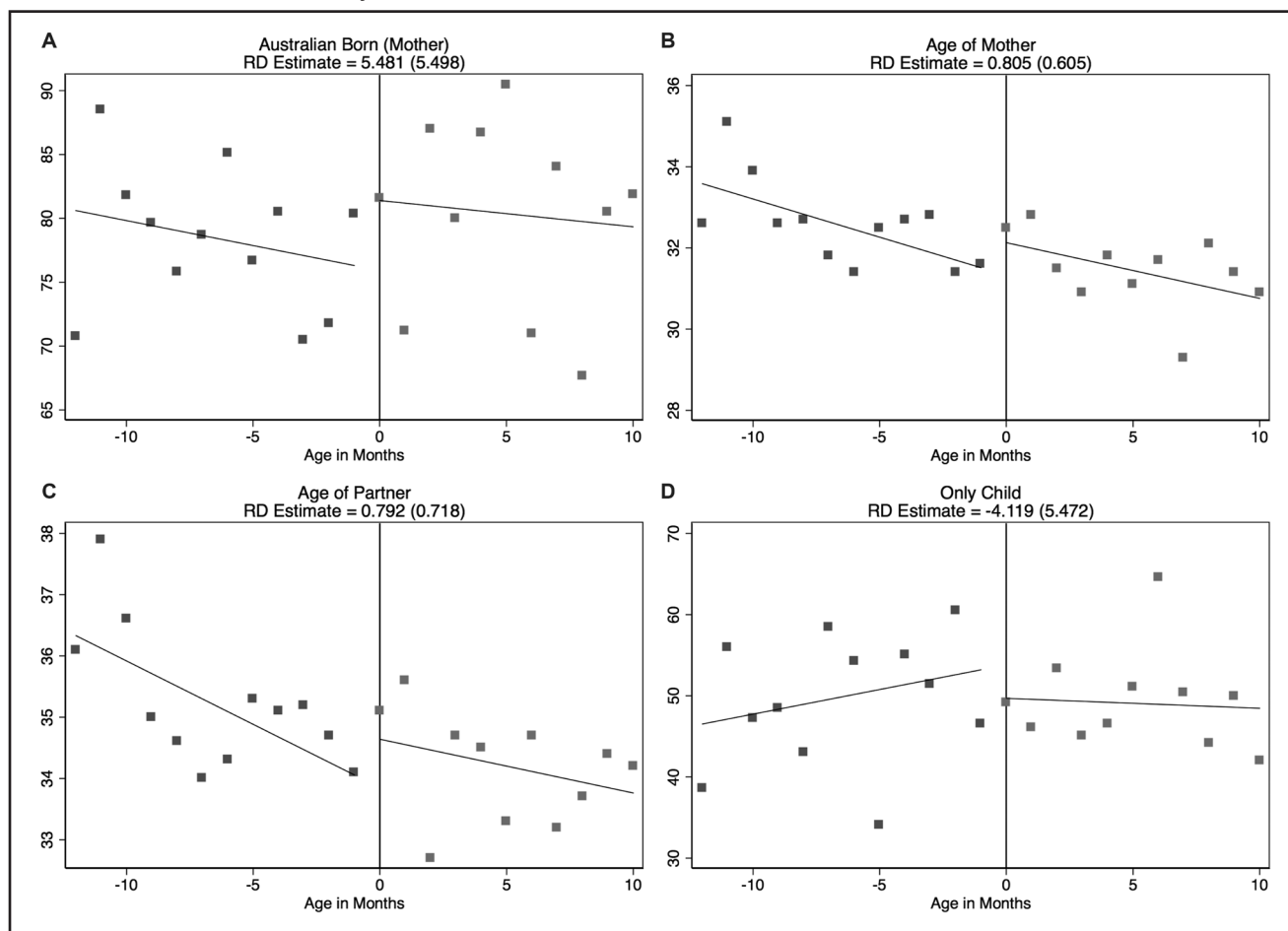
Notes: Each coefficient reported is the estimated discontinuity in the daily number of logged births at the threshold as a result of the PPL scheme. The “m” in each column heading stands for months, and represents the number of months on each side of the threshold. Each coefficient is from a different regression. Robust standard errors are in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

weekends. Table 1 reports the estimates corresponding to Figure 4 in column 1, and estimates from varying bandwidths and polynomial choices. All estimates are statistically insignificant.

The other key identification assumption underlying the regression discontinuity procedure is that the conditional expectations of the outcomes (e.g., hours worked) with respect to the month of birth are smooth through the January 1 2011, cut point. Although I cannot test this assumption directly, an implication is that there should be no discontinuities in predetermined variables. I test for discontinuities in predetermined characteristics of mothers, and examine if any discontinuities in the percentage of mothers who are Australian born, the average age of the mother, the average age of the mother’s partner, and the percentage of

**Figure 5** Balance in covariates around the January 1 2011 threshold: **(A)** Percentage of mothers who are Australian born. **(B)** Average age of the mother. **(C)** Average age of the mother's partner. **(D)** Percentage of mothers with only one child.



mothers with only one child exist. Figure 5A–D plot the distribution of these predetermined characteristics and the corresponding local linear regression estimates. There is no evidence of any discontinuities in the predetermined characteristics.

Therefore, in the absence of birth manipulation and discontinuities in predetermined characteristics, I am able to identify the effect of PPL by comparing outcomes of mothers giving birth during or after January 2011 to outcomes of mothers giving birth before January 2011. If the policy had an effect on maternal labor market outcomes, we would expect to see a sharp jump or fall in the outcome under study after the PPL cutoff date.

To analyze whether there is a discrete jump or fall in the studied outcomes, the following reduced-form equation is estimated:

$$Y_m = \alpha + \beta_1 M + \beta_2 \text{Post} + \beta_3 (M * \text{Post}) + \delta' X_m + \varepsilon_m \quad (1)$$

where  $Y_m$  is the considered outcome in 1-month age cell  $m$ ,  $M$  is age in months re-centered at 0 in January 2011,  $\text{Post}$  is a binary indicator equal to 1 in all months beginning January 2011, and  $X_m$  is a vector of 1-month age cell covariates including the percentage of mothers who are Australian born, average age of the mother, average age of the mother's partner, and percentage of mothers with only one child. The linear term  $M$  accounts for any smooth fertility trends and is allowed to change on either side of the cutoff date. I also experiment with a quadratic term  $M$ ,

and show that the results are generally robust across specifications. The coefficient of interest,  $\beta_2$ , would capture a discrete jump or fall in the outcome around January 2011 and is identified by assuming no other factor affected the outcome discontinuously at the cutoff. No other policy changes in early 2011 applied differentially to children born before and after the January 1 cutoff date, including the cutoff birth date that determines the year when a child starts school.

Since the units of observation in equation 1 are sample means within cells that are defined by discrete values of age in months, the estimates and robust standard errors are obtained from regressions that are weighted by the number of mothers contributing to each outcome cell. These estimates and standard errors are equivalent to estimates and standard errors that could be obtained by estimating unweighted regressions using individual-level data, and clustering the standard errors by month of birth (Lee and Lemieux 2010).

## 4.2 Data

My primary analysis will use data from the 2011 Australian Pregnancy and Employment Transitions Survey (PETS). The PETS is a supplement to the Australian Bureau of Statistics monthly Labor Force Survey. The survey was conducted in November 2011 and collected information on women's employment transitions during pregnancy, on starting or returning to work after the birth of their child, and job details, for birth mothers of a child living with them for which a child was under 2 years of age at the time of interview (Pink 2011). The PETS data are well suited for this study because, most importantly, they contain the month and year of birth of all children, and they contain several measures of mothers' labor market outcomes, including employment status, income, number of hours worked and the age of the child when the mother returned to work. The Household, Income and Labour Dynamics in Australia (HILDA) survey, a household-based panel study that collects information about economic and personal well-being, labor market dynamics, and family life, is also an appropriate data source that could be used for this analysis. However, the HILDA contains a very limited number of mothers who gave birth around the January 2011 threshold and does not contain information about employment during pregnancy.

Although the PETS data are the preferred data source for this analysis, there are two main limitations worthy of note. First, the data are available upon request as statistics in tabulated form from the Australian Bureau of Statistics. The PETS data are also available as a microdata product accessible from a secure data lab in Australia. At this time, I do not have access to the microdata. That is, the data are group-level data, provided as cell means for the respective variable (e.g., hours worked), instead of individual counts. With individual-level data, I would be able to estimate the effect of PPL across different subgroups of women if we believe the effect varies across age of the mother, race, marital status, etc. Second, the PETS only includes mothers with children between the ages of 0 and 2 years old as of November 2011. Since the data are provided by month and year of birth of the child, this amounts to 24-month-year observations. Fewer month-year cells make it more difficult to estimate a discontinuity at the threshold (Lee and Card 2008).

Despite these limitations, I use the PETS data to analyze the effect of PPL on PPL take-up, and three short-term maternal labor market outcomes: average number of hours worked per week immediately before stopping work to give birth, average number of weeks the mother

stopped work before birth, and average number of hours actually worked per week in all jobs as of November 2011. The PETS data also include information on the number of women receiving the Baby Bonus and/or PPL. That is, in November 2011 when the survey was administered, women were asked if they received the Baby Bonus or PPL (or both in the case of multiple births) at the time of their child's birth. This information allows me to estimate the effect of PPL on Baby Bonus receipt – an indirect estimate of PPL take-up. Regarding the labor market outcomes, both hours worked outcomes and number of weeks stopped work are conditional on the mother being employed at the time of pregnancy. That is, only mothers who reported being employed while pregnant answered the survey questions about the number of hours worked before stopping work to give birth, the number of weeks stopped work before birth, and the number of hours worked at the time of survey in November 2011.

Additionally, I estimate the effect of PPL on the average age of the child when the mother returned to work. This question is asked of the PETS respondents in November 2011. That is, mothers who reported being employed and had already returned to work as of November 2011 reported a positive age of the child when they returned to work. For mothers who reported being employed but have not yet gone back to work, they reported an age of the child when they returned to work of 0 years old. All mothers, whether or not they have returned to work, are included in the estimation sample. Additionally, the sample is restricted to mothers who reported being employed while they were pregnant, as these women are most likely to be eligible for PPL.

Table 2 (panel I) presents descriptive statistics pre and post PPL for each of the outcomes previously listed. Pre PPL, the percentage of mothers receiving the Baby Bonus is 68.13, and post PPL, this percentage substantially falls to 19. The average number of weeks that mothers stop work before giving birth is nearly 4 weeks both pre and post PPL. The average number of

**Table 2** Descriptive statistics of analysis variables

	Pre-PPL	Post-PPL
<b>Panel I: outcomes</b>		
Percentage receiving Baby Bonus	68.13 (5.647)	19.00 (8.183)
Average number of weeks stopped work before birth	3.858 (0.979)	3.864 (0.775)
Average number of hours worked before stopped for birth (per week)	30.07 (2.021)	31.07 (2.306)
Average age of the child when the mother returned to work (in weeks)	30.41 (5.804)	12.54 (7.712)
Average number of hours worked in all jobs (per week)	16.04 (3.865)	4.564 (3.507)
N (number of months)	11	12
<b>Panel II: covariates</b>		
Australian born (mother)	78.33 (5.584)	80.18 (7.324)
Age of partner	35.24 (1.154)	34.22 (0.877)
Age of mother	32.59 (1.067)	31.45 (0.943)
Only child	49.48 (8.067)	49.33 (6.090)
N (number of months)	11	12

Notes: Data on each outcome was provided by the Australian Bureau of Statistics. The covariates in Panel II are: the percentage of mothers who are Australian born, the average age of the mother's partner, the average age of the mother and the percentage of mothers with only one child. Means and standard deviations (in parentheses) are presented.

hours worked before stopping work for childbirth is similar pre and post PPL, with mothers working on average 30–31 hours. The age of the child when the mother returns to work differs between pre and post PPL, due to some mothers post PPL just giving birth and remaining out of work and on leave (i.e., mothers who gave births in the few months before November 2011). Pre PPL, mothers return to work when their child is 30-week-old, and post PPL, the average age of child is 12.5. Similarly, the average number of hours worked in all jobs per week is much lower post PPL (4.6 weeks) than pre PPL (16 weeks), again due to some mothers post PPL just giving birth near the time of the survey. Hours worked per week in all jobs as of November 2011 is asked of all mothers who reported being employed while pregnant, whether or not they started work since giving birth. Thus, the average number of hours worked per week as of November 2011 includes zeros.

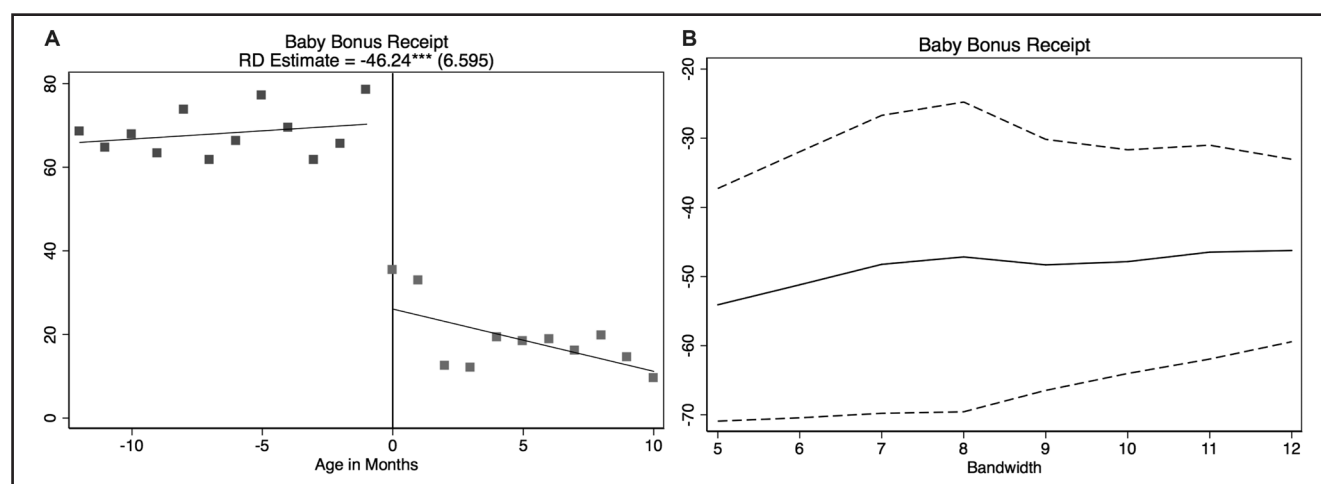
Table 2 (panel II) presents descriptive statistics pre and post PPL for the included covariates. All covariate means are similar across both time periods. The average number of mothers who are Australian born is around 78–80%, the average age of the mother's partner is roughly 35 years, the average age of the mother is around 32 years, and the percentage of mothers with only one child is about 49%.

## 5 Results

### 5.1 PPL take-up

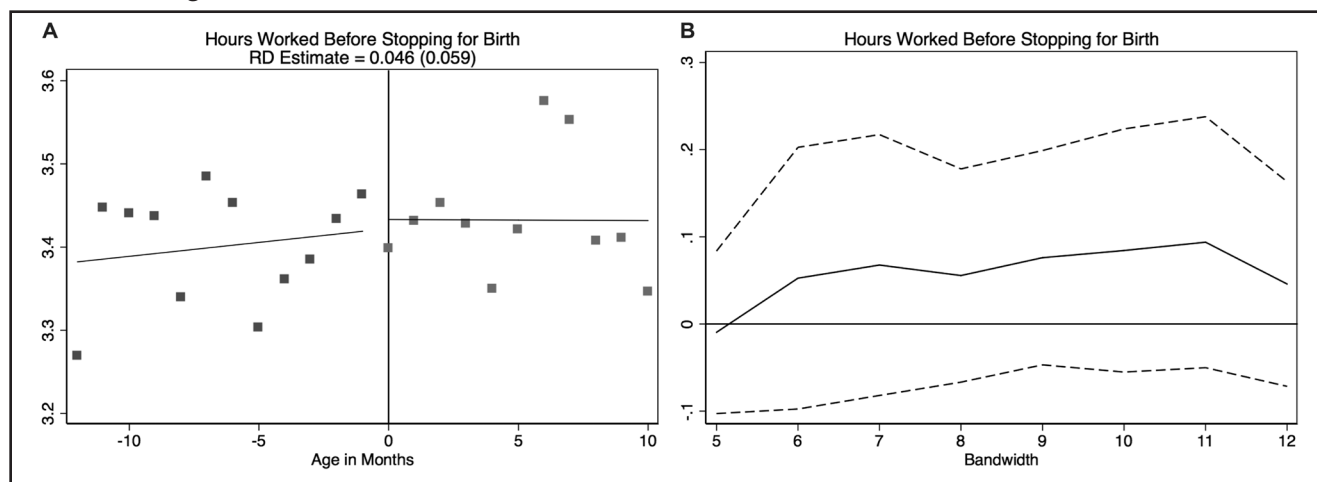
The effects of the PPL scheme on maternal labor market outcomes are summarized in Figures 6–10, and Tables 3–5. I begin by showing the effect of PPL on the percentage of mothers receiving the Baby Bonus. Recall that women who gave birth to a child from July 1, 2004 until December 31, 2013 and had a family adjusted taxable income of \$75,000 or less in the 6 months after childbirth automatically received the Baby Bonus. Once the PPL scheme was introduced,

**Figure 6** The percentage of mothers receiving the Baby Bonus. **(A)** Each data point corresponds to the average value of the percentage of mothers receiving the Baby Bonus by month of birth of the child in 1-month bins. The window includes all children born to mothers from January 2010 until November 2011. The vertical line denotes the PPL cutoff of January 1 2011, normalized to 0. **(B)** The equivalent coefficient estimates and associated 95% confidence intervals when equation 1 is estimated using 3, 4, ..., 12 month-of-birth cohorts on either side of the threshold.

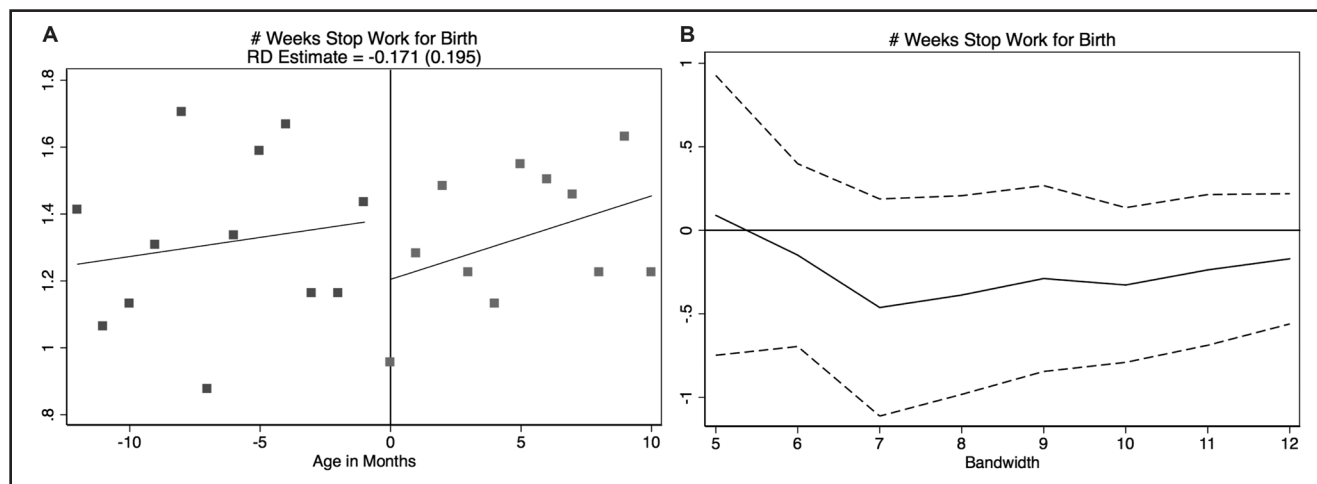




**Figure 7** Average number of hours worked by the mother immediately before stopping work for the birth of her child. **(A)** Each data point corresponds to the average value of each outcome by month of birth of the child in 1-month bins. The window includes all children born to mothers from January 2010 until November 2011. The vertical line denotes the PPL cutoff of January 1 2011, normalized to 0. **(B)** The equivalent coefficient estimates and associated 95% confidence intervals when equation 1 is estimated using 3, 4, ..., 12 month-of-birth cohorts on either side of the threshold.

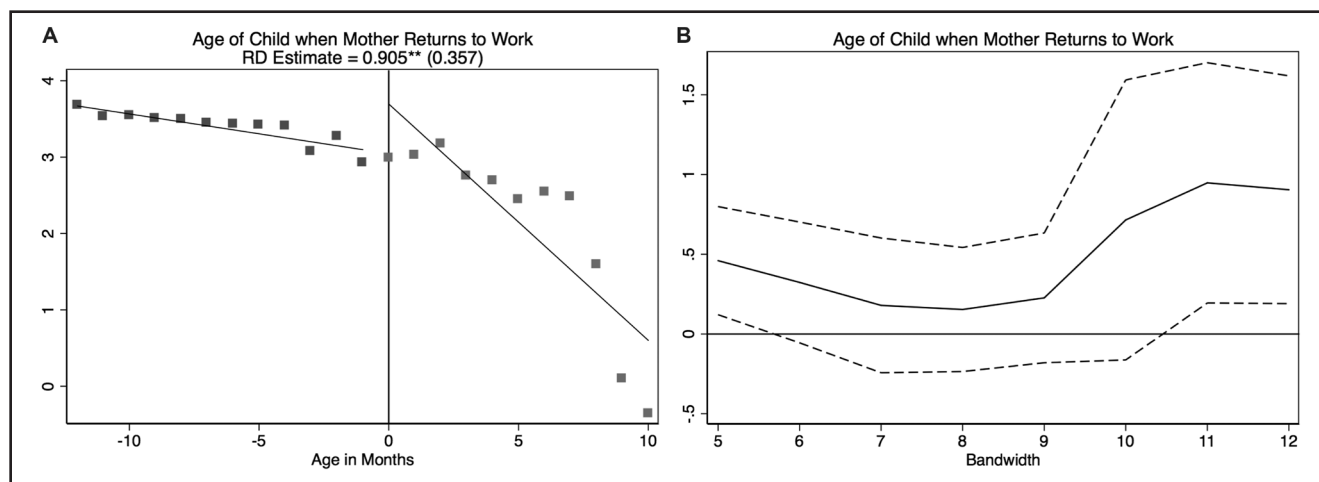


**Figure 8** Average number of weeks the mother stopped work before the birth of her child. **(A)** Each data point corresponds to the average value of each outcome by month of birth of the child in 1-month bins. The window includes all children born to mothers from January 2010 until November 2011. The vertical line denotes the PPL cutoff of January 1 2011, normalized to 0. **(B)** The equivalent coefficient estimates and associated 95% confidence intervals when equation 1 is estimated using 3, 4, ..., 12 month-of-birth cohorts on either side of the threshold.

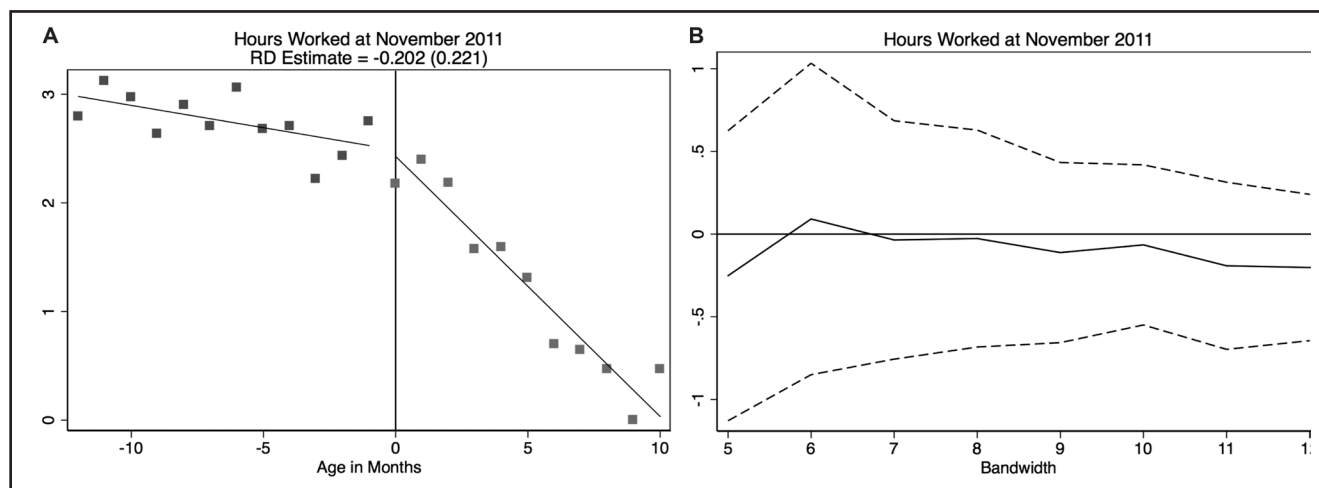


mothers who gave birth on or after January 1 2011, were able to receive either the PPL or the Baby Bonus, dependent upon eligibility for both. Thus, only mothers who had family income below \$75,000 after 6 months of childbirth and who had taxable income of \$150,000 or less in the year before birth were eligible for both the Baby Bonus and PPL (but still only able to receive one or the other). Due to data limitations, I am unable to limit the Baby Bonus analysis to those who were eligible for both the Baby Bonus and PPL. Therefore, I estimate the effect of PPL on the average Baby Bonus receipt among the restricted sample (i.e., those women who reported being employed while pregnant) in the PETS.

**Figure 9** Average age of the child when the mother returned to work. **(A)** Each data point corresponds to the average value of each outcome by month of birth of the child in 1-month bins. The window includes all children born to mothers from January 2010 until November 2011. The vertical line denotes the PPL cutoff of January 1 2011, normalized to 0. **(B)** The equivalent coefficient estimates and associated 95% confidence intervals when equation 1 is estimated using 3, 4, ..., 12 month-of-birth cohorts on either side of the threshold.



**Figure 10** Average number of hours worked by the mother as of November 2011. **(A)** Each data point corresponds to the average value of each outcome by month of birth of the child in 1-month bins. The window includes all children born to mothers from January 2010 until November 2011. The vertical line denotes the PPL cutoff of January 1 2011, normalized to 0. **(B)** The equivalent coefficient estimates and associated 95% confidence intervals when equation 1 is estimated using 3, 4, ..., 12 month-of-birth cohorts on either side of the threshold.



A mother could not claim both the Baby Bonus and PPL, except in the case of multiple births. To determine the take-up of PPL, I look for a discontinuity in the percentage of mothers receiving the Baby Bonus. Since families receiving PPL would, on average, receive around \$2,000 more than under current family assistance arrangements, it is expected that receipt of the Baby Bonus should decrease once the PPL scheme was introduced (Australian Government 2009). Figure 6A suggests that receipt of the Baby Bonus significantly decreases after the implementation of the PPL scheme. Table 3 reports the results from equation 1 on Baby Bonus receipt, where the dependent variable is the percentage

**Table 3** Baby Bonus receipt

	12–12 m	12–12 m	12–12 m
Baby bonus	−46.24*** (6.595)	−44.52*** (10.11)	−43.06*** (7.703)
<i>N</i> (number of months)	23	23	23
Controls	Yes	Yes	Yes
Linear term in <i>m</i>	Yes	No	No
Quadratic term in <i>m</i>	No	Yes	No
Cubic term in <i>m</i>	No	No	Yes

Notes: The coefficient reported is the estimated discontinuity in Baby Bonus Receipt as a result of the PPL scheme. The “m” in the column heading stands for months. An observation is the outcome rate for a 1-month age cell. Controls include the percentage of mothers in each age cell that are Australian born, the average age of the mother in each age cell, the average age of the partner in each age cell, and the percentage of mothers with one child in each age cell. Estimates are weighted by the population, and robust standard errors are in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

**Table 4** The effect of PPL on maternal labor market outcomes

	Hours before birth (1)	Weeks stop before birth (2)	Age of child return (3)	Hours worked, November 2011 (4)
<b>Panel I</b>				
PPL	0.046 (0.059)	−0.171 (0.195)	0.905** (0.357)	−0.202 (0.221)
<i>N</i> (number of months)	23	23	23	23
Controls	Yes	Yes	Yes	Yes
Linear term in <i>m</i>	Yes	Yes	Yes	Yes
<b>Panel II</b>				
PPL	0.042 (0.112)	−0.324 (0.272)	0.036 (0.207)	−0.101 (0.390)
<i>N</i> (number of months)	23	23	23	23
Controls	Yes	Yes	Yes	Yes
Quadratic term in <i>m</i>	Yes	Yes	Yes	Yes

Notes: The coefficient reported is the estimated discontinuity in the outcome as a result of the PPL scheme. Each coefficient is from a different regression. An observation is the outcome rate for a 1-month age cell. Controls include the percentage of mothers in each age cell that are Australian born, the average age of the mother in each age cell, the average age of the partner in each age cell, and the percentage of mothers with one child in each age cell. Estimates are weighted by the population, and robust standard errors are in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

of mothers receiving the Baby Bonus. The results show that receipt of the Baby Bonus decreases by 46% after the implementation of PPL. Columns 2 and 3 of Table 3 include quadratic and cubic terms in *m*, respectively. The estimated coefficients slightly decline in magnitude, but remain highly statistically significant. Figure 6B displays the estimates and 95% confidence intervals for the effect of PPL on Baby Bonus receipt using various bandwidths. The results remain stable and significant across the different bandwidths.

**Table 5** Average age of the child when the mother returned to work, by income quintile

	First quintile	Second quintile	Third quintile	Fourth quintile	Fifth quintile
<b>Panel I</b>					
Average age of child	−0.153 (0.771)	1.012 (0.675)	1.248 (1.074)	0.171 (0.529)	0.529 (0.466)
<i>N</i> (number of months)	23	23	23	23	23
Controls	Yes	Yes	Yes	Yes	Yes
Linear term in <i>m</i>	Yes	Yes	Yes	Yes	Yes
<b>Panel II</b>					
Average age of child	0.067 (1.325)	0.325 (0.697)	1.160 (1.480)	0.965 (0.764)	0.219 (0.837)
<i>N</i> (number of months)	23	23	23	23	23
Controls	Yes	Yes	Yes	Yes	Yes
Quadratic term in <i>m</i>	Yes	Yes	Yes	Yes	Yes

Notes: Each coefficient reported is the estimated discontinuity in the outcome as a result of the PPL scheme. Each coefficient is from a different regression. An observation is the outcome rate for a 1-month age cell. Controls include the percentage of mothers in each age cell that are Australian born, the average age of the mother in each age cell, the average age of the partner in each age cell, and the percentage of mothers with one child in each age cell. Estimates are weighted by the population, and robust standard errors are in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

## 5.2 Labor market outcomes

Next, I report the results for the effect of PPL on logged maternal labor market outcomes in Table 4. Panel I includes a linear term in *m*, and panel II includes a quadratic term in *m*. I first begin with discussing the effect of PPL on maternal labor market outcomes pre birth, and then discuss the effect of PPL post birth.

Given the work requirements for PPL eligibility, and the associated labor supply predictions presented in Figure 2, we would expect PPL to either increase or decrease pre-birth labor hours depending on the mothers' current work hours. Table 4 (panels I and II) suggests that the PPL scheme increases the average number of hours worked before stopping work by roughly 4%, but the effect is not statistically significant. Figure 7A presents the corresponding regression discontinuity figure, and estimates by varying bandwidths are presented in Figure 7B. Across varying bandwidths, the estimates are fairly stable, and appear to hover around zero as the bandwidth increases. This effect is in line with the predictions, if mothers not meeting the work requirements to be eligible for PPL are inclined to increase their work hours pre birth. However, this positive effect, although insignificant, is surprising. Recall that mothers are required to be employed for 10 of the last 13 months prior to the birth of the child, and have worked at least 330 hours in the 10-month period. A mother could qualify for PPL by working 8.25 hours a week in the 10 months prior to the birth of her child. Full-time, employed women in Australia work an average of 39.8 hours/week, and part-time employed women work 18.8 hours/week, and women typically stop working 1–3 weeks before childbirth.<sup>1</sup> Therefore, we should expect women to decrease their work hours, since they most likely already qualify

<sup>1</sup> These figures were obtained from the OECD: <https://stats.oecd.org/Index.aspx?DataSetCode=ANHRS> accessed December 2, 2017.

for the PPL. The positive effect could be driven by more disadvantaged mothers attempting to increase their work hours to qualify for the PPL. Due to data limitations, I am unable to parse out the effect by socioeconomic subgroups.

Similarly, if PPL receipt could affect the number of hours worked pre birth, we may expect PPL to also affect the number of weeks the mother stopped work before the birth of her child. If women are attempting to qualify for the PPL, they may decrease the number of weeks they stop working before the birth of their child. Similarly, for women who are already going to qualify for the PPL, they may increase the number of weeks they stop working before the birth of their child. Table 4 (column 2) suggests that indeed women are decreasing the number of weeks they stop working before birth, but the estimated effects are statistically insignificant. In Figure 8B, the estimated effects across varying bandwidths are relatively stable, but still indistinguishable from zero. However, the precision of the estimate is such that I can rule out, at the 95% confidence level, the number of weeks stopped work before the birth increasing by more than 16%, and decreasing by more than 50%. It is important to note, though, that the lack of a statistically significant effect of the PPL on the average number of hours worked before stopping work for birth and the average number of weeks stopped working before birth could be due to the empirical methodology used to estimate the effect. Mothers who are not certain if they will give birth before or after the January 1 2011, cut point may not alter their behavior. Thus, using a RDD to estimate the effect of PPL pre birth may not be the most ideal empirical strategy. A difference-in-difference design would likely yield more precise estimates, but pretreatment data on the outcomes under study are not available.

Once a mother gives birth, she can either choose to go back to work right away (within a reasonable amount of time post birth), or remain at home and care for her child. After the introduction of PPL, the predictions discussed above imply that more mothers should be out of work and on leave than mothers who did not receive the PPL. Although I cannot directly measure the average length of leave the mother took for the birth of her child, I can measure the average age of the child when the mother returned to work. Table 4 (column 3) suggests that the introduction of PPL significantly increases the average age of the child when the mother returned to work by 90.5%, or 27.5 weeks ( $30.41 \times 0.905$ ). However, it is clear in Figure 9A (Table 4, panel II, column 3) that the positive effect of PPL on this outcome is driven by the linearity imposed in the RDD model, and the downward trend on the right side of the threshold – a result of mothers just giving birth near the time of the survey still being out of work and at home with their child. If we look at a narrower bandwidth, illustrated in Figure 9B, it does not appear that PPL significantly increases the average age of the child when the mother returns to work. Taken together, it seems that the PPL scheme does not significantly increase the average length of leave taken by the mother post birth. Since this effect was a primary goal of the policy, this finding is of considerable importance.

Though there is no clear aggregate effect of PPL increasing mothers' length of leave, this null finding may mask heterogeneity in subgroup effects. Specifically, it may be that the average length of leave varies by socioeconomic status, with the most advantaged (disadvantaged) mothers being able (not able) to afford to take the full 18 weeks of paid leave. To test this, I collected PETS data on the average age of the child when the mother returned to work by income quintile measured at the time of pregnancy. Average income per week by quintile is as follows: first quintile = \$555.27; second quintile = \$1,140.94; third quintile = \$1,580.48;

fourth quintile = \$2,083.20; fifth quintile = \$3,684.51. Mothers in the fifth income quintile have an average income that is nearly seven times higher than mothers in the first quintile. Table 5 reports the results for the effect of PPL on the average age of the child when the mother returned to work by income quintile. The positive effect persists across nearly all quintiles, but all estimates are statistically insignificant. Although the estimates for all quintiles are imprecise, the evidence is suggestive that all women are increasing their average length of leave as a result of PPL.

Although there does not appear to be an effect on the average age of the child when the mother returns to work, we may still see an effect on the number of hours worked post birth as of November 2011. Women who receive the PPL may choose to go back to work at the same time as mothers who did not receive the PPL, but the intensity of their work hours may differ. The receipt of the National minimum wage each week for 18 weeks for PPL mothers may allow those mothers to return to work part-time during the 18-week period. If this is the case, then as of November 2011, these mothers will have returned to work, but work fewer hours per week than mothers who did not receive the PPL. Table 4 (column 4) and Figure 10A present the effect of PPL on average number of hours worked per week as of November 2011. In Figure 10A, the downward trend on the far right side of the threshold is likely a result of mothers just giving birth near the time of the survey still being out of work and at home with their child. Although there is a clear negative trend in work hours within a narrow bandwidth of the threshold, the resulting RD estimate is small and statistically insignificant. Across varying bandwidths (Figure 10B), this result appears to hover around zero, suggesting that mothers are not significantly decreasing their work hours as a result of PPL receipt.

## 6 Discussion and conclusion

Using the introduction of a paid parental leave scheme in Australia on January 1 2011, this paper presents theoretical predictions and estimates the effect of an introduction of a family leave policy on maternal labor market outcomes. The theoretical predictions imply that after the introduction of PPL, hours of work in the pre-birth period should decrease for mothers who will qualify for PPL, and increase for mothers who are attempting to qualify for PPL. Post birth, more mothers are out of work and on leave than would have been in the absence of PPL. By comparing the outcomes of mothers with babies born before January 1 2011, to the outcomes of mothers with babies born on or after January 1 2011, using a RDD, the empirical results show that the introduction of the PPL scheme significantly decreases receipt of the Baby Bonus by 46%. Regarding maternal labor market outcomes pre and post birth, the results suggest that the PPL had no effect on hours or weeks worked pre birth, hours worked post birth, or average length of leave taken by the mother. From a policy perspective, the last result is striking since the Australian Government introduced the PPL scheme with the primary goal of increasing the average length of leave taken by the mother for the birth of her child.

The lack of an effect on length of leave taken post birth after the introduction of PPL appears at odds with the theoretical predictions discussed above. In the conceptual framework, the post-birth labor market prediction after the introduction of PPL implies a positive income effect, where both consumption and leisure increase. However, the empirical results suggest a zero income effect, where length of leave remains unchanged, and consumption increases. This



could be due to mothers deciding pre birth how much leave they will take, regardless of the leave being financed through the Baby Bonus or PPL. Recall the average age of the child when the mother returns to work is 27.3 weeks. If mothers were already taking longer than 18 weeks of leave without pay, an introduction of paid leave of a shorter length of time would not alter their behavior. They will take as much leave as they would have in the absence of PPL, and simply be happy that some of it turns out to be paid.

The effect of an introduction of a paid family leave policy is of great importance and needs to be understood, especially given the current conversations in the United States and other countries around the world about introducing paid family leave. Although the PPL results of this paper do not appear to affect labor market outcomes for mothers on average, it is possible that the effects of PPL for some subgroups are masked. Future work would benefit from individual-level data that could be used to estimate the effect of PPL across different subgroups of women, beyond income quintiles, if we believe the effect varies across age of the mother, race, marital status, etc. Additionally, PPL may have significant positive effects on the children affected by the policy. If mothers receiving PPL are not increasing their length of leave, but are collecting PPL payments throughout some of the leave, this extra income may be used to benefit the child. This paper does not have the data necessary to explore this hypothesis, but it is worth exploring in future work related to PPL policies.

#### **Declarations**

##### **Availability of data and material**

The data that support the findings of this study are available from the Australian Bureau of Statistics but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the Australian Bureau of Statistics.

##### **Competing interests**

The author declares that they have no competing interests.

##### **Funding**

The author acknowledges funding from the Economic Self-Sufficiency Policy Research Institute, and the UCI Economics Summer Research Fellowship. The funding contributed to the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

##### **Author's contributions**

The author, Brittany Bass, contributed solely to the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

##### **Acknowledgments**

The author would like to thank Mireille Jacobson, David Neumark, Damon Clark, and UCI Applied Microeconomics workshop participants for their excellent comments on earlier drafts. Financial support from the Economic Self-Sufficiency Policy Research Institute, and the UCI Economics Summer Research Fellowship is also acknowledged.

##### **Ethics approval and consent to participate**

Not applicable.

##### **Consent for publication**

Not applicable.

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