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Family Pension Benefits and Maternal Employment

Evidence from Germany

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Family pension benefits and maternal employment: Evidence from Germany

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Abstract

Child care pension benefits in Germany are designed to compensate for maternal employment interruptions due to child-birth. In comparison to most family benefits, child care pension benefits are accumulated upon child birth but only become effective on the verge of retirement. Hence, whether mothers adjust their employment status in response to the economic incentives depends crucially on how they discount the long-run consequences of their current decisions. This paper tests the hypothesis that child care pension benefits reduce maternal employment. The paper exploits the benefit extension in 1992 as a natural experiment in a regression discontinuity design to estimate short- and medium-run maternal employment effects. All results indicate that mothers do not consider child care pension benefits in their employment decision.

Keywords: pension reform, natural experiment, maternal employment.

JEL: D19, H55.

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1 Introduction

Child birth causes a natural interruption of employment of mothers. In the months following child birth many mothers tend to focus on child care while dedicating less time to paid work (cf. Schönberg and Ludsteck (2014)). These employment interruptions reduce paid pension contributions and, ultimately, increase the risk of old-age poverty among mothers. In order to mitigate this risk, Germany introduced a family pension benefit in 1986. Since then, the benefit increases the mother's pension entitlements in compensation for periods when child care precluded work. However, despite the positive impact on old-age income, the child care pension benefit introduces negative work incentives to mothers. Mothers whose pension entitlements' are already higher through benefit accrual, do not have to become employed in order to accumulate the same amount of pension entitlements through compulsory pension contributions. Furthermore, pension entitlements from employment were withdrawn against those based on the child care pension benefit in the first decade after its introduction. If mothers strongly reduce employment due to the benefit provision, their behavior could counteract the intended positive impact of the child care pension benefit on old-age income.

The aim of this paper is to test whether mothers reduce employment in response to the benefit provision. By exploiting an extension of the child care pension benefit in 1992 as a natural experiment, I estimate short- and medium-run employment effects among mothers. It is well known that career interruptions generally lower the individual earnings potential through human capital depreciation and less work experience (Mincer and Ofek, 1982; Albrecht et al., 1999). Therefore, short- and medium-run employment responses pave the way for the individual long-term earnings potential (Shapiro and Mott, 1994).

The identification strategy of this paper exploits the extension of child care pension benefits in 1992 as a natural experiment (Rosenzweig and Wolpin, 2000). The reform prolonged the provision period of the child care pension benefit from one to three years for all newborns starting from January 1992. The maximum gain from the reform implies a net present value of more than €2,500.[1] However, in 1992 both the child care pension benefit and the parental leave period was extended. It increased in the same

[1] The calculation of the is described in the Appendix A

discontinuous way for all births after December 1991 from 18 to 36 months. The impact of the parental leave expansion on maternal employment is documented by Schönberg and Ludsteck (2014). They find that the expansion of parental leave from 18 to 36 months reduces employment among mothers in the short-run. In order to disentangle the effects of the parental leave from the pension reform, I focus on mothers who were not employed three months prior to giving birth. Hence, these mothers were not affected by the extension of parental leave; only by the longer provision of the child care pension benefit. By comparing mothers who had their child in the last months of 1991 - subject to the old child care pension benefit regulation - to women who had a child early in 1992 - benefiting from the extended benefit duration - the causal effect of the child care pension benefit on maternal employment can be identified.

In contrast to most family benefits and transfers, child care pension benefits only become effective at the verge of retirement. Hence, its inter-temporal nature plays a crucial role in the analysis of the impact on maternal employment. While a perfectly rational forward-looking mother would fully internalize the economic incentives that are implied by the child care pension benefit in her employment decision, a myopic individual is less likely to respond. When looking at the impact of family benefits on mothers in Germany, the child allowance is a prime example (*Kindergeld*).[2] Parents are entitled to the child allowance upon child birth and it is generally granted to parents until a child turns 18 years old. The impact of the child allowance on maternal employment was evaluated in a recent study (Rainer et al., 2012). They find that the child allowance tends to reduce maternal employment, particularly among mothers with a low earnings potential. These findings indicate that mothers generally consider family benefits in their employment decision. However, in contrast to most family benefits, the child care pension benefit does not become effective upon child birth but at retirement age. Hence, whether mothers respond to the child care pension benefit in a similar way is an empirical question.

Finally, the results of the paper can be summarized as follows: Child care pension ben-

[2]In 2013 the child allowance amounted to EUR 184 for the first and second child, EUR 190 for the fourth and EUR 215 for each subsequent child. It is not means-tested. (`http://www.arbeitsagentur.de/web/content/DE/BuergerinnenUndBuerger/FamilieundKinder/KindergeldKinderzuschlag/Detail/index.htm?dfContentId=L6019022DSTBAI486116`).

efits do not play a role in the mothers' employment decision after child birth. Neither employment responses in the short- nor in the medium run could be identified. Hence, with regard to short- and medium-run employment the child care pension benefit can be regarded as a benefit that increases a mother's old-age income without negative employment effects. The paper is structured as following: The next section introduces the institutional background of the pension reform. Then, the economic incentives are explained in detail. In section 4, the identification strategy is presented. Next, the data set is described and the empirical results are discussed. The final section concludes.

2 Related literature

Different strands of literature are related to this paper. First, it is related to the literature that looks at the impact of family policies on mothers' employment. This section focuses on parental leave and child care as family policies. This literature on family policies provides a reference of how mothers respond for the analysis of the child care pension benefit extension in 1992. However, since child care pension benefits become only effective when a mother enters retirement, they are not completely comparable to most family policies. Second, this review looks at the literature that focuses on the public pension system and individual discounting.

Parental leave and maternal employment

A cross-country study by Ruhm (1998) finds that a moderate parental leave duration is associated with a stronger labor market attachment of mothers. Several studies report only weak or no significant effects of parental leave on maternal employment (Baum and Charles, 2003; Klerman and Leibowitz, 1999; Waldfogel, 1999). However, they focus on the US maternity leave scheme, which exhibits a rather short provision period compared to parental leave durations in other Western countries. Studies find indeed that mothers tend to adjust their employment behavior when (paid) parental leave is provided (Lalive and Zweimüller, 2009; Lalive et al., 2014; Bergemann and Riphahn, 2010; Kluve and Tamm, 2009; Geyer et al., 2014; Schönberg and Ludsteck, 2014). Lalive and Zweimüller (2009) exploit two subsequent parental leave reforms in Austria as natural experiments. They find that an extension of the parental leave duration reduces substantially short-run labor supply of mothers. In the long-run, however,

the longer absenteeism from the labor market does not seem to harm employment and earnings of mothers. Lalive et al. (2014) show that a combination of job-protection and cash benefits is most effective to encourage mothers to return to the labor after childbirth.

In Germany, most studies exploit the parental leave reform in 2007 that halved the duration of paid parental leave while substantially increasing the cash benefit. Bergemann and Riphahn (2010) and Kluve and Tamm (2009) exploit it as a natural experiment and find that the parental leave reform increased the mother's willingness to (re-)enter employment in the second year after child birth. Geyer et al. (2014) document an employment reduction of mothers in the first year after child birth due to the parental leave reform in 2007. In the second year, however, only certain subgroups of mothers (low-income and East-Germans) increased employment.

Most related to this study is the work by Schönberg and Ludsteck (2014) and Dustmann and Schönberg (2011). They evaluate the impact of several major expansions in parental leave coverage in Germany between 1973 and 1993 on mothers' labor market outcomes as natural experiments. Overall, they find that mothers respond to extensions of parental leave by reducing labor supply in the short-run, but not in the long-run. Dustmann and Schönberg (2011) document that these parental leave expansions did not improve long-run outcomes of children. The extension of parental leave from 18 to 36 months in 1992 is particularly relevant for this paper. Both the parental leave extension and the child care pension reform that this paper exploits, became effective simultaneously in January 1992. Schönberg and Ludsteck (2014) find that mothers substantially reduced labor supply in the short-run in response to this parental leave expansion in 1992.

Child care policies and maternal employment

A large body of literature investigates the impact of child care provision on maternal employment. Summaries of empirical studies are provided by Anderson and Levine (1999), Blau and Currie (2006) and Blau and Tekin (2007). The first set of studies relies on structural models (Guner et al., 2013; Geyer et al., 2014; Haan and Wrohlich, 2011). For the US, Guner et al. (2013) find that a hypothetical fully subsidized pro-

vision of child care to all households would substantially increase participation rates among married females by 10%. For Germany, Haan and Wrohlich (2011) find that higher subsidized child care, conditional on employment, increases maternal employment.

The main difficulty in the identification of employment effects is the endogeneity of child care. Many studies rely therefore on quasi-experimental approaches, mainly the difference-in-difference method, often exploiting an expansion of subsidized child care as a natural experiment (Havnes and Mogstad, 2011; Cascio, 2009; Bauernschuster and Schlotter, 2013; Givord and Marbot, 2013; Nollenberger and Rodriguez-Planas, 2011; Bettendorf et al., 2012; Lefebvre et al., 2009; Lundin et al., 2008; Fitzpatrick, 2010). Cascio (2009) exploits the large expansion of kindergarten seats for 5-year old children, offered by public schools since the mid 1960s in the US, as a natural experiment. He finds that single mothers substantially increased their labor supply, while married mothers did not respond. In a similar vein, Havnes and Mogstad (2011) rely on large expansion of subsidized childcare in Norway. Estimating employment responses, they exploit spatial and temporal variation on the municipality level. The empirical analysis is conducted using administrative data that covers the entire Norwegian population over the relevant period. In contrast to the previous study, however, they find only little empirical support for the hypothesis that subsidized childcare increases maternal employment. Finally, a recent German study exploits the introduction of the legal claim to a place in kindergarten for three- to six-year old children in 1996 in West Germany to estimate the effect on maternal employment (Bauernschuster and Schlotter, 2013). Results from two different quasi-experimental approaches consistently document large positive effects on employment among mothers whose youngest child is three to four years old.

To sum up, there is substantial evidence how the mothers' employment is affected by parental leave and child care policies. However, since the child care pension benefit differs to most family benefits, the extend to which mothers adjust employment to the pension benefit remains an empirical question.

Public pension system and individual decisions

Next, this paper relates to the literature that investigates the impact of public pension systems on individual behavior. Gruber and Wise (2002) summarize the results from a large international cross-country research project based on micro-data. The authors emphasize that the provision of social security programs is a key determinant of the retirement decision.

The link between social security wealth and retirement has been investigated for Germany (Berkel and Börsch-Supan (2004); Geyer and Steiner (2010); Hanel (2010)). Applying an option value model, Berkel and Börsch-Supan (2004) simulate individual retirement responses to various pension reform options in Germany. They predict that the introduction of an early-retirement disincentive in 1992, a reduction of pension payments by about 3.6% for each year of early retirement, delays effective retirement by almost two years among men. Hanel (2010) exploits the implementation of the adjustment factors in 1992 as a natural experiment when estimating its long-term impact on retirement. In line with the previous paper, she finds that individuals notably retire later.

Among the few papers that analyze the child care pension benefit, Frommert and Thiede (2011) show in their descriptive analysis that the extension of the child care pension benefit in 1992 is associated with higher old-age income of mothers. The only study investigating the impact of the provision of child care pension benefits on the decision to (re-)enter employment after child birth is Albrecht et al. (2013). In a hypothetical scenario, they ask mothers about their labor supply response to the abolition of child care pension benefits. When taking into account other factors that restrict labor supply, e.g. the lack of child care provision, mothers would only (re-)enter the labor market mildly earlier after child birth. However, the results are not completely comparable to this paper as their study assumes a stronger variation in the provision of child care pension benefits based on a different legal framework.

Overall, the literature shows the link between the provision of public pensions and the individual retirement decision. However, there is little evidence on the impact of the pension system on employment when being younger. This paper adds to this literature by analyzing the impact of a pension benefit on the employment decision of young mothers.

Finally, the extent to which changes in social security wealth affect the behavior of individuals depends on the individual adjustment horizon. Gale (1998) emphasize the importance of the adjustment period left until retirement, when estimating the savings response to a change in social security wealth. A young worker has, on average, more time to adjust individual savings to the change in social security wealth, compared to a 60-years-old. Further, the planning horizon as well as the individual discounting behavior determines the extend to which individuals react to changes in social security wealth. Gustman and Steinmeier (2005) incorporate individual-specific time preferences in their model of retirement and saving in order to obtain a better representation of actual individual behavior. Further, individual discount rates tend to decline when education increases. Hence, the extend to which individuals respond to changes in their social security wealth depends on their individual-specific discounting.

3 Institutional background

3.1 Child care pension benefits

This section describes the accumulation of pension entitlements in the German pension system (GRV) and further introduces the institutional setting of child care pension benefits. The GRV principally links the amount of pension payments to the value of a pensioner's accumulated pension contributions over their working life. Pension payments are calculated based on a formula that incorporates accumulated pension contributions, the timing of retirement, an adjustment factor and the current value of pension contributions. Boersch-Supan and Wilke (2004) describe the pension formula in detail. The main determinant of pension payments is the sum of individual accumulated pension points *(Entgeltpunkte)*. One pension point represents annual pension contributions made by a reference contributor earning the average income. Upon retirement, one pension point corresponds to pension payments of €28 per month (West-Germany, July 2012 values).[3] This monetary equivalent is adjusted each year. Faik and Köhler-Rama (2009) describe the adjustment mechanism in detail.

After this brief introduction into the German pension system, we focus on the child

[3] `http://www.deutsche-rentenversicherung.de/cae/servlet/contentblob/238644/publicationFile/52076/aktuelle_daten_2013.pdf`

Table 1: Child care pension benefit in the GRV 1986-1999

Reform	Child care pension benefit (maximum benefit)	Duration
Survivors and child care periods Act 1986	0.75 pension points (PP)	1 year
Pension Reform Act 1992	0.75 PP	3 years
Pension Reform Act 1999	1 PP + additivity against pension contributions from employment	3 years

Source: Own illustration.

care pension benefit. Table 1 depicts the development of the child care pension benefit until 1999. In general, child care pension benefits can be regarded as pension contributions in periods of child care that are made by the State. Hence, the child care pension benefit increases total pension entitlements. From its introduction in 1986 till 1992, mothers accrued a maximum of 0.75 pension points in the first year following giving birth.[4] However, the benefit was granted conditional on employment. In particular, pension contributions stemming from child care periods were fully withdrawn against compulsory contributions from employment. Accordingly, an employed mother with earnings equivalent to 50% of the average only received 0.25 pension points due to the child care pension benefit. The remaining 0.5 pension points were withdrawn against the compulsory pension contributions from employment. Therefore, a mother only gained from the child care pension benefit if she was either not employed or if she earned less than 75% of the average (corresponding to 0.75 pension points) in the first year after child birth.

The first change of the child care pension benefit was adopted in December 1989 and implemented by the Pension Reform Law 1992 *(Rentenreformgesetz 1992)* two years later in January 1992. The reform tripled the child care pension benefit duration from one to three years, but only for newborns born on or after January 1, 1992. Hence, women with a child meeting this condition were entitled to the maximum benefit of 2.25

[4]The benefit was only granted to mothers born after 1921. In principle, also fathers are entitled. However, predominantly mothers are recipients of the child care pension benefit.

pension points (3 years x 0.75 pension points) instead of 0.75 points points, granted for births on or before December 31, 1991. Converted into pecuniary values of 2012, the maximum gain of 1.5 additional pension points results in a monthly payment of €42 upon retirement til death. As an example, the maximum gain from the reform of a mother, aged 30 years in January 1992, amounts to €2640 (expressed in 2012 net present discounted values). The underlying calculation assumes that the mother retires at the age of 65 with a life expectancy of 83 years, based on a discount rate of 3% (details are provided in Appendix A). Since pension contributions stemming from employment were still offset against those from child care pension benefits, mothers were only entitled to the full child care pension benefit if they were not being employed in the three years after child birth.

Since subsequent reforms changed the incentives for all mothers, regardless of a child's date of birth, I use only the variation that is implied by the child care pension benefit reform of 1992. Therefore, only the time period before 1999 is considered in the empirical analysis. This allows to study the short- and medium-run employment effects of the child care pension benefit extension in 1992. Nevertheless, the 1999 reform of the child care pension benefit, described here, consisted of two main changes: First, it increased the generosity of the child care pension benefit from 0.75 to one pension point. Second, it removed the employment penalty. Pension contributions from employment were not withdrawn anymore against those from child care periods if the sum of both did not exceed the contributions based on the contribution ceiling.

3.2 Economic incentives

This section illustrates by a simple example how the extension of the child raising pension benefit in 1992 affects the employment decision of mothers. In general, the degree to which mothers consider the economic incentives in their employment decision depends on the individual discounting behavior. While mothers with a high discount rate or a short decision-making horizon are less prone to react to the benefit provision, perfectly rational mothers would fully incorporate the future implications of the pension benefit. In principle, the extension of child care pension benefits from one to three years in 1992 lowered the incentives for mothers to (re-)enter the labor market during

the three years following child birth. Since pension contributions are accumulated through child care pension benefits, no compulsory pension contributions - resulting from employment - had to be made. To illustrate the economic incentives, let us consider the following example of two young mothers: While the first (A) has her child in December 1991, the second (B) has her child *ceteris paribus* in January 1992. In addition, we assume that only the accrual of pension contributions matters in the employment decision. Then, mother B has no incentive to (re-)enter employment in year two and three after child-birth if she would earn less than 75% of the average since those pension contributions would be fully withdrawn. In contrast, mother A faces positive work incentives in that period because child care pension benefits expire after the first year. The accrual of pension entitlements is clearly not the only determinant of a mother's employment decision. Nevertheless, this example illustrates that a mother who did not benefit from the child care pension benefit extension has an incentive to return earlier into employment.

4 Identification

This paper analyzes the impact of an extension of the child care pension benefit on mothers' employment in a regression discontinuity design. The identification strategy exploits the specific design of the pension reform in 1992. It extended the child care pension benefit from one to three years for births after December 31, 1991. In order to identify the reform effect, I construct two groups. The control group consists of mothers who had a child shortly before the policy change was implemented (in 1991 Q4). These mothers are entitled to only one year of child care pension benefits. The treatment group is based on mothers who had a child shortly after the implementation of the reform (in 1992 Q1) and thus they are entitled to three years of child care pension benefits. Comparing mothers who had a child close[5] to this cut off date (January 1, 1992), the only institutional discontinuity between the treatment and the control group is the different duration of child care pension benefits. In this way, a difference in the employment behavior across both groups can be attributed to the longer duration of

[5]In the baseline specification "close to the cut-off date" refers to having a child in the last quarter 1991 vs. the first quarter 1992. As a robustness check, however, I expand the the bandwidth to ± six months.

the child care pension benefit. In comparison with other "typical natural experiment strategies" (e.g. differences-in-differences or instrumental variables), the regression discontinuity design requires only mild assumptions and isolates "treatment variation that is as good as randomized" (Lee and Lemieux, 2010, p. 282). In recent years, economists increasingly adopted the regression discontinuity design to a broad range of economic problems.[6] This paper analyzes the employment response of mothers to the extension of child care pension benefits. Therefore, the dependent variable is the binary employment status. A mother can either be employed (one) or not (zero). The corresponding probit model [7] is defined as follows:

$$Pr(employed_{it}) = \Phi(\alpha + \beta_1 post_{it} + \gamma' X_{it}) \tag{2}$$

where Φ is the cumulative distribution function of the standard normal distribution, i indicates the mother and t the age of a child. *post* is one if a mother is in the treatment group, and zero if she is in the control group. X is a vector of control variables: *Age, age*^{2}*, education, region, number of children, accumulated prior employment* and *German nationality*. On the basis of β_1 the marginal effect, that captures the impact of the child care pension benefit extension in 1992, can be calculated. Since mothers are observed in the entire period following the birth of their child, the model can be estimated at various points in time based on the identical sample. In the following, the model is estimated at a child age of 18, 28, 36, 60 and 120 months. Estimating the model based on child age ensures that at month t all mothers had been entitled to t months of child care pension benefits, regardless of the calender month.

For assigning mothers into treatment and control group conditional on their child's birth date, the crucial prerequisite is the fact that other pension reforms were dependent on the mother's and not the child's date of birth. Therefore, other pension reforms

[6] Angrist and Lavy (1999) apply the identification strategy in estimating the impact of class size on student test scores in Isreal. Oreopoulos (2006) estimates the returns to education by exploiting the design of a compulsory schooling law in the UK. Geyer et al. (2014) estimate the impact of the German parental leave reform 2007 on maternal employment using a regression discontinuity strategy. An overview of the application of regression discontinuity designs to economic problems is given by Lee and Lemieux (2010).

[7] The OLS model is specified analogously by

$$Employed_{it} = \alpha_0 + \phi post_{it} + \gamma' X_{it} + e_{it} \tag{1}$$

where the variables are defined as in the probit model and e captures the error term.

would have affected mothers in both groups in the same way. Further, only mothers who gave birth to their last child are considered since subsequent births naturally would reduce a mother's propensity to (re-)enter employment. As mentioned above, in order to disentangle the impact of the expansion of child care pension benefits from the simultaneous parental leave reform in 1992, only mothers who were not employed in the three months prior to giving birth to a child are considered in this analysis. Since no pre-child-birth employment existed, they were only affected by the extension of child care pension benefits.[8] About two thirds of all mothers with births around the turn of the year 1991/92 had not been employed in the three months prior to giving birth to their child.

Two principle threats could invalidate the identification strategy. The first threat is the potential self-selection of parents into the treatment group by strategically choosing the child's date of birth. Further, if mothers in the treatment and control group would differ in unobservable factors that effect employment, this would impose the second threat.

Regarding the first, mothers principally have an incentive to self-select into the treatment group to benefit from the extended child care pension benefit. Since the child care pension benefit extension was adopted by the parliament in December 1989 two years before becoming effective, parents theoretically could self-select into the treatment group by strategically choosing 1992 as their child's year of birth. The literature documents the strategic timing of births for different policy changes (Neugart and Ohlsson, 2013; Gans and Leigh, 2009; Tamm, 2012). Nevertheless, a child's birth date can only partially be controlled by parents. Ekberg et al. (2013) emphasize that birth, as such, is a "random event", since parents cannot completely control the timing of conception. The duration of pregnancy follows a normal distribution of 40 weeks and a standard deviation of two weeks (Ekberg et al., 2013, p. 135). In addition, parents who strategically chose 1992 as a child's year of birth, most likely prefer a birth date not in the first quarter to prevent the risk of having a premature baby in 1991. However, it might still be possible that particularly around the cut-off date (1/1/1992) births have

[8] A subsequent birth within the 18-month parental leave period could potentially extend the entitlement to parental leave. As a robustness check, I therefore exclude mothers who might have experienced such an extension of parental leave entitlements. The results are described in section 5.4.

been postponed. In order to address that concern, (Dustmann and Schönberg, 2008, Appendix A) analyze the timing of births shortly around the turn of the year 1991/92. They find no evidence that there has been a strategic timing of births around the turn of the year 1991/92. However, as a robustness check I exclude births in January and December from the sample and re-estimate the model.[9] In addition, I compare the total number of births around (± six months) the turn of the year 1991/92 with the two subsequent years, without finding a strategic timing of birth behavior. The results are in Appendix B.

Regarding the second threat to the validity of the research design, I investigate if the distribution of observable characteristics differs across treatment and control group. This is the standard test in empirical work to check for random assignment of individuals into treatment and control group (Lee and Lemieux, 2010, p. 296). When, I compare observable characteristics across both groups in section 5.2, the distribution does not differ substantially, suggesting random selection of mothers into treatment and control group.

The identification strategy implicitly assumes that mothers are aware of the extension of the child care pension benefit. It is an assumption inherent in all quasi-experimental designs that evaluate the impact of policy changes on individual behavior. Further, I have anecdotal evidence that the German Pension Insurance increased substantially their effort to inform about the child care pension benefit extension in 1992 by publishing brochures and providing information to the media.

5 Data and Results

Next, this section describes the data and sample selection followed by the discussion of results.

[9] The results are in documented in section 5.4

5.1 Data

The empirical analysis is based on the weakly anonymized version of the Biographical Data of Social Insurance Agencies in Germany (BASiD, version 1951-2009).[10] The data results from a linkage of two administrative data sources from the Statutory Pension Insurance and the Federal Employment Agency. The two data sets are merged via the identical social security number that serves as the unique individual identifier (Hochfellner et al., 2012). First, a sample was selected based on the Sample of Insured Persons and their Insurance Accounts (VSKT) 2007 of the German pension system. Then, this sample was enriched with the administrative data from the Federal Employment Agency. The joint data set provides spell information about the employment history for each individual on a daily level until 2007. In addition, BASiD contains information about education[11] and several individual and work-related characteristics. However, for some individuals not all information is available. Mainly the educational degree is missing. About 37% of all mothers in the sample lack information about education. Therefore, the estimation results are displayed for specifications with and without covariates. Compared to different data sources, BASiD appears to be the most appropriate one. The use of survey data, e.g. the German Socio Economic Panel (GSOEP), is not appropriate since the sample size would be too small. Other administrative data sets do not contain important information. The Social Security Records, used by Schönberg and Ludsteck (2014) in the evaluation of the parental leave expansion in 1992, do not contain precise information about the child's date of birth. Schönberg and Ludsteck (2014) had to deduce this information based on maternity leave usage. In contrast, BASiD provides the exact date of birth for all children.

Since fertility declined substantially in East Germany after the re-unification, the sample is based only on West-German mothers. Selective fertility in East Germany would be particularly problematic since the empirical analysis relies on births shortly after the German re-unification. In addition, only mothers that are coded as employees or laborers[12] are selected into the sample. Further, only validated pension accounts

[10] The data was accessed at the Data Research Center of the Federal Statistical Office in Berlin and provided by the Institute for Employment Research (IAB) in Nuremberg.

[11] In order to improve quality of the education variable, the imputation procedure, suggested by Fitzenberger et al. (2005), is applied.

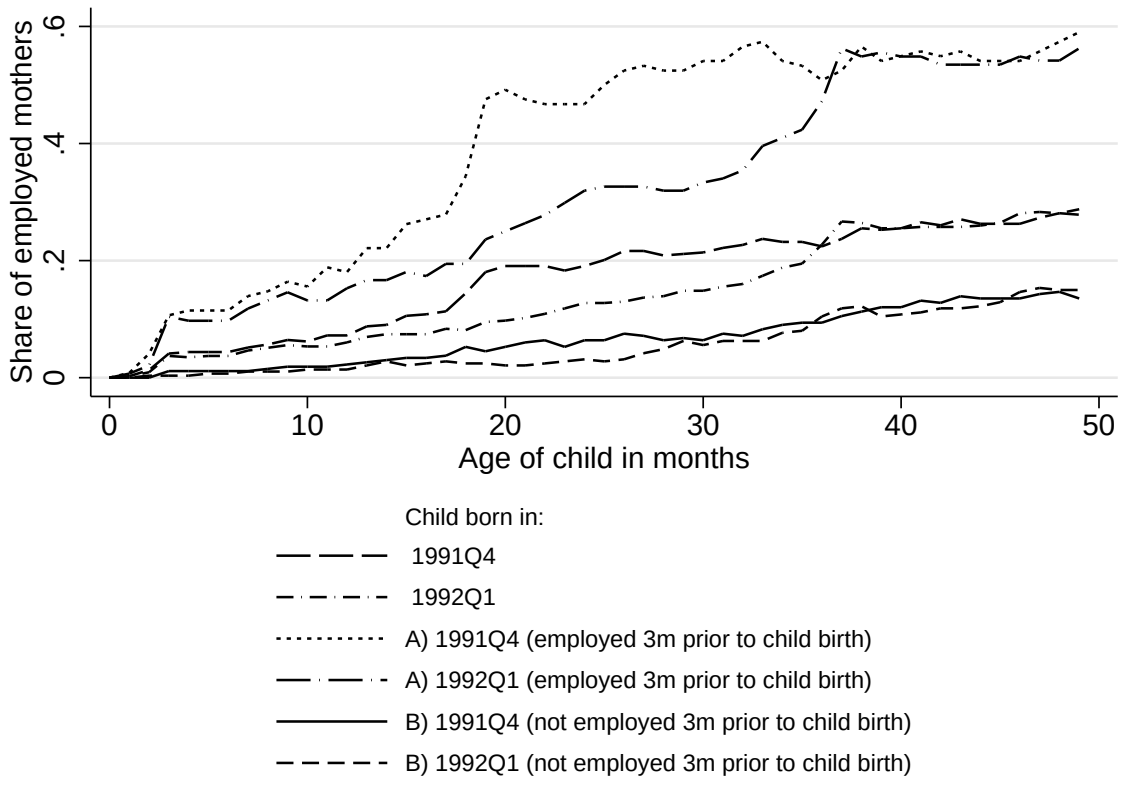
[12] Since miners and crafts-persons have separate pension funds, they are excluded from the analysis.

used. For these accounts the contained information was cross-checked by the German Pension Insurance and therefore it is reliable. About 10% of all pension accounts in BASiD are not validated. Finally, only mothers aged 18 to 45 years at delivery are selected into the sample. In the baseline specification, the sample consists of 533 (328 when including covariates) observations.

5.2 Descriptive evidence

This section presents first descriptive results and the distribution of observable characteristics across treatment and control groups. Figure 1 shows maternal employment

Figure 1: Maternal employment by child age



Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

by child age, measured in months. They are distinguished by the child's date of birth (1991Q4 or 1992Q1) and by the employment status three months prior to child birth. The German maternity leave regulation prohibits employment in the first eight weeks

after delivery. This is why no mother is employed in the first two months after child birth. Next, we focus on all mothers - regardless of their employment status three months before child birth - who had a child in 1991Q4 or in 1992Q1. After the initial months of maternity leave, employment among mothers increases gradually, independent of the child's quarter of birth. From month 18 through 36 a substantially higher share of 1991Q4 mothers became employed compared to mothers who had a child in 1992Q1. After restricting the sample to mothers who had been employed in the three months prior to child birth (A), the difference in employment among mothers who had a child in 1991Q4 relative to 1992Q1 increases further. Overall, the labor market attachment is strongest among mothers who were employed three months before child birth. The higher employment quota between month 18 and 36 is in line with the evaluation of the parental leave extension in 1992 by Schönberg and Ludsteck (2014).[13] Hence, these employment pattern mainly the response to parental leave. These descriptive results emphasize the importance of disentangling the effects of the child care pension benefit extension from the parental leave reform in 1992. Finally, we focus on mothers who belong to the baseline sample (B). They were not employed three months prior to child birth. According to the initial hypothesis, mothers who had a child in 1991Q4 are expected to (re-)enter earlier into employment after their child turns one year old. However, the employment behavior in the treatment group (child born in 1992Q1) is relatively similar to the control group (child born in 1991Q4), independent of child age. Between month 17 and 29, the employment share in the control group is slightly higher than in the treatment group. However, this difference is not statistically significant.Therefore, these findings are first evidence against the hypothesis of an employment response of mothers to the extension of the child care pension benefit in 1992.

Next, Table 2 compares the distribution of observable characteristics across treatment and control group. If mothers are randomly assigned into treatment- and control group, then we would expect a similar distribution of covariates across both groups. The first line in Table 2 describes the distribution of employment entry. Employment entry equals to one if a mother has worked for at least two consecutive months before a child

[13]In order to replicate their results based on BASiD, I re-estimate the model by Schönberg and Ludsteck (2014), obtaining similar results.The findings are in Table 13 in Appendix D.

Table 2: Comparision of observable characteristics across Treatment- and Control group

	Treatment group (N=172)				Control group (N=156)				Group Difference‡
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Employment entry (0/1)	.73	3.83	0	14.10	.70	3.80	0	22.0	.03
Prior employment (years)	3.77	3.83	0	14.10	3.72	3.8	0	22.0	.05
Mother's age at delivery	28.6	4.36	20	41	29.1	5.00	18	42	-.5
Number of children	1.99	.98	1	7	2.08	.1.15	1	8	-.09
German (0/1)	.73		0	1	.75		0	1	-.02
Higher education (0/1)	.15		0	1	.13		0	1	.02
Region									
North	.15		0	1	.15		0	1	0
Middle	.47		0	1	.55		0	1	-.08
South	.37		0	1	.30		0	1	.07

Notes: Mothers who had a child in 1991Q4 (control) or in 1992Q1 (treatment) are in the baseline sample. Employment entry is defined as being employed for two subsequent months in the first five years after child birth. Higher education indicates a secondary\intermediate school leaving certificate with completed vocational training or a higher education level. Region captures the different regions of residence based on the states of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria).

‡For all variables the group difference is not statistically significant.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

turns five.[14] We can interpret the variable as a measure of labor market attachment. The share of mothers that (re-)enters employment in both groups is similar (about 70 %). Furthermore, mothers in both groups had been employed on average for about four years before child birth. Therefore, mothers in this baseline sample exhibit on average a certain degree of attachment to the labor market. Looking at nationality, the share of German mothers is similar in the treatment (73 %) and in the control group (75 %). Next, we look at the distribution of education across both groups. Higher education indicates whether a mother holds a secondary\intermediate school leaving certificate with completed vocational training or a higher degree. While the share of mothers with higher education is relatively low in both groups, it is slightly higher (.15 %) in the treatment than in the control group (.13 %). However, the difference is not statistically significant. Region is constructed based on the state of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria). Region varies slightly across treatment and control group. Nevertheless, the difference is not statistically significant. In conclusion, mothers in the treatment and the control group share relatively similar observable characteristics.

Furthermore, I compare mothers by the employment status three months prior to child birth. The baseline sample contains only mothers who were not employed in the three months prior to child birth. They are compared to women who had a child in the same period (1991Q4 or 1992Q1), but who were not employed three months before child birth. Table 6 in Appendix C reports the results. The comparison shows that mothers who were employed three months prior to child birth on average have more work experience and the employment entry is more likely before the child turns five. In addition, they have on average less children than mothers in the baseline sample who were employed three months before having a child. In summary, the comparison shows that the baseline sample differs slightly with respect to the overall labor market attachment. This has to be kept in mind when interpreting the empirical findings.

[14]When employment entry is alternatively defined as having worked for at least five consecutive months, the shares are still similar in both groups.

5.3 Main estimation results

This section discusses the estimation results, which suggest that child care pension benefits have no impact on maternal employment. I report estimates for the probit and the OLS model and with and without the inclusion of covariates. Since all mothers in the sample are observed in the entire time span, I can estimate the model at different child ages, i.e. at 19, 28, 36, 60 and 120 months. Repeating the estimation at different points in time allows the distinction between short- and medium-run employment effects among mothers. Table 3 captures treatment estimates that refer to the impact of the child care pension benefit extension in 1992 on mothers' employment. In the OLS model this refers to the estimated coefficient while in the probit model the estimated average marginal effect is depicted. The full estimation results, including estimates for the controls are in Appendix D (in Table 9 for OLS and in Table 8 for the probit model).

Beginning at a child age of 19 months in column (1) and (2), when we take the estimated treatment effect at face value, this implies a three percentage points lower employment probability (including controls) due to the extended provision of child care pension benefits when a child is 19 months old. But, the effect is statistically insignificant. Therefore, I cannot conclude that the reform has an impact on mothers' employment. However, the treatment effect is rather imprecisely estimated, since the corresponding standard errors are relatively large due to the small number of observations. Estimates based on the probit model are similar to those obtained on the basis of the OLS model. Further, the inclusion of control variables does not affect the general results. Next, columns (3) to (10) show the estimated reform effect at a child age of 28, 36, 60 and 120 months. In all specifications the estimated reform effect remains statistically insignificant. Hence, these results suggest that mothers do neither reduce employment in the short- nor in the medium-term in response to the provision of the child care pension benefit.

A potential explanation why mothers do not respond to the child care pension benefit extension in 1992 is a short planning horizon or a high discount rate of future income. While a mother with a short planning horizon or a high discount rate would react to a change in family benefits, that are paid from the date a child is born, she is less likely

Table 3: Estimation results of the treatment effect - Baseline sample: Mothers with a child in 1991Q4 or 1992Q1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Child age (in months) ‡	19		28		36		60		120	
Treatment estimates on mothers' employment										
Probit	-0.0208	-0.0306	-0.0151	0.0025	0.0106	0.0417	-0.0054	0.0322	0.0040	-0.0105
	[0.0160]	[0.0235]	[0.0196]	[0.0262]	[0.0255]	[0.0350]	[0.0317]	[0.0406]	[0.0420]	[0.0537]
OLS	-0.0207	-0.0322	-0.0151	0.0021	0.0105	0.0385	-0.0054	0.0326	0.0040	-0.0111
	[0.0157]	[0.0230]	[0.0197]	[0.0269]	[0.0255]	[0.0355]	[0.0318]	[0.0410]	[0.0421]	[0.0540]
Controls	no	yes	no	yes	no	yes	no	yes	no	yes
N	553	328	553	328	553	328	553	328	553	328

Note: The OLS model shows the estimated coefficient on the reform effect, while the probit model depicts the estimated average marginal effect. All specifications include a constant term. ‡ The estimates are based on the age of a mother's last child. */**/*** Statistically significant at the 10%/5%/1%-level. The standard error is reported in brackets.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

to incorporate child care pension benefits in her employment decision when the child is young. In contrast to most family benefits, child care pension benefits become only effective on the verge of retirement, many years after being accrued.

5.4 Robustness checks

Next, Table 4 contains the findings of a series of robustness checks. For brevity reasons, only estimates of the treatment effect are reported for specifications that include control variables. Detailed estimation results for all separate robustness checks are in the Appendix. Summarizing the results, none of the specification tests provides empirical evidence against the general findings that the child care pension benefit does not affect mothers' employment decision.

Bandwidth variation

First, not finding statistically significant treatment effects could potentially be driven by the small number of observations. In the baseline model, the treatment and control group consist of mothers who had a child ± three months around the cut-off-date January 1, 1992. A larger bandwidth imposes a higher risk for unobservable determinants of employment to differ across both groups. However, as a robustness check the bandwidth is expanded to six months to increase the sample size. Hence, mothers who gave birth to a child in the second half of 1991 (control group) are compared to all mothers who delivered a child in the first six months in 1992 (treatment group). A comparison of control variables across the new treatment and control group are provided by Table 5 in Appendix C.[15] While it is well known that a larger sample increases efficiency, comparing mothers who gave birth to their last child further away from the cut-off date of the policy change (1/1/1992) is less desirable. Those mothers are more likely to differ in more dimensions than in the child care pension benefit scheme. Nevertheless, for the purpose of this robustness check a range of two quarters around the cut-off-date seems acceptable. Panel B) in Table 4 reports the reform effect estimates based on the larger sample. The sample size becomes twice as large as in the baseline specification, as depicted in panel A). As in the baseline sample, the treatment effect estimate based

[15]The control variables are relatively similar distributed across both groups

Table 4: Robustness checks

	(1)	(2)	(3)	(4)	(5)
Child age (in months)‡	19	28	36	60	120
A) Baseline specification					
Probit	-0.0306	0.0025	0.0417	0.0322	-0.0105
	[0.0235]	[0.0262]	[0.0350]	[0.0406]	[0.0537]
OLS	-0.0322	0.0021	0.0385	0.0326	-0.0111
	[0.0230]	[0.0269]	[0.0355]	[0.0410]	[0.0540]
N	328	328	328	328	328
B) Larger bandwidth (± 6 months)					
Probit	-0.0194	-0.0067	0.0081	-0.0119	0.0121
	[0.0170]	[0.0209]	[0.0242]	[0.0288]	[0.0371]
OLS	-0.0223	-0.0090	0.0091	-0.0077	0.0121
	[0.0168]	[0.0210]	[0.0244]	[0.0292]	[0.0374]
N	690	690	690	690	690
C) Exclusion of births around cut-off					
Probit	-0.0097	-0.0092	0.0102	-0.0120	0.0211
	[0.0287]	[0.0328]	[0.0429]	[0.0500]	[0.0643]
OLS	-0.0161	-0.0042	0.0523	0.0399	0.0056
	[0.0289]	[0.0328]	[0.0429]	[0.0510]	[0.0647]
N	229	229	229	229	229
D) Control for seasonal differences					
Probit	-0.0097	0.0152	0.0689	0.1410**	-0.0420
	[0.0327]	[0.0385]	[0.0460]	[0.0549]	[0.0760]
OLS	-0.0139	0.0127	0.0634	0.1257**	-0.0409
	[0.0330]	[0.0389]	[0.0461]	[0.0548]	[0.0769]
N	656	656	656	656	656

Note: The average of marginal effects is reported for the probit model, and estimated coefficients in case of OLS. All specifications include the control variables that are specified in Table 2 and a constant term. */**/*** Statistically significant at the 10%/5%/1%-level. The standard error is reported in brackets. ‡ The estimates are based on the age of a mother's last child.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

on the larger sample is not statistically significantly different from zero. This finding holds for all different child ages, as depicted by columns (1) to (5). Due to the larger sample size the standard errors become somewhat smaller. However, they still remain relatively large.

Strategic timing of child birth

Next, I control for the potential strategic timing of a child's date of birth. Pregnant women who expected the delivery around the turn of the year 1991/92 could have tried to postpone child birth to the first week of January 1992. As mentioned before, Dustmann and Schönberg (2008, Appendix A) investigate the birth patterns around the turn of the year 1991/92 without detecting irregularities. Nevertheless, parents who expected a child around the turn of the year 1991/92 might have wished to postpone delivery from December 1991 to January 1992. Such a behavior would invalidate the identification strategy if parents who strategically choose the child's date of birth differed systematically in terms of the employment behavior from the remaining parents. To account for this potential bias, I follow the literature (Kluve and Tamm, 2009) and re-estimate the baseline model under the exclusion of mothers who had a child either in December 1991 or in January 1992. The treatment estimates are reported in Panel C) of Table 4. Regardless of child age, for none of the five different estimations (columns (1) - (5)), the estimated treatment effect is statistically significant different from zero, as in the baseline model.

Seasonal systematic differences

Some authors argue that mothers might differ systematically, depending on the birth season of their child (Buckles and Hungerman, 2008). To address this issue, mothers from the baseline sample are compared to mothers who had a child in the same period around the turn of the year before, 1990/91, when no child care pension benefit reform was implemented. Following the literature, I estimate the model that has already been applied by Lalive et al. (2014) or Schönberg and Ludsteck (2014). This *difference-in-difference-regression-discontinuity* model can be formulated in the following way:

$$Pr(employed_{it}) = \Phi(\alpha + \beta_1 turn91/92_{it} + \beta_2 beginning_{it} + \beta_3 turn9192_{it} * begin_{it} + \gamma' X_{it}). \quad (3)$$

where i represents the mother and t child age in months. As in the baseline model, *employed* indicates the maternal employment status, one being employed and zero not employed. Φ is the cumulative distribution function of the standard normal distribution. *turn91/92* indicates whether a child was born around the turn of the year 1991/92 (one) or in the corresponding period the year before 1990/91 (zero). *beginning* captures the impact of being born in the beginning of a year, e.g. the first quarter or half of a year in comparison to being born toward the end of a year. X captures the same vector of control variables as in the baseline model. The results are depicted in panel D) of Table 4. For brevity reasons panel D) only reports the treatment effect estimate. In column (1) to (3) and (5) the estimates are not statistically significantly different from zero as in the baseline model. Solely, the treatment effect estimate at a child age of 60 months is weakly statistically significant and positive. All in all, systematic differences among mothers according to the their child's birth season seem not to impose a risk for the identification.

Eligibility to parental leave

In order to disentangle the impact of the child care pension benefit extension in 1992 from the impact of the simultaneously implemented parental leave expansion, I only compare mothers who were not employed in the three months prior to child birth. These mothers simply do not have an employer they could return to. However, if a mother has a second child, while being on parental leave, the eligibility for parental leave is extended. Prior to 1992, parental leave was generally granted for the first 18 months after child birth. Hence, having a child in these 18 months would generally extend parental leave entitlements by another 18 months upon the subsequent child birth. In order to control for this potential source of bias, I re-estimate the model only considering mothers who had no child in 1990 (nor in 1991 if they belong to the treatment group). The regression results are depicted by Table 14 in Appendix D. For the different child ages, all point estimates are very similar to the baseline model. In addition, all estimates remain statistically insignificant. Hence, a bias through a potential eligibility to parental leave seems unlikely.

6 Discussion and conclusion

In this paper, I analyze the impact of child care pension benefits on the mothers' employment decision. The main purpose of child care pension benefits is to compensate mothers for employment interruptions due to child birth. Career interruptions generally lower the individual earnings potential through human capital depreciation and lower work experience. Hence, this paper tests the hypothesis that mothers reduce employment in response to the provision of child care pension benefits.

The identification strategy exploits the specific design of the pension reform in 1992. The reform extended the child care pension benefit from one to three years for all births upon January 1992. In the analysis, I compare mothers who had a child in the last quarter of 1991 to mothers who had a child in the first quarter of 1992. While the first group received the child care pension benefit for one year, the latter was entitled to three years. To separate the effects from a simultaneously introduced parental leave expansion, only mothers who were not employed in the last three months prior to child birth are compared. I estimate the employment response at different points in time, to distinguish between short- and medium-run employment effects.

In contrast to other family benefits and transfers, the child care pension benefit becomes effective at the verge of retirement. Therefore, the extend to which a mother considers the pension benefit in her employment decision depends crucially on her personal discounting behavior.

The empirical findings suggest that mothers are neither in the short- nor in the medium-run less likely to be employed due to the provision of child care pension benefits. These results are broadly in line with the descriptive findings by Albrecht et al. (2013), who find only weak employment effects due to child care pension benefits. Nevertheless, some caution has to be applied in the interpretation of the results due to the small number of observations. Further, employment responses for other groups - in particular mothers with a stronger attachment to the labor market - could potentially differ. Overall, the findings are not in line with the behavior of a perfectly rational mother who would fully incorporate the economic incentives in her employment decision. The fact that mothers do not react to the child care pension benefit extension can be explained by a short planning horizon or a high discount rate.

From a political perspective, the empirical results are important. With regard to short- and medium-run employment the child care pension benefit can be regarded as a benefit that increases a mother's old-age income without negative employment effects. Nevertheless, mothers could adjust their behavior in different ways. First, the positive impact of the benefit on pension entitlements could crowd out individual old age savings due to the increase in public pension wealth. Second, mother could decide to retire earlier due to the higher pension entitlements implied by the child care pension benefit. A comprehensive assessment of the child care pension benefit has to take these aspects into account.

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Appendix

A Net present value of the gain from the child care benefit extension in 1992

In the following, I calculate the net present value of the maximum gain that is due to extension of child care pension benefits in 1992. The calculation is based on a reference mother who delivers a child shortly after the day of reform implementation, i.e. after January 1, 1992. The maximum gain from the reform is calculated, comparing the reference mother to an identical mother who delivers her child shortly before the cut-off date, i.e. before January 1, 1992. The calculation assumes the following:

- A mother is entitled to obtain an old-age pension in the German public pension system.
- She is 30 years old at the date of child birth.
- She retires at the age of 65.
- Her life expectancy is 83 years.[16]
- The discount rate is set to 0.03.
- The annual gain in terms of 2012 values is EUR 42 * 12 = EUR 504.

$$PV_{reformgain} = \frac{504}{(1+z)^{35}} + \frac{504}{(1+z)^{36}} + ... + \frac{504}{(1+z)^{53}} = \sum_{t=35}^{53} \frac{504}{(1+z)^t}$$

if z=0.03, then

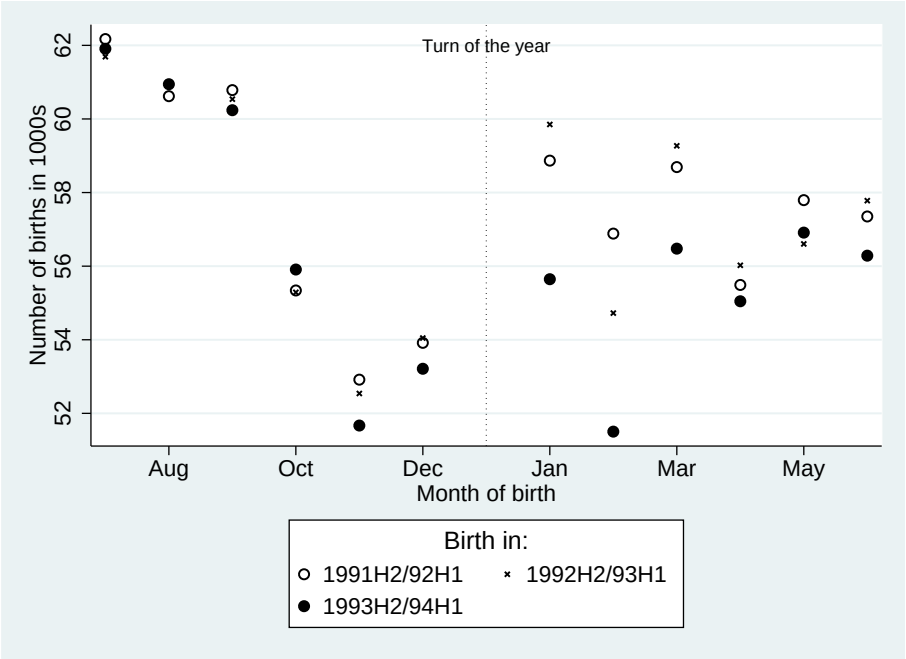
$$PV_{reformgain} = \sum_{t=35}^{53} \frac{504}{(1+0.03)^t} = 2642.5[EUR]$$

[16] A 30 year old mother who has a child in 1992 is born in 1962. According to calculations of the Federal Statistical Office, life expectancy of a women born in 1969 amounts to 83-84 years (`https://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/Bevoelkerung/Sterbefaelle/Tabellen/ModellrechnungLebenserwartung.html`).

B Did the child care pension benefit extension 1992 affect timing of births?

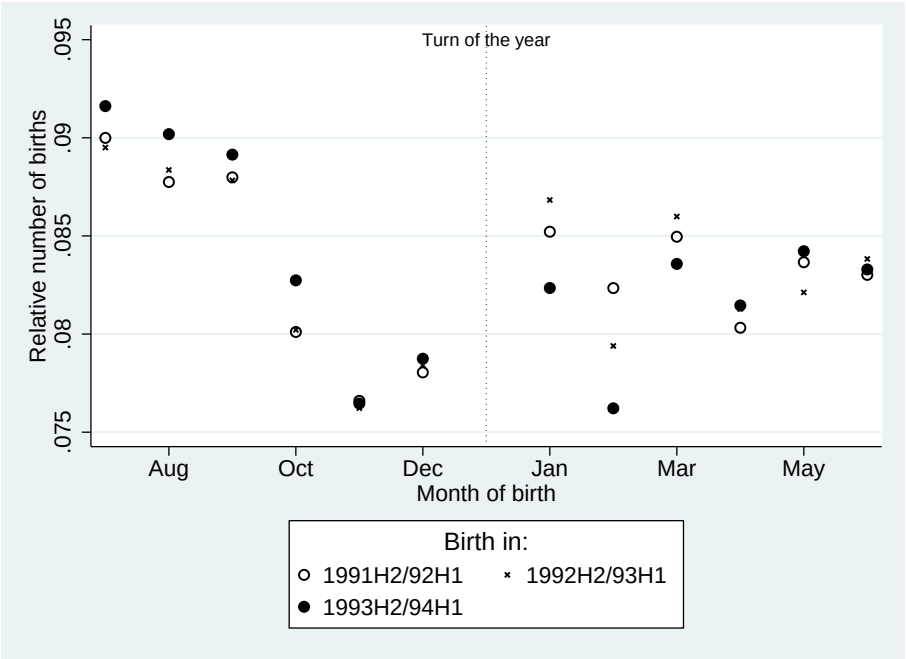
This section investigates birth patterns around (± 6 months) the extension of the child care pension benefit in 1992 and subsequent years. The reform provides incentives for potential parents to have a child after December 1991. If parents strongly respond to the reform by strategically adjusting the timing of child births, then we would expect to find such a behavior in birth statistics. The following analysis compares the birth pattern between July 1991 and June 1994 based on the vital statistics 1991, 1992, 1993 and 1994. The data covers all registered births in West Germany. Figure 2 shows the absolute number of births per month. Parents who wanted to strategically select into the treatment group would prefer to have their child after December 1991. Hence, in particular in the first half of 1992 (1992H1) we expect lower birth rates in the months before and higher rates after the turn of the year in comparison to subsequent years. However, the comparison of the number of births across different months does not provide clear evidence for strategic birth patterns. In some months of the first half-year, more children were born in 1992 compared to subsequent years. The comparison based solely on the absolute number of births could lead to wrong conclusions if the total number of births differed substantially across the three periods. Hence, Figure 3 relates the number of monthly births to the period average. Accordingly, the y-axis reports the monthly share of total births in the period. In comparison, to Figure 2 the general pattern persists. There is no evidence for a clear strategic timing of births.
These findings are in line with Dustmann and Schönberg (2008). They, in particular compare births shortly around the turn of the year 1991/92 based on vital statistics for the West German states Bavaria, Hesse, and Schleswig-Holstein.

Figure 2: Number of births by month, July 1991 - June1994



Notes: The data covers all births between July 1991 and June 1994 in West Germany.
Data source: Vital statistics 1991, 1992, 1993 and 1994.

Figure 3: Relative number of births by month, July 1991 - June 1994



Notes: The data covers all births between July 1991 and June 1994 in West Germany. Monthly number of births are divided by the group average.
Data source: Vital statistics 1991, 1992, 1993 and 1994.

C Further descriptives

Table 5: Comparison of covariates across Treatment- and Control group (larger bandwidth of ± 6 months)

	Treatment group (N=352)				Control Group (N=338)				Group Difference‡
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Labor market return (0/1)	.72		0	1	.74		0	1	-.02
Prior employment (years)	3.56	4.11	0	28.05	3.88	4.09	0	23.89	-.32
Mother's age at delivery	28.7	5.20	18	43	28.3	4.84	19	44	.4
German (0/1)	.72		0	1	.75		0	1	-.03
Number of children	2.09	1.18	1	7	2.01	.99	1	8	.08
Higher education (0/1)	.13		0	1	.15		0	1	-.02
Region									
North (0/1)	.16		0	1	.20		0	1	-.04
Middle (0/1)	.49		0	1	.45		0	1	.04
South (0/1)	.35		0	1	.35		0	1	0

Notes: Mothers who had a child in 1991H2 (control) or in 1992H1 (treatment) are in the sample. Labor market return is defined as being employed for two subsequent months in the first five years after child birth. Higher education indicates a secondary\intermediate school leaving certificate with completed vocational training or a higher education level. Region captures the different regions of residence based on the states of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria).

‡None of the variables is statistically significantly different across the two groups (95 %-level).

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

Table 6: Comparison of characteristics across baseline sample and mothers who were employed three months prior to child birth (births ± 3months around January 1, 1992)

	A) Employed 3m prior to child birth (N=145)				B) Not employed 3m prior to child birth(N=328)				Group Difference ‡
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Employment (re-)entry (0/1)†									
Prior employment (years)	7.77	4.59	.59	20.45	3.74	3.81	0	22.0	4.028***
Mother's age at delivery	28.88	4.89	19	41	28.56	4.71	18	42	.026
Number of children	1.76	.96	1	6	2.04	1.07	1	8	–.278***
German (0/1)	.78		0	1	.74		0	1	.04
Higher education (0/1)†									
Region									
North (0/1)	.16		0	1	.15		0	1	.01
Middle (0/1)	.41		0	1	.51		0	1	-.1
South (0/1)	.43		0	1	.34		0	1	.09

Notes: Sample A) are mothers who had a child in 1991Q4 or 1992Q1 and who were employed 3 months prior to child birth. Sample B) are mothers who had a child in 1991Q4 or 1992Q1 and who were not employed three months prior to child birth. Employment entry is defined as being employed for two subsequent months in the first five years after child birth. Higher education indicates a secondary\intermediate school leaving certificate with completed vocational training or a higher education level. Region captures the different regions of residence based on the states of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria).

†Due to the data security regulations, I cannot report the mean comparison for these variables. However, the values are similar to the ones in table 7.

‡*/**/*** Statistically significant at the 10%/5%/1%-level.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

Table 7: Comparison of characteristics across the extended baseline sample and mothers who were employed three months prior to child birth (births ± 6months around January 1, 1992)

	A) Employed at child birth (N=314)				B) Not employed at child birth(N=690)				Group Difference‡
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Employment entry (0/1)	.90				.73				.17***
Prior employment (years)	7.84	4.93	.1	29.02	3.72	4.10	0	28.02	4.12***
Mother's age at delivery	29.01	4.78	19	44	28.50	4.9	18	45	.5
Number of children	1.71	1.01	1	10	2.05	1.09	1	8	-.34***
German (0/1)	.78				.73				.05
Higher education (0/1)	.08				.12				-.04**
Region									
North (0/1)	.17				.18				-.01
Middle (0/1)	.44				.47				-.03
South (0/1)	.39				.35				.04

Notes: Sample A) are mothers who had a child in 1991Q4 or 1992Q1 and who were employed 3 months prior to child birth. Sample B) are mothers who had a child in 1991H2 or 1992H1 and who were not employed three months prior to child birth. Employment entry is defined as being employed for two subsequent months in the first five years after child birth. Higher education indicates a secondary\intermediate school leaving certificate with completed vocational training or a higher education level. Region captures the different regions of residence based on the states of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria).

‡*/**/*** Statistically significant at the 10%/5%/1%-level.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

D Supplementary regression results

Re-estimation of the model of Schönberg and Ludsteck (2014)

This exercise re-estimates the model of Schönberg and Ludsteck (2014, cf. Table 1, reform 4, p. 487) that evaluates the German parental leave extension from 18 to 36 months in 1992 using the BASiD.[17] The comparison of the empirical results from the two different data sources allows to draw conclusions regarding comparability of the BASiD. While both data sets are relatively similar, there is a striking difference. Schönberg and Ludsteck (2014) relies on the administrative Social Security Records that results in a sample size of more than 200,000 mothers. Despite that, the data sets are relatively similar since BASiD consists partly of the Social Security Records (vom Berge et al., 2013; Hochfellner et al., 2012). I follow Schönberg and Ludsteck (2014) in selecting the sample. Accordingly, a mother that gave birth to a child in the first quarter 1992 is assigned into the treatment group, while a mother who had her child in the last quarter 1991 constitutes the control group. Mothers are selected into the sample regardless of their pre-childbirth employment status. The estimates of the treatment effect are reported in Table 13, in Appendix D. According to the results, 19 months after delivery the mothers' employment propensity is statistically significantly about 12 percentage points lower, if they benefit from the longer parental leave duration. In comparison, Schönberg and Ludsteck (2014, Table 1, Reform 4, p. 487) obtain an estimate of about -10 percentage points. Overall, the point estimates are relatively similar.

[17] Precisely, I re-estimate the following OLS model:

$$Pr(employed_{it}) = \delta_0 + \delta_1 turn91/92_{it} + \delta_2 beginning_{it} + \delta_3 turn9192_{it} * beginning_{it} + \eta' X_{it} + \epsilon_{it}. \quad (4)$$

where i indicates the mother and t child age in months. *turn91/92* indicates whether a child was born around the turn of the year 1991/92 (one) or in the corresponding period the year before 1990/91 (zero). *beginning* captures the impact of being born in beginning of a year, e.g. the first quarter or first half, in comparison to being born toward the end of a year. X captures the same vector of control variables as in the baseline model, as described before. The interaction term *turn91/92* $*$ *beginning* captures the impact of being affected by the parental leave expansion on maternal employment. ϵ is the error term.

Table 8: Probit model - Baseline sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Child age (in months) ‡	19		28		36		60		120	
Employed										
Treatment	-0.0208	-0.0306	-0.0151	0.0025	0.0106	0.0417	-0.0054	0.0322	0.0040	-0.0105
	[0.0160]	[0.0235]	[0.0196]	[0.0262]	[0.0255]	[0.0350]	[0.0317]	[0.0406]	[0.0420]	[0.0537]
German		-0.0593**		-0.0802***		-0.1046***		-0.1577***		0.0491
		[0.0272]		[0.0301]		[0.0400]		[0.0445]		[0.0653]
Number of children		-0.0133		-0.0039		-0.0180		-0.0543**		-0.0084
		[0.0136]		[0.0146]		[0.0181]		[0.0238]		[0.0269]
Educ2		-0.0008		-0.0228		0.0615		0.0479		0.1858**
		[0.0342]		[0.0444]		[0.0466]		[0.0559]		[0.0774]
Age		0.0170		-0.0401		-0.0082		0.0110		0.1625**
		[0.0294]		[0.0276]		[0.0386]		[0.0477]		[0.0781]
Age2		-0.0003		0.0005		0.0001		-0.0002		-0.0022**
		[0.0005]		[0.0004]		[0.0006]		[0.0007]		[0.0010]
North		0.0345		0.0488		0.0045		-0.1043		-0.0338
		[0.0347]		[0.0385]		[0.0584]		[0.0728]		[0.0833]
Middle		0.0285		0.0295		0.0553		0.0349		0.0246
		[0.0267]		[0.0304]		[0.0391]		[0.0438]		[0.0601]
Prior employment		0.0078**		0.0099**		0.0133**		0.0089		0.0051
		[0.0038]		[0.0043]		[0.0052]		[0.0061]		[0.0083]
N	553	328	553	328	553	328	553	328	553	328

Note: The baseline sample consists of mothers who had a child in 1991Q4 (control) or in 1992Q1 (treatment). The table shows average marginal effects and all specifications include a constant term. ‡ The estimates are based on the age of a mother's last child. Higher education indicates a secondary\intermediate school leaving certificate with completed vocational training or a higher education level. Region captures the different regions of residence based on the states of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria). */**/*** Statistically significant at the 10%/5%/1%-level. The standard error is reported in brackets.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

Table 9: OLS model - Baseline sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Child age (in months) ‡	19		28		36		60		120	
Employed										
Treatment	-0.0207	-0.0322	-0.0151	0.0021	0.0105	0.0385	-0.0054	0.0326	0.0040	-0.0111
	[0.0157]	[0.0230]	[0.0197]	[0.0269]	[0.0255]	[0.0355]	[0.0318]	[0.0410]	[0.0421]	[0.0540]
German		-0.0736**		-0.0951**		-0.1168**		-0.1746***		0.0471
		[0.0374]		[0.0437]		[0.0501]		[0.0576]		[0.0664]
Number of children		-0.0111		-0.0027		-0.0162		-0.0421***		-0.0097
		[0.0119]		[0.0103]		[0.0163]		[0.0161]		[0.0252]
Educ2		-0.0007		-0.0154		0.0664		0.0516		0.1876**
		[0.0365]		[0.0347]		[0.0621]		[0.0679]		[0.0835]
Age		0.0094		-0.0541		-0.0052		0.0037		0.1394**
		[0.0295]		[0.0354]		[0.0384]		[0.0523]		[0.0640]
Age2		-0.0002		0.0007		0.0000		-0.0001		-0.0019**
		[0.0004]		[0.0005]		[0.0006]		[0.0007]		[0.0008]
North		0.0503		0.0500		0.0138		-0.0723		-0.0313
		[0.0404]		[0.0482]		[0.0501]		[0.0527]		[0.0830]
Middle		0.0410		0.0392		0.0593		0.0344		0.0239
		[0.0274]		[0.0309]		[0.0414]		[0.0484]		[0.0612]
Prior employment		0.0083**		0.0099**		0.0140***		0.0088		0.0048
		[0.0041]		[0.0041]		[0.0053]		[0.0063]		[0.0081]
N	553	328	553	328	553	328	553	328	553	328

Note: The baseline sample consists of mothers who had a child in 1991Q4 (control) or in 1992Q1 (treatment). The table shows estimated coefficients and all specifications include a constant term. ‡ The estimates are based on the age of a mother's last child. Higher education indicates a secondary\intermediate school leaving certificate with completed vocational training or a higher education level. Region captures the different regions of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria). */**/*** Statistically significant at the 10%/5%/1%-level. The standard error is reported in brackets.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

Table 10: Probit model - Mothers giving birth to a child in 1991H2 or 1992H1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Child age (in months) ‡	19		28		36		60		120	
Employed										
Treatment	-0.0192	-0.0194	-0.0240	-0.0067	-0.0036	0.0081	-0.0058	-0.0119	0.0349	0.0121
	[0.0123]	[0.0170]	[0.0153]	[0.0209]	[0.0178]	[0.0242]	[0.0223]	[0.0288]	[0.0288]	[0.0371]
German		-0.0333*		-0.0636***		-0.0695**		-0.0587*		-0.0140
		[0.0195]		[0.0239]		[0.0278]		[0.0332]		[0.0442]
Number of children		-0.0122		-0.0038		-0.0065		-0.0332**		0.0190
		[0.0096]		[0.0117]		[0.0128]		[0.0162]		[0.0185]
Higher education		0.0019		-0.0119		0.0805**		0.0764*		0.1994***
		[0.0277]		[0.0377]		[0.0360]		[0.0440]		[0.0577]
Age		0.0093		-0.0229		0.0027		-0.0686**		0.0274
		[0.0170]		[0.0202]		[0.0250]		[0.0289]		[0.0456]
Age2		-0.0002		0.0002		-0.0002		0.0008**		-0.0006
		[0.0003]		[0.0003]		[0.0004]		[0.0004]		[0.0006]
North		0.0199		0.0539*		0.0436		-0.0353		-0.0518
		[0.0247]		[0.0293]		[0.0356]		[0.0442]		[0.0539]
Middle		0.0251		0.0293		0.0498*		0.0382		-0.0571
		[0.0194]		[0.0241]		[0.0278]		[0.0321]		[0.0415]
Prior employment		0.0070***		0.0127***		0.0145***		0.0130***		0.0247***
		[0.0025]		[0.0033]		[0.0035]		[0.0041]		[0.0052]
N	1186	690	1186	690	1186	690	1186	690	1186	690

Note: The table shows average marginal effects and all specifications include a constant term. ‡ The estimates are based on the age of a mother's last child. Higher education indicates a secondary\intermediate school leaving certificate with completed vocational training or a higher education level. Region captures the different regions of residence based on the states of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria). */**/*** Statistically significant at the 10%/5%/1%-level. Standard errors are in reported in brackets.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

Table 11: Probit model - Mothers giving birth to a child in 1991Q4 or 1992Q1 (excluding births in January and December)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Child age (in months) ‡	19		28		36		60		120	
Employed										
Treatment	-0.0106	-0.0095	-0.0050	-0.0055	0.0167	0.0544	0.0116	0.0377	-0.0032	0.0070
	[0.0199]	[0.0287]	[0.0249]	[0.0328]	[0.0317]	[0.0429]	[0.0390]	[0.0500]	[0.0509]	[0.0643]
German		-0.0541		-0.0659*		-0.1111**		-0.1107**		0.0593
		[0.0331]		[0.0373]		[0.0481]		[0.0555]		[0.0760]
Number of children		-0.0458**		-0.0018		-0.0418		-0.0666**		0.0068
		[0.0230]		[0.0188]		[0.0255]		[0.0316]		[0.0347]
Higher education		0.0102		-0.0078		0.0797		0.0643		0.1785**
		[0.0397]		[0.0513]		[0.0543]		[0.0672]		[0.0899]
Age		0.0221		-0.0562*		-0.0172		-0.0073		0.1912*
		[0.0370]		[0.0323]		[0.0462]		[0.0585]		[0.0978]
Age2		-0.0004		0.0008		0.0003		0.0001		-0.0026**
		[0.0006]		[0.0005]		[0.0007]		[0.0008]		[0.0012]
North		0.0600		0.0643		0.0142		-0.1301		0.0163
		[0.0433]		[0.0468]		[0.0668]		[0.0878]		[0.0977]
Middle		0.0400		0.0146		0.0197		0.0084		0.0072
		[0.0353]		[0.0387]		[0.0474]		[0.0537]		[0.0722]
Prior employment		0.0095**		0.0106**		0.0169***		0.0089		0.0078
		[0.0046]		[0.0054]		[0.0065]		[0.0076]		[0.0098]
N	373	229	373	229	373	229	373	229	373	229

Note: The table shows estimated average marginal effects and all specifications include a constant term. ‡ The estimates are based on the age of a mother's last child. Higher education indicates a secondary\intermediate school leaving certificate with completed vocational training or a higher education level. Region captures the different regions of residence based on the states of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria). */**/*** Statistically significant at the 10%/5%/1%-level. Standard errors are reported in brackets.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

Table 12: Probit model - Mothers giving birth to a child in 1991Q4 or 1992Q1 (compared to 1990Q4 or 1991Q1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Child age (in months) ‡	19		28		36		60		120	
Employed										
Treatment	-0.0128	-0.0097	-0.0014	0.0152	0.0276	0.0689	0.0531	0.1410**	-0.0455	-0.0420
	[0.0238]	[0.0327]	[0.0291]	[0.0385]	[0.0344]	[0.0460]	[0.0429]	[0.0549]	[0.0595]	[0.0760]
Turn91/92	-0.0048	0.0035	-0.0111	-0.0121	0.0070	-0.0023	0.0092	-0.0147	0.0009	-0.0302
	[0.0157]	[0.0209]	[0.0201]	[0.0271]	[0.0244]	[0.0325]	[0.0298]	[0.0372]	[0.0428]	[0.0548]
Beginning	-0.0110	-0.0232	-0.0154	-0.0143	-0.0185	-0.0365	-0.0593*	-0.1149***	0.0464	0.0291
	[0.0159]	[0.0232]	[0.0199]	[0.0270]	[0.0251]	[0.0343]	[0.0312]	[0.0410]	[0.0419]	[0.0538]
German		-0.0307*		-0.0444**		-0.0548**		-0.0978***		0.0217
		[0.0181]		[0.0213]		[0.0255]		[0.0301]		[0.0444]
Number of children		-0.0142		-0.0091		-0.0248*		-0.0450***		0.0079
		[0.0102]		[0.0120]		[0.0134]		[0.0168]		[0.0207]
Higher education		-0.0017		0.0280		0.0721**		0.0680*		0.1540***
		[0.0260]		[0.0287]		[0.0306]		[0.0382]		[0.0571]
Age		-0.0108		-0.0305		-0.0114		-0.0146		0.1063**
		[0.0157]		[0.0194]		[0.0237]		[0.0308]		[0.0528]
Age2		0.0002		0.0004		0.0002		0.0002		-0.0014*
		[0.0003]		[0.0003]		[0.0004]		[0.0005]		[0.0007]
North		0.0059		0.0045		-0.0103		-0.0386		-0.0909
		[0.0249]		[0.0290]		[0.0382]		[0.0438]		[0.0595]
Middle		0.0045		-0.0117		0.0294		-0.0003		-0.0602
		[0.0179]		[0.0213]		[0.0256]		[0.0301]		[0.0429]
Prior employment		0.0066***		0.0104***		0.0102***		0.0105***		0.0146**
		[0.0024]		[0.0030]		[0.0033]		[0.0040]		[0.0057]
N	1108	656	1108	656	1108	656	1108	656	1108	656

Note: The table shows average marginal effects and all specifications include a constant term. ‡ The estimates are based on the age of a mother's last child. Higher education indicates a secondary\intermediate school leaving certificate with completed vocational training or a higher education level. Region captures the different regions of residence based on the states of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria). */**/*** Statistically significant at the 10%/5%/1%-level. Standard errors are reported in brackets.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

Table 13: Re-estimation of the model by Schönberg and Ludsteck (2014) based on BASiD

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Child age (in months) ‡	19		28		36		60		120	
Employed										
Treatment	-0.0680*	-0.1236***	-0.0431	-0.0525	0.0366	0.0417	0.0162	0.0489	-0.0179	-0.0351
	[0.0356]	[0.0447]	[0.0392]	[0.0480]	[0.0411]	[0.0514]	[0.0446]	[0.0551]	[0.0492]	[0.0625]
turn91/92	-0.0016	0.0327	-0.0277	-0.0321	-0.0169	-0.0118	0.0045	-0.0136	0.0031	-0.0278
	[0.0272]	[0.0349]	[0.0294]	[0.0358]	[0.0298]	[0.0372]	[0.0326]	[0.0404]	[0.0352]	[0.0447]
Beginning	-0.0182	-0.0152	-0.0275	-0.0112	-0.0346	-0.0274	-0.0487	-0.0635*	0.0096	0.0094
	[0.0262]	[0.0315]	[0.0288]	[0.0347]	[0.0288]	[0.0352]	[0.0310]	[0.0378]	[0.0345]	[0.0431]
German		-0.0898***		-0.0614**		-0.0857***		-0.1005***		0.0189
		[0.0263]		[0.0277]		[0.0300]		[0.0320]		[0.0359]
Number of children		-0.0072		-0.0085		-0.0290**		-0.0380***		-0.0015
		[0.0117]		[0.0121]		[0.0132]		[0.0139]		[0.0171]
Higher education		-0.0021		0.0265		0.0750*		0.0588		0.1081**
		[0.0316]		[0.0369]		[0.0430]		[0.0445]		[0.0517]
Age		-0.0182		-0.0140		-0.0109		0.0138		0.1148***
		[0.0248]		[0.0266]		[0.0270]		[0.0337]		[0.0407]
Age2		0.0002		0.0000		0.0000		-0.0003		-0.0015***
		[0.0004]		[0.0004]		[0.0004]		[0.0005]		[0.0005]
North		0.1160***		0.0578		0.0295		0.0006		-0.1078**
		[0.0357]		[0.0379]		[0.0389]		[0.0419]		[0.0477]
Middle		0.0705***		0.0210		0.0185		-0.0127		-0.1026***
		[0.0249]		[0.0273]		[0.0292]		[0.0310]		[0.0348]
Prior employment		0.0295***		0.0317***		0.0315***		0.0313***		0.0220***
		[0.0031]		[0.0032]		[0.0033]		[0.0035]		[0.0039]
N	1657	980	1657	980	1657	980	1657	980	1657	980

Note: The table shows estimated coefficients and all specifications include a constant term. ‡ The estimates are based on the age of a mother's last child. This sample contains mothers independent of their pre-child birth employment status. Higher education indicates a secondary\intermediate school leaving certificate with completed vocational training or a higher education level. Region captures the different regions of residence based on the states of residence: North (Schleswig-Holstein, Hamburg, Bremen, Lower Saxony), Middle (North Rhine-Westphalia) and South (Baden-Wuerttemberg and Bavaria). */**/*** Statistically significant at the 10%/5%/1%-level. Robust standard errors are in brackets.
Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).

Table 14: Control for parental leave eligibility through subsequent child births

	(1)	(2)	(3)	(4)	(5)
Child age (in months)‡	19	28	36	60	120
A) Baseline specification					
Probit	-0.0306	0.0025	0.0417	0.0322	-0.0105
	[0.0235]	[0.0262]	[0.0350]	[0.0406]	[0.0537]
OLS	-0.0322	0.0021	0.0385	0.0326	-0.0111
	[0.0230]	[0.0269]	[0.0355]	[0.0410]	[0.0540]
N	328	328	328	328	328
B) Control for parental leave entitlement					
Probit	-0.0088	0.0070	0.0125	0.0197	-0.0179
	[0.0220]	[0.0261]	[0.0351]	[0.0406]	[0.0593]
OLS	-0.0217	0.0021	0.0062	0.0206	-0.0172
	[0.0214]	[0.0253]	[0.0358]	[0.0414]	[0.0598]
N	266	266	266	266	266

Note: The average of marginal effects is reported for the probit model, and estimated coefficients in case of OLS. All specifications include the control variables that are specified in Table 2 and a constant term. */**/*** Statistically significant at the 10%/5%/1%-level. The standard error is reported in brackets. ‡ The estimates are based on the age of a mother's last child.

Data source: Biographical data of selected social insurance agencies in Germany (BASiD, version 1951-2009).