Labor supply of mothers with young children: Validating a structural model using a natural experiment

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In this paper we estimate an intertemporal structural model of labor supply for mothers with young children. In order to validate the structural model, we make use of a recently introduced parental leave reform in Germany. We compare the behavioral predictions of the structural model under the reform (out-of-sample fit) to results based on an evaluation where we exploit the parental leave reform as a natural experiment. Based on both methods we find that due to the new parental leave scheme, that pays higher benefits for a shorter period of time, labor supply of mothers in the first year after giving birth declines, however increases in the second year. Further, we find the strongest effects for low-income mothers, who have a significantly higher probability to return to work two years after giving birth than under the old parental leave scheme. Overall our findings support a policy evaluation based on the structural model since despite the imposed structural assumptions the model can replicate the causal effect of a real policy reform.

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1. Introduction

In empirical economics, there is an ongoing debate whether structural or reduced form models are more suitable for the evaluation of public policies.[1] Proponents of structural models stress the advantages of this approach: Starting from a theoretical model, hypotheses are deducted that can be tested with data. Channels of causal effects and the mechanism are also derived from theory. Moreover, the proponents argue the estimated parameters have a clear economic meaning, and, very important from a public policy point of view, these models can be used to predict effects of hypothetical reforms that have not yet taken place. However, it is often criticized that structural models rely on strong assumptions that need to be imposed. Therefore, opponents of the structural approach question the reliability of those policy evaluations and instead suggest to exploit true exogenous variation for the identification of the causal effect on behavior induced by a policy reform.

Amongst others Blundell (2012) suggests rather to exploit all available evidence than being categorical about the "right" empirical approach for policy evaluation. If possible, researchers should base their policy evaluation on descriptive evidence, quasi-experimental evaluations and also on structural model estimation. For example, exogenous variation can be used with experimental methods for identification or validation of structural models. In this paper we follow this suggestion and combine both methods: it is the aim to validate estimates from a structural model with the results obtained by exploiting a natural experiment using a different data source. To be more precise, we estimate an intertemporal structural labor supply model based on data from the German Socio-Economic Panel Study (SOEP), simulate the employment effects of a parental leave reform that has taken place in Germany in 2007, and compare the results with estimates obtained from the evaluation of a natural experiment. The natural experiment is analyzed with data from the German Microcensus.

Amongst others, Lise et al. (2005), Todd and Wolpin (2006) or Hansen and Liu (2011) use estimates based on natural or randomized experiments to validate a structural model.[2] Todd and Wolpin (2006) show that a dynamic structural model of parental decisions about schooling and fertility based on Mexican data provides results which can be validated with results obtained from a natural experiment (Progresa).[3] Similarly,

[1] See Angrist and Pischke (2010) and the comments to this paper for an example.

[2] An alternative way for validation of structural models has been proposed by Keane and Wolpin (2007) who compare predictions for a non-random holdout sample with actual data for this group.

[3] Attanasio et al. (2011) use the same natural experiment (Progresa) but use this directly for identification of a dynamic structural model.

Hansen and Liu (2011) show that a static structural model of labor supply and welfare take-up on Canadian data fits results from a regression discontinuity which is based on a welfare reform.

In this paper we develop and estimate a intertemporal structural labor supply model for mothers. It is based on the assumption that mothers maximize a utility function with respect to income and leisure, i.e. choose that employment status that yields the highest utility. For the validation of this model, we draw on a parental leave reform in Germany that strongly changed working incentives for mothers in the first two years after giving birth. Before the reform families received a means-tested transfer amounting to 300 euro per month that was paid to the parent on leave for a maximum period of 24 months. After the reform the transfer is paid only for a period of 12 or 14 months (there exists a 2 months "father quota") and the amount of this transfer depends on the earnings of the parent on leave prior to birth. Due to the timing of this reform, it can be interpreted as natural experiment. We provide evidence that a causal effect can be identified by comparing mothers who gave birth shortly before and shortly after the implementation of the reform. These results can be compared to the predictions that we obtain based on our structural model.

Overall we can validate the structural model. Although point estimates are somewhat higher based on the ex-post evaluation, the confidence intervals of point estimates from both methods overlap. Moreover, with both methods we find the same pattern of behavioral responses across different socio-economic groups.

There are two main contributions of this paper to the literature: First, our results imply that our structural labor supply model - despite of the imposed assumptions - can explain the link between financial incentives and labor supply behavior of motherers reasonably well. This is empirical evidence against the criticism on structural models put forward by the opponents of this method and gives support for the use of structural models for policy evaluations. This is important, since many questions can only be analyzed based on structural models, e.g. what policy reform achieves policy goals at least cost or what the social welfare implications of policy reforms are.

Second, our results contribute to the discussion about the effect of parental leave reforms on maternal employment. From the policy perspective this is a key question, in particular in a country like Germany where at the same time maternal employment rates are fairly low and there exists a shortage of skilled labor. We find that in line with the induced incentives the new design of transfers leads to a decrease in labor supply of mothers in the first year after birth of a child. In the second year, however, we find positive labor supply responses. The overall effect after the first 24 months differs by

socio-economic characteristics. For low-income mothers and for mothers in East Germany the positive effects of the second year dominate and we find a significant positive overall effect. For other groups, the total effect is either not significant or slightly negative. Given that the reform was only introduced in 2007 the employment effects are only the short run effects, i.e. the first two years after giving birth. Long run effects such as effects on child outcomes or long-run wage effects for mothers can be studied only in the future.

2. Institutional Background and Previous Literature

2.1. Parental Leave Legislation in Germany

In contrast to other OECD countries, in particular the US, parental leave legislation in Germany has been very generous with respect to both job-protection as well as monetary benefits during the leave.[4] In Germany, both parents are entitled to take parental leave ("Elternzeit") for a maximum period of three years after childbirth. During this time, they cannot be dismissed by their employer and they have the right to return to the same job held before. During that leave, parents can also claim parental leave benefits from the government. Up until 2006, there was a child-rearing benefit ("Erziehungsgeld") amounting to 300 Euro per month that was paid to the parent on leave for a maximum period of 24 months. This transfer was means-tested with income thresholds below the median income of a one-earner family. Thus, less than half of all families with newborn children were entitled for this transfer. The transfer was only paid to families in which at least one parent was working less than 30 hours per week.

In 2007, the child-rearing benefit was replaced by the newly introduced "Elterngeld", or "parents' benefit". In contrast to the old scheme, this transfer is paid only for a period of 12 or 14 months. Mother and father can either share this period, in which case they get in total 14 months, or one parent can take the whole period which then lasts only 12 months. Note in this paper we do not analyze the behavior of the father nor the effect of this "partner quota", the focus is only on the employment effects of mothers. While receiving the parents' benefit, the parent is not allowed to work more than 30 hours per week. In contrast to the old scheme, the new parents' benefit is not means-tested on household income and the amount of the benefit depends on earnings prior to birth. It replaces 67% of net earnings prior to birth, however does not exceed 1,800 Euro per

[4] For an overview of the development of parental leave legislation in Germany, including the development since 2007, see Kluve and Tamm (2009), Schönberg and Ludsteck (2007) or Spiess and Wrohlich (2008).

month. There is a minimum amount of 300 euro per month that is paid to parents whose parents' benefit would be lower than 300 euro including parents without prior earnings. If the parent who is receiving the benefit is working part-time, the benefit is reduced. It then replaces 67% of the difference in net earnings prior to and after birth. Families with two children under three years or three or more children under six years get an extra bonus of 10%. Also, for parents with prior-to-birth earnings of less than 1,000 Euro per month, the replacement rate increases gradually until it reaches 100%. Note, however, that the right to take parental leave for up to three years with job protection, has not been changed by the reform.

Related to the very generous parental leave schemes that have been in place in Germany for many years, the share of mothers who withdraw from the labor market more than two years has increased over the years.[5] The government's goal of the reform in terms of female employment was therefore to increase the share of mothers returning to work one year after birth. In contrast the intention for the first year was to provide the household with sufficient income to provide care for the child without the necessity that both parents work.

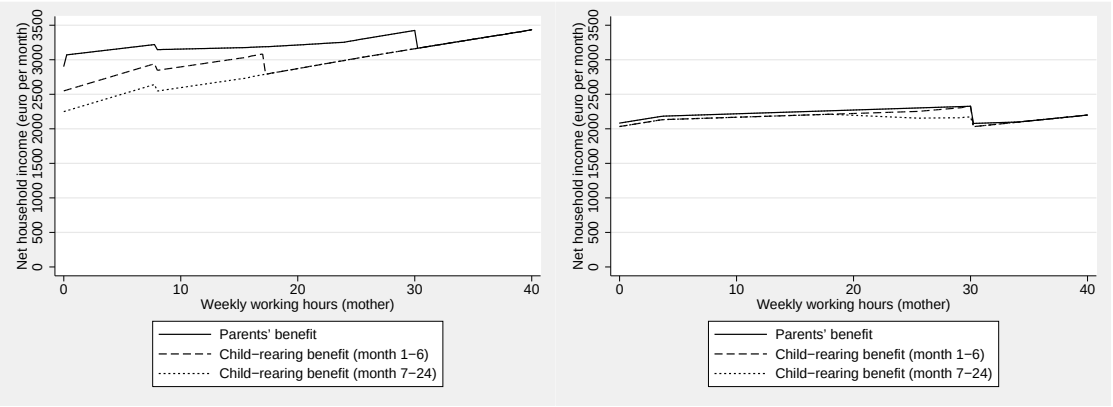
2.2. Changes in Work incentives due to the most recent reform

Before we turn to the empirical analysis, it is useful to take a closer look at how work incentives were changed by the reform. The change in work incentives depends on several characteristics, such as household income, mothers prior-to-birth earnings and number of children, and on the time. In the first year after giving birth, work incentives have generally decreased, while incentives to work have increased in the second year after birth, in particular for low-income mothers. In the following, we illustrate the change in work incentives by presenting budget lines for several stylized households that show how net household income depends on the mother's working hours before and after the reform.

In Figure 1 we show how work incentives changed in the first year after giving birth for four different household types. Panel (a) shows budget lines under the old and under the new scenario for a couple with median income. The solid line shows household net income by working hours of the mother under the new regime, while the dotted lines refer to the old scheme. It becomes clear that for the couples with median income, work incentives during the first year after births have decreased. First, the household now gets a higher, increasing out-of-work income. Second, the transfer is withdrawn at a high

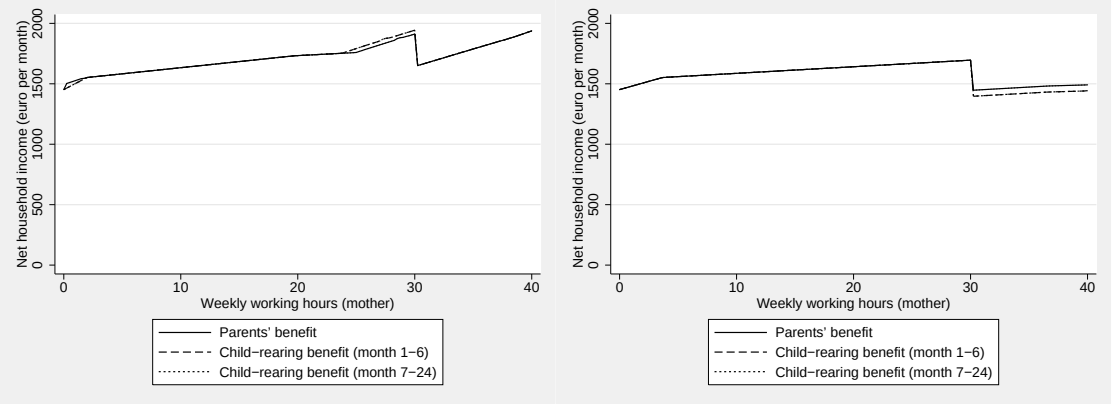
[5] For a detailed description of this development, see Schönberg and Ludsteck (2007); there is also an overview in Kluve and Tamm (2009).

rate, such that the budget line is relatively flat. Panels (b) to (d) show budget lines for different household types, namely low-income or single mother households. As these panels show, in contrast to the household with median income, the reform did not change work incentives for these groups much.



(a) Couple household, median income

(b) Couple household, low income



(c) Single household, median income

(d) Single household, low income

Figure 1: Household budget constraint with respect to mothers' working hours, first year after first childbirth

The picture is quite different in the second year after giving birth. In this time period, couple households with median income (such as shown in Panel (a) of Figure 2) and above do not face any changes in work incentives since this group was not entitled to the two-year benefit under the old scheme. Thus, for this household type, we do not expect changes in labor supply behavior in the second year.

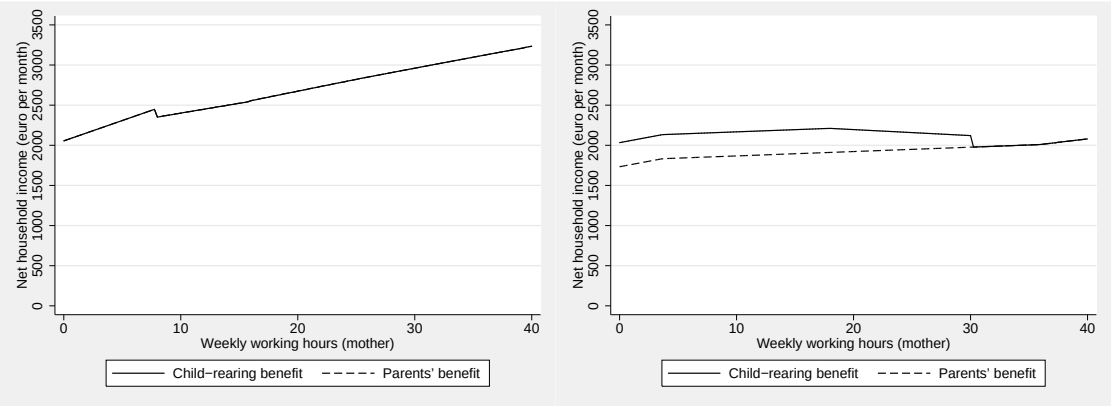
For lower-income households and for single mothers, however, the pictures show that work incentives have increased due to the reform. As the graphs in Panels (b) to (d) in

Figure (2) show, the budget line for households with low income or for single mothers implies strong disincentives to work under the old parental leave benefit scheme, in particular to work more than 20 hours. Between 20 and 30 hours, the slope of the budget line is negative, implying marginal tax rates of far more than 100%. If the mother works full-time, net household income is about the same as when she is not working. These strong disincentives to work are reduced under the new benefit scheme. The budget line of this household is still very flat, because with these low earnings, the family can draw a number of other social benefits, however, the slope of the budget line is positive over the whole range of working hours. Thus, for this household type, we would expect an increase in labor supply in the second year after childbirth.

For single mothers, work incentives in the first year after childbirth generally decreased as for mothers with partners. In the second year, however, incentives to work full time have increased. As Figures 2c and 2d show, working part-time up to a maximum of 30 hours per week was relatively attractive under the old scheme. Single mothers could keep the whole transfer while working. If they worked more than 30 hours per week, however, the whole transfer was withdrawn at once. This strong disincentive has disappeared under the new scheme since the benefit is not paid any more in the second year after childbirth.

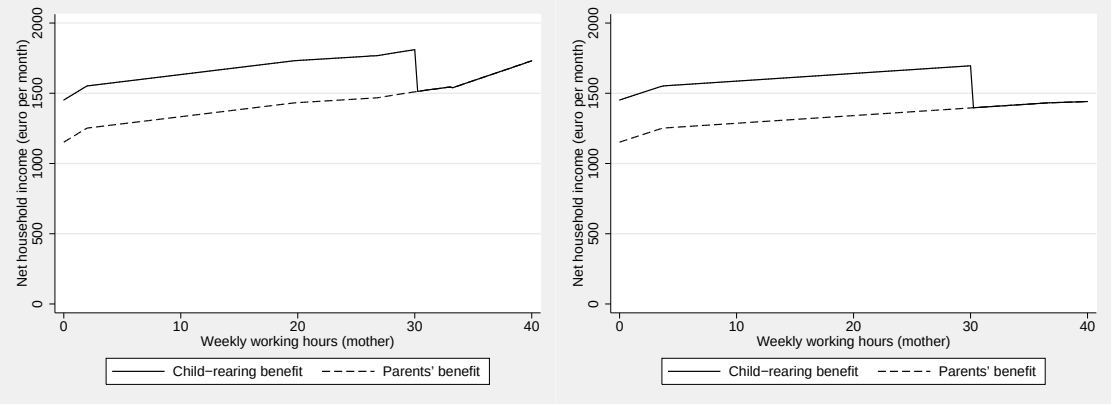
For families with more than one child, work incentives should on average increase more than for families with one child, since the income threshold of the old benefit scheme was increased by each additional child. For example, a family with three children would have received the old benefit even at incomes above the median.

To sum up, based on the work incentives that have been induced by the reform, it is to be expected that mothers reduce labor supply in the first year after childbirth. We expect this effect to be particularly large for mothers with high prior-to-birth earnings. In the second year, work incentives changed for mothers who have a partner with below-median earnings (or for mothers with more than two children and partners with earnings in the first three quarters of the wage distribution) and for single mothers. For all other families, work incentives in the second year after childbirth have not changed due to the reform. Thus, we expect to find labor supply increases of mothers in low-income families. For single mothers, we expect that in particular full-time work increases in the second year after childbirth.



(a) Couple household, median income

(b) Couple household, low income



(c) Single household, median income

(d) Single household, low income

Figure 2: Household budget constraint with respect to mothers' working hours, second year after first childbirth

2.3. Previous literature on parental leave reforms

Overall there exists a fairly large number of studies for many countries that compare the behavior of mothers[6] and their children before and after the change in the parental leave programs to estimate the causal effect of this policy change. In the following we will only briefly discuss the most relevant studies for Germany, for a survey or summary of international evidence see Lalive et al. (2011). However it is important to stress that so far all prominent papers in this literature are based on reduced form methods.[7]

[6] A small number of papers, e.g. Ekberg et al. (2005) and Cools et al. (2011) focus in addition on the behavior of fathers.

[7] Lalive et al. (2011) can be seen as an exception. In addition to reduced form evidence they present results from a calibrated structural search model.

As far as this particular German parental leave reform is concerned, to our knowledge there are only two studies evaluating the effects on maternal employment. Bergemann and Riphahn (2011) and Kluve and Tamm (2009) analyze the recent German parental leave reform and exploit the fact that the introduction of the reform can be interpreted as a natural experiment. However, in contrast to our study, Bergemann and Riphahn (2011) use data from the SOEP with only very few births around the introduction of the reform. Kluve and Tamm (2009) use non-representative data from a health insurance company. More importantly, these studies do not analyze the realized employment effects but the desire of mothers to work in the future. To our knowledge there is only one study on the recent parental leave reform (Spiess and Wrohlich (2008)) that also uses a structural approach however in a static context. The authors predict labor supply changes for a policy reform similar to the one that has actually been introduced based on a static labor supply model.

A larger body of literature exists on the effects of previous reforms of the parental leave regulation in Germany. For example, Schönberg and Ludsteck (2007) and Dustmann and Schönberg (2011) analyze the short- and long-run outcomes of several expansions in maternity leave coverage in Germany during the 1980s and 1990s exploiting a similar identification strategy. They find a significant reaction of female employment behavior in the short run but only weak evidence for long run employment effects. Dustmann and Schönberg (2011) find no support that the expansions in leave coverage improved children's outcomes.

3. Estimation strategy

In the following we discuss two different methodologies to evaluate the employment effects of the parental leave reform. First we present an intertemporal structural model which is derived from economic theory. As mentioned in the introduction this model relies on several structural assumptions which are imposed on the model. Based on this structural model we can estimate preferences of households which allows us then to simulate the employment behavior of mothers and the responses to the parental leave reform. In particular we simulate the employment behavior i) assuming child-rearing benefit (legal status of 2006) and ii) assuming the newly introduced "parents' benefit" (legal status 2011). All other components of the tax and transfer system in both scenarios are identical (law as of 2006), so that we simulate only the change in the labor supply incentives introduced by the parental leave reform. Note that for the estimation of the structural model we only use data from the pre-reform period; in this sense this is an ex-ante

evaluation of this reform.

The second method does not rely on imposed structural assumptions; here we exploit directly the variation induced by the parental leave reform. In particular we argue that this reform can be used as a natural experiment and thus we simply compare the employment behavior of mothers who gave birth just before and after the introduction of the reform on January first 2007. In contrast to the structural approach, however, this identification strategy relies on the assumption that the introduction of the reform can truly be interpreted as a natural experiment, i.e. there were no other factors affecting mothers' employment decisions in the treatment group as compared to the control group.

3.1. Structural model

The structural model is based on the assumption that mothers maximize a household utility function U_{ijt} which is a function of the net household income and her leisure time in a discrete labor market status j. In this set up we assume that the labor supply of fathers is exogenously given, in other words mothers maximize the household utility conditional on the behavior of their partners.[8] In line with van Soest (1995) or Blundell et al. (2000), the utility function has the following functional form

$$U_{ijt} = \beta_l l_j + \beta_y y_{ijt} + \beta_{ll} l_j^2 + \beta_{yy} y_{ijt}^2 + \beta_{ly} l_j y_{ijt} + \epsilon_{ijt} \tag{1}$$

where l_j is the leisure time of the wife in labor market status j, y_{ijt} the related net income of household i at time t, and ϵ_{ijt} is an error term. The household net income describes the financial incentives for working. These incentives vary between households by demographic characteristics and over time. This variation is key for the identification of the model. The variation over time is related to several changes in the tax and transfer system in the observed period (2001 - 2006). In particular a reform in the "child-rearing benefit" in 2004, when income thresholds were significantly reduced, is important since similar mothers before and after the reform had different incentives to return to work. Below we explain in more detail how we calculate the household net income.

Based on this utility function we develop a discrete time hazard rate model which describes the monthly transition of mothers with newborns from non-employment ($j = 0$) into either part-time work ($j = 1$) or full-time work ($j = 2$). It is important to analyze the employment behavior of mothers with newborns in a dynamic rather than in a static

[8] At first glance this often applied simplification, Killingsworth (1983) named this a male chauvinist model, might seem restrictive. However, empirical evidence suggests that cross elasticities between spouses are either not significant or of little importance (Steiner and Wrohlich, 2004) and this provides justification for this assumption.

context since persistence and state dependence might affect the behavior of mothers. Moreover the pecuniary and non-pecuniary transaction costs of working are in particular important and vary significantly by the age of a newborn. The model is estimated based on the inflow sample of mothers with newborns which by law are at the time of giving birth non-employed. More precisely mothers are not allowed to work within the first eight weeks after birth, hence we analyze the transitions after that time.

Assuming that ϵ_{ijt} follows an extreme value distribution the destination specific hazard rate, $h_{ij}(t_i|y_{ijt}, X_{it})$, i.e. a mother's conditional probability of making a transition from non-employment into employment state j $(j = 1, 2)$ in period t, given no transition has occurred until the beginning of that period, is specified by a conditional logit function:

$$h_{ij}(t_i) = \frac{exp(\beta_l l_j + \beta_y y_{ijt} + \beta_{ll} l_j^2 + \beta_{yy} y_{ijt}^2 + \beta_{ly} l_j y_{ijt})}{\sum_0^{j=2} exp(\beta_l l_j + \beta_y y_{ijt} + \beta_{ll} l_j^2 + \beta_{yy} y_{ijt}^2 + \beta_{ly} l_j y_{ijt})} \tag{2}$$

The base line hazard $\alpha(t)$ which is common to all mothers and depends only on elapsed spell duration and observed characteristics is introduced in the model similar to other demographic characteristics through interactions with the state specific leisure time

$$\beta_l = \alpha_0 + \alpha(t) + \alpha_l X_{it}. \tag{3}$$

In the empirical model we specify $\alpha(t)$ nonparametrically by a set of monthly dummy variables, with the first month as the base category. X_{it} contains individual and time specific explanatory variables, such as mothers age, educational status of both parents and number of siblings of the newborn.

Assuming that, conditional on $\alpha(t)$, y_{ijt}, l_j, and X_{it}, all observations are independent,[9] the sample likelihood function is given by

$$L = \prod_{i=1}^{n} h_{ij}(t_i)^{\delta_{ij}} \prod_{\tau=1}^{t_i-1} (1 - h_{ij}(\tau_i)) \tag{4}$$

where δ_{ij} is 1 if the mother makes a transition into employment state j in period t.

3.2. Evaluation of the natural experiment

The second estimation strategy fundamentally differs from the estimation of the structural model. Instead of simulating the employment effects based on estimated parameters

[9] Baker and Melino (2000) discuss the difficulties of identifying unobserved heterogeneity in a discrete duration model with unknown duration dependence.

we directly estimate the employment effects of the parental leave reform. We argue that the timing of the reform allows us to interpret the setting as a natural experiment: First, the reform was introduced for all newborns at one point in time. If children were born until December 31st 2006, parents were entitled to the old scheme, while if children were born on or after January 1st 2007, parents were entitled to the new scheme. Second, as is documented in great detail in Kluve and Tamm (2009), mothers who gave birth in the first three months of 2007 did not know at the time of the conception that there would be a new benefit scheme. Thus, we argue that the introduction of the new benefit scheme can be evaluated by a simple comparison the employment behavior of a treatment and a control group: the treatment group consists of mothers who gave birth in the first quarter of 2007, and the control group are mothers who gave birth in the fourth quarter of 2006.[10]

More formally, we estimate the labor supply (ls) of mothers with a child in the first and second year after birth, respectively, depending on whether the child was born in the last three months of 2006 ($D_i = 0$) or in the first three months of 2007 ($D_i = 1$), i.e.

$$ls_i = \beta D_i + \gamma X_i + \varepsilon \tag{5}$$

where X_i includes demographic characteristics, such as education, age or place of residence. The identifying assumption for the causal effect which is captured by β is that no other factors that potentially influence labor supply are correlated with D, in other words ε is not correlated with the treatment. This assumption cannot be tested. However, we argue that this assumption is plausible in this setting because there are no selection effects (since the reform was not known at the time of the conception) and no time trend since the time period in which we compare treatment and control group is very small (6 months). Table 10 in the Appendix shows the distribution of several mothers' characteristics such as income, education, residence in East Germany and marital status

[10] Theoretically, there is a chance that some mothers tried to delay births that would otherwise have taken place in December 2006 to January 2007 because of the reform. If this were the case, then we would have self-selection into the treatment group, which would bias our estimates. Actually, there are two studies claiming that the parental leave reform in fact led to a significant delay of births. Neugart and Ohlsson (2009) estimate that the probability to give birth the first seven days of 2007 rather than the last seven days of 2006 increased by 5 percentage points for employed mothers. Another study by Tamm (2009) quantifies the number of delayed births due to the reform around 1,000. However, we think that this problem is negligible for the following reasons. Even if it is true that these births have been delays due to the reform, this fraction of births is very small. Since our treatment and control group include mothers who gave births three months before and three months after the reform, respectively, the "delayed" births have a very small weight. To be more precise, according to the Federal Statistical Office, there were 57,578 births in January 2007 in Germany. Thus, the proportion of delayed births is less than 2 percent. If we take the number of births of our treatment group, i.e. births from January to March 2007, this fraction is less than 0.01 percent.

across the two groups. There are no large differences in characteristics between treatment and control groups.

4. Data

The two proposed methods have quite different requirements with respect to the data. For the estimation of the structural model the longitudinal dimension of the data is important; the policy evaluation based on the natural experiment on the other side requires a large data set such that enough observations are available despite of the narrow definition of the treatment and the control group. Therefore we use two different representative data sources for the estimation of the two models. The structural model is estimated based on panel data from the SOEP, the policy evaluation based on the natural experiment used data from the German Microcensus.

4.1. Data for the Estimation of the Structural Model: SOEP

The SOEP is a representative longitudinal micro-database that provides a wide range of socio-economic information on private households in Germany. In 2010, the sample included about 19,000 respondents living in 12,800 households.[11] The SOEP includes detailed information about an individual's monthly employment state in the year prior to the interview date. This allows us to precisely identify the working behavior of a mother at a defined period after giving birth. The data allow us to distinguish three discrete employment states, non-employment, part-time employment and full-time employment. In line with the empirical distribution of working hours we assume that working hours in part-time and full-time work amount to 15 and 38 hours, respectively. Moreover the SOEP includes detailed income information on the individual and household level and other demographic characteristics.

The sample of our analysis consists of mothers who gave birth to a child between 2001 and 2006, that is, births before the parental leave reform 2007. We follow each mother up to 36 months after birth; thus the data refers to the years 2001 until 2009. We only analyze the first transition into employment, thus after a transition into part-time or full-time employment women leave the sample. Uncompleted spells are treated as right censored. We treat each birth as a separate unit of observation, women who give birth to a second child within the observation period are treated as right-censored. Table 1 shows descriptive statistics of the regression sample. In total we observe 1,039 births in that period which leads to 17,959 spells until the first transition.

[11] A description of the SOEP is provided by Wagner et al. (2007).

Table 1: Descriptive statistics for regression sample

Variable	mean
Average duration (months)	17.36
Age	31.25
Level of education:	
Low	0.16
Medium	0.58
High	0.25
Number of children	1.86
Migration background	0.26
East German	0.20
Net household income (in euro):	
Non-employment ($j = 0$)	2,693
Part-time work ($j = 1$)	3,018
Full-time work ($j = 2$)	3,404
Number of births	1,039
Number of spells	17,959

Notes: The sample consists of mothers who gave birth before 2007.
Source: SOEP, own calculations

The average duration out of employment after childbirth is about 17 months. In addition to socio-demographic characteristics, the table shows the average net household income at the three discrete employment states of the mother defined above, namely non-employment, part-time and full-time work.

Net household income

The net household income is calculated using the microsimulation model STSM.[12] Based on variables drawn from the SOEP, gross earnings, the taxable income, the amount of income taxes, all important transfers and finally the disposable net income can be derived at the household level. Gross household income consist of the observed earnings of the father, the alternative specific gross earnings of the mother and other non labor income, such as rental and capital income. The employment state specific gross labor earnings of the mothers are calculated on basis of the alternative specific working hours and a constant hourly gross wage.

To calculate the gross hourly wage we estimate a standard Mincer wage equation with selection effects using the information of the working population and interpret the predicted hourly wages of the non-working individuals as the mean of the distribution of offered wages. Note in order to have sufficient observations we estimate the wage equation for all women but control for marital status and age of children.[13]

The income tax is computed by applying the income tax function to the taxable income of the household. In Germany there exists the principle of joint taxation of married households, whereby the income tax of a married couple is calculated by applying the tax function to half of the sum of the spouses' incomes; this amount is then doubled to determine the tax amount of the couple. Income tax and employee's social security contributions are deducted from gross income, and social transfers that depend on the employment state are added to derive net household income. Social transfers include child benefits, child-rearing benefits, unemployment compensation, housing benefits and social assistance. During the observed period 2001 – 2006 there were several changes in the tax and transfer system which affected the net income of households significantly. Most important there was a significant reduction in the progressivity in income taxation, moreover the level and withdrawal design of out of work transfers was changed from 2005 on. Finally, as mentioned above, in 2004 there was a reform in the "child-rearing benefit" which significantly reduced income thresholds for the means-testing. For the estimation we account for all these changes and apply the relevant tax code for each particular year.

[12] For a detailed description of this model, see Steiner et al. (2008).
[13] The specification and the estimation results can be obtained upon request.

As mentioned above this variation over time in addition to the cross sectional variation improves the identification of the structural model.

The average difference in the disposable income between the three employment states is fairly moderate, about 300 Euro between non-employment and part-time work and about 400 euro between full-time and part-time work. This is in line with the low working incentives for the secondary earner in the German tax and transfer system. Due to the system of joint income taxation for married couples the secondary earner faces high marginal tax rates (Steiner and Wrohlich, 2004).

In addition to the descriptive statistics we show cumulated hazard functions and the 95% confidence interval for transitions out of non-employment into full-time or part-time work by region (Figure 3a). The graphs show that the average transition probability in the first year is lower in East Germany compared to West Germany. However, in the second year, the hazard rate of East German mothers lies above the hazard rate of West German mothers. This regional difference is in line with the working incentives induced by the child rearing benefits. On average the incentives differ because of the different position of East and West German households in the income distribution. This affects the means-testing of the child rearing benefits. This implies that, on average, East German mothers are more often eligible for the means tested child-rearing benefit and have thus a lower incentives to work in the first year than West German mothers. However, employment rates of women are in general higher in the East than in the West, and therefore transitions are higher in the second and third year.

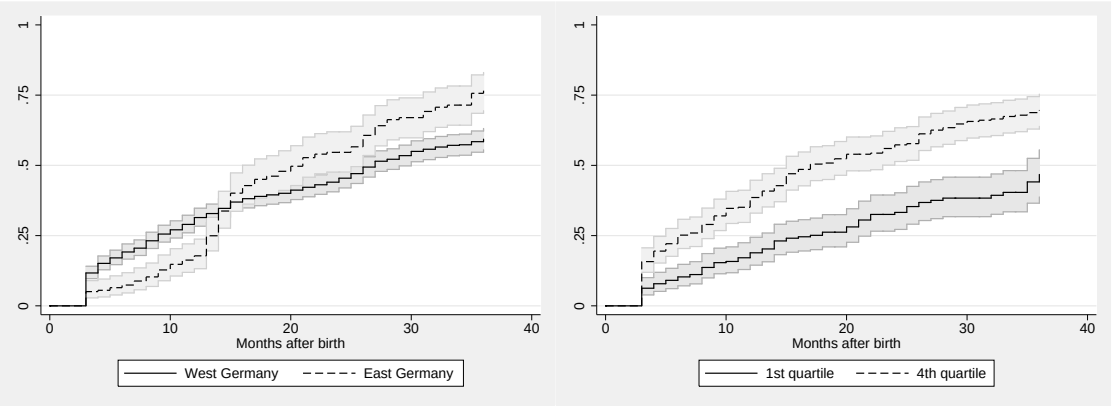
A similar argument holds for Figure 3b which shows the cumulative hazard function for households in the first and fourth quartile of a hypothetical net income distribution. The hypothetical net income distribution is calculated assuming that both partners work full-time. Mothers in the upper part of the income distribution are more likely to reentry employment after childbirth moreover on average they have in general a higher labor market attachment than mothers in the lowest income quartile.

4.2. Data for the evaluation of the natural experiment: The Microcensus

The German Microcensus is a 1-percent random sample of the population living in Germany and includes 830,000 observations per year living in 390,000 households.[14] We use the waves 2007 and 2008 in order to select mothers who gave birth to children in the fourth quarter of 2006 (control group) and in the first quarter of 2007 (treatment group).

From this subsample, we further select mothers whose youngest child was 3-12 months

[14]For more information on the microcensus, see http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/EN/Content/Statistics/Mikrozensus/Aktuell.psml.



(a) by region (b) by household income

Figure 3: Transitions into employment after childbirth (cumulative hazard functions)

old (to analyze the effect on labor supply in the first year after birth) or when their children are between 13-24 months old (to analyze the effect on labor supply in the second year after birth) at the time of the interview.[15] As Table 2 shows, we have 993 observations in the treatment group and 851 in the control group for the analysis of labor supply of mothers with 3-12 months old children. For mothers with children between 13 and 24 months we have almost twice as many observations, 1,231 in the treatment and 1,321 in the control group.

Table 2: Descriptive statistics of mothers' employment in the microcensus

Mothers with children...	aged 3-12 months		aged 13-24 months	
	control group	treatment group	control group	treatment group
Number of obs.	851	993	1,231	1,321
Employment rate	15%	10%	30%	32%
Part-time employment	11%	6%	22%	23%
Full-time employment	4%	4%	8%	9%

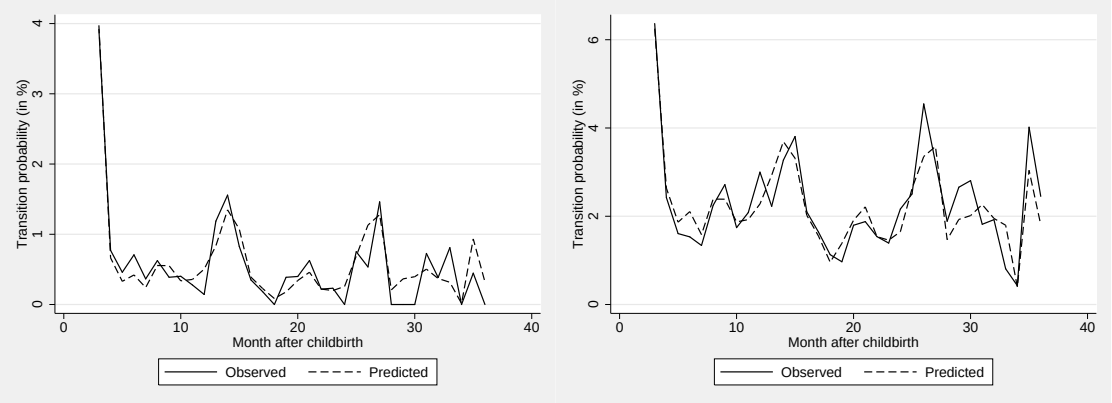
Source: Microcensus, waves 2007 and 2008.

[15] Unfortunately, the exact month of the interview is not available in the MicroCensus data, but only the quarter of the interview. Thus, although we know the exact month of birth of a child, which is necessary to define mothers into treatment and control group, we do not know the exact age of the child at the time of the interview. We assume that all interviews take place in the last month of each quarter, thus generally overestimating the exact age of the child by 1.5 months.

5. Results

5.1. Results from the structural model

Table 3 reports the estimated coefficients of the structural model described above. The model provides a reasonable in-sample fit as Figure 4 shows. For both full-time (Figure 4a) and part-time employment (Figure 4b) the predicted transition probabilities resemble the observed transition rates in the data. Due to the nonlinearities of the model and the multiple interaction affect a clear interpretation of the coefficients is difficult. Therefore, for the interpretation of regression results – in terms of magnitude of the effects – we conduct a simulation showing how labor supply reacts to changes in income. In particular we simulate a 1% increase in mother's net earnings and calculate a net-elasticity of labour supply. The overall labor supply elasticity amounts to 0.32 which is in line with previous findings for Germany, see for example Steiner and Wrohlich (2004). Part-time employment reacts more strongly than full-time employment. The elasticity with respect to part-time and full-time employment is about 0.22 and 0.09, respectively.



(a) Full-time (b) Part-time

Figure 4: Model fit: Observed and predicted part-time and full-time rates

Based on these estimates we are able to simulate the labor supply effects of the introduction of the parental leave reform in 2007. To do this, we calculate for all households their net income under the counterfactual parental leave scenario. In the next step, we predict labor supply behavior of mothers under this scenario. More precisely, we predict the probability that a mother takes up part-time or full-time employment for each month after the expiry of maternity leave (starting from the third month after birth). Cumulated transition probabilities are calculated after 12 and 24 months. The differences in

Table 3: Conditional logit: regression results

Variable	Coefficient (s.e.)
Leisure	-0.205^{***}
	(0.0271)
Leisure^2	0.00252^{***}
	(0.000177)
Leisure × Age	−0.000606
	(0.000386)
Leisure × Low education	0.0286^{***}
	(0.00741)
Leisure × Medium education	0.0123^{**}
	(0.00389)
Leisure × Number of children	0.00986^{***}
	(0.00223)
Leisure × Migration background	0.00648
	(0.00500)
Leisure × East Germany	-0.0173^{***}
	(0.00417)
Net household income	0.00108^{**}
	(0.000374)
Net household income^2 / 1000	−0.0000550
	(0.0000367)
Leisure × Net household income / 1000	-0.00431^{*}
	(0.00211)
Net elasticity:[a]	
ϵ_{PT}	0.22
ϵ_{FT}	0.09
ϵ_T	0.32
Observations	54,120
Log-likelihood	-2,613.13
LR χ^2_{44}	$34{,}411.68^{***}$
Pseudo R^2	0.87

Notes: The dependent variable consists of three categories: non-employment, part-time work, and full-time work. The base category is non-employment. Standard errors in parentheses. Significance levels: $*$ p <0.05, $**$ p <0.01, $***$ p <0.001. The model includes 32 dummies for the baseline hazard (estimates not reported). (a) The reported elasticity ϵ is the change in participation probabilities (in percentage points) conditional on a one percent increase in net household income. The result is reported for full-time (FT), part-time (PT), and (T) total participation rate.

Source: SOEPv27, own calculations

transition probabilities between the two scenarios measure the causal effect of the reform.

As discussed above, the introduction of the new parental leave benefit had heterogeneous impacts on the labor supply incentives of different households, e.g. depending on income, employment prior to the birth, or the number of children. Therefore we calculate the effects for three different types of households: married women with one child, married women with two children, and single mothers with one child. These three Household types, we further subdivide into West Germany, East Germany, households with a low income potential (here defined as the mother's wage rate in the 1st quartile) and high income potential (mother's wage rate in the 3rd Quartile). Table 7 shows the assumptions on wages and working hours for each household.

The results concerning the effects of "parents' benefit" on the employment of mothers in the first 24 months after birth are shown in Table 4. We present differences of the transition probabilities in percentage points in part-time and full time employment. Here we distinguish the effect in the first year, the effect in the second year, and the overall effect after two years. Finally, we show also differences in the total duration of the employment break after childbirth.

Table 4: Simulated cumulative transition probabilities

	First year		Second year		Total effect	
	Part-time	Fulle-time	Part-time	Fulle-time	Part-time	Fulle-time
Family, one child:						
Average	-0.69	-1.272	0.526	0.139	-0.164	-1.133
	(-1.378; -0.002)	(-2.027; -0.517)	(0.132; 0.92)	(0.026; 0.252)	(-0.509; 0.181)	(-1.784; -0.482
West	-0.727	-1.155	0.484	0.12	-0.243	-1.034
	(-1.429; -0.025)	(-1.847; -0.463)	(0.116; 0.852)	(0.021; 0.219)	(-0.617; 0.131)	(-1.636; -0.43
East	-0.358	-1.303	2.361	0.878	2.004	-0.424
	(-0.781; 0.065)	(-2.073; -0.533)	(0.969; 3.753)	(0.294; 1.462)	(0.946; 3.062)	(-0.763; -0.085)
1.Quartile	-0.259	-0.683	2.299	0.580	2.040	-0.103
	(-0.577; 0.059)	(-1.063; -0.303)	(0.984; 3.614)	(0.213; 0.947)	(0.978; 3.102)	(-0.283; 0.077)
4.Quartile	-1.028	-1.384	0.666	0.182	-0.361	-1.202
	(-1.955; -0.101)	(-2.262; -0.506)	(0.152; 1.18)	(0.031; 0.333)	(-0.824; 0.102)	(-1.941; -0.463
Family. two children:						
Average	-0.627	-0.621	0.935	0.206	0.307	-0.415
	(-1.152; -0.102)	(-1.013; -0.229)	(0.333; 1.537)	(0.06; 0.352)	(0.13; 0.484)	(-0.682; -0.148)
West	-0.617	-0.565	0.549	0.113	-0.068	-0.451
	(-1.131; -0.103)	(-0.93; -0.2)	(0.177; 0.921)	(0.028; 0.198)	(-0.245; 0.109)	(-0.739; -0.163)
East	-0.150	-0.655	1.571	0.662	1.421	0.00655
	(-0.399; 0.099)	(-1.057; -0.253)	(0.609; 2.533)	(0.227; 1.097)	(0.657; 2.185)	(-0.183; 0.196)
1.Quartile	0.432	-0.120	0.855	0.381	1.287	0.261
	(0.232; 0.632)	(-0.188; -0.052)	(0.269; 1.441)	(0.144; 0.618)	(0.536; 2.038)	(0.079; 0.443)
4.Quartile	-0.304	-0.816	0.268	0.0605	-0.0356	-0.755
	(-0.763; 0.155)	(-1.375; -0.257)	(0.025; 0.511)	(0.002; 0.119)	(-0.29; 0.219)	(-1.259; -0.251)
Single mother, one child:						
Average	0	0	-0.325	0.524	-0.325	0.524
	(0; 0)	(0; 0)	(-0.568; -0.082)	(0.222; 0.826)	(-0.568; -0.082)	(0.222; 0.826)
West	0	0	-0.307	0.487	-0.307	0.487
	(0; 0)	(0; 0)	(-0.542; -0.072)	(0.203; 0.771)	(-0.542; -0.072)	(0.203; 0.771)
East	0.00	0.00	-0.439	0.782	-0.439	0.782
	(0; 0)	(0; 0)	(-0.729; -0.149)	(0.327; 1.237)	(-0.729; -0.149)	(0.327; 1.237)
1.Quartile	0	0	-0.333	0.49	-0.333	0.49
	(0; 0)	(0; 0)	(-0.586; -0.08)	(0.218; 0.762)	(-0.586; -0.08)	(0.218; 0.762)
4.Quartile	0	0	-0.323	0.572	-0.323	0.572
	(0; 0)	(0; 0)	(-0.56; -0.086)	(0.227; 0.917)	(-0.56; -0.086)	(0.227; 0.917)

Notes: 95%-Confidence intervals in parentheses. Confidence intervals were simulated by parametric bootstrap.
Source: SOEPv27, own calculations

With exception of the group of married women with two children and low income and single mothers the transition probabilities decrease for all the mothers in the first year after having a child. This applies to both part-time, as well as full-time employment. For mothers with one child, the introduction of the "parents' benefit" leads to a decrease in the transition probability to part-time and full-time employment in the first year by 0.7 and 1.3 percentage points, respectively. The largest effects are found for married mothers with high incomes. For single mothers, we find no change in employment behavior in the first year after having a child.

The picture changes, however, during the second year. Columns three and four of Table 4 show the transitions probabilities in the second year after childbirth. Here we find for all women positive employment effects due to the introduction of the "parents' benefit" with the exception of part-time employment for single mothers. The average transition probabilities of married mothers with one child in the 13-24 months after birth increase by 0.5 and 0.1 percentage points for part-time and full-time employment, respectively. The increase is larger for low income households and for East German mothers. For the latter group, part-time employment rises by 2.4 percentage points. For mothers with two children, the effect amounts to 1.6 percentage points.

For single parents, we find negative effects with respect to the probability to take up part-time work within months 13-24 after childbirth. For this group, however, we find positive effects in terms of full-time employment: for the average, the probability increases by 0.5 percentage points. The largest effect is found for East Germany, where full-time employment increases by 0.8 percentage points.

The total effect after two years is shown in columns five and six of Table 4. For some groups, e.g. married women with high income, the negative effect of the first year dominates the positive effect of the second year and thus we find a negative overall effect. For low income mothers, however, we find that the probability that they take up part-time employment 24 months after birth has increased significantly. For low-income mothers with one child, this probability increases by 2 percentage points, for low-income mothers with two children it increases by 1.3 percentage points. For single mothers, the probability to take up full-time employment 24 months after giving birth increases by 0.5 percentage points.

5.2. Results of the Evaluation of the Natural Experiment

The results of the estimation exploiting the natural experiment show that the change in overall employment and part-time employment of mothers in the first year after giving birth is negative and significant. We find that overall employment in the first year after

birth declines by 5 percentage points. This effect is solely driven by the decline in part-time employment. We do not find significant changes in full-time employment.

In order to analyze the influence of socio-economic variables on this effect, we have estimated the three models (overall employment, part-time employment and full-time employment) not only the whole sample but also for four subgroups: Mothers in West Germany, mothers in East Germany, mothers (in East and West Germany) with household income below and above the median.[16] As Table 5 shows, we find that the decline in overall employment is higher in east than in west Germany and higher for mothers with income above the median. For mothers with income below the median, we do not find significant changes. As far as part-time employment is concerned, we find a significant change only for the subgroup of mothers with income below the median. We do not find any significant changes in full-time employment, neither for the whole sample nor for any of the subgroups.

Table 6 shows estimation results of employment reactions of mothers in the second year after giving birth. Generally, employment rates of mothers with children aged 13 to 24 months are higher than in the first year after giving birth. Before the reform, the employment rate of mothers with children aged 13-24 months is 30%; 22% are working part-time and 8% are working full-time. As the descriptive statistics show, after the reform, the employment rate increased by 2 percentage points to 32% (23% part-time and 9% full-time). However, as our estimation results show, this increase is not statistically significant. The only subgroup for whom we find a significant increase in employment is mothers with below-median income. For this group, we find an increase by 6 percentage points. If we look only at part-time employment, we find a significant[17] increase also for mothers in east Germany (plus 7 percentage points).

As a robustness check, we also perform a difference-in-difference analysis by adding mothers who have born children in the last three months of 2005 and in the first three months of 2006 to the sample. With this strategy we can control for potential seasonal effects or inherent differences between mothers who give birth in different months of the year (see Schönberg and Ludsteck (2007)). As Tables 11 and 12 in the Appendix show, the results from the difference-in-difference analysis are the same as from the estimation reported above.

[16] Unfortunately, information on income is not as detailed in the Microcensus as in the SOEP. There are only two questions on income in the Microcensus questionnaire. The first one is the amount of the personal net income, the second one on the amount of the household net income. The personal income (and therefore also the household income) is endogenous since it depends on the mother's employment status. Thus, we take the difference between the household and the personal net income in order to net out the influence of the mother's employment.

[17] Significant at the 10% level.

Table 5: RD Estimation results: Change in labor supply of mothers with children aged 3-12 months (marginal effects of the parental leave reform).

	Total employment	Part-time employment	Full-time employment	Obs.
Germany	-0.053 (-0.083; -0.023)	-0.050 (-0.075; -0.025)	-0.003 (-0.021; 0.015)	1844
West Germany	-0.050 (-0.083; -0.016)	-0.045 (-0.073; -0.016)	-0.005 (-0.025; 0.015)	1486
East Germany	-0.065 (-0.128; -0.002)	-0.072 (-0.125; -0.018)	0.006 (-0.036; 0.048)	358
Low income	-0.040 (-0.081; 0)	-0.040 (-0.072; -0.008)	0 (-0.028; 0.027)	865
High income	-0.062 (-0.105; -0.020)	-0.057 (-0.095; -0.019)	-0.006 (-0.029; 0.018)	979

Notes: 95% Confidence intervals in parentheses. The sample consists of mothers of children born in 2007. Low income and high income refers to mothers who earn below and above the median, respectively.
Source: Mikrozensus 2007 and 2008, own calculations

Table 6: RD Estimation results: Change in labor supply of mothers with children aged 13-24 months (marginal effects of the parental leave reform).

	Total employment	Part-time employment	Full-time employment	Obs.
Germany	0.020 (-0.016; 0.056)	0.013 (-0.019; 0.046)	0.007 (-0.015; 0.028)	2552
West Germany	0.010 (-0.030; 0.049)	0.002 (-0.035; 0.038)	0.008 (-0.013; 0.029)	2033
East Germany	0.056 (-0.027; 0.138)	0.065 (-0.002; 0.131)	-0.008 (-0.074; 0.057)	519
Low income	0.060 (0.007; 0.113)	0.049 (0.004; 0.095)	0.011 (-0.025; 0.047)	1149
High income	-0.013 (-0.061; 0.036)	-0.016 (-0.061; 0.029)	0.003 (-0.023; 0.029)	1403

Notes: Standard deviation in parentheses. The sample consists of mothers of children born in 2007. Low income and high income refers to mothers who earn below and above the median, respectively.
Source: Mikrozensus 2007 and 2008, own calculations

Our results are comparable with those from other studies using the natural experiment evaluation approach for the identification of the labor supply effects of the German parental leave benefit reform. Kluve and Tamm (2009) find on the basis of health insurance data from one insurance company that mothers' participation rate in the first year after giving birth drops by 6 percentage points, which exactly matches our result. For the second year after giving birth, the authors can only analyze the intentions to work since actual employment was not yet observed at the time the data were collected. They find that the intended participation rate of mothers in the second year after giving birth does not change in West Germany, however increases by 15 percentage points in East Germany. In the same line, Bergemann and Riphahn (2011) find on the basis of the SOEP that the intention to work of mothers in the second year after giving birth increases by 15 percentage points due to the reform. They do not find a significant effect on the general intention to return to the labor market.

5.3. Interpretation of Results from Both Methods

Comparing the results from the structural model and those from the natural experiment evaluation shows that both methods come to very similar results. In the first year after giving birth, labor supply declines for mothers of all socio-economic groups, after two years we find positive effects especially for low income mothers. The point estimates - if significant - are usually higher from the evaluation design, but are estimated with lower precision than those from the structural model. The confidence intervals from both methods, however, overlap in all cases.

For example, we find on the basis of the evaluation of the natural experiment that part-time employment dropped by 5 percentage points in the first year after giving birth. On the basis of the structural model, we find that part-time employment dropped by 0.7 percentage points. As Tables 4 and 5 show, however, the confidence intervals of both estimates overlap. The same is true for our results for the second year: Based on the evaluation of the natural experiment we find that part-time employment increases by 5 percentage points for mothers with low incomes in the second year after giving birth. The structural model predicts an increase of 2 percentage points for the same group. This point estimate, however, lies within the confidence interval of the evaluation study estimate.

To sum up, we find that the results from both methods have the same sign and show the same pattern across socio-economic groups. Although the point estimates of the evaluation of the natural experiment are larger in magnitude, we find that the confidence intervals of estimates resulting from both methods overlap in all cases. Based on this

criterion, we argue that the structural model does a good job at out-of-sample prediction, i.e. predicting the behavioral change implied by a major policy reform.

Furthermore, our results are in line with what can be expected from the change in incentives to work as described in section 2. In the first year after giving birth, incentives to work decrease due to the new benefit scheme, therefore we find a large negative effect on participation. Incentives to work decrease more strongly for women who had high prior-to-birth earnings, and this is why we find the strongest effect for mothers with high income and mothers living in West Germany. In the second year, however, incentives change only for those who were entitled to the old scheme, i.e. low income households. This is the reason why we do not find significant changes in employment for mothers overall or for mothers in West Germany or mothers with income above the median. However, for some subgroups, we do find changes, namely for mothers with income below the median and for mothers in East Germany.

6. Conclusion

In this paper, we are able to show that a structural model of labor supply as it is widely used in the literature predicts actual behavior reasonably well. We base the validation of our structural model on comparing the predictions of labor supply under a parental leave policy reform to results from the evaluation of the natural experiment that this policy reform presents. We find that estimates from both methods are not statistically significantly different from one another. This is reassuring evidence for researchers using structural models and also for policy makers who rely on these models for the evaluation of potential policy reforms.

The policy reform that we were looking at, a parental leave benefit reform that cut the benefit duration from two to one year and at the same time increased benefits during the first year after giving birth for mothers with medium to high prior-to-birth earnings, partially achieved its goal, namely to increase the share of mothers who return to work one year after giving birth. This effect, however, can only be found for low-income mothers. In the first year after giving birth, however, we find an overall decline in mother's labor supply. To sum up, we find that the parental leave benefit reform that was introduced in Germany in January 2007 lead to a higher share of mothers that withdraw from the labor market for one year, but reduced the total parental leave period for low-income mothers.

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A. Tables

Table 7: Assumptions about stylized households

	Mothers' working hours		Parents' wage	
	first child	second child	Mother	Father
Average	28.1	18.2	11.1	16.3
West Germany	27.7	15.9	11.4	16.7
East Germany	29.4	29.9	9.3	13.4
Low income	28.1	18.2	9.1	11.3
High income	28.1	18.2	12.6	19.5

Notes: Hours denote average working hours for the year before having a child. Low income and high income denote the 0.25 and 0.75 percentile of the hourly wage, respectively. For couple households, the male spouse is assumed to work 40 hours per week.
Source: SOEPv27, own calculations.

Table 8: Conditional Logit: regression results with alternative specific dummies

Variable	Coefficient (s.e.)
Part-time × Age	0.0617^{**}
	(0.0198)
Part-time × Low education	-2.191^{**}
	(0.754)
Part-time × Medium education	-0.363
	(0.213)
Part-time × Number of children	-0.478^{***}
	(0.122)
Part-time × Migration background	0.180
	(0.328)
Part-time × East Germany	1.312^{***}
	(0.227)
Full-time × Age	-0.00825
	(0.0113)
Full-time × Low education	-0.410^{*}
	(0.191)
Full-time × Medium education	-0.296^{*}
	(0.123)
Full-time × Number of children	-0.147^{*}
	(0.0622)
Full-time × Migration background	-0.334^{*}
	(0.149)
Full-time × East Germany	-0.125
	(0.126)
Net household income	0.000732^{*}
	(0.000300)
Net household income^2 / 1000	-0.0000435
	(0.0000507)
Part-time × Net household income / 100	0.00429
	(0.0148)
Full-time × Net household income / 100	0.0146^{*}
	(0.00603)
Net elasticity:[a]	
ϵ_{PT}	0.32
ϵ_{FT}	0.08
ϵ_{T}	0.41
Observations	54,120
Log-likelihood	-2,563.29
LR χ^2_{97}	$131{,}285.74^{***}$
Pseudo R^2	0.87

Notes: The dependent variable consists of three categories: non-employment, part-time work, and full-time work. The base category is non-employment. Standard errors in parentheses. Significance levels: $*$ p $<$0.05, $**$ p $<$0.01, $***$ p $<$0.001. The model includes 82 dummies for year dummies and alternative specific baseline hazards (estimates not reported). (a) The reported elasticity ϵ is the change in participation probabilities (in percentage points) conditional on a one percent increase in net household income. The result is reported for full-time (FT), part-time (PT), and (T) total participation rate.

Source: SOEPv27, own calculations

Table 9: Simulated cumulative transition probabilities - model with alternative-specific dummies

	First year		Second year		Total effect	
	Part-time	Fulle-time	Part-time	Fulle-time	Part-time	Fulle-time
Family, one child:						
Average	-0.459	-0.873	0.384	0.109	-0.075	-0.764
	(-1.284; 0.366)	(-1.753; 0.007)	(-0.088; 0.856)	(-0.062; 0.28)	(-0.614; 0.464)	(-1.507; -0.021)
West	-0.521	-0.718	0.367	0.082	-0.154	-0.636
	(-1.399; 0.357)	(-1.451; 0.015)	(-0.099; 0.833)	(-0.047; 0.211)	(-0.707; 0.399)	(-1.269; -0.003)
East	-0.155	-1.461	2.075	1.853	1.920	0.392
	(-0.582; 0.272)	(-2.811; -0.111)	(0.45; 3.7)	(0.203; 3.503)	(0.599; 3.241)	(-0.729; 1.513)
1.Quartile	-0.118	-0.483	2.596	0.758	2.479	0.276
	(-0.485; 0.249)	(-0.955; -0.011)	(0.779; 4.413)	(0.031; 1.485)	(0.923; 4.035)	(-0.269; 0.821)
4.Quartile	-0.824	-0.936	0.538	0.145	-0.286	-0.791
	(-1.986; 0.338)	(-1.924; 0.052)	(-0.121; 1.197)	(-0.075; 0.365)	(-0.984; 0.412)	(-1.604; 0.022)
Family, two children:						
Average	-0.476	-0.38	1.065	0.208	0.589	-0.172
	(-1.101; 0.149)	(-0.78; 0.02)	(0.218; 1.912)	(-0.012; 0.428)	(0.215; 0.963)	(-0.46; 0.116)
West	-0.49	-0.313	0.607	0.094	0.117	-0.218
	(-1.129; 0.149)	(-0.646; 0.02)	(0.072; 1.142)	(-0.012; 0.2)	(-0.132; 0.366)	(-0.483; 0.047)
East	-0.034	-0.665	1.416	1.317	1.382	0.653
	(-0.281; 0.213)	(-1.324; -0.006)	(0.25; 2.582)	(0.09; 2.544)	(0.392; 2.372)	(-0.239; 1.545)
1.Quartile	0.439	-0.075	0.929	0.467	1.368	0.392
	(0.172; 0.706)	(-0.151; 0.001)	(0.072; 1.786)	(0.016; 0.918)	(0.343; 2.393)	(-0.016; 0.8)
4.Quartile	-0.099	-0.492	0.165	0.032	0.067	-0.46
	(-0.693; 0.495)	(-1.037; 0.053)	(-0.125; 0.455)	(-0.035; 0.099)	(-0.329; 0.463)	(-0.95; 0.03)
Single mother, one child:						
Average	0	0	-0.676	0.785	-0.676	0.785
	(0; 0)	(0; 0)	(-1.131; -0.221)	(0.052; 1.518)	(-1.131; -0.221)	(0.052; 1.518
West	0	0	-0.666	0.66	-0.666	0.66
	(0; 0)	(0; 0)	(-1.121; -0.211)	(0.033; 1.287)	(-1.121; -0.211)	(0.033; 1.287
East	0	0	-0.763	1.836	-0.763	1.836
	(0; 0)	(0; 0)	(-1.261; -0.265)	(0.309; 3.363)	(-1.261; -0.265)	(0.309; 3.363
1.Quartile	0	0	-0.677	0.742	-0.677	0.742
	(0; 0)	(0; 0)	(-1.14; -0.214)	(0.05; 1.434)	(-1.14; -0.214)	(0.05; 1.434)
4.Quartile	0	0	-0.679	0.846	-0.679	0.846
	(0; 0)	(0; 0)	(-1.132; -0.226)	(0.052; 1.64)	(-1.132; -0.226)	(0.052; 1.64)

Notes: 95%-Confidence intervals in parentheses. Confidence intervals were simulated by parametric bootstrap.
Source: SOEPv27, own calculations

Table 10: Descriptive statistics of mothers' characteristics in treatment and control group

	Control group	Treatment group
Residence in East Germany	19%	21%
Income Below Median	45%	45%
Low Education	30%	28%
Married	78%	75%

Source: Microcensus, waves 2007 and 2008.

Table 11: Difference-in-Difference Results: Change in labor supply of mothers with children aged 3-12 months (marginal effects of the parental leave reform).

	Total employment	Part-time employment	Full-time employment	Obs.
Germany	-0.051 (-0.096; -0.006)	-0.059 (-0.097; -0.022)	0.009 (-0.018; 0.036)	3733
West Germany	-0.049 (-0.099; 0.001)	-0.052 (-0.095; -0.009)	0.003 (-0.027; 0.033)	3033
East Germany	-0.054 (-0.150; 0.043)	-0.087 (-0.161; -0.013)	0.033 (-0.034; 0.100)	700
Low income	-0.015 (-0.077; 0.47)	-0.026 (-0.075; 0.023)	0.011 (-0.029; 0.052)	1785
High income	-0.084 (-0.149; -0.020)	-0.091 (-0.148; -0.034)	0.006 (-0.030; 0.043)	979

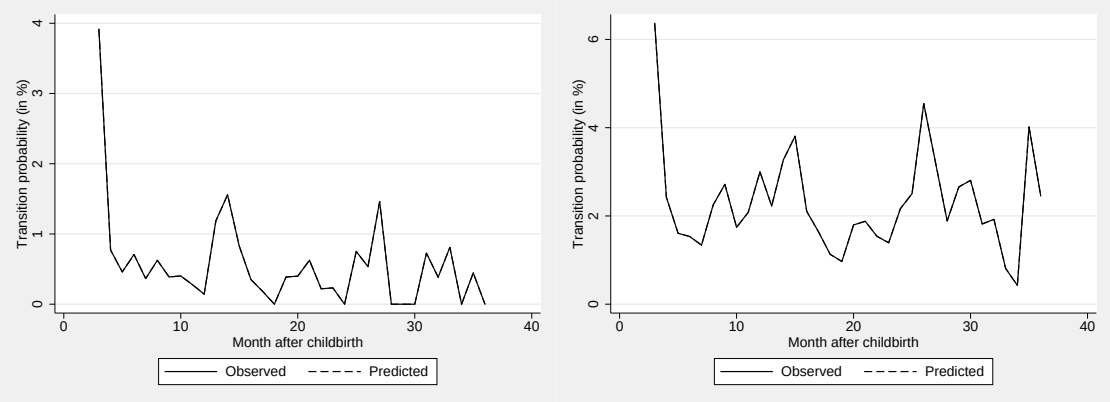
Notes: 95%-Confidence intervals in parentheses. The sample consists of mothers of children born in 2007. Low income and high income refers to mothers who earn below and above the median, respectively.
Source: Mikrozensus 2007 and 2008, own calculations

Table 12: Difference-in-Difference results: Change in labor supply of mothers with children aged 13-24 months (marginal effects of the parental leave reform).

	Total employment	Part-time employment	Full-time employment	Obs.
Germany	0.035 (-0.016; 0.085)	0.024 (-0.021; 0.069)	0.011 (-0.020; 0.041)	5044
West Germany	0.017 (-0.039; 0.073)	0.005 (-0.046; 0.056)	0.012 (-0.018; 0.042)	4051
East Germany	0.104 (-0.014; 0.224)	0.104 (0.010; 0.197)	0.001 (-0.092; 0.092)	993
Low income	0.105 (0.032; 0.178)	0.083 (0.021; 0.145)	0.022 (-0.029; 0.072)	2315
High income	-0.026 (-0.096; 0.043)	-0.030 (-0.095; 0.034)	0.004 (-0.033; 0.041)	2729

Notes: 95%-Confidence intervals in parentheses. The sample consists of mothers of children born in 2007. Low income and high income refers to mothers who earn below and above the median, respectively.
Source: Mikrozensus 2007 and 2008, own calculations

B. Figures



(a) Full-time (b) Part-time

Figure 5: Model fit: Observed and predicted part-time and full-time rates; fully interacted model