# Maternal Employment Consequences of Family Policy: Evidence from New Zealand on Paid Parental Leave and Universal Child Benefits

by

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# Abstract

From 1 July 2018, the New Zealand government implemented the Families Package: a bundle of policies including two specifically aimed at new mothers: (1) an extension in paid parental leave from 18 to 22 weeks; and (2) the introduction of a universal 'Best Start' child benefit. The paid parental leave extension was designed to encourage mothers to increase the length of time they spend at home with the child in the first six months following birth. At the end of the paid parental leave period, mothers receive the Best Start child benefit comprising $60 weekly payments which expire when the child turns one. The purpose of the Best Start payments was to supplement childcare costs and ease mothers' transition back into the labour market, strengthening their labour force attachment. I evaluate the effects of both the paid parental leave extension and Best Start payments on maternal labour force attachment up to 18 months postbirth. Eligibility for the two policies was restricted to women who gave birth after 1 July 2018, meaning that women who gave birth prior to this date were entitled to only 18 weeks of paid parental leave and did not receive a universal child benefit. Using population-wide administrative data, I select a sample of mothers who gave birth six months before 1 July 2018 (comparison) and six months after (treatment).

Difference-in-differences analysis shows an increase in the average paid parental leave of about three weeks - from 11 to nearly 14 weeks. This behavioural response shows up between 18 and 22 weeks following birth as a 3.6 percentage point decrease (about 18% compared to the counterfactual scenario) in the maternal employment rate. Such a significant increase in the proportion of mothers outside the labour market between 18 and 22 weeks suggests that the paid parental leave extension does incentivise mothers to stay at home with the child for longer and does not simply crowd out unpaid leave. However, I find no evidence of either Best Start or the paid parental leave extension impacting maternal employment from six months postbirth. These results are robust to a series of specifications including variation in the sampling window around the 1 July 2018 and instrumental variable analyses. Given that household division or labour choices are made at the family level, I extend the analysis to fathers and maternal grandmothers but identify no change in postbirth employment as a result of the paid parental leave extension or Best Start payments for either group.

# Attestation of authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university of other institution of higher learning.

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# Disclaimer

These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Statistics New Zealand. For more information about the IDI please visit the Statistics New Zealand website

The results are based in part on tax data supplied by Inland Revenue to Statistics New Zealand under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

All observation counts have been randomly rounded to base 3 in accordance with Statistics New Zealand's confidentiality rules.

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# 1 Introduction

The increase in women's labour force participation over the last century has been one of the most significant drivers of economic growth in the developed world (Galor and Weil, 1996). A shared goal among OECD countries has been to continue to advance female labour force participation in order to achieve further economic growth and improve gender equality in both the home and workplace (OECD, 2016a). Common tools that policymakers use to support female labour force attachment are, specifically, paid parental leave and, more generally, family policy.

All OECD countries, with the exception of the US, offer a period of publicly funded paid parental leave (henceforth denoted as "PPL") (OECD, 2019a). PPL provides financial support in the weeks following childbirth and is usually taken by mothers who use the opportunity to rest, recover and bond with their child at home (Employment New Zealand, 2021a). The health and wellbeing benefits from mothers taking this time to stay at home have been extensively documented (see, for example, Heckman (2008)). PPL, in combination with job-protection policies, also incentivises mothers to return to work once they have reached the end of the leave period by providing financial support and guaranteeing them the option of returning to the prebirth employer in the months postbirth (National Advisory Council on the Employment of Women, 2008). Although all OECD countries offer some parental leave provision, such provisions vary greatly between countries. For example, the US does not provide any PPL provision, while Germany and France offer one year of PPL paid at a replacement rate between 75 and 90% of prebirth labour income (OECD, 2019a). From 2016, New Zealand offered 18 weeks of PPL, matching the OECD average length, which were paid at the equivalent of the full-time minimum wage (OECD, 2020).[1]

From 1 July 2018, New Zealand's Labour-led government implemented the 2018 Families Package. This package included a bundle of policies, two of which were aimed at new mothers: (1) an extension in PPL from 18 to 22 weeks (without a change in the 52-week job-protected leave entitlement); and (2) the introduction of a universal $60 weekly per-child 'Best Start' payment (Robertson, 2017). The PPL extension was designed to encourage mothers to spend more time at home with their child in the first six months

[1] Parental Leave and Employment Protection Amendment Act 2017.

postbirth (Ministry of Social Development, 2019). After the PPL period, all mothers received Best Start payments, which lasted until the child turned one. Best Start payments were designed to contribute to childcare costs and ease mothers' transition back into the labour market (Ministry of Social Development, 2019).

Despite the intended impacts of the Families Package, there has been some policy debate over the potential employment effects. On one hand, the New Zealand Treasury (2018) hypothesised that labour supply for both mothers and fathers would decrease. On the other, the Ministry of Social Development (2019) expected that the Best Start policy, in conjunction with the PPL increase, would strengthen mothers' labour force attachment at the end of the PPL period. On the policy front, National, the main opposition political party at the time of the Families Package's introduction, claimed that the universal Best Start payments would have no impact on employment without specific earmarking (New Zealand Parliament, 2017). The Best Start policy has also been the subject of media scrutiny as $35m of the $166m spent on the policy in the first year went to families in the top income percentile earning more than $100,000 per annum, while the median level of household income at the time was around $82,000 per annum (Perry, 2019; Trevett, 2021).

The link between paid parental leave and female labour supply has also received attention in the academic literature. Most of the empirical literature on the topic use variation around PPL expansions as the exogenous source of variation and distinguish between short-run (within the PPL period) and long-run (outside of the PPL period) postbirth responses in labour supply. An example of the former is, Baker and Milligan (2008b) who use the 2000 Canadian PPL expansion from 25 to 50 weeks to show a significantly reduced maternal employment rate in the child's first year of life. This short-run decrease in the maternal employment rate is also found in work by Schönberg and Ludsteck (2007, 2014) who study five major expansions in maternity leave coverage in Germany that increased the maximum entitlements from eight to 96 weeks. However, Schönberg and Ludsteck (2007, 2014) also show that there is no impact on mothers' long-run postbirth employment. Carneiro et al. (2015) and Dahl et al. (2016) reach a similar conclusion, finding no effects on postbirth employment in the long-run (beyond the PPL period) after examining a series of Norwegian policy reforms between 1987 and 1992 where paid parental leave increased from 18 to 35 weeks.

Although these international academic contributions provide a basis on which to form expectations of the possible impacts of New Zealand's 2018 PPL extension and Best Start payments on maternal labour supply, there are a few notable differences that may affect their external validity. First, the former three studies evaluate overseas expansions that took place between 18 and 30 years prior to 2018, thus the results of each study are within the context of arguably different labour markets than New Zealand's in 2018. Second, the studies evaluating PPL expansions in Germany, Norway and Canada all examined specific reforms that were considerably larger than New Zealand's four-week extension. Third, the income replacement rates of the PPL payments in Norway and Germany are based on prebirth income, replacing between 90 and 100% of mothers' annual labour earnings, while New Zealand's PPL payments are capped at the full-time minimum wage equivalent which is about 46% of the median weekly income (OECD, 2019b).

However, the New Zealand literature evaluating PPL is small and consists mostly of qualitative studies (see, for example, Callister and Caltry (2006), Forbes (2009)). One exception is Crichton (2008), which provides an empirical evaluation of the effect of PPL on maternal labour supply in New Zealand. However, unlike the international literature, this study does not use quasi-experimental methods. The only study recovering a causal effect estimate of PPL using New Zealand data is a recently released working paper by Wilson and McLeod (2021). The study examines the effect of the 2018 PPL extension and Best Start payments, however, the outcomes of interest include total household income and mothers' employment up to six months postbirth (where employment is used as a proxy for leave-taking and this outcome is the focus of the study). The study identifies a modest negative effect on short-run maternal employment (within the PPL period), however it does not offer insight into the impacts of the 2018 PPL extension or Best Start payments beyond six months postbirth (long-run effects).[2] Consequently, there is a gap in the New Zealand literature on PPL and family policy provisions and their impacts on maternal labour supply, particularly beyond the PPL and job-protected period. I seek to fill this gap by posing the following research question:

*What is the causal effect of the 2018 extension in PPL from 18 to 22 weeks and the*

[2] Wilson and McLeod's (2021) empirical evaluation of New Zealand's 2018 PPL extension and Best Start payments was not released until January 2021. This thesis was already underway by July 2020 and my methodology and results were established prior to my awareness of their study.

*introduction of the universal $60 weekly Best Start payments on mothers' employment and labour earnings in the 18 months postbirth?*

My contribution to the literature is two-fold. First, using population-wide administrative data, I identify the causal effect of the 2018 extension in PPL and introduction of Best Start payments on maternal employment and labour earnings up to 18 months postbirth. This contribution provides insight into the employment effects beyond the PPL period and thereby aligns the New Zealand literature with the international literature's methodology and outcomes of interest i.e., I evaluate both the short-run and long-run impacts of parental leave and family policy using quasi-experimental methods. Second, by exploiting the possibility in the administrative data to link family members to one another, I evaluate the policy's spillover effects on employment and labour earnings by extending the analysis to fathers and maternal grandmothers associated with my sample of mothers. This analysis contributes to the international literature which, as outlined above, is largely focused on mothers' employment outcomes.

The implementation of the 2018 Families Package restricted eligibility for the 22 weeks of PPL and Best Start payments to mothers who were due or gave birth after 1 July 2018. I exploit the discontinuity in eligibility for the policy change by comparing mothers who gave birth between July and December 2018 i.e., were eligible for the PPL extension and Best Start payments, and mothers who gave birth between January and June 2018 who were ineligible. I use a difference-in-differences estimator to recover the causal effect of the PPL extension and Best Start payments on maternal employment up to 18 months postbirth.

I identify an increase of nearly three weeks in the length of PPL taken, illustrating that mothers do increase their length of PPL when offered the additional four weeks. At 20 weeks postbirth, I find that maternal employment decreases by 3.6 percentage points which is 18% of the estimated counterfactual employment rate, suggesting that increased PPL results in more time spent at home with the child as opposed to crowding out unpaid leave. However, I find no change in employment from six months postbirth, implying that the Best Start payments and additional weeks of PPL do not affect employment beyond the PPL period. Furthermore, I find no evidence of a change in fathers' postbirth employment rates which suggests that Best Start payments do not affect fathers either.

Similarly, maternal grandmothers demonstrate no change in postbirth employment as a result of the PPL extension or Best Start payments, perhaps because the consistency in mothers' employment beyond the PPL period does not leave room for an increase in informal childcare arrangements made with grandmothers.

The remainder of this thesis proceeds as follows. In Section 2, I provide further details of the PPL extension, Best Start payments and the remaining components of the 2018 Families Package, outline their position in the context of New Zealand's history of family policy, and then place New Zealand's PPL provisions in an international context. In Section 3, I review key studies in the literature that empirically evaluate the effect of parental leave and family policy on maternal labour force attachment. In Section 4, I describe my data source and estimation sample, including descriptive analyses using my chosen sample and mothers giving birth in years without a policy change. In Section 5, I provide my econometric methodology including both instrumental variables and difference-in-differences methods. In Section 6, I present the results from my primary and robustness analyses. In Section 7, I conclude.

# 2 Policy background

The Families Package is a bundle of policies targeted at low- and middle-income families that was implemented in New Zealand on 1 July 2018 (Robertson, 2017). Two of these policies specifically affect new mothers: (1) an extension in publicly-funded paid parental leave (henceforth denoted as PPL); and (2) the introduction of the so-called 'Best Start' - a $60 weekly payment available to *all* new mothers (Robertson, 2017). In this section I provide further details of PPL, Best Start payments, and the other components of the 2018 Families Package. I conclude this section by placing New Zealand's parental leave provisions in an international context.

## 2.1 Paid Parental Leave (PPL) policy in New Zealand

PPL was first legislated in New Zealand under the Parental Leave and Employment Protection Act 2002 (henceforth the Act). Under the original Act, pregnant women qualified for 12 weeks of paid leave provided they had worked for the same employer for an average of 10 hours per week in the 12 months prior to their due date.[3] The weekly payments matched the lower of the full-time minimum wage or the mother's prebirth wage.[4] Women could receive PPL from as early as six weeks prior to their due date, and as late as one year postbirth, giving them the opportunity to take employer-owing annual leave or employer-funded maternity leave in addition to PPL.[5] The purpose of PPL is to allow mothers to rest and recover after childbirth while at the same time strengthening their postbirth labour force attachment (Ministry of Business, Innovation and Employment, nd).[6]

The Act underwent several reforms prior to the enactment of the 2018 Families Package. Each reform consisted of changes to either the employment criteria or the maximum number of weeks. The relative payment level has not changed much over time as the

[3] Note that pregnant women were also entitled to 52 weeks of job-protected leave if they met these criteria. Refer to Section 2.3 for more information about job-protected leave in New Zealand.

[4] This equated $325 per week in 2002.

[5] The total PPL payment entitlement is back paid if mothers choose to start receiving PPL at a point that is closer to the child's first birthday than than the maximum number of weeks of PPL.

[6] Mothers may transfer some or all of their PPL entitlement to fathers provided that fathers also meet the same employment criteria, however I identify that only 1% fathers took PPL in 2018 (using data sourced from Statistics New Zealand's Integrated Data Infrastructure), thus I focus on mothers for the remainder on this thesis and explore the spillover effects on fathers in Section 6.

maximum weekly payments are modified each year to reflect increases in the New Zealand median wage.

Between 2004 and 2006, the employment criteria for PPL were relaxed such that PPL became available for pregnant women who: (a) had worked an average of 10 hours per week for the same employer in the *six or* 12 months prior to their due date, or (b) fulfilled the same criteria but from self-employment. Further, the maximum PPL duration was extended from 12 to 14 weeks by 2005, and again from 14 to 16 weeks by 2015.[7]

The last amendment to the Act prior to 2018 occurred in 2016. The 2016 Amendment included two changes: first, the maximum PPL duration was extended to 18 weeks; and second, the employment criteria were lowered once more. The revised employment criteria, which still apply after the 2018 PPL extension, required that pregnant women be employed (with multiple employers or self-employed) for, at least an average of, 10 hours a week in any 26 of the 52 weeks prior to their due date. From 1 July 2017, the maximum weekly payment was $538.55.[8]

## 2.2 The 2018 PPL extension

The Families Package was passed into law on 14 December 2017 by Honourable Grant Robertson who was the Minister of Finance in New Zealand's Labour-led government (New Zealand Parliament, 2017). The Families Package came into force on 1 July 2018 and included an extension in the maximum PPL duration from 18 to 22 weeks. The PPL extension was designed to reduce the financial stress of new mothers and allow them to spend more time at home with their child (Ministry of Social Development, 2019). The extension applied to pregnant women who were due or gave birth after 1 July 2018 (Robertson, 2017).

All other features of PPL, including employment requirements and transferability between mothers and fathers, remained unchanged from those prescribed in the Parental Leave and Employment Protection Act 2016 - with the exception of the regular annual increase in the maximum weekly payment, which increased the payment to $564.38, also occurring

[7] Parental Leave and Employment Protection Amendment Act 2004, 2006, 2014.

[8] Parental Leave and Employment Protection Amendment Act 2016.

on 1 July 2018.[9]. Importantly for my identification strategy, the increase affected all PPL payments from this date, regardless of due date or birth date.

## 2.3 Job-protected parental leave

By way of context, I provide some details of job-protected leave in New Zealand. Job-protected leave was introduced as the Parental Leave and Employment Protection Act 1987, 15 years prior to the introduction of PPL. Mothers were (and still are) offered up to 52 weeks of unpaid job-protected leave. In order to qualify for either six or 12 months of job-protected leave, pregnant women must have worked at least an average of 10 hours per week for the same employer in the six or 12 months preceding their due date, respectively.[10] Between the 2016 Amendment to the Act and the implementation of the 2018 Families Package, both the six-month and 12-month job-protected leave entitlements and their employment requirements did not change.

Job-protected leave allows mothers the option of returning to their prebirth job and wage after taking parental leave, provided they return within the six or 12 months. Mothers who delay their return to work until after their job-protected leave entitlement is exhausted have necessarily exited the labour market (Employment New Zealand, 2018).

## 2.4 Best Start

The 1946 Family Benefit was the first non-means-tested payment to mothers with dependent children (16 years and younger) in New Zealand. The Family Benefit, which was designed to incentivise women to stay at home and look after their children, was repealed in 1990 in favour of earned income tax credits (EITC) (Welfare Expert Advisory Group, 2018). The abolition of universal payments was accompanied by a shift in focus towards incentivising employment. As such, universal family benefits did not exist between 1990 and June 2018.

On 1 July 2018, the Labour government reinstated a non-means-tested family benefit - the so-called 'Best Start'. Best Start is a weekly payment of $60 for every child due or

[9]Parental Leave and Employment Protection Amendment Act 2016, 2017

[10]The PPL period is included in the job-protected leave period – i.e., mothers who meet the six-month criteria and receive 18 weeks of PPL are then entitled to an additional eight weeks of unpaid job-protected leave.

born after 1 July 2018 (Robertson, 2017). The eligibility criterion for Best Start is that the child must be a New Zealand resident living in New Zealand. Mothers start receiving Best Start payments from the end of the PPL period and the payments are universal until the child turns one (New Zealand Government, 2020a).[11] Contrary to the rationale behind the 1946 Family Benefit, Best Start is designed to ease mothers' transition back into the labour market in the months postbirth (Ministry of Social Development, 2019).

## 2.5 Other elements of the 2018 Families Package

The 2018 Families Package also included new policies and changes to pre-existing policies, listed as follows: an increase in the Family EITC abatement threshold; a winter energy payment for beneficiaries and pensioners to contribute to household heating costs; an increase in the Orphan's Benefit, the Unsupported Child Benefit and Foster Care Allowance; an increase in the Accommodation Benefit and Accommodation Supplement; and the reintroduction of the Independent Earner EITC. Importantly, eligibility for these additional payments is unrelated to birth or due dates. Rather, the additional policies took effect for all eligible families from 1 July 2018 (Arnesen, 2020). Therefore, these other components of the Families Package have no bearing on the validity of my identification strategy.

## 2.6 New Zealand's parental leave provisions in an international context

According to the OECD (2019b), all OECD countries offer some form of PPL, except the US. After the introduction of the 2018 Families package, New Zealand's PPL provision surpassed the OECD average of 18 weeks. However, regarding the income replacement rate of PPL payments, the average among OECD countries is 77% of mothers' prebirth earnings (OECD, 2017).[12] New Zealand is slightly less generous, replacing less than 50% of the average mother's weekly income, however this income replacement rate is

[11] Mothers receive Best Start from the day the child is born if they do not receive PPL. Best Start is available in the child's second and third years for families earning \$93,858 or less. The full \$60 payments are available for the second and third years of the child's life if household income is \$79,000 or less and are abated at 21% if family income is between \$79,000 and \$93,858. Best Start is paid to the primary caregiver listed as per the birth certificate, which in most cases is the mother (Robertson, 2017)

[12] Austria, Chile, Estonia, Germany, Israel, Lithuania, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovenia and Spain provide PPL payments at a 100% income replacement rate (OECD, 2019b)

in accordance with other anglophone OECD countries (OECD, 2017). In the following section, I summarise how New Zealand's PPL policy compares to that of Australia, the US, the UK, Germany, Finland and Sweden in the following areas: (i) maximum length of PPL; (ii) maximum weekly payments of PPL; (iii) criteria in order to qualify for PPL; and (iv) job protection.

New Zealand's parental leave provisions are in accordance with those of other culturally similar countries, such as Australia and the UK. In Australia and the UK, the eligibility criteria for PPL follow the same format, requiring that a minimum of eight to 10 hours per week are worked in the six months prior to the mother's due date. Australia's Paid Parental Leave Act 2010 offers 18 weeks of PPL at a replacement rate equivalent to the full-time minimum wage, with an additional 52 weeks of unpaid job-protected leave – the same as New Zealand's provisions prior to the introduction of the 2018 Families Package.[13] The UK offers longer leave lengths. Mothers are entitled to a total of 39 weeks of PPL (paid at a similar income replacement rate as New Zealand) and 70 weeks of unpaid job-protected leave (UK Government, 2021). In contrast, the US is one of few countries that does not offer PPL and mandates a significantly shorter job-protected leave period than New Zealand of 12 weeks (US Department of Labor, 2021).[14]

European countries differ from New Zealand, Australia and the US in that they have higher levels of redistribution. Germany, France and Scandinavian countries are welfare states with public spending focused on subsidising healthcare, higher education, and care for the elderly (Fenwick, 2019). In accordance with this, Germany and France, and Scandinavian countries, such as Finland and Sweden, offer more generous parental leave provisions than New Zealand. These European countries have also shifted their focus from maternity leave to parental leave (European Commission, ndb). Parental leave reflects a change in gender attitudes towards more equal distributions of labour market and parenting duties between mothers and fathers (Grunow et al., 2018). As such, maternity leave is short, highly paid leave specifically for mothers and is taken immediately following birth to allow rest and recovery after childbirth. Parental leave is longer and lower paid

[13] Paid Parental Leave Act 2010.

[14] Employees in the US are entitled to 12 weeks of unpaid job-protected leave if their employer is a public agency, an educational institution, or a company with 50 or more employees (US Department of Labor, 2021).

leave that either parent may apply for, taken after maternity leave.[15] France and Germany offer maternity leave for 16 and 14 weeks, at 90- and 100%-income replacement rates, respectively. At the end of this period, either parent may take PPL which is paid at a lower replacement rate for 26 weeks and 44 weeks respectively (OECD, 2019b).

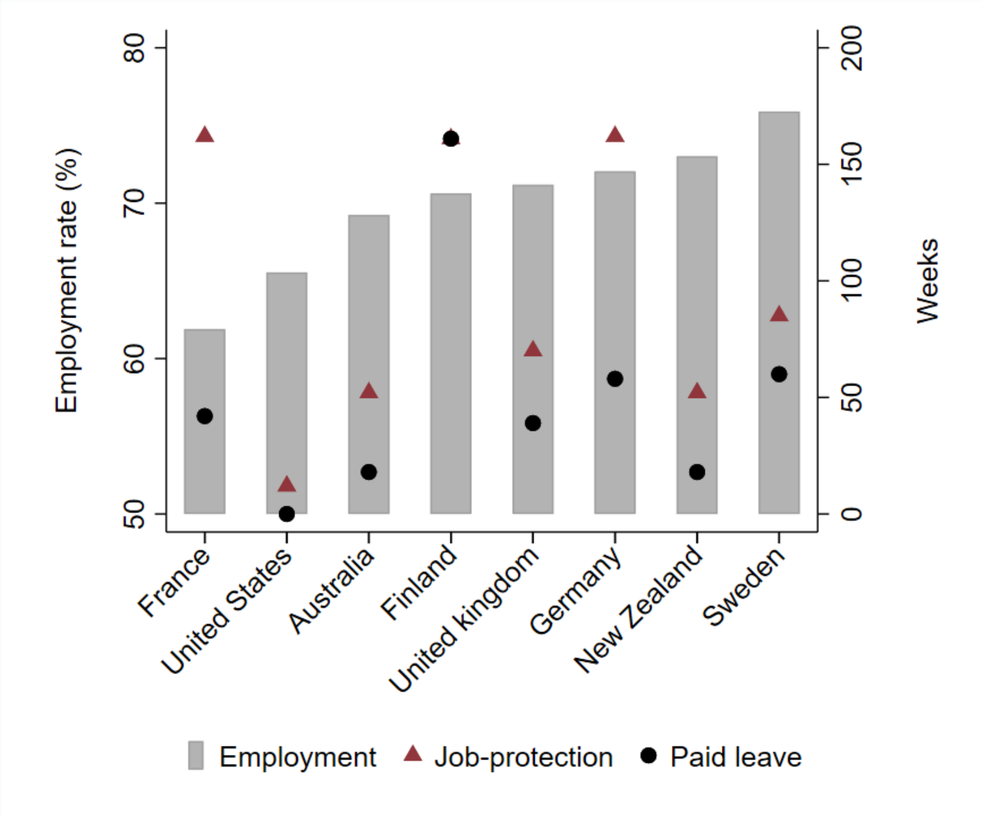
Next, I describe parental leave entitlements in the Scandinavian countries. Sweden is a welfare state with publicly-funded childcare, healthcare and education, as well as high employment rates for both men and women. The high labour force attachment of women is, in part, due to the promotion of gender equality in the labour market and equal involvement of both mothers and fathers in household duties. Finland has lower employment rates but shares the same policy focus on gender-equal parenting and dual-earner households (Nygård and Duvander, 2021). In both countries, maternity leave is available to all mothers, regardless of employment status. Finland grants 17 weeks of maternity leave with an income replacement rate of 75%, and then an extensive PPL length of 143 weeks to be taken after maternity leave. However, the 143 weeks of PPL are paid at an income replacement rate that is about half of that of New Zealand's (approximately 20% of prebirth income) (European Commission, nda). Sweden offers 13 weeks of maternity leave also paid at a 75% income replacement rate, and then 43 additional weeks of PPL which are paid at a higher income replacement rate than Finland's of 60% (OECD, 2019b). Furthermore, Finland provides a universal monthly childcare payment for all children under three, which is further supplemented by a means-tested payment for low-income households (Finland Institution of Insurance, 2021).

Figure 2.1 below depicts the maximum paid leave and job-protected leave entitlements for New Zealand, Australia, the US, the UK, France, Germany, Finland and Sweden against female employment rates. France, with the highest spending on welfare, has the lowest female employment rate, while Sweden, with an explicit goal of full employment, has the highest (OECD, 2016b). The most common setup is that job protection outlasts PPL, with Finland being the only country among those selected to provide PPL for the same duration as job protection. There is large variation in the parental leave provisions between countries and no obvious correlation between female employment and parental leave policy. Although New Zealand has less generous parental leave provisions than the

[15] Although New Zealand gives mothers the option of sharing PPL with their partner, two types of paid leave are not offered and PPL is aimed at mothers (New Zealand Government, 2020b).

other developed countries, female labour supply is relatively high.

**Figure 2.1:** Female employment rates, job-protected leave and PPL in 2018

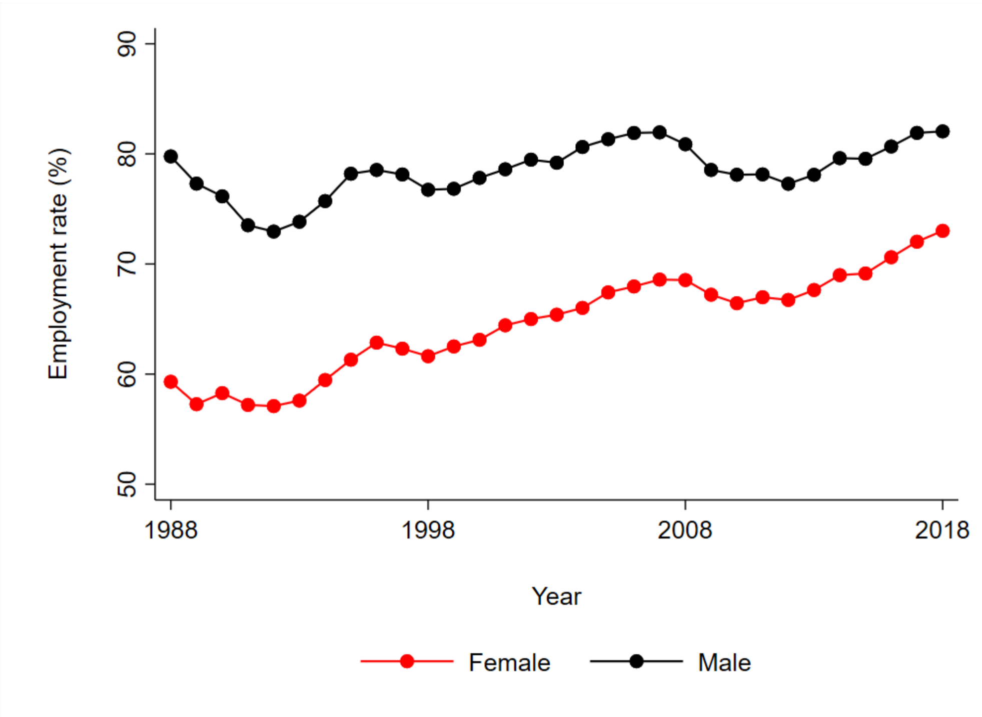



*Notes:* The countries are ordered by female employment rate, and this is measured as a percentage of working age women (15-64) as at September 2018. The points represent the maximum job-protected leave and PPL entitlements that are available to mothers, including paid leave entitlements that can be applied for by either parent or shared between both parents. Thus, the points represent the maximum leave entitlement as if only mothers apply for those leave types. The graph gives a measure of the maximum length in weeks.
*Source:* OECD (2020). *Family database*. http://www.oecd.org/els/family/database.htm and www.oecd.org/social/expenditure.htm.

# 3 Literature

The upsurge of the female workforce over the last century has been an important driver of modern economic growth among developed countries (Galor and Weil, 1996). As illustrated in Figure 3.1 below, New Zealand is no exception. Figure 3.1 shows New Zealand's male and female employment rates from 1988 to 2018, highlighting the narrowing of the gender employment gap as a result of steadily increasing female labour supply. There are many reasons as to why female labour supply has increased so drastically in the last several decades, thus the academic literature on the subject is vast.

**Figure 3.1:** Male and female employment rates in New Zealand 1988-2018




*Notes:* Employment rate is defined as the proportion of the working age population (aged 15-64) in paid employment for at least one hour in the reference week. The data go as far back as 1986 and as recently as 2021. The variation in employment rates between years, particularly for the curve denoting male employment, reflects changes in general labour market conditions as these employment rates have been calculated using raw data without accounting for exogenous shocks or the business cycle. The reference week is not specified.
*Source:* OECD (2021). Employment rate database. https://data.oecd.org/emp/employment-rate.htm.

A very brief summary of the key findings of the literature could be as follows: (a) technological advancement improves the efficiency of household labour such that women can invest more hours into paid employment (Greenwood et al., 2016); (b) the widespread introduction of contraceptives led to decreased fertility, and women with fewer children have more time to allocate to the labour market (Bailey, 2006); (c) the 1970s saw an ubiquitous change in attitudes towards the role of women in society whereby women are able to attain higher education and higher-paying employment (Fernandez, 2007); and (d) public policy has been used to encourage labour supply among mothers, in particular.

According to the Ministry of Social Development (2019), the 2018 extension in PPL from 18 to 22 weeks and the Best Start payments are expected to work in tandem to achieve both: (i) an increase in the time mothers spend at home with the child during the six months following child birth; and (ii) an increase in maternal labour supply from six months postbirth.

Despite the literature on maternal labour supply being only a subset of the general literature on the female workforce, it is incredibly extensive. Therefore, in this section, I provide a selective overview on evaluations of policies similar to New Zealand's 2018 PPL extension and Best Start payment scheme[16] in the following key areas: (i) job-protected leave, (ii) PPL, (iii) universal family benefits, and (iv) childcare policies.[17] My thesis adds to the second and third strands of this literature since I evaluate the impacts of PPL and universal family benefits on maternal labour supply using quasi-experimental methods, hence the inclusion of these two policy areas. The literature on job protection and childcare subsidies gives useful insights when interpreting my results, so I also include a brief review of key studies in these areas.

## 3.1 Paid parental leave and job-protected leave

One of the overarching goals of parental leave policy – both PPL and job-protected leave – is to strengthen female labour force participation (Department of Labour, 2007). Employment allows mothers to: (a) contribute more to household income, increasing quality of life; and (b) increase financial investment into children, demonstrating that children also benefit from parental employment (Jaumotte, 2004). Furthermore, long periods outside of the labour market can cause not only depreciation of firm-specific

[16] One recent study evaluates the same policy, i.e., the 2018 PPL extension and Best Start payments, however the outcomes of interest differ from those in this thesis, see Wilson and McLeod (2021).

[17] The structure of this section is loosely based on that of Olivetti and Petrongolo (2017).

human capital, but also depreciation in skills more generally (Edin and Gustavsson, 2008). In order to mitigate this issue, mothers must strike a balance between time spent at home with their child and time at work. Policymakers can use PPL as a tool to encourage the preferred leave-taking and employment behaviour.

Below, I summarise a selection of both international and New Zealand empirical microeconometric studies that evaluate how job protection and PPL affect maternal employment. The international studies use quasi-experimental methods that directly inform my research due to their similarities in data and empirical strategy (see Section 5 for further discussion on my econometric methodology), and their relevance in contemporary policy settings.[18] Naturally, the (few) studies evaluating PPL in New Zealand and Australia directly relate to the context of New Zealand's 2018 PPL extension and Best Start payments.

### 3.1.1 Job-protected leave

Job-protected leave guarantees mothers the right to return to their prebirth job and wage at the end of the parental leave period. Job protection is designed to strengthen labour force attachment among eligible mothers and reduce the wage penalty of motherhood (Ruhm, 1997). In this section I provide an overview of studies evaluating job-protected leave in Germany, Canada and Austria.[19] New Zealand's 52-week job protection entitlement did not change after the implementation of the 2018 Families Package. I include this section to provide some insight as to whether the mothers tend to exhaust the job-protected period, and discern what this might mean for the impact of the 2018 PPL extension on employment.

In 1955, Germany became one of the first countries to implement job-protected leave, introducing two months of job protection for new mothers. Germany has enacted several extensions in job-protected leave since, two of which have been extensively studied: a two- to six-month extension in 1979, affecting mothers giving birth after 1 July 1979; and an 18- to 36-month extension in 1992, affecting mothers giving birth after 1 July 1992. Dustmann and Schönberg (2012) compare the employment status of mothers who gave birth six months before and six months after the date of each policy change and use a

[18] See Ruhm (1998) for an earlier comprehensive cross-country analysis of parental leave provisions in Europe.

[19] There are no New Zealand studies empirically evaluating the causal effect of job-protected leave, in isolation, on postbirth maternal labour force attachment.

difference-in-differences estimator to identify the effect of each expansion on maternal labour force attachment, an approach which I also take in this thesis (see Section 5). The 1979 expansion reduced maternal labour supply in the child's first year, and the subsequent 1992 expansion reduced maternal labour supply in the child's second and third years, suggesting that a significant proportion of mothers tend to exhaust the job-protected leave period. If a significant proportion of New Zealand mothers tend to exhaust the job-protected leave period, then the extension from 18 to 22 weeks in PPL is likely to have little effect on employment.

Almost 30 years after Germany, Canada introduced a nationwide job-protected leave entitlement of 17 weeks in 1982. In 2000, job protection was increased to 52 weeks at the same time that PPL was increased from 10 to 35 weeks. Implementation of this policy change was staggered across provinces. Baker and Milligan (2008a,b) exploit this regional variation to find that the offer of 52 weeks of job-protected leave caused a significant decrease in employment within the job protection period, but increased labour force attachment after those 52 weeks. This finding provides further evidence that a significant proportion of mothers return to work at the end of the job protection period regardless of the length of PPL.

Similar to Germany and Canada, Austria implemented three significant changes to their parental leave legislation. The first was an increase in both job-protected leave and PPL from 12 to 24 months, occurring on 1 July 1990. The second was a reduction in the length of PPL to 18 months, enacted 1 July 1996, after which job protection outlasted PPL. The third was an increase in PPL to 30 months, introduced from 1 July 2000, after which the PPL duration was six months longer than the job-protected period. Eligibility for the revised provisions was determined by birth date relative to 1 July of the corresponding year – mothers giving birth before were not eligible and mothers giving birth after were. Lalive and Zweimüller (2009) and Lalive et al. (2014) evaluate the effects of these three policy changes on employment up to 10 years postbirth using a combination of regression discontinuity and difference-in-differences approaches. In contrast to the previous two studies, the authors find that, when job protection outlasts PPL, PPL expiry is a more significant driver in returning to employment than job-protected leave expiry. This result suggests that the additional four weeks of PPL in New Zealand may enable more mothers to stay at home for longer in the months following birth.

### 3.1.2 Paid parental leave

PPL is designed to encourage women to stay at home in the months following childbirth, affording them the opportunity to rest, recover and bond with their child (Lees-Galloway, 2018). The benefits of mothers staying home with their children in the early developmental stages has been well documented. For example, Cunha and Heckman (2007) find that almost 50% of income inequality between societal groups can be explained by the environment that children grow up in until the age of 18. Moreover, the formation of cognitive and non-cognitive skills that impact health, employment and life satisfaction outcomes is dependent on the quality of care in early childhood (see, for example, Liu and Skans (2010), Heckman et al. (2013)). The World Health Organization (2020) has also emphasised the physiological benefits of exclusive breastfeeding in the six months postbirth, such as decreased risk of obesity and diabetes.

The four-week extension in PPL, as part of the 2018 Families Package, is designed to increase mothers' investment in full-time childcare in the first six months following birth (Ministry of Social Development, 2019). In a survey conducted by the Department of Labour (2007), mothers reported that they would like to stay home for at least a year after giving birth, but often return to work during or at the end of the maximum PPL period due to financial constraints (see also Noy and Sin (2021)). Thus, there is potential for mothers to increase leave-taking as a result of the four-week extension in PPL. Nonetheless, the period of job-protected leave remains unchanged.

As outlined in the previous section, both job protection and PPL are important tools for incentivising greater time spent at home. Building upon the previous literature, I provide a selection of studies that look at both the introduction of and extensions in PPL in international policy settings. I then discuss the New Zealand literature on PPL policy and compare this with Australian literature on the same subject.

#### 3.1.2.1 PPL - International literature

The two areas of focus in the international literature are short-run employment (within the PPL period) and long-run employment (beyond the PPL period). Thus, I include studies which provide insight into how PPL extensions affect employment at both stages postbirth in Norway and Germany.

Norway first introduced 18 weeks of PPL and 52 weeks of job protection in 1977. Carneiro et al. (2015) examine this introduction using a difference-in-differences estimator and find that mothers spent more time at home with the child within the extended PPL period, and this improved children's educational and employment outcomes. There was no change in employment or labour earnings after the PPL period up to five years postbirth.

Between 1987 to 1992 Norway legislated five PPL expansions, increasing the maximum duration to 35 weeks while job-protected leave remained unchanged. Like the Austrian parental leave reforms, eligibility for each extension was determined by birth date. Dahl et al. (2016) conduct a cost-benefit analysis with population-wide administrative data by exploiting the discontinuities in PPL length at the margins of each policy amendment date. Naturally, all five reforms required increased public spending and this analysis measures whether there was any payoff in maternal employment and child outcomes to justify such spending. The first and second parental leave amendments increase PPL from 18 to 20 weeks and 20 to 22 weeks, respectively, which are remarkably similar expansions to New Zealand's four-week PPL extension in 2018.[20] The authors find no change in maternal employment in the short- or long-run, nor any significant improvement in children's outcomes, from any of the PPL expansions - including the two that increased PPL from 18 to 22 weeks.

Schönberg and Ludsteck (2007, 2014) examine the same parental leave reforms in Germany, as outlined in the previous section on job-protected leave, but with a focus on the corresponding extensions in paid leave. Using a similar method, the authors compare ineligible mothers who gave birth shortly before the enactment of each expansion with eligible mothers who gave birth shortly afterwards. The expansions lend themselves to a comparison of a relatively moderate increase in PPL (from two to six months), a steep increase in PPL (from six to 22 months), and a modest increase (from 22 to 24 months). The study concludes that the first and last reforms had no significant impact on maternal labour supply, but the steep increase from six to 22 months significantly reduced employment within the child's first six years, thus impacting both short- and

[20] Note that the replacement rate of PPL payments in Norway are 100% (Dahl et al., 2016).

long-run labour supply. They also find that such a decrease in employment results in a substantial wage penalty. This study suggests that a modest increase, such as New Zealand's four-week extension, is likely to have no impact on maternal labour supply postbirth.

#### 3.1.2.2 PPL - New Zealand literature

There is a small literature on PPL in New Zealand mostly made up of qualitative studies and reviews of the international literature (see, for example, Callister and Caltry (2006), National Advisory Council on the Employment of Women (2008), Forbes (2009), St. John and Familton (2011), St. John (2014)). I focus on three key empirical New Zealand studies that evaluate PPL.

The first study was conducted by the Department of Labour (2007) and is an evaluation of the 2002 introduction of 12 weeks of PPL. The authors use quantitative survey data to provide descriptive analysis of maternal employment in the 18 months postbirth. The data were collected by the Department of Labour in a series of interviews that were conducted in 2005. The questions sought to measure self-reported length of leave taken, preferred length of leave and postbirth employment habits. The main finding is that a majority of mothers return to work within the six months postbirth due to financial constraints. Mothers reported that they would like to take the entire year of unpaid job-protected leave but could not afford to. Fathers appear to take almost no parental leave.

The second study is by Crichton (2008), who also evaluated the introduction of PPL in New Zealand, instead using administrative data to describe the effects of PPL on postbirth employment. The author observes the employment status of mothers who gave birth between 2002 and 2005 in the 36 months prior to the date they give birth and the 18 months post. The study finds that, after the 2002 introduction of 12 weeks of PPL, just under half of mothers return to work in the six months following birth and that almost all mothers had returned to work by the end of the unpaid job-protected leave period. These results are in accordance with those of the Department of Labour's (2007) study, however causality is not asserted in this study.

Third, and more recently, Wilson and McLeod (2021) evaluated the effect of the 2018 PPL extension and Best Start payments on household income and mothers' length of leave in the first six months postbirth using administrative data. As outlined in Section 2, women qualify for 18 weeks of PPL unless they are due or give birth after 1 July 2018, in which case they are eligible for 22 weeks of PPL and Best Start payments. The authors exploit this variation in eligibility for the PPL extension and Best Start payments by comparing mothers who gave birth within three months prior to 1 July 2018 with mothers who gave birth within the three months after 1 July 2018. The authors acknowledge that it was possible for mothers to delay childbirth until after 1 July 2018 in order to become eligible for the additional policy provisions. They test for manipulation of birth timing using birth registration data containing the exact day of birth. The results suggest that there was a modest spike in births in early July with a mean of 80, which is around 1.6% of the average monthly birth rate of 5,000. However, there was no significant reduction in births in late June, which suggests that only a small number of mothers shifted their delivery date from June into July. The second part of the analysis uses a difference-in-differences approach to track the effect of the PPL extension and Best Start payments on household (labour and non-labour) income and mothers' leave taken in the six months postbirth. The main findings suggest that total household income significantly increased in the six months postbirth, suggesting that there is a high takeup rate of both the additional PPL payments and Best Start. The results also highlight a small increase in mothers' leave-taking within the PPL period due to the PPL extension.[21]

#### 3.1.2.3 PPL - Australian literature

Australia did not legislate PPL until the 2010 Paid Parental Leave Act which offered pregnant women 18 weeks of PPL if they were employed in the 12 months prior to their due date and earned less than AU $150,000 per year (Department of Social Services, 2014). PPL was introduced in Australia for the same reasons as it was in New Zealand - to allow mothers to stay at home for longer with their child whilst simultaneously maintaining their labour market attachment. Martin et al. (2014) use survey data to assess the employment effects of the introduction of PPL up to 12 months postbirth. The results of this study show that the introduction of PPL increased the proportion of mothers on leave in the

[21] The methodology used by Wilson and McLeod (2021) is very similar to my methodology (see Section 5). However, I had undertaken my analysis in July 2020 and was not aware of their 2021 study until after determining the appropriate methodology (inspired by Dustmann and Schönberg (2012)) and establishing my results. Thus my analysis was conducted independently of Wilson and McLeod (2021).

first six months postbirth. This increase in leave-taking was most pronounced in the 18 weeks postbirth in which PPL payments are received. However, the modest increases between 18 weeks and six months postbirth that are identified suggest that PPL has employment effects even after the entitlement period is exhausted.

Broadway et al. (2020) also evaluated the effects of PPL on maternal labour supply in Australia using survey data. The authors conducted surveys for a sample of mothers giving birth in October 2009, who did not qualify for PPL, and a second sample of mothers giving birth in April 2011, who did. Mothers from both groups were surveyed about their employment status at six months and at 12 months postbirth. Both studies use propensity score matching to find that, after the introduction of PPL, there was an increase in both the number of mothers on leave in the 18 weeks postbirth and the number of mothers employed at 12 months postbirth (the end of the job protection period). These results appear to be more pronounced among low-income and lower-educated mothers who are eligible for PPL, perhaps reflecting that the replacements rates are higher for this group. The finding that PPL increased leave-taking is consistent with findings in New Zealand. From this, one might expect mothers with higher household income to be less responsive than mothers with lower household income to the 2018 PPL extension and Best Start payments as they can afford to take more time off work.

## 3.2 Universal child benefits

For New Zealand mothers who take PPL, the Best Start scheme of the 2018 Families Package commences at the end of the PPL period.[22] According to the Ministry of Social Development (2019), the additional $60 per week (per child) is intended to increase family income and serve as a childcare subsidy, thus reducing the friction that comes with transitioning back into the labour market. The payments have additional indirect effects, such as reducing financial stress and improving income equality between socioeconomic groups, which is intended to improve a range of outcomes, including employment, among recipients. Therefore, employment is expected to increase from six months postbirth. In this section I discuss the findings in evaluations of similar policies enacted in Canada, Australia and Spain.

[22] Best Start payments can begin as early as the date of birth for mothers who do not take PPL.

The Canadian National Child Benefit (NCB) was enacted in 1998 and is available to all families earning under CAN $79,000 per annum (low-income families) regardless of their employment status. The NCB was introduced to financially assist families with children and incentivise parental labour force participation, much like New Zealand's Best Start (Government of Canada, 2005). Although the NCB is targeted at low-income families, it is unearmarked among families earning under the aforementioned threshold, which draws a parallel with New Zealand's Best Start payments that are unearmarked and available to all families at any income level. Some Canadian provinces chose to subtract the NCB from total benefit receipts, therefore implementing the NCB as if it were an earned income tax credit (EITC), while the other provinces administering the unearmarked NCB treated it as a universal benefit. Milligan and Stabile (2009) exploit this variation using survey data to measure mothers' employment two years after the policy change. They find that there was a 20% decrease in the average benefit receipt as a result of the EITC-structured NCB, and no change in employment in provinces where the NCB was implemented as a non-means-tested payment among low-income families. This finding suggests that Best Start is likely to have little impact on employment because the payments are unearmarked.

In response to declining fertility and an ageing population, Australia implemented the Baby Bonus in 2004. The Bonus was designed similarly to Best Start - as a universal per-child payment to help with childcare costs. However, the Bonus amounting to AU $3000 was paid as a lumpsum. The Baby Bonus was not designed to incentivise maternal employment, thus there is only one study that evaluates its effect on mothers' postbirth employment, namely Brough et al. (2009). This qualitative study comprises 26 Australian mothers who received the Baby Bonus and also returned to work within one year postbirth. Focus group interviews were carried out in order to gauge when exactly the mothers returned to work, why they returned at that point in time, and their attitudes towards the Baby Bonus. Mothers reported that the Baby Bonus is helpful in covering childcare costs; however, the authors conclude that the $3,000 lumpsum payment had no effect on maternal employment.

On 1 July 2007, Spain introduced a universal child benefit, also in the form of a lumpsum payment, of €3,000. Women who gave birth after 1 July 2007 were eligible for the payment, while women who gave birth beforehand were not. The purpose of this policy was to increase fertility; however, González (2013) evaluated its impact on maternal labour supply. The eligibility criterion lends itself to a regression discontinuity design, used by the author in combination with a difference-in-differences approach to control for labour market seasonality. The results demonstrate that the lumpsum universal benefit caused mothers to remain outside the labour market for longer, and that the use of childcare decreased, implying that mothers spent more time with their children as a result.

## 3.3 Childcare subsidies

Best Start payments can positively affect maternal labour supply by supplementing spending on childcare. New Zealand has the second least affordable childcare among the 38 OECD countries which could inhibit postbirth employment (OECD, 2016b). The Best Start payments received by mothers in the child's first year total roughly two-thirds of babies' annual childcare costs (Preston, 2019). I provide a selection of key studies that evaluate the impacts of childcare subsidies in Norway and Canada on maternal employment to provide some general insight into mothers' labour market responses *if* the Best Start payments were spent on childcare. I conclude this section with a New Zealand study that also evaluates the employment effect of a childcare subsidy for children aged between three and four. Of course, the applicability of these results to my analysis is limited as Best Start is not earmarked.

### 3.3.1 Childcare subsidies - International literature

Norway was one of the first countries to subsidise childcare, in addition to being one of the first to introduce PPL, doing so in 1962 by legislating nationwide means-tested childcare subsidies. In 1975, Norway expanded the coverage of subsidised childcare to all children aged between three and six regardless of parental income. This reform was staggered across region and time, with 400 regions implementing the expansion in different years between 1976 and 1979. Havnes and Mogstad (2011) evaluate the effect of the expansion on maternal employment by exploiting both regional and temporal variation using a difference-in-differences approach. After controlling for labour market seasonality and time-varying region-specific characteristics, the authors find that the expansion had no impact on the employment status of women with children aged between three and six. This finding suggests that these mothers were not constrained by childcare costs and replaced informal childcare arrangements, such as those with grandparents, with the subsidised childcare provisions. This could cause an increase in grandparents' employment as informal childcare arrangements are no longer needed.

In 2000, the Canadian province of Quebec introduced a CA $5 per day maximum spend on childcare for all children under five in order to encourage maternal labour supply. While New Zealand's Best Start payment is not as generous as Quebec's childcare subsidy, both schemes are non-means-tested thus the literature on Quebec's subsidy directly applies to my analysis of Best Start. Baker et al. (2008) and Lefebvre and Merrigan (2008) use panel survey data to evaluate the impact of Quebec's childcare subsidy on maternal employment. Due to the fact that Quebec was the only province in Canada to introduce the subsidy, both studies use a difference-in-differences model that exploits regional variation to find that the policy resulted in a significant increase in married women's labour supply. These results contrast those of Havnes and Mogstad (2011) for Norway, highlighting the range of impacts that such family policies have on maternal labour supply in different policy settings. Baker et al. (2008) provide additional findings on children's outcomes as a result of Quebec's subsidy, concluding that the increased maternal labour supply occurred at the expense of children's behavioural and health outcomes (see also Baker et al. (2019)).

Shortly after Quebec introduced their childcare subsidy, Italy implemented their 'Early Kindergarten' policy in 2003. In Italy, heavily subsidised childcare was originally reserved for children aged between three and five. The 'Early Kindergarten' policy relaxed the age restrictions on such childcare to allow some mothers with two-year-olds to qualify for the same subsidised childcare provisions. Eligibility was based on birth date – children that turned three by April of the following year qualified for subsidised childcare from September of that current year. Carta and Rizzica (2018) evaluate the effect of this policy on employment using administrative data and a regression discontinuity design. The authors find that subsidised childcare increased maternal labour supply. These results are in line with those of Baker et al. (2008) and Lefebvre and Merrigan (2008) for Canada. This evidence showing that childcare subsidies incentivise employment among mothers with children as young as two years old suggests that there is potential for women to return to work sooner as a result of Best Start payments when they are between six months and one year old.

### 3.3.2 Childcare subsidies - New Zealand literature

From 2007, New Zealand introduced a childcare subsidy providing mothers with 20 hours a week of free childcare for children aged three and four. Bouchard et al. (2020) evaluate New Zealand's childcare subsidy using population-wide administrative data. The policy was uniformly implemented across the entire country thus the authors compare mothers giving birth between 2000 and 2002, whose children turned five before 2007, with mothers giving birth between 2004 and 2006, whose children were the first cohort to receive the subsidised childcare provisions in 2007. The authors use a difference-in-differences analysis to recover the effect of the childcare subsidy and find that first-time mothers demonstrated a decrease in employment, while mothers with a second child demonstrated an increase, highlighting that childcare subsidies can have ambiguous effects depending on birth parity.

This thesis adds to the literature on PPL and universal child payments in New Zealand, specifically by examining their effects on employment beyond the PPL period and their spillover effects by including fathers and maternal grandmothers in my analysis. In the next section, I describe my data source and the estimation sample used in my analysis and follow this with a section outlining my econometric methodology.

# 4 Data

The following data section contains six subsections. The first three subsections concern my source of data, my population of interest, and the method I use to derive my estimation samples. I then proceed with two subsections on the structure of my key outcome variables (employment and labour earnings) and on the observability of mothers' due dates and PPL eligibility in my data source. I conclude the section with some descriptive statistics of the sample used in my primary analysis. On several occasions in this section, I will refer to the treatment and comparison groups. While I discuss my econometric methodology in detail in Section 5, as foreshadowed in my introduction, I will follow the methodology of the international literature (see, for example, Dustmann and Schönberg (2012)) and apply a difference-in-differences analysis to a sample of mothers giving birth within a narrow window of time before and after the implementation date of the PPL extension and Best Start payments (1 July 2018). Thus, part of the descriptive statistics subsection pertains to the comparability between the comparison and treatment groups.

## 4.1 The Integrated Data Infrastructure (IDI)

The primary data source for my analysis is the Integrated Data Infrastructure (IDI). The IDI is a database comprising individual-level linked administrative data sourced from a variety of government agencies and compiled by Statistics New Zealand. The data are collected by government agencies for administrative purposes, such as wage and salary information collected by the Inland Revenue Department (IRD) to determine tax liability, and then provided to Statistics New Zealand where they can be accessed in the IDI for research purposes (Statistics New Zealand, 2020).

A useful feature of the IDI is the ability to link individuals across distinct datasets from separate government agencies, and to one another, through their unique identifier. For example, I identify mothers and their children using Department of Internal Affairs (DIA) birth record data, and then obtain labour earnings information for those mothers using IRD data.

## 4.2 Population of interest and estimation sample

To evaluate the causal effect of the policy change, I start with women who gave birth in 2018. I use DIA birth record data to identify a total of 57,621 women who gave birth to 58,401 children in 2018.[23]

In my primary analysis, I focus on first-time mothers in 2018. I identify these first-time mothers using the following five steps. First, I include all 2018 mothers who did not have a previously registered birth in New Zealand (observations: 27,189). Second, I include mothers whose children I identified as New Zealand citizens (observations: 25,272). Some mothers may have given birth overseas prior to 2018, thus including the second step increases the probability that the selected mother-child units represent the first child born to that mother. Third, I exclude observations where the child, or the mother, died within 18 months of the birth (identified using DIA records) (observations: 24,990). Fourth, I include mothers who were resident in New Zealand during the 18 months postbirth based on New Zealand Customs border movements data (observations: 23,943).[24] Fifth, I exclude mothers who were in same-sex couples and mothers who had a second child in 2018.[25] This leaves me with a sample of 23,859 observations. I allocate the 11,811 mothers who gave birth between July and December 2018 to the treatment group and the 12,048 mothers who gave birth between January and June 2018 to the comparison group.

In addition to this primary estimation sample (henceforth denoted as my "estimation sample"), I follow the same five steps to construct six additional samples of mother-child units to use in robustness analyses. I vary the window of time around the implementation date of the PPL extension and Best Start payments (1 July 2018) to produce the first three samples: (1) first-time mothers who gave birth one month before and one month after this date, (2) two months before and after this date, and (3) three months before and after. To account for my inability to observe due dates (discussed below), I also construct a doughnut sample by omitting mothers who gave birth in June and July from my estimation sample. In my fifth robustness sample, I exclude mothers who were likely to be ineligible for PPL based on their employment history. Finally, my sixth sample

[23] This figure is in accordance with the 58,020 live births recorded by Statistics New Zealand (2019).

[24] That is, I excluded mothers who were identified as having left the country permanently within the 18 months postbirth. As such, mothers who went on holiday for a short time are included.

[25] To comply with Statistics New Zealand's confidentiality rules, I group these two steps.

comprises all women who gave birth in 2018, not just first-time mothers.[26] Table 4.1 below provides an overview of my primary sample and the six additional samples.

**Table 4.1:** Observation counts across samples

| Samples | Comparison | Treatment | Total |
|---|---|---|---|
| First-time mothers: 6-month window | 11,811 | 12,048 | 23,859 |
| *Samples used for robustness analyses* | | | |
| First-time mothers: 1-month window | 1,896 | 2,013 | 3,909 |
| First-time mothers: 2-month window | 3,951 | 4,059 | 8,010 |
| First-time mothers: 3-month window | 5,877 | 6,027 | 11,904 |
| First-time mothers: doughnut sample | 11,811 | 12,048 | 23,859 |
| First-time mothers: eligible for PPL | 8,358 | 8,712 | 17,070 |
| All mothers: 6-month window | 26,400 | 26,646 | 53,043 |

*Notes:* the length of the window of time refers to the number of months either side of the July cut-off, i.e. my estimation sample, first-time mothers: six-month window spans all 12 months of 2018. The doughnut sample is based on my estimation sample but excludes June and July and therefore includes a total of 10 months. In the sample "First-time mothers: eligible for PPL", I use the IRD records on past labour earnings to estimate eligibility for PPL at an individual level.
*Source:* Own calculations using Statistics New Zealand's IDI.

## 4.3 Data structure

In order to track the impacts of the PPL extension and Best Start payments, I measure mothers' labour market outcomes up to 18 months following birth.[27] To set up the data, I construct a grid with 55 fields for each mother: 36 months before birth and 18 after. This approach leaves me with a perfectly balanced panel of 1,312,245 observations. I populate these fields using labour market information from the IRD Employer Monthly Schedule (EMS) which includes monthly gross wages and salary (henceforth denoted as "W&S") information for each individual. When the individual has received no W&S in a given month then there is no W&S record for this month, and these missing fields are replaced as zeros.[28] Next, I construct a binary indicator for employment in each month which is equal to one for positive W&S.[29] For my analysis, I normalise birth month to zero and

[26]See Appendix 1 for details on how I arrive at this sample.
[27]The data stop at August 2020.
[28]Gross W&S is measured in New Zealand dollars (NZD). The EMS data does not include annual income from self-employment.
[29]See Figure A4.1 for the employment rate among mothers in my estimation sample between 2015 and 2020 using different W&S thresholds to define employment.

create an event timeline in which each month is referred to by its position relative to the month of birth (0).[30]

## 4.4 Birth date versus due date

All mothers who gave birth on or after 1 July 2018 were eligible for the PPL extension (provided they fulfilled the PPL eligibility criteria) and Best Start payments (which were universal with no such eligibility criteria). Mothers who gave birth before 1 July 2018 were also eligible for the PPL extension and Best Start payments if their due date was on or after 1 July. The DIA birth record data includes birth month, allowing me to identify all eligible mothers giving who gave after July 1. However, data limitations prevent me from observing mothers' due dates. Consequently, I cannot observe mothers who gave birth prior to July 1 and were eligible for the PPL extension and Best Start payments on the basis of their due date.

As a result, the issue of incomplete identification of the treatment group arises, the econometric implications of which are discussed in Section 5. As previously mentioned, I further address this issue by conducting a robustness analysis using a doughnut sample. Furthermore, I observe Best Start payment information from Working for Families (WFF) and IRD data. I use this information to create a binary indicator for Best Start takeup that I use as a proxy for identifying mothers who gave birth prior to July 1 2018 who were eligible for the PPL extension and Best Start.

Using this proxy-variable approach, I identify 601 mothers in the comparison group receiving Best Start. Of course, 601 is likely to be an underestimate because the proxy variable captures *takeup*, and eligibility may be less than 100%. I discuss how capturing fewer mothers than are eligible for the PPL extension and Best Start payments using this proxy variable could impact my results in Section 5.[31]

[30] Using the same process, I create a panel dataset including mothers' W&S and employment for the period July 2015 to July 2020 to be used for Figure 6.3, Panel A in Section 6.

[31] Best Start data are recorded by tax year (March 2019) and are linked to mothers (for tax purposes) rather than the child thus mothers giving birth in e.g., June and again before March 2019 could potentially be misclassified using my proxy variable approach. For that reason, I exclude the (very few!) comparison group mothers giving birth twice between January 2018 and March 2019 in my analysis using this variable.

## 4.5 PPL eligibility and takeup

As outlined in Section 1, women are eligible for PPL if they work for, at least an average of, 10 hours per week during any 26 of the 52 weeks prior to birth (Employment New Zealand, 2021a). Unfortunately, PPL eligibility itself is not recorded in the IDI data. I instead estimate PPL eligibility using earnings data from the IRD in combination with minimum wage information. I consider that a mother satisfied the eligibility criteria if her total W&S across the 12 months prior to birth was at least the equivalent of 260 hours at the minimum wage ($15.75).[32] A simple cross-tabulation shows that only 849 mothers (of 23,859) receive PPL but are not considered eligible for PPL using this proxy. This is a relatively small proportion of my estimation sample and should not interfere with the results from my analysis using the sample of first-time mothers who are eligible for PPL.

The EMS dataset provides the gross PPL receipt for each month. For mothers with positive PPL payments in the EMS data, I can also calculate the approximate average number of weeks of PPL by dividing the total receipt by the maximum weekly payment amount of $563.83.[33] This will underestimate the number of weeks of PPL received for those who qualified for less than the maximum payment. However, it is likely to be a fairly good approximation given the relatively low level the payments are set at (equivalent to a full-time job paid at the minimum wage). See Appendix 3 for the results from this calculation.

## 4.6 Descriptive statistics

The following section includes some descriptive analyses for my estimation sample. For comparison, I also show selected descriptive analyses on similar samples of first-time mothers in 2016, 2017 and 2019. The following descriptive statistics have two overarching purposes. Firstly, I show the development of a few key birth-related metrics to identify whether there is any visible undue variation around the 1 July 2018 implementation of the PPL extension and Best Start payments which could affect the *internal* validity of my

[32] There was a change in the minimum wage on 1 April 2018 from $15.75 to $16.50 per hour (Employment New Zealand, 2021b). I use the $15.75 per hour amount for my calculations.

[33] The maximum weekly PPL payment amount increased from $538.55 to $563.83 on 1 July 2018, so I inflate the PPL payments received prior to this date by 4.5%, which was the percentage increase in the maximum payments (Lees-Galloway, 2018).

results. Similarly, using the longer time horizon from 2016 to 2019 is useful in determining whether 2018 is an outlier year, which could impact the *external* validity of my results. Also regarding internal validity, I conduct a standard covariate balance test between the treatment and comparison groups to assess whether any baseline differences exist.

### 4.6.1 Birth density of first-time mothers

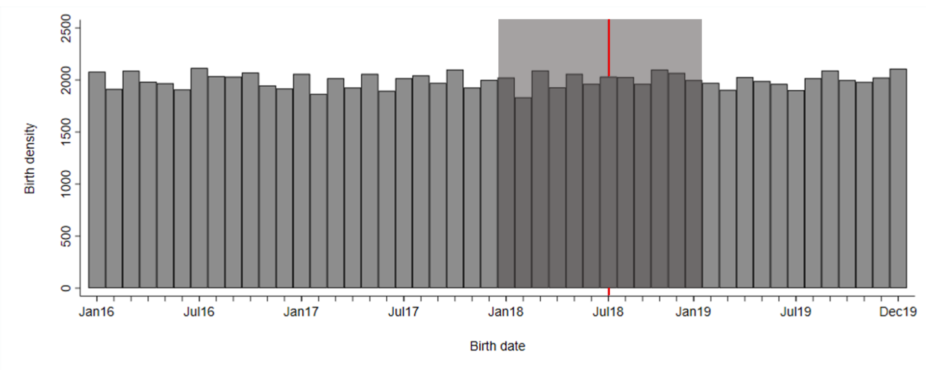
Figure 4.1 offers a visual representation of birth density across the 48 calendar months from January 2016 to December 2019. About 2000 births took place each month and while there is some variation across months, seasonal patterns are not overly pronounced. Closer inspection reveals February tends to have the lowest number of births and women are more likely to give birth in the second half of the year.

A potential issue that could impact the internal validity of my results is the possible manipulation of birth dates and/or due dates. I cannot statistically test for such manipulation as the birth data are discrete – I observe birth month but not birth day (McCrary, 2008). However, it is unlikely that that such manipulation occurred in this context. The policy was not publicly announced (with full details) until December 2017, leaving insufficient time for mothers to delay the conception and birth of their child in order to receive treatment (New Zealand Government, 2017). Second, mothers applying for PPL and Best Start are required to provide medical evidence of their due date to the IRD (IRD, n.d.). It is common practice for due dates to be established early in the pregnancy via an ultrasound scan, which would make the due date difficult to forge or modify later (Ministry of Health, 2019). There is a possibility that a small number of mothers manipulated their delivery date (by less than a week) in the case of, for example, inductions or elective caesareans. Rather than being scheduled in the last few days of June (2018), these could have instead been scheduled for the first few days of July. This could explain the conclusion in Wilson and McLeod (2021): there were no fewer births than expected prior to 1 July 2018, but that a small number of extra births were observed in the first three days of July. The authors find a mean of an additional 80 births, or 1.6% of the births in June 2018, that were shifted into July. However, 1.6% is a relatively small proportion and suggests that my analysis should not be compromised as a result of such small-scale birth shifting.

If, somehow, mothers in my estimation sample were successful in delaying their births to qualify for the extended PPL and Best Start payments, that behaviour would be reflected in the density plot as fewer births in June and more in July 2018. As evident in my one-month window sample (see Table 4.1), I have identified 2,013 first time mothers in July 2018 and 1,896 in June, a difference that closely mimics that of the June/July relationship in other years without a policy change, shown in Figure 4.1. While this visual inspection is not a formal test of differences, it does offer some reassurance. In addition, for robustness, I conduct an analysis using the previously outlined doughnut sample, which omits mothers who gave birth in June and July 2018 and therefore mitigates the possible bias arising from mothers shifting their birth date from June to July in order to qualify for the policy.

In terms of fertility changes as a result of the PPL extension and Best Start payments, the Families Package was not announced in full detail until December 2017. Should these two new policy initiatives have caused an increase in fertility, we would see a distinctly higher number of births in September 2018. Figure 4.1 suggests that the number of births per month between 2016 and 2019 stayed roughly constant. In other words, upon visual inspection, there were no obvious fertility effects resulting from the Families Package being passed into law in December 2017. Thus my analysis is not compromised by possible fertility effects either.

**Figure 4.1:** Birth density of births in 2016-2019 to first-time mothers




*Notes:* Birth density is depicted for samples of first-time mothers giving birth in New Zealand in 2016, 2017 and 2019 that are constructed following the same steps that I take to arrive at my estimation sample. The birth density for 2018 is the birth density pertaining to my estimation sample (grey shaded area).

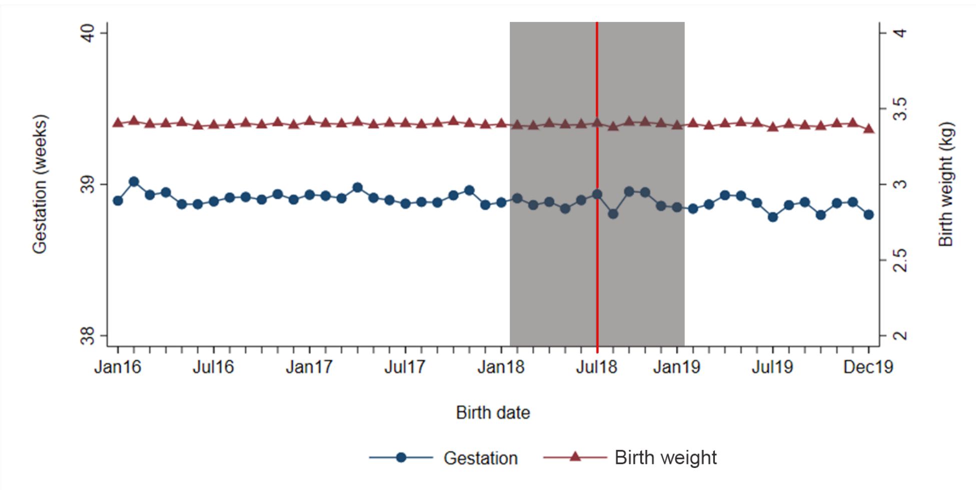
Each bar represents the month of birth as the birth record data are discrete. The vertical line is the policy implementation date of 1 July 2018.
*Source:* Own calculations using Statistics New Zealand's IDI.

### 4.6.2 Average gestation length and birth weight

Figure 4.2 shows the average gestation length and birth weight of children to first-time mothers across calendar month from 2016-2019. A full-term pregnancy is about 280 days or 40 weeks. The average gestation length in New Zealand for first-time mothers is just shy of 40 weeks. The average birth weight is just below 3.5 kg.

Birth weight and gestation length are two key birth outcome metrics. Figure 4.2 is included to allow a visual inspection of their development across time. Importantly, Figure 4.2 does not suggest any significant changes in average gestation length or birth weight around the policy implementation time of July 2018. If a significant group of mothers (either directly or through their lead maternity carer) incorrectly reported that their due dates fell on or after 1 July in order to qualify for the PPL extension and Best Start payments, the average gestation period would be significantly shorter for births in June 2018. The fact this does not appear to be the case provides further reassurance that mothers did not manipulate the month in which they gave birth. Furthermore, my analysis is not compromised by such a possibility.

**Figure 4.2:** Gestation length and child's birth weight of first-time mothers in 2016-2019




*Notes:* Gestation length and birth weight of children are measured for samples of first-time mothers giving birth in New Zealand in 2016, 2017 and 2019 that are constructed following the same steps that I take to

arrive at my estimation sample. The gestation length and birth weight measurements for 2018 pertain to my estimation sample (grey shaded area). The vertical red line represents the policy implementation date of 1 July 2018.
*Source:* Own calculations using Statistics New Zealand's IDI.

### 4.6.3 Covariate balance

Table 4.2 below provides formal tests for differences in means between the treated and comparison groups using my estimation sample taken from a six-month window around July 2018.[34] In order to assess covariate balance at the time of birth, I calculate standard t-tests for differences in means across a range of observable characteristics that could affect postbirth employment and W&S.

I group covariates into the following five categories: (i) general demographic; (ii) ethnicity; (iii) region of mothers' residental address at birth; (iv) education: highest achieved qualification; and (v) labour market. While these tests should, ideally, be based on the full sample of 23,859 first-time mothers, the education data are not available for all mothers. This is due to the time coverage of the Ministry of Education qualifications data in the IDI and because these data are unavailable for mothers who completed overseas qualifications. For this variable, I test for differences across groups for the mothers with information, i.e., a sub-set of the full sample. Columns two and four of Table 4.2 show the number of observations for the given variable.

[34]See Tables A2.1, A2.2, A2.3, A2.4, A2.5 and A2.6 for covariate balance checks for the one-month, two-month, three-month, six-month doughnut, PPL eligible and the all mothers samples.

**Table 4.2:** Covariate balance across treatment and comparison groups

| | Comparison | | Treatment | | |
|---|---|---|---|---|---|
| | Count | Mean(SD) | Count | Mean(SD) | t-statistic |
| *General demographic* | | | | | |
| Age at birth | 11,811 | 29.0(5.89) | 12,048 | 29.1(5.86) | -1.25 |
| Born in NZ | 11,811 | 0.60(0.49) | 12,048 | 0.59(0.49) | 0.50 |
| Twins or triplets | 11,811 | 0.01(0.10) | 12,048 | 0.01(0.11) | 2.50* |
| Subsequent children | 11,811 | 0.07(0.26) | 12,048 | 0.06(0.25) | -1.04 |
| Gestation length | 11,811 | 39.1(2.21) | 12,048 | 39.1(2.03) | -1.29 |
| Birth weight | 11,811 | 3.35(0.59) | 12,048 | 3.36(0.58) | -1.08 |
| Father identified | 11,811 | 0.95(0.21) | 12,048 | 0.95(0.21) | -0.28 |
| *Ethnicity* | | | | | |
| European | 11,811 | 0.61(0.49) | 12,048 | 0.60(0.49) | 1.27 |
| Māori | 11,811 | 0.18(0.38) | 12,048 | 0.19(0.29) | -1.08 |
| Pacific | 11,811 | 0.10(0.30) | 12,048 | 0.09(0.29) | 2.32* |
| Asian | 11,811 | 0.23(0.42) | 12,048 | 0.24(0.43) | -1.85 |
| MELAA | 11,811 | 0.02(0.15) | 12,048 | 0.02(0.15) | -0.06 |
| *Region* | | | | | |
| Auckland | 11,811 | 0.38(0.49) | 12,048 | 0.38(0.49) | -0.18 |
| Canterbury | 11,811 | 0.12(0.33) | 12,048 | 0.12(0.33) | -0.08 |
| Wellington | 11,811 | 0.11(0.31) | 12,048 | 0.11(0.31) | -0.78 |
| *Education* | | | | | |
| NCEA level 1 or 2 | 7,701 | 0.20(0.40) | 7,959 | 0.21(0.41) | -0.73 |
| NCEA level 3 | 7,701 | 0.19(0.39) | 7,959 | 0.19(0.39) | -1.12 |
| Bachelor's degree | 7,701 | 0.29(0.46) | 7,959 | 0.30(0.46) | -0.16 |
| *Labour market* | | | | | |
| Annual W&S | 11,811 | $32,897(33,528) | 12,048 | $33,605(32,870) | -1.65 |
| Employment | 11,811 | 0.67(0.47) | 12,048 | 0.68(0.47) | -1.93 |
| Annual benefit | 11,811 | $641(2,350) | 12,048 | $606(2,309) | 1.14 |
| Eligible for PPL | 11,811 | 0.71(0.45) | 12,048 | 0.72(0.45) | -2.63 |

*Notes:* Age at birth is measured in years. Born in NZ is an indicator for the mother being born in New Zealand. Twins or triplets is an indicator for the first-time mother having multiples. Subsequent children is the average number of children born within 18 months after the first birth event. Gestation length is measured in weeks. Birth weight is the weight of the child at birth and is measured in kilograms. Father identified is an indicator for the father being identified on the child's birth certificate. While marital status is available in the IDI via DIA marriage and civil union information, the IDI does not allow the identification of de facto relationships on a population-wide basis. Therefore, I include the 'identification of the child's father' indicator as a proxy for partnership status. As per Table 4.2, the proportion of mothers who identify a father on the child's birth certificate is 95%, which is similar to the 90% of parents who are together for the first 12 months of the child's life according to the Growing Up in New Zealand Study (Growing Up in New Zealand, 2012). Ethnicity is an indicator for the ethnicity that the mother identifies with. Region is the region of the mother's residential address at the time of birth - note that

the proportion of mothers living in regions other than Auckland, Canterbury or Wellington is 0.39 in both groups. Demographic and region data are taken from DIA birth records and Statistics New Zealand general derived data tables. The education variables denote the highest educational qualification achieved by the mother split into three categories as per the New Zealand Qualification Framework (NZQF): (i) NCEA Level 1 or 2 which is completion of levels less than high school certificate; (ii) NCEA level 3 which is the equivalent of high school certificate; and (iii) a Bachelor's degree. These three categories were by far the largest of the 10 levels in the NZQF. The proportion of women with other education types as their highest achievement, not listed in the table, is 0.32 in the comparison group and 0.30 in the treatment group. Note that the NZQF data are only available from 2004 for secondary school qualifications and 1994 for tertiary qualifications. Therefore, secondary school qualifications of mothers older than about 35 years are not included. It also excludes overseas qualifications, hence, the number of observations is lower than for other covariates. Those with no qualifications are also not included in this data, thus it is impossible to distinguish these individuals from those who gained their qualification before the data started being recorded. Annual wages and salary and annual benefit receipt are measured for the year ending 12 months prior to birth and is rounded to the nearest NZD. Employment is measured at the cross-section 12 months prior to birth and is defined as a positive wages and salary record in the IRD data. Eligible for PPL is an indicator for the mother's total W&S in the year prior to birth being the equivalent of 260 hours at the minimum wage ($15.75). Statistical significance of the mean differences between the comparison and treatment groups across each covariate is derived from simple t-tests. Significance levels of the t-statistics are defined as follows: *** if $p<0.001$ ** if $p<0.01$ and * if $p<0.05$. I have a large number of observations, hence I choose these significance levels to reflect that the statistical power of these t-tests is high.
*Source:* Own calculations using Statistics New Zealand's IDI.

Table 4.2 illustrates that mothers allocated to the treatment and comparison groups within my preferred estimation sample are almost identical. Such a close resemblance between the two groups is perhaps not surprising given the sample includes only first-time mothers just six months either side of the policy change. Across the 21 covariates, only two have statistically significant differences at the 5% level between the treatment and comparison groups but even then, the magnitude of the differences are so small that they are not economically meaningful.

Table 4.2 also provides a general understanding about the characteristics of first-time mothers. On average, they are 29-years old, the vast majority give birth to a singleton child rather than twins or triplets, and they are more likely to identify as being of European descent. They earnt about $33,000 on average in the year ending 12 months prior to childbirth and nearly three-quarters of the group meet the estimated employment threshold to qualify for PPL. There is a disproportionately high number of mothers (30%) with a bachelor's degree as their highest attained qualification and a significant number of missing observations among the Ministry of Education dataset. The tertiary education data start at 1994 and the secondary school education data start at 2004, thus higher qualifications are overrepresented in the data. Although these education estimates are not representative of the population they serve the purpose of illustrating covariate balance between the comparison and treatment groups.

In addition to Table 4.2, I provide Tables A2.1, A2.2, A2.3, A2.4, A2.5 and A2.6 in Appendix 2, which detail the same covariance balance checks for the one-month, two-month, three-month, six-month doughnut, PPL eligible and all mothers samples. Note that the means in all covariates across both the treatment and comparison groups of the one-month, two-month, three-month, doughnut samples are consistent with those in my estimation sample, suggesting that birth seasonality among socio-economic groups is not overly pronounced among first-time mothers in 2018.

# 5 Econometric methodology

The aim of this thesis is to recover the causal effect of New Zealand's 2018 PPL extension and introduction of Best Start payments on mothers' labour force attachment up to 18 months postbirth. Specifically, I estimate the causal effect of *eligibility* for both aspects (henceforth denoted as "PPLE & BS eligibility" to be concise) of the 2018 Families Package, rather than takeup. I do this for two reasons. First, only examining mothers who increase their length of PPL from 18 to 22 weeks necessarily results in an additional four weeks outside the labour market, thus the treatment is also the outcome. Second, Smith and Sweetman (2016) and Smith (2018) suggest that estimating the effect of eligibility can be more useful than estimating takeup if a policy prescribes an *offer* of treatment. Evaluating eligibility answers the question of how the average mother responds to an additional option, as opposed to the impact of treatment at the extensive margin. Furthermore, I measure the impacts of both the PPL extension and Best Start payments together as, by virtue of their implementation, I cannot evaluate each separately.

In this section, I focus on employment as the outcome of interest. Note that the same methodology also applied to my second outcome of interest: monthly W&S. Both employment and W&S are measured at the monthly level on the event timeline (where 0 denotes time of birth, see Section 4 for further information on data structure). Using Rubin's (1974) counterfactual model, I frame the causal effect ($\Delta$) of PPLE & BS eligibility on mothers' postbirth employment in the following equation:

$$\Delta = E[Y_1|D=1] - E[Y_0|D=1]. \tag{1}$$

The first term $E[Y_1|D=1]$ is the average postbirth employment rate among PPLE & BS eligible mothers which, importantly, is an observable quantity. The second term $E[Y_0|D=1]$ denotes PPLE & BS eligible mothers' average postbirth employment rate in the counterfactual scenario in which they are PPLE & BS ineligible. Of course, $E[Y_0|D=1]$ is an unobservable quantity. The econometric challenge is then to find a suitable group of PPLE & BS ineligible mothers to be used as a comparison group - i.e., $E[Y_0|D=0]$, where a suitable comparison group means that $E[Y_0|D=0] = E[Y_0|D=1]$.

In what follows, I define my chosen comparison group and present my research design which includes three quasi-experimental methods: (i) intention-to-treat analysis (ITT); (ii) instrumental variables analysis (IV); and (iii) difference-in-differences analysis (DD), which is my preferred specification.

## 5.1 Intention-to-treat (ITT) analysis

To determine a comparison group, I exploit the 1 July 2018 policy implementation date and assign mothers who gave birth after 1 July 2018 as PPLE & BS eligible, and mothers who gave birth prior as PPLE & BS ineligible. Because women who gave birth before, but had a due date after, 1 July 2018 are also PPLE & BS eligible, my assignment rule classifies a small group of women to the comparison group when they in fact belong to the treatment group. I propose a way to deal with this issue using a simple Wald-estimator and two-stage least squares regression in the IV section below.[35] Using birth date to assign the comparison and treatment groups produces the intention-to-treat effect (ITT) of PPLE & BS eligibility. I express the ITT effect in equation (2):[36]

$$ITT = E[Y|Z = 1] - E[Y|Z = 0], \tag{2}$$

in which $Z = 1$ when birthdate is on or after 1 July and $Z = 0$ otherwise, and $Y$ is employment. The ITT effect is simply the difference between the average employment rate of treatment-group mothers and the average employment rate of comparison-group mothers at, for example, 18 months postbirth.

ITT analysis is a commonly used approach in experiments with non-compliance and accounts for the fact that assignment of individuals into a treatment group does not necessarily result in all those individuals being treated and vice versa, i.e. $eligibility = 1 \nRightarrow takeup = 1$ (Frangakis and Rubin, 1999). I use an ITT approach because there is non-compliance in PPLE & BS eligibility between the comparison and treatment groups defined by birth date. As previously outlined, mothers who gave birth before, but had

[35] Note also that the data issues around due versus birth date are discussed in the "due or born after" caveat in Section 2.

[36] Angrist and Pischke (2014)

due dates after, 1 July 2018 were PPLE & BS eligible though they are assigned to the comparison group. However, it is well documented that individuals who actively take up treatment have certain underlying characteristics, thus estimates derived from a comparison between mothers who take up treatment and those who do not suffer from selection bias (see Newell (1992), Mark and Robins (1993)). I apply the same idea to the subsample of mothers who were PPLE & BS eligible because they gave birth prematurely. Children born prematurely are at increased risk of illness and are more likely to require greater care, which might affect the employment behaviour of mothers who were PPLE & BS eligible mothers solely because they gave birth prematurely (Baer et al., 2016). Thus, the results of a simple comparison between PPLE & BS eligible and PPLE & BS ineligible mothers would be similarly compromised – all mothers giving birth to preterm babies experience increased risk in their child becoming ill, thus shifting these mothers into the treatment group based on PPLE & BS eligibility would cause selection bias (Gross et al., 1997). However, in its elimination of selection bias, the ITT estimate necessarily understates the employment effect of the policy change (Fergusson et al., 2002). In order to address this, I use an IV approach.

## 5.2 Instrumental variables (IV) analysis

As outlined in the previous section, the ITT estimator – although informative – is only equal to the average treatment effect of PPLE & BS eligibility if there is full compliance. I have already established that there is non-compliance in the comparison group, causing the ITT estimate to understate the actual treatment effect on employment. I use an instrumental variables (IV) analysis to scale the ITT estimate by the change in probability of PPLE & BS eligibility between the comparison and treatment groups, while preserving the randomisation of comparison and treatment group assignment as in the ITT analysis (Angrist, 1991; Heckman, 1996).[37] In this analysis, birthdate ($Z$) is the instrument for PPLE & BS eligibility ($D$). As a starting point, I rescale the ITT estimate using the

[37] Not all mothers in my estimation sample qualify for PPL. I run the same analysis using an approximate sample of mothers that qualify for PPL. See Section 4 for further discussion.

Wald estimator expressed as follows (Wald, 1940):

$$\Delta_{WALD} = \frac{E[Y|Z=1] - E[Y|Z=0]}{E[D|Z=1] - E[D|Z=0]}. \quad (3)$$

The numerator is the ITT estimate, or the difference in the expected employment outcomes between the comparison and treatment groups. The denominator is the difference in the proportion of PPLE & BS eligible mothers between the comparison and treatment groups. When non-compliance is present, the denominator of the Wald estimator is strictly smaller than one, thus the ITT is inflated accordingly.

However, as outlined in Section 4, a further complication is that I am unable to observe whether $D = 1$ among mothers for whom $Z = 0$. I construct a proxy variable for PPLE & BS eligibility ($D = 1$) labelled $T$.[38] For the comparison group, $T$ is the proportion of mothers who *took up* Best Start, and for the treatment group $T = 1$ is the true PPLE & BS eligibility as prescribed by the policy.[39] In capturing Best Start takeup, the proxy variable captures the lower bound of the proportion of PPLE & BS eligible mothers in the treatment group, thus the IV estimate is also an understatement. In order to address this, I approximate $E[D|Z = 0]$ when calculating the Wald estimator using the following method: first, I measure the takeup rate of Best Start among mothers in the treatment group; second, I compare this figure to the observed eligibility rate of 100%; and third, I approximate $E[D|Z = 0]$ using the ratio:

$$E[D|Z=0] = \frac{T_C}{BS_T}. \quad (5)$$

Component $T_C$ is the proxy for PPLE & BS eligibility (Best Start takeup) in the comparison group and $BS_T$ is Best Start takeup in the treatment group. For example, if I observe that 80% of mothers in the treatment group take up Best Start when 100% are PPLE & BS eligible, I assume that PPLE & BS eligible mothers in the comparison also have an 80% Best Start takeup rate. Upon observing that 5% of mothers take up Best Start in the

[38] Among mothers that qualify for PPL, positive Best Start payments imply that they were also eligible for the PPL extension.

[39] Note that $E[D|Z = 1] = 1$, thus the ITT and Wald estimates are the same if $E[D|Z = 0] = 0$.

comparison group, I approximate that the PPLE & BS eligibility rate in the comparison group is as follows:

$$E[D|Z = 0] = \frac{0.05}{0.8} = 6.25\%. \tag{6}$$

Although the simplicity of the Wald estimator is useful for such an exercise, it does not provide a standard error, confidence interval or measure of statistical significance (Angrist and Imbens, 1995).

In order to recover an IV estimate with a measure of statistical significance, I carry out a two-stage least squares (2SLS) regression using T in place of the partially unobserved $D$:

$$\Delta_{IV} = \frac{E[Y|Z = 1] - E[Y|Z = 0]}{E[T|Z = 1] - E[T|Z = 0]}. \tag{7}$$

$Z$ is an instrument for PPLE & BS eligibility that randomly assigns mothers to either the comparison or treatment group and $T$ is my proxy for PPLE & BS eligibility. The numerator is the ITT estimate and the denominator is the difference in PPLE & BS eligibility between the comparison and treatment groups using the proxy variable $T$. As mentioned previously, $E[T|Z = 0]$ is an underestimate of PPLE & BS eligibility. Therefore, my 2SLS estimate, like my ITT estimate, is downward biased.[40]

In a standard IV-scenario with a homogeneous treatment effect, three assumptions warrant discussion: (i) the stable unit treatment value assumption (SUTVA); (ii) the exclusion restriction; and (iii) relevance of the instrument, the only testable assumption of the three (Imbens and Rubin, 1997; Pischke, 2018).

SUTVA stipulates that a mother's employment status 18 months postbirth must be completely independent of another mother's delivery date or treatment receipt, which I assume to be true in this analysis. I also assume that the instrument satisfies the exclusion restriction, meaning that the birth date instrument only affects employment via its correlation with PPLE & BS eligibility (see Section 4 for descriptive analyses including

[40]In Section 6, I explain how my results further reinforce that identifying Best Start takeup to be used a proxy for PPLE & BS eligibility does not significantly underestimate my results.

an assessment of birth seasonality in 2018). Finally, the instrument is relevant if it directly affects treatment status. As per the implementation of the policy change, in which PPLE & BS eligibility is at least partially dependent on birthdate, it must be the case that birth date is a relevant instrument. The fulfilment of these three assumptions substantiates my 2SLS estimates of maternal employment at cross-sections six, 12 and 18 months postbirth, though they are still slightly underestimated.

Although the IV estimator is useful for capturing the employment effect given that there is non-compliance in PPLE & BS eligibility between the comparison and treatment groups, it is a cross-sectional estimator which does not fully exploit the information in my panel dataset. Thus, I also conduct difference-in-differences analyses in order to capture the longitudinal effects of PPLE & BS eligibility on employment. Furthermore, as my panel dataset is constructed along an event timeline, each cross-section corresponds to a different calendar month for the comparison and treatment groups. Labour market conditions vary across calendar time, thus one could worry that the IV estimates capture not only the effect of the policy, but also the employment effects of labour market seasonality. I cannot control for labour market seasonality in my cross-sectional model; however, as I add a control for labour market seasonality to my difference-in-differences model, it is my preferred specification. The next subsection details this approach.

## 5.3 Difference-in-differences (DD) analysis

Panel data has the advantage that the same individuals can be observed across time (Callaway and Sant'Anna, 2020). I observe each mother in 55 monthly periods along an event timeline spanning -36 months and +18 months relative to the child's month of birth (0). In order to capture the employment effects of PPLE & BS eligibility over time, I conduct a difference-in-differences (DD) analysis using the approximate month of conception (event time -9) as a baseline category. In this analysis, my parameter of interest is the ITT effect of PPLE & BS eligibility on postbirth employment. In a typical DD analysis, a comparison group is taken from a different region or point in time (Wooldridge, 2015). However, due to my sampling method, my comparison group are those giving birth prior to the July 1 2018 implementation date of the PPL extension and Best Start payments.As assessed in Section 4, these mothers are statistically identical across observable characteristics, thus, my DD model does not require individual-level controls. However, as previously mentioned, I do control for calendar time fixed effects in order to account for labour market seasonality.

I include the period between one and 36 months prior to birth to establish parallel trends in prebirth employment between mothers in both groups, as none of these mothers are treated in this initial period. Fulfilment of the parallel trends assumption is crucial in validating DD estimates (Abadie, 2005). If both the comparison and treatment groups demonstrate the same employment patterns prior to the policy, it is assumed that both groups would continue to follow the same employment patterns in the counterfactual scenario, hence any differences in outcomes in the posttreatment period can be attributed to the PPL extension and introduction of Best Start payments. I further validate my results by clustering standard errors at the individual level as, monthly observations for each mother are likely to be correlated; however, employment outcomes are unlikely to be correlated between mothers. Thus, non-independence between monthly employment observations for the same mother is accounted for and the standard errors are robust to issues such as heteroskedasticity (Cameron et al., 2008).

I measure treatment effects in employment from month of birth to 18 months postbirth. I express my DD model in equation (8) below:

$$Y_{iet} = \alpha + \beta Z_i + \sum_{\substack{j=-36 \\ j \neq -9}}^{18} \delta_j \cdot 1[j = e] + \sum_{\substack{j=-36 \\ j \neq -9}}^{18} \gamma_j \cdot (1[j = e] \cdot Z_i) + \sum_{m} \tau_m \cdot 1[m = t] + u_{iet}, \quad (8)$$

in which: $Y_{iet}$ denotes the dichotomous employment status of mother $i$ at event time $e$ and calendar time $t$; $\alpha$ is a measure of the comparison group's employment rate at the baseline period ($e = -9$); $\beta$ represents the level difference between the treatment group's employment rate and the comparison group's employment rate at the baseline period; $\delta_j$ is a vector of event time dummies that capture the deviation in the comparison group's employment rate relative to $\alpha$ in each of the other 54 months relative to birth, essentially controlling for employment trends across the event timeline; $\tau_m$ controls for calendar time fixed effects, effectively controlling for labour market seasonality; and $u_{iet}$ is the error term which captures unobserved characteristics that can vary over time. $\gamma_j$ is the parameter of interest and an interaction between $Z_i$ and $\delta_j$ that isolates the ITT effect of PPLE & BS eligibility on postbirth employment, interpreted as the level difference between the employment rates of the comparison and treatment groups in each of the 54 months, relative to the baseline period.

## 5.4 DD estimates expressed as a percentage of the counterfactual

In order to provide a second interpretation to my results, I also present the DD estimates from equation (8) as a percentage of the employment rate in the counterfactual scenario for treatment group mothers, see Kleven et al. (2019). I express the treatment effect on employment as a percentage of the counterfactual $P_e$ in equation (9):

$$P_e = \frac{\gamma_j}{E[\tilde{Y}_{iet}|e]} \cdot 100, \tag{9}$$

where $P_e$ is the ratio of the parameter of interest from equation (8) ($\gamma_j$) at event time $e$ (where $[j = e]$), to the predicted employment outcome excluding the vector of event time dummies and conditional on event time $e$, $E[\tilde{Y}_{iet}|e]$. I then multiply this quantity by 100 to translate the ratio to a percentage.

# 6 Results

In what follows, I answer my research question: *what is the effect of the 2018 PPL extension and Best Start payments on maternal employment and labour earnings up to 18 months post birth?* I first approach this question using an instrumental variables (IV) analysis in order to account for the fact that some mothers in my comparison group are eligible for the policies. Next, I conduct an analysis using my preferred estimation specification – a difference-in-differences (DD) estimator - to provide a picture of how the employment effect evolves over the entire 18-month period. I run the same analysis on segments of my sample stratified by fathers' position in the income distribution. I then perform a number of robustness analyses with the same DD approach using samples constructed from my estimation sample, a sample of mothers who qualify for PPL and a sample of all mothers giving birth in 2018. I conclude the section with results of DD analyses on the fathers and maternal grandmothers related to the mothers in my estimation sample in order to discern the spillover effects of the PPL extension and Best Start payments.

## 6.1 Instrumental variables (IV) analyses

I provide the causal effect of PPLE & BS eligibility on employment among my estimation sample at three, six, 12 and 18 months post birth derived from my IV analysis. I use the following estimators: (i) Wald; (ii) two-stage least squares (2SLS); and (iii) fuzzy regression discontinuity design (FRDD). Employment is my outcome of interest since it can be used to measure both leave-taking behaviour and labour force attachment - I define leave as absence of W&S records, and I define employment as positive W&S records.[41]

The Wald estimator comprises a numerator - the intention-to-treat (ITT) estimate - and a denominator - the change in probability of PPLE & BS eligibility between the comparison and treatment groups. I provide the ITT employment estimates at each cross-section in Table 6.1 below. I then calculate the denominator of the first Wald estimator (Wald 1). As explained in Section 4, I use a proxy variable for PPLE & BS eligibility that is the same as the true eligibility for the treatment group, but represents *takeup* as opposed

[41] My second outcome variable is labour earnings in the form of monthly W&S. I derive the treatment effect on this outcome in the analysis which used my preferred DD specification.

to PPLE & BS eligibility for the comparison group. Figure 6.1, Panel A depicts the proportion of mothers giving birth in each month of 2018 that are PPLE & BS eligible, as per the proxy variable. The red line signifies the policy start date of 1 July 2018. The Wald estimator uniformly weights the estimates corresponding to each mother regardless of birth month, thus I calculate the value of the denominator using the average monthly PPLE & BS eligibility in the comparison and treatment groups. The change in probability is 97.46 percentage points, which is remarkably close to one, thus the Wald 1 estimates are similar to the ITT estimates, see Table 6.1 below. This suggests that PPLE & BS eligibility is concentrated in mothers giving birth in June and that takeup among eligible mothers is relatively high. Further, using an ITT instead of IV estimator should have no significant bearing on my qualitative results.

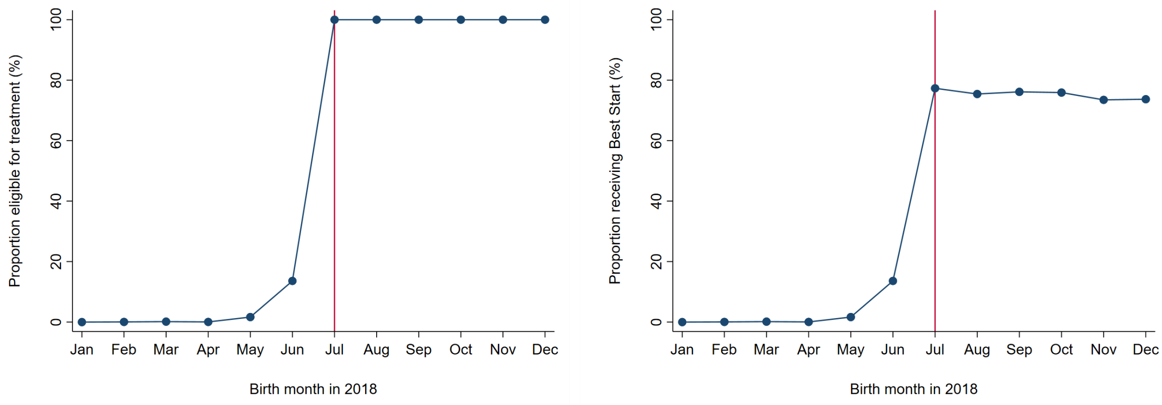
I find a 1.66 percentage point decrease in employment at six months postbirth among my estimation sample, suggesting that the PPL extension is encouraging mothers to stay at home with their child for longer in the first six months, as per its design. The positive employment effect at 12 months of 0.70 percentage points, although modest, implies that, potentially, both Best Start and the PPL extension result in mothers returning to work sooner. The significant negative effect on employment at 18 months is likely due to the imposition of the March 2020 Alert Level 4 lockdowns (in response to COVID-19 outbreak) which only affect the treatment group.[42] The government implemented a nationwide lockdown in which only essential workers were able to work such as health professionals, workers involved in supermarket operations, and pharmacy workers. Some white collar workers could also work from home during this time, however it is likely that many mothers, particularly those working in events or in casual contracts, could not have worked or received W&S during this period (Ministry of Health, 2020).

I calculate a second Wald estimate (Wald 2), this time inflating the proportion of PPLE & BS eligible mothers in the comparison group using the method outlined in Section 5. Figure 6.1, Panel B depicts the proportion of mothers giving birth in each month of 2018 for which I identify a positive Best Start receipt. Best Start takeup for mothers giving birth between July and December comes to a monthly average of 75.33%. I find

[42]More specifically, for mothers giving birth in September, October, November and December 2018 the observations at month(s) 18; 17 and 18; 16, 17 and 18; and 15, 16, 17 and 18 postbirth are impacted by the March 2020 Alert Level 4 lockdowns, respectively.

that the second term in the denominator of the Wald 2 estimator is 3.37%. Although the Wald 2 estimates are higher than Wald 1 estimates, the same overall pattern in postbirth employment is identified as Best Start takeup is high (see Table 6.1 below). However, as mentioned in Section 5, there is no measure of statistical significance associated with any of the Wald estimates.

**Figure 6.1:** PPLE & BS eligbility and Best Start takeup




**(a)** PPLE & BS eligibility proxy **(b)** Best Start takeup

*Notes:* Panel A represents the proportion of first-time mothers in my estimation sample who are PPLE & BS eligible by the month in 2018 in which they give birth. PPLE & BS eligiblity is defined using the proxy variable outlined in Section 4. The red line represents the policy implementation date of 1 July 2018. The proportion is interpreted as a percentage of all first-time mothers giving birth in that month. Note that, as per the policy, PPLE & BS eligiblity is 100% for all mothers in the treatment group. The underlying percentages for the months January to December are as follows: January to April: 0, May: 1.65, June: 13.61, July to December: 100. Panel B represents the proportion of first-time mothers in my estimation sample identified with the positive Best Start receipt plotted against the month in 2018 in which they give birth. The underlying percentages for the months January to December are as follows: January to April: 0, May: 1.65, June: 13.61, July: 77.32, August: 75.42, September: 76.14, October: 75.90, November: 73.50, December: 73.70.
*Source:* Own calculations using Statistics New Zealand's IDI.

For robustness, using the original proxy variable, I also conduct 2SLS and FRDD regressions. The 2SLS estimator uniformly weights observations regardless of distance from the 1 July 2018 PPL extension and Best Start implementation date, thus the 2SLS estimates are identical in numerical value to the Wald 1 estimates but have the advantage of accompanying statistical significance. The FRDD regressions replicate the process of the 2SLS method; however, mothers that give birth closer to the 1 July are given more weight in the estimation procedure. See Table 6.1 below for these estimates. The

FRDD method requires a continuous running variable that assigns mothers to either the comparison or treatment group (Cattaneo et al., 2020). However, the birth record data are discrete. To address this issue, I create a simulation of birthdays and by uniformly distributing the total number of births in each month across the number of days in that month. Naturally, this method assumes that there is no manipulation of birth date (for which I cannot test), thus the FRDD estimates are calculated solely as a robustness check. Bandwidth and triangular weighting kernel are optimised in the FRDD regressions according to the information available across the full event timeline.[43]

**Table 6.1:** ITT, Wald 1, Wald 2 and FRDD estimates

| Cross-section postbirth | ITT | Wald 1 | Wald 2 | 2SLS | FRDD |
|---|---|---|---|---|---|
| 3 months | -0.52 | -0.53 | -0.54 | -0.53 | -0.62 |
| 6 months | -1.62** | 1.66 | -1.68 | -1.66** | -2.79 |
| 12 months | 0.68 | 0.70 | 0.70 | 0.70 | -0.92 |
| 18 months | -2.01** | -2.06 | -2.08 | -2.06** | -5.10 |

*Notes:* The estimates are the effect of the policy on the average monthly employment rates for mothers in my estimation sample. Each cross-section represents a point relative to birth month (0). The ITT estimates are calculated by taking the difference in average employment between the treatment and comparison groups. The Wald 1, Wald 2 and 2SLS estimates are derived from calculations which uniformly weight all observations, regardless of their distance from the 1 July cut-off. The FRDD estimate is derived from a regression which optimises bandwidth and triangular kernel weighting. Significance levels of the 2SLS and FRDD estimates are defined as follows: *** if $p<0.001$, ** if $p<0.01$ and * if $p<0.05$. Note that there is no level of statistical significance associated with Wald estimates. The estimates are to be interpreted as a percentage point difference in employment between the treatment and comparison groups.
*Source:* Own calculations using Statistics New Zealand's IDI.

The Wald 1 and Wald 2 estimates are, numerically, very similar. Economically, it is unlikely that the use of my proxy variable for PPLE & BS eligibility is omitting substantial information or distorting my results. Similarly, there is almost no meaningful difference between the Wald 1 or Wald 2 and ITT estimates, thus using the ITT estimates in my primary analysis should not compromise my qualitative results.

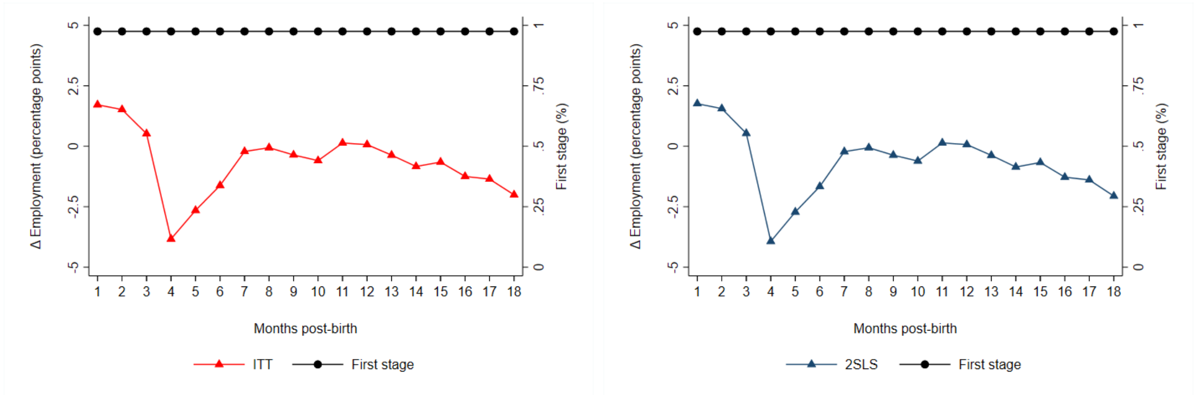
My 2SLS analysis suggests that the 1.66 percentage point decrease in employment at six months postbirth is significant to the one percent level, confirming that mothers do take

[43]The bandwidth for FRDD analysis at the: three-month cross-section is 73 days, six-month cross-section is 52 days, 12-month cross-section is 73 days, and 18-month cross-section is 49 days (rounded to the nearest day).

more leave as a result of PPLE & BS eligibility. However, there appears to be no significant employment effect as a result of the two policies from six to 18 months postbirth, or in the long-run. The 2.06 percentage point decrease at 18 months is also statistically significant, however, as noted above, it may be a reflection of the lockdowns and not the PPL extension and Best Start payments. The FRDD estimates are not statistically significant from zero, suggesting that there is potentially no impact on employment. However, the FRDD estimates at each cross-section, with exception at 12 months postbirth, corroborate the direction of the relationship between PPLE & BS eligibility and employment apparent in the 2SLS estimates.

It is difficult from these four cross-sectional estimates to convey the full picture of the policy's effect on employment up to 18 months postbirth. Thus, I provide Figure 6.2 which is a visual representation of the ITT (Panel A) and 2SLS estimates (Panel B) of the changes in employment at each of the 18 months postbirth as a result of PPLE & BS eligibility. Note that the 2SLS estimates in Panel B are the quotients associated with the ITT and first stage estimates for each month in Panel A. Interestingly, within the six months postbirth, the largest negative employment effect is at around 12 to 16 weeks (between three and four months), which reflects the average increase in PPL length taken from 11 to 14 weeks (see Appendix 3 for further details on the increase in the length of PPL taken as a result of the extension). The ITT estimate of the decrease in employment at three to four months postbirth is a 3.83 percentage point, while the 2SLS estimate is 3.93 percentage points. The close resemblance between the ITT and 2SLS curves in Figure 6.2 provide further evidence that the ITT estimates are informative of the true treatment effect. There appears to be zero or negative employment effects after six months (in the long-run) suggesting that the Best Start payments, and possibly the PPL extension. However, labour market seasonality is not controlled for in either the ITT or 2SLS estimates.

**Figure 6.2:** First stage, ITT and 2SLS estimates for employment




**(a)** First stage and ITT estimates

**(b)** First stage and 2SLS estimates

*Notes:* The ITT estimates in Panel A can be divided by the first stage estimates to result in the 2SLS estimates in Panel B. The underlying number behind the first stage estimates is 97.46%. The largest employment decrease as a result of the policy is seen at four months and equates to 3.83 and 3.93 percentage points, respectively. These estimates in both Panel A and Panel B pertain to the employment effect derived from regressions using my estimation sample. Note that the ITT and 2SLS estimates are to be interpreted as a percentage point difference in employment between the treatment and comparison groups.
*Source:* Own calculations using Statistics New Zealand's IDI.

## 6.2 Difference-in-differences (DD) analyses

I now present the results from my primary analysis: difference-in-differences (DD) analysis applied to my estimation sample. Once again, I focus on employment as the main outcome of interest. I follow this with the results from the remainder of my primary analysis: DD analysis on monthly labour earnings using my estimation sample, which is then followed by a series of robustness specifications. I conclude this section by conducting DD analyses on fathers' and maternal grandmothers' employment. In each DD analysis, I recover the *ITT effect* of the 2018 PPL extension and Best Start payments.

### 6.2.1 Primary analysis: Employment

In my primary analysis, I recover the causal effect of PPLE & BS eligibility on employment for mothers in my estimation sample. As previously mentioned, and in reference to Appendix 3, mothers significantly increase their length of PPL taken by approximately three weeks as a result of the PPL extension (and possibly Best Start payments). This estimate is an average among my estimation sample consisting of first-time mothers in which roughly 72% qualify for PPL (see Appendix 3 for estimates of the change in the length of PPL taken among PPL-qualifiers (as per my proxy) and among mothers conditional on at least one positive PPL record in the IRD data). This change in weeks is also relevant to the interpretations of my DD estimates.

I begin by illustrating the average monthly employment rates for the comparison and treatment groups across calendar time and event time in Figure 6.3. Panel A is a depiction of average employment in both groups between 1 July 2015 and 1 July 2020. I place a vertical red line at 1 July 2018 to indicate the implementation of the PPL extension and Best Start payments. Between July 2015 and January 2018, both the comparison and treatment group demonstrate the same employment patterns. From January 2018 to July 2018, mothers in the comparison group started to give birth and their employment rate decreases accordingly. During this period, the treatment mothers continue on the same employment trajectory, until July 2018 when they started to give birth. In reference to Figure 6.3, Panel A, it is difficult to infer how much of the variation in employment between the groups can be attributed to the policy change.

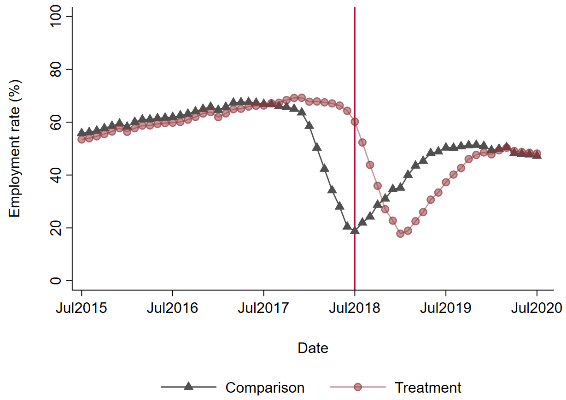
In order to provide a clearer picture, I provide Figure 6.3, Panel B. The curves are identical to those in Panel A, the only difference is that the calendar timeline on the x-axis is replaced with the event timeline which serves to shift the curves such that they overlap. The event timeline spans the 36 months prebirth and the 18 months postbirth. The month of birth (0) is indicated by the vertical red line.[44] The two curves are overlaid at almost every point relative to birth, suggesting that the policy has little to no effect on employment. However, it is important to note that, for each mother, observations in the same month relative to birth on the event timeline correspond to different calendar months. Different calendar months have different labour market conditions that could affect monthly employment rates. As a result, Figure 6.3 may not be informative of the causal effect of PPLE & BS eligibility (see Figure A5.1 for further detail on seasonality in employment).[45] However, judging from the employment rate at 12 months depicted in

[44]Note that, as per Table 4.2 in Section 4, mothers in both the comparison and treatment groups are, on average, 29 years old at birth. Thus, using the event timeline naturally controls for the fact that in any given month, the comparison group is older on average.

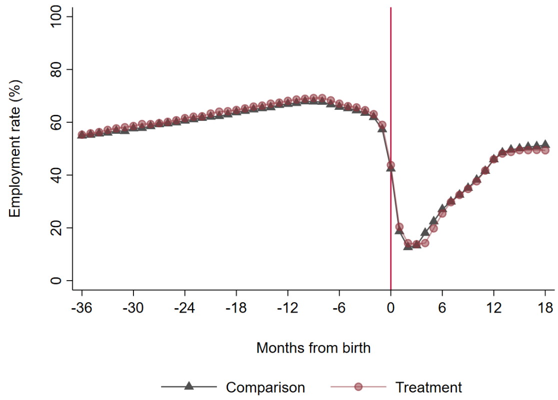
[45]Figure 6.3 also shows that employment rates immediately following birth do not fall as low as might be expected. However, recall that my measure of employment is whether positive W&S was received in that month. This highlights a limitation of the IRD data used as it includes forms of W&S that can be

Figure 6.3, Panel B, it appears that most mothers in both groups have returned to work by the end of the job-protected period (of 52 weeks).

**Figure 6.3:** Average employment across calendar and event timelines




**(a)** Employment across calendar time




**(b)** Employment across event timeline

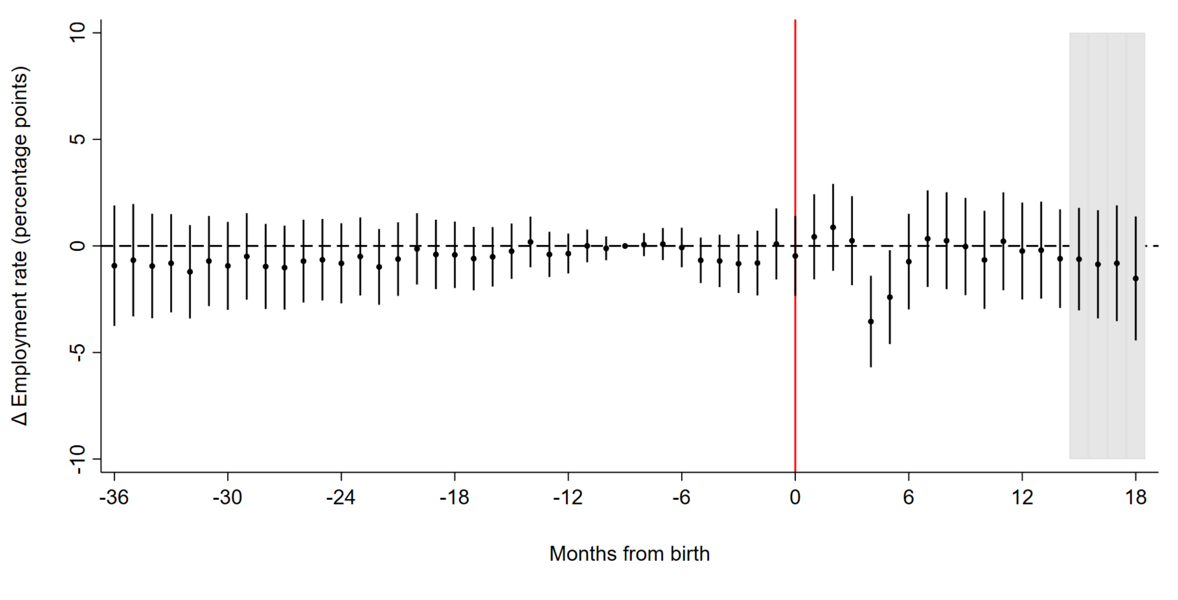
*Notes:* Panel A shows the average monthly employment rate as a percentage for the comparison and treatment groups spanning July 2015 to July 2020. The PPL extension and Best Start implementation date (1 July 2018) is indicated by the vertical red line. Panel B also shows monthly employment for the comparison and treatment groups but against the event timeline, in which month of birth is normalised to 0 as indicated by the red line.
*Source:* Own calculations using Statistics New Zealand's IDI.

In the following results, I visually depict the estimates of the effect of PPLE & BS eligibiliy on employment derived from a DD analysis in which I control for labour market seasonality using an interaction of calendar month and year fixed effects. Figure 6.4 below represents the percentage point difference in monthly employment rates between the treatment and comparison groups. Note that each estimate is interpreted relative to the comparison group's employment and the baseline period event time -9. Focusing first on the estimates in the 36 months prior to birth, it is clear that none are statistically different from zero which improves the likelihood that the parallel trends assumption is met. Employment is also unchanged within the first three months, suggesting that there is no change in leave-taking in the extensive margin as a result of the offer of the additional four weeks of PPL and Best Start payments. The 3.55 percentage point decrease in employment starting at 14 weeks postbirth (the average PPL length among the treatment group) and continuing between 18 and 22 weeks postbirth (between three and six months in the

received while not working, such as annual leave or employer-provided parental leave payments.

depicted monthly estimates) can be attributed to both the additional three weeks of PPL taken and PPLE & BS eligibility. As such, PPL does not simply crowd out unpaid leave - mothers are outside the labour market for longer as a result.However, no significant impacts on long-run employment (beyond the PPL period/six months postbirth) are identified.[46] The area of the graph between 15 and 18 months is highlighted grey as the 2020 Alert Level 4 restrictions were imposed upon treatment-group mothers in these months. As a result, employment gradually decreases among the treatment group mothers, though these estimates are not statistically different from zero.

**Figure 6.4:** The average treatment effect on monthly employment rates



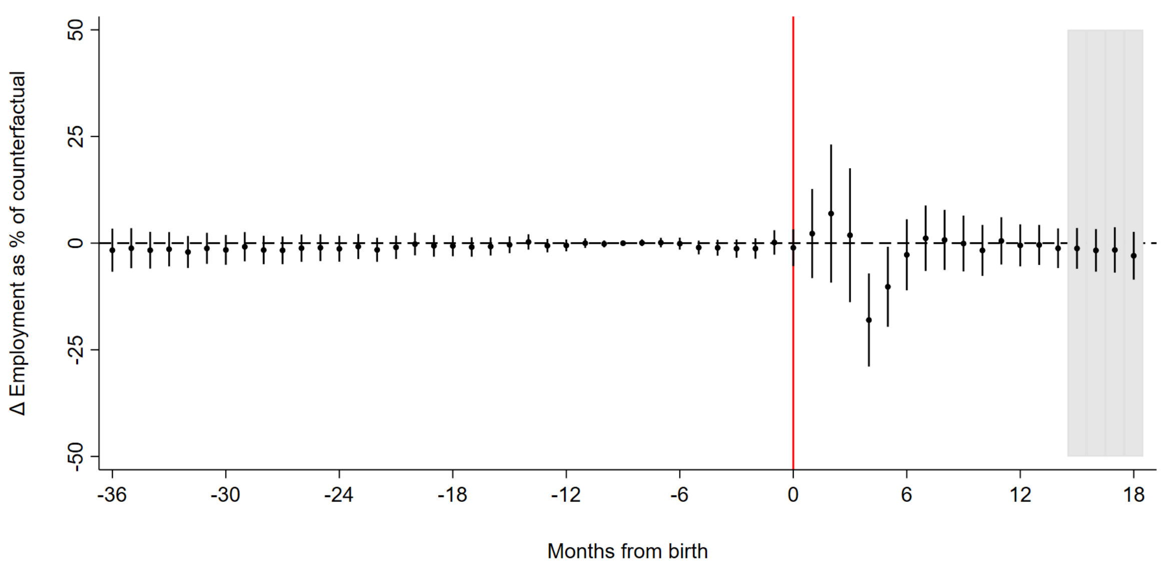

*Notes:* The employment effect estimates in this figure pertain to my estimation sample and are measured in percentage points. The event timeline runs along the x-axis and spans the 36 months prior to birth, and the 18 months postbirth. Birth month is normalised to zero as indicated by the red line. All points are to be interpreted relative to the baseline period event time -9 months. The points represent the point estimates and the vertical lines represent the corresponding 95% confidence intervals. The section of the graph which is highlighted in grey represents a period where mothers in the treatment group giving birth between September and December experience the March 2020 Alert Level 4 lockdowns between 15 to 18 months postbirth.
*Source:* Own calculations using Statistics New Zealand's IDI.

In addition, I provide an alternative interpretation of these results by converting the aforementioned percentage point estimates into a percentage of the treatment group's

[46]The employment effect estimates between three and six months postbirth are significant at the one percent level.

employment in the counterfactual scenario i.e., if there was no policy change, see Figure 6.5 below. The 3.55 percentage point decrease in employment between three and six months in Figure 6.5 is 18.61% of the counterfactual employment rate, which suggests that an economically significant proportion of mothers take the opportunity to extend their length of leave.

**Figure 6.5:** The average treatment effect as a percentage of the counterfactual




*Notes:* The estimates shown above pertain to my estimation sample and to be interpreted as a percentage of the counterfactual outcome for the treatment group had the policy change not taken place. The event timeline runs along the x-axis and spans the 36 months prior to birth, and the 18 months postbirth. Birth month is normalised to zero as indicated by the red line. All points are to be interpreted relative to the baseline period event time -9 months. The points represent point estimates and the vertical lines represent the corresponding 95% confidence intervals. The section of the graph which is highlighted in grey represents a period where mothers in the treatment group giving birth between September and December experience the March 2020 Alert Level 4 lockdown in the 15 to 18 months postbirth.
*Source:* Own calculations using Statistics New Zealand's IDI.

### 6.2.2 Primary analysis: Wages and salary

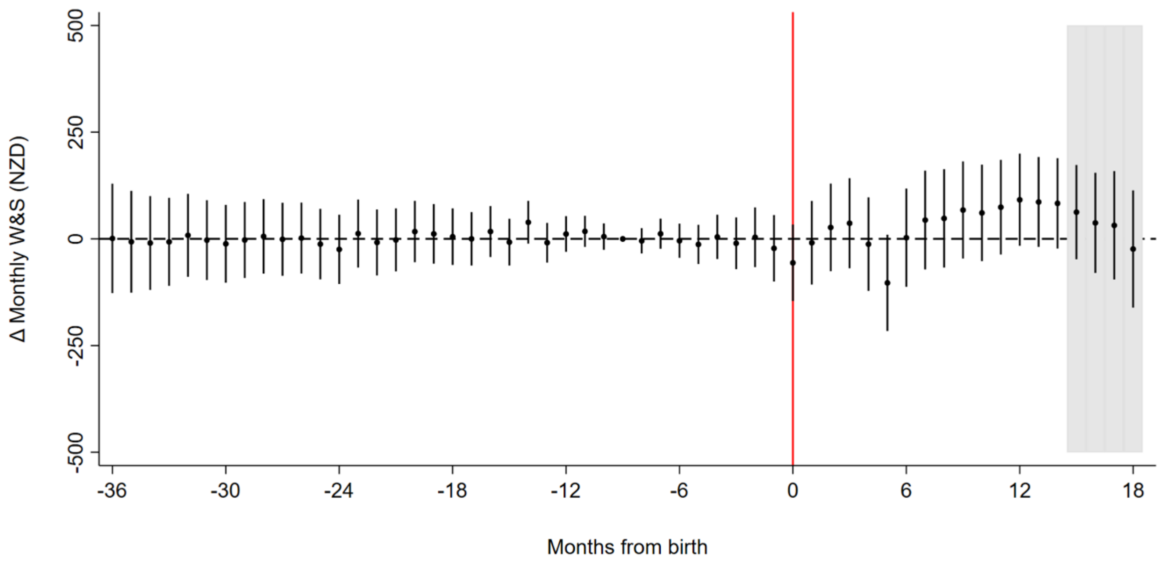
I replicate the process in my primary analysis on employment (also using my estimation sample) but instead focus on gross monthly W&S as the outcome of interest. Figure A5.2 depicts the average monthly W&S for mothers in the comparison and treatment groups across calendar time. In accordance with the graph of monthly employment, both groups follow the same trend until January 2018 when mothers in the comparison group started to give birth and W&S started to decrease. Upon replacing the x-axis with the event timeline, there are no apparent differences between the comparison and treatment groups' monthly W&S which is in accordance with Figure 6.3, Panel B. It is also the case in Figure A5.2, portraying W&S across the event timeline, that each point coincides with different calendar months for each mother, thus labour market seasonality is not accounted for.[47]

Figure 6.6 below portrays the causal effect of PPLE & BS eligibility on monthly W&S derived from a DD analysis which controls for labour market seasonality. The estimates pertaining to each of the 36 months prior to birth are not statistically different to zero which, similar to the analysis on employment, improves the chances that the parallel trends assumption is satisfied. As a result of the increased proportion of mothers on leave between three and six months postbirth, shown in Figure 6.6, monthly W&S decreases by $103.10, though this estimate is not statistically significant. From six months on, the policy appears to cause W&S to increase between 60 - $90 per month. As the average employment rates do not change, this finding may suggest that mothers increase their work hours or are more likely to return to fulltime, as opposed to parttime employment. However, on an individual basis, these estimates are not statistically different from zero. The grey area represents the months in which the treatment group is impacted by the March 2020 lockdown, hence the gap between the comparison and treatment group earnings converges.

I also portray these estimates as a percentage of the counterfactual scenario in Figure A5.3. I find that the decrease in monthly W&S of $103.10 is equivalent to 23% of the treatment groups counterfactual W&S which, similarly to the employment estimate expressed as a percentage of the counterfactual, economically significant. The $60 - $90 increase in W&S from six months is approximately 10% of counterfactual earnings which is a substantial increase, though these estimates are not statistically significant. This result provides some evidence that either the PPL extension or the $60 weekly Best Start payments (or both) encourage mothers to work more hours postbirth, as the average employment rates do not change from six months onward while W&S appear to slightly increase.

[47] See Figure A5.1 for further details on seasonality in W&S.

**Figure 6.6:** The average treatment effect on monthly labour earnings




*Notes:* The employment effect estimates conveyed in this figure pertain to my estimation sample and are measured in NZD. The event timeline runs along the x-axis and spans the 36 months prior to birth, and the 18 months postbirth. Birth month is normalised to zero as indicated by the red line. All points are to be interpreted relative to the baseline period event time -9 months. The points represent the point estimates and the vertical lines represent the corresponding 95% confidence intervals. The section of the graph which is highlighted in grey represents a period where mothers in the treatment group giving birth between September and December experience the March 2020 Alert Level 4 lockdown in the 15 to 18 months postbirth.
*Source:* Own calculations using Statistics New Zealand's IDI.

### 6.2.3 DD analysis by fathers' income percentile

In addition to recovering the causal effect of PPLE & BS eligibility on the average monthly employment, I perform the same DD analysis to determine the treatment effect on monthly employment rates for my estimation sample stratified by level of fathers' income. As mentioned earlier in Section 2, the Families Package is designed to target low- and middle-income families. However, some studies have found more generous PPL policy to be regressive i.e., positive effects are concentrated among higher-earning women (see Dahl et al. (2016)). In order to discern which income groups demonstrate greater leave-taking response to the PPL extension and Best Start payments, I assign mothers in my estimation sample into two categories based on the distribution of fathers' annual

W&S in the year ending 12 months prior to birth as a proxy for household income.[48] I present the results for mothers in my estimation sample among whom corresponding fathers belong to either the lower and upper halves of the income distribution in Figure 6.7 below.

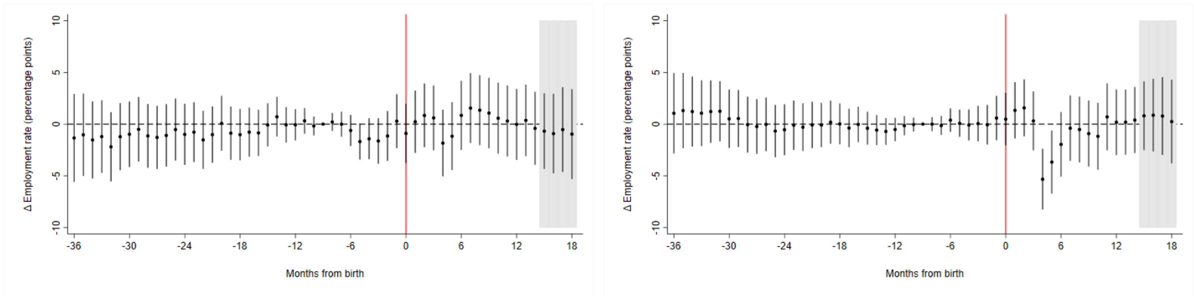
Figure 6.7, Panels A and B depict the effect of the PPL extension and Best Start payments on mothers associated with fathers belonging to the lower and upper halves of the income distribution, respectively. The increase in the length of leave between three and six months postbirth as a result of PPLE & BS eligibility is only statistically different from zero among mothers who are associated with fathers belonging to the upper half of the income distribution. There are two possible reasons as to why this result holds. One, the higher proportion of PPL-qualifiers among the sample of mothers asociated with fathers who belong to the upper half of the income distribution (83%) is driving a significant result i.e., a higher PPL eligibility rate leads to an increase in the length of PPL taken which drives more significant results.

However, 62% of the sample of mothers associated with fathers belonging to the lower half of the income distribution qualify for PPL (using the proxy outlined in Section 4). 62% is should be substantial enough to drive a significant employment result, thus there could be other factors at play. It might be the case that mothers associated with fathers in the upper half of the income distribution are more likely to be partnered with said fathers, thus household income is high enough that mothers can take time off of work despite the PPL payments replacing only a fraction of pre-birth income (PPL payments are the equivalent of the full-time minimum wage, or 46% of the weekly median salary). If this is the case, it is implied that the weekly PPL payments are not high enough for mothers associated with fathers in the lower half of the income distribution to take time off of work due to financial constraints, either because household income is insufficient or because these mothers are less likely to be partnered. This result suggests that an increase in the PPL payments might be more effective in incentivising a greater proportion of mothers, paricularly mothers belonging to low- and middle-income families, to stay at home with

[48]If a father is not identified on the child's birth certificate, I assign the mother to the sample among which associated fathers belong to the lower half of the income distribution. I choose fathers' income as the model suffers collinearity when using mothers' income to stratify groups. According to previous research, 90% of mothers are partnered with the father of their child in the first year of the child's life, thus this analysis could be representative of an analysis using partners' income (Growing Up in New Zealand, 2012).

the child for longer in the months following birth.

**Figure 6.7:** Treatment effect on employment by fathers' income percentile




**(a)** Lower half of the income distribution **(b)** Upper half of the income distribution

*Notes:* The employment effect estimates plotted in this figure pertain to my estimation sample and are measured in percentage points. Birth month is normalised to zero as indicated by the red line. All points are to be interpreted relative to the baseline period event time -9 months. The section of the graph which is highlighted in grey represents a period where mothers in the treatment group giving birth between September and December experience the March 2020 Alert Level 4 lockdown in the 15 to 18 months postbirth. Mothers in Panel A have identified fathers on the birth certificate that belong to the lower half of the income distribution, and mothers in Panel B have identified fathers on the birth certificate belong to the upper half of the income distribution, calculated using fathers' annual income in the year ending 12 months prior to birth. Mothers who do not identify a father are assigned to the sample for whom fathers belong to the lower half of the income distribution.
*Source:* Own calculations using Statistics New Zealand's IDI.

## 6.3 Robustness analyses

To further substantiate the results from my primary analysis, I conduct three main robustness DD analyses using (i) samples constructed from my estimation sample including mothers giving birth within different windows around the 1 July 2018 PPL extension and Best Start implementation date, (ii) a sample of mothers who qualify for PPL, and (iii) a sample of all mothers giving birth in 2018.

### 6.3.1 Samples constructed using estimation sample

I present the results for employment using the samples constructed from my estimation sample including my: (i) doughnut sample, (ii) three-month window sample, (iii) two-month window sample, (iv) one-month window sample in Figure A5.4.[49] The effect of

[49]See Figure A5.5 for these estimates presented as a percentage of the counterfactual outcome for the treatment group, which provides a better idea of economic significance.

PPLE & BS eligibility on employment in the doughnut sample, Figure A5.4, Panel A in which mothers giving birth in June and July are excluded, reinforces the decrease in employment between three and six months postbirth identified in my primary analysis. However, the result is not statistically significant and is 1.22 percentage points smaller than the decrease among the full estimation sample. A less significant effect on employment among the doughnut sample is an interesting finding considering that the majority of PPLE & BS eligible mothers in the comparison group gave birth in June so are excluded, which suggests that the estimate should be larger. Also contrary to the results from my primary analysis, employment from six months appears to increase by approximately two percentage points, though these estimates are not significant.

In contrast, the analyses using the two- and three-month window samples produce the same qualitative result as that found in my primary analysis - a significant decrease in employment between three and six months postbirth (short-run) and then no change in employment from six months onward (long-run). However, in my analysis using the three-month and two-month samples, I control for calendar month and year fixed effects separately due to collinearity. As a result, Figure A5.4, Panels B and C display moderate variation in employment in the 36 months prior to birth, however the same employment effect is evident – mothers take more leave between 18 to 22 weeks, and from six months there is no change in employment. In my analysis using the one-month sample, see Figure A5.4, Panel D, I cannot control for calendar time fixed effects at all, resulting in even larger variation in estimates between months.[50] This result necessitates the presence of the interaction between calendar month and calendar year fixed effects, validating that the results from my primary analysis are robust and that my cross-sectional estimates are compromised by the inability to control for labour market seasonality.

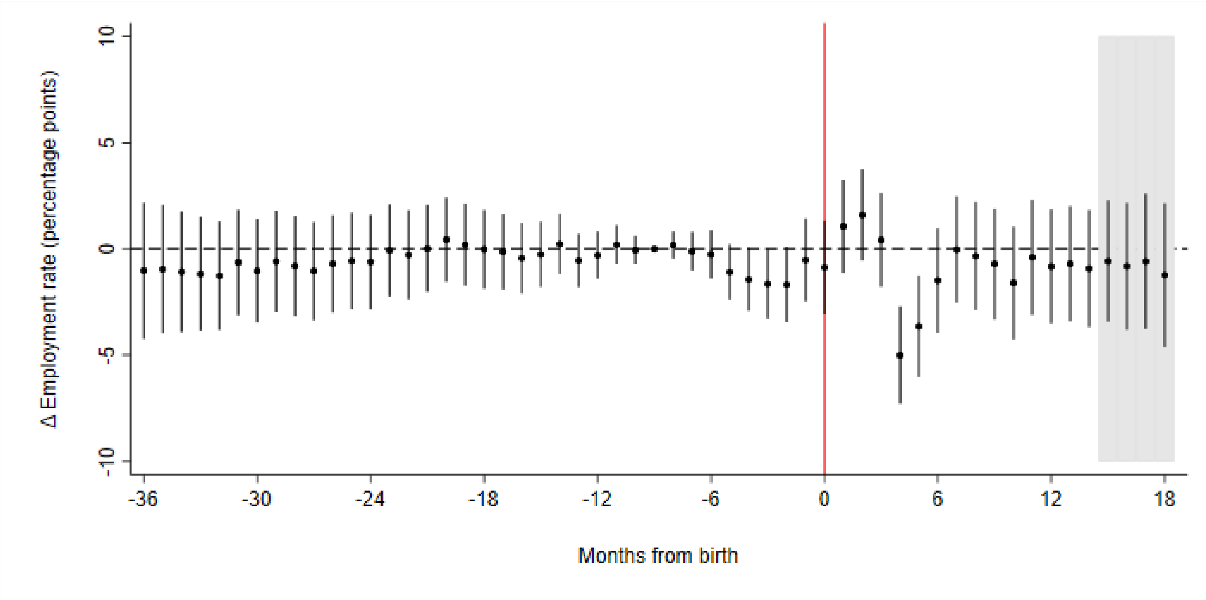
### 6.3.2 Sample of mothers who qualify for PPL

I present the results for first-time mothers who are eligible for PPL, as per the proxy variable outlined in Section 4, utilising the same methodology as in my primary analysis in Figure 6.8. The decrease in employment between 18 and 22 weeks is 5.00 percentage points, nearly 2.55 percentage points greater than the average estimate. Although my proxy for PPL-eligibility is imperfect, this analysis is informative as it highlights that, when offered

[50]See Figure A5.1 for a depiction seasonality in employment and income for the years 2017–2019.

additional weeks of PPL, mothers that qualify tend to take them, and it is likely that the PPL extension is the main driver behind the negative effect on employment between three and six months postbirth identified in my primary analysis. Also in accordance with the results from my primary analysis, there is no effect on employment from six months which suggests that PPL does not affect employment beyond its maximum length (short-run), and emphasises that the combination of PPL and Best Start together does not strengthen post-PPL labour force attachment. Additionally, Figure A5.6 verifies that W&S estimates in my primary analysis are also robust when considering first-time mothers who are eligible for PPL.

**Figure 6.8:** The average treatment effect on employment among PPL-qualifers



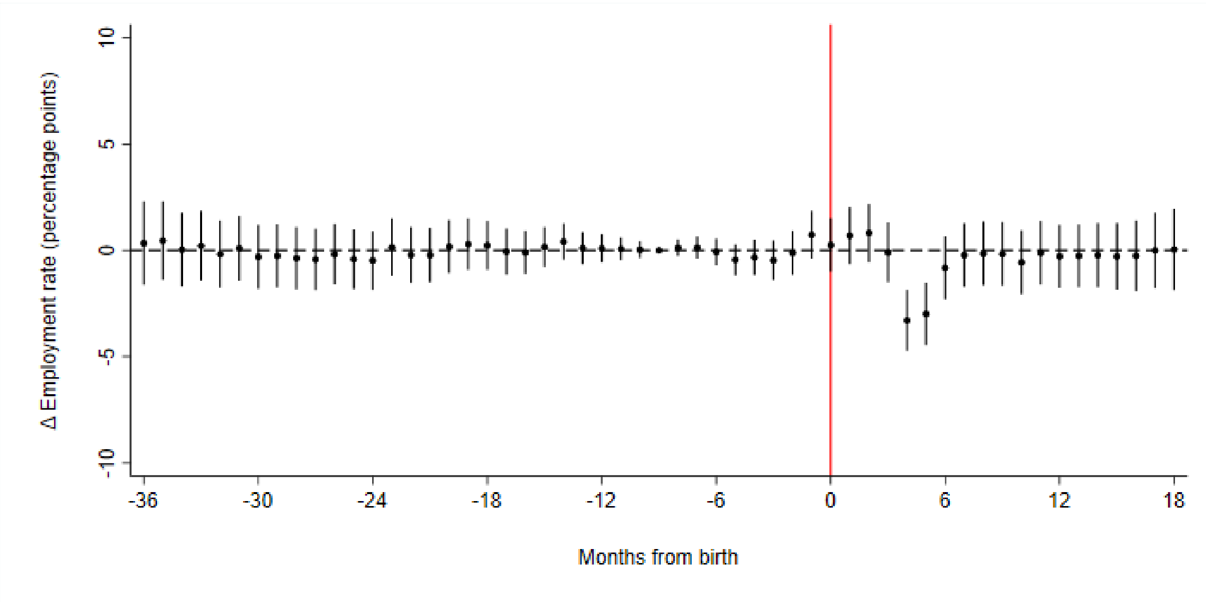

*Notes:* The estimates are derived from analysis using the mothers in my estimation sample that qualify for PPL. Birth month is normalised to zero as indicated by the red line. All points are to be interpreted as percentage point changes in employment between the treatment and comparison groups relative to the baseline period event time -9 months. The section of the graph which is highlighted in grey represents a period where mothers in the treatment group giving birth between September and December experience the March 2020 Alert Level 4 lockdown in the 15 to 18 months postbirth.
*Source:* Own calculations using Statistics New Zealand's IDI.

### 6.3.3 Sample of all mothers giving birth in 2018

Figure 6.9 below visually represents the causal effect of PPLE & BS eligibility on the monthly employment rate of *all* mothers giving birth in 2018 (not just first-time mothers).

Both the comparison and treatment groups follow the same employment trends in the 36 months prior to birth, improving the probability that the parallel trends assumption is fulfilled in the month following birth among all mothers giving birth in 2018 as well as first-time mothers in 2018. The decrease in employment between three and six months postbirth is 3.78 percentage points (short-run). There is no change in employment from six months postbirth (long-run). Both of these findings further validate the internal validity of the results from my primary analysis. This is also true of an analysis on monthly W&S of all mothers giving birth in 2018, see Figure A5.7. Figure 6.9 suggests that my analysis using a sample of first-time mothers is informative of the effects of PPLE & BS eligibility among all mothers.

**Figure 6.9:** The average treatment effect on employment among all mothers




The estimates are derived from analysis using a sample of all mothers giving birth in 2018. Birth month is normalised to zero as indicated by the red line. All points are to be interpreted as percentage point changes in employment between the treatment and comparison groups relative to the baseline period event time -9 months. The section of the graph which is highlighted in grey represents a period where mothers in the treatment group giving birth between September and December experience the March 2020 Alert Level 4 lockdown in the 15 to 18 months postbirth.
*Source:* Own calculations using Statistics New Zealand's IDI.

## 6.4 Fathers' employment

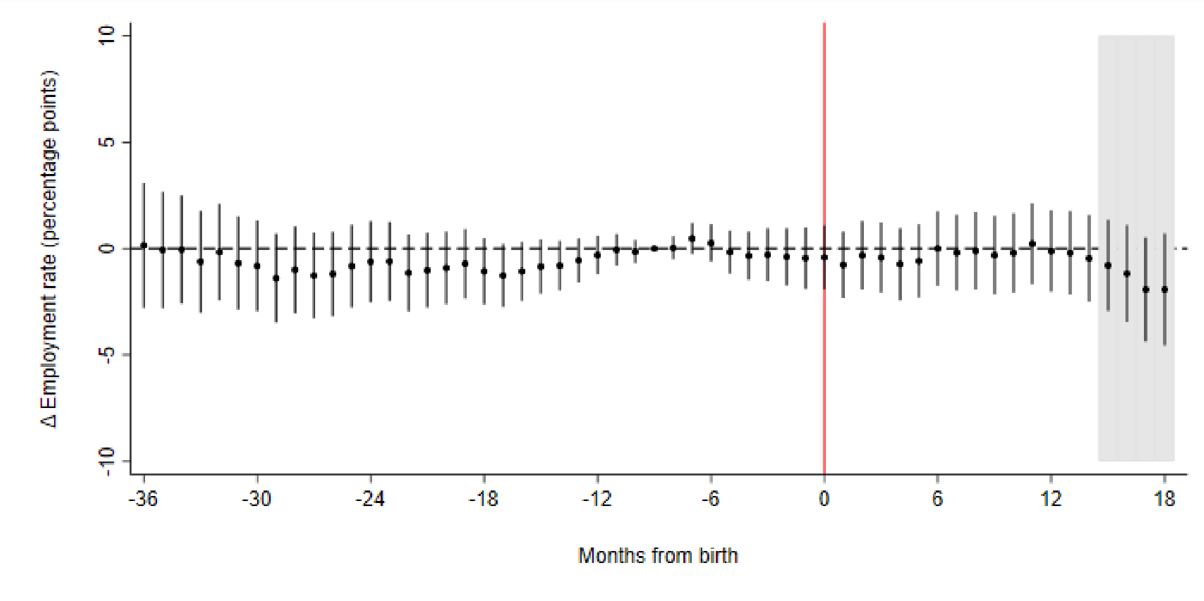
I extend my analysis to a sample of fathers that are identified on the birth certificate of the first-born child to the mothers in my estimation sample.[51]

One of the overarching goals of PPL policy is to improve gender equality within the home and workplace, and the shareability of PPL is designed to achieve this (Lees-Galloway, 2018). I conduct an analysis on fathers' postbirth employment in order to explore whether the offer of additional PPL will incentivise fathers to take more leave, possibly via signalling or the potential for the four-week extension to increase leave-sharing between parents. I plot fathers' employment and W&S across the same calendar and event timelines used previously and find that both figures look almost identical, suggesting that there is no variation in employment as a result of childbirth, or of the PPL extension and Best Start payments change, see Figure A5.8.

I conduct a DD analysis using the same approach as in my primary analysis and find that fathers' employment rate is consistent in the 36 months prior to birth, and is similarly unchanged in the 18 months post, see Figure 6.10 below. There is also no change across the event timeline in fathers' monthly W&S, see Figure A5.8. Prior to the 2018 PPL extension and Best Start payments, fathers seldom took any leave, and this is still the case ex post, as illustrated by the lack of change in employment in Figure 6.10, and lack of change in W&S in Figure A5.9.

[51]I include mothers who give birth again within the 18-month period if they had their first child in 2018. Thus, I only include fathers associated with the first child. Refer to Appendix 1 for details on how I arrive at this sample. Refer to Table A2.7 for covariate balance between the comparison and treatment groups

**Figure 6.10:** The average treatment effect on employment among fathers




*Notes:* Estimates are for each month across the event timeline in which birth month is normalised to zero as indicated by the red line. All points are to be interpreted as percentage point changes in employment between the treatment and comparison groups relative to the baseline period event time -9 months. The section of the graph which is highlighted in grey represents a period where fathers in the treatment group experience the March 2020 Alert Level 4 lockdown in the 15 to 18 months postbirth.
*Source:* Own calculations using Statistics New Zealand's IDI.

## 6.5 Grandmothers' employment

I also extend my analysis to include maternal grandmothers.[52] As a greater proportion of mothers stay home in the first six months postbirth, and as there is potential evidence to suggest that mothers work slightly longer hours from six months onward, it is possible that informal childcare arrangements with grandmothers change as a result. Thus, I examine the spillover effects of PPLE & BS eligibility on grandmothers' employment.

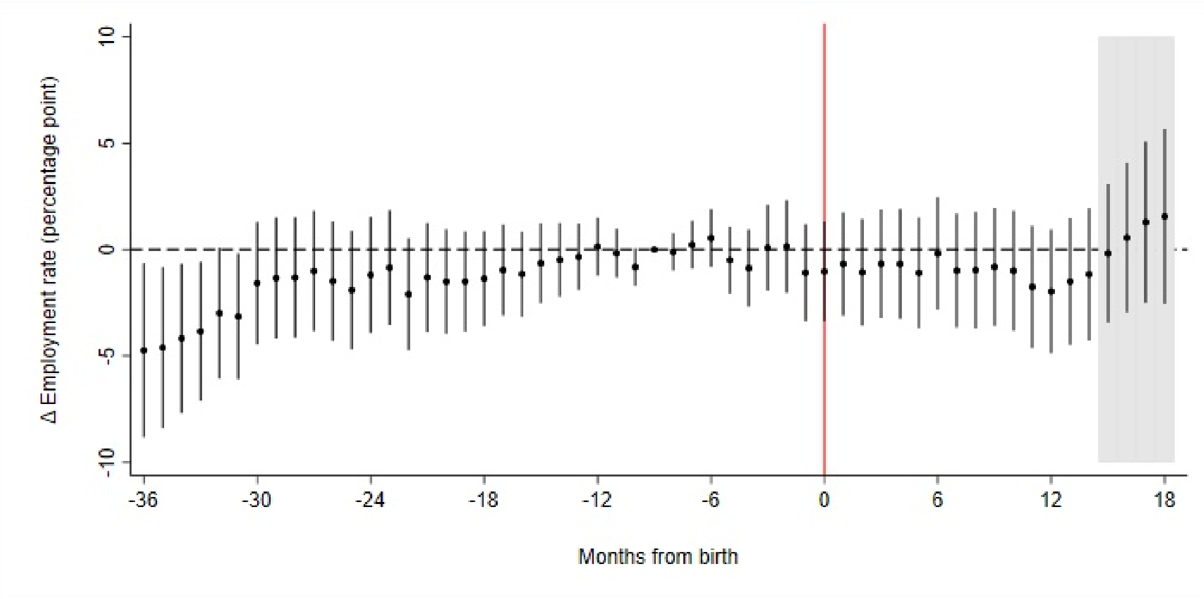
Figure A5.10 provides a visual depiction of grandmothers' employment and W&S over calendar time and the event timeline. There appears to be no change in employment or W&S across the entire event timeline - from 36 months prebirth to 18 months postbirth.

Figure 6.11 below illustrates the effect of PPLE & BS eligibility (of mothers) on maternal

[52] See Appendix 1 for how I arrive at this sample. Note that I can only see grandmothers listed on the birth certificates, thus this sample comprises mothers of first-time mothers who were born in New Zealand. See Table A2.8 for covariate balance between grandmothers in the comparison and treatment groups

grandmothers' employment. There appears to be no change in employment as a result of the PPL extension or Best Start payments. Although there is a significant difference in employment between 30 and 36 months prior to birth, there is no difference in employment between the comparison and treatment group from 30 months, or two and a half years, which is long enough to increase the probability that the parallel trends assumption holds. Interestingly, during the March 2020 lockdowns, grandmothers in the treatment group demonstrate an increase their employment - the opposite to the labour supply responses of mothers and fathers. However, these estimates are not significant. Overall, I find no evidence that grandmothers change their employment behaviour as a result of their daughters being PPLE & BS eligible and Figure A5.10 suggests the same for grandmothers' W&S.

**Figure 6.11:** The average treatment effect on employment among grandmothers




Estimates are for each month across the event timeline in which birth month is normalised to zero as indicated by the red line. All points are to be interpreted as percentage point changes in employment between the treatment and comparison groups relative to the baseline period event time -9 months. The section of the graph which is highlighted in grey represents a period where grandmothers in the treatment group experience the March 2020 Alert Level 4 lockdown in the 15 to 18 months postbirth.
*Source:* Own calculations using Statistics New Zealand's IDI.

# 7 Conclusion

In response to my research question: *what was the effect of the 2018 extension in PPL from 18 to 22 weeks and the introduction of universal $60 weekly Best Start payments on maternal labour force attachment up to 18 months postbirth?*, I evaluated the causal effect of PPLE & BS eligibility on monthly employment rates and monthly W&S in the 18 months postbirth. The PPL extension was designed to encourage mothers to stay at home with their child in the six months following birth, while the Best Start payments, received from the end of the PPL period until the child's first birthday, were expected to contribute to childcare costs and ease mothers' transition back into the labour market from six months postbirth.

Although these two policies have been empirically evaluated in the past, the focus has been on short-run employment (within the PPL period). My analysis extends the New Zealand literature to also include long-run employment effects (beyond the PPL period). Similarly, I add to the international literature by quantifying the spillover effects of the PPL extension and Best Start payments by including analyses of fathers' and maternal grandmothers' employment also in the 18 months postbirth. Using a difference-in-differences estimator, I find that when offered an additional four weeks of PPL, the average mother increases her length of PPL taken from roughly 11 to 14 weeks. Following this increased length in average PPL, I identify a significant decrease in maternal employment between 18 and 22 weeks postbirth of 3.6 percentage points (18% of the counterfactual scenario), a result which implies that the PPL extension did cause mothers to stay at home with the child for longer. However, I find no evidence to suggest that either policy impacted long-run maternal labour force attachment (from six months postbirth). These results are robust to a number of specifications, including instrumental variables analyses. I also fail to identify any change in labour force attachment for fathers or maternal grandmothers as a result of the PPL extension and Best Start payments.

In terms of justifying the cost of the PPL extension and Best Start payments, not enough time has passed since the implementation of the 2018 Families Package (on 1 July 2018) to estimate the effects of the extra time mothers spend at home, as identified in this thesis, on children's outcomes. A key area to be addressed in future research is a cost-benefit analysis of the PPL extension and Best Start payments, taking into account the now identified changes in maternal labour force attachment in the short-run as well as changes in children's outcomes.

# References

Abadie, A. (2005). Semiparametric difference-in-differences estimators. *The Review of Economic Studies*, 72(1):1–19.

Angrist, J. D. (1991). Grouped-data estimation and testing in simple labor-supply models. *Journal of Econometrics*, 91(434):459–462.

Angrist, J. D. and Imbens, G. W. (1995). Two-stage least squares estimation of average causal effects in models with variable treatment intensity. *Journal of the American Statistical Association*, 90(430):431–442.

Angrist, J. D. and Pischke, J. S. (2014). *Mastering'metrics: The path from cause to effect*. Princeton University Press.

Arnesen, L. (2020). *Families Package and 2020 Income Support Packages - 2020 Monitoring Report: Trends in receipt of payments*. Ministry of Social Development. https://www.msd.govt.nz/documents/about-msd-and-our-work/publications-resources/evaluation/family-packages/2020-monitoring-report.pdf.

Baer, R. J., Chambers, C. D., Bandoli, G., and Jelliffe-Pawlowski, L. L. (2016). Risk of preterm birth by subtype among Medi-Cal participants with mental illness. *American Journal of Obstetrics and Gynecology*, 215(4):519–e1.

Bailey, M. J. (2006). More power to the pill: The impact of contraceptive freedom on women's life cycle labour supply. *The Quarterly Journal of Economics*, 121(1):289–320.

Baker, M., Gruber, J., and Milligan, K. (2008). Universal child care, maternal labor supply, and family well-being. *Journal of Political Economy*, 116(4):709–745.

Baker, M., Gruber, J., and Milligan, K. (2019). The long-run impacts of a universal child care program. *American Economic Journal: Economic Policy*, 11(3):1–26.

Baker, M. and Milligan, K. (2008a). How does job-protected maternity leave affect mothers' employment? *Journal of Labor Economics*, 4(3):655–691.

Baker, M. and Milligan, K. (2008b). Maternal employment, breastfeeding, and health: Evidence from maternity leave mandates. *Journal of Health Economics*, 27(4):871–887.

Bouchard, I., Cheung, L., and Pacheco, G. (2020). Evaluating the impact of 20 hours free early childhood education on mothers' labour force participation and earnings. *New Zealand Economic Papers*.

Broadway, B., Kalb, G., McVicar, D., and Martin, B. (2020). The impact of paid parental leave on labor supply and employment outcomes in Australia. *Feminist Economics*, 26(3):30–65.

Brough, P., O'Driscoll, M. P., and Biggs, A. (2009). Parental leave and work-family balance among employed parents following childbirth: An exploratory investigation in Australia and New Zealand. *Kōtuitui: New Zealand Journal of Social Sciences Online*, 4(1):71–87.

Callaway, B. and Sant'Anna, P. (2020). Difference-in-differences with multiple time periods. *Journal of Econometrics*.

Callister, P. and Caltry, J. (2006). Paid parental leave in New Zealand: A short history and future policy options. *Policy Quarterly*, 2(1).

Cameron, A. C., Gelbach, J. B., and Miller, D. L. (2008). Bootstrap-based improvements for inference with clustered errors. *The Review of Economics and Statistics*, 90(3):414–427.

Carneiro, P., Løken, K. V., and Salvanes, K. G. (2015). A flying start? Maternity leave benefits and long-run outcomes of children. *Journal of Labor Economics*, 123(2):365–412.

Carta, F. and Rizzica, L. (2018). Early kindergarten, maternal labor supply and children's outcomes: Evidence from Italy. *Journal of Public Economics*, 158:79–102.

Cattaneo, M. D., Titiunik, R., and Vazquez-Bare, G. (2020). The regression discontinuity design. *The Sage Handbook of Research Methods in Political Science and International Relations*, pages 835–857.

Crichton, S. (2008). *Work patterns after paid parental leave*. Statistics New Zealand.

Cunha, F. and Heckman, J. J. (2007). Identifying and estimating the distributions of ex post and ex ante returns of schooling. *Labour Economics*, 14(6):870–893.

Dahl, G. B., Løken, K. V., Mogstad, M., and Salvanes, K. G. (2016). What is the case for paid maternity leave?. *Review of Economics and Statistics*, 98(4):655–670.

Department of Labour (2007). *Parental leave in New Zealand 2005/2006: Evaluation 2007*. https://thehub.swa.govt.nz/assets/documents/Parental%20Leave%20in%20New%20Zealand%202005-2006%20Evaluation.pdf.

Department of Social Services (2014). *Paid parental leave scheme: Review report*. Australian Government. https://www.dss.gov.au/sites/default/files/documents/06_2014/paid_parental_leave_scheme_review_report.pdf.

Dustmann, C. and Schönberg, U. (2012). Expansions in maternity leave coverage and children's long-term outcomes. *American Economic Journal: Applied Economics*, 4(3):190–224.

Edin, P. A. and Gustavsson, M. (2008). Time out of work and skill depreciation. *Industrial and Labor Relations Review*, 61(2):180.

Employment New Zealand (2018). *Parental leave and payment eligibility table*. https://www.employment.govt.nz/assets/Uploads/tools-and-resources/documents/parental-leave-payment-eligibility-factsheet.pdf.

Employment New Zealand (2021a). *Easier applications for paid parental leave*. New Zealand Government. https://www.employment.govt.nz/about/news-and-updates/easier-applications-paid-parental-leave/.

Employment New Zealand (2021b). *Previous minimum wage rates*. https://www.employment.govt.nz/hours-and-wages/pay/minimum-wage/previous-rates/.

European Commission (n.d.a). *Finland - Maternity and paternity*. https:/ec.europa.eu/social/main.jsp?catId=1109&intPageId=4514&langId=en.

European Commission (n.d.b). *France - Maternity and paternity allowances*. https://ec.europa.eu/social/main.jsp?catId=1110&langId=en&intPageId=4533.

Fenwick, C. (2019). The political economy of immigration and welfare state effort: Evidence from Europe. *European Political Science Review*, 11(3):357–375.

Fergusson, D., Aaron, S. D., Guyatt, G., and Herbert, P. (2002). Post-randomisation exclusions: The intention to treat principle and excluding patients from analysis. *British Medical Journal*, 325(7365):652–654.

Fernandez, R. (2007). Women, work, and culture. *Journal of the European Economic Association*, 5(2-3):305–332.

Finland Institution of Insurance (2021). *Amount of child home care allowance*. Kela. https://www.kela.fi/web/en/home-care-allowance-amount-and-payment.

Forbes, K. (2009). *Paid parental leave under (new) Labour*. Ministry of Social Development. https://msd.govt.nz/documents/about-msd-and-our-work/publications-resources/journals-and-magazines/social-policy-journal/spj34/33-paid-parental-leave.pdf.

Frangakis, C. E. and Rubin, D. B. (1999). Addressing complications of intention-to-treat analysis in the combined presence of all-or-none treatment-noncompliance and subsequent missing outcomes. *Biometrika*, 86(2):365–379.

Galor, O. and Weil, D. N. (1996). The gender gap, fertility, and growth. *The American Economic Review*, pages 374–387.

González, L. (2013). The effect of a universal child benefit on conceptions, abortions, and early maternal labor supply. *American Economic Journal: Economic Policy*, 5(3):160–188.

Government of Canada (2005). *The National Child Benefit: Progress report 2003*. https://www.canada.ca/content/dam/esdc-edsc/documents/programs/child-benefit/papers/evaluation-report/eval_ncb.pdf.

Greenwood, J., Guner, N., Kocharkov, G., and Santos, C. (2016). Technology and the changing family: A unified model of marriage, divorce, educational attainment, and married female labour-force participation. *American Economic Journal: Macroeconomics*, 8(1):1–41.

Gross, R. T., Spiker, D., and Haynes, C. W. (1997). *Helping low birth weight, premature babies: The Infant Health and Development Program*. Stanford University Press.

Growing Up in New Zealand (2012). *Key findings*. https://www.growingup.co.nz/key-findings-0.

Grunow, D., Begall, K., and Buchler, S. (2018). Gender ideologies in Europe: A multidimensional framework. *Journal of Marriage and Family*, 80(1):42–60.

Havnes, T. and Mogstad, M. (2011). Money for nothing? Universal child care and maternal employment. *Journal of Public Economics*, 95(11-12):1455–1465.

Heckman, J. J. (1996). Identification of causal effects using instrumental variables: Comment. *Journal of American Statistical Association*, 91(434):459–462.

Heckman, J. J. (2008). The case for investing in disadvantaged young children. *CESifo DICE Report*, 6(2):3–8.

Heckman, J. J., Pinto, R., and Savelyev, P. (2013). Understanding the mechanisms through which an influential early childhood program boosted adult outcomes. *American Economic Review*, 103(6):2052–2086.

Imbens, G. W. and Rubin, D. B. (1997). Estimating outcome distributions for compliers in instrumental variables models. *The Review of Economic Studies*, 64(4):555–574.

Jaumotte, F. (2004). *Labour force participation of women: Empirical evidence of the role of policy and other detemrinants in OECD countries*. OECD.

Kleven, H., Landais, C., and Søgaard, J. E. (2019). Children and gender inequality: Evidence from Denmark. *American Economic Journal: Applied Economics*, 11(4):181–209.

Lalive, R., Schlosser, A., Steinhauer, A., and Zweimüller, J. (2014). Parental leave and mothers' careers: The relative importance of job protection and cash benefits. *Review of Economic Studies*, 81(1):219–265.

Lalive, R. and Zweimüller, J. (2009). How does parental leave affect fertility and return to work? Evidence from two natural experiments. *The Quarterly Journal of Economics*, 124(3):1363–1402.

Lees-Galloway, I. (2018). *Paid parental leave increases for families this Sunday*. New Zealand Government. https://www.beehive.govt.nz/release/paid-parental-leave-increases-families-sunday.

Lefebvre, P. and Merrigan, P. (2008). Child-care policy and the labor supply of mothers with young children: A natural experiment from Canada. *Journal of Labor Economics*, 26(3):519–548.

Liu, Q. and Skans, O. N. (2010). The duration of paid parental leave on children's scholastic performance. *Journal of Economic Analysis & Policy*, 10(1).

Mark, S. D. and Robins, J. M. (1993). A method for the analysis of randomized trials with compliance information: An application to the Multiple Risk Factor Intervention Trial. *Controlled Clinical Trials*, 14(2):79–97.

Martin, B., Baird, M., Brady, M., Broadway, B., Hewitt, B., Kal, G., Strazdins, L., Tomaszewski, W., Zadoroznvi, M., J, B., Chen, R., Foley, M., McVicar, D., Whitehouse, G., and Ziang, N. (2014). *PPL evaluation: Final report*. The University of Queensland. https://www.dss.gov.au/sites/default/files/documents/03_2015/finalphase4_report_6_march_2015_0.pdf.

Milligan, K. and Stabile, M. (2009). Child benefits, maternal employment, and children's health: Evidence from Canadian child benefit expansions. *American Economic Review*, 99(2):128–142.

Ministry of Business, Innovation and Employment (n.d.). *Extending paid parental leave to 26 weeks*. https://www.mbie.govt.nz/assets/22751a59e2/extending-paid-parental-leave-26-weeks-cabinet-paper.pdf.

Ministry of Health (2019). *New Zealand obstetric ultrasound guidelines*. https://www.health.govt.nz/system/files/documents/publications/new-zealand-obstetric-ultrasound-guidelines-2019-dec19.pdf.

Ministry of Health (2020). *COVID-19: Essential services in the health and disability system.* https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-essential-services-health-and-disability-system.

Ministry of Social Development (2019). *Families Package monitoring and impact evaluation report.* https://msd.govt.nz/documents/about-msd-and-our-work/publications-resources/official-information-responses/2020/february/20200213-families-package-monitoring-and-impact-evaluation.pdf.

National Advisory Council on the Employment of Women (2008). *Priority improvements to parental leave.* New Zealand Government. https://women.govt.nz/sites/public_files/parental-leave.pdf.

New Zealand Government (2020a). *Apply for Best Start payments.* https://www.govt.nz/browse/family-and-whanau/financial-help-for-your-family/apply-for-best-start-payments/.

New Zealand Government (2020b). *Taking parental leave.* https://www.govt.nz/browse/work/parental-leave/taking-parental-leave/.

New Zealand Parliament (2017). *Families Package (Income Tax and Benefits) Bill- First reading.* https://www.parliament.nz/en/pb/hansard-debates/rhr/combined/HansDeb_20171214_20171214_24.

New Zealand Treasury (2018). *Families Package information release document.* https://www.treasury.govt.nz/sites/default/files/2018-04/fp-3810514.pdf.

Newell, D. J. (1992). Intention-to-treat analysis: Implications for quantitative and qualitative research. *International Journal of Epidemiology*, 21(5):837–841.

Noy, S. and Sin, I. (2021). *The drivers of mothers' parental leave decisions: Evidence from the Growing Up in New Zealand longitudinal survey.* Number 21/08. Motu.

Nygård, M. and Duvander, A. Z. (2021). Social inclusion or gender equality? Political discourses on parental leave in Finland and Sweden. *Social Inclusion*, 9(2):300–312.

OECD (2016a). *The economic empowerment of women for more productive and inclusive societies.* https://www.oecd.org/industry/economic-empowerment-women-productive-inclusive-societies.html.

OECD (2016b). *Society at a glance 2016: OECD Social Indicators.* https://doi.org/10.1787/9789264261488-en.

OECD (2017). *Parental leave replacement rates.* https://www.oecd.org/els/family/PF2_4_Parental_leave_replacement_rates.pdf.

OECD (2019a). *Paid parental leave systems.* https://www.oecd.org/els/soc/PF2_1_Parental_leave_systems.pdf.

OECD (2019b). *Parental leave schemes.* https://www.oecd.org/els/soc/PF2_1_Parental_leave_systems.pdf.

OECD (2020). *Additional leave entitlements for working parents.* https://www.oecd.org/els/soc/PF2_3_Additional_leave_entitlements_of_working_parents.pdf.

Olivetti, C. and Petrongolo, B. (2017). The economic consequences of family policies: Lessons from a century of legislation in high-income countries. *Journal of Economic Perspectives*, 31(1):205–300.

Perry, B. (2019). *Household incomes in New Zealand: Trends in indicators of inequality and hardship 1982 to 2018*. Ministry of Social Development. https://www.msd.govt.nz/about-msd-and-our-work/publications-resources/monitoring/household-incomes/household-incomes-1982-to-2018.html.

Pischke, J. S. (2018). Labour ecnomics for PhD students. *Econometrica*, 45:1–22.

Preston, K. (2019). Childcare most expensive cost of raising children: Research. *New Zealand Herald*. https://www.nzherald.co.nz/nz/childcare-most-expensive-cost-of-raising-children-research/QFZQBBVRBSBVZKLRDRNT2IQM6E/.

Robertson, G. (2017). *Fact sheet - Families Package*. New Zealand Government. https://www.beehive.govt.nz/release/fact-sheet-families-package.

Rubin, D. B. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology*, 66(5):688.

Ruhm, C. J. (1997). Policy watch: The Family and Medical Leave Act. *Journal of Economic Perspectives*, 11(3):175–186.

Ruhm, C. J. (1998). The economic consequences of parental leave mandates: Lessons from Europe. *The Quarterly Journal of Economics*, 113(1):285–317.

Schönberg, U. and Ludsteck, J. (2007). Maternity leave legislation, female labor supply, and the family wage gap, IZA Discussion Papers, No. 2699. *Institute for the Study of Labor*.

Schönberg, U. and Ludsteck, J. (2014). Expansions in maternity leave coverage and mothers' labor market outcomes after childbirth. *Journal of Labor Economics*, 32(3):469–505.

Smith, J. (2018). The usefulness of experiments. *IZA World of Labor*.

Smith, J. and Sweetman, A. (2016). Estimating the causal effects of policies and programs. *Canadian Journal of Economics*, 49(3):871–905.

St. John, S. (2014). *New Zealand must invest in all newborns*. Child Action Poverty Group. https://www.cpag.org.nz/assets/Backgrounders/140129%20PPL%20Backgrounder%200114%20SSJ.pdf.

St. John, S. and Familton, A. (2011). *Paid parental leave ib New Zealand: Catching up with Australia?* Child Action Poverty Group. https://www.cpag.org.nz/assets/Backgrounder%20PPL%20Jan%202011.pdf.

Statistics New Zealand (2019). *Births and deaths: Year ended December 2018*. https://www.stats.govt.nz/information-releases/births-and-deaths-year-ended-december-2018.

Statistics New Zealand (2020). *Integrated Data Infrastructure*. https://www.stats.govt.nz/integrated-data/integrated-data-infrastructure/.

Trevett, C. (2021). Prime minister's best start scheme for babies pays out millions to the well-off. *New Zealand Herald*. https://www.nzherald.co.nz/nz/prime-ministers-best-start-scheme-for-babies-pays-out-millions-to-the-well-off.

UK Government (2021). *Maternity pay and leave*. https://www.gov.uk/maternity-pay-leave/pay.

US Department of Labor (2021). *Family and Medical Leave (FMLA)*. https://www.dol.gov/general/topic/benefits-leave/fmla.

Wald, A. (1940). The fitting of straight lines if both variables are subject to error. *The Annals of Mathematical Statistics*, 11(3):284–300.

Welfare Expert Advisory Group (2018). *A brief history of family support payments in New Zealand*. http://www.weag.govt.nz/assets/documents/WEAG-report/background-documents/133db2ad05/History-of-family-support-payments-010419.pdf.

Wilson, M. and McLeod, K. (2021). *Estimating the impact of the introduction of the 2018 Families Package early-years changes – Technical report*. Ministry of Social Development. https://www.msd.govt.nz/documents/about-msd-and-our-work/publications-resources/evaluation/family-packages/early-years-impacts-full-report.pdf.

Wooldridge, J. M. (2015). *Introductory econometrics: A modern approach*. Cengage Learning.

World Health Organization (2020). *Breastfeeding*. https://www.who.int/health-topics/breastfeeding.

# Appendices

## A1 Additional sample construction

### A1.1 Sample of all mothers

For robustness, I construct a sample of all mothers giving birth in 2018. I identify 57,621 mothers giving birth to 58,401 babies in 2018. I follow five steps to arrive at the sample used in my analysis. First, I include only mothers giving birth once in the year 2018 (observations: 57,585). Second, I include mothers whose children I identify as New Zealand citizens (observations: 55,476). Third, I exclude children, or mothers, for whom I identify a death record within the 18 months postbirth (observations: 55,032). Fourth, I include mothers who did not permanently migrate overseas using New Zealand customs data (observations: 53,118). Fifth, I exclude mothers belonging to same-sex couples as per the gender of each parent listed on the child's birth certificate. This leaves me with a sample of 53,004 mothers who gave birth in 2018. I assign the 26,400 mothers who gave birth between January and June to the comparison group and the 26,646 mothers who gave birth between July and December to the treatment group.

### A1.2 Sample of fathers

My sample of fathers consists of the fathers identified on the birth certificate of the child(ren) to the first-time mothers in my estimation sample (observations: 22,743). However, I exclude the fathers who: have more than one child in 2018 (observations: 20,734); have permanently migrated using New Zealand customs data (observations: 22,389); or appear with a death record in the 18 months following birth. I am left with a sample of 22,347 fathers. I assign the 11,031 fathers associated with mothers who gave birth between January and June (2018) to the comparison group and the 11,316 fathers associated with mothers who gave birth between July and December to the treatment group.

## A1.3 Sample of maternal grandmothers

My sample of maternal grandmothers comprises the mothers identified on the birth certificate of the mothers in my estimation sample (observations: 14,169). Note that this results in identification of maternal grandmothers to first-time mothers who are born in New Zealand only (about %60 of my estimation sample, hence the very low count). I exclude grandmothers who have multiple grandchildren born in 2018 (observations: 13,779), grandmothers who have permanently migrated using New Zealand customs data (observations: 13,377), and grandmothers for whom I identify with a death record within the 18 months postbirth. I am left with a sample of 13,284 grandmothers. I assign the 6,816 grandmothers associated with mothers who gave birth between January and June (2018) to the comparison group and the 6,468 grandmothers associated with mothers who gave birth between July and December to the treatment group.

## A2 Covariate balance tables

**Table A2.1:** Covariate balance for one-month window sample

| | Comparison | | Treatment | | |
|---|---|---|---|---|---|
| | Count | Mean(SD) | Count | Mean(SD) | t-statistic |
| *General demographic* | | | | | |
| Age at birth | 3,951 | 29.3(5.97) | 4,059 | 29.2(6.00) | 0.82 |
| Born in NZ | 3,951 | 0.60(0.49) | 4,059 | 0.60(0.49) | -0.68 |
| Twins or triplets | 3,951 | 0.01(0.11) | 4,059 | 0.01(0.10) | 0.13 |
| Subsequent children | 3,951 | 0.07(0.27) | 4,059 | 0.07(0.25) | 1.22 |
| Gestation length | 3,951 | 39.0(2.27) | 4,059 | 39.0(2.14) | -1.14 |
| Birth weight | 3,951 | 3.34(0.58) | 4,059 | 3.34(0.59) | -0.19 |
| Father identified | 3,951 | 0.95(0.22) | 4,059 | 0.95(0.21) | -1.00 |
| *Ethnicity* | | | | | |
| European | 3,951 | 0.61(0.49) | 4,059 | 0.61(0.49) | 0.24 |
| Māori | 3,951 | 0.18(0.38) | 4,059 | 0.19(0.39) | -1.71 |
| Pacific | 3,951 | 0.10(0.30) | 4,059 | 0.09(0.29) | 0.84 |
| Asian | 3,951 | 0.23(0.42) | 4,059 | 0.22(0.41) | 0.27 |
| MELAA | 3,951 | 0.02(0.15) | 4,059 | 0.02(0.15) | -0.19 |
| *Region* | | | | | |
| Auckland | 3,951 | 0.38(0.49) | 4,059 | 0.38(0.49) | 0.23 |
| Canterbury | 3,951 | 0.12(0.32) | 4,059 | 0.13(0.34) | -1.70 |
| Wellington | 3,951 | 0.10(0.31) | 4,059 | 0.11(0.31) | -0.64 |
| *Education* | | | | | |
| NCEA level 1 or 2 | 2,529 | 0.21(0.41) | 2,655 | 0.21(0.41) | -0.05 |
| NCEA level 3 | 2,529 | 0.18(0.39) | 2,655 | 0.19(0.39) | -0.03 |
| Bachelor's degree | 2,529 | 0.28(0.45) | 2,655 | 0.29(0.46) | -0.44 |
| *Labour market* | | | | | |
| Annual W&S | 3,951 | $33,014(33,731) | 4,059 | $32,963(32,989) | 0.07 |
| Employment | 3,951 | 0.67(0.47) | 4,059 | 0.67(0.47) | -0.29 |
| Annual benefit | 3,951 | $620(2,321) | 4,059 | $613(2,325) | 0.14 |
| Eligible for PPL | 3,951 | 0.71(0.45) | 4,059 | 0.71(0.45) | -0.14 |

*Notes:* Units are as follows: Age at birth: years; Subsequent children: number of children born after the first; Gestation length: weeks; Birth weight: kilograms; Indicator variables: Father identified: father identified on the child's birth certificate; Region: region of the mother's residential address at the time of birth - the proportions living in other regions are 0.41 (comparison) and 0.39 (treatment); Education: highest educational qualification achieved by the mother - the proportions with other highest achieved education types are 0.32 (comparison) and 0.31 (treatment); Eligible for PPL is an indicator for the mother qualifying for PPL using my proxy variable (see Section 4). Significance levels of the t-statistics are defined as follows: *** if $p<0.001$ ** if $p<0.01$ and * if $p<0.05$.
*Source:* Own calculations using Statistics New Zealand's IDI.

**Table A2.2:** Covariate balance for two-month window sample

| | Comparison | | Treatment | | |
|---|---|---|---|---|---|
| | Count | Mean(SD) | Count | Mean(SD) | t-statistic |
| *General demographic* | | | | | |
| Age at birth | 3,951 | 29.3(5.97) | 4,059 | 29.2(6.00) | 0.82 |
| Born in NZ | 3,951 | 0.60(0.49) | 4,059 | 0.60(0.49) | -0.68 |
| Twins or triplets | 3,951 | 0.01(0.11) | 4,059 | 0.01(0.10) | 0.13 |
| Subsequent children | 3,951 | 0.07(0.27) | 4,059 | 0.07(0.25) | 1.22 |
| Gestation length | 3,951 | 39.0(2.27) | 4,059 | 39.0(2.14) | -1.14 |
| Birth weight | 3,951 | 3.34(0.58) | 4,059 | 3.34(0.59) | -0.19 |
| Father identified | 3,951 | 0.95(0.22) | 4,059 | 0.95(0.21) | -1.00 |
| *Ethnicity* | | | | | |
| European | 3,951 | 0.61(0.49) | 4,059 | 0.61(0.49) | 0.24 |
| Māori | 3,951 | 0.18(0.38) | 4,059 | 0.19(0.39) | -1.71 |
| Pacific | 3,951 | 0.10(0.30) | 4,059 | 0.09(0.29) | 0.84 |
| Asian | 3,951 | 0.23(0.42) | 4,059 | 0.22(0.41) | 0.27 |
| MELAA | 3,951 | 0.02(0.15) | 4,059 | 0.02(0.15) | -0.19 |
| *Region* | | | | | |
| Auckland | 3,951 | 0.38(0.49) | 4,059 | 0.38(0.49) | 0.23 |
| Canterbury | 3,951 | 0.12(0.32) | 4,059 | 0.13(0.34) | -1.70 |
| Wellington | 3,951 | 0.10(0.31) | 4,059 | 0.11(0.31) | -0.64 |
| *Education* | | | | | |
| NCEA level 1 or 2 | 2,529 | 0.21(0.41) | 2,655 | 0.21(0.41) | -0.05 |
| NCEA level 3 | 2,529 | 0.18(0.39) | 2,655 | 0.19(0.39) | -0.03 |
| Bachelor's degree | 2,529 | 0.28(0.45) | 2,655 | 0.29(0.46) | -0.44 |
| *Labour market* | | | | | |
| Annual W&S | 3,951 | $33,014(33,731) | 4,059 | $32,963(32,989) | 0.07 |
| Employment | 3,951 | 0.67(0.47) | 4,059 | 0.67(0.47) | -0.29 |
| Annual benefit | 3,951 | $620(2,321) | 4,059 | $613(2,325) | 0.14 |
| Eligible for PPL | 3,951 | 0.71(0.45) | 4,059 | 0.71(0.45) | -0.14 |

*Notes:* Units are as follows: Age at birth: years; Subsequent children: number of children born after the first; Gestation length: weeks; Birth weight: kilograms; Indicator variables: Father identified: father identified on the child's birth certificate; Region: region of the mother's residential address at the time of birth - the proportions living in other regions are 0.40 (comparison) and 0.38 (treatment); Education: highest educational qualification achieved by the mother - the proportions with other highest achieved education types are 0.33 (comparison) and 0.31 (treatment); Eligible for PPL is an indicator for the mother qualifying for PPL using my proxy variable (see Section 4). Significance levels of the t-statistics are defined as follows: *** if $p<0.001$ ** if $p<0.01$ and * if $p<0.05$.
*Source:* Own calculations using Statistics New Zealand's IDI.

**Table A2.3:** Covariate balance for three-month window sample

| | Comparison | | Treatment | | |
|---|---|---|---|---|---|
| | Count | Mean(SD) | Count | Mean(SD) | t-statistic |
| *General demographic* | | | | | |
| Age at birth | 5,877 | 29.1(5.91) | 6,027 | 29.1(5.96) | 0.82 |
| Born in NZ | 5,877 | 0.60(0.49) | 6,027 | 0.59(0.49) | 0.64 |
| Twins or triplets | 5,877 | 0.01(0.11) | 6,027 | 0.01(0.10) | 0.59 |
| Subsequent children | 5,877 | 0.07(0.27) | 6,027 | 0.07(0.25) | 1.64 |
| Gestation length | 5,877 | 39.0(2.26) | 6,027 | 39.1(2.06) | -1.52 |
| Birth weight | 5,877 | 3.35(0.58) | 6,027 | 3.35(0.58) | -0.20 |
| Father identified | 5,877 | 0.95(0.22) | 6,027 | 0.95(0.21) | -0.44 |
| *Ethnicity* | | | | | |
| European | 5,877 | 0.61(0.49) | 6,027 | 0.60(0.49) | 1.12 |
| Māori | 5,877 | 0.18(0.39) | 6,027 | 0.19(0.39) | -1.25 |
| Pacific | 5,877 | 0.10(0.30) | 6,027 | 0.10(0.29) | 0.89 |
| Asian | 5,877 | 0.22(0.42) | 6,027 | 0.23(0.42) | -1.37 |
| MELAA | 5,877 | 0.02(0.15) | 6,027 | 0.02(0.15) | -0.40 |
| *Region* | | | | | |
| Auckland | 5,877 | 0.38(0.49) | 6,027 | 0.38(0.48) | -1.32 |
| Canterbury | 5,877 | 0.12(0.32) | 6,027 | 0.13(0.34) | 0.33 |
| Wellington | 5,877 | 0.10(0.31) | 6,027 | 0.11(0.31) | 0.25 |
| *Education* | | | | | |
| NCEA level 1 or 2 | 3,819 | 0.20(0.40) | 3,933 | 0.22(0.41) | -1.20 |
| NCEA level 3 | 3,819 | 0.19(0.39) | 3,933 | 0.18(0.39) | 8.86 |
| Bachelor's degree | 3,819 | 0.29(0.45) | 3,933 | 0.29(0.45) | -0.38 |
| *Labour market* | | | | | |
| Annual W&S | 5,877 | $33,049(33,790) | 6,027 | $32,723(32,620) | 0.54 |
| Employment | 5,877 | 0.67(0.47) | 6,027 | 0.67(0.47) | -0.11 |
| Annual benefit | 5,877 | $640(2,365) | 6,027 | $602(2,291) | 0.88 |
| Eligible for PPL | 5,877 | 0.71(0.46) | 6,027 | 0.72(0.45) | -1.43 |

*Notes:* Units are as follows: Age at birth: years; Subsequent children: number of children born after the first; Gestation length: weeks; Birth weight: kilograms; Indicator variables: Father identified: father identified on the child's birth certificate; Region: region of the mother's residential address at the time of birth - the proportions living in other regions are 0.40 (comparison) and 0.38 (treatment); Education: highest educational qualification achieved by the mother - the proportions with other highest achieved education types are 0.32 (comparison) and 0.29 (treatment); Eligible for PPL is an indicator for the mother qualifying for PPL using my proxy variable (see Section 4). Significance levels of the t-statistics are defined as follows: *** if $p<0.001$ ** if $p<0.01$ and * if $p<0.05$.

*Source:* Own calculations using Statistics New Zealand's IDI.

**Table A2.4:** Covariate balance for doughnut sample

| | Comparison | | Treatment | | |
|---|---|---|---|---|---|
| | Count | Mean(SD) | Count | Mean(SD) | t-statistic |
| *General demographic* | | | | | |
| Age at birth | 9,915 | 29.0(5.86) | 10,035 | 29.1(5.84) | -1.63 |
| Born in NZ | 9,915 | 0.60(0.49) | 10,035 | 0.59(0.49) | 1.12 |
| Twins or triplets | 9,915 | 0.01(0.10) | 10,035 | 0.01(0.11) | -1.39 |
| Subsequent children | 9,915 | 0.07(0.26) | 10,035 | 0.06(0.24) | 2.22* |
| Gestation length | 9,915 | 39.1(2.25) | 10,035 | 39.1(2.08) | -0.39 |
| Birth weight | 9,915 | 3.35(0.59) | 10,035 | 3.35(0.58) | -0.39 |
| Father identified | 9,915 | 0.95(0.21) | 10,035 | 0.95(0.21) | 0.06 |
| *Ethnicity* | | | | | |
| European | 9,915 | 0.61(0.49) | 10,035 | 0.60(0.49) | 1.57 |
| Māori | 9,915 | 0.18(0.38) | 10,035 | 0.18(0.39) | -0.69 |
| Pacific | 9,915 | 0.10(0.30) | 10,035 | 0.09(0.29) | 2.16* |
| Asian | 9,915 | 0.23(0.42) | 10,035 | 0.24(0.43) | -2.36* |
| MELAA | 9,915 | 0.02(0.15) | 10,035 | 0.02(0.15) | 0.65 |
| *Region* | | | | | |
| Auckland | 9,915 | 0.38(0.49) | 10,035 | 0.38(0.49) | -0.59 |
| Canterbury | 9,915 | 0.12(0.33) | 10,035 | 0.12(0.33) | 0.03 |
| Wellington | 9,915 | 0.11(0.31) | 10,035 | 0.11(0.31) | 1.88 |
| *Education* | | | | | |
| NCEA level 1 or 2 | 6,471 | 0.20(0.40) | 6,633 | 0.21(0.40) | -0.05 |
| NCEA level 3 | 6,471 | 0.19(0.40) | 6,633 | 0.19(0.39) | 0.13 |
| Bachelor's degree | 6,471 | 0.30(0.46) | 6,633 | 0.30(0.46) | 0.03 |
| *Labour market* | | | | | |
| Annual W&S | 9,915 | $32,755(33,466) | 10,035 | $33,574(32,760) | -1.71 |
| Employment | 9,915 | 0.67(0.47) | 10,035 | 0.68(0.47) | -1.79 |
| Annual benefit | 9,915 | $639(2,343) | 10,035 | $604(2,308) | 1.05 |
| Eligible for PPL | 9,915 | 0.71(0.46) | 10,035 | 0.72(0.45) | -2.90* |

*Notes:* Units are as follows: Age at birth: years; Subsequent children: number of children born after the first; Gestation length: weeks; Birth weight: kilograms; Indicator variables: Father identified: father identified on the child's birth certificate; Region: region of the mother's residential address at the time of birth - the proportions living in other regions are 0.39 (comparison) and 0.39 (treatment); Education: highest educational qualification achieved by the mother - the proportions with other highest achieved education types are 0.31 (comparison) and 0.30 (treatment); Eligible for PPL is an indicator for the mother qualifying for PPL using my proxy variable (see Section 4). Significance levels of the t-statistics are defined as follows: *** if p<0.001 ** if p<0.01 and * if p<0.05.
*Source:* Own calculations using Statistics New Zealand's IDI.

**Table A2.5:** Covariate balance for eligible PPL sample

| | Comparison | | Treatment | | |
|---|---|---|---|---|---|
| | Count | Mean(SD) | Count | Mean(SD) | t-statistic |
| *General demographic* | | | | | |
| Age at birth | 8,358 | 29.7(5.37) | 8,712 | 29.6(5.41) | 0.31 |
| Born in NZ | 8,358 | 0.62(0.48) | 8,712 | 0.62(0.48) | -0.29 |
| Twins or triplets | 8,358 | 0.01(0.10) | 8,712 | 0.01(0.11) | -0.61 |
| Subsequent children | 8,358 | 0.06(0.25) | 8,712 | 0.06(0.23) | 2.35* |
| Gestation length | 8,358 | 39.1(2.26) | 8,712 | 39.1(2.08) | -1.18 |
| Birth weight | 8,358 | 3.35(0.59) | 8,712 | 3.34(0.58) | -0.76 |
| Father identified | 8,358 | 0.97(0.18) | 8,712 | 0.97(0.17) | -0.40 |
| *Ethnicity* | | | | | |
| European | 8,358 | 0.67(0.47) | 8,712 | 0.66(0.47) | 0.97 |
| Māori | 8,358 | 0.15(0.36) | 8,712 | 0.16(0.37) | -1.89 |
| Pacific | 8,358 | 0.08(0.28) | 8,712 | 0.08(0.27) | 1.22 |
| Asian | 8,358 | 0.21(0.41) | 8,712 | 0.22(0.41) | -1.39 |
| MELAA | 8,358 | 0.02(0.14) | 8,712 | 0.02(0.13) | 1.16 |
| *Region* | | | | | |
| Auckland | 8,358 | 0.38(0.49) | 8,712 | 0.38(0.49) | 0.23 |
| Canterbury | 8,358 | 0.12(3) | 8,712 | 0.12(0.33) | -1.70 |
| Wellington | 8,358 | 0.11(0.31) | 8,712 | 0.11(0.31) | -0.64 |
| *Education* | | | | | |
| NCEA level 1 or 2 | 2,529 | 0.17(0.38) | 2,655 | 0.17(0.38) | -0.65 |
| NCEA level 3 | 2,529 | 0.18(0.38) | 2,655 | 0.18(0.39) | -0.71 |
| Bachelor's degree | 2,529 | 0.33(0.47) | 2,655 | 0.32(0.47) | 0.52 |
| *Labour market* | | | | | |
| Annual W&S | 8,358 | $45,336(32,047) | 8,712 | $45,460(30,964) | -0.26 |
| Employment | 8,358 | 0.91(0.28) | 8,712 | 0.91(0.28) | 0.05 |
| Annual benefit | 8,358 | $294(1,434) | 8,712 | $280(1,402) | 0.64 |

*Notes:* Units are as follows: Age at birth: years; Subsequent children: number of children born after the first; Gestation length: weeks; Birth weight: kilograms; Indicator variables: Father identified: father identified on the child's birth certificate; Region: region of the mother's residential address at the time of birth - the proportions living in other regions are 0.39 (comparison) and 0.39 (treatment); Education: highest educational qualification achieved by the mother - the proportions with other highest achieved education types are 0.32 (comparison) and 0.33 (treatment). Significance levels of the t-statistics are defined as follows: *** if p<0.001 ** if p<0.01 and * if p<0.05.
*Source:* Own calculations using Statistics New Zealand's IDI.

**Table A2.6:** Covariate balance for all mothers sample

| | Comparison | | Treatment | | |
|---|---|---|---|---|---|
| | Count | Mean(SD) | Count | Mean(SD) | t-statistic |
| *General demographic* | | | | | |
| Age at birth | 26,400 | 30.2(5.70) | 26,646 | 30.4(5.67) | -2.38* |
| Born in NZ | 26,400 | 0.67(0.47) | 26,646 | 0.67(0.47) | 0.12 |
| Twins or triplets | 26,400 | 0.01(0.11) | 26,646 | 0.01(0.11) | -1.07 |
| Other children | 26,400 | 1.13(1.21) | 26,646 | 1.03(1.21) | -9.08*** |
| Gestation length | 26,400 | 39.0(2.03) | 26,646 | 39.0(2.00) | -0.59 |
| Birth weight | 26,400 | 3.43(0.58) | 26,646 | 3.43(0.59) | -1.14 |
| Father identified | 26,400 | 0.95(0.22) | 26,646 | 0.95(0.22) | -0.86 |
| *Ethnicity* | | | | | |
| European | 26,400 | 0.63(0.48) | 26,646 | 0.63(0.48) | -0.41 |
| Māori | 26,400 | 0.24(0.42) | 26,646 | 0.23(0.42) | 1.02 |
| Pacific | 26,400 | 0.12(0.32) | 26,646 | 0.11(0.31) | 2.33* |
| Asian | 26,400 | 0.17(0.38) | 26,646 | 0.18(0.38) | 2.11* |
| MELAA | 26,400 | 0.02(0.14) | 26,646 | 0.02(0.14) | -0.64 |
| *Region* | | | | | |
| Auckland | 26,400 | 0.38(0.45) | 26,646 | 0.38(0.45) | 0.17 |
| Canterbury | 26,400 | 0.11(0.31) | 26,646 | 0.10(0.32) | -1.05 |
| Wellington | 26,400 | 0.10(0.30) | 26,646 | 0.10(0.31) | -0.79 |
| *Education* | | | | | |
| NCEA level 1 or 2 | 17,289 | 0.47(0.50) | 17,676 | 0.48(0.50) | -2.08* |
| NCEA level 3 | 17,289 | 0.18(0.38) | 17,676 | 0.17(0.38) | 1.25 |
| Bachelor's degree | 17,289 | 0.17(0.38) | 17,676 | 0.17(0.38) | 0.70 |
| *Labour market* | | | | | |
| Annual W&S | 26,400 | $25,545(30,529) | 26,646 | $25,400(30,700) | -3.22** |
| Employment | 26,400 | 0.55(0.50) | 26,646 | 0.57(0.57) | -3.66*** |
| Annual benefit | 26,400 | $2,452(5,615) | 26,646 | $2,352(5,534) | 2.06* |
| Eligible for PPL | 26,400 | 0.60(0.49) | 26,646 | 0.61(0.49) | -3.24** |

*Notes:* Units are as follows: Age at birth: years; Other children: total number of children aside from child born in 2018; Gestation length: weeks; Birth weight: kilograms; Indicator variables: Father identified: father identified on the child's birth certificate; Region: region of the mother's residential address at the time of birth - the proportions living in other regions are 0.41 (comparison) and 0.42 (treatment); Education: highest educational qualification achieved by the mother - the proportions with other highest achieved education types are 0.18 (comparison) and 0.18 (treatment); Eligible for PPL is an indicator for the mother qualifying for PPL using my proxy variable (see Section 4). Significance levels of the t-statistics are defined as follows: *** if p<0.001 ** if p<0.01 and * if p<0.05.
*Source:* Own calculations using Statistics New Zealand's IDI.

**Table A2.7:** Covariate balance for fathers

| | Comparison | | Treatment | | |
|---|---|---|---|---|---|
| | Count | Mean(SD) | Count | Mean(SD) | t-statistic |
| *General demographic* | | | | | |
| Age at birth | 11,031 | 31.6(6.91) | 11,316 | 31.6(6.82) | -0.36 |
| Born in NZ | 11,031 | 0.61(0.49) | 11,316 | 0.61(0.49) | 0.99 |
| Twins or triplets | 11,031 | 0.01(0.10) | 11,316 | 0.01(0.10) | -0.93 |
| Subsequent children | 11,031 | 0.07(0.26) | 11,316 | 0.07(0.25) | 1.01 |
| Gestation length | 11,031 | 39.1(2.16) | 11,316 | 39.1(2.04) | -0.68 |
| Birth weight | 11,031 | 3.35(0.58) | 11,316 | 3.35(0.58) | -0.53 |
| *Ethnicity* | | | | | |
| European | 11,031 | 0.61(0.49) | 11,316 | 0.60(0.49) | 1.38 |
| Māori | 11,031 | 0.18(0.38) | 11,316 | 0.18(0.38) | -0.08 |
| Pacific | 11,031 | 0.10(0.31) | 11,316 | 0.10(0.30) | 0.99 |
| Asian | 11,031 | 0.21(0.41) | 11,316 | 0.23(0.42) | -2.47* |
| MELAA | 11,031 | 0.02(0.15) | 11,316 | 0.02(0.15) | 0.16 |
| *Region* | | | | | |
| Auckland | 11,031 | 0.32(0.47) | 11,316 | 0.32(0.47) | -0.44 |
| Canterbury | 11,031 | 0.12(0.32) | 11,316 | 0.12(0.32) | -0.05 |
| Wellington | 11,031 | 0.11(0.31) | 11,316 | 0.12(0.32) | -1.11 |
| *Education* | | | | | |
| NCEA level 1 or 2 | 6,654 | 0.19(0.40) | 7,080 | 0.21(0.41) | -2.06* |
| NCEA level 3 | 6,654 | 0.17(0.37) | 7,080 | 0.17(0.37) | 0.08 |
| Bachelor's degree | 6,654 | 0.19(0.39) | 7,080 | 0.18(0.39) | 0.53 |
| *Labour market* | | | | | |
| Annual W&S | 11,031 | $42,708(41,336) | 11,316 | $43,989(41,933) | -2.30* |
| Employment | 11,031 | 0.69(0.46) | 11,316 | 0.70(0.46) | -1.25 |
| Annual benefit | 11,031 | $449(1,978) | 11,316 | $431(1,939) | 0.68 |
| Eligible for PPL | 11,031 | 0.72(0.45) | 11,316 | 0.74(0.44) | -2.27* |

*Notes:* Units are as follows: Age at birth: years; Subsequent children: number of children born to father after the first; Gestation length (mother): weeks; Birth weight: kilograms; Indicator variables: Region: region of the father's residential address at the time of birth - the proportions living in other regions are 0.45 (comparison) and 0.44 (treatment); Education: highest educational qualification achieved by the father - the proportions with other highest achieved education types are 0.45 (comparison) and 0.44 (treatment); Eligible for PPL is an indicator for the mother qualifying for PPL using my proxy variable (see Section 4). Significance levels of the t-statistics are defined as follows: *** if p<0.001 ** if p<0.01 and * if p<0.05.
*Source:* Own calculations using Statistics New Zealand's IDI.

**Table A2.8:** Covariate balance for grandmothers

| | Comparison | | Treatment | | |
|---|---|---|---|---|---|
| | Count | Mean(SD) | Count | Mean(SD) | t-statistic |
| *General demographic* | | | | | |
| Age at birth | 6,816 | 53.9(7.94) | 6,468 | 54.0(7.97) | -1.21 |
| Born in NZ | 6,816 | 0.78(0.42) | 6,468 | 0.79(0.41) | -0.68 |
| No. grandchildren | 6,816 | 2.77(2.23) | 6,468 | 2.66(2.00) | 1.32 |
| Gestation length | 6,816 | 39.1(2.40) | 6,468 | 39.2(2.18) | -1.14 |
| Birth weight | 6,816 | 3.39(0.59) | 6,468 | 3.39(0.59) | 0.41 |
| Father identified | 6,816 | 0.95(0.21) | 6,468 | 0.95(0.21) | -0.81 |
| *Ethnicity* | | | | | |
| European | 6,816 | 0.67(0.47) | 6,468 | 0.68(0.47) | -0.55 |
| Māori | 6,816 | 0.24(0.43) | 6,468 | 0.25(0.43) | -1.19 |
| Pacific | 6,816 | 0.07(0.26) | 6,468 | 0.07(0.25) | 0.93 |
| Asian | 6,816 | 0.02(0.14) | 6,468 | 0.02(0.41) | 0.13 |
| MELAA | 6,816 | 0.00(0.05) | 6,468 | 0.00(0.06) | -0.71 |
| *Region* | | | | | |
| Auckland | 6,816 | 0.30(0.40) | 6,468 | 0.31(0.41) | -0.08 |
| Canterbury | 6,816 | 0.11(0.31) | 6,468 | 0.12(0.29) | -0.98 |
| Wellington | 6,816 | 0.09(0.29) | 6,468 | 0.09(0.29) | -0.36 |
| *Education* | | | | | |
| NCEA level 1 or 2 | 1,923 | 0.23(0.42) | 2,016 | 0.24(0.43) | -0.78 |
| NCEA level 3 | 1,923 | 0.23(0.42) | 2,016 | 0.21(0.41) | 0.99 |
| Bachelor's degree | 1,923 | 0.14(0.35) | 2,016 | 0.15(0.36) | -0.94 |
| *Labour market* | | | | | |
| Annual W&S | 6,816 | $19,877(29,503) | 6,468 | $20,847(30,223) | -1.91 |
| Employment | 6,816 | 0.42(0.49) | 6,468 | 0.43(0.50) | -1.94 |
| Annual benefit | 6,816 | $1,923(5,159) | 6,468 | $1,938(5,144) | -0.17 |
| Eligible for PPL | 6,816 | 0.74(0.44) | 6,468 | 0.76(0.42) | -3.13** |

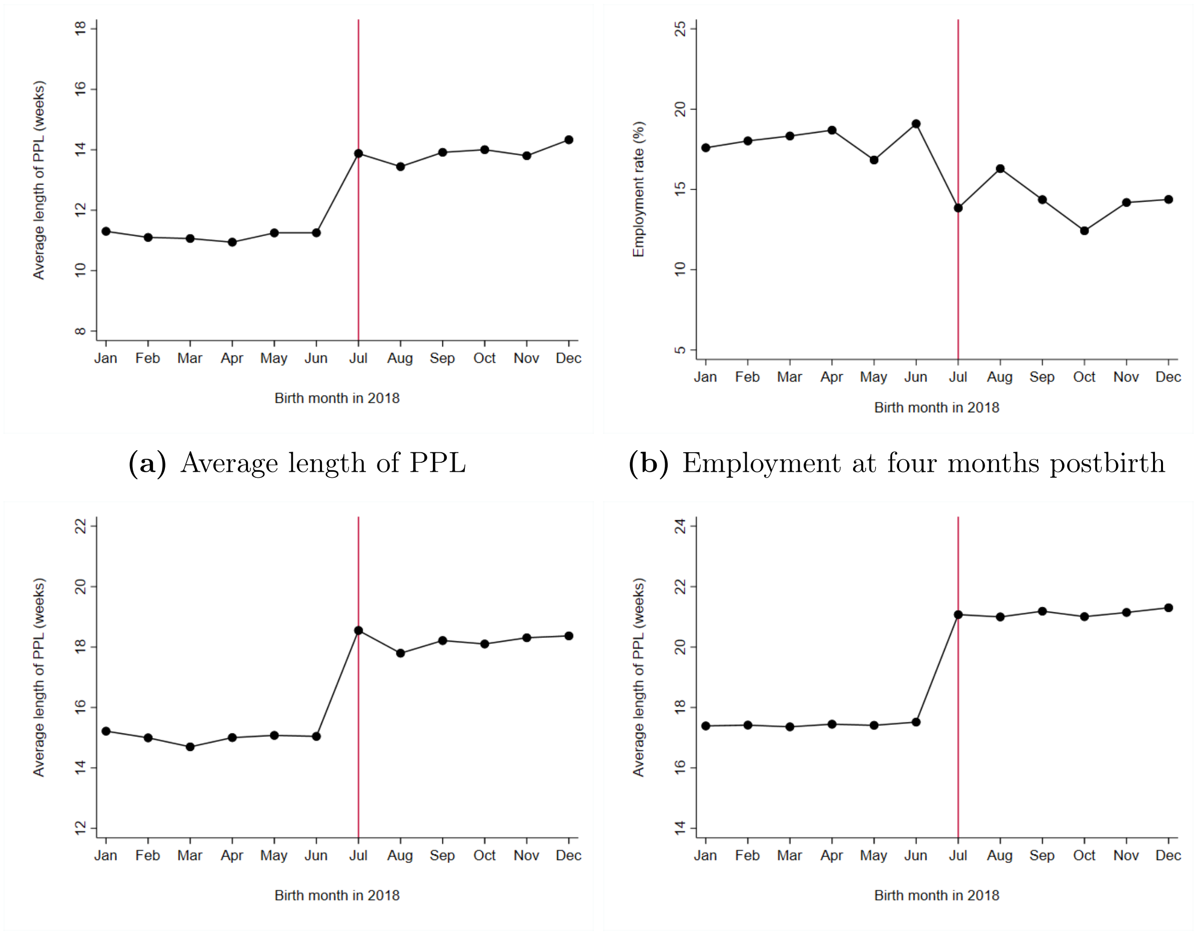
*Notes:* Units are as follows: Age at birth: years; No. grandchildren: number of other grandchildren to grandmother (total); Gestation length (mother): weeks; Birth weight: kilograms; Indicator variables: Father identified: father identified on the child's birth certificate; Region: region of the grandmother's residential address at the time of birth - the proportions living in other regions are 0.50 (comparison) and 0.48 (treatment); Education: highest educational qualification achieved by the grandmother - the proportions with other highest achieved education types are 0.40 (comparison) and 0.40 (treatment); Eligible for PPL is an indicator for the mother qualifying for PPL using my proxy variable (see Section 4). Significance levels of the t-statistics are defined as follows: *** if $p<0.001$ ** if $p<0.01$ and * if $p<0.05$.
*Source:* Own calculations using Statistics New Zealand's IDI.

## A3 Paid parental leave takeup

In this Appendix, I provide the mean differences in the average length of PPL calculated using the method outlined in Section 4. In Figure A3.1, the points represent the length of PPL taken, in weeks, by first-time mothers giving birth in each month of 2018. The red line is placed at the 1 July 2018 implementation date (of the PPL extension and Best Start payments). Mothers who gave birth on the left-hand-side of this line were offered 18 weeks, while the mothers who gave birth on the right-hand-side were offered 22 weeks (plus the Best Start payments). Panel A shows the average length of PPL taken for my entire estimation sample including mothers who qualify and mothers who do not qualify for PPL. Panel B is a comparison of the average monthly employment rate, also for the estimation sample, at 16 weeks of four months postbirth. This cross-section is the month in which the employment effect of the PPL extension and best Start payments appears to be the largest. Panel A suggests that the average length of PPL taken by mothers in the comparison group is 11.15 weeks, while the average length of PPL taken by mothers in the treatment group is 13.90, which is a difference of 2.75 (or nearly three) weeks. There is a subsequent decrease in the average employment rate at four months postbirth by nearly four percentage points between the comparison and treatment groups which could be attributed to the additional length of PPL taken.

Panel C shows the average length of PPL taken by mothers who qualify for PPL (see Section 4). Among this sample, the average in the comparison group is 15.01 weeks and the average in the treatment group is 18.22 weeks, which is a difference of 3.21 weeks, or just over three weeks. Panel D shows the average length of PPL taken among a sample of mothers (taken from the estimation sample) conditional on the identification of at least one positive PPL record in the IRD data. Among this group, the average length of leave taken for mothers giving birth between January and June 2018 is 17.42 weeks while the average length for mothers giving birth between July and December 2018 is 21.11, which is a difference of 3.69, or nearly four weeks. As the PPL extension was from 18 to 22 weeks, it is apparent that mothers who take PPL tend to fully exhaust the total length. Note that this is not the same as staying home, as the payments could be crowding out unpaid leave, however it is clear that there was an increase in takeup as a result of the PPL extension. This change in takeup informs my results which measure the change in labour force attachment as a result of the PPL extension and Best Start payments, however it is important to note that the effects of the PPL extension and Best Start payments are indistinguishable in my analysis.

**Figure A3.1:** Average length of PPL taken and employment at four months postbirth




**(a)** Average length of PPL

**(b)** Employment at four months postbirth

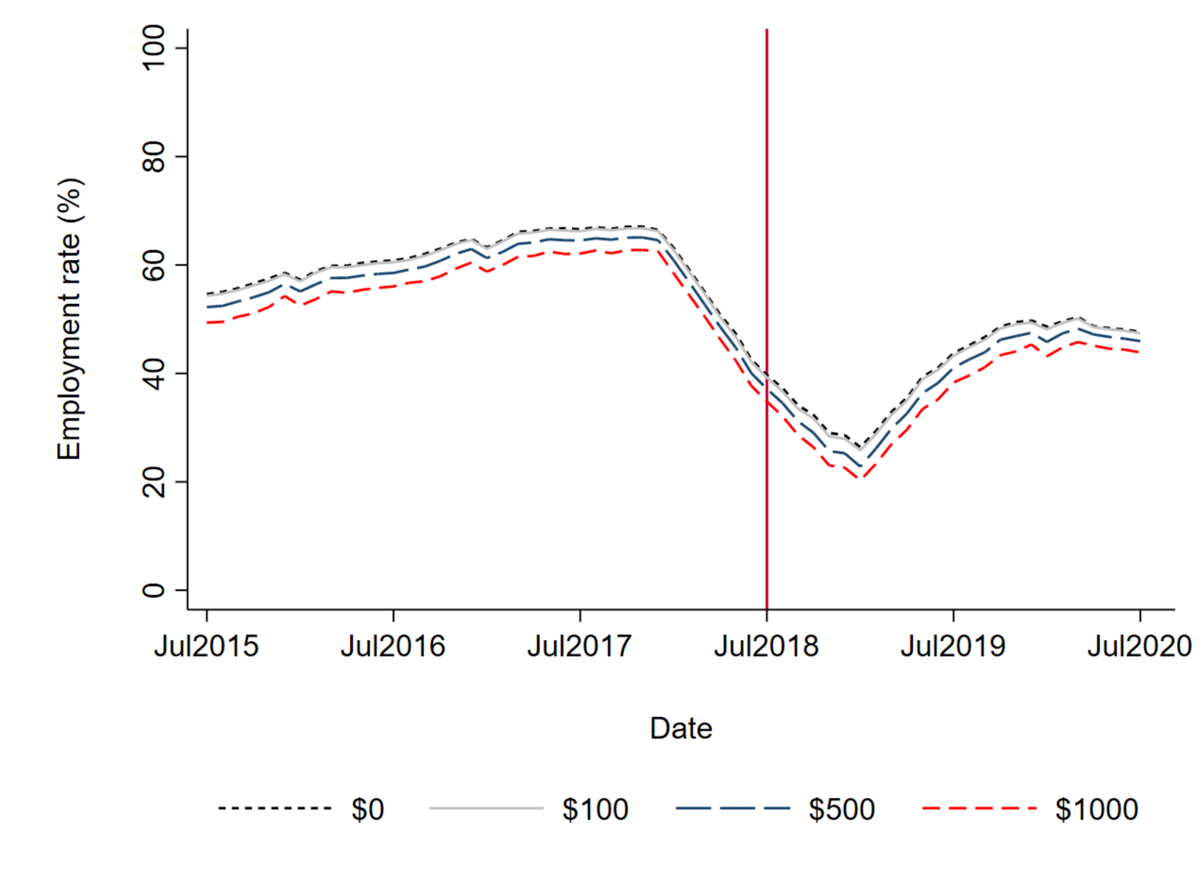
**(c)** Length of PPL: Eligible mothers

**(d)** Length of PPL: Conditional on takeup

*Notes:* Panel A shows the average length of PPL taken by my entire estimation sample including mothers who qualify for PPL and mothers who do not, thus it is the average. Panel B shows the employment rate (%) of mothers at the cross-section four months post birth in which the decrease in employment appears to be the greatest. Panel C shows the length of PPL taken by mothers in my sample of mothers who qualify for PPL (see Section 4). Panel D shows the length of PPL taken by mothers, conditional on being identified with at least one record of positive PPL payments in the IRD data. Length of PPL is measured in total weeks which is estimated using the method outlined in Section 4. The x-axis is the month of birth in 2018 and the vertical red line separates the mothers in the comparison group (who gave birth between January and June 2018) and the treatment group (who gave birth between July and December 2018).
*Source:* Own calculations using Statistics New Zealand's IDI.

# A4 Data section

**Figure A4.1:** Employment rates using different earnings thresholds

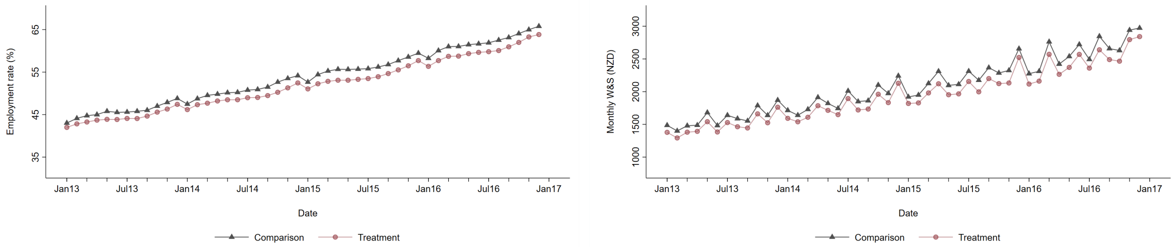



*Notes:* The average monthly employment rates for mothers in my estimation sample are shown for July 2015 to July 2020 using different definitions of the minimum monthly W&S for employment including $0 (the definition used in this thesis), $100, $500 and $1000 per month. The red vertical line indicates the date of the implementation of the PPL extension and Best Start payments.
*Source:* Own calculations using Statistics New Zealand's IDI.

# A5 Results section

## A5.1 Primary analysis: Estimation sample

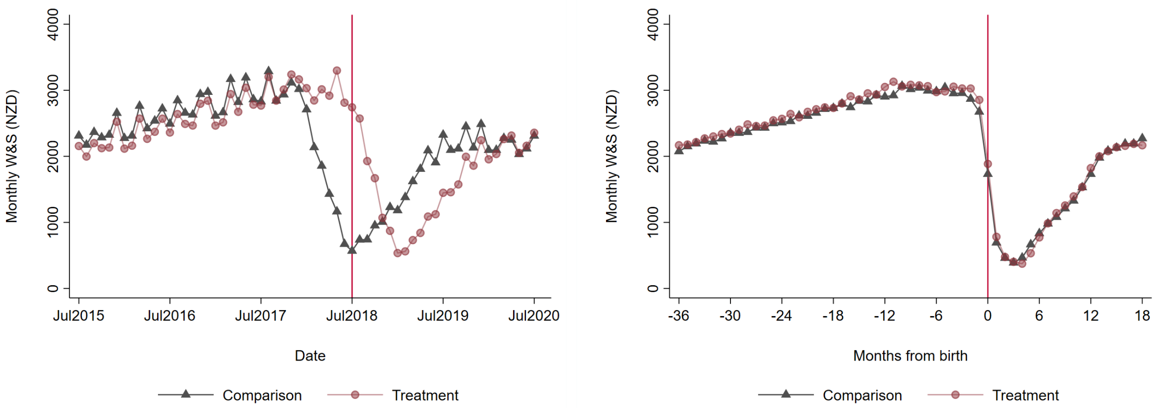
**Figure A5.1:** Labour market seasonality




**(a)** Employment seasonality **(b)** Labour earnings seasonality

*Notes:* Panel A shows the average monthly employment rate and Panel B shows the average monthly w&S for the comparison and treatment groups in my estimation sample from January 2013 to December 2016, prior to any possible changes in employment due to planning for the child's birth in 2018. Note that, as it is the same mothers, both employment and earnings increase as they get older, however systematic changes are still visible between months. Similarly, in the IRD data, as W&S records are monthly, women who are paid fortnightly are sometimes recorded as receiving three paychecks in one month (a relatively higher amount) and two paychecks in other months (a relatively lower amount). Interestingly, there is an almost five percetnage point difference in employment between December and January each year, which affects mothers in the one-month window sample, for example, as six months postbirth and 18 months postbirth the two groups face the labour market conditions in December (comparison) and January (treatment). This could affect employment, thus a control for labour market seasonality is required. For W&S, earnings appear to be greater in the Spring months each year which similarly affects the labour conditions faced by mothers in the comparison and treatment group when they return to work in different calendar months but at the same point on the event timeline, also confirming that labour market seasonality must be controlled for in my empirical strategy.
*Source:* Own calculations using Statistics New Zealand's IDI.

**Figure A5.2:** Monthly labour earnings across event and calendar time

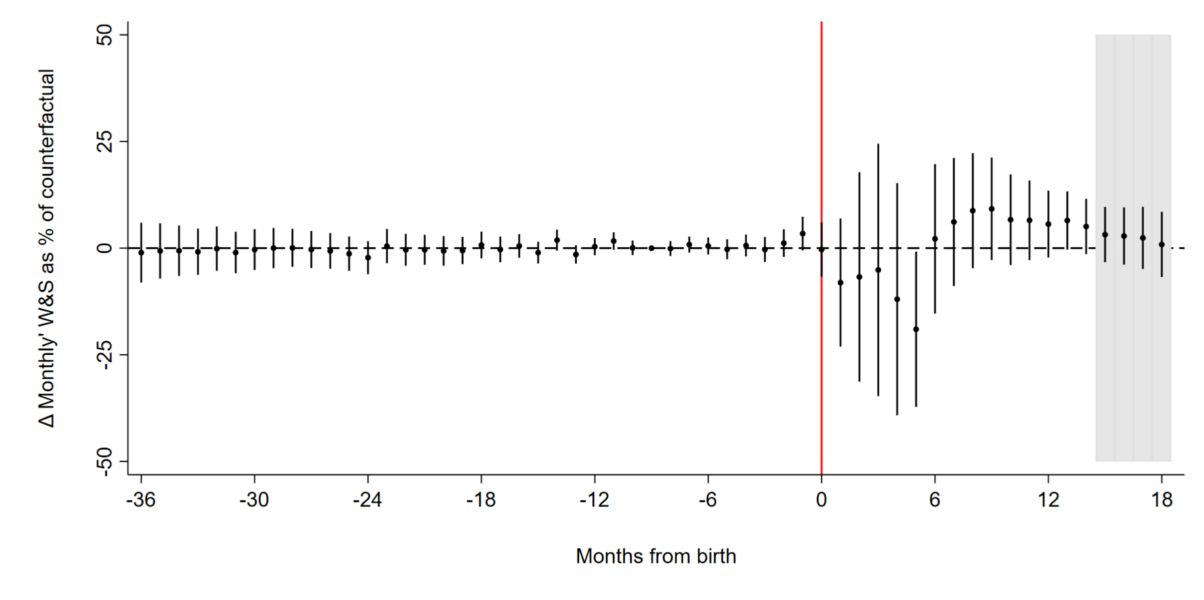



**(a)** Labour earnings across calendar time **(b)** Labour earnings across event timeline

*Notes:* Panel A shows the average monthly W&S across for the comparison and treatment groups across calendar time from July 2015 to July 2020. The implementation of the PPL extension and Best Start

payments is indicated by the vertical red line. Panel B shows the average monthly W&S across for the comparison and treatment groups across the event timeline in which month of birth is normalised to 0 and the observations span from 36 months prior to birth to 18 months postbirth. The month of birth (0) is indicated by the vertical red line.
*Source:* Own calculations using Statistics New Zealand's IDI.

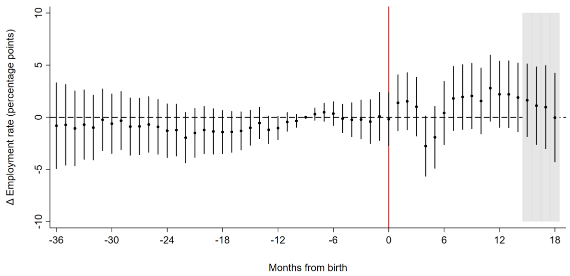
**Figure A5.3:** Treatment effect on labour earnings as a precentage of the counterfactual



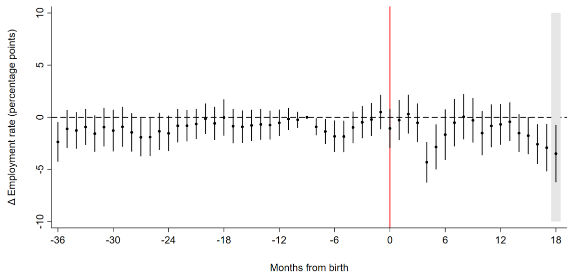

*Notes:* The average effect of PPLE & BS eligibility on monthly W&S is shown for the estimation sample and is conveyed as a percentage of monthly W&S in the counterfactual scenario. The x-axis is the event timeline in which the month of birth in normalised to 0, as indicated by the red line. The baseline period is event time=-9 and results are to be interpreted in relation to this period in the month relative to 0 on the event timeline. The grey area marks the months in which at least some proportion of mothers in the treatment group are affected by the 2020 Alert Level 4 lockdowns.
*Source:* Own calculations using Statistics New Zealand's IDI.

## A5.2 Robustness analyses

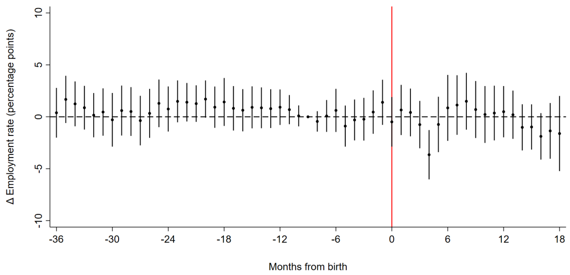
**Figure A5.4:** Treatment effect on employment among robustness samples



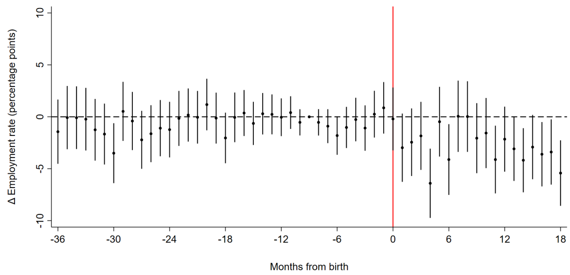

**(a)** Doughnut sample




**(b)** 3-month window sample



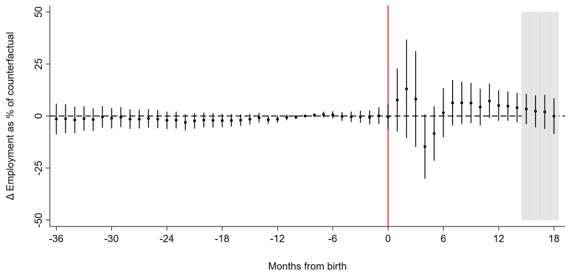

**(c)** 2-month window sample



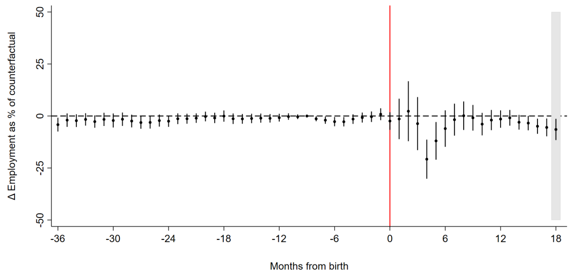

**(d)** 1-month window sample

*Notes:* The average effect of PPLE & BS eligibility on monthly employment is shown for: Panel A, the doughnut sample; Panel B, the three-month window sample; Panel C, the two-month window sample; and Panel D, the one-month window sample (see Section 4 for further details on these samples). The x-axis is the event timeline in which the month of birth in normalised to 0, as indicated by the red line. The baseline period is event time=-9 and results are to be interpreted in relation to this period in the month relative to 0 on the event timeline. The grey area marks the months in which at least some proportion of mothers in the treatment group are affected by the 2020 Alert Level 4 lockdowns.
*Source:* Own calculations using Statistics New Zealand's IDI.

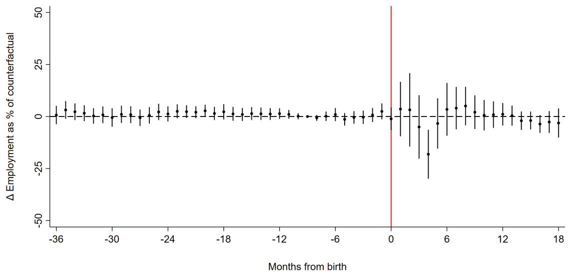
**Figure A5.5:** Treatment effect on employment among robustness samples as a % of the counterfactual



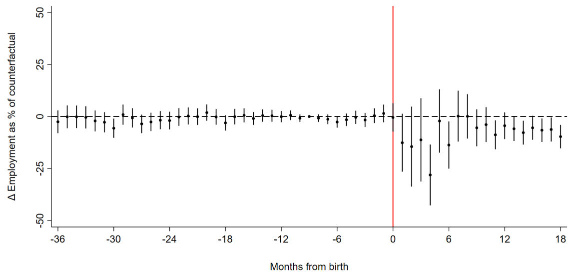

**(a)** Doughnut sample




**(b)** 3-month window sample



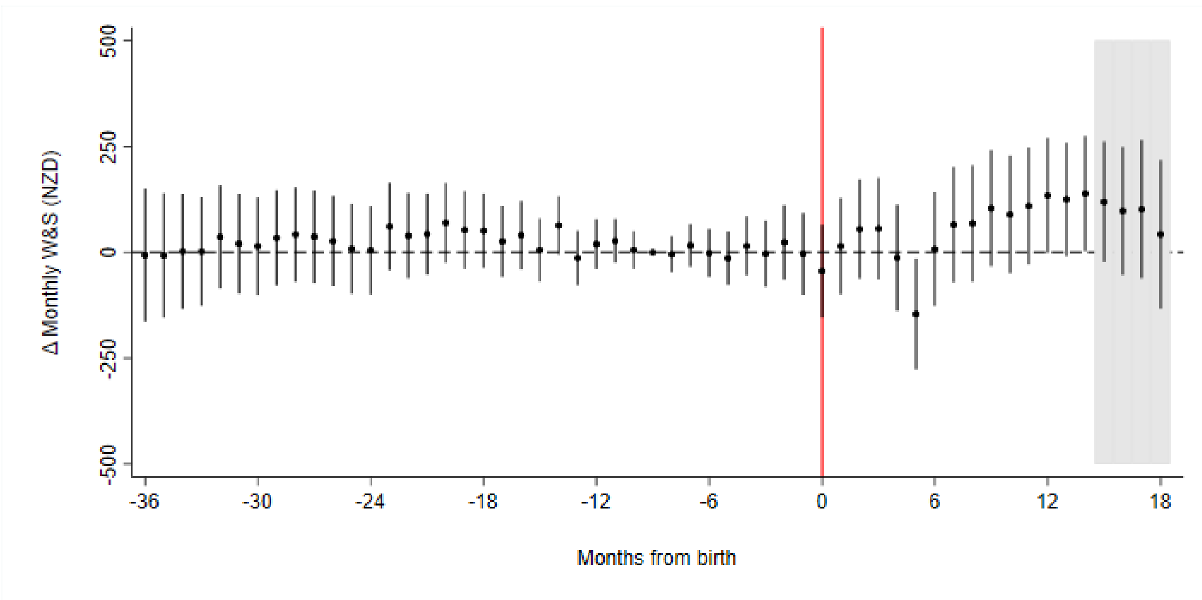

**(c)** 2-month window sample




**(d)** 1-month window sample

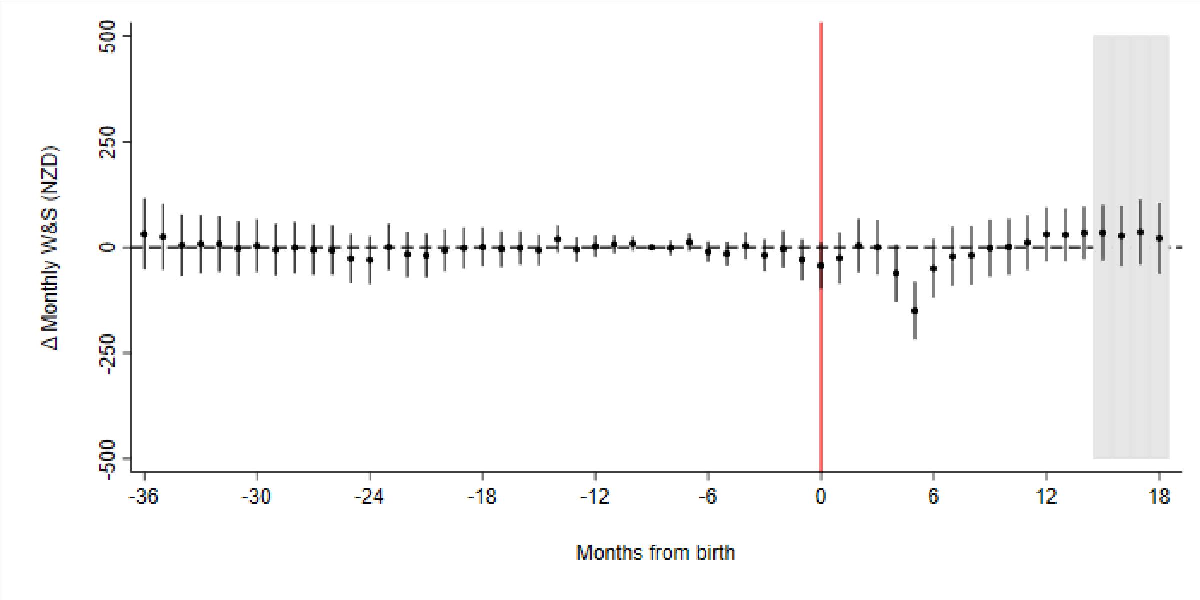
*Notes:* The average effect of PPLE & BS eligibility on monthly employment presented as a percentage of the counterfactual scenario is shown for: Panel A, the doughnut sample; Panel B, the three-month window sample; Panel C, the two-month window sample; and Panel D, the one-month window sample (see Section 4 for further details on these samples). The x-axis is the event timeline in which the month of birth in normalised to 0, as indicated by the red line. The baseline period is event time=-9 and results are to be interpreted in relation to this period in the month relative to 0 on the event timeline. The grey area marks the months in which at least some proportion of mothers in the treatment group are affected by the 2020 Alert Level 4 lockdowns.
*Source:* Own calculations using Statistics New Zealand's IDI.

**Figure A5.6:** Treatment effect on labour earnings for sample eligible for PPL



*Notes:* The average effect of PPLE & BS eligibility on monthly W&S is shown for the sample of mothers who are eligible for PPL (NZD). The x-axis is the event timeline in which the month of birth in normalised to 0, as indicated by the red line. The baseline period is event time=-9 and results are to be interpreted in relation to this period in the month relative to 0 on the event timeline. The grey area marks the months in which at least some proportion of mothers in the treatment group are affected by the 2020 Alert Level 4 lockdowns.
*Source:* Own calculations using Statistics New Zealand's IDI.

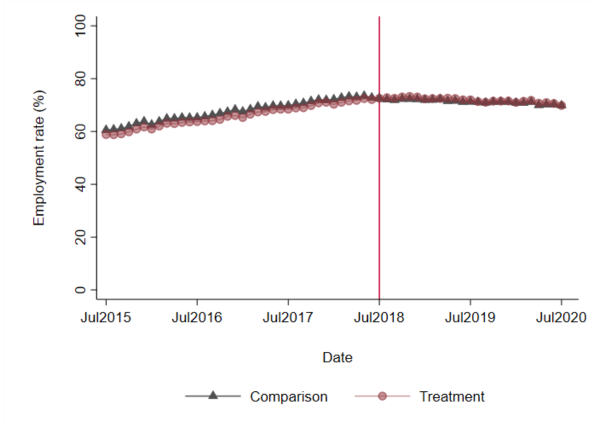
**Figure A5.7:** Treatment effect on labour earnings for all mothers



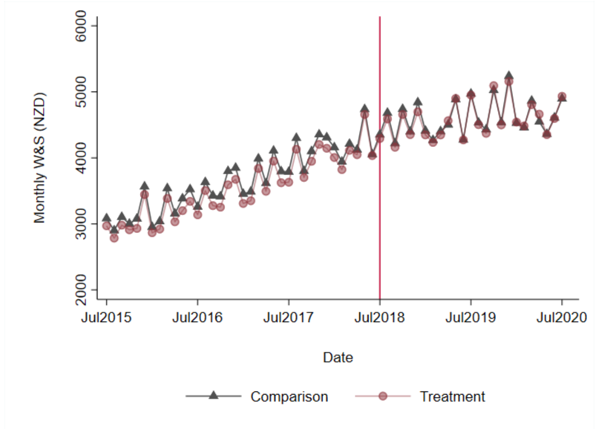

*Notes:* The average effect of PPLE & BS eligibility on monthly W&S is shown for the sample of all mothers who gave birth in 2018 (NZD). The x-axis is the event timeline in which the month of birth in normalised to 0, as indicated by the red line. The baseline period is event time=-9 and results are to be interpreted in relation to this period in the month relative to 0 on the event timeline. The grey area marks the months in which at least some proportion of mothers in the treatment group are affected by the 2020 Alert Level 4 lockdowns.
*Source:* Own calculations using Statistics New Zealand's IDI.

## A5.3 Fathers

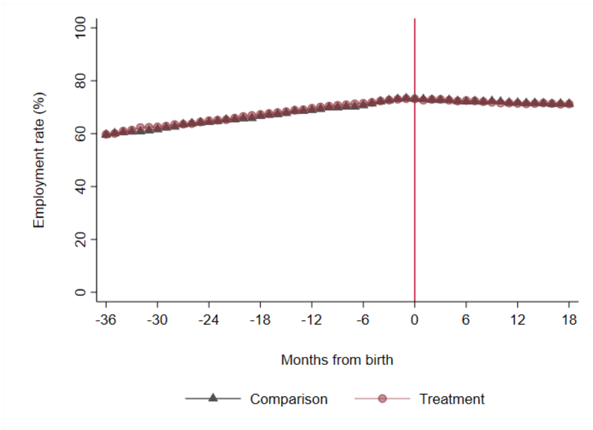
**Figure A5.8:** Fathers employment and labour earnings across calendar time and event timeline



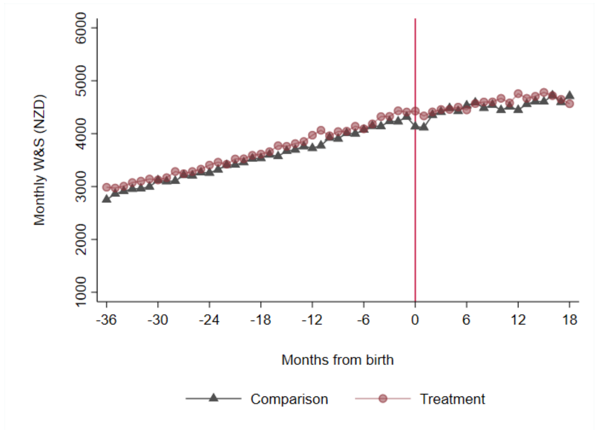

**(a)** Employment across calendar time




**(b)** Labour earnings across calendar time



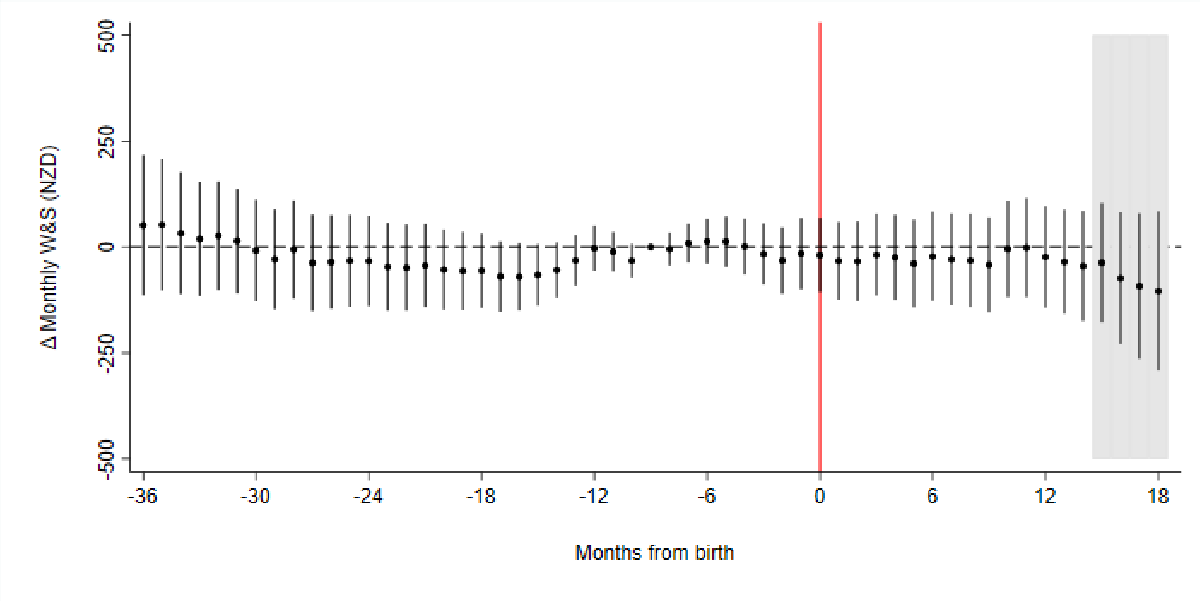

**(c)** Employment across event timeline




**(d)** Labour earnings across event timeline

*Notes:* Panel A shows the average monthly employment rate, and Panel B shows the average monthly W&S for the comparison and treatment groups in the sample of fathers across calendar time from July 2015 to July 2020. The red vertical line indiciates the implementation of the PPL extension and Best Start payments (1 July 2018). Panel C shows the average monthly employment rate and Panel D shows the average monthly W&S for the comparison and treatment groups in my sample of fathers across the event timeline. Birth month is normalised to 0, ad indicated by the vertical red line, and months along the timeline are interpreted relative to birth month (0).
*Source:* Own calculations using Statistics New Zealand's IDI.

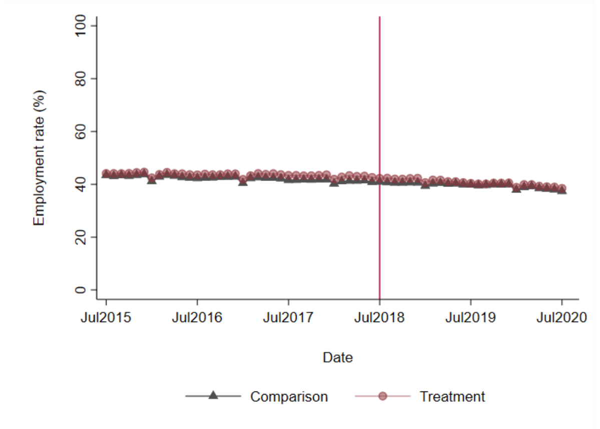
**Figure A5.9:** Treatment effect on fathers' labour earnings



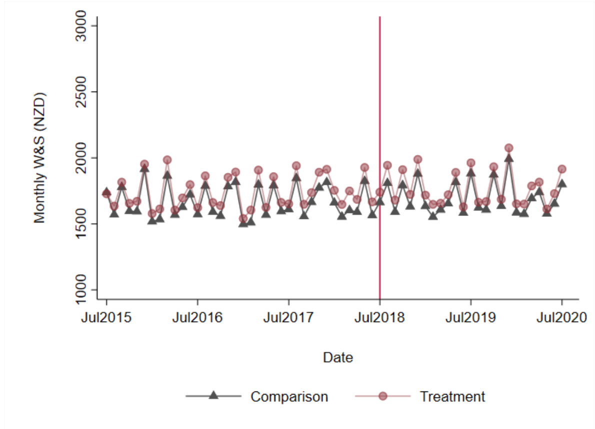

*Notes:* The average effect of PPLE & BS eligibility on monthly W&S is shown for the sample of fathers measured as a change in NZD. The x-axis is the event timeline in which the month of birth in normalised to 0, as indicated by the red line. The baseline period is event time=-9 and results are to be interpreted in relation to this period in the month relative to 0 on the event timeline. The grey area marks the months in which at least some proportion of fathers in the treatment group are affected by the 2020 Alert Level 4 lockdowns.
*Source:* Own calculations using Statistics New Zealand's IDI.

## A5.4 Maternal grandmothers

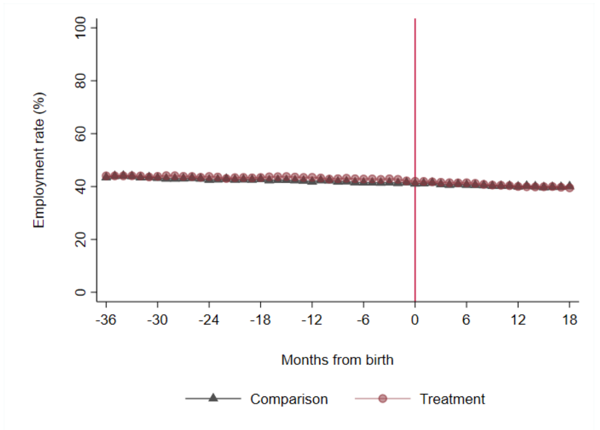
**Figure A5.10:** Grandmothers' employment and labour earnings across calendar time and event timeline



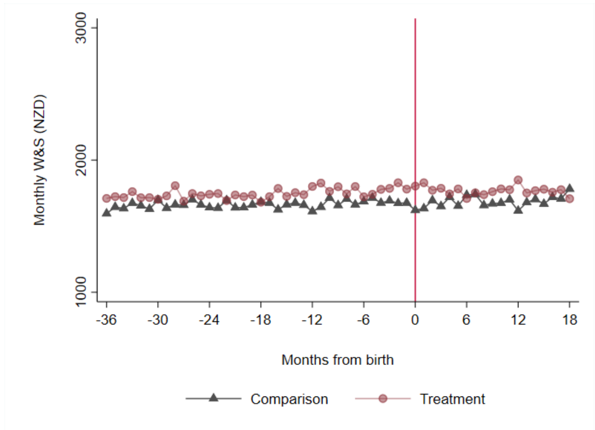

**(a)** Employment across calendar time




**(b)** Labour earnings across calendar time



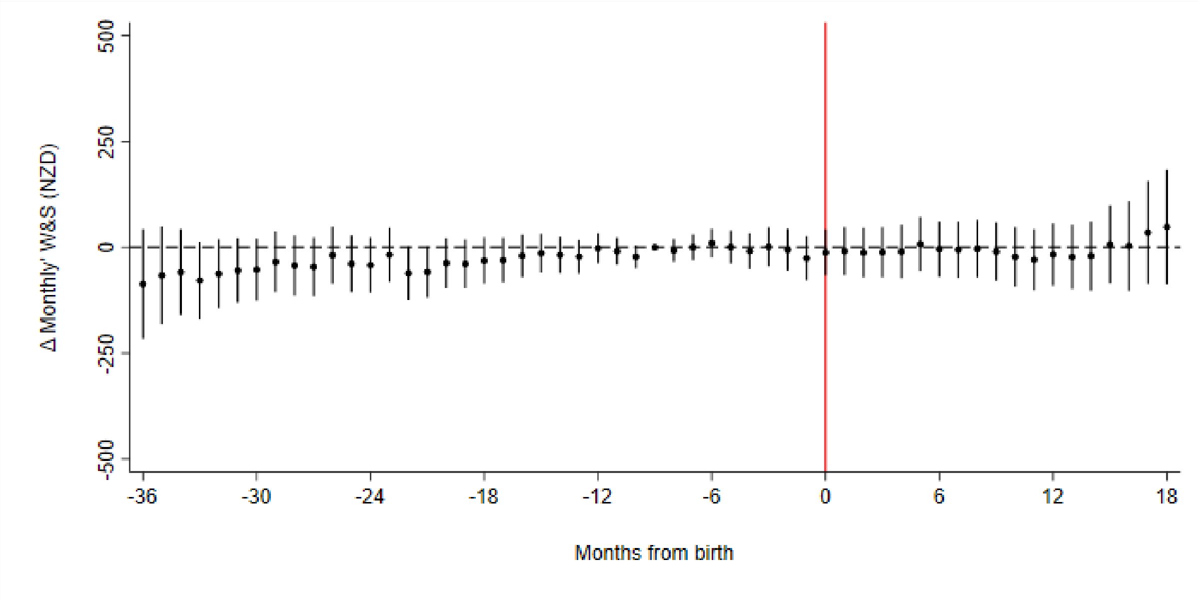

**(c)** Employment across event timeline




**(d)** Labour earnings across event timeline

*Notes:* Panel A shows the average monthly employment rate, and Panel B shows the average monthly W&S for the comparison and treatment groups in the sample of maternal grandmothers across calendar time from July 2015 to July 2020. The red vertical line indiciates the implementation of the PPL extension and Best Start payments (1 July 2018). Panel C shows the average monthly employment rate and Panel D shows the average monthly W&S for the comparison and treatment groups in my sample of maternal grandmothers across the event timeline. Birth month is normalised to 0, ad indicated by the vertical red line, and months along the timeline are interpreted relative to birth month (0).
*Source:* Own calculations using Statistics New Zealand's IDI.

**Figure A5.11:** Treatment effect on grandmothers' labour earnings




*Notes:* The average effect of PPLE & BS eligibility on monthly W&S is shown for the sample of maternal grandmothers measured as a change in NZD. The x-axis is the event timeline in which the month of birth in normalised to 0, as indicated by the red line. The baseline period is event time=-9 and results are to be interpreted in relation to this period in the month relative to 0 on the event timeline. The grey area marks the months in which at least some proportion of maternal grandmothers in the treatment group are affected by the 2020 Alert Level 4 lockdowns.
*Source:* Own calculations using Statistics New Zealand's IDI.