Income Effects and Labour Supply: Evidence from a Child Benefits Reform*

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Abstract

In this paper, we exploit a unique and unexpected reform to the child benefit system in Denmark to assess the effects of child benefits on parental labour supply. A cap on child benefit payments in 2011 led to a non-negligible reduction in child benefits for larger families with young children. The differential impact of this policy shift represents an opportunity to assess the causal impact of child benefit programmes on the labour supply of mothers and fathers. As a new government was elected in late 2011, the reform was repealed after being in place for a single year, which allows us to assess long term effects of a temporary income shock that was perceived to be permanent.

We find that a reduction in child benefits leads to a large increase in the labour supply of mothers; the effect on fathers is much smaller. Both mothers and fathers respond to the policy at the intensive margin, but the strongest response is from mothers at the extensive margin. The majority of the effects can be ascribed to fertility responses, but even after controlling for fertility-related family characteristics, we find significant increases in labour supply after the introduction of the reform. We confirm this result by using data on parents' consultations with doctors regarding sterilisation, a common procedure in Denmark. Lastly, the labour supply effects of the reform are generally sustained for at least 3 years after its repeal.

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1 Introduction

Financial assistance to families with young children is a common policy adopted across many developed countries to encourage fertility, improve well-being and enhance the long-term opportunities of children. Child or family benefits are cash transfers to families with dependent children and are often independent of income and labour market status. Child benefits thus represents an alternative to conditional or in-work benefits, such as the federal Earned Income Tax Credit (EITC) in the United States. Child benefits are a major part of public spending in most European countries, and spending on family benefits amounts on average to 1.16% of GDP across OECD countries in 2017.[1] There are many potential motivations for government spending on child benefits, such as the well-being of families, opportunities for children, and effects on fertility. Recently, the US child tax credit has been expanded to include monthly allowances to families with children, and thus, discussions of the effects of unconditional child benefits has reemerged (Financial Times, 2021).

Child benefits can be viewed as a subsidy to parents enabling them to limit their labour supply. We are particularly interested in this effect. Limiting parental labour supply may be beneficial for certain (child) outcomes, but it may also reinforce less desirable outcomes, such as the child pay penalty and the gender pay gap if labour supply responses are more pronounced for mothers than for fathers (see e.g. Kleven et al., 2019; Blau & Kahn, 2017).

A simple economic analysis would predict that higher levels of child benefits would increase fertility and decrease labour supply among parents. But despite their prevalence, relatively little is known about the impact of unconditional child benefits on key margins of fertility, and particularly, of labour supply. Most of the current evidence on the effects of child benefits rely on difference-in-differences analyses comparing families with and without children, although these families may differ along many other unobservable dimensions.

We exploit a unique and unexpected reform to the child benefit system in Denmark to assess the effects on maternal and paternal labour supply. A cap on child benefit payments in 2011 led to a non-negligible reduction in child benefits for larger families with young children, but did not directly affect families with one or two children. The differential impact of this policy shift represents an opportunity to assess the causal impact of child benefit programmes on the labour supply of mothers and fathers respectively. Importantly, the cap on child benefits was not directly related to families' levels of income, but only to the number and age composition of their children. Thus, we can compare families with different compositions of children and not rely on a comparison between families with and without children. Furthermore, we can control for individual fixed effects due to the population-level Danish employment registers. Although the cap on child benefits was announced as and intended to be permanent, a new government was elected in November 2011, and the cap was repealed from 2012 onward.

[1] https://data.oecd.org/socialexp/family-benefits-public-spending.htm

We find that both women and men respond to a reduction in child benefits at the intensive margin and increase the number of hours worked per month if employed. However, the strongest response to the reduction in child benefits is at the extensive margin for mothers for whom we find large increases in participation rates. A large share of the estimated effects can be ascribed to fertility responses, but even after controlling for fertility related family characteristics and limiting our sample to sterilised parents, we find relatively large and significant labour supply responses, most noticeably at the extensive margin for mothers. Finally, the labour supply effects of the reform generally remain three years after its repeal. Thus, we find evidence of long term effects of the temporary income shock that was perceived to be permanent, which can be explained by labour market entry/switching costs or by increased uncertainty about future child benefit payments.

The paper is structured as follows: In the next section, we consider related literature. In section 3, we describe the Danish child benefits system and the 2011-cap in detail. In section 4, we outline the hypotheses, we test in the following sections. In section 5, we describe our data and define our treatment and control groups. In section 6, we outline our empirical strategy. In section 7, we report our estimated effects on aggregate labour supply, and in section 8 we split up the responses to the reform into adjustments at the extensive and intensive margins of labour supply. Finally, in section 9, we conclude.

2 Literature

Our analysis of the Danish 2011-cap on child benefits contributes to at least two large literatures. Firstly, our analysis relates to the specific literature on the effects of child benefits, family cash transfers, and family tax credits on labour market outcomes, e.g. the many papers on the EITC in the US and the 1996-reform of child benefits in Germany. Secondly, the unexpected income loss for the affected families relate to the large and general body of studies on income effects on, e.g., labour supply. Importantly, the income shock we study in this paper is not directly related to labour market status and labour market income. In the following, we focus on the literature specifically on child benefits.

Labour supply effects of conditional family or child benefits are well-documented. For example, evaluations of the effects of the US EITC show that single mothers' labour supply increase with the introduction and expansions of the tax credits (Kleven, 2019; Eissa & Hoynes, 2006; Eissa & Liebman, 1996). For example, by comparing single mothers with single women without children, Eissa & Liebman (1996) find that single mothers increase their labour supply at the extensive margin in response to expansions of the EITC in the late 1980s, but they find no effects on the intensive margin. Evaluations of Working Families Tax Credit (WFTC) in the UK show similar results, see e.g. Francesconi & van der Klaauw (2007). Thus, it appears well-established that the in-work child subsidies positively affect labour supply of mothers, or at least, single mothers. Eissa & Hoynes (2004) consider the labour supply responses of married couples to EITC expansions between 1984 and 1996. They find that women decrease their labour supply at the extensive margin, and the labour supply responses of their spouses do not offset this effect. Thus, Eissa & Hoynes (2004, p. 1931) conclude that *"the EITC is effectively subsidizing married mothers to stay home..."* Using detailed administrative data from California, Hotz & Scholz (2006) again consider the labour supply effects of the EITC. Hotz & Scholz (2006) exploit variation in the EITC by the number of children, and they control for family fixed effects. They find that expansions of the EITC increase family labour supply.

In addition to the in-work child benefits or tax credits, many countries also pay unconditional child benefits to families with children. Only few studies have evaluated the effects of these – very expensive – policies. For example, Hener (2016) and Tamm (2010) consider the effects of the 1996-increase in child benefit payments in Germany. Using a difference-in-differences setup, Hener (2016) and Tamm (2010) compare couples with and without children. Tamm (2010) finds that mothers decrease their labour supply on the intensive margin after the increase in child benefits while fathers' labour supply is unaffected. Hener (2016) points out that the policy's effectiveness in improving families' financial situation is limited while the strain on public finances are amplified by the behavioural response to the increase in child benefits as the resulting decrease in maternal labour supply reduces tax payments. Nevertheless, Raschke (2016) exploits the same reform to show that families' expenditures on food increase after the increase in child benefits. In addition to the German reform, González (2013) study the introduction of an unconditional child benefit in Spain, namely one-time payment of €2,500 after birth. González (2013) find positive fertility effects, no effects on child expenditures, and negative labour supply responses for mothers.

In comparison to the existing papers on the effects of unconditional child benefits, our analysis differs in at least the following ways: 1) We study a cap on child benefit payments, not an increase in or an introduction of child benefits; 2) The cap on child benefits only affect a subgroup of families with children. Therefore, we can use the non-affected families with children as a control group, rather than childless couples, and we can control for family characteristics, such as number of children and the age of youngest child; 3) We are able to isolate the income effect and shut down the fertility response by looking only at families where at least one parent have consulted a doctor regarding sterilisation prior to the reform; 4) The 2011-cap on child benefits was repealed after being in place for a single year, which allows us to assess long term effects of a temporary income shock that was perceived to be permanent; 5) More detailed Danish data allow us to control for individual fixed effects, and we can further analyse mechanisms, heterogeneity, and timing of policy responses.

In an unpublished note, Almlund (2018) discusses fertility effects of the 2011-reform in child

Table 1: Yearly per-child benefit levels in 2011

Age of child:	0-2	3-6	7-17
Annual payment (DKK)	16,992	13,452	10,584

benefits in Denmark. Almlund (2018) finds that the reduction in child benefits significantly decreases the probability of having a third or higher order child. Our focus is on the labour supply effects of the reform, but fertility is, of course, a crucial determinant of labour supply. Therefore, we also separate the labour supply responses from the fertility response by controlling for family characteristics and by exploiting data on medical consultations regarding sterilisation, a common procedure in Denmark.

3 Child benefits in Denmark

In the following sections, we briefly outline the Danish child benefits system, the 2011 reform and its repeal, although further details are reserved to Appendix A.

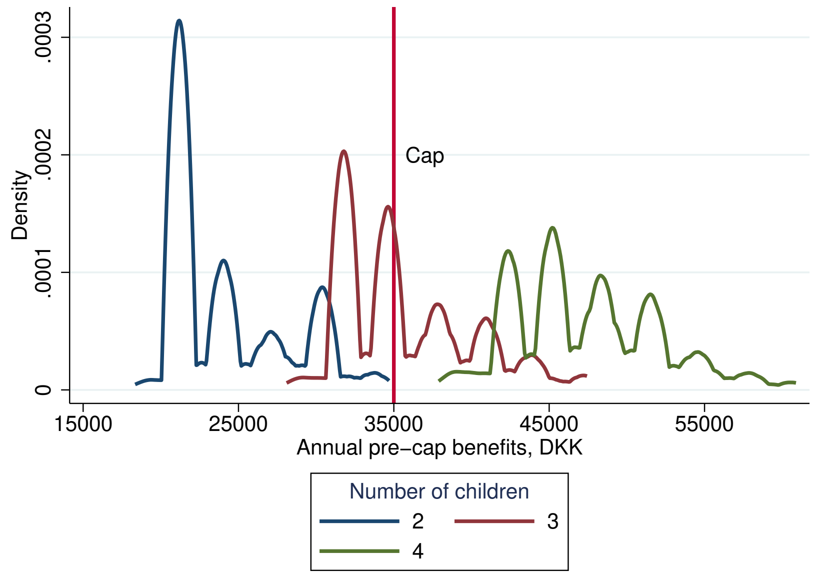
Since 1986, families with dependent children have received child benefits from the government in Denmark. The amount of child benefits paid to each family depend on the number of children as well as on the age of each child, with younger children allocated the greatest benefit level. Child benefits are paid quarterly directly to the child's mother, or father if no mother present. The first payment is made at the beginning of the next quarter following a child's birth.[2] 2011 per-child benefits are listed in Table 1. For families with multiple children, the per-child benefits are simply added together. For example, a family with three children of ages 1, 5, and 8 would receive $16,992 + 13,452 + 10,584$ DKK $= 41,028$ DKK in annual child benefits in 2011. Importantly, child benefits are not subject to income taxation in Denmark, where tax rates otherwise are relatively high. Figure 1 shows the distributions of child benefit payments in 2011 if the cap on child benefits described below had not been introduced.

3.1 Reform

In May 2010, in response to strong pressure on public finances after the global financial crisis, it was announced that there would be introduced a cap of 35,000 DKK (2011-level, approx 5,000 USD) on total child benefits received by each family. The policy affected child benefit payments from January 2011 and onwards. The policy is estimated to have affected 50,000 families. To smooth the income shock, child benefits were reduced evenly over 3 years. Furthermore, the policy included a maximum cut of approximately 12,000 DKK per year; a maximum which was

[2] Specifically, all child benefit payments are made on 20 January, 20 April, 20 July, and 20 October every year.

Figure 1: Distributions of yearly child benefit payments

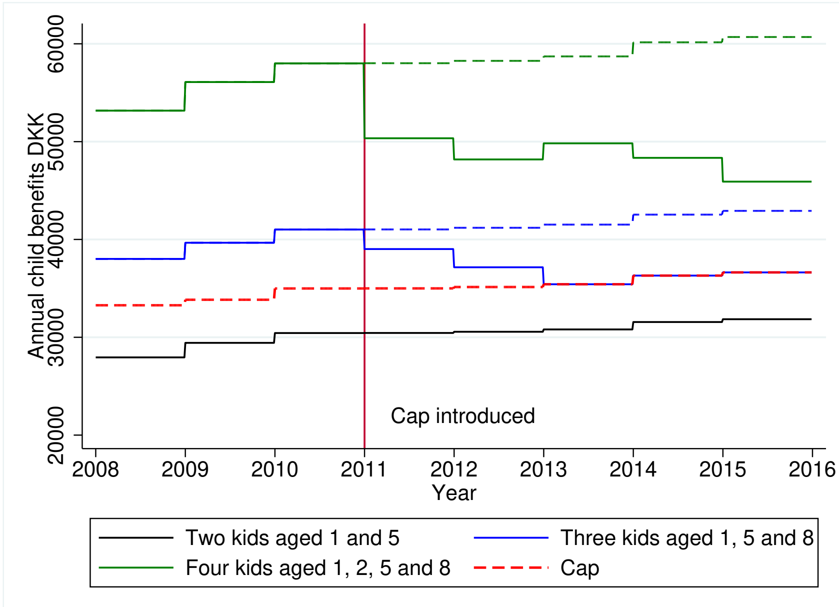


Notes: Annual pre-cap benefits in 2011. Cap at DKK 35,000 indicated. Although child benefits generally are paid in discrete amounts (see Table 1), in the quarter a child turns 18, child benefits are cut proportionally to the number of days under 18, which smooths the distribution. Observations below/above 7th/99th percentiles dropped due confidentiality restrictions on Danish register data. Epanechnikov kernel density, bandwidth = 500.

gradually increased over the coming years (see details in Appendix A). Finally, the reduction of child benefits in 2011 is generally proportional to the total expected future loss of benefits for each family in the following years.

The 35,000 DKK-cap on child benefits did not directly affect one-child families. Even though the reform did not directly affect the financial situation of two child families, it did change the marginal child benefit received for having an additional child for two-child families and above. In other words, two child families would receive a lower amount of child benefits for a potential third child post reform. The 35,000 DKK-cap on child benefits changed the unearned income for three-child families with young kids, specifically for families with at least one child under the age of 3 or at least two children under the age of 7 years old. The reform changed the unearned income for all families with four or more kids. Figure 2 shows the total child benefits received for families of different structures from 2008 to 2016 after the introduction of the reform. Figure C.11 in Appendix C shows the distribution of child benefits losses for families with different numbers of children.

Figure 2: Introduction of reform

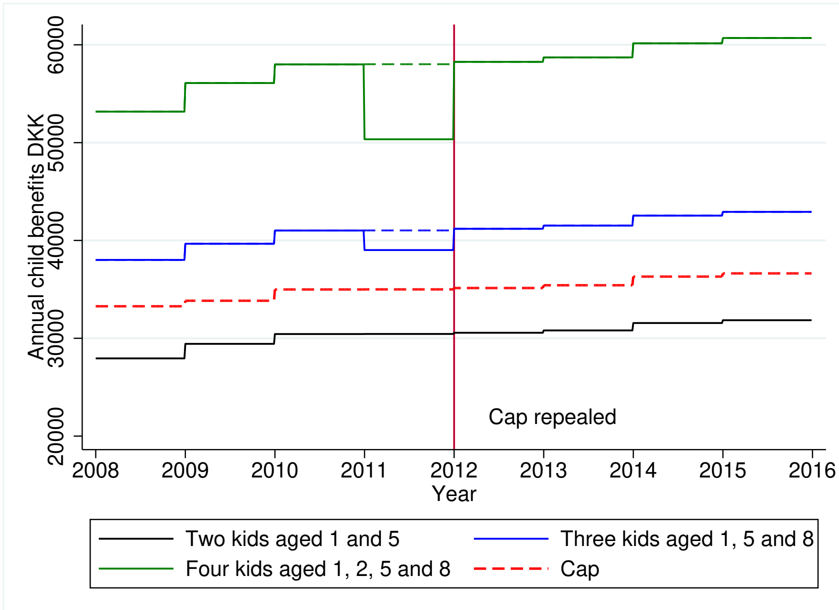


Notes: DKK 35,000 threshold introduced in 2011 in dashed red, counterfactuals are dashed. Child benefits level are inflation-adjusted yearly. Policy given as announced in 2010. Notice the gradual (and non-linear) phase-in of the reform; it would be fully phased-in by 2020 (see details in Appendix A). Child age composition is fixed across years - we compare the effect of the reform on families with children of similar ages across years.

3.2 Repeal

At the end of November 2011, a newly elected government announced that from 2012, the cap would be abolished; it was highlighted as damaging to large families. Therefore, the loss in child benefits for those with large families was ultimately restricted to the year 2011, with 2012 payments returning approximately to 2010 levels. Figure 3 illustrates both the introduction and repeal of the reform for various family compositions. See further details on the Danish child benefits system, and the 2011-reform and its repeal in Appendix A.

Figure 3: Repeal of reform



Notes: DKK 35,000 threshold introduced in 2011 in dashed red, counterfactuals are dashed. Child benefits level are inflation-adjusted yearly. Policy given as announced in 2010, and repeal as announced in 2011. Child age composition is fixed across years - we compare the effect of the reform on families with children of similar ages across years.

4 Hypotheses

In Appendix B, we outline a simple, static model in which parents derive utility from having children, from consumption, and from leisure. Children are associated with a financial cost, which is in part mitigated by the child benefit system.

The simple model has a number of key implications. The introduction of a cap on child benefit is predicted to:

1. Increase labour supply at the intensive margin for individuals in work with large numbers of children.

2. Increase labour supply at the extensive margin for individuals not working with large numbers of children. These effects may persist after the repeal of the reform due to switching costs.

3. Not affect individuals with few children.

4. Reduce fertility among individuals with large numbers of children.

In the sections that follow below, we will test the predictions of the model set out here. We are particularly interested in predictions 1. to 3.

Although the cap on child benefits was intended to be permanent when it was announced and introduced, it was repealed after being in place for just a year as a new government was elected. Despite the repeal of the cap, however, there are at least two reasons for expecting permanent effects of the reform.

Firstly, if we consider policy responses on the extensive margin, we may find that parents enter the labour market and carry the costs of entry when their non-market income decreases as child benefits are capped (Cogan, 1981). If parents also face a cost when exiting the labour market, the parents are likely to remain in the labour market, even after the repeal of the reform. We model this as a switching cost in the model outlined in Appendix B.

Secondly, the reform introduced uncertainty about the future levels of child benefits. Prior to the 2011-cap, child benefits in Denmark had not been subject to any substantial cuts since their introduction, only increases. With the 2011-cap, child benefits suddenly attracted (negative) political attention, and parents could likely be subject to another cut in benefits if the balance of power in the parliament shifted again. If parents are risk averse, uncertainty about future levels of child benefits are likely to affect labour supply at both the intensive and extensive margins in the long run for the families that were subject to the 2011-cap.

5 Data, sample selection, treatment and control groups

5.1 Data and sample selection

We construct a balanced panel with monthly observations of women and men covering the period September 2008 to December 2014. We exclude observations prior to September 2008 as a small change in the amounts of child benefits was implemented earlier in 2008. From the Danish register data (BEF, BFL, OF), we construct a monthly dataset with individual-level data on number of children, age of children, age, gender, earnings, immigrant background, parental leave, hours worked etc. Note that we exclude immigrants from our estimation sample. In addition, we have annual data on marital status and cohabiting partners (from BEF).

From Danish register data (BOBO/BOTI), we also have data on child benefits payments, but these registers only include data on payouts from the fourth quarter of the years 2009-2014. From the population registers, however, we can construct child benefits payments based on each family's number of children and the children's ages. Importantly, we can validate our measure of child benefits with the fourth quarter register data, and we can exclude families who receive irregular child benefits payments, e.g. because one or more children are in foster care.

Lastly, we obtain data on consultations with doctors regarding sterilisation procedures (from 1994 and onwards from LPRADM, SYSI, SSSY). We construct monthly dummies that equal one if ever having seen a doctor regarding sterilisation. Sterilisation is a relatively common procedure to undergo in Denmark after finalising fertility (see Figure C.21 in Appendix C).

We impose a number of sample selection criteria, and exclude people who are:

- Less than 25 years old by September 2008
- 60 years old or older by December 2014
- Paid irregular child benefits (e.g. because a child is in foster care)
- Immigrants
- Self-employed (as we do not observe hours worked for this group)

After defining treatment and control groups in the following section, we comment on the relevant summary statistics of the various samples.

5.2 Defining treatment and control groups

We group our families into those who were affected by the policy (treatment group) in the first two quarters of 2011, i.e. the families that experienced a strictly positive reduction in child benefits due the policy, and those who were not affected by the policy (control group) in the first two quarters of 2011. We define the treatment/control groups based on the first two quarters of 2011 to avoid selection in and out of the treatment group. Child benefits payments in a given quarter is based on the number and ages of the children in a family in the *previous* quarter. As the child benefit reform was announced in late May 2010, children conceived before the announcement of the policy may have been born until March 2011, and thus, affect the child benefits payments in the second quarter of 2011. In other words, children born later than March 2011 will almost definitely have been conceived after the announcement of the reform, and they will affect child benefits payments from the third quarter of 2011 and thereafter.

In choosing our treatment and control groups, we want to select groups that are as similar as possible in all ways except for their treatment under the policy. In general, the policy affected families with more children and with younger children. Families with 3 children under 18 are affected by the policy if they have at least one infant (0-2 years old) or two children in the age bracket 3-6 years. All families with 4 children under 18 are affected by the policy. In order to have young children in our control group after the policy introduction, we can therefore not limit our sample to families with 3 children or more under 18. Instead, we limit our analysis to the individuals that in January 2011:

- Had at least 2 children under 18 [3]
- Had no more than 4 children in total

[3] We also require that both children were registered in the Danish population register BEF in 2011 (or 2012 for children born in 2011) with the relevant parent ID.

- Were married or in a cohabiting couple

Thus, we have young children in both control and treatments groups, and 4-child families are also present in the control group if at least one child is older than 18.

After we impose these additional selection criteria, we balance the panel, and exclude people who are not present in the Danish population registers and in our sample for the entire sample period, September 2008 to December 2014. We are left with 28,968 treated women and 22,477 treated men. The difference in sample size between women and men is a result of the sample selection criteria: Compared to women, men are more likely to be self-employed, and men are typically older when they have children.

We report summary statistics for the various samples in Tables C.8 to C.11 in Appendix C. Generally, both the treated women and men are younger, have less labour market experience, are better educated, and are more likely to have twins or triplets when compared to the control groups. On average, the youngest child is also younger for the treatment group. These differences in characteristics can be explained by the fact that our treatment is related to the age composition of a family's children – a family is more likely to be affected by the cap on child benefits if the have young children. In our empirical strategy, which we outline in the following section, we specifically address these differences in characteristics between our treatment and control group, and next, we compare pre-trends in outcomes for the different groups. Notice that the "Benefits lost in 2011" is not equal to zero for the control group. This is because we define our treatment group as those who were affected by the policy in the first two quarters of 2011 in order avoid selection into the treatment group, which is further detailed above.

6 Empirical strategy

We would like to test whether the temporary introduction of the child benefit cap affected labour supply, and how the labour supply responses were affected by fertility.

Our first set of specifications will simply group our families into those who had their child benefits reduced due to the reform (treatment group) and those who were not affected by the reform (control group) as described above. By classifying families in this way, we can estimate the effect of the reform by using a binary treatment indicator. This is a simplification of the reform, but it is one which is particularly useful for a graphical analysis and provide some first evidence of the direction of a potential effect. We will then extend our analysis and consider the treatment as continuous.For all the analyses below, we run the analyses separately for women and men and compare the results.

6.1 Binary treatment

We undertake two sets of analyses using our binary treatment indicator. First, we analyse treatment dynamics using a Generalised Difference-in-Differences setup, and determine whether or not parallel trends are a reasonable assumption for our further analyses. Second, we apply a standard Difference-in-Differences model, but with three time periods, namely: 1) before introduction of reform 2) after introduction of reform 3) after repeal of reform.

6.1.1 Generalised Difference-in-Differences

$$Y_{it} = \beta_0 + \sum_{j=0}^{T} \beta_1^j 1[j = t] + \sum_{j=0}^{T} \beta_2^j 1[j = t] * W_i + \beta_3 X_{it} + m_t + \alpha_i + \epsilon_{it} \tag{1}$$

Where:

- Y_{it} is an outcome of interest for person i in time t (e.g. hours worked or employment)
- W_i indicates whether i is in the treatment group (affected by benefit cut in Q1 and/or Q2 2011)
- X_{it} is a set of time-varying family controls
- m_t are 12 calendar month fixed effects (January to December, i.e. not year*month fixed effects)
- α_i are individual fixed effects

Note that a treatment group indicator without a time interaction is not included, as treatment group membership is fixed over time, and thus, absorbed by the individual fixed effects. We cluster standard errors at the individual level.

6.1.2 Difference-in-Differences

After inspecting pre-trends both in the actual levels of hours worked of our treatment and control group as well as in our Generalised Difference-in-Differences results from the specification above, we conclude that the parallel trends assumption is full-filled (see results below). Thus, we can estimate our next specification with a binary treatment indicator. Our main specification is:

$$Y_{it} = \beta_0 + \beta_1 Intro_t + \beta_2 W_i * Intro_t + \beta_3 Repeal_t + \beta_4 W_i * Repeal_t + \beta_6 X_{it} + \beta_7 m_t + \alpha_i + \epsilon_{it} \tag{2}$$

Where:

- Y_{it} is an outcome of interest for person i in time t (e.g. hours worked or employment)
- $Intro_t$ is an indicator which equals 1 in all periods after policy introduction
- $Repeal_t$ is an indicator which equals 1 in all periods after policy repeal
- W_i indicates whether i is in the treatment group (affected by benefit cut in Q1 and/or Q2 2011)
- X_{it} is a set of time-varying family controls
- m_t is time in months (giving a common linear time trend)
- α_i are individual fixed effects

Our main hypothesis is therefore that $\beta_2 > 0$. Again, we cluster standard errors at the individual level.

6.2 Continuous treatment

In practice, the magnitude of the policy treatment is continuous. Therefore we also estimate the following specification including a continuous treatment measure:

$$Y_{it} = \beta_0 + \beta_1 Intro_t + \beta_2 V_i * Intro_t + \beta_3 Repeal_t + \beta_4 V_i * Repeal_t + \beta_5 X_{it} + \beta_6 m_t + a_i + \epsilon_{it} \quad (3)$$

Where:

- Y_{it} is an outcome of interest for person i in time t (e.g. hours worked or employment)
- $Intro_t$ is an indicator which equals 1 in all periods after policy introduction
- $Repeal_t$ is an indicator which equals 1 in all periods after policy repeal
- V_i is the reduction in child benefits in thousand DKK in 2011 due to our reform for i's family if i is in the treatment group (affected by benefit cut in Q1 and/or Q2 2011) and zero otherwise
- X_{it} is a set of time-varying family controls
- m_t is time in months (giving common a linear time trend)
- α_i are individual fixed effects

Again, we cluster standard errors at the individual level. We do not consider the actual level of child benefits, but only the reduction in child benefits due to the reform. Individual fixed effects and family controls capture the factors that otherwise determine the total level of child benefits.

6.3 Fertility and treatment effects

Due to the fertility effects of reform described above, we can attribute a significant share of the treatment effect to decreased fertility. In order to disentangle the effects of changed fertility on labour supply from the income effect, we run three versions of the analyses described above, where we add different control variables and additional sample selection criteria:

1) *Parental controls:*
   Only individual FEs and parental age FEs. Parental age FEs include fixed effects for each year of age in order to control nonparametrically for age effects of parents.

2) *Parental controls + Family controls:*
   Same as above, but also age of youngest child FEs and total number of children FEs.[4] Age of youngest child FEs include fixed effects for each year of age in order to control nonparametrically for age effects children.

3) *Parental controls + Family controls + Sterilisation - Young:*
   Same as above, but only families where at least one parent has consulted a doctor regarding sterilisation prior to the announcement of the policy. Also excluding families with young children (below the age of 3 throughout the sample period).

In model 1), we estimate the combined effects of decreased fertility and the income effect of loosing child benefits due to the reform. In model 2), we control for a changing composition of children, and in model 3) we shut down fertility response completely by only considering families where one or both parents have consulted a doctor regarding sterilisation prior to the announcement of the reform and who do not have young children. Models 2) and 3) should therefore allow us to separately estimate the income effects of lost child benefits on parental labour supply.

6.4 Alternative strategies

Existing papers have estimated the effects of child/family benefits using various empirical strategies. Many papers use a DiD strategy similar to ours, but importantly Dahl & Lochner (2012) have suggested an IV approach when they exploit changes in the EITC over time to estimate the impact of family income on children's math and reading achievement. Dahl & Lochner

[4]Of children registered in the Danish population register BEF in each year from 2008-2014

(2012, p. 1932) introduce a simulated instrument variable approach that *"eliminates omitted variable biases due to both permanent and temporary shocks correlated with family income and alleviates bias due to measurement error in income."* First, they use lagged pre-tax income to predict changes in EITC income, and next, they use the predicted change in income as an IV. Although Dahl & Lochner's (2012) IV approach targets potential biases when considering the effect of family income on childrens achievement, their strategy is neither feasible, nor applicable when considering effects on parental labour supply due the cap on child benefits in Denmark. Firstly, and most importantly, the Danish child benefits were unconditional and not a function of income during the period we consider. Therefore, we cannot apply an IV strategy analogous to that of Dahl & Lochner (2012). Sticking to their terminology, the predicted income change and the actual income change due to the cap on child benefits in Denmark would be identical as it is independent of income levels. Secondly, the EITC schedule changed repeatedly in 1980s and 1990s, which yields lots of variation in predicted EITC income. Therefore, when generating their instrument, Dahl & Lochner (2012, p. 1935) only *"exploit variation in predicted EITC income due to government changes in EITC schedules over time and not due to changes in family structure."* In the context of child benefits in Denmark, we observe much less variation in the payment schedules of child benefits over time. In fact, the reform we consider is the first major cut in child benefits in Denmark since their introduction in the 1980s. Again, this makes a similar IV estimation strategy infeasible in the context of Danish child benefits. Furthermore, these two differences between the EITC and the Danish child benefits also explain why we do not apply a strategy similar to Hoynes & Patel (2018) who use a "simulated" EITC to estimate the effect of multiple changes to the EITC on the income of single mothers with children. Thirdly, the omitted variable biases Dahl & Lochner (2012) aim to alleviate are less likely to affect our results. We can precisely measure the income shock from the cap on child benefits due to the detailed information in the Danish register data. We also correct for permanent income effects using individual FEs. However, as discussed above, our estimates may be biased as our control group may respond to the cap on child benefits by delaying or changing fertility decisions, even though their incomes were not directly affected by the reform at the time of introduction. For example, a family with two children may respond to the policy by not having a third or fourth child as they realise that they will receive a lower level of child benefits for the additional children. Rather than pursuing an IV strategy to eliminate this source bias, we first control for fertility-related family characteristics, and next, we exploit data on sterilisation and focus on families that have finalised fertility prior to the announcement of the reform.

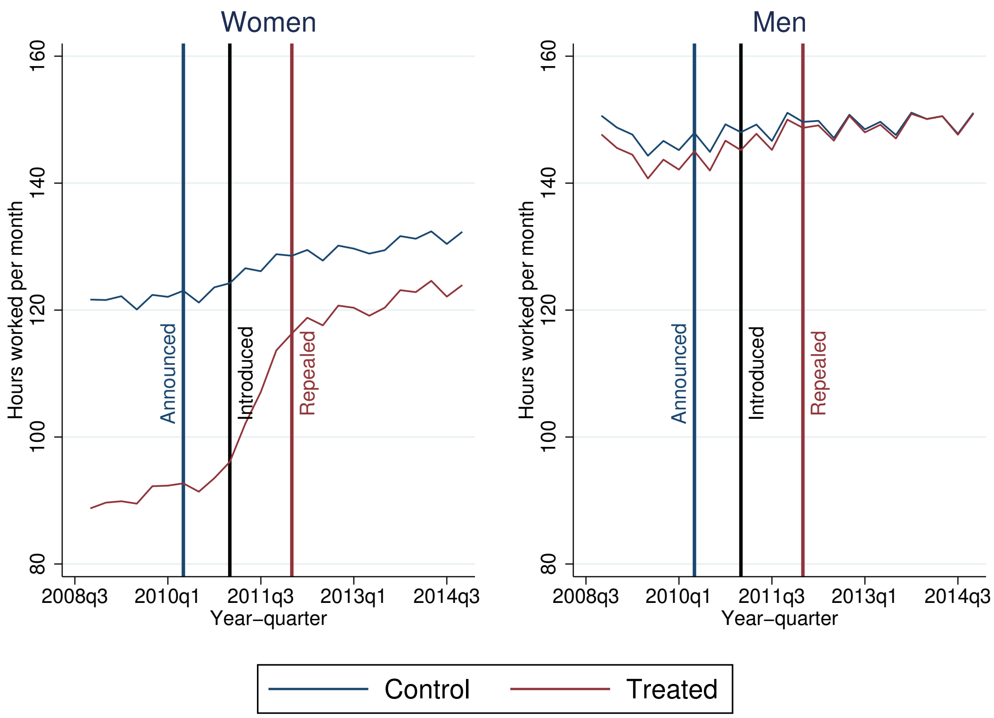
7 Results

7.1 Descriptives

Firstly, we inspect the raw trends in hours worked per month for our treatment and control groups. In Figure 4, we see that the trends in hours worked are very similar for the two groups before the introduction of the reform as well as after its repeal. This serves as a first indication of the parallel trends assumption being full-filled for our treatment and control groups. However, we see a large increase in hours worked per month for our treatment group during the reform period, roughly 20 hours per month. Notice that the response to the reform is gradual after its introduction; mothers do not respond immediately after the announcement of the reform. This is in line with Hotz & Scholz (2006, p. 42) who find that *"the employment responses to EITC policy changes occur with a lag of one or two years."*

We also see a very small increase in hours for our control group after the introduction of the reform. Although the control group is not directly affected by the cap on child benefits, families with two children can be indirectly affected if they were planning to have a third child before the introduction of the reform. If they have a third child, their child benefits for this child will be reduced after the introduction of the reform. Therefore, families may delay or reconsider having a third child due to the reform. Therefore, if fertility is fixed, we should not observe this effect. We use our sterilisation subsample to confirm this, see Figure C.12 in Appendix C.

Figure 4: Hours worked per month for women and men



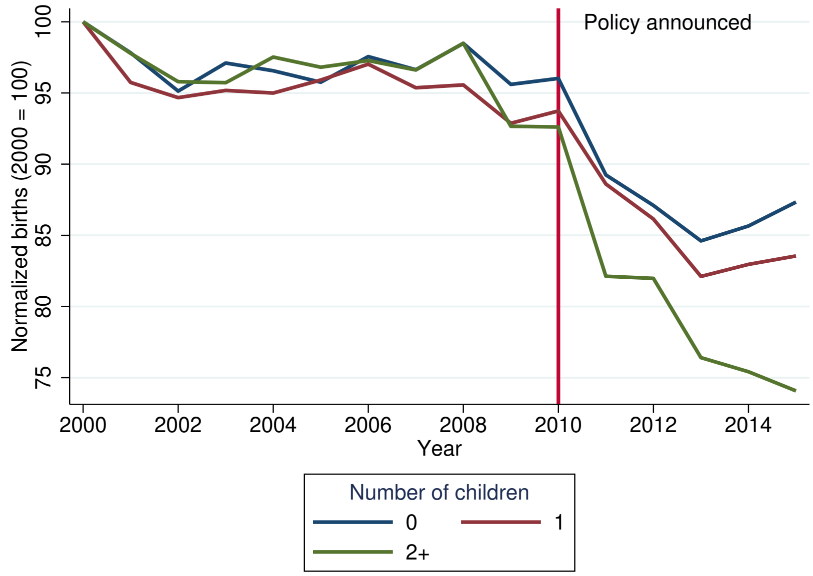
Notes: Average hours worked per month for women and men respectively, including individuals working zero hours.

Secondly, in Figure 5 we see a general decrease in fertility rates, but we also see that the number of births disproportionally decreases in families with two or more children after the introduction of the policy. This is in line with the results of Almlund (2018). We keep this in mind throughout our analysis by estimating the effects of the reform both with and without controls for fertility related characteristics.

7.2 Generalised Difference-in-Differences

After concluding that the raw trends in hours worked per month are very similar for our treatment and control groups, we further inspect pre- and post-trends using our generalised difference-in-differences model. In Figure 6, we show the results from our model only including individual fixed effects and parent age fixed effects. Again, we observe parallel trends for our treatment and control groups. In addition, for women, we find a large increase in labour supply for our treatment group relative to our control group, but only a small effect on men. Similar to the raw trends in hours worked per month reported above, we see that the effect increases through the reform period and remain stable after the repeal. The effects shown in Figure 6 can be ascribed to both reduced fertility as well as a general income effect caused by the reduction in child benefits for our treatment group.

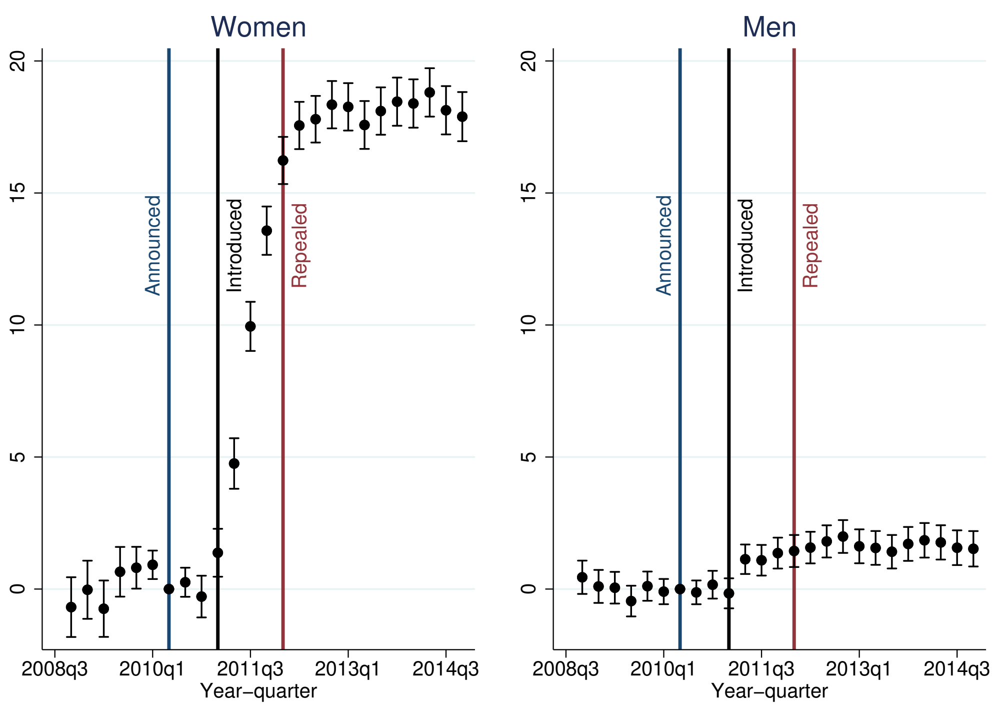
Figure 5: Total number of births by pre-birth number of children



Notes: Normalised, 2000 = 100. Numbers for the full population and not just the estimation sample from which 1-child families are excluded.

Figure 6: G-DiD: Hours worked per month

Parental Controls

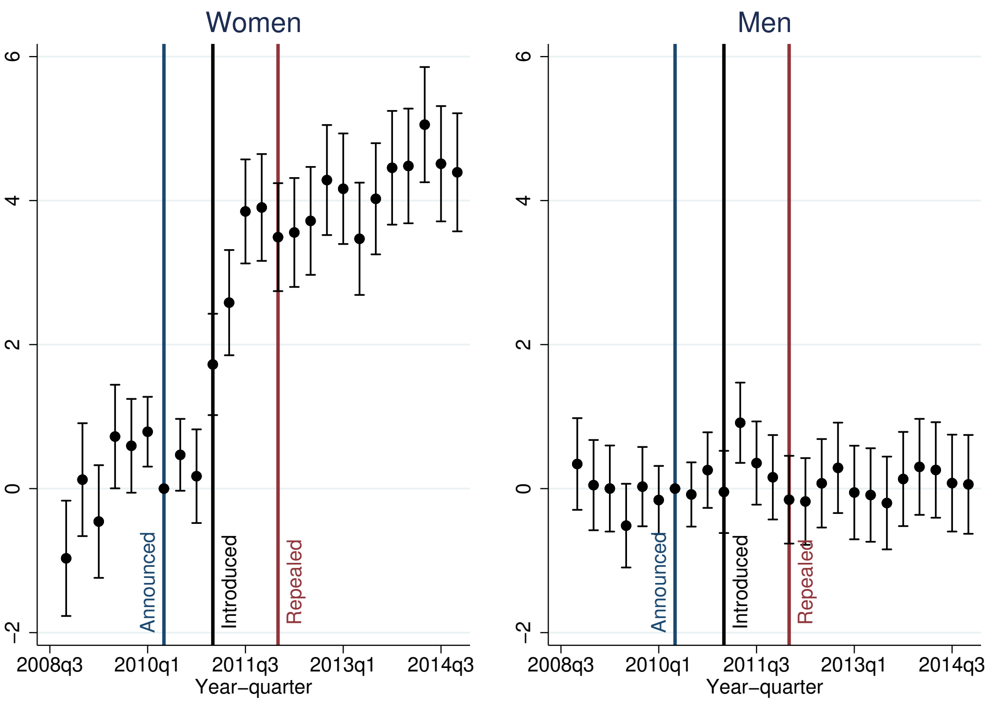


Notes: Dependent variable (y-axis): hours worked per month. Parental controls include: individual FEs and parental age FEs.

In order to separate the effect of reduced fertility from the general income effect of the reform, we control for fertility-related family characteristics in Figure 7. We see a smaller, but still significant effect on women's labour supply both during the reform period and after its repeal. For men, we observe a small and only marginally significant effect and only during the reform period, not after its repeal.

Figure 7: G-DiD: Hours worked per month

Parental Controls + Family Controls

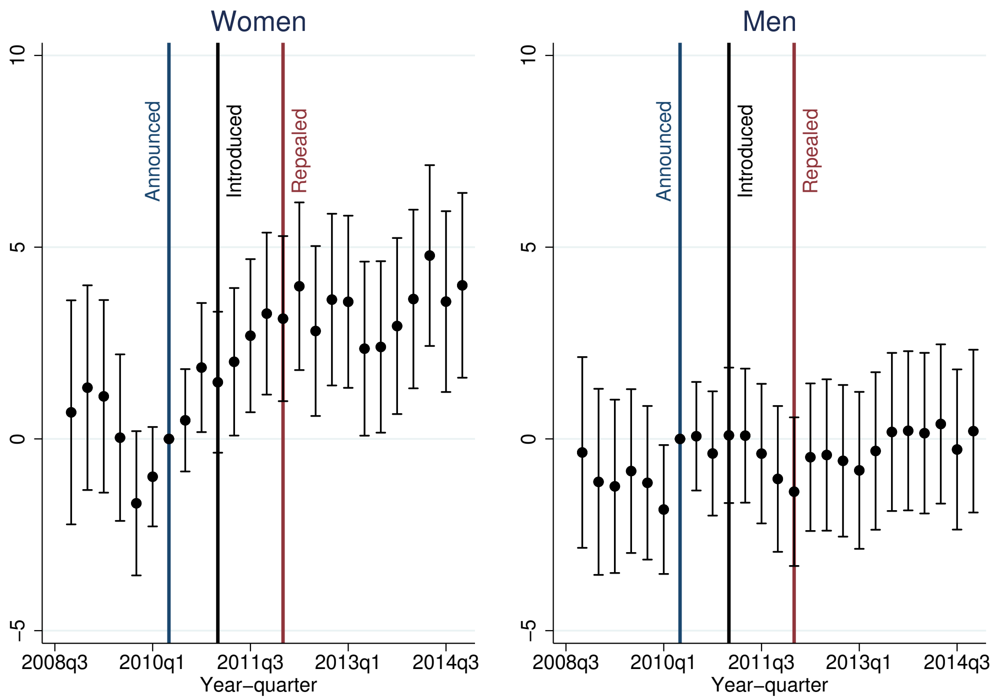


Notes: Dependent variable (y-axis): hours worked per month. Parental controls include: individual FEs and parental age FEs. Family controls include: age of youngest child FEs and number of children FEs.

In order to fully shut down the effect of the fertility response to the policy, we now limit the sample to families where at least one parent had consulted a doctor regarding sterilisation prior to the announcement of the policy. Furthermore, we exclude families with young children throughout the sample period and unbalance the panel in this sub-analysis. In Figure 8, we see similar effect sizes for women for this subgroup of families, but with the smaller sub-sample the coefficients are also less precisely estimated.

Figure 8: G-DiD: Hours worked per month

Parental Controls + Family Controls + Sterilisation - Young



Notes: Dependent variable (y-axis): hours worked per month. Parental controls include: individual FEs and parental age FEs. Family controls include: age of youngest child FEs and number of children FEs. Sterilisation - Young include: only families where at least one parent has consulted a doctor regarding sterilisation prior to the announcement of the policy. Also excluding families with young children (below the age of 3 throughout the sample period).

7.3 DiD

We now move on to report our difference-in-differences estimates. In Table 2, the results using our binary treatment indicator confirm our previous findings. For women, we see a treatment effect of $7.334 + 10.57 = 17.904$ hours worked per month, when we include the fertility response. After controlling for fertility-related family characteristics, we find an effect of $2.820 + 1.130 = 3.95$ hours worked per month. The estimates from the subgroup of sterilised families without young children confirm these results, although the coefficient on the interaction between the repeal and treatment indicators is insignificant.

For men, we find a small, but significant effect of $0.862 + 0.830 = 1.692$ hours worked per month, but only when the fertility response is included.

Table 2: Binary treatment

	Dependent variable: hours worked per month					
	Women			Men		
	(1)	(2)	(3)	(4)	(5)	(6)
1.Intro × 1.Treat	7.334***	2.820***	2.242**	0.862***	0.362	0.578
	[0.327]	[0.249]	[0.776]	[0.187]	[0.192]	[0.633]
1.Repeal × 1.Treat	10.57***	1.130***	0.998	0.830***	-0.265	0.0169
	[0.291]	[0.241]	[0.621]	[0.186]	[0.188]	[0.551]
1.Intro	1.247***	-0.271***	-1.046***	0.952***	0.757***	0.545**
	[0.0958]	[0.0814]	[0.173]	[0.0725]	[0.0726]	[0.167]
1.Repeal	1.114***	0.0190	-0.171	0.510***	0.290***	-0.0822
	[0.0942]	[0.0778]	[0.161]	[0.0693]	[0.0690]	[0.156]
R^2	0.516	0.610	0.662	0.455	0.459	0.508
N	18153075	18153075	3205408	14655450	14655450	2575379
Female	1	1	1	0	0	0
Parental controls	1	1	1	1	1	1
Family controls	0	1	1	0	1	1
Sterilisation	0	0	1	0	0	1
Ex. young	0	0	1	0	0	1

Notes: Standard errors in brackets, clustered at the individual level, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Parental controls: individual FEs and parental age FEs. Family controls: age of youngest child FEs and number of children FEs. Sterilisation: only families where at least one parent has consulted a doctor regarding sterilisation prior to the announcement of the policy. Ex. young: excluding families with young children (below the age of 3 throughout the sample period).

In the next set of analyses, we replace our binary treatment indicator with a continuous measure of child benefits lost due the reform in DKK divided by 1000. 1000 DKK corresponds to approximately 160 USD. The estimates are reported in Table 3. Keep in mind that an average family in our treatment group experiences in a reduction in child benefits of approx. 2300 DKK (see Appendix C), but within our treatment group there is substantial variation in the amount of benefits lost, e.g. four-child families are particularly affected by the reform. Child benefits are tax free, and with the relatively high Danish taxes on labour market income, $\approx 50\%$, this corresponds to about 4600 DKK in labour market income. We find large and significant effects on the treated women. For every 1000 DKK lost due to the reform, women work $2.071 + 3.862 = 5.933$ hours more per month on average. Excluding the fertility response, we find an effect between 1.088 and 0.804 hours per month for every 1000 DKK lost. With a tax rate around 50% and hourly wages of 200 DKK, the estimated effect indicates that women offset the income loss due to the reform roughly 1-to-1 when excluding the fertility response by earning an additional $(12 \times 1.088 \times 200) \times 0.5 = 1305.6$ for 1000 DKK lost in child benefits.

For men, the estimated effects are smaller, but highly significant when including the fertility response. A small effect remains significant even after including family controls, but not when limiting the sample to the sterilised subgroup.

Table 3: Continuous treatment: Reduction in 1000 DKK

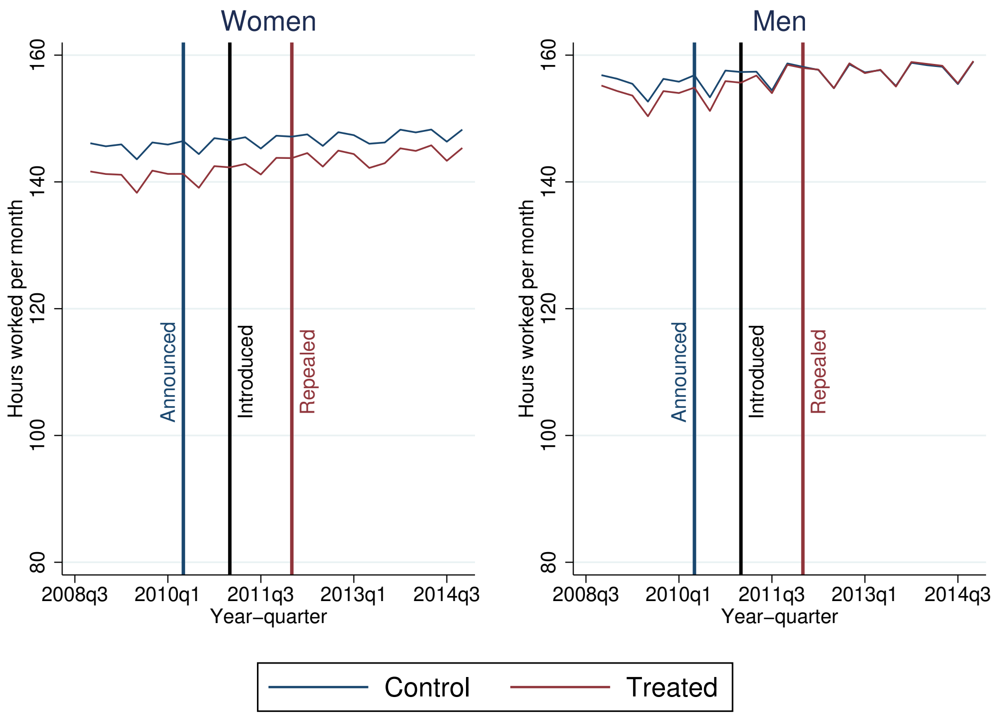
	Dependent variable: hours worked per month					
	Women			Men		
	(1)	(2)	(3)	(4)	(5)	(6)
1.Intro × c.Treat	2.071***	1.088***	0.804**	0.304***	0.230***	0.203
	[0.118]	[0.0920]	[0.299]	[0.0668]	[0.0692]	[0.230]
1.Repeal × c.Treat	3.862***	0.117	0.433	0.339***	-0.0884	-0.0616
	[0.107]	[0.0901]	[0.241]	[0.0657]	[0.0660]	[0.205]
1.Intro	1.535***	-0.236**	-1.027***	0.969***	0.739***	0.549***
	[0.0953]	[0.0807]	[0.172]	[0.0714]	[0.0716]	[0.166]
1.Repeal	1.306***	0.115	-0.160	0.513***	0.284***	-0.0702
	[0.0939]	[0.0771]	[0.160]	[0.0684]	[0.0680]	[0.155]
R^2	0.516	0.610	0.662	0.455	0.459	0.508
N	18153075	18153075	3205408	14655450	14655450	2575379
Female	1	1	1	0	0	0
Parental controls	1	1	1	1	1	1
Family controls	0	1	1	0	1	1
Sterilisation	0	0	1	0	0	1
Ex. young	0	0	1	0	0	1

Notes: Standard errors in brackets, clustered at the individual level, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Parental controls: individual FEs and parental age FEs. Family controls: age of youngest child FEs and number of children FEs. Sterilisation: only families where at least one parent has consulted a doctor regarding sterilisation prior to the announcement of the policy. Ex. young: excluding families with young children (below the age of 3 throughout the sample period).

8 Extensive and intensive margins

In this section, we further analyse the increase in average hours worked for the treatment group. Particularly, we want to separate adjustments along the intensive and extensive margins of labour supply. As a first step, in Figure 9, we map out the average hours of work per month for employed people only, i.e. we exclude people working zero hours.

Figure 9: Hours worked per month, excluding people working zero hours



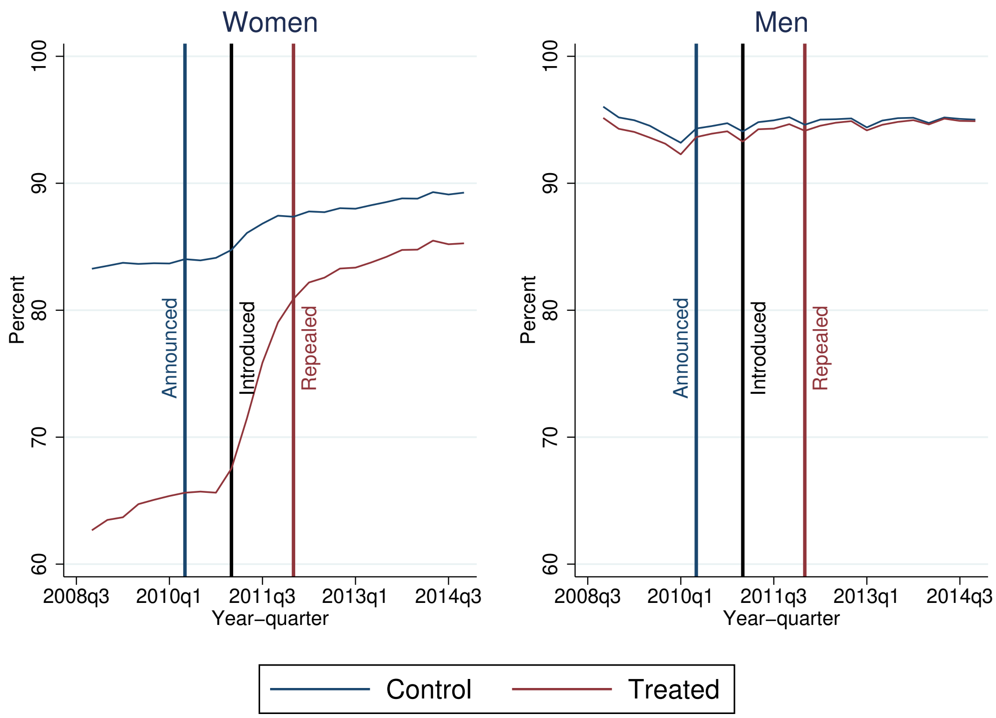
Notes: Average number of hours worked per month, excluding people working zero hours, for women and men respectively. This illustrates changes in labour supply at the intensive margin.

From Figure 9, it appears that there is only a small break in the trend of average hours worked per month for women in the treatment group after the reduction in child benefits. For men, the gap in hours worked between the treatment and control groups closes during the treatment period. Thus, we have a first indication of men's labour supply being affected at the intensive margin during the treatment period.

Before moving onto a casual setting, another descriptive static is important to emphasise, namely participation rates. In Figure 10, we map out participation rates for women and men respectively. We see a large jump in the participation rate for the treated women, but not for men. From Figures C.13 and C.14 in Appendix C, we see that the jump in the participation rate for treated women appears both in part-time and full-time jobs. We also see a small increase the participation rate for women in our control group after the introduction of the reform. Although the control group is not directly affected by the cap on child benefits, families with two children would be affected if they had a third child. This may delay or change the decision to have a third child. Again, we use our sterilisation sub-sample to exclude this effect.

Thus, the descriptive results suggest that women's response to the reform in child benefits happen through increased participation, whereas men may respond at the intensive margin. In the following subsection, we explore the responses at the extensive and intensive margins respectively in the casual setting from the previous section.

Figure 10: Percent of women and men currently employed (i.e. working non-zero hours)



Notes: Percent of women and men currently employed (i.e. working non-zero hours). This illustrates changes in labour supply at the extensive margin.

8.1 Extensive margin

We report the graphical Generalised Difference-in-Differences results in Appendix C, see Figures C.15 to C.17. The graphical analyses again confirm that the parallel trends assumption is full-filled. In Table 4, the effects of the reform are reported using our binary treatment indicator. The results confirm that men do not respond to the reduction in child benefits at the extensive margin. For women, however, we observe a large response to the reform at the extensive margin. Including the fertility response, we find an effect of $5.01 + 6.95 = 11.96$ percentage points (column 1). Excluding the fertility response, we estimate an effect ranging between 1.27 (column 3) and $2.0 + 0.6 = 2.6$ percentage points (column 2).

Table 4: Binary treatment

	Dependent variable: Employment indicator					
	Women			Men		
	(1)	(2)	(3)	(4)	(5)	(6)
1.Intro × 1.Treat	0.0501***	0.0200***	0.0127**	-0.0000148	-0.00251*	0.000577
	[0.00212]	[0.00158]	[0.00473]	[0.00100]	[0.00104]	[0.00342]
1.Repeal × 1.Treat	0.0695***	0.00600***	0.00394	0.00210*	-0.000817	0.00144
	[0.00187]	[0.00152]	[0.00389]	[0.000990]	[0.00101]	[0.00291]
1.Intro	0.00695***	-0.00250***	-0.00792***	0.00212***	0.00170***	0.00214*
	[0.000609]	[0.000508]	[0.00108]	[0.000397]	[0.000398]	[0.000899]
1.Repeal	0.00769***	-0.000113	0.000873	0.00377***	0.00337***	0.00137
	[0.000596]	[0.000485]	[0.000998]	[0.000377]	[0.000377]	[0.000847]
R^2	0.466	0.588	0.638	0.466	0.467	0.524
N	18153075	18153075	3205408	14655450	14655450	2575379
Female	1	1	1	0	0	0
Parental controls	1	1	1	1	1	1
Family controls	0	1	1	0	1	1
Sterilisation	0	0	1	0	0	1
Ex. young	0	0	1	0	0	1

Notes: Standard errors in brackets, clustered at the individual level, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Parental controls: individual FEs and parental age FEs. Family controls: age of youngest child FEs and number of children FEs. Sterilisation: only families where at least one parent has consulted a doctor regarding sterilisation prior to the announcement of the policy. Ex. young: excluding families with young children (below the age of 3 throughout the sample period).

In Table 5, the effects of the reform are reported using our continuous treatment measure. Again, these results confirm that men do not respond to the reduction in child benefits at the extensive margin. Again, we observe that women respond at this margin. Including the fertility response, we find a positive effect on participation of $1.43 + 2.62 = 4.5$ percentage points for every 1000 DKK lost in child benefits (column 1). Excluding the fertility response, we estimate an effect ranging between 0 (column 3) and $0.823 + 0.119 = 0.942$ percentage points (column 2).

Table 5: Continuous treatment: Reduction in 1000 DKK

	Dependent variable: Employment indicator					
	Women			Men		
	(1)	(2)	(3)	(4)	(5)	(6)
1.Intro × c.Treat	0.0143***	0.00823***	0.00363	-0.000129	-0.000856*	0.000228
	[0.000778]	[0.000591]	[0.00186]	[0.000355]	[0.000371]	[0.00119]
1.Repeal × c.Treat	0.0262***	0.00119*	0.00251	0.000960**	-0.000124	0.000634
	[0.000693]	[0.000574]	[0.00153]	[0.000353]	[0.000358]	[0.00110]
1.Intro	0.00890***	-0.00236***	-0.00769***	0.00215***	0.00164***	0.00214*
	[0.000606]	[0.000505]	[0.00107]	[0.000391]	[0.000392]	[0.000893]
1.Repeal	0.00872***	0.000253	0.000811	0.00375***	0.00332***	0.00138
	[0.000595]	[0.000481]	[0.000988]	[0.000371]	[0.000371]	[0.000837]
R^2	0.466	0.588	0.638	0.466	0.467	0.524
N	18153075	18153075	3205408	14655450	14655450	2575379
Female	1	1	1	0	0	0
Parental controls	1	1	1	1	1	1
Family controls	0	1	1	0	1	1
Sterilisation	0	0	1	0	0	1
Ex. young	0	0	1	0	0	1

Notes: Standard errors in brackets, clustered at the individual level, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Parental controls: individual FEs and parental age FEs. Family controls: age of youngest child FEs and number of children FEs. Sterilisation: only families where at least one parent has consulted a doctor regarding sterilisation prior to the announcement of the policy. Ex. young: excluding families with young children (below the age of 3 throughout the sample period).

8.2 Intensive margin

In order to assess labour supply responses at the intensive margin, we unbalance the panel and delete all monthly observations with zero hours of work. Again, we report the graphical Generalised Difference-in-Differences results in Appendix C, see Figures C.18 to C.20. The pre-trends for women are less convincing for this sub-analysis, due to the changing composition of the sample as participation increases through the sample period, but keep in mind the parallel trends in Figure 9. For men, the pre-trends are also parallel in Figure 9, as well as in the Generalised Difference-in-Differences setup.

Using our binary treatment indicator, the effects of the reform on the number of hours worked for people in employment are reported in Table 6. Interestingly, both women and men respond at the intensive margin by increasing their number of hours worked. The estimates are consistent across all specifications, although less significant in columns 3 and 6. Notice that in column 5, we have a first significant indication of a partial reversal of the effects of the reform after its repeal for men.

Table 6: Binary treatment

	Dependent variable: hours worked per month, ex. zero hours					
	Women			Men		
	(1)	(2)	(3)	(4)	(5)	(6)
1.Intro × 1.Treat	0.604***	0.724***	0.754	0.950***	0.802***	0.816*
	[0.139]	[0.147]	[0.480]	[0.114]	[0.116]	[0.373]
1.Repeal × 1.Treat	1.355***	0.917***	0.694	0.477***	-0.226*	-0.431
	[0.133]	[0.135]	[0.369]	[0.112]	[0.112]	[0.319]
1.Intro	-0.165***	-0.338***	-0.475***	0.504***	0.370***	0.0281
	[0.0447]	[0.0452]	[0.103]	[0.0418]	[0.0419]	[0.102]
1.Repeal	0.0161	-0.0664	-0.310**	-0.00372	-0.174***	-0.297**
	[0.0434]	[0.0431]	[0.102]	[0.0411]	[0.0408]	[0.0965]
R^2	0.474	0.478	0.543	0.324	0.328	0.370
N	15440331	15440331	2839834	13883537	13883537	2441788
Female	1	1	1	0	0	0
Parental controls	1	1	1	1	1	1
Family controls	0	1	1	0	1	1
Sterilisation	0	0	1	0	0	1
Ex. young	0	0	1	0	0	1
Ex. zero hours	1	1	1	1	1	1

Notes: Standard errors in brackets, clustered at the individual level, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Parental controls: individual FEs and parental age FEs. Family controls: age of youngest child FEs and number of children FEs. Sterilisation: only families where at least one parent has consulted a doctor regarding sterilisation prior to the announcement of the policy. Ex. young: excluding families with young children (below the age of 3 throughout the sample period). Ex. zero hours: drop monthly observations in which an individual works zero hours.

In Table 7, we again report the effects of the reform on the number of hours worked for people in employment are reported, but this time using our continuous treatment measure. These results confirm that both women and men respond to the reduction in child benefits at the intensive margin by increasing their number of hours worked. Notice that the estimates again are consistent across all specifications, although less significant in column 3. However, using our continuous treatment measure, we find that men respond to the reform almost as strongly as women at the intensive margin. Interestingly, we also see a partial reversal of the increase in hours worked of men after the repeal of the reform after controlling for fertility responses (columns 5 and 6).

Table 7: Continuous treatment: Reduction in 1000 DKK

	Dependent variable: hours worked per month, ex. zero hours					
	Women			Men		
	(1)	(2)	(3)	(4)	(5)	(6)
1.Intro × c.Treat	0.167**	0.223***	0.425*	0.365***	0.401***	0.292*
	[0.0542]	[0.0584]	[0.192]	[0.0419]	[0.0433]	[0.143]
1.Repeal × c.Treat	0.450***	0.225***	0.222	0.185***	-0.101*	-0.254*
	[0.0508]	[0.0511]	[0.142]	[0.0398]	[0.0400]	[0.118]
1.Intro	-0.143**	-0.314***	-0.487***	0.515***	0.357***	0.0353
	[0.0443]	[0.0448]	[0.103]	[0.0412]	[0.0413]	[0.101]
1.Repeal	0.0574	-0.0224	-0.293**	0.00132	-0.172***	-0.288**
	[0.0429]	[0.0426]	[0.101]	[0.0406]	[0.0403]	[0.0954]
R^2	0.474	0.478	0.543	0.324	0.328	0.370
N	15440331	15440331	2839834	13883537	13883537	2441788
Female	1	1	1	0	0	0
Parental controls	1	1	1	1	1	1
Family controls	0	1	1	0	1	1
Sterilisation	0	0	1	0	0	1
Ex. young	0	0	1	0	0	1
Ex. zero hours	1	1	1	1	1	1

Notes: Standard errors in brackets, clustered at the individual level, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Parental controls: individual FEs and parental age FEs. Family controls: age of youngest child FEs and number of children FEs. Sterilisation: only families where at least one parent has consulted a doctor regarding sterilisation prior to the announcement of the policy. Ex. young: excluding families with young children (below the age of 3 throughout the sample period). Ex. zero hours: drop monthly observations in which an individual works zero hours.

9 Conclusions

A temporary cap on child benefit payments in 2011 led to a non-negligible reduction in child benefits for 3-child families with young children as well as larger families. The differential impact of this policy shift represents an opportunity to assess the causal impact of child benefit programmes on the labour supply of mothers and fathers. We find that a reduction in child benefits increase the labour supply of mothers, but only marginally of fathers. The majority of the effect on mothers can be ascribed to reduced fertility, but even after controlling for fertility-related family characteristics, we find a significant increase in mothers' labour supply after the introduction of the reform. This is in line with the existing literature which highlights that women's labour supply relatively more elastic when compare to men, e.g Evers et al. (2008).

We find that both mothers and fathers in affected families respond to the reform at the intensive margin, and that the effect on fathers partially reverses after the repeal of the reform. The strongest response to the reform, however, is at the extensive margin, but only for mothers.

Furthermore, the effects on mothers' labour supply is persistent, even after the repeal of the reform. There are at least two explanations of the persistence of the effects: 1) The costs of entry to labour market / the costs of increasing work hours have already been borne by the mothers, e.g. by enrolling children in daycare and kindergarten. 2) The reform introduced uncertainty about future child benefit payments, even after its repeal, as the generosity of the payments received increased political and public awareness.

We confirm our results by using data on parents' consultations with doctors about sterilisation, a common procedure in Denmark. The advantage of the data on sterilisation is that we can limit our analyses to families who had finalised their fertility decisions prior to the announcement of the reform.

In terms of policy implications, our results complement existing evidence on the EITC from the US, e.g. Kleven (2019), which generally find positive employment effects of in-work benefits on single mothers. The universal child benefit system in Denmark appears to have the opposite effect for women in two-parent families. Thus, our results support the conclusion by Eissa & Hoynes (2004, p. 1931) who found that in the US, *"the EITC is effectively subsidizing married mothers to stay home..."* Depending on policymakers' objectives, alternative policies could be developed, e.g. to target the child pay penalty or part-time pay penalty of mothers. However, other outcomes, such as the well-being and poverty of children and mothers, should of course also be considered.

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A Policy background

A.1 Child benefits in Denmark

The introduction of the the income-independent child benefits in 1986 (Act no. 147 of 19 March 1986) was a part of reform of the Danish tax system intended to improve the economic conditions for families with children in Denmark, cf. the remarks to the proposed legislation, Bill no. 110 of 20 February 1986. Hence, only children of parents who were fully subject to income taxation in Denmark qualified for the new benefits/tax relief. In the remarks to original piece of legislation, the government notes that although the intention is provide a tax relief for child families, it is largely similar to a benefit. This also explains why the Ministry of Taxation is still responsible for child benefit payments today (and not the Ministry for Children and Social Affairs). The remarks to the proposed legislation, Bill no. 110 of 20 February 1986, does not mention any considerations of effects on labour supply.

Prior to the 2011-cap on benefits, numerous changes to the original law from 1986 were implemented. Importantly, changes prior to the 2011-cap included the introduction of child age-dependent benefits so that younger children would qualify for higher levels of benefits. The first two-tier system came into effect in 1990, and it became three-tier in 1995. Furthermore, benefit levels have been increased a few times.

The 2011-cap on child benefits was, however, the first cut in child benefits. The only exception is the introduction of proportional benefits to children in quarter they turn 18 from 2006 and thereafter. The cap 2011-cap was repealed already in the year of its introduction. Non-capped benefits were paid out again from Q1 2012 and thereafter. However, another cut in child benefits was introduced with the means-testing of child benefits in 2014, although it only affected couples with very high earnings. We generally limit our sample period to September 2008 to December 2014.

The remaining changes to 1986-child benefits law were either due to updates in references to other laws, rules for the withholdment of benefits, changes in rules on repayment of benefits received by non-eligible families, and lastly, residency requirements of eligible children.

A.2 2011 Reform

In light of the Great Recession, The Government and The Danish Peoples Party agreed on an austerity package on 25 May 2010 with the intention of limiting Denmark's budget deficit.[5]

The austerity package included a 30,000 DKK-cap on child benefits from 2011 and onwards, which was later changed to 35,000 DKK. Details on the cap are outlined below.

[5]https://www.fm.dk/Nyheder/Pressemeddelelser/2010/05/20100525%20Aftale%20om%20genopret-ning%20af%20dansk%20oekonomi.aspx

A.2.1 Introduction

The initial Bill no. 221 of 27 May 2010 included a yearly cap on child benefits of 30,000 DKK with effect from 1 January 2011, but with a gradual implementation over three years. Families would be cut 1/3 of benefits exceeding 30,000 DKK in 2011, 2/3 in in 2012, and the full amount in 2013. No maximum cut was mentioned in this first proposal, and no general cut in benefits.

Less than a week after their agreement of 25 May 2010, the Government and The Danish Peoples Party agreed to update their proposal to secure a fairer distribution of the cuts in child benefits on 31 May 2010. The yearly cap on child benefits was increased from 30,000 DKK to 35,000 DKK. This proposal also included a maximum cut of 12,000 DKK per year in 2011-2013 (see details below). From 2014 and onwards, the maximum cut would be increased by 3,000 DKK every year till 2019 where it would amount to 30,000 DKK. In 2020, the maximum cut was to be abolished. The gradual implementation over three years where families would be cut 1/3 of benefits exceeding 35,000 DKK in 2012, 2/3 in in 2013, and the full amount in 2013 remained in the updated proposal.

An additional rule modifies the rule of a maximum cut of 12,000 DKK (2011-level), making the cut slightly smaller for the families with benefits exceeding 68,335 DKK. It states that in 2011, the level of paid out benefits must be at least equal to: non-capped benefits * 1.013 - 12,000 DKK.

The maximum cut of 12,000 DKK is therefore not imposed on actual non-capped benefits, but on the non-capped benefits with a 1.3 percentage addition. This means that maximum cut in practice was 11112 DKK, affecting families with non-capped benefits of 68,335 DKK and above. It also means that maximum cut in benefits is decreasing in the level of benefits above 68,335 DKK.

Lastly, the updated proposal from the Government and The Danish Peoples Party proposal included a general cut in child benefits of 5 percent from 2011 to 2013. Despite the more lenient 35,000 DKK-cap on child benefits, the general 5 percent cut secured savings for the government that exceeded those of the original proposal.

After approval in parliament, the final law, Law no. 725 of 25 June 2010, came into force on 27 June 2010, but it only affected benefits payouts from Q1 2011 and thereafter.

A.2.2 Repeal

The repeal of 2011-cap on child benefits was included in the 2012 Finance Act. A complete Finance Act proposal published by the newly elected left-wing government on 3 November 2011 included the repeal of the 2011-cap on child benefits.[6] However, the repeal was already announced in the press on 30 October 2011. The proposal simply repealed the 35,000 DKK cap

[6] https://fm.dk/media/15064/ansvaroghandling.pdf

on child benefits and its gradual implementation. However, it did not contain a repeal of the general 5 % cut in child benefits.

The final law as proposed by the government was approved in parliament on 21 December 2011 with the support of the RedGreen Alliance (DA: Enhedslisten). After approval in parliament, the final law, Law no. 1382 of 28 December 2011, came into force on 1 January 2012, and affected benefits payouts from Q1 2012 and onwards.

B Conceptual framework

In this appendix, we introduce a theoretical framework which generates tight predictions over individual behavior under different child benefit regimes. This provides hypotheses which can be tested empirically. The static model below that individuals do not consider utility in the future, and thus, it assumes very high discount rates.

Utility U_i is a function of leisure l, consumption C and number of children K. We assume that leisure, consumption and number of children are additively separable:

$$U_i(C, l, K) = f_i(C) + g_i(l) + j_i(K) \tag{4}$$

Note the subscript i: We consider agents to be heterogeneous, although we do make some common assumptions about the structure of their preferences. Here j_i is the function determining utility generated from having children. This could capture expectations of future family earnings or simply the consumption value of having children. We assume that utility is increasing and concave in number of children, so $j_i'(K) > 0$ and $j_i''(K) < 0$. We assume the same of f_i and g_i, and we assume that both consumption and leisure are normal goods. To simplify exposition, we assume log functions for each component of utility, giving us a Cobb-Douglas utility function:

$$U_i(C, l, K) = \lambda_{c,i} log(C) + \lambda_{l,i} log(l) + \lambda_{k,i} log(K) \tag{5}$$

In order to consider a specific monotonic transformation of the utility function for each individual, i, we also assume that:

$$\lambda_{c,i} + \lambda_{l,i} + \lambda_{k,i} = 1 \tag{6}$$

$$\lambda_{c,i}, \lambda_{l,i}, \lambda_{k,i} > 0 \tag{7}$$

B.1 Linear child benefits

Before choosing the number of children, an individual can choose between two states. First, we consider the state in which an individual works and receives the wage w_i, which varies across individuals. Next, we consider the state in which an individual does not work, but instead receives a fixed transfer from the government.

B.1.1 Working

If working, an individual splits their total time, which is normalized to 1, between leisure l and work h:

$$h = 1 - l \tag{8}$$

The budget constraint is as follows, with wage w_i taken as given:

$$C + \alpha K = w_i(1 - l) + P(K) \tag{9}$$

Here α represents the cost of having a child, which we assume to be linear. $P(K)$ represents the amount of child benefits received, which is a function of the number of children. This could be a linear or a non-linear function, and could be zero in the case of no child benefits. When child benefits are linear, $P(K) = \delta K$, where δ is the per-child benefit amount. The budget constraint then becomes:

$$C + \alpha K = w_i(1 - l) + \delta K \tag{10}$$

We assume that the financial cost of having a child exceeds the per-child benefit, so $\alpha > \delta$. In this setup, where children are viewed as a consumption good with price $\alpha - \delta$, we obtain the usual optimality condition for consumption / leisure choices and an additional one for consumption / number of children. The superscript W, indicates that this is the optimal choice after deciding to work:

$$C^W = \frac{\lambda_{c,i}}{\lambda_{l,i}} w_i l^W \tag{11}$$

$$C^W = \frac{\lambda_{c,i}}{\lambda_{k,i}} (\alpha - \delta) K^W \tag{12}$$

Combining these with the budget constraint gives the following optimal allocations in terms of factors external to the model:

$$l^W = \frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i} + \lambda_{k,i}} = \lambda_{l,i} \tag{13}$$

$$C^W = \frac{\lambda_{c,i}}{\lambda_{c,i} + \lambda_{l,i} + \lambda_{k,i}} w_i = \lambda_{c,i} w_i \tag{14}$$

$$K^W = \frac{\lambda_{k,i}}{\lambda_{c,i} + \lambda_{l,i} + \lambda_{k,i}} \frac{w_i}{(\alpha - \delta)} = \lambda_{k,i} \frac{w_i}{(\alpha - \delta)} \tag{15}$$

B.1.2 Not working

If not working, individuals do not split their total time between leisure and working, and we have that:

$$l = 1 \tag{16}$$

Again assuming that child benefits are linear, the budget constraint is as follows, where T is a fixed transfer from the government:

$$C + \alpha K = T + \delta K \tag{17}$$

We obtain the following optimality condition for consumption / number of children where the superscript NW, indicates that this is the optimal choice after deciding not to work:

$$C^{NW} = \frac{\lambda_{c,i}}{\lambda_{k,i}}(\alpha - \delta)K^{NW} \tag{18}$$

Combining these with the budget constraint gives the following optimal allocations in terms of factors external to the model:

$$C^{NW} = \frac{\lambda_{c,i}}{\lambda_{c,i} + \lambda_{k,i}}T \tag{19}$$

$$K^{NW} = \frac{\lambda_{k,i}}{\lambda_{c,i} + \lambda_{k,i}}\frac{T}{(\alpha - \delta)} \tag{20}$$

We see that an individual chooses to work if:

$$\lambda_{c,i}log(\lambda_{c,i}w_i) + \lambda_{l,i}log(\lambda_{l,i}) + \lambda_{k,i}log(\lambda_{k,i}\frac{w_i}{\alpha - \delta}) > \lambda_{c,i}log(\frac{\lambda_{c,i}}{\lambda_{c,i} + \lambda_{k,i}}T) + \lambda_{k,i}log(\frac{\lambda_{k,i}}{\lambda_{c,i} + \lambda_{k,i}}\frac{T}{\alpha - \delta}) \tag{21}$$

B.2 Non-linear child benefits: The introduction of a benefits cap

Now let us consider a case where individuals have already chosen l, C and K subject to the linear benefits system, but then a new non-linear system is introduced. We first consider the case of an individual that decided to work under the previous benefits system, and decides to do so again. The new optimal choices will be denoted $l^{W,W}$, $C^{W,W}$ and $K^{W,W}$.

Under the new system, $P(K) = \min(\delta K, \phi)$ where ϕ is the maximum amount of child benefits. This also means that $\frac{\phi}{\delta}$ is a positive number which can be interpreted as the maximum number of kids for which you can receive benefits.

Clearly, if $K^W < \frac{\phi}{\delta}$, individuals are unaffected by the cap. However, if $K^W > \frac{\phi}{\delta}$ individuals will be away from the optimum. We assume that the parameters are such that it is not optimal to have children above the capped level, so $K^{W,W} \leq \frac{\phi}{\delta}$.

It is not in general possible to reduce your number of children, so individuals are subject to the constraint the $K^{W,W} \geq K^W$. For these individuals "stuck" with a sub-optimally high number of children, what do we expect to happen to consumption and labor supply in the model?

B.2.1 Working before cap

If working already before the cap on child benefits were introduced, individuals re-optimize to choose consumption and leisure subject to the new budget constraint:

$$C + \alpha K^W = w_i(1-l) + \phi \tag{22}$$

Once again, the optimal consumption-leisure trade-off is determined by:

$$C^{W,W} = \frac{\lambda_{c,i}}{\lambda_{l,i}} w_i l^{W,W} \tag{23}$$

This gives us:

$$l^{W,W} = \frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i}} \frac{w_i - \alpha K^W + \phi}{w_i} \tag{24}$$

Substituting for K^W gives the following:

$$l^{W,W} = \frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i}} + \frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i}} \frac{\phi}{w_i} - \frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i}} \frac{\alpha \lambda_{k,i}}{\alpha - \delta} \tag{25}$$

How does this relate to $l^W = \lambda_{l,i}$, the leisure choice under linear child benefits? We have that individuals increase their labour supply if the following inequality holds:

$$\lambda_{l,i} < \frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i}} + \frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i}} \frac{\phi}{w_i} - \frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i}} \frac{\alpha \lambda_{k,i}}{\alpha - \delta} \tag{26}$$

$$\lambda_{l,i}(\lambda_{c,i} + \lambda_{l,i}) < \lambda_{l,i}\left(1 + \frac{\phi}{w_i} - \frac{\alpha \lambda_{k,i}}{\alpha - \delta}\right) \tag{27}$$

$$\lambda_{c,i} + \lambda_{l,i} < 1 + \frac{\phi}{w_i} - \frac{\alpha \lambda_{k,i}}{\alpha - \delta} \tag{28}$$

(29)

Now, remember that $\lambda_{c,i} + \lambda_{l,i} + \lambda_{k,i} = 1$, and we have that:

$$\lambda_{c,i} + \lambda_{l,i} < 1 + \frac{\phi}{w_i} - \frac{\alpha\lambda_{k,i}}{\alpha - \delta} \tag{30}$$

$$1 - \lambda_{k,i} < 1 + \frac{\phi}{w_i} - \frac{\alpha\lambda_{k,i}}{\alpha - \delta} \tag{31}$$

$$\frac{\alpha\lambda_{k,i}}{\alpha - \delta} - \lambda_{k,i} < \frac{\phi}{w_i} \tag{32}$$

$$-\frac{\delta\lambda_{k,i}}{\alpha - \delta} < \frac{\phi}{w_i} \tag{33}$$

$$0 < \frac{\phi}{w_i} + \frac{\delta\lambda_{k,i}}{\alpha - \delta} \tag{34}$$

$$\tag{35}$$

Since $\phi > 0$, $\delta\lambda_{k,i} > 0$ and $\alpha > \delta$ by definition, the inequality holds. Thus, labour supply increases for people who decided to work already prior to the cap on child benefits.

B.2.2 Not working before cap

For the group of individuals not working before the introduction of the cap on child benefits, the choice of C is now given by the following budget constraint if they continue to stay out of work:

$$C^{NW,NW} + \alpha K^{NW} = T + \phi \tag{36}$$

$$C^{NW,NW} = T + \phi - \alpha K^{NW} \tag{37}$$

$$C^{NW,NW} = T - X \tag{38}$$

$$\tag{39}$$

Where $X = \alpha K^{NW} - \phi$ is a constant and are the expenses to children not covered by the capped child benefits.

Next, we consider the case where an individual switches from not working to working after the cap on child benefits is introduced. Then they face the budget constraint:

$$C = w_i(1 - l) - X \tag{40}$$

The optimal consumption-leisure trade-off is determined by $C^{NW,W} = \frac{\lambda_{c,i}}{\lambda_{l,i}} w_i l^{NW,W}$. This gives us:

$$l^{NW,W} = \frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i}} \frac{w_i - X}{w_i} \tag{41}$$

$$C^{NW,W} = \frac{\lambda_{c,i}}{\lambda_{c,i} + \lambda_{l,i}} (w_i - X) \tag{42}$$

Thus, an individual switches from not working to working after the introduction of the cap if the following inequality holds:

$$\lambda_{c,i} log(\frac{\lambda_{c,i}}{\lambda_{c,i} + \lambda_{l,i}}(w_i - X)) + \lambda_{l,i} log(\frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i}} \frac{w_i - X}{w_i}) + \lambda_{k,i} log(K^{NW}) > \lambda_{c,i} log(T - X) + \lambda_{l,i} log(1) + \lambda_{k,i} log(K^{NW}) \tag{43}$$

$$\lambda_{c,i} log(\frac{\lambda_{c,i}}{\lambda_{c,i} + \lambda_{l,i}}(w_i - X)) + \lambda_{l,i} log(\frac{\lambda_{l,i}}{\lambda_{c,i} + \lambda_{l,i}} \frac{w_i - X}{w_i}) > \lambda_{c,i} log(T - X) \tag{44}$$

B.3 An example

We now turn to an example of an agent, j, with the following parameters:

$$w_j = 400 \tag{45}$$

$$T = 0.35 w_j = 140 \tag{46}$$

$$\alpha = 20 \tag{47}$$

$$\delta = 13 \tag{48}$$

$$\phi = 35 \tag{49}$$

$$\lambda_{l,j} = \frac{3}{8} \tag{50}$$

$$\lambda_{c,j} = \frac{1}{2} \tag{51}$$

$$\lambda_{k,j} = \frac{1}{8} \tag{52}$$

$$\tag{53}$$

B.3.1 Before introduction of cap

First, the agent chooses between working and not working. If working, the agent would choose:

$$l^W = \lambda_{l,j} = \frac{3}{8} \tag{54}$$
$$C^W = \lambda_{c,j} w_j = \frac{1}{2} 400 = 200 \tag{55}$$
$$K^W = \lambda_{k,j} \frac{w}{(\alpha - \delta)} = \frac{1}{8} \frac{400}{(20 - 13)} \approx 7.14 \tag{56}$$

If not working, the agent would choose:

$$l^{NW} = 1 \tag{57}$$
$$C^{NW}, = \frac{\lambda_{c,j}}{\lambda_{c,j} + \lambda_{k,j}} T = \frac{\frac{1}{2}}{\frac{1}{2} + \frac{1}{8}} 140 = 112 \tag{58}$$
$$K^{NW} = \frac{\lambda_{k,j}}{\lambda_{c,j} + \lambda_{k,j}} \frac{T}{(\alpha - \delta)} = \frac{\frac{1}{8}}{\frac{1}{2} + \frac{1}{8}} \frac{140}{(20 - 13)} = 4 \tag{59}$$

We can now compare the levels of utility from working and not working:

$$U_j^W(200, 3/8, 7.14) = \frac{1}{2} log(200) + \frac{3}{8} log(\frac{3}{8}) + \frac{1}{8} log(7.14) \approx 1.0975 \tag{60}$$
$$U_j^{NW}(112, 1, 4) = \frac{1}{2} log(112) + \frac{1}{8} log(4) \approx 1.0998 \tag{61}$$

As $U_j^{NW}(112, 1, 4) > U_j^W(200, 3/8, 7.14)$, the individual chooses not to work and to have 4 children before the introduction of the cap on child benefits.

B.3.2 After introduction of cap

Now consider the choices of the same individual after the introduction of the cap on child benefits. We assume that the individual has finalised fertility decisions and cannot change the number of children from 4. First, we calculate:

$$X = \alpha K^{NW} - \phi = 20 * 4 - 35 = 45 \tag{62}$$

If the individual is still not working after the introduction of cap on benefits, the individual's consumption is given by:

$$C^{NW,NW} = T - X = 140 - 45 = 95 \tag{63}$$

If the individual starts to work after the introduction of the cap, the optimal choices of consumption and leisure are:

$$l^{NW,W} = \frac{\lambda_{l,j}}{\lambda_{c,j} + \lambda_{l,j}} \frac{w_j - X}{w_j} = \frac{\frac{3}{8}}{\frac{1}{2} + \frac{3}{8}} \frac{400 - 45}{400} = \frac{213}{560} \approx 0.38 \tag{64}$$

$$C^{NW,W} = \frac{\lambda_{c,j}}{\lambda_{c,j} + \lambda_{l,j}} (w_j - X) = \frac{\frac{1}{2}}{\frac{1}{2} + \frac{3}{8}} (400 - 45) = \frac{1420}{7} =\approx 202.86 \tag{65}$$

We can now compare the levels of utility from working and not working after the introduction of the cap on benefits:

$$U_j^{NW,W}(202.86, 0.38, 4) = \frac{1}{2} log(202.86) + \frac{3}{8} log(0.38) + \frac{1}{8} log(4) \approx 1.0714 \tag{66}$$

$$U_j^{NW,NW}(95, 1, 4) = \frac{1}{2} log(95) + \frac{1}{8} log(4) \approx 1.0641 \tag{67}$$

As $U_j^{NW,W}(202.86, 0.38, 4) > U_j^{NW,NW}(95, 1, 4)$ the individual starts working after the introduction of the cap.

B.3.3 Switching costs

Until now, we have assumed that individuals are able to switch freely between working and not working. Let us now consider the case where an individuals face a switching cost, S, when switching from working to not working or vice versa. How much would the individual be willing to pay to switch from not working to working when the cap on child benefits are introduced?

If the individual starts to work after the introduction of the cap, and pays the switching cost, the optimal choices of consumption and leisure are:

$$l^{NW,W} = \frac{\lambda_{l,j}}{\lambda_{c,j} + \lambda_{l,j}} \frac{w_j - X - S}{w_j} = \frac{\frac{3}{8}}{\frac{1}{2} + \frac{3}{8}} \frac{400 - 45 - S}{400} = \frac{1065 - 3S}{2800} \tag{68}$$

$$C^{NW,W} = \frac{\lambda_{c,j}}{\lambda_{c,j} + \lambda_{l,j}} (w_j - X - S) = \frac{\frac{1}{2}}{\frac{1}{2} + \frac{3}{8}} (400 - 45 - S) = \frac{1420 - 4S}{7} \tag{69}$$

Thus, the maximum switching cost the individual is willing to pay is given by the equation:

$$U^{NW,W}\left(\frac{1420 - 4S}{7}, \frac{1065 - 3S}{2800}, 4\right) = U^{NW,NW}(95, 1, 4) \tag{70}$$

$$\frac{1}{2} log\left(\frac{1420 - 4S}{7}\right) + \frac{3}{8} log\left(\frac{1065 - 3S}{2800}\right) + \frac{1}{8} log(4) = 1.0641 \tag{71}$$

$$S \approx 6.7593 \tag{72}$$

We now want to consider the case where the cap on benefits is repealed again. How much would the individual be willing to pay to stop working? If the individual stop working, the level of consumption is given by:

$$C^{NW,W,NW} = T - (\alpha - \delta)4 - S = 140 - 7 * 4 - S = 112 - S \tag{73}$$

If the individual keeps working after the repeal of the cap on benefits, the level of consumption and leisure are given by:

$$l^{NW,W,W} = \frac{\lambda_{l,j}}{\lambda_{c,j} + \lambda_{l,j}} \frac{w_j - (\alpha - \delta) \times 4}{w_j} = \frac{\frac{3}{8}}{\frac{1}{2} + \frac{3}{8}} \frac{400 - (20 - 13) \times 4}{400} = \frac{279}{700} \approx 0.40 \tag{74}$$

$$C^{NW,W,W} = \frac{\lambda_{c,j}}{\lambda_{c,j} + \lambda_{l,j}} (w_j - (\alpha - \delta) \times 4) = \frac{\frac{1}{2}}{\frac{1}{2} + \frac{3}{8}} (400 - (20 - 13) \times 4) = \frac{1488}{7} = \approx 212.57 \tag{75}$$

Thus, the maximum switching cost the individual is willing to pay to stop working again is given by the equation:

$$U_j^{NW,W,W}(\frac{1488}{7}, \frac{279}{700}, 4) = U_j^{NW,W,NW}(112 - S, 1, 4) \tag{76}$$

$$1.0891 = \frac{1}{2} log(112 - S) + \frac{1}{8} log(4) \tag{77}$$

$$S \approx 5.3687 \tag{78}$$

This example shows that if, for example, $S = 6$ then at least some individuals will switch to from not working to working when the cap on benefits is introduced, but then not switch back after the repeal of the cap.

B.4 Fertility responses

While the above model assumes the number of children is already chosen, fertility is a dynamic process and will also be affected by a change from linear to non-linear child benefits. If optimal number of children in the linear child benefits case is under the level of the child benefits cap, so $K^W < \phi/\delta$ or $K^{NW} < \phi/\delta$. For individuals with $K < K^W$ or $K < K^{NW}$ who are still accumulating children, the fertility decision is unchanged upon the introduction of the cap.

Next, we consider the case where the optimal number of children in the linear case is above the level of the child benefits cap, so $K^W > \phi/\delta$ or $K^{NW} > \phi/\delta$. Maintaining the assumptions above, upon the switch to the non-linear child benefits system the optimal number of children is $K^W = \phi/\delta$ or $K^{NW} = \phi/\delta$. If individuals accumulating children currently have $K < \phi/\delta$, they will continue accumulating until $K = \phi/\delta$. If individuals have already accumulated $K > \phi/\delta$, but not reached previous optimum $K^W > \phi/\delta$ or $K^{NW} > \phi/\delta$, they will stop accumulating children.

C Data

C.1 Summary statistics, full sample

Table C.8: Summary statistics, full sample: Women

	Treatment Group	Control	Diff.	Std. Error
Age	36.0308	39.1069	3.0761***	0.0331
Benefits lost in 2011	2319.8836	3.4718	-2316.4118***	3.5557
Family has twins or triplets	0.1364	0.0460	-0.0905***	0.0014
Age of youngest child	2.1035	6.7948	4.6913***	0.0259
Annual disposable income	255901.0676	259745.9958	3844.9282***	635.4222
Hours (BFL)	94.5865	123.4527	28.8662***	0.3930
Hours > 0 (BFL)	0.6651	0.8421	0.1770***	0.0024
Years of education	15.0313	14.8576	-0.1737***	0.0138
Potential experience, years	11.6676	14.7797	3.1121***	0.0441
Register experience, years	11.3949	15.5240	4.1292***	0.0454
Number of individuals	28968	213073		

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Data from January 2011. Potential experience equals years since finishing education. Notice that the "Benefits lost in 2011" is not equal to zero for the control group. This is because we define our treatment group as those who were affected by the policy in the first two quarters of 2011 in order avoid selection into the treatment group.

Table C.9: Summary statistics, full sample: Men

	Treatment Group	Control	Diff.	Std. Error
Age	38.0318	40.9809	2.9491***	0.0398
Benefits lost in 2011	2357.1098	3.0487	-2354.0610***	4.0960
Family has twins or triplets	0.1423	0.0453	-0.0970***	0.0016
Age of youngest child	2.1249	6.6513	4.5264***	0.0293
Annual disposable income	325148.4529	324784.1813	-364.2716	4363.0986
Hours (BFL)	144.9328	147.5132	2.5804***	0.3378
Hours > 0 (BFL)	0.9302	0.9393	0.0091***	0.0017
Years of education	15.0767	14.7984	-0.2783***	0.0162
Potential experience, years	14.1452	17.5651	3.4198***	0.0538
Number of individuals	22477	172929		

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Data from January 2011. Potential experience equals years since finishing education. Notice that the "Benefits lost in 2011" is not equal to zero for the control group. This is because we define our treatment group as those who were affected by the policy in the first two quarters of 2011 in order avoid selection into the treatment group.

C.2 Summary statistics, sterilisation subsample

Table C.10: Summary statistics, sterilisation subsample: Women

	Treatment Group	Control	Diff.	Std. Error
Age	38.3770	41.6980	3.3209***	0.0906
Benefits lost in 2011	2103.1343	0.1192	-2103.0151***	7.0791
Family has twins or triplets	0.1770	0.0443	-0.1327***	0.0046
Age of youngest child	5.0734	9.4886	4.4152***	0.0681
Annual disposable income	252710.5064	252411.8932	-298.6131	1831.8352
Hours (BFL)	119.3680	130.3181	10.9501***	1.1795
Hours > 0 (BFL)	0.8373	0.8865	0.0492***	0.0067
Years of education	14.5484	14.3308	-0.2176***	0.0443
Potential experience, years	14.3822	17.6526	3.2704***	0.1451
Register experience, years	13.0508	18.0290	4.9782***	0.1533
Number of individuals	2440	39552		

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Data from January 2011. Potential experience equals years since finishing education. Notice that the "Benefits lost in 2011" is not equal to zero for the control group. This is because we define our treatment group as those who were affected by the policy in the first two quarters of 2011 in order avoid selection into the treatment group.

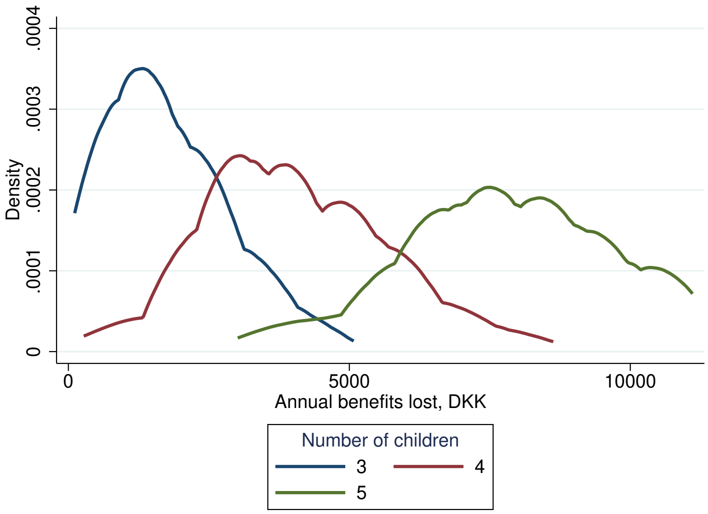
Table C.11: Summary statistics, sterilisation subsample: Men

	Treatment Group	Control	Diff.	Std. Error
Age	40.5988	43.8436	3.2448***	0.1070
Benefits lost in 2011	2124.0295	0.0042	-2124.0253***	8.5254
Family has twins or triplets	0.1768	0.0459	-0.1309***	0.0052
Age of youngest child	5.0208	9.4544	4.4337***	0.0757
Annual disposable income	318245.2932	315419.3384	-2825.9548	5583.2587
Hours (BFL)	147.3259	148.3792	1.0533	1.1070
Hours > 0 (BFL)	0.9357	0.9399	0.0042	0.0055
Years of education	14.4667	14.3157	-0.1510***	0.0508
Potential experience, years	17.6218	21.1897	3.5679***	0.1622
Register experience, years	19.9189	23.4733	3.5544***	0.1608
Number of individuals	1974	31764		

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Data from January 2011. Potential experience equals years since finishing education. Notice that the "Benefits lost in 2011" is not equal to zero for the control group. This is because we define our treatment group as those who were affected by the policy in the first two quarters of 2011 in order avoid selection into the treatment group.

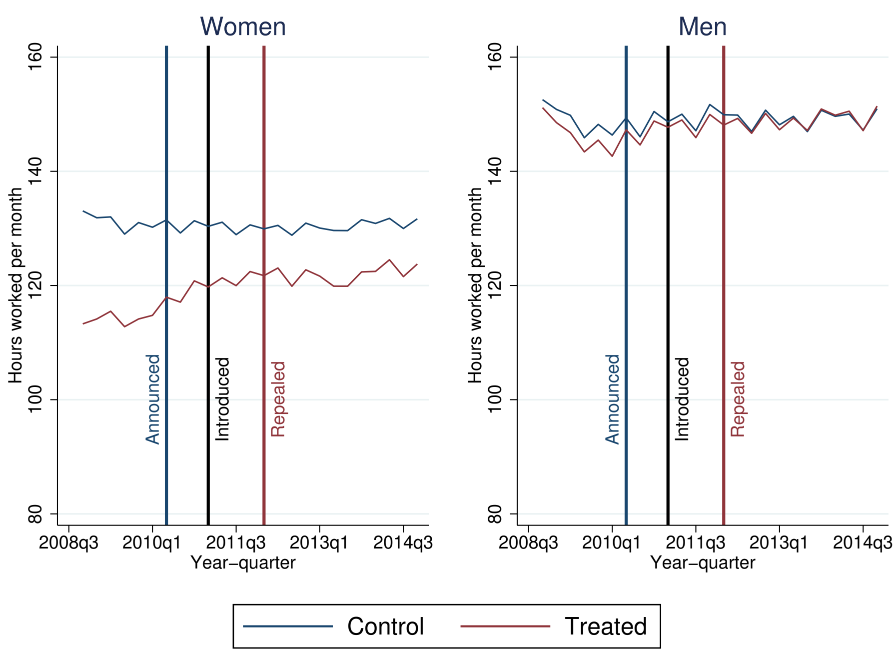
C.3 Descriptives

Figure C.11: Benefits lost in 2011 by number of children



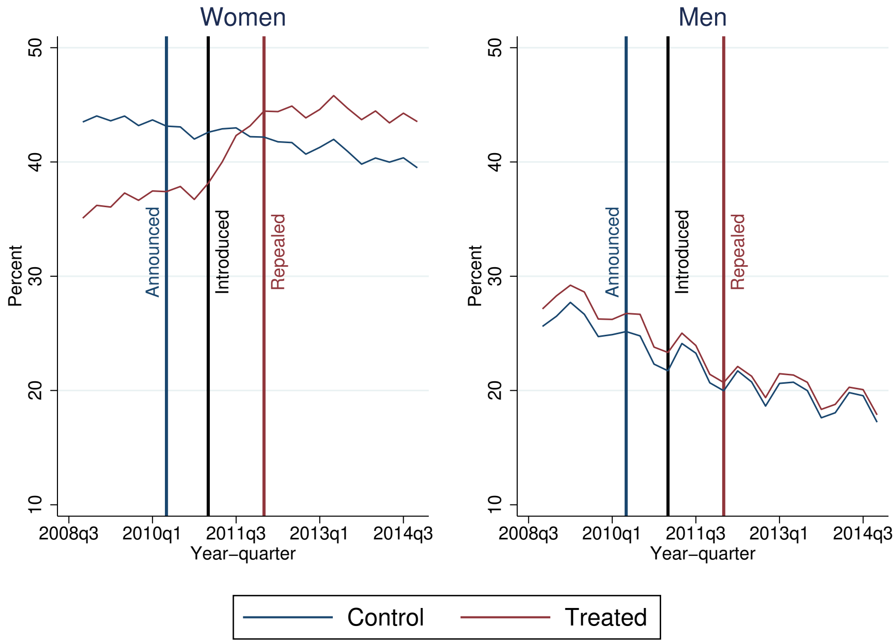
Notes: Benefits lost as a consequence of the cap on child benefits. Observations below/above 1st/99th percentiles dropped. Epanechnikov kernel density, bandwidth = 500.

Figure C.12: Hours worked per month for women and men, sterilisation subsample



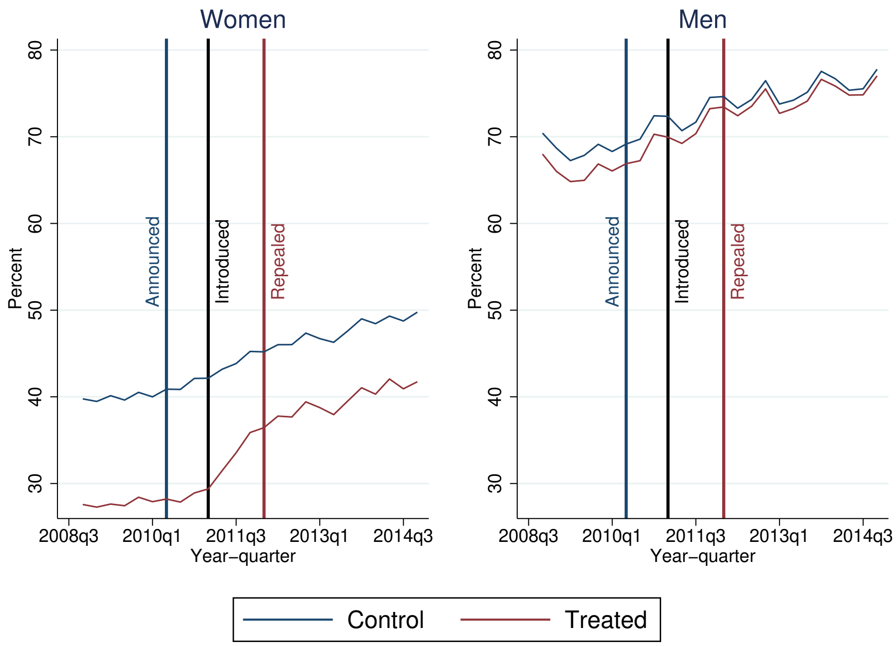
Notes: Average hours worked per month for women and men respectively, including individuals working zero hours. Sterilisation subsample only.

Figure C.13: Percent of women and men employed in part-time jobs



Notes: Percent of women and men currently employed in part-time jobs. Part-time work is defined as working 160 hours or less per month.

Figure C.14: Percent of women and men employed in full-time jobs

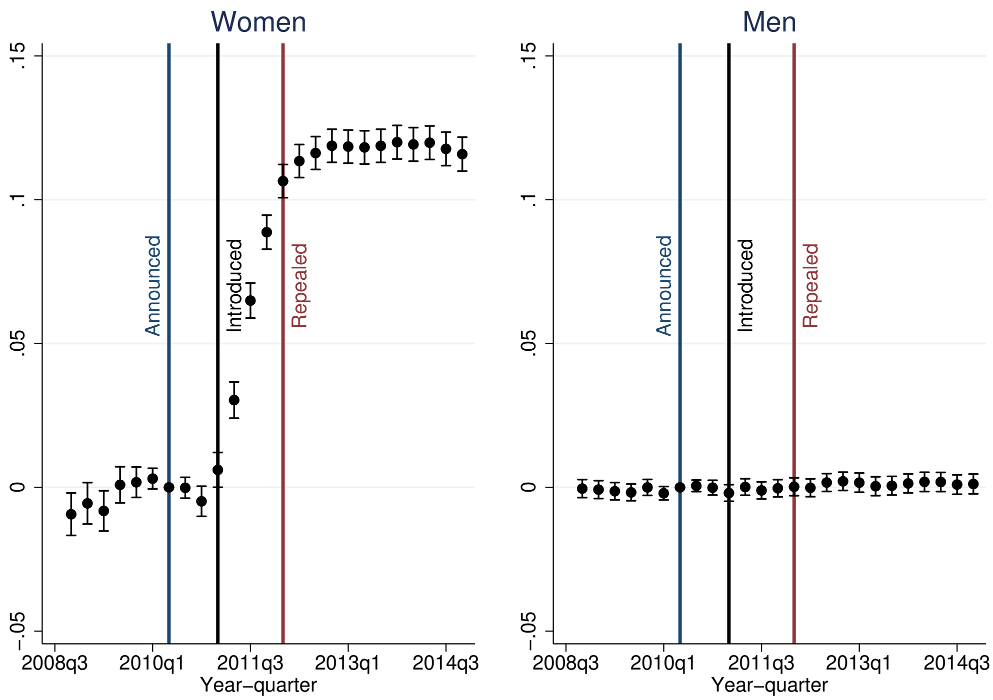


Notes: Percent of women and men currently employed in full-time jobs. Full-time work is defined as working more than 160 hours per month.

C.4 Extensive margin

Figure C.15: G-DiD: Employment indicator (working non-zero hours)

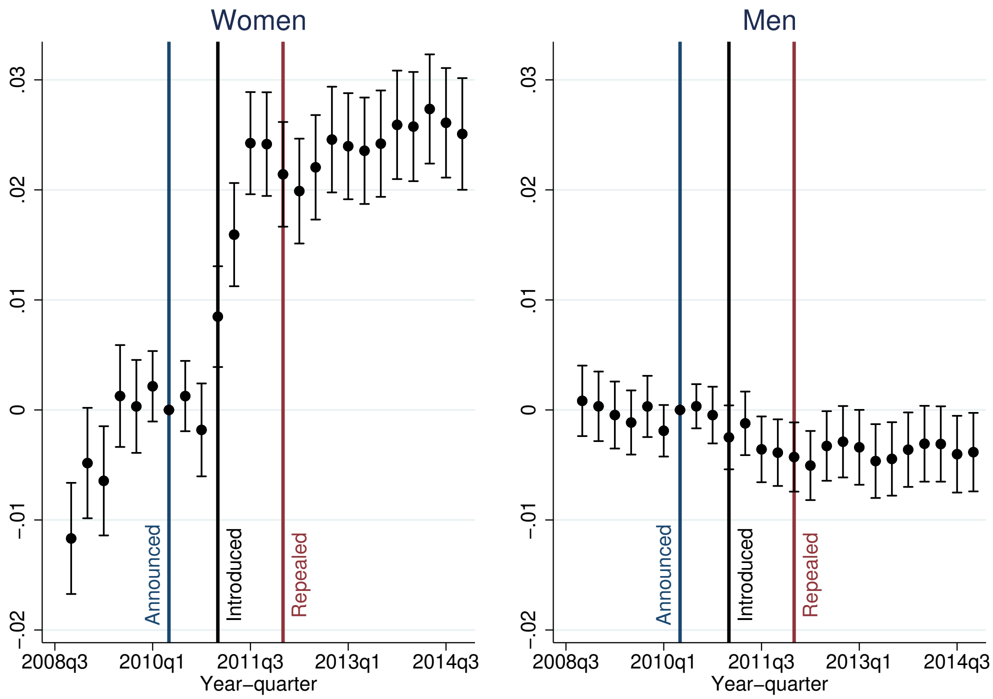
Parental Controls



Notes: Dependent variable (y-axis): employment indicator (working non-zero hours). Parental controls: individual FEs and parental age FEs.

Figure C.16: G-DiD: Employment indicator (working non-zero hours)

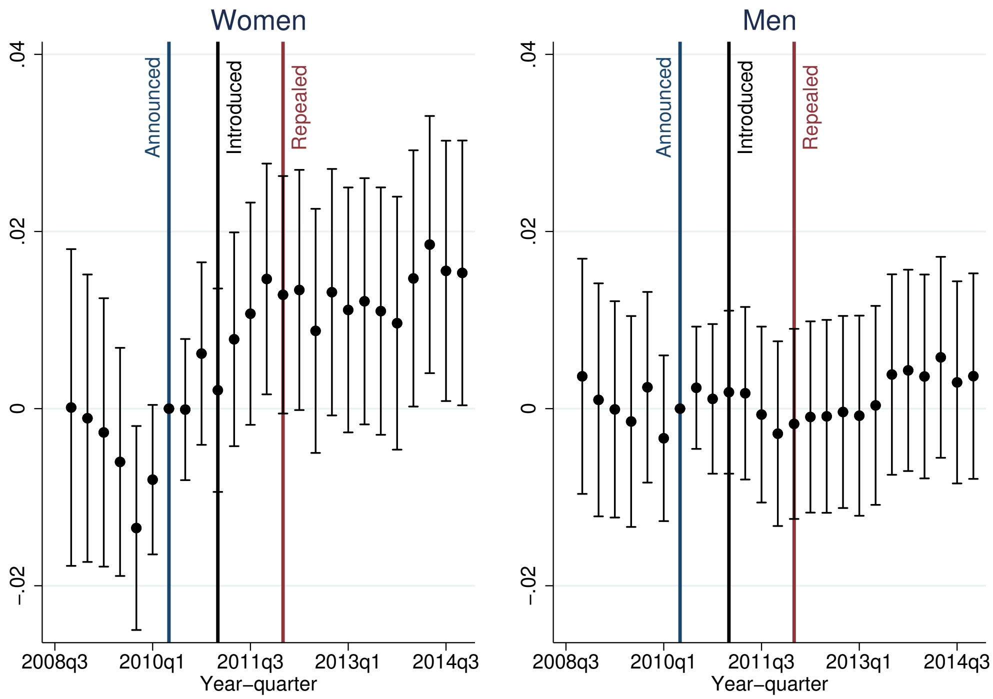
Parental Controls + Family Controls



Notes: Dependent variable (y-axis): employment indicator (working non-zero hours). Parental controls: individual FEs and parental age FEs. Family controls: age of youngest child FEs and number of children FEs.

Figure C.17: G-DiD: Employment indicator (working non-zero hours)

Parental Controls + Family Controls + Sterilisation - Young

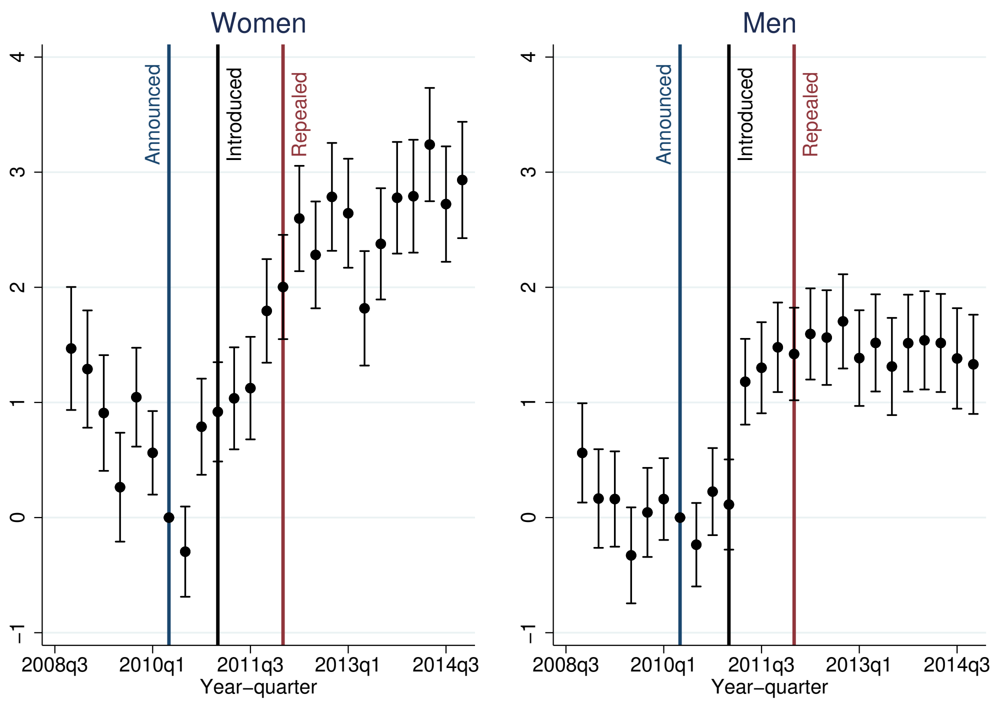


Notes: Dependent variable (y-axis): employment indicator (working non-zero hours). Parental controls: individual FEs and parental age FEs. Family controls: age of youngest child FEs and number of children FEs. Sterilisation - Young: only families where at least one parent has consulted a doctor regarding sterilisation prior to the announcement of the policy. Also excluding families with young children (below the age of 3 throughout the sample period).

C.5 Intensive margin

Figure C.18: G-DiD: Hours worked per month, excluding people working zero hours

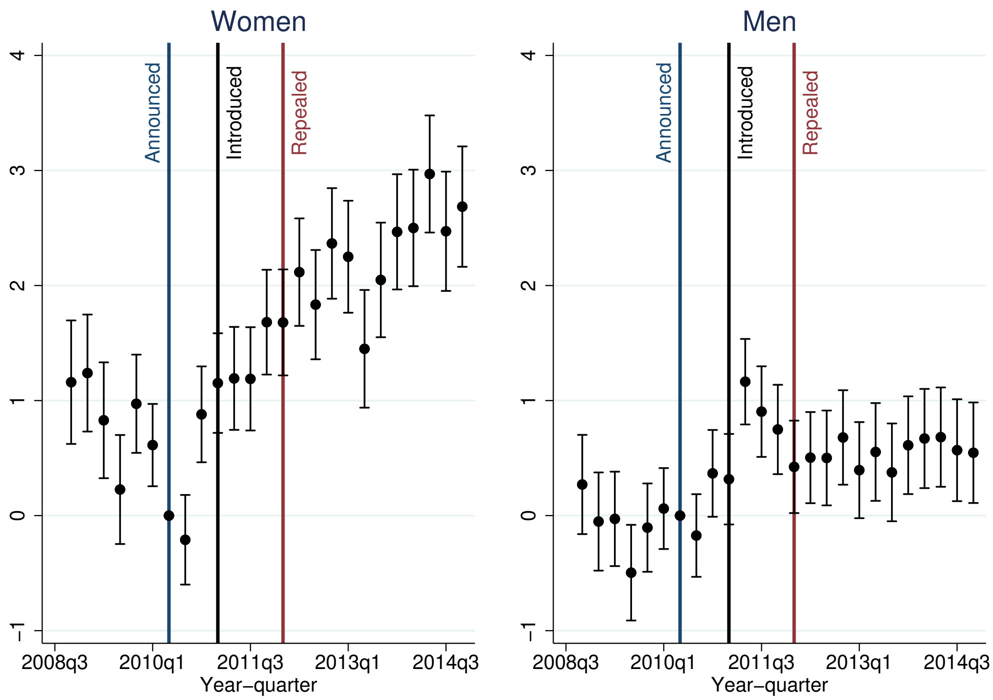
Parental Controls



Notes: Dependent variable (y-axis): hours worked per month. Excluding people working zero hours. Parental controls: individual FEs and parental age FEs.

Figure C.19: G-DiD: Hours worked per month, excluding people working zero hours

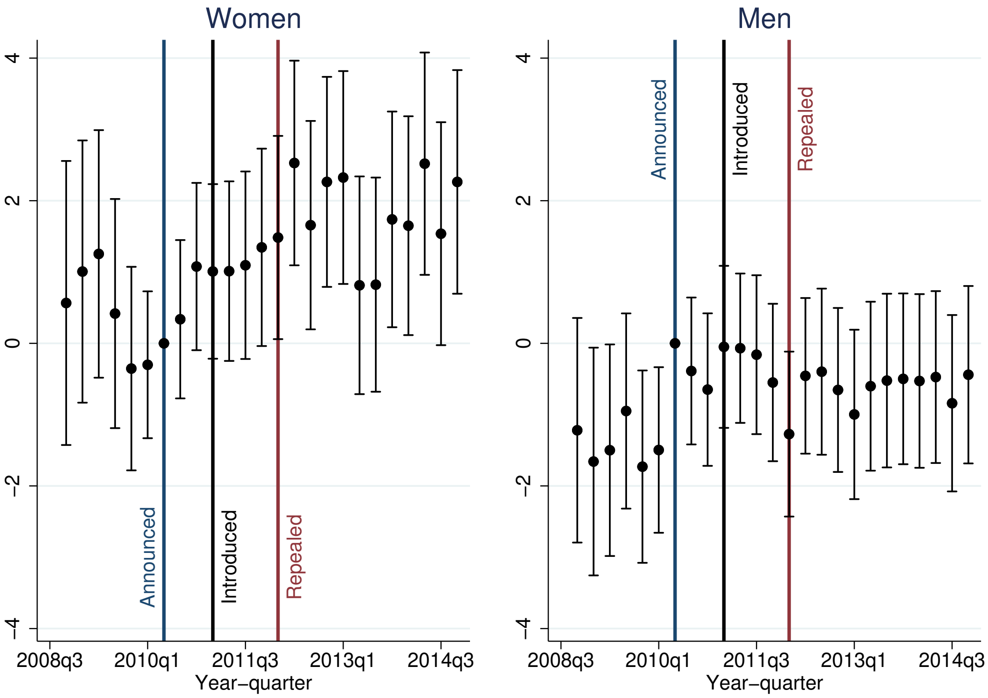
Parental Controls + Family Controls



Notes: Dependent variable (y-axis): hours worked per month. Excluding people working zero hours. Parental controls: individual FEs and parental age FEs. Family controls: age of youngest child FEs and number of children FEs.

Figure C.20: G-DiD: Hours worked per month, excluding people working zero hours

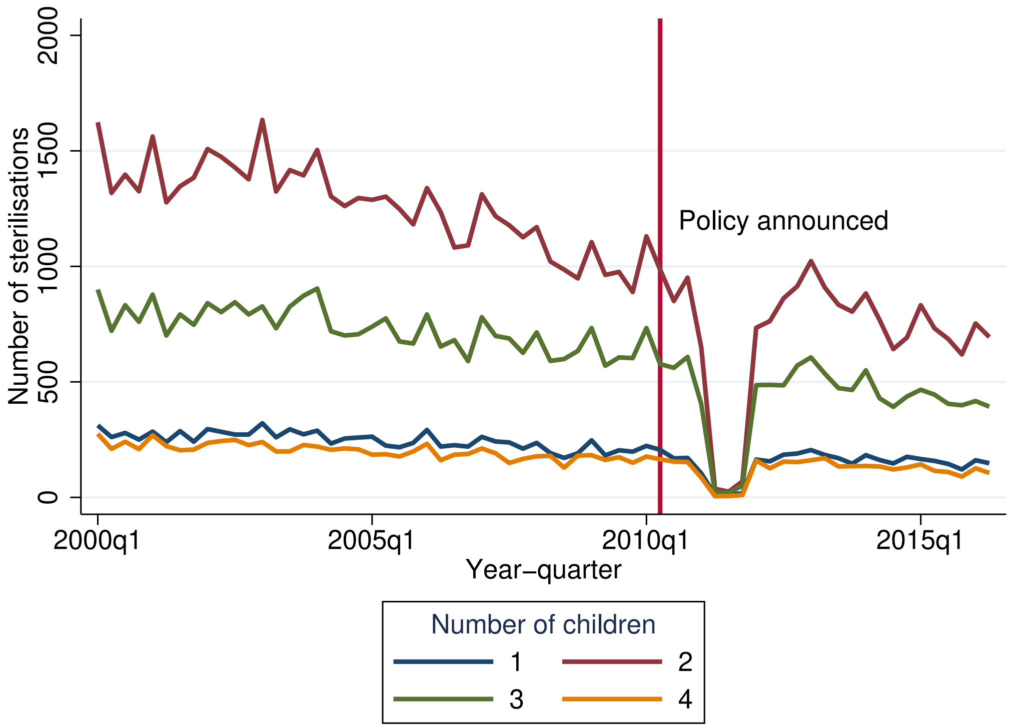
Parental Controls + Family Controls + Sterilisation - Young



Notes: Dependent variable (y-axis): hours worked per month. Excluding people working zero hours. Parental controls: individual FEs and parental age FEs. Family controls: age of youngest ch ild FEs and number of children FEs. Sterilisation - Young: only families where at least one parent has consulted a doctor regarding sterilisation prior to the announcement of the policy. Also excluding families with young children (below the age of 3 throughout the sample period).

C.6 Sterilisation

Figure C.21: Quarterly number of consultations on sterilisation by number of children



Notes: If multiple consultations per person, only the first is included here. In 2011, a co-payment for sterilisation procedures was temporarily introduced, hence the large decrease in consultations. Note that in our sterilisation subsample, we only include families where at least one parent that have consulted a doctor regarding sterilisation no later than May 2010. The the cap on child benefits was announced in late May 2010, and therefore the 2011-drop in sterilisations does not affect our subsample. These are number from the full Danish population, not just our estimation sample.