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Maternal Employment Trajectories and
Caring for an Infant or Toddler with a Disability

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Abstract

Mothers caring for an infant or toddler continue to face barriers in returning to work after child birth. Mothers caring for an infant or toddler with a disability, however, may face even greater barriers. This paper contributes to the literature by exploring the employment costs for this group of mothers using a novel Australian administrative data set. The employment patterns of mothers with and without a disabled infant or toddler are compared both before and after child birth. The data follow 7,600 mothers on a bi-weekly basis for the entire period 12 months before and the 24 months after child birth and contain information on the disability status of the child, measures of employment and the intensity of employment. I find that mothers of disabled toddlers and infants suffer employment disadvantages relative to mothers of non-disabled children. The employment gaps grow from approximately six percentage points shortly after their children are born to 14-17 percentage points when their children are 12 to 24 months old. The employment gaps exist for full-time employment as well as for short part-time employment.

JEL classification: I12, J13, J22

Keywords: Disability, infants or toddlers, mothers' employment

I. Introduction

Mothers caring for an infant or toddler continue to face barriers in returning to work after child birth (Waldfogel 1998, Anderson, Binder et al. 2003). Mothers caring for an infant or toddler with a disability, however, may face even greater barriers. The objective of this paper is to quantify the extent to which Australian mothers with a disabled toddler or infant delay returning to work after child birth compared to those with a typically developing infant or toddler.

Spending longer out of the workforce after child birth can have negative repercussions for mothers' future earnings and employment prospects (Mincer and Ofek 1982, Ruhm 1998, Das and Polachek 2014).¹ Consequently, mothers and their families can be more susceptible to living in poverty and social exclusion (Lukemeyer, Meyers et al. 2000, Reichman, Corman et al. 2008). Mothers that stay out of the workforce for extended periods of time also tend to report lower levels of general well-being (Shearn and Todd 2000, Carmichael and Charles 2003, Garbarski and Witt 2013). The consequence of delaying workforce return on children, however, is ambiguous. Spending more time with the child has been found to benefit children, albeit mainly relatively advantaged children (Baum 2003, Baker and Milligan 2008). At the same time, the reduction in the mother's market income tends to disproportionately divert household expenditure away from investments in the child (for example, expenditure on medical treatments for the child) (Lundberg, Pollak et al. 1997). Identifying mothers who are more susceptible to delaying workforce return is thus critical for the development of policies that aim to promote greater overall workforce participation and also individual well-being.

¹ Extending short periods of leave, however, can have positive effects on future employment and earnings (Rossin-slater et al. 2013).

Mothers caring for a disabled infant or toddler are likely to face greater employment barriers than mothers with an older disabled child or mothers without a disabled child. The former mothers are likely to face formidable time-pressures as disabilities diagnosed in infancy or very early tend to be more severe or bring greater physical impairment to the child's normal functioning (Powers 2003, Patel, Greydanus et al. 2010). Furthermore, these mothers tend to find mainstream child care services to be unsuitable or unavailable for children with disabilities (Shearn and Todd 2000, Powers 2001, Porterfield 2002). They are also more susceptible to post-natal stress and depression and often face stronger gendered expectations to assume full-time caregiving responsibilities (Kimmel 1998, Lewis, Kagan et al. 2000, Kearney and Griffin 2001, Baker, McIntyre et al. 2003, Gordon, Rosenman et al. 2007, Rosenzweig, Brennan et al. 2008). Thus, while many mothers, after child birth, continue to be affected by societal pressures as well as structural and practical barriers (Waldfoegel 1998, Anderson, Binder et al. 2003), mothers with a disabled infant or toddler may be constrained to a greater extent.

Despite the potentially unique challenges faced by mothers with a disabled infant or toddler, we have scarce knowledge about the extent of the employment penalties they endure compared to those without a disabled infant or toddler. An initial set of studies exploring this relationship faced severe data limitations (Landis 1992, Cuskelly, Pulman et al. 1998, Booth and Kelly 1999). These studies tend to be based on small cross-sections, using either qualitative or cross-sectional methods and consequently report findings that may suffer from non-response selection, self-reporting bias and lack of generalisability. Also, they generally fail to control for subtle and unobserved differences between mothers with and without a disabled infant or toddler such as, inadequate nutrition and poor health in other family members, poor quality housing, sexual violence, and poor access to health care. Neglecting to consider how these risk factors may underlie the relationship between child disability and

maternal employment can lead the estimated impact of caring for a disabled child to be biased.

Improvements in data availability have subsequently allowed researchers to utilise more sophisticated quantitative methods to address various risk factors, including unobserved ones – or in short, unobservable heterogeneity. Consequently, a large number of studies have convincingly shown that mothers endure large employment penalties when they care for a disabled child (Norberg 1998, Powers 2001, Baydar, Joesch et al. 2007, Coley, Ribar et al. 2011, Wasi, den Berg et al. 2012, Kvist, Nielsen et al. 2013).

In particular, three studies have extended our knowledge of this topic. A study by Kvist et al. (2013) is a key example of how data improvements have facilitated more compelling evidence on this topic. These authors use a rich Danish register-based panel data set, containing an extraordinarily comprehensive set of conditioning variables. With these data, the authors are able to reduce estimation bias from major risk factors such as maternal health or socio-economic disadvantage. The main drawback of their approach, however, is that it does not control for unobserved risk factors. As the authors explain themselves, they have omitted the potentially important effect of maternal psychopathology.

Another notable study is by Norberg (1998), who more effectively addresses the omitted variable issue by using panel data methods in the form of sibling fixed effects. She capitalises on the fact that siblings share many family characteristics, which can be eliminated by comparing maternal employment patterns across siblings who do and do not have a disability. However, the sibling fixed effects estimates are biased if parents respond to child endowments by compensating for or reinforcing them when distributing household resources (Rosenzweig and Wolpin 1988, Datar, Kilburn et al. 2010). This can be manifested in mothers' employment choices.

A third notable study by Powers (2001) circumvents this issue by using an alternative panel-data method, namely comparing changes in maternal employment patterns over time. She uses a two-year period at a later stage in a child's life once the disability is firmly in place. A drawback of this approach, however, is that employment levels at these later periods may already capture child disability effects, leading to an underestimate of the overall impact.

These aforementioned studies all estimate, however, average employment penalties across a wide range in child age or for older children or adolescents with a disability. One reason for this is that it is very difficult to diagnose disability or developmental delay in young children (Patel, Greydanus et al. 2010). In any case, the impact of caring for a disabled infant or toddler on maternal employment remains unclear.

This paper thus fills a gap in the literature by specifically assessing employment penalties associated with caring for a disabled infant or toddler whilst addressing the issue of unobservable heterogeneity. It does so by using a national administrative panel data set based on a near universal sample of Australian families with children. These data follow mother-child pairs on a bi-weekly basis for over a five-and-a-half-year period (from June 2001 to December 2006), which means mothers' employment patterns can be observed for the entire duration 12 months before and 24 months after child birth. The data set also contains information on the disability status of the child, which are based on diagnoses from child specialists as well as measures of employment and the intensity of employment. These data are thus ideally suited to addressing the objectives of this paper.

Another major strength of this study is that it employs a panel-data method to address unobservable heterogeneity that avoids many of the methodological issues associated with the studies by Norberg 1998, Powers 2001 and Kvist et al. 2013. Specifically, I compare a mother's employment patterns after giving birth with her own employment patterns before

giving birth. The comparison across time eliminates the influence of any unobserved (and observed) risk factors that stay constant over time such as poor maternal health. I further eliminate the effect of common time-varying factors by comparing the pre- and post-birth changes in employment patterns of mothers who give birth to a disabled child with those who give birth to a typically-functioning child. Mothers can change their attitudes towards and preferences for work, for example, or more directly, mothers naturally adjust their employment levels after the event of child birth. Thus the Difference-in-Difference (DD) strategy can help us to distinguish the employment effects of caring for a disabled infant or toddler from normative changes in employment behaviour during the peri-natal period.

The DD strategy here implicitly assumes that the two groups of mothers would respond to child birth in the same way had the disability status of their children been the same, which is known as the common trends assumption. This paper adopts several strategies to strengthen the grounds for this assumption. It allows for differential trends in maternal employment arising from differences in pre-birth demographic and socio-economic characteristics (by interacting pre-birth factors with time-varying variables). It also controls for time-varying factors, such as changes to maternal health and to welfare policy. Further, it focuses on second or higher parity births, which can minimise any interactive effects of child disability status and fertility patterns, such as first-time birth effects on mothers' preferences and attitudes. This paper provides evidence in support of the common trends assumption by showing it visually and with formal statistical tests that maternal employment trajectories before child birth are indeed aligned.

The DD method may still, however, neglect other forms of bias from unobserved time-varying confounders. For example, the incidence of disability may be correlated to maternal health conditions that only become apparent after child birth or correlated to post-natal access

to paediatric services. While these factors and other environmental risks are unlikely to influence the incidence of disability for the types of disabilities that are diagnosed in children aged zero to four years (Patel, Greydanus et al. 2010), I refrain from interpreting the estimates as causal.

I find a significant employment gap of six percentage points within three months of child birth between mothers who do and do not give birth to a child with disability. The gap widens to 14 to 17 percentage points in the 12-24 months after child birth. These gaps are associated with caring for a disabled infant or toddler after we difference away the pre-birth employment gaps. The results are substantively similar across alternative measures of maternal employment. However, they show that mothers forego employment not only at a full-time level but even at short- part-time levels.

The next section describes the data and sample. Sections III and IV define the key variables used. Section V describes the econometric methodology. Sections VI, VII and VIII present the descriptive statistics, the main results and the sensitivity analysis, respectively. Finally, section IX concludes.

II. Data and Sample selection

Nearly all benefits in Australia are administered at the national level through one central agency known as Centrelink. The data used in this paper are based on bi-weekly Centrelink welfare and social benefit records from the period June 2001 to December 2006. More precisely, the data are derived from payment records for Family Tax Benefit part A (FTB(A)) – a family payment that is means-tested and paid to around three-quarters of families with young children (Bradbury and Zhu 2010) (families with high levels of income or assets are

excluded). Thus the wide coverage of family payments means that these data capture a large and representative sample of low and middle-income Australian families.

Centrelink also administers a wide set of payments that provide information on the key variables of interest. The dependent variable of the mother's employment status as well as the intensity of her employment can be deduced through the mother's earnings reports and the receipt of particular payments, such as Family Tax Benefit (part B) (detailed in Section IV). The independent variable of the child's disability status is based on whether the mother is receiving Carers Allowance (CA) Child (a universal payment for carers of disabled children in order to cover the cost of care). Furthermore, the data set contains information on other types of allowances and income support payments received by carers, partners in their own right and on behalf of all children in the household as well as their demographic and socio-economic characteristics. Together with the general structure, these data are ideally suited to addressing the aims of this paper.

Sample selection

This paper uses a (randomised) ten per cent file of the data set described above. Further, only females receiving a family payment as the main Centrelink payment and those enlisted as the primary carer receiving CA on behalf of the child are included in order to increase the chance that the primary carer is the mother. In the event that two or more female carers are observed, only the female carer receiving CA for the longest duration is included. Going forward, the terms primary carer and mother are used interchangeably.

The sample of mothers analysed consists of continuously partnered women between the ages of 16 and 55 who give birth to a second or higher-order child during the window of June

2002 to December 2004. Thus each mother-child pair is observed for 12 months before and 24 months after child birth.

We are limited to looking at higher parity births because the original sample is based on women who were caring for at least one child in June 2001. The benefit here is that all women in the pre-birth period already have caring responsibilities, making the pre- and post-birth periods more comparable. The drawback is that it can potentially introduce selection bias to the sample since poor health among existing children can influence whether parents choose to have another child (Rosenzweig and Wolpin 1988). Further, the estimated total effect of caring for a higher order child with disability may also capture the effects of caring for an older disabled child as well as other associated indirect effects. Later, I test the sensitivity of the results to excluding households who already have a disabled child present. In any case, neither set of results will be generalisable to first-time mothers including those who stop at first parity.

The sample restriction to continuously partnered mothers ensures that all periods of analysis are as homogenous as possible, which enhances comparability. For example, it avoids attributing changes in mothers' welfare receipt patterns to changes in their partnership situation. This may arise as single and partnered mothers adhere to a different set of eligibility rules and income reporting requirements to obtain welfare benefits. The drawback of using continuously partnered mothers is that it may eliminate legitimate channel effects of parental separation. It can also introduce selection issues as mothers with a disabled infant or toddler who stay partnered may be a select sample (Powers, 2003, Wolfe and Hill, 1995). It is unclear what direction is the bias as mothers who separate may be more likely to seek work for financial reasons but may also reduce employment due to greater time restrictions (Stabile

and Allin, 2012). The results in this paper therefore, need be interpreted with this potential limitation in mind.

In all, this paper uses a balanced sample of approximately 7,600 persons and nearly 200,000 person-time observations including approximately 160 mothers with a child who was diagnosed with a disability before the age of four.

The various sample selection criteria (higher parity births and continuously partnered mothers) on top of the initial population composition means the analysis sample is not generalisable to the Australian population. In addition, the results are not generalisable to the behaviour of mothers who have selective abortions or to those who do not claim the Carers Allowance payment despite being eligible. Nevertheless, these data are nation-wide and provide a sample large enough to explore the employment penalties associated with caring for an infant or toddler with disability.

III. Defining and measuring disability for preschool children

A preschool child is considered as disabled if their mother was receiving a Carers Allowance (CA) Child payment when the child was aged 0-4 years. CA is a universal payment provided by the Australian government to help carers of disabled children with the financial cost of care.

In this paper, carers are also required to receive CA for at least seven consecutive fortnights to be counted as having a disabled child. More temporary spells of CA receipt are not considered because they may represent cases that are not the focus of this paper such as, the child dies, the disability is a temporary one, or mothers move overseas. The threshold of seven consecutive fortnights is a conservative choice because the majority of temporary

spells last for less than five fortnights. In any case, the results are not sensitive to other threshold points.

Carers of disabled children are required to report to Centrelink any changes to the child's disability status and their child is subject to regular medical reviews.² There are no periodic reviews for children below three years and four months as their condition is considered unlikely to improve significantly before they reach this age. For a similar reason, this paper considers any CA receipt (for seven continuous fortnights) before age four to indicate the presence of a disabled infant or toddler in the household.

A key benefit of using CA receipt to indicate the presence of a disabled infant or toddler in the household is that it is relatively objective compared to survey-based, parent-reported measures of disability. Carers must satisfy strict and objective criteria in order to be eligible for the payment. For example, carers must show that the child has an impairment listed on the List of Recognised Disabilities (LORD). At the beginning of the data period, the disabilities listed on the LORD included: physical disability, Autism Spectrum Disorders, Bilateral blindness, Cystic Fibrosis, Down syndrome, Phenylketonuria, Galactosaemia, Neurometabolic conditions, Neuromuscular conditions, and Primary Congenital Hypothyroidism.³

Alternatively, carers can seek a formal assessment from a medical practitioner to show that the child has a limiting disability using the Child Disability Assessment Tool (CDAT) (Centrelink, 2004). The medical practitioner must assess the child's functional ability against

² CA medical reviews are conducted within two months of developmental milestones such as at three years and four months (if CA was granted before the child was two years old).

³ Additional physical and developmental disabilities and medical conditions were added to the LORD in 2005.

standards appropriate to the child's age. Functional ability is measured in a series of categories including language skills, self-care skills, social and community skills, fine motor and gross motor skills. In addition, the child's behaviour is taken into account where it is significantly affected by the disability, along with any special care needs.⁴

Carers with two or more children with disabilities are eligible for CA even if the impairments of one or both children are not listed in the LORD or satisfied in the CDAT. They become eligible if the sum of the caring responsibility is considered equivalent to that of a carer with one child with a formally recognised disability. This pertains to 6 percent of families in the sample. In section VIII, I assess the sensitivity of the results to excluding the carers who were previously receiving CA for an older child.

While carers have financial incentives to report the incidence of child disability⁵, some will delay or forego payments. The timing of first receipt of CA can lag behind the timing of the disability diagnosis because of administrative delays or carers postponing when they notify Centrelink of the child's disability. Alternatively, some carers may forego claiming CA payments altogether in order to avoid social stigma effects. Consequently, some families may be misclassified in the analysis (as some disabled children could be classified as healthy). A better measure to use would be the timing of diagnosis because it can (partly) overcome some of the above issues but also as it may be more relevant and important for a woman's decision to withdraw from the labour market. Unfortunately, this is not observed in the data and the timing of CA receipt is used as a proxy.

⁴ Around 76 percent of medical report forms are completed by general practitioners and the remaining 24 percent are filled out by specialist practitioners (Department of Social Security, 2013).

⁵ Between 2001-2004, the CA amount given to parents was between 80-90 Australian dollars per fortnight.

IV. Measuring maternal employment

The dependent variable of interest is the mother's level of employment. In the administrative data, we do not directly observe hours of employment or whether or not mothers are employed. Thus we rely on a proxy variable based on the mother's reported earned income. A mother is considered as employed in any given fortnight if she reports a positive earned income for that fortnight; and zero otherwise.

The amount of earned income reported depends on the main benefit the mother receives. Mothers receiving family payments as their main benefit are required to report income from the following sources: taxable income, foreign income, fringe benefits, superannuation contributions, as well as some Government benefits such as Disability Support Pensions (DSP), Carers Payment, and Wife Pension (it excludes family payments, such as Family Tax Benefits, or CA payments) minus child support payments. Mothers receiving income support payments such as DSP are mainly required to report their earned income in the form of salary and wages and real estate earned income. In the starting population, there are both mothers who receive income support payments as their main benefit and those who receive family payments as their main benefit. In order to ensure that the earned income variable is measured consistently for every mother in the sample (and to minimise the chance that a positive earned income amount originates from a non-employment source), I exclude mothers who were receiving income support at any point in the analysis window as their main government benefit.⁶

⁶ Mothers who start to receive income support payments after withdrawing from the labour market are now excluded, which can lead me to underestimate the employment penalties. It does, however, avoid misclassifying a mother who churns onto the income support system (for example, she begins to receive a DSP payment) once she withdraws from the labour market as being 'employed' when in fact she only has a non-zero income because of DSP receipt.

Furthermore, how regularly clients report their earned income to Centrelink depends on the main benefit they receive. Earned income is updated on a fortnightly basis for clients who receive an income support payment. Clients who primarily receive family payments, however, are required to provide an estimate of their yearly income. Centrelink, at year-end, then reconciles the income estimates with actual earned income using Australian Tax Office (ATO) records. The Centrelink records for that given financial year are then adjusted to reflect the actual income amount.⁷ Although the periodicity of reporting for family payments is on an annual basis, recipients are required to promptly report (within 14 days) any changes in their circumstance (such as the birth of a child or return-to-work) that may affect their eligibility. Previous research shows that payment receipt status is highly responsive to changes in significant life circumstances (Zhu and Bradbury, 2015).

This paper also models the receipt of Family Tax Benefit part B (FTB(B)) to proxy for no or low hours of maternal employment. In 2001, for a family with one child under five, the secondary earner could earn up to AUD 10,291 per annum. Eligibility to FTB(B) is primarily tested on the secondary earner's income – and for the majority of partnered Australian households, this represents the mother's income. Thus a mother working a two-day week and earning at the minimum wage would be considered ineligible for payment. The low employment engagement variable is defined as equal to one if a mother receives FTB(B) in any given fortnight; and zero otherwise.

It is important to note that during the time period covered by the data, Australia did not have a universal paid maternity leave scheme. The government-funded Paid Parental Leave (PPL) scheme was subsequently introduced on 1 January 2011. However, before the introduction of

⁷ The family payment receipt status is also adjusted accordingly.

PPL, 54 percent of organisations reported offering paid maternity leave to some employees (Martin, Yerkes et al. 2013). Also, under the National Employment Standards in the Fair Work Act 2009, non-casual employees were entitled to ten days paid personal or carers leave for each year of service with their employer and this leave could be accumulated over time. The earned income variable in the administrative data will not be able to distinguish earned income through maternity leave or carer's leave payments versus income through active employment.

V. Methodology

For expositional purposes, begin by considering a basic DD model where the employment for mother i at time t is given by the following:

$$y_{it} = \alpha + \vartheta \text{disabled}_i + \beta T + \gamma (\text{disabled}_i * T) + \delta' X_i + \theta' G_{it} + \mu_i + \epsilon_{it} \quad (1)$$

where y_{it} equals one if mother i is participating in the workforce in time t , and zero otherwise. The T dummy variable equals to one for the entire period after giving birth, and zero otherwise. Disabled_i denotes child disability and equals to one if the child is diagnosed with a disability between zero and four years of birth. This indicator is interacted with the time dummy, T to provide a measure, γ , of the average effect of giving birth to a disabled child net of the effect of giving birth to a typically developing child. It is the difference-in-difference estimate. The vector X_i refers to background characteristics as measured before the birth of the child⁸, which are interacted with the time dummy, T , to minimise divergences in mothers' employment trajectories arising from differences in their background

⁸ Neighbourhood status based on a Socio-Economic Index for Areas (SEIFA) score of disadvantage (ABS, 2013), mother's age, partner's age, family size, age of the youngest child, marital or de-facto status of relationship, indigenous status, Australian born status, mother's disability status, and the presence of an older child with disability in the household.

characteristics. G_i includes time-varying variables.⁹ Lastly, μ_i represents observable and unobservable characteristics that are fixed over time and are specific to the mother.

The above model is expanded upon in order to assess how the employment effect of giving birth to a disabled child varies in the short versus longer term. It includes several leads and lags of the interaction between the disability indicator and time-relative to birth dummies.

$$y_{it} = \alpha + \vartheta \text{disabled}_i + \sum_{k=1}^7 \beta_k T_{kt} + \sum_{k=1}^7 \gamma_k (\text{disabled}_i * T_{kt}) + \sum_{k=1}^7 \delta'_k X_i + \theta' G_{it} + \mu_i + \epsilon_{it} \quad (2)$$

The variables are as described above, however, Equation 2 allows for more than just two time periods. Now T , which continues to denote time from birth, equals to one if t equals to k , and zero otherwise where $k = 1-7$. The periods 1-7 refer to the following periods: 6-12 months before, 3-6 months before (omitted category), 0-3 months before, 0-3 months after, 3-6 months after, 6-12 months after, and 12-24 months after giving birth, respectively.

A fixed effects model is used to estimate the coefficients and the robust standard errors. The coefficients on the interaction terms between disability and the time from birth dummies directly test whether there are short- and longer-term effects of caring for a child with disability (above the average impact of giving birth to a typically developing child), compared to the period 3-6 months before giving birth.

The DD strategy implicitly accounts for all average time-constant differences between mothers who do and do not give birth to a disabled child since it exploits within person variation. Subsequently, α , Disabled_i and μ_i will drop out of Equation 2. It also accounts for

⁹ Historical time as a fifth-order polynomial of days after 15 June 2001, seasonal dummies for every month of the year, an indicator to capture changes to Carer's Allowance eligibility rules (equals to one for all time periods after year 2005; zero otherwise), and maternal health shocks in the form of any changes to the mother's Disability Support Pensions (DSP) receipt.

common changes that occur across time between the two groups as it exploits across-person variation. Yet, how effective DD is in eliminating changes over time depends on whether the two groups of mothers would exhibit similar employment patterns around child birth in the scenario that both groups have typically developing children.

The common trends assumption is strengthened in this paper by accounting for potential differences in mothers' experiences over time – such as observed changes over time or potential differences in trajectories based on pre-birth differences in characteristics (interacting fixed pre-birth factors with the time dummies). One way to test the common trends assumption is to examine whether there are differential trends in employment patterns between these two groups of mothers before child birth. The individual and joint statistical significance of the leads of the interaction terms (between the disability indicator and the time relative-to-birth dummy variables) are presented in Section VII.

VI. Descriptive statistics

Table 1 compares the characteristics of mothers with and without a disabled infant or toddler – for two different time periods/points: one year before child birth and two years after child birth. For some variables, the means are reported for the respective periods. For other variables, such as the demographic characteristics, the means are reported at the respective points-in-time.

The workforce participation rate declines, on average, by 18 percentage points across the two time periods for mothers with a disabled child, whereas it only declines by seven percentage points for mothers of a typically developing child.

[Table 1 here]

Similarly, the receipt rate of FTB(B) (or the percentage of mothers who are working zero or a few hours per week), increases by 18 percentage points for mothers with a disabled child and by ten percentage points for mothers without a disabled child. Taken together, this suggests that caring for a disabled infant or toddler or toddler, unlike caring for a typically developing child, tends to delay mothers' return to the labour market. It also reduces how much mothers engage with employment for those who return to the workforce after child birth.

These two groups of mothers exhibit differences in key demographic and socio-economic characteristics even before the birth of the child. The former group is slightly more likely to be employed (by two percentage points) than the latter group. Despite this, they earn, on average, a lower annual income. Their share of the total household earned income is also lower (compared to the latter group) and this disparity widens after child birth. In addition, they tend to be older in age and are less likely to reside in poorer neighbourhoods (in the bottom 40 per cent of the SEIFA index). Additionally, there is variation in the state-of-residence across these two groups of mothers.

While families with and without a disabled preschool child exhibit different characteristics before the child is born, Table 1 does not unambiguously point to negative selection into the former group. Nevertheless, it implies the need for econometric methods to address potential biases in OLS results. For the DD approach, it can have implications for the validity of the common trends assumption if the pre-birth differences translate into differential employment trajectories.

Figure 1, however, shows evidence in support of the common trends assumption. It plots the average employment rates by the time to and from child birth for mothers with a disabled child and those with a typically developing child. Time is normalised such that time zero represents the time of birth and it ranges from 12 months before and 24 months after child

birth. The top figure plots the percentage of mothers who report a non-zero income for each fortnight, which proxies for workforce participation rates. The bottom figure plots the Family Tax Benefit (part B) receipt rates, which proxies for the percentage of mothers with low- (or zero-) level engagement with the labour market.

At the time of child birth, the top figure reveals that around 63 percent of mothers report earning a non-zero income. Most mothers here would be in receipt of employer-provided paid maternity leave or carers leave payments rather than actively working.

Before giving birth, the employment trajectories for the two groups of mothers are broadly aligned, particularly for FTB(B) receipt. The workforce participation gradients are also aligned except for the period immediately before child birth. Even though the workforce participation rate is higher among mothers with a disabled infant or toddler in the period leading up to child birth, it converges immediately before the event. The convergence is likely to reflect that mothers with a disabled infant or toddler had lower access to paid entitlements around the time of child birth, for example, they may be more likely to work in casual or non-standard employment. This may also explain why they have the unusual confluence of lower annual incomes but higher participation rates than mothers without a disabled infant or toddler (see Table 1). In Section VII (Figure 2), I show that the apparent difference in the pre-birth trends is not statistically significant.

Immediately after child birth, a workforce participation gap appears and generally grows over time in magnitude before narrowing again towards the end of the window. Figure 1 echoes the findings in Table 1 – over the 24 months after child birth, mothers with a disabled infant or toddler are, on average, less likely to participate in the workforce and they are more likely to be tenuously engaged with employment than their counterparts without a disabled infant or toddler.

Figure 1 also shows that the post-birth employment gaps fluctuate slightly in size over the course of the 24 months. Initially, they are relatively small, reflecting the fact that both groups of mothers tend to stay out of the workforce or engage with employment at a low level. However, the gap grows over time as mothers with a typically developing child steadily return to work. Interestingly, the workforce participation rates for mothers with a disabled infant or toddler also appear to increase between the 24th and 44th fortnights, but plateau from the 45th fortnight onwards. This may be due to some children being diagnosed around age four, and some mothers having little time to adjust their employment levels. The next section examines the size and statistical significance of these employment gaps in comparison to the pre-birth employment gaps.

[Figure 1 here]

VII. Results

The estimated relationship between maternal employment trajectories and caring for an infant or toddler with a disability is reported in Table 2. It presents results from two models which are increasing in the number of controls included. Model (1) only accounts for historical time, and seasonal (month-of-the-year) dummies and Model (2) further controls for confounders (vector X_i) as outlined in Equation 2. However, Table 2 only presents the coefficients on the interaction terms between the child disability indicator and the time relative to birth indicators (the DD estimates). Any employment gaps existing at the base period (3-6 months before child birth) are parameterised to equal zero. Models (1) and (2) are estimated for both the variables of workforce participation (non-zero earned income) as well as low (or no) workforce engagement (FTB(B) receipt).

[Table 2 here]

Mothers who care for a disabled infant or toddler are less likely to participate in the labour force both in the short and longer term compared to mothers who care for a typically developing child. The workforce participation gap increases by around 6 percentage points within 3-6 months of giving birth (relative to the 3-6 months before giving birth) and widens to 14-17 percentage points within 12-24 months of child birth (see columns 1 and 2). The employment penalty associated with caring for a disabled infant or toddler increases slightly once we allow the observed differences in the pre-birth demographic and socio-economic characteristics of mothers to have differential employment effects over time. The characteristics with the greatest influence include the age of the mother and her partner, and the number of children in the household. By contrast, accounting for maternal health shocks or broader macroeconomic conditions appear to matter little to the results.

A similar story emerges when an alternative measure of employment in the form of FTB(B) receipt is used. Mothers with a disabled infant or toddler are more likely to have a tenuous level of engagement with employment than mothers with a typically developing child. Table 2 shows that the gap in the FTB(B) receipt rates increase by 5-6 percentage points in the 3-6 months after child birth (relative to the 3-6 months before giving birth). This subsequently expands to 8-10 percentage points in the 12-24 months after child birth, which may correspond with the increasing rates of disability diagnosis over time.

The employment trends in the 12 months before child birth are broadly parallel for the two groups of mothers. Specifically, the employment gaps in the periods before child birth (relative to the period 3-6 months before giving birth) are small and all statistically insignificant. The parallel pre-birth employment trends apply to both workforce participation as well as low workforce engagement (FTB(B)). This indicates that the group of mothers who give birth to a typically developing child is an appropriate control group.

Model (2) can be re-estimated with a more general specification in order to further test the common trends assumption. More specifically, the time dummies closer to the event of birth are disaggregated into finer fortnightly categories (for fortnights immediately before and after child birth) and then into larger categories further away from child birth. Figure 2 shows the plot of the leads and lags of the DD estimates and their confidence intervals for workforce participation (top figure) and FTB(B) receipt (bottom figure). The coefficients on the employment leads are close to zero and they are not statistically different from zero, showing little evidence of an unanticipated event uniquely affecting mothers who give birth to a disabled child. The F-test of joint significance of the lead coefficients returns a p-value greater than 0.93 and 0.91 for both the workforce participation and FTB(B) regressions respectively – jointly, they are not different from zero.

[Figure 2 here]

VIII. Sensitivity Analysis

There are a number of potential drawbacks to using the timing of first CA receipt to identify mothers who care for a disabled infant or toddler. First, the timing of first CA receipt may be endogenous. Mothers who receive CA earlier may differ from those who receive CA later – and in ways that correlate directly with labour supply. Mothers who receive CA earlier may be more proficient in navigating the health care system (for example, acquiring a diagnosis from a health care professional) and subsequently adjust their employment differently from other mothers. Alternatively, mothers who receive CA earlier may have received CA already for an older child (particularly given how the sum of the impairments of all the children in the household are used to determine an individual child’s eligibility for CA). These mothers may have larger pre-existing caring responsibilities or a genetic pre-disposition to disability

themselves and consequently, may be more likely to reduce employment levels after child birth.

I cannot identify which mothers are more proficient at navigating the health care system, however, I can test the sensitivity of the results to excluding any families who previously received CA. Table 3 displays the DD estimates for Model (2) after this sample exclusion (leading to a sample reduction of approximately 37,400 person-time observations). The results in Table 3 remain similar to those in Table 2, where the main difference is that there is a smaller gap in FTB(B) receipt rates immediately after child birth. Mothers with fewer disabled children may be better equipped to return to work sooner than those who have an existing disabled child in the household. Overall, however, these results suggest there is little bias stemming from previous receipt of CA.

The timing of CA receipt can also be problematic if it lags substantially behind the actual diagnosis of the child's disability or the onset of symptoms. Mothers may consequently adjust their employment levels prior to the timing of first CA receipt. The lags can also lead to the mis-classification of some disabled children as healthy at any point in time. For this reason, I consider mothers who begin receiving CA before the child turned four as the treatment case even though I only observe mothers' employment up to 24 months after child birth.

The consequence of this decision, however, is that some mothers in this group may exhibit similar employment patterns as those without a disabled child since they are still unaware of their child's disability status. This would lead to an underestimate of the gaps between the

two groups. It is also possible that a diagnosis is established following job loss or high sustained levels of employment i.e. reverse causation.¹⁰

A second sensitivity test thus will make a distinction between mothers who first begin to receive CA when the child is aged zero to two versus three to four years. The base group consists of mothers who did not begin to receive CA before the child reached age four – it consists of mothers whose child is never diagnosed with a disability and those who are diagnosed with a disability after the age of four. The three distinct categories thus minimises cases of mis-classifying disabled toddlers in the base group. It also allows us to minimise reverse causation issues because we can focus on the results for mothers who first receive CA when their child is zero to two years. Last, it allows us to gauge if mothers adjust their employment levels before they begin to receive CA. A negative estimate for the group of mothers who begin to receive CA when their child is aged three to four can indicate these anticipation effects since we only observe mothers 24 months after child birth. However, we will not be able to distinguish anticipation effects from potential reverse causation effects.

Table 4 shows that the employment gaps after birth are primarily driven by the group who first receive CA when the child is aged zero to two. The workforce participation gaps are most pronounced in the longer-term period (12-24 months after child birth) at around 24 per cent. Whereas for mothers who first receive CA when the child is aged three to four, the gap is ten per cent. The FTB(B) receipt gaps are also far less pronounced for the latter group (at six per cent) than the former group (at 14 per cent). The larger employment penalties associated with caring for a disabled zero to two year old (compared to a three to four year

¹⁰ As the types of disabilities that are diagnosed before age four and in the List of Recognised Disabilities are those that are less susceptible to external factors, I assume that reverse causation is not a problem.

old) is expected since it is likely to be more time-consuming and mothers have had more time to adjust their employment.

IX. Discussion and Conclusion

The objective of this paper was to assess how caring for a disabled infant or toddler affects a mother's employment patterns. Mothers with a disabled infant or toddler tend to stay out of the workforce for longer than those with a typically developing child. Even two years after child birth, there is still a gap of 14-17 percentage points. The gap not only exists for full-time employment but also for short part-time employment. The results are driven primarily by those who care for a disabled infant (zero to two year old) as opposed to a disabled three to four year old.

Similar to the literature, I identify that the incidence of child disability is not random. Even before child birth, mothers who do and do not later give birth to a disabled child differ along several demographic and socio-economic characteristics. However, these differences do not appear to translate into differential pre-birth employment trajectories. I show the common trends assumption holds visually and with formal tests that confirm the leads of the DD estimates are not statistically different from zero.

Nevertheless, I do not interpret the negative association between caring for an infant or toddler and maternal employment as causal for a number of reasons. Mothers who give birth to a typically developing child may still be an imperfect control group for mothers who give birth to a disabled child. Their pre-birth differences may become more influential after child birth. For example, the employment effects of living in poor quality neighbourhoods, poor local infrastructure or poor maternal health may only activate after birth. I have employed

strategies to minimise these issues but measurement issues or other non-random unobserved changes over time may continue to bias the estimates.

Future research is required to estimate causal estimates of the impact of caring for a disabled infant or toddler. We also need to gain a better understanding of what employment barriers mothers exactly face – namely, whether the constraints related to time, structural factors or around social norms and expectations of mothers with a disabled infant or toddler. A greater knowledge of the exact barriers will help to inform policy makers on how to better assist mothers overcome them. Structural barriers could be alleviated, for example, by increasing funds and subsidies for more inclusive childcare centres. Similarly, practical barriers could be addressed by encouraging employers to offer more flexible workplace conditions such as working from home or flexible start and finish work hours.

Alternatively, some mothers may prefer to stay at home full-time to provide care for their disabled infant or toddler. In this case, governments could provide more generous compensation to mothers for the opportunity cost of being a full-time carer and to help them afford the medical and practical costs of treatment for the child. Gaining greater knowledge on this topic can enable the development of policies to support maternal employment and reduce the risk of poverty and disadvantage among families with disabled infants or toddlers.

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Figure 1: Employment Trajectories before and after Child birth for Treatment and Control Groups

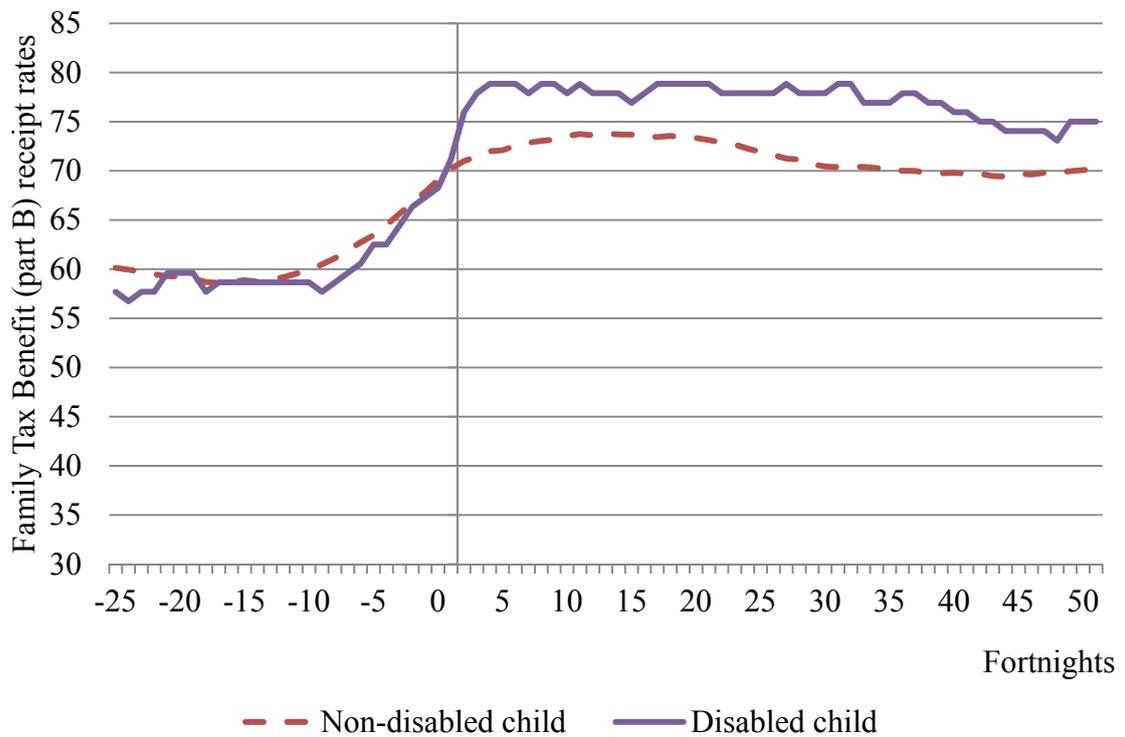
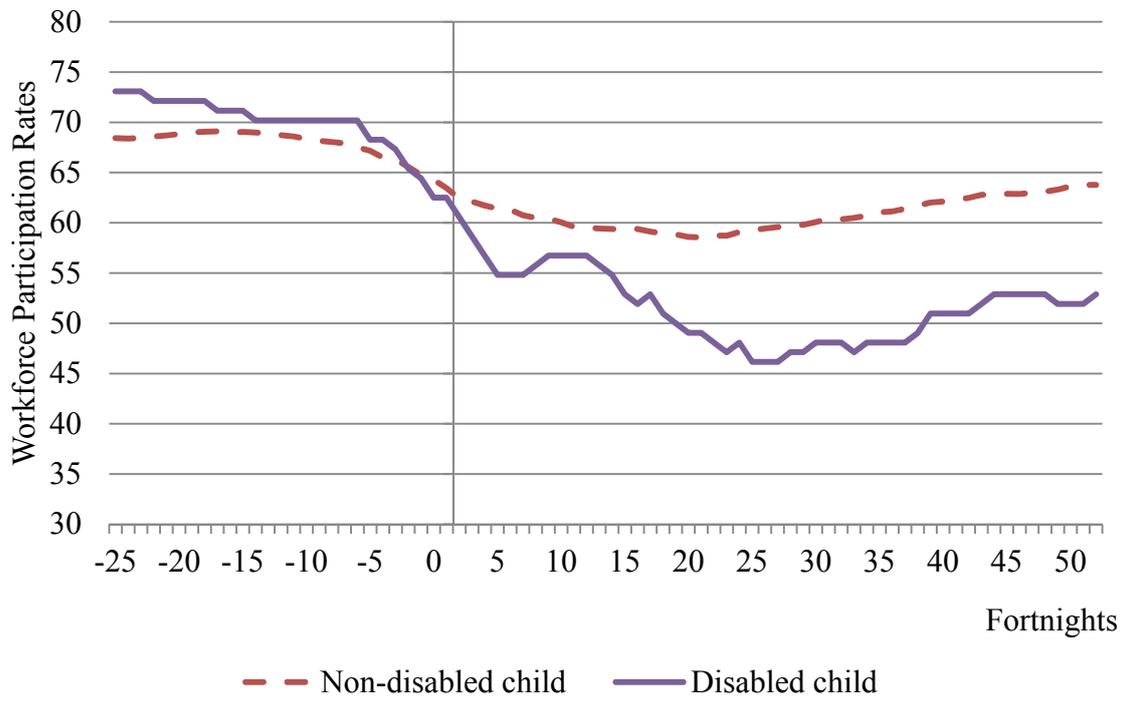


Figure 2: Estimated Maternal Employment Impact of Caring for a Disabled Infant or Toddler for the Fortnights before, during and after Child birth

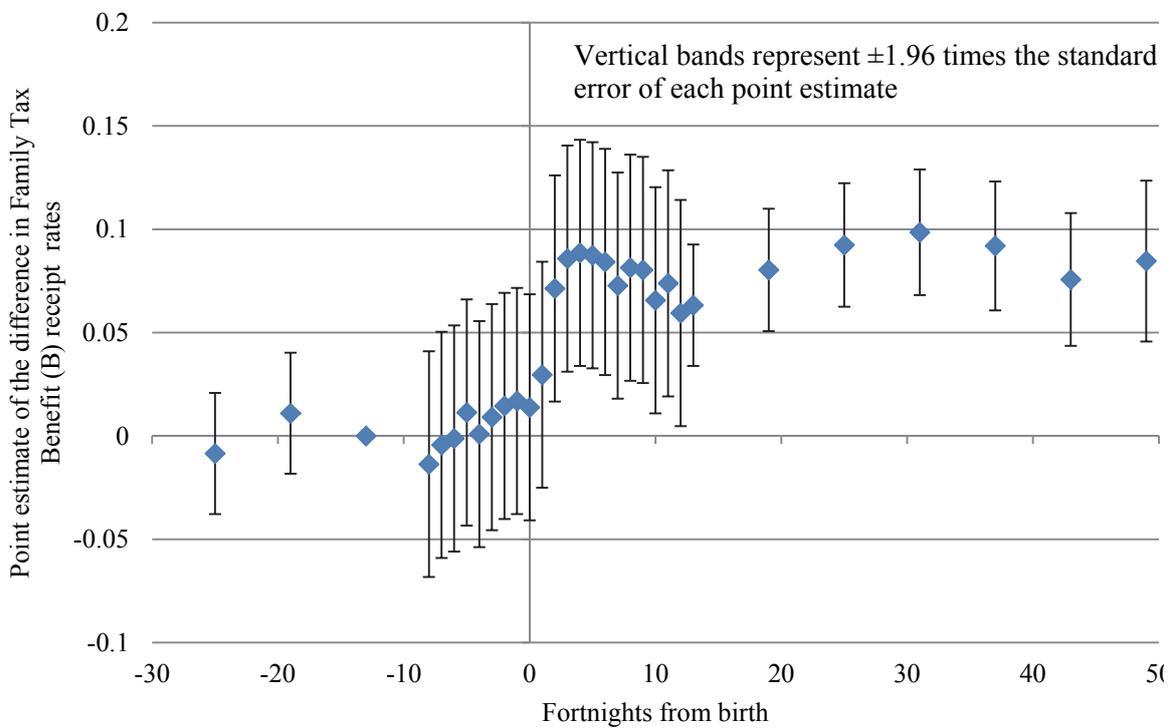
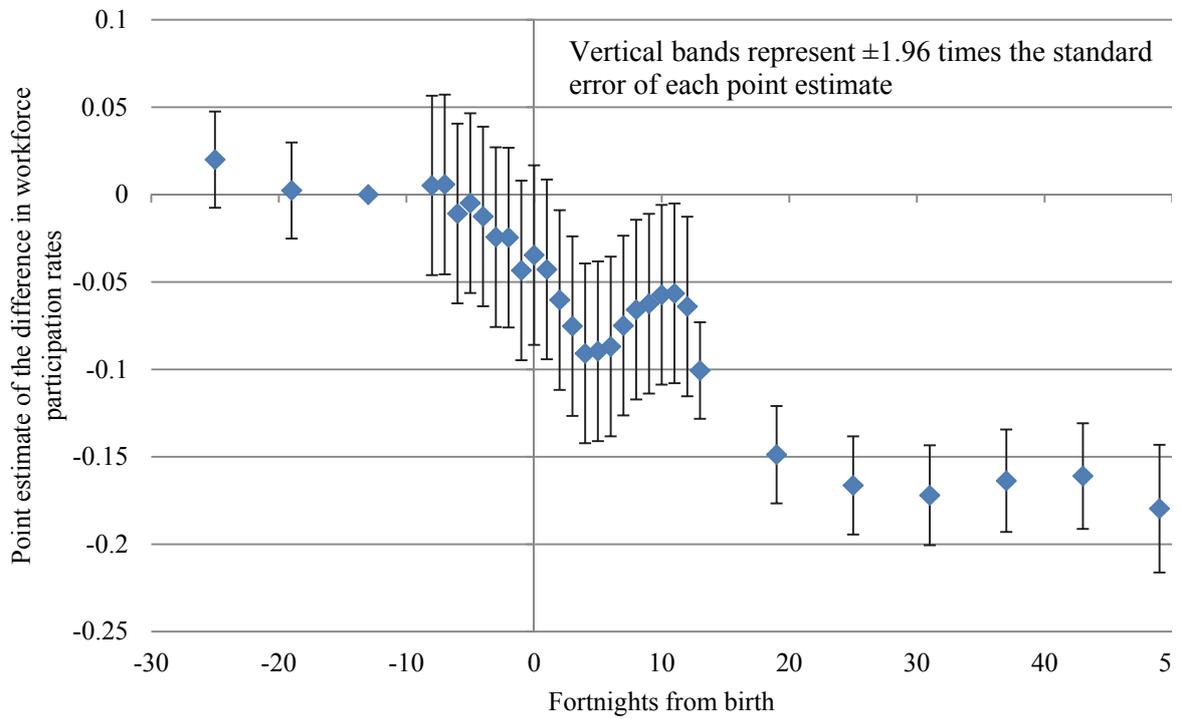


Table 1: Descriptive Statistics for Mothers of Infants and Toddlers with and without a Disability

Variable	Disabled	Non-disabled	t-test of diff	Disabled	Non-disabled	t-test of diff
	12 months before			24 months after		
	Mean	Mean		Mean	Mean	
<i>Time-varying characteristics</i>						
Workforce participation	0.70	0.68	2.50	0.52	0.61	-13.29
Low workforce engagement (FTB(B) receipt)	0.59	0.61	-1.25	0.77	0.71	9.41
Annual income earned (in 2006 prices)						
By the mother	11,101.85	11,712.84	-2.49	7,303.34	9,353.33	-12.93
By the father	51,560.62	49,860.20	3.83	56,189.47	53,993.27	6.49
<i>Demographic characteristics</i>						
Child diagnosed below age 2	0.52	n/a		0.52	n/a	
Child diagnosed below age 3-4	0.48	n/a		0.48	n/a	
Defacto relationship	0.15	0.14	0.35	0.15	0.14	0.35
Indigenous	0.00	0.01	0.00	0.00	0.01	-0.83
Overseas-born	0.22	0.17	1.23	0.22	0.17	1.23
Number of children: two	0.57	0.49	1.51	0.00	0.00	0.00
Number of children: three	0.29	0.36	-1.75	0.50	0.47	0.66
Number of children: four	0.09	0.10	-0.39	0.36	0.37	-0.29
Number of children: five or more	0.05	0.05	0.06	0.14	0.16	-0.50
Age of youngest child: below 1 year	0.16	0.18	-0.37	0.04	0.03	0.38
Age of youngest child: 1-3 years	0.59	0.56	0.47	0.93	0.96	-1.54
Age of youngest child: 3-5 years	0.17	0.17	0.05	0.02	0.00	1.70
Age of youngest child: above 5 years	0.08	0.08	-0.26	0.01	0.00	0.00
Age of mother: less than 30 years	0.36	0.37	-0.30	0.36	0.37	-0.30
Age of mother: 30-34 years	0.38	0.41	-0.54	0.38	0.41	-0.54
Age of mother: 35-39 years	0.19	0.18	0.24	0.19	0.18	0.24
Age of mother: above 40 years	0.07	0.03	1.65	0.07	0.03	1.65
Age of partner: less than 30 years	0.46	0.39	1.38	0.46	0.39	1.38
Age of partner: 30-34 years	0.27	0.35	-1.92	0.27	0.35	-1.92
Age of partner: 35-39 years	0.18	0.19	-0.22	0.18	0.19	-0.22
Age of partner: above 40 years	0.09	0.07	0.59	0.09	0.07	0.59
New South Wales or Australian Capital Territory	0.37	0.34	0.56	0.37	0.34	0.56
Northern Territory	0.00	0.01	0.00	0.00	0.01	0.00
Queensland	0.09	0.19	-3.19	0.09	0.19	-3.19
South Australia	0.16	0.08	2.18	0.16	0.08	2.18
Tasmania	0.01	0.02	-1.39	0.01	0.02	-1.39
Victoria	0.24	0.26	-0.50	0.24	0.26	-0.50
Western Australia	0.13	0.11	0.93	0.13	0.11	0.93
<i>Neighbourhood quality measure</i>						
1st (bottom) SEIFA* quintile	0.13	0.17	-1.09	0.18	0.16	0.46
2nd SEIFA* quintile	0.13	0.19	-1.98	0.13	0.19	-2.11
3rd SEIFA* quintile	0.26	0.20	1.34	0.23	0.21	0.54
4th SEIFA* quintile	0.27	0.22	1.26	0.27	0.22	1.16
5th (top) SEIFA* quintile	0.21	0.22	-0.24	0.19	0.21	-0.54
Person-wave observations	4,108	193,050		4,108	193,050	
Person observations	158	7,425		158	7,425	

Notes: For the time-varying characteristics, the averages over the pre- and post- periods are displayed. For the demographic characteristics, point-in-time estimates are displayed. *SEIFA refers to the Socio Economic Index For Areas and is constructed by the Australian Bureau of Statistics based on the social and economic conditions of the neighbourhood.

Table 2: Employment Gaps between Mothers with and without a Disabled Infant or Toddler and Time Relative to Child birth

	Workforce participation – non-zero earned income reported		Low workforce engagement – FTB(B)	
	(1)	(2)	(1)	(2)
9-12 months before	0.025 (0.017)	0.026 (0.017)	-0.015 (0.018)	-0.013 (0.018)
6-9 months before	0.005 (0.013)	0.005 (0.013)	0.011 (0.013)	0.011 (0.013)
3-6 months before	<i>base case</i>			
0-3 months before	-0.012 (0.014)	-0.014 (0.014)	0.004 (0.015)	0.009 (0.015)
0-3 months after	-0.058*** (0.014)	-0.064*** (0.014)	0.053*** (0.015)	0.060*** (0.015)
3-6 months after	-0.059*** (0.012)	-0.069*** (0.012)	0.071*** (0.013)	0.080*** (0.013)
6-12 months after	-0.109*** (0.010)	-0.125*** (0.010)	0.068*** (0.010)	0.076*** (0.010)
12-24 months after	-0.138*** (0.009)	-0.167*** (0.010)	0.078*** (0.009)	0.094*** (0.010)

Notes: Model (1) includes a limited set of controls including historical time, and season-of-the-month dummies. Model (2) includes a larger set of pre-existing fixed characteristics that are interacted with time relative to childbirth. Two employment measures are used - the first is based on workforce participation; the second is based on whether the mother was receiving Family Tax Benefit (part B) - a proxy for short or zero hours of employment. We interpret the coefficients as the additional decline in employment after childbirth (relative to the period 3 months to half a year before childbirth) that is due to child disability for the base case of a woman who (at the time 12 months before birth) was not living in a poor neighbourhood (living in a neighbourhood from top three SEIFA quintiles), aged below 40 years, with a partner aged below 40 years, had two or more existing children, where the youngest existing child was older than five years, was in a marital relationship (as opposed to a de-facto one), non-indigenous, Australian born, did not have an existing child with a disability, and after accounting for the effect of the 2005 policy, which allowed carers receiving Carer's payment to expand the number of work hours from 20 hours to 25 hours per week. * denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level, and *** denotes statistical significance at the 1% level. N=7,583.

Table 3: Employment Gaps between Mothers with and without a Disabled Infant or Toddler and Time Relative to Child birth – Excluding Existing Recipients of Carers Allowance

	Workforce participation – non-zero earned income reported	Low workforce engagement – FTB(B)
9-12 months before	0.013 (0.014)	0.016 (0.015)
6-9 months before	0.010 (0.016)	0.021 (0.017)
3-6 months before		<i>base group</i>
0-3 months before	-0.011 (0.018)	0.000 (0.019)
0-3 months after	-0.052*** (0.018)	0.033* (0.019)
3-6 months after	-0.050*** (0.015)	0.054*** (0.016)
6-12 months after	-0.122*** (0.010)	0.059*** (0.010)
12-24 months after	-0.176*** (0.010)	0.102*** (0.010)

Notes: The models shown here exclude those in receipt of carers allowance, disability payment or carers payment in pre-treatment period. They include controls for historical time, and season-of-the-month dummies as well as a larger set of pre-existing fixed characteristics that are interacted with time relative to child birth. Two employment measures are used - the first is based on workforce participation; the second is based on whether the mother was receiving Family Tax Benefit (part B) - a proxy for short or zero hours of employment. We interpret the coefficients as the additional decline in employment after child birth (relative to the period 3 months to half a year before child birth) that is due to child disability for the base case of a woman who (at the time 12 months before birth) was not living in a poor neighbourhood (living in a neighbourhood from top three SEIFA quintiles), aged below 40 years, with a partner aged below 40 years, had two or more existing children, where the youngest existing child was older than five years, was in a marital relationship (as opposed to a de-facto one), non-indigenous, Australian born, and after accounting for the effect of the 2005 policy, which allowed carers receiving Carer's payment to expand the number of work hours from 20 hours to 25 hours per week. * denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level, and *** denotes statistical significance at the 1% level. N=7,103.

Table 4: Employment Gaps between Mothers with and without a Disabled Infant or Toddler and Time Relative to Child birth, by the Timing of Carers Allowance Receipt

	Workforce participation – non-zero earned income reported		Low workforce engagement – FTB(B)	
	Carers Allowance receipt at:			
	Age 0-2	Age 3-4	Age 0-2	Age 3-4
9-12 months before	-0.011 (0.025)	0.033 (0.027)	0.022 (0.027)	-0.015 (0.028)
6-9 months before	0.003 (0.030)	0.003 (0.032)	0.018 (0.032)	-0.019 (0.034)
3-6 months before	<i>base case</i>			
0-3 months before	-0.018 (0.027)	-0.004 (0.029)	-0.003 (0.029)	0.022 (0.031)
0-3 months after	-0.085*** (0.027)	-0.036 (0.028)	0.064** (0.028)	0.056* (0.030)
3-6 months after	-0.080*** (0.027)	-0.053* (0.029)	0.077*** (0.029)	0.084*** (0.031)
6-12 months after	-0.153*** (0.025)	-0.093*** (0.027)	0.099*** (0.027)	0.053* (0.028)
12-24 months after	-0.237***	-0.095***	0.135***	0.056**

Notes: Model (1) includes a limited set of controls including historical time, and season-of-the-month dummies. Model (2) includes a larger set of pre-existing fixed characteristics that are interacted with time relative to childbirth. Two employment measures are used - the first is based on workforce participation; the second is based on whether the mother was receiving Family Tax Benefit (part B) - a proxy for short or zero hours of employment. We interpret the coefficients as the additional decline in employment after childbirth (relative to the period 3 months to half a year before childbirth) that is due to child disability for the base case of a woman who (at the time 12 months before birth) was not living in a poor neighbourhood (living in a neighbourhood from top three SEIFA quintiles), aged below 40 years, with a partner aged below 40 years, had two or more existing children, where the youngest existing child was older than five years, was in a marital relationship (as opposed to a de-facto one), non-indigenous, Australian born, did not have an existing child with a disability, and after accounting for the effect of the 2005 policy, which allowed carers receiving Carer's payment to expand the number of work hours from 20 hours to 25 hours per week. * denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level, and *** denotes statistical significance at the 1% level. N=7,583.