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Discussion Papers

Two Steps Forward - One Step Back?

Evaluating Contradicting Child Care Policies in Germany

Kai-Uwe Müller and Katharina Wrohlich

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Evaluating contradicting child care policies in Germany

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Abstract:
We apply a structural model of mothers' labor supply and child care choices to evaluate the effects of two childcare reforms in Germany that were introduced simultaneously in August 2013. First, a legal claim to subsidized child care became effective for all children aged one year or older. Second, a new benefit called 'Betreuungsgeld' came into effect that is granted to families who do not use public or publicly subsidized child care. Both reforms target children of the same age group and are unconditional on the parents' income or employment status, yet affect mothers' incentives for labor supply and child care choices in opposite directions. Our model facilitates estimating the joint reform impact as well as disentangling the individual effects of both policies. A comprehensive data set with information on labor supply, the use of and potential access restrictions to various child care arrangements provides the basis for the empirical analysis. We find the overall effect of both reforms to be small but positive as far as mother's labor supply and the use of formal care is concerned. The legal claim's positive impact on mothers' labor supply and the use of formal child care is largely offset by the negative effect on both outcomes resulting from the introduction of the 'Betreuungsgeld'.

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1 Introduction

Germany has long ranked low on indicators such as fertility, mothers' labor force participation, and the well-being of children. Since the middle of the 2000s policy makers have introduced a number of family policy reforms aimed at reducing the relatively long work interruptions of mothers, increasing the number of children in formal care, and raising fertility (Ristau, 2005). The expansion of public child care is a major building block of the reforms.[1] Since 2005 several child care reforms have been carried out that have successively increased the availability of subsidized child care for children below three years.[2] In 2002 there were on average 8 slots per 100 children of this age group (2 in West and 35 in East Germany). Until 2013 this number has increased to an average 29 slots (24 in West and 52 in East Germany). As of August 2013 every child has a legal claim to a slot in a publicly subsidized child care institution after the first birthday.[3] The increase in child care availability improves the incentives for mothers to return to work in the first three years after giving birth.

In August 2013, at the same time as the legal claim to child care was introduced and motivated by distributive goals, a new benefit – the 'Betreuungsgeld' – came into effect. It is paid to parents with children aged 15-36 months who are not using publicly subsidized child care. The idea is that these families should also benefit from care subsidies in the form of direct cash transfers. The incentives of this benefit counteract the positive work stimulus created by the legal claim to a child care slot. The 'Betreuungsgeld' has been criticized for discouraging mothers to return to work and for providing negative incentives for children to attend formal child care. It has been argued that children from disadvantaged socio-economic family backgrounds would particularly be deterred from child care institutions, although it is presumed that this group could benefit most from attending these institutions already at an early age.[4]

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[1] The new parental leave benefit ('Elterngeld') that came into effect in 2007 is another crucial component of these reforms. (see Bergemann and Riphahn, 2011; Kluve and Tamm, 2012; Geyer et al., 2014; Raute, 2013; or Cygan-Rehm, 2013 for details and evaluations).

[2] For an overview of the child care reforms in the past 10 years, see Spiess (2011).

[3] In the same period, also the supply of afternoon care for school-children has been increased dramatically by the large expansion of all-day schools (see, e.g., Beblo et al., 2005 or Marcus et al., 2013).

[4] For a critical analysis of the 'Betreuungsgeld' from an economic perspective, see Boll and Reich (2012).

In this paper we assess the effects that the two policies introduced on August 1st 2013 have on mothers' employment and the use of formal child care. Both, the legal claim to child care and the new 'Betreuungsgeld' are targeted at families with children in their second and third year of life. Theoretically, we expect the two policies to have effects in opposite directions: The legal claim to child care should increase mothers' labor supply and the use of formal child care. On the contrary, we expect the 'Betreuungsgeld' to diminish the utilization of formal child care and – depending on the availability of informal care – also mothers' labor supply.

Since both reforms were introduced simultaneously, we base our evaluation on a structural model of mothers' labor supply and child care choices. This approach allows us not only to evaluate the overall impact of both policy reforms but also to disentangle the effects of the two reforms. To this end we simulate counterfactual scenarios where only one of the two measures is introduced at a time. We exploit a comprehensive data set constructed from the German Socio-Ecomomic Panel (SOEP) and the relatively new „Familien in Deutschland" (FID). Besides providing a viable sample for the group targeted by the reforms, the FID contains information on access restrictions to public childcare that is crucial for the child care choice which is part of our empirical model and had previously not been available (Wrohlich, 2011).

We find that the joint introduction of the legal claim to formal child care and the 'Betreuungsgeld' has a very small positive effect on the labor supply of mothers with children in the targeted age group with their participation rate increasing by 0.4 percentage points. The use of part-time formal care also rises by 0.5 percentage points. Separate simulations of the two scenarios introducing each reform at a time show that the relatively small overall increase in labor supply can be explained by two effects going in opposite directions. The sole introduction of the legal claim to formal child care would increase mothers' labor supply by 1.3 percentage points. This is largely off-set by the introduction of the 'Betreuungsgeld' that diminishes labor supply by 0.9 percentage points.

The remainder of the paper is organized as follows: After providing some details on the two reforms we discuss the structural model in section 3. We describe the data set in Section 4 and present the empirical results in section 5. The final section concludes.

2 Institutional details

2.1 Child care reforms

West Germany has long been known for its very low availability of formal child care for children below the age of three.[5] In 2002 there were 2 slots available for 100 children in this age group (Table 1). The situation was markedly different in East Germany where child care has been provided for more than a third of all children belonging to this age group. Several laws have been passed that aimed at increasing the supply of publicly subsidized child care for children below three years since 2005.[6] The availability of child care for children in this age group has successively increased in the following years and reached 24 percent in West and 52 percent in East Germany in 2013. A *legal claim* to a subsidized child care slot was introduced for all children after their first birthday in August 2013. This claim is not conditional on income or employment status of their parents.

As Wrohlich (2008) has shown for data from 2002, there has been considerable excess demand with respect to subsidized child care for children under three years in East and West Germany. 24 percent of children in West and 59 percent of children in East Germany were rationed with respect to formal child care in 2002. Note that these numbers are not observed, but derived from the estimated parameters of a partial observability model. Information on the incidence of rationing with respect to child care was not directly available. Since 2010 a new data set 'Familien in Deutschland' (FID) is available that provides explicit information on access restrictions to formal child care.[7] According to these data the share of families with children who are rationed with respect to formal child care was considerably lower in 2010 amounting to 16 percent in West and 14 percent in East Germany.

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[5] Note that for children aged three years a legal claim to formal child care has already been in place since 1996. See Bauernschuster and Schlotter (2013) for more details on this issue.

[6] For a detailed description of the several laws that have been passed concerning the expansion of child care, see Spiess (2011).

[7] A more detailed description of the FID is provided in section 4. The information on the rationing with respect to formal child care is retrieved from the following question: All interviewed parents whose child is not attending formal child care are asked for the reason why that is. All parents that answered "because we did not get a slot" in combination with "because the distance to the next child care center is too far" or "because opening hours are not suitable for us" were considered as being rationed.

Table 1   Availability of subsidized child care for children under three

Year	Children aged 0-2 years	
	East Germany	**West Germany**
2002	0.35	0.02
2006	0.41	0.07
2007	0.42	0.09
2008	0.43	0.12
2009	0.47	0.14
2010	0.49	0.17
2011	0.50	0.20
2012	0.52	0.22
2013	0.52	0.24

Source: Statistisches Bundesamt. Data for the years 2003-2005 not available.

Since data from the FID are not yet available for the year 2013, we do not know whether the legal claim to child care introduced in August 2013 actually eliminated rationing with respect to formal child care for all children in their second and third year of life. However, since there is no information or public debate about a noticeable fraction of parents suing their local communities for not providing a child care slot; the current supply of child care slots apparently satisfies the demand.

Few studies have investigated the causal effect of the availability of child care on mothers' employment. Wrohlich (2011) has analyzed the introduction of a legal claim to child care for all children up to the age of three years conditional on both parents being employed using a structural model. Bauernschuster and Schlotter (2013) use the introduction of a legal claim to child care for children aged three years in 1996 as a quasi-experiment. They show that the availability of child care for children aged 3-6 years had large effects on mothers' employment in the 1990s.

2.2 'Betreuungsgeld'

On the same day the legal claim to child care for children aged 1 year came into effect, the so-called 'Betreuungsgeld' was introduced. This benefit is paid to parents of children in their second and third year of life and amounts to 100 €per month (150 €per month as of August

2014). It is not conditional on the parents' income or employment status. The only prerequisite is that the child is not attending any form of public or publicly subsidized child care.

A similar benefit had been introduced in the federal state of Thuringia already in 2006 ('Thüringisches Landesbetreuungsgeld'). This benefit was more generous as far as the monthly amount was concerned. It was, however, only paid for one year, namely to families of children in the third year of their life. If these children were not attending public or publicly subsidized child care, their families would get a monthly benefit of 150 € Were they attending part-time care, they would still get 75 €[8] In addition, there was a sibling supplement of 50 €per sibling. The effects of this benefit have been evaluated in several studies (e.g. Beninger et al., 2010, Gathmann and Sass, 2012, Müller et al., 2013) that all point to a negative effect on mothers' labor force participation.

3   A structural model of mother's labor supply and child care choices

3.1   The mother's maximization problem

In order to evaluate the effects of the legal claim to a child care slot and the 'Betreuungsgeld', we need to model mothers' labor supply and child care choices simultaneously.[9] Although these are two separate decisions (we observe a large share of mothers with children attending child care are not working; see, e.g., Table 4 below), they are obviously linked. Since we observe that children of working mothers are not always attending formal child care, the model also needs to take informal child care options into account. Our data set does not contain information on the access to informal care, but only on the actual use of such informal care. We therefore have to

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[8] Before introducing the 'Betreuungsgeld', Thuringia had a different benefit called 'Thüringer Landeserziehungsgeld' that was means-tested with respect to household income, however unconditional on the use of child care. For more details on both benefits, see Müller et al. (2013), p. 141.

[9] In our specification the father's labor supply is assumed to be exogenous from the mother's decisions on labor supply and type of child care. Therefore his alternatives are not part of the choice set. This simplification keeps the model tractable, since we model the child care choice for multiple children. Endogenizing the father's labor supply would further inflate the choice set (see sub-section 3.2 below) and complicate the interpretation. The assumption does not have far-reaching consequences, given that the majority of fathers is in full time employment (4 % of fathers work part time, 6 % are non-employed in our sample).

rely on several assumptions concerning the families' access to informal child care (sub-section 3.2). The model also needs to take into account that in the year 2010 (the reference year of our data set) there was still considerable excess demand for subsidized child care. Access restrictions to formal child care are therefore modeled explicitly in our framework.

The model presented here closely follows the approach developed in Wrohlich (2011). Besides a newer and broader data source (section 4), there are two important differences to note: First, the data set that we use here provides direct information on the excess demand for public child care slots. We exploit this information and do not have to impute the rationing probability for each child from a supply/demand model. Second, in this paper we model the demand for child care for up to three children in each family separately. Wrohlich (2011) only considers the demand for child care for the youngest child in each family. This extension is important, as we want to analyze the effects of the two child care policies on child care choices not only for those children immediately targeted by the reforms but also for their siblings.

The model is based on the assumption that the mother maximizes a utility function (u)[10] in the arguments of disposable income (Y^{DISP}), leisure (l), the overall "quality" of her children (operationalized as sum of the "quality" for each child c: $Q = \sum q_c$) and socio-demographic characteristics (D):

(1) $U = u(Y^{DISP}, l, Q; D)$

Leisure time in this model is interpreted as time that is neither spent with market work nor child care. The "quality" of each child c in the family depends on the child care arrangement, that means hours of formal care (f) and hours of informal care (inf):

(2) $q_c = f(f_c, inf_c)$

Note that formal care here is used synonymously to paid care (formal institutional-based child care as well as paid private child care arrangements, e.g. nannies). It is thus assumed that all forms of paid child care influence the mothers' utility in the same way. For simplification, we only consider mothers with one, two or three children in the empirical estimation of the model.

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[10] We leave out sub-scripts referring to the household and particular alternative of the choice set to simplify the notation for this exposition.

The mother's budget constraint, i.e. disposable income (Y^{DISP}), can be written as:

$$(3) \qquad Y^{DISP} = t(h*w, Z) - \Sigma(ec_c * f_c)$$

Where $t(.)$ denotes the tax-transfer function, h hours of market work, w the mother's wage rate and Z income from other sources than the mother's earnings (i.e. the fathers earnings, other income etc.). The term ec_c refers to expected costs of child care per hour for child c and f_c is hours of formal (i.e. paid) child care of child c.

We follow Wrohlich (2011) and use the concept of "expected costs of child care" since it allows us to model access restrictions to subsidized child care through the budget constraint.[11] We assume that rationing only occurs with respect to subsidized child care. Child care on the "private market", i.e. child care by nannies or babysitters, is not restricted. Each family is able to find a person who looks after the children, although at a (potentially quite high) price. We thus calculate "expected costs of child care" as weighted average of parents' fees to subsidized slots and the price of privately organized care. The weights reflect the probability of being restricted with respect to subsidized child care:

$$(4) \qquad ec = c^s * \pi + c^{ns} * (1 - \pi)$$

Expected costs of care per child ec^{12} consist of the parents' fee for a subsidized child care slot c^s and a market (non-subsidized) price for child care charged by a nanny c^{ns}, weighted by the probability to get a child care slot π and $1 - \pi$, respectively (for details see Appendix A 1).

The time constraints of the mother and each child c depend on whether they have access to informal, unpaid care arrangements or not. For mothers and children who do have access to unpaid care arrangements, total time T can be written as:

$$(5) \qquad T = h + m + l = m + min(f_c) + inf$$

This equation states that a mother can allocate her time to three activities consisting of market work h, maternal child care m and pure leisure l. A child has to be cared for over the whole day.

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[11] Only few international studies on labor supply and child care take access restrictions to formal child care into account. In a study for Norway, Kornstad and Thoresen (2007) restrict the choice set of families who report to be rationed with respect to formal child care. Lokshin (2004) models access restrictions to formal child care in Russia in a similar way. This implies that for families who report to be restricted, the option of paid child care is not available at all. Similarly, Del Boca and Vuri (2007) in a study on Italy restrict the choice set of families according to a simulated probability that families are restricted in the access to center-based child care.

[12] The subscript c is omitted for convenience.

Hours of maternal care *m*, formal care *f* and informal care *inf* must therefore add up to the total time per week available *T*. Since we consider families with up to three children who might be in different care arrangements (see sub-section 3.2 below), this has to be taken into account in the time budget of mothers. How the remaining time can be allocated is determined by the child *c* with the smallest amount of formal care (denoted by $min(f_c)$, i.e. the minimum out of the set of *f* for all children). We assume that informal care does not exceed working hours of the mother; in other words, informal care is the residual in the case that working hours of the mother exceed the smallest hours of paid care for all children in the household:

$$(6) \qquad inf = max(h\text{-}min(f_c),0)$$

From equations (5) and (6), it follows that the mother's pure leisure only takes on positive values in the case that the minimum of formal child care hours among all children in the household exceeds the mother's hours of market work ($min(f_c) > h$) For mothers and their children without access to informal care opportunities, the time constraint from equation (5) changes to:

$$(7) \qquad T = h + m + l = m + min(f_c)$$

The time constraint of the mother is the same as in the unrestricted case. The time of the child, however, can now only be spent with the mother (*m*) or in formal, i.e. paid child care (*f*). From this, it follows that the mother's market work and leisure together cannot exceed the hours that the youngest child spends in formal child care ($min(f_c)$).

3.2   The Mother's Choice Set

The choice set for mothers in our model results from all available combinations of working hours categories and different child care arrangements for up to three children in a family. Modeling labor supply and child care choices jointly reflects the inherent link between those decisions: a mother can only choose to work when her child is either in formal or informal care. The detailed treatment of child care options for each child allows capturing heterogeneity in parents' decisions with respect to age and other characteristics of the child. Just looking at the youngest child might not be representative for the behavior of a family. We consider decisions on child care arrangements for up to the three children below the age of 12. Households with more than

three children are excluded from the sample as the number of observations is small relative to the large choice set for those cases.

The number of choice categories depends thus on the number of children. The choice set for a mother of a family with one child consists of 12 alternatives (Table 2). She chooses between 4 categories referring to hours of work: non-employment, marginal employment (between zero and 12 hours per week), part time (between 12 and 20 hours per week) and full time (more than 20 hours per week). We assume that only three categories of formal care exist: no formal care, part time care (<= 20 hours per week) and full time care (> 20 hours per week).

Formal care includes any type of paid child care, e.g. in a crèche, a kindergarten, with a childminder, or a paid nanny at home.[13] Unpaid care assembles all types of unpaid arrangements including care provided by grandparents or other relatives. We do not have detailed information about the exact amount of informal care in the data. Therefore we assume that households that have access to informal care utilize it in the exact amount of the mother's working hours. This means that a mother will not substitute maternal by informal care to increase her leisure time, which is defined as the time the mother spends at home without children. For a total time endowment of 80 hours per week the time in maternal care and leisure results from observed working hours and time in formal care (Table 2).

The model does not rely on a fixed relation of the mother's working time and formal child care. This is important given that by far not all children of employed women are in formal child care. On the other hand, non-employed mothers may nevertheless opt for formal child care as descriptive evidence has shown. Although the decision is modeled jointly, no particular pattern is assumed a priori, but preferences are freely estimated.

Not every mother has the option of informal care at her disposal, though. We use the question in the data whether in addition to formal care arrangements other persons outside of the household (grandparents, friends) take the responsibility of caring for the children on a regular basis. This serves as a proxy for the accessibility of informal care.

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[13] We cannot distinguish between day nurseries and individual nannies coming to the house due to the limited number of observations for these constellations.

Table 2   Choice categories for families with one child

Category	Mother's working hours	Formal care	Informal care	Maternal care	Mother's leisure
1	0	0	0	80	0
2	8	0	8	72	0
3	20	0	20	60	0
4	38	0	38	42	0
5	0	20	0	60	20
6	8	20	0	60	12
7	20	20	0	60	0
8	38	20	18	42	0
9	0	38	0	42	38
10	8	38	0	42	30
11	20	38	0	42	18
12	38	38	0	42	0

Notes: The grey-shaded areas mark households with no access to informal care. The number of choice categories thus depends on the availability of informal care.

Source: Own illustration.

In addition, we assume that children aged 7-12 have in general access to informal care. These older children can in principle care for themselves. For the remaining households informal care is not available. On the other hand, we also observe mothers who state not to use informal care but whose working hours are larger than the hours of formal child care for at least one child. We exclude those observations from the sample because we have no information on how these children spend their time while their mother is at work. Doing so, we lose about 5 per cent of our observations. For the remaining mothers the number of choice categories depends on whether informal care is available or not. For the latter case categories 2, 3, 4 and 8 (shaded in grey in Table 2) cannot be chosen. Mothers with a restricted choice set have only 8 instead of 12 categories at their disposal.

Extending the set of possible alternatives in Table 2 with care categories for a second child without making further assumptions would result in a choice set of 36 alternatives. This specification would allow any possible combination of care arrangements for the younger and the older child. A further extension on the basis of three children would yield a choice set of 108 possibilities (not shown). To reduce the complexity and to avoid a large number of never actually chosen categories we make additional assumptions that a priori limit the flexibility of the mother's choice, but drastically reduce the number of available alternatives. The key assumption here is that the youngest child determines the minimum amount of formal care for all children in

the family.[14] Due to these restrictions the choice set for families with two children is limited to 24, for families with three children to 40 categories (Tables 21 and 22 in Appendix A 2).

Similar to one-child families the total number of alternatives in the choice sets of families with multiple children depends on the availability of informal care. These alternatives are also marked grey in the tables. For households that do not have access to informal care the size of the choice set is reduced from 24 to 13 alternatives and from 40 to 19 alternatives in families with two and three children, respectively. Both types of households are used for the estimation of the empirical discrete choice model.

3.3 Econometric Specification

The parameters of the utility function are estimated using a discrete choice model (Aaberge et al., 1995; van Soest, 1995). Estimation is based on the mothers' utility comparisons of the different choice categories in each period. We assume that the terms of the "child quality" function linearly enter the utility function. The utility function is assumed to have a linear-quadratic form. Thus, the utility index U of mother i for a particular working/child care category k can be stated as follows:

$$(8) \qquad U_{ik} = V_{ik} + \varepsilon_{ik} = X_{ik}{}'\beta + X_{ik}{}'AX_{ik} + \varepsilon_{ik}$$

with $X_{ik} = (\Sigma f_{ik},\ \Sigma inf_{ik},\ l_{ik},\ Y^{DISP}{}_{ik})$. The components of X_{ik} are disposable household income, the mother's leisure time, hours of formal and informal child care, which all vary by household (i) and choice category (k). ε_{ik} is an unobserved error term that is assumed to follow an extreme value distribution and to be independently distributed over households and choice categories. Matrix A contains the coefficients of the quadratic terms and cross terms. Vector β contains the coefficients of the linear terms. Preferences are allowed to vary across mothers through taste shifters of the linear terms of mother's leisure and formal child care. We include socio-demographic characteristics such as age of the mother, living in East Germany, single mother,

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[14] Take the following example: In a family with two children aged three and five. When the younger child is in part time formal care, we assume that the 5-year old is at least in paid part time care. We rule out that the older child is not attending any formal child care. The choice set for the older child is limited to part and full time formal care.

German nationality as well as the age of the youngest child being 0-1, 1-2, 2-3, 3-6 or 7-12 years old as taste shifters.

The model is estimated separately for households with one, two, and three children. These three models are based on three different choice sets as the number of child care choices depends on the number of children resulting in more available combinations overall (see subsection 3.2 above). We thus allow for preference heterogeneity among those different family types. There are no model restrictions as far as the signs of the coefficients for income, leisure or the different care choices are concerned.

4   Data

We construct a sample up of two data-sets, the German Socio-Economic Panel Study (SOEP) and „Familien in Deutschland" (FID), for the year 2010. In addition to the individual and household information needed to estimate the labor supply of mothers, this data set is unique for two main reasons: First, direct questions are asked in the FID related to access restrictions to public or subsidized child care slots. We are thus able to utilize information on the excess demand for public child care from the data. Second, the size of the combined data set produces a reliable sample size for the target group of the family policy reforms of interest.

The SOEP is a representative longitudinal household study that started in 1984 and contains information on roughly 20 000 individuals living in 12 000 households in the year 2010 (Wagner et al., 2007). The relatively new FID data set is an important extension of the microdata on families available in Germany (Schröder et al., 2013). From 2010 on, about 4 000 families with children born in the years 2007-2010 have been interviewed every year. Moreover, there is a subsample on the population of lone mothers, low-income families and families with three or more children. In terms of information and data structure it is very similar and comparable to the SOEP. In particular, the samples from the two data sources can be pooled using integrated weighting factors for SOEP and FID. Adding the FID actually more than triples the sample size of families with children up to age 12 as compared to the SOEP resulting in an estimation sample of 4, 415 households (Table 3).

Table 3   Sample statistics

	SOEP		FiD		SOEP and FiD	
	Number of obs.	Share of total in %	Number of obs.	Share of total in %	Number of obs.	Share of total in %
All Households	9 187		4,309		13,496	
Thereof:						
Families with children up to age 12	1 612	17.5	3,865	89.7	5,477	40.6
Thereof:						
Families with 1, 2 or 3 children	1 592	98.8	3,852	99.7	5,444	99.4
Without missings in child variables	1 528	94.8	3,629	93.9	5,157	94.2
Mothers younger than 65	1 527	94.7	3,629	93.9	5,156	94.1
Mothers not self-employed	1 405	87.2	3,467	89.7	4,872	89.0
Without missing in child care costs / income	1 340	83.1	3,419	88.5	4,759	86.9
Without inconsistency in informal care info	1 299	80.6	3,182	82.3	4,481	81.8
No neg. income / missings in model variables	1 288	79.9	3,127	80.9	4,415	80.6
Thereof: Households affected by the reforms						
Analyzed, i.e. with children aged 1-2	229	14.2	1,122	29.0	1,351	24.7

Source: SOEP 2010; FiD 2010; own calculations; not weighted.

Note that for the empirical results presented in section 5, i.e. the elasticities of labor supply and child care utilization as well as the policy simulations, we restrict the sample to the group of households that is directly affected by the introduction of the legal claim and the 'Betreuungsgeld'. This group consists of families with at least one child between the age of one and three years and is smaller than the estimation sample. The FiD provides a substantial amount of additional observations to guarantee reliable and representative findings for this sub-group of the population (Table 3).

4.1   Sample Characteristics

We estimate the model on the sample of all families with at least one and at most three children. The amount of leisure and the time spent in formal care is interacted with the age of the youngest child. As mentioned we are primarily interested in the effect on mothers with children aged between one and three years in the policy simulations as the reforms considered are targeted on this age bracket. The behavioral effects will also affect younger or older siblings in families with multiple children. Moreover, using a broader sample provides additional variation which helps for the identification of the structural parameters of interest.

All families with one child under the age of 12, about 26 percent of mothers are not working and the child is not attending formal or informal child care (Table 4). About 17 percent of mothers are working, but only using informal child care arrangements for their children. 10 percent of mothers are working and using formal as well as informal care arrangements. On the other hand, 8 percent of mothers use formal child care for their child although they are not working. The distribution across choice categories for families with two and three children are shown in Tables 23 and 24 in the Appendix A 2.

Table 4   Actual and predicted distribution of households across choice categories:
Families with 1 child

Working hours of the mother	Formal child care	Informal child care	Observed share	Predicted share
0	0	0	0.256	0.213
Minijob	0	1-8	0.094	0.047
Part-time	0	9-20	0.073	0.064
Full-time	0	>20	0.006	0.039
0	20	0	0.028	0.064
Minijob	20	0	0.012	0.047
Part-time	20	0	0.023	0.030
Full-time	20	>20	0.100	0.140
0	38	0	0.052	0.045
Minijob	38	0	0.017	0.020
Part-time	38	0	0.133	0.104
Full-time	38	0	0.206	0.187

Source: SOEP 2010; FiD 2010; own calculations.

4.2 Disposable Household Income

Disposable household income, as described in section 3, is the difference between net household income and expected costs of child care. The calculation of this child care costs measure is explained in detail in Appendix A 1. Net household income that depends on the mother's working hours, her gross wage rate and other household income is calculated for the actual choice category and simulated for all alternative choice categories using the tax-transfer micro-

simulation model STSM.[15] This tax-benefit model contains the main features of the German tax and transfer system. The calculation of taxable income is based on information on earnings from dependent employment, income from capital, property rents and other income. For most families, earnings from dependent employment are the most important source of income. The mother's earnings are calculated by multiplying gross hourly wages by the respective working hours in each category, while the father's earnings are taken as exogenous.

For non-working mothers gross wages cannot be observed. Therefore, it is necessary to estimate their expected gross hourly wage. We estimate a Mincer-type wage equation controlling for sample selection, whereby we use non-labor income, health indicators and the presence of young children as exclusion restrictions. The wage estimations are performed separately for East and West Germany (Table 26 in Appendix A 3).

5 Empirical Results

5.1 Estimation Results and Elasticities

The parameter estimates cannot be directly interpreted due to the nonlinear nature of the structural model and the various interaction terms in our specification (Table 27 in Appendix A 4). The consistency of the model in terms of the underlying economic interpretation relies first on positive partial derivatives of the utility function with respect to income. This condition is fulfilled for virtually all observations in the different estimations for families with one, two and three children. The second condition refers to the second order derivative of income which has to be negative (van Soest, 1995); this is also satisfied in our application.

Due to the nonlinearities and the interaction terms in our specification behavioral implications cannot be derived directly from the various models estimates. In order to analyze the predictions of the models in terms of the mothers' reactions to financial incentives related to their labor supply or child care choices, we calculate labor supply elasticities as well as

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[15] For a detailed description of the microsimulation model STSM, see Steiner et al. (2012).

elasticities with respect to the demand for formal child care. The labor supply elasticities are obtained by simulating a one percent increase in the mother's hourly wage rate. We find that in this case, mothers on average increase their participation rate by 0.1 percentage points and their average working hours by 0.5 percent (Table 5). These results are in line with previous findings of the literature (Bargain et al, 2014).

Table 5 *Change in labor force participation rate and average working hours if hourly wages increase by 1 percent*

	Change in participation rate in percentage points	Change in average working hours in percent
Overall	0.11**	0.50*
Mothers with at least one child, <1 y.	0.13	1.05
Mothers with at least one child, 1 y.	0.10*	0.47***
Mothers with at least one child, 2 y.	0.12*	0.51
Mothers with at least one child, 3-6 y.	0.08*	0.42**
Mothers with at least one child, 7-12 y.	0.13**	0.57*
Mothers[1] with low education	0.14	0.93
Mothers[1] with intermediate education	0.10**	0.36
Mothers[1] with higher education	0.13**	0.41*
Mothers[1] with German nationality	0.10**	0.41*
Mothers[1] with foreign nationality	0.16	0.81
Household income in 1st quartile[2]	0.07	0.28
Household income in 2nd quartile[2]	0.18	1.02
Household income in 3rd quartile[2]	0.11**	0.37*
Household income in 4th quartile[2]	0.10*	0.32

Notes: [1] All mothers with a child aged 1or 2 years.
         [2] Household income is measured on the modified OECD equivalent scale.
         *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: SOEP 2010; FiD 2010; own calculations.

Likewise we simulate labor supply elasticities with respect to the costs of formal child care. For an increase of child care costs by 1 percent, the change in the mothers' labor force participation rate is found to be virtually zero for all groups (Table 6). On average, mothers would reduce their working hours by about 0.1 percent.

Table 6   Change in labor force participation rate and average working hours if child care costs increase by 1 percent

	Change in participation rate in percentage points	Change in average working hours in percent
Overall	-0.02	-0.08
Mothers with at least one child, <1 y.	0.11	0.43
Mothers with at least one child, 1 y.	-0.04**	-0.20**
Mothers with at least one child, 2 y.	0.00	0.00
Mothers with at least one child, 3-6 y.	-0.04**	-0.18*
Mothers with at least one child, 7-12 y.	-0.03	-0.13
Mothers[1] with low education	0.03	0.35
Mothers[1] with intermediate education	-0.04*	-0.19
Mothers[1] with higher education	-0.02	-0.24
Mothers[1] with German nationality	-0.03	-0.14
Mothers[1] with foreign nationality	0.03	0.13
Household income in 1st quartile[2]	-0.04	-0.22
Household income in 2nd quartile[2]	0.02	0.34
Household income in 3rd quartile[2]	-0.04***	-0.25**
Household income in 4th quartile[2]	-0.04**	-0.23**

Notes: [1] All mothers with a child aged 1or 2 years.
         [2] Household income is measured on the modified OECD equivalent scale.
         *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: SOEP 2010; FiD 2010; own calculations.

Table 7   Change in child care choices if mother's hourly wage rate increases by 1 percent

	Change of total formal child care in percentage points	Change of part-time formal child care in percentage points	Change of full-time formal child care in percentage points	Change of informal child care in percentage points
Overall[1]	0.04	0.01	0.02	0.05**
Mothers with at least one child, <1 y.	-0.01	0.00	-0.01	0.14
Mothers with at least one child, 1 y.	0.05*	0.02	0.02	0.04
Mothers with at least one child, 2 y.	0.03	0.00	0.03	0.06
Mothers with at least one child, 3-6 y.	0.02*	0.01	0.02*	0.02**
Mothers with at least one child, 7-12 y.	0.03*	0.00*	0.03**	0.02*
Mothers[1] with low education	0.03	0.02	0.01	0.09
Mothers[1] with intermediate education	0.04*	0.01	0.03**	0.04
Mothers[1] with higher education	0.05	0.01	0.04	0.06*
Mothers[1] with German nationality	0.04*	0.01	0.03*	0.04
Mothers[1] with foreign nationality	0.03	0.01	0.02	0.10
Household income in 1st quartile[2]	0.03	0.01	0.02	0.03
Household income in 2nd quartile[2]	0.04	0.01	0.03	0.08
Household income in 3rd quartile[2]	0.04	0.02	0.02	0.04
Household income in 4th quartile[2]	0.05	0.01	0.04	0.05

Notes: [1] All mothers with a child aged 1or 2 years.
         [2] Household income is measured on the modified OECD equivalent scale.
         *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: SOEP 2010; FiD 2010; own calculations.

Labor supply is not the only margin of adjustment within our model. Mothers can also react with respect to their child care choices, when wages or child care costs change. On average, the use of formal child care increases by 0.04 percentage points, if the mother's wage is increased by 1 percent (Table 7). The share of children in informal care arrangements increases on average by 0.05 percentage points.

The behavioral changes in case that child care costs increase by 1 percent are of similar magnitude – albeit in the different direction – as in case of a 1 percent increases in the mother's wage (Table 8). We find the largest reaction for mothers with children aged 1-3 years: If child care costs increase by 1 percent, the use of formal child care of children in this age group decreases by 0.06 percentage points. However, informal care arrangements increase only slightly, if at all.

Table 8   Change in child care choices if child care costs increase by 1 percent

	Change of total formal child care in percentage points	**Change of part-time formal child care** in percentage points	**Change of full-time formal child care** in percentage points	**Change of informal child care** in percentage points
Overall[1]	-0.06**	-0.02**	-0.04***	0.03
Mothers with at least one child, <1 y.	-0.05	-0.01	-0.04	0.13
Mothers with at least one child, 1 y.	-0.06**	-0.02*	-0.03**	0.01
Mothers with at least one child, 2 y.	-0.06*	-0.01*	-0.04**	0.04
Mothers with at least one child, 3-6 y.	-0.05**	0.00**	-0.04***	0.01*
Mothers with at least one child, 7-12 y.	-0.04*	0.00**	-0.05***	0.01*
Mothers[1] with low education	-0.07*	-0.02	-0.05***	0.07
Mothers[1] with intermediate education	-0.05**	-0.02**	-0.04***	0.01
Mothers[1] with higher education	-0.06**	-0.02	-0.04**	0.03**
Mothers[1] with German nationality	-0.06**	-0.02**	-0.04***	0.01
Mothers[1] with foreign nationality	-0.07**	-0.03	-0.04***	0.08
Household income in 1st quartile[2]	-0.06**	-0.02**	-0.05***	0.02
Household income in 2nd quartile[2]	-0.07**	-0.03	-0.04**	0.06
Household income in 3rd quartile[2]	-0.05**	-0.01**	-0.03***	0.01
Household income in 4th quartile[2]	-0.04	-0.01**	-0.03**	0.00

Notes: [1] All mothers with a child aged 1or 2 years.
          [2] Household income is measured on the modified OECD equivalent scale.
          *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: SOEP 2010; FiD 2010; own calculations.

As far as the in-sample fit is concerned, the model performs reasonably well in predicting most choice categories (Table 4 in section 4 for mothers with 1 child, Table 23 in the Appendix A 1 for mothers with 2, and Table 24 in Appendix A 1 for mothers with 3 children). We predict, for

example, that 21 percent of mothers with 1 child choose no participation, no formal and no informal care; the observed share in our sample is 26 percent. The share of mothers working full-time and using full-time child care is 21 percent in the data and 19 percent predicted by our model. We are, on the other hand, under-predicting the share of mothers with marginal employment using informal care (9 percent observed versus 5 percent predicted), while we over-predict the share of mothers working full-time and using full-time informal care (1 percent observed versus 4 percent predicted).

5.2   Policy Simulations

In order to evaluate the effect of the legal claim to a child care slot as well as the 'Betreuungsgeld' we investigate three scenarios: First, we simulate the introduction of the legal claim to a child care slot for all children who are one year or older without the simultaneous introduction of the 'Betreuungsgeld'. For this simulation, we assume that the expected costs of child care are equal to the parents' fees to subsidized slots for all families with children above the age of 1 since the rationing probability is set to zero (see Appendix A 1). As a result household income in choice categories with part-time and full-time care increases, whereas income in all other choice categories stays constant. For families with one child, the average increase in categories with part-time care is about 110 €per month and about 190 €per month in categories with full-time care. In a second simulation, we introduce the 'Betreuungsgeld' amounting to 100 €per month for each child aged 1 or 2 years. This benefit is only added to disposable household income in choice categories where no formal child care is used for children in this age group and only for families who are not receiving any other social transfers. Finally, we simulate the introduction of both reforms at the same time. Note that all three scenarios are simulated for data and legislation of the year 2010. This has to be kept in mind for the interpretation of the results: In all simulations both reforms (separately or jointly, depending on the scenario) are introduced already in 2010.

If only the legal claim to child care had been introduced, we find that mothers with children in the targeted age group would have increased their labor force participation rate by more than 1 percentage point; their average working hours would have increased by almost 6

percent (Table 10, first two columns). Mothers with children aged 1 would react slightly more to this policy than mothers with children aged 2 because the labor force participation and working hours in the latter group are already higher (Table 9). If we differentiate mothers by education level, we find that mothers with low education react more strongly to the introduction of the legal claim (increase in participation rate by almost 2 percentage points) than mothers with higher education (increase in participation rate by 1 percentage point). Again, mothers with low education are more responsive as they have lower participation rates (44 percent) compared to mothers with higher education (51 percent). Moreover, low-educated mothers were facing more access restrictions to formal child care, as our estimations of rationing probabilities have shown (Table 17 in Appendix A 1). We similarly find that the response to the reform is smaller for households with higher overall income: the participation rate increases by 1.5 percentage points for mothers in the lowest quartile versus 0.6 percentage points for mothers in the highest quartile (Table 10). These differences can be attributed to lower participation rates of the lower-income mothers before the introduction of the reforms (Table 9).

Table 9　　　*Labor force participation rates and average working hours of mothers, formal and informal child care participation rates of children before the reforms, households affected*

	Mothers' participation rates in percent	Mothers' average working hours in hours per week	Children's participation rates in formal child care in percent	Children's participation rates in informal child care in percent
Overall[1]	51	11	56	20
All mothers with a child aged 1 year	46	1	50	22
All mothers with a child aged 2 years	54	12	61	18
Mothers[1] with low education	44	8	54	15
Mothers[1] with intermediate education	53	11	57	21
Mothers[1] with higher education	51	11	57	20
Mothers[1] with German nationality	53	11	57	20
Mothers[1] with foreign nationality	40	8	51	15
Household income in 1st quartile[2]	45	8	59	13
Household income in 2nd quartile[2]	44	8	54	13
Household income in 3rd quartile[2]	57	13	54	27
Household income in 4th quartile[2]	61	14	57	30

Notes:　[1] All mothers with a child aged 1or 2 years.
　　　　[2] Household income is measured on the modified OECD equivalent scale.
Source:　SOEP 2010; FiD 2010; own calculations.

Table 10   *Change in labor force participation rate and average working hours – reforms: legal claim, 'Betreuungsgeld', legal claim + 'Betreuungsgeld', households affected*

	Legal claim		'Betreuungsgeld'		Legal claim + 'Betreuungsgeld'	
	Change in participa-tion rate (pp.)	Change in average working hours (pct.)	Change in participa-tion rate (pp.)	Change in average working hours (pct.)	Change in participa-tion rate (pp.)	Change in average working hours (pct.)
Overall[1]	1.25***	5.59***	-0.86***	-2.99***	0.39	2.51
All mothers with a child aged 1 year	1.60***	7.88***	-0.89*	-3.61***	0.67	4.05
All mothers with a child aged 2 years	0.98***	3.95***	-0.83***	-2.53***	0.17	1.42
Mothers[1] with low education	1.79***	8.59***	-0.75	-3.05**	1.02	5.36
Mothers[1] with intermediate education	1.17***	5.02***	-0.82***	-2.79***	0.35	2.16
Mothers[1] with higher education	1.07***	4.37***	-1.10***	-3.48***	-0.02	0.85
Mothers[1] with German nationality	1.14***	4.98***	-0.81**	-2.77***	0.33	2.12
Mothers[1] with foreign nationality	1.87***	8.39***	-1.10***	-3.97***	0.75	4.31
Household income in 1st quartile[2]	1.71***	7.93**	-0.40	-1.32*	1.31***	6.53***
Household income in 2nd quartile[2]	1.67***	6.72***	-1.43***	-5.09***	0.21	1.43
Household income in 3rd quartile[2]	0.78***	3.40***	-1.05***	-3.97***	-0.27	-0.65
Household income in 4th quartile[2]	0.53*	1.92**	-1.04***	-3.07***	-0.50***	-1.16**

Notes: [1] All mothers with a child aged 1or 2 years.
   [2] Household income is measured on the modified OECD equivalent scale.
   pp. – percentage points; pct. – percent.
   *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: SOEP 2010; FiD 2010; own calculations.

As expected, negative labor supply effects, result from the simulation scenario of the isolated introduction of the 'Betreuungsgeld'. The decrease in mothers' labor supply that is a bit smaller in magnitude than the positive effect of the legal claim to child care. Mothers whose youngest child is in the targeted age group would decrease their labor force participation rate by 0.9 percentage points and their working hours by almost 3 percent (Table 10, columns 3 and 4). We do not find that the effects differ significantly by education level of the mothers or by nationality. However, mothers living in households with very low incomes (first quartile of the income distribution) have a much lower response to the introduction of the 'Betreuungsgeld' than mothers living in households with middle or high incomes because the subsidy is withdrawn when families receive other social transfers. This explanation is supported by an additional simulation of a hypothetical scenario where we assume that recipients of other social transfers are additionally granted the 'Betreuungsgeld' (not shown in Table). We find that mothers in families in the bottom quartile of the income distribution decrease their participation rate by 1.6 percentage points instead of 0.4 percentage points in the scenario shown above.

In the simulation that reflects the actual reform from August 2013 where both policies are introduced simultaneously, the overall effect on mothers' labor supply is still positive, albeit much smaller than the effect of the isolated introduction of the legal claim to child care and no longer statistically significant. Mothers with children in the targeted age group would increase their labor force participation rate by 0.4 percent and their working hours by 2.5 percent in this scenario (Table 10, last two columns). The labor supply effect for mothers with low education still amounts to an increase in the participation rate of about one percentage point. For high educated mothers, however, the joint effect of both reforms is zero. The differentiatiation by household income reveals that mothers significantly increase their labor supply in the lowest quartile, whereas mothers at the top of the income distribution work significantly less overall. For this group the negative effect of the 'Betreuungsgeld' dominates the positive effect of the introduction of the legal claim to child care. Mothers in households at the top of the income distribution have higher participation rates before the reform and are on average less affected by access restrictions to public childcare. For these reasons they are less responsive to the legal claim, yet significantly affected by the 'Betreuungsgeld' which is not withdrawn for high income families.

These different reform scenarios also affect the decisions on childrens' care arrangements. If only the legal claim had been introduced, the share of children aged 1 or 2 years attending formal child care would have increased by about 2 percentage points, while the share of children in informal care arrangements would have decreased by roughly 0.6 percentage points (Table 11). In this scenario not only the child care arrangements of those children directly affected by the reform change, but also the choice of child care for their older siblings: The share of children aged 3-6 years (who have siblings aged 1 or 2) attending formal care would have increased by 1.4 percentage points. The share of primary school age children (7-12 years) attending afternoon care would have increased even by 1.8 percentage points. As far as the heterogeneity of effects according to the mother's education is concerned, we find a similar pattern in the child care reaction as in the labor supply responses. Low educated mothers show the largest response. The share of children with low educated mothers attending formal child care increases by almost 3 percentage points, whereas this share among the children with high educated mothers increases by less than 2 percentage points. Again, these differences can be explained by the fact that children with high educated mothers already had much higher

participation rates in formal care before the introduction of the legal claim. Moreover, rationing was less severe for this group than for lower-educated mothers before the introduction of the legal claim (Tables 17 and 18 in Appendix A 1).

Table 11 *Change in child care choices – reform: legal claim, only households affected*

	Change of total formal child care in percentage points	**Change of informal child care** in percentage points
All children aged 1 or 2 years	2.07***	-0.59***
Children aged 1 year	2.34**	-0.54***
Children aged 2 years	1.91***	-0.63***
Children aged 3-6 years with siblings aged 1 or 2 years	1.37**	-0.37**
Children aged 7-12 years with siblings aged 1 or 2 years	1.76***	-0.50***
Children[1] with low educated mothers	2.81**	-0.63**
Children[1] with intermediate educ. mothers	1.96***	-0.61***
Children[1] with high educated mothers	1.70***	-0.53**
Children[1] with German mothers	1.99***	-0.62***
Children[1] with non-German mothers	2.47***	-0.45*
Household income in 1st quartile[2]	2.70***	-0.65**
Household income in 2nd quartile[2]	2.19**	-0.43***
Household income in 3rd quartile[2]	1.55***	-0.66***
Household income in 4th quartile[2]	1.12**	-0.58**

Notes: [1] All mothers with a child aged 1or 2 years.
[2] Household income is measured on the modified OECD equivalent scale.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: SOEP 2010; FiD 2010; own calculations.

In contrast, the introduction of the 'Betreuungsgeld' – without the legal claim to child care coming into effect at the same time – has a negative impact on the use of formal child care. The share of children attending formal care in the targeted age group would significantly decrease by 1.5 percentage points (Table 12). Older children with younger siblings eligible for the 'Betreuungsgeld' would also be attending formal child care to a lower extent (-1.2 percentage points). We do not find large differences in the response to the 'Betreuungsgeld' for children with mothers of different educational backgrounds. There are noticeable differences by household income, though. As mentioned the 'Betreuungsgeld' is not available for families with lower incomes that receive other social benefits. Their behavioral response is thus much smaller as we could see with the labor supply effects. In a hypothetical simulation scenario where we assume that the 'Betreuungsgeld' can be drawn in addition to other social benefits, the effects for children from households in the 1st quartile amounts to -2.3 percentage points (not shown)

whereas in the scenario where this benefit withdrawn should the family receive social transfers, the effect for this group is only -0.65 percentage points (Table 12).

Table 12   Change in child care choices – reform: 'Betreuungsgeld', households affected

	Change of total formal child care in percentage points	**Change of informal child care** in percentage points
All children aged 1 or 2 years	-1.53***	0.47*
Children aged 1 year	-1.39**	0.37*
Children aged 2 years	-1.65***	0.55**
Children aged 3-6 years with siblings aged 1 or 2 years	-1.21**	0.44**
Children aged 7-12 years with siblings aged 1 or 2 years	-1.16***	0.43**
Children[1] with low educated mothers	-1.38**	0.39*
Children[1] with intermediate educ. mothers	-1.57***	0.54
Children[1] with high educated mothers	-1.59***	0.38*
Children[1] with German mothers	-1.52***	0.50*
Children[1] with non-German mothers	-1.62**	0.34
Household income in 1st quartile[2]	-0.88***	0.29*
Household income in 2nd quartile[2]	-1.95***	0.34
Household income in 3rd quartile[2]	-2.09***	0.74*
Household income in 4th quartile[2]	-1.75**	0.62*

Notes: [1] All mothers with a child aged 1or 2 years.
[2] Household income is measured on the modified OECD equivalent scale.
*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: SOEP 2010; FiD 2010; own calculations.

In the simulation scenario where both reforms are introduced at the same time the overall effect of the use of formal child care for children in the targeted age group is still positive and weakly significant amounting to 0.5 percentage points (Table 13). Compared to the sole introduction of the legal claim to child care it is reduced significantly. The increase in the share of children with low educated mothers attending formal child care would still be relatively large (+ 1.4 percentage points). Children from families with incomes in the upper half of the income distribution, however, would attend formal care even to a significantly lesser extent than without the introduction of the two reforms. Similar to the negative labor supply effects of this group and for the same reasons (relatively larger participation rates and lower access restrictions), the negative effect of the 'Betreuungsgeld' dominates the positive effect of the legal claim to child care.

Table 13   *Change in child care choices – reform: legal claim + 'Betreuungsgeld',*
              households affected

	Change of total formal child care in percentage points	Change of informal child care in percentage points
All children aged 1 or 2 years	0.52*	-0.11
Children aged 1 year	0.88**	-0.14
Children aged 2 years	0.27	-0.08
Children aged 3-6 years with siblings aged 1 or 2 years	0.12	0.09*
Children aged 7-12 years with siblings aged 1 or 2 years	0.58	-0.05
Children[1] with low educated mothers	1.39**	-0.22
Children[1] with intermediate educ. mothers	0.36	-0.05
Children[1] with high educated mothers	0.11	-0.14
Children[1] with German mothers	0.45	-0.11
Children[1] with non-German mothers	0.83	-0.09
Household income in 1st quartile[2]	1.80**	-0.36
Household income in 2nd quartile[2]	0.20	-0.08
Household income in 3rd quartile[2]	-0.57**	-0.11
Household income in 4th quartile[2]	-0.64**	0.06

Notes: [1] All mothers with a child aged 1or 2 years.
         [2] Household income is measured on the modified OECD equivalent scale.
         *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: SOEP 2010; FiD 2010; own calculations.

6   Conclusions

Since 2006 several family policy reforms have been implemented in Germany. A principal goal inherent in most of those new policies is to reduce family-related employment interruptions for mothers. The expansion of public or publicly subsidized child care is an important component of this strategy. The legal claim to a publicly subsidized child care slot for children aged after the first birthday which became effective in August 2013 is the latest step in this direction. At exactly the same time, however, a new benefit, the so-called 'Betreuungsgeld' was introduced that counteracts improvements in labor supply and child care incentives, since it is only granted to families whose children do not attend publicly subsidized formal child care. It also targets all children aged one year or older. Both reforms are unconditional on the parents' income or employment status.

From an economic policy perspective, the interesting question is in what way the two reforms affected the behavior of families, in particular mothers' labor supply and their use of formal and informal child care. We presented a structural model of labor supply and child care

choices that is suitable for the evaluation of the joint effect of both reforms. The model was used to decompose the joint impact of both reforms into two separate effects that the policies exerted on mothers' labor supply and child care decisions.

According to our results the combination of both policies in the actual reform from August 2013 leads to a small increase in mothers' labor supply: Mothers whose youngest child is aged 1 to 3 years increase their labor force participation rate by about 0.4 percentage points and their average hours by 2.5 percent. If the legal claim to child care had been introduced without the 'Betreuungsgeld', labor force participation would have increased by more than 1 percentage point and working hours by almost 6 percent. This positive effect is mostly offset by the introduction of the 'Betreuungsgeld' as the simulation of an introduction of this benefit without the legal claim to child care reveals. In this scenario, mothers with children in the targeted age group reduce their labor force participation rate by 0.9 percentage points and their average working hours by almost 3 percent.

Similar patterns can be found as far as the use of formal child care is concerned: A relatively large positive effect results from the introduction of the legal claim. The share of children attending formal child care would increase by more than 2 percentage points. This increase is to a large extent offset by the introduction of the 'Betreuungsgeld'. If the latter had been introduced without the legal claim, the share of children attending formal child care would have decreased by 1.5 percentage points.

A breakdown of the effects by socio-economic subgroups illustrated that for mothers with low education and from low income families the overall effects with respect to labor supply and the utilization of public child care are more positive. These groups are more responsive to the legal claim because they had smaller participation rates before the reform and access restrictions were particularly severe for them. Moreover, 'Betreuungsgeld' cannot be drawn in addition to other social benefits. Negative incentives to work and to send the children to formal child care are thus not effective for families who receive other social benefits. The positive impact by the legal claim is therefore to a lower extent offset by the 'Betreuungsgeld' compared to high educated mothers or mothers from high-income families.

We conclude that the simultaneous introduction of the 'Betreuungsgeld' almost counteracts the positive effects the legal claim to child care has on mothers' employment and

children's child care attendance. The 'Betreuungsgeld' has been primarily motivated by distributional arguments in the political sphere: families (mostly mothers) who are not inclined to use public or publicly subsidized child care should also be rewarded for the care work they provide at home or organize in private settings. On the other hand, such a benefit clearly implies strong disincentives to work for mothers with children aged 1 to 3 years. This holds in particular for mothers in families with medium or higher incomes. It thus weakens previous reforms efforts which were deliberately aimed at reducing the employment interruptions of mothers. However, the conjecture that disadvantaged families would react most strongly to the 'Betreuungsgeld' by having the largest negative labor supply responses and reductions in formal child care cannot be confirmed, as our results for different socio-economic subgroups show. On the contrary, since low-income families often receive other social transfers, they do not (fully) benefit from the 'Betreuungsgeld'. We rather find the largest negative responses among higher-income families.

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Appendix

A 1   Calculation of the expected costs of child care

Following Wrohlich (2011) we argue that since there has still been excess demand for subsidized child care facilities in Germany in the year 2010, we have to calculate a measure of child care costs that takes rationing explicitly into account. Parents' fees to subsidized child care facilities are relatively low in Germany. However, access to these slots has been rationed in many regions. Families who do not have access to subsidized child care have to rely on the private market of nannies or babysitters, which comes at considerably higher costs. We therefore define the expected costs of child care (*ec*) for each child to consist of the parents' fee for a subsidized child care slot c^s and a market (non-subsidized) price for child care charged by a nanny c^{ns}, weighted by the probability to get a child care slot π and *1- π*, respectively:

$$ec = c^s * \pi + c^{ns} * (1 - \pi)$$

For the calculation of the expected costs of child care we need three components: the parents' fees to a subsidized slot (c^s), the costs for child care organized in private arrangements (c^{ns}), and the probability that a child has access to a slot in a subsidized facility (π).

Calculation of parents' fess (c^s)

Unfortunately, information on parents' fees is not available in the SOEP for the year 2010. Information thereon is, however, available in the FID data set. We therefore estimate parents' fees to part-time and full-time care based on information about the age of the child, household income, federal state, family status of the mother and number of siblings. Based on this model, we impute average parents' fees for all families in the SOEP and also for FID families who are currently not using formal child care. Table 14 shows descriptive statistics of the sample that we use for the estimation of parents' fees.

Table 14   Descriptive statistics parents' fees for center-based child care

	Parents' fees for...		
	Part time care children aged 0-6	**Full time care children aged 0-6**	**After school care children aged 7-12**
Mean	71.94	107.46	40.08
Standard deviation	88.80	117.52	96.83
Median	60	80	0
Minimum	0	0	0
Maximum	1,100	1,300	1,200
Observations	1,045	1,180	706

Source: FiD 2010; own calculations.

Table 15   Estimation of parents' fees for center-based child care (Tobit model)

	Part time care children aged 0-6		Full time care children aged 0-6		After school care children aged 7-12	
	Coeff.	**Std.E.**	**Coeff.**	**Std.E.**	**Coeff.**	**Std.E.**
Age 0-2	57.68***	8.20	63.35***	8.14	--	--
Income < 500	-33.18	100.99	-196.77**	84.97	--	--
Income >= 500 &< 1000	-73.48***	27.64	-95.17***	26.32	--	--
Income >= 1000 &< 1500	-75.17***	22.95	-132.46***	21.17	-11.82	27.15
Income >= 1500 &< 2000	-49.74***	17.33	-75.41***	15.17	6.34	21.80
Income >= 2000 &< 2500	-9.55	19.04	8.72	16.98	-52.35**	23.28
Income >= 2500 &< 3000	-25.68***	9.37	-32.93***	10.99	20.60	22.95
Income >= 3000 &< 3500	-18.65*	10.96	-8.04	12.81	-17.68	29.96
Income >= 3500 &< 4000	1.78	13.01	18.59	13.99	67.08**	31.26
Income >= 4000	--	--	--	--	82.82***	24.14
Number of siblings	-15.96***	3.37	-30.50***	3.95	-28.12***	7.41
Mother single	-19.98	13.43	-14.18	10.77	7.84	16.70
Bavaria	15.81	10.54	42.75***	12.77	15.92	21.18
Baden-Wuerttemberg	5.69	10.28	11.72	13.84	3.41	24.13
Berlin	-13.56	24.99	-0.24	15.19	-38.28	31.11
Brandenburg	-47.66	38.17	-5.17	15.85	-131.49***	31.19
Hamburg/Bremen	40.41*	22.82	84.99***	21.14	-22.09	51.66
Hesse	30.84**	13.24	52.55***	16.25	18.83	30.20
Mecklenburg-Western Pomerania	26.30	59.07	10.27	17.23	-67.95*	37.73
Lower Saxony	-6.87	11.21	36.51**	17.15	-38.38	33.05
Rhineland P. / Saarland	-106.08***	15.14	-69.36***	21.99	-56.15	37.87
Saxony	-8.16	23.54	-22.92*	13.58	-69.84***	25.98
Saxony-Anhalt	-5.69	18.12	27.48	20.16	-93.08***	31.01
Schleswig-Holstein	-5.35	17.08	58.33***	21.83	12.40	36.84
Thuringia	-37.47	36.41	30.49*	16.88	-88.82**	35.31
Constant	98.39***	10.38	140.13***	11.73	44.00*	23.02
Observations	1,027		1,171		698	
Not censored	790		985		339	
Left-censored	237		186		359	

Notes: North Rhine-Westphalia is the reference category among the dummies for federal states.
          *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: FiD 2010; own calculations.

We estimated three separate regression models, one for part-time care for children aged 0-6 years, one for full-time care for children of the same age group and one for parents' fees for afternoon care for children aged 6-12 years. We use Tobit models for the estimation of parents' fees since a relatively large share of parents does not have to pay for child care services (Table 15).

Costs for private care arrangements (c^{ns})

Similarly to parents' fees we observe the costs for private care arrangements only for families who use this kind of care. These costs need to be imputed for all other families. Information on costs for private child care arrangements (nannies or babysitters) is also available only in the FID data set. Here we have information on the monthly expenses for this child care arrangement and the hours of private care per week. Since we want to calculate hourly costs, the latter information is important.

Unfortunately, information on monthly expenses *and* hours of care per week for private care arrangements only exist for 31 children in the FID data set. Due to this very limited number of observations it is not reasonable to estimate an econometric model. We therefore choose to impute the average of the hourly costs of those 31 children (which is 6.4 Euro per hour) and assume that all families have access to this sort of care arrangement at this price.

Rationing probability ($1-\pi$)

The FID is the first data set in which parents whose children are not attending formal child care are explicitly asked for the reasons. Among other reasons, parents can tick the following answers (more than one option possible):

- „Because I did not get a slot"
- „Because the distance is too far"
- „Because the opening hours do not fit my needs"

If parents tick one of these three reasons for why their children are not attending formal child care, we can interpret this as rationing. Based on this interpretation we set the probability that a child is rationed $(1-\pi)$ to 1 for all children for whom parents tick one of these options. For all other children (i.e. for children, who are attending formal child care as well as for children who are not attending, whose parents however tick other reasons for this) we set this probability to 0. Table 16 gives an overview on the incidence of formal care attendance and rationing for children in different age groups and regions.

Table 16   *Share of children in formal care and incidence of rationing*

| | Shares in percent | | | | | |
| | Children aged 0-2 | | Children aged 3-6 | | After school care children aged 7-12 | |
	formal care	rationed	formal care	rationed	formal care	rationed
Overall	20.1	15.4	82.2	8. 7	30.5	4.2
East	36.0	13.5	91.3	3.3	60.5	0.6
West	15.7	16.0	80.0	10.0	23.8	5.0

Source: FiD 2010; own calculations (unweighted).

Parents are not asked for the reasons that their children are not attending formal child care in the SOEP. The probability $(1-\pi)$ is thus not directly available for these children. Therefore we estimate the rationing probability depending on age of the child, age, education and employment history of the mother, number and age of siblings as well as regional characteristics in order to impute the rationing probability for all children in our data set.

Table 17 shows the estimation results from a probit model of the probability of being rationed for children aged 0-6 years. Table 18 presents the results for children aged 7-12 years. Based on these models, we predict rationing probabilities for all children in the SOEP and FID data set. Average rationing probabilities by age group and region are reported in Table 19. Based on this model we find, for example, that 19 percent of one year old and 14 percent of two year old children are rationed with respect to formal child care.

Table 17   Probit model: rationing probability children aged 0-6

	Coefficient	**Standard error**
Age< 1 year	-0.0126	0.0796
Age 1-2 years	0.2209***	0.0842
Age 3-6 years	-0.2214**	0.1043
Age mother	-0.0065	0.0063
Mother single	0.1801*	0.0987
Mother German	-0.0465	0.0879
Mother upper secondary education	-0.3071***	0.0963
Mother tertiary education	-0.1045	0.0844
Number siblings 0-2 years	-0.0863	0.0693
Number siblings 3-6 years	-0.1514***	0.0554
Number siblings 7-12 years	-0.0171	0.0557
Number siblings > 12 years	0.0236	0.1110
Bavaria	-0.1293	0.0980
Baden-Wuerttemberg	-0.1094	0.1035
Berlin	-0.4614***	0.1709
Brandenburg	-0.2942	0.2033
Hamburg / Bremen	-0.0035	0.1904
Hesse	-0.0886	0.1247
Mecklenburg-Western Pomerania	-0.3606*	0.2100
Lower Saxony	-0.3476**	0.1369
Rhineland P. / Saarland	-0.2266	0.1533
Saxony	-0.0469	0.1332
Saxony-Anhalt	-0.4618**	0.2125
Schleswig-Holstein	-0.2784	0.1869
Thuringia	-0.4435**	0.2157
Constant	-0.5596**	0.2200
Observations	2,681	
Log-Likelihood	-1,064	

Notes: North Rhine-Westphalia is the reference category among the dummies for federal states.
         *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: FiD 2010; own calculations.

Table 18   Probit model: rationing probability children aged 7-12

	Coefficient	**Standard error**
Age 6-7 years	-0.4084*	0.2436
Age 8-9 years	-0.3023	0.2130
Age mother	-0.0112	0.0191
Mother single	0.1011	0.1975
Mother German	0.6062	0.4243
Mother upper secondary education	-0.1619	0.2366
Mother tertiary education	0.0795	0.2541
Number siblings 0-2 years	-0.1966	0.1830
Number siblings 3-6 years	-0.0239	0.1474
Number siblings 7-12 years	0.1207	0.1273
Number siblings > 12 years	0.0028	0.1771
Bavaria	-0.0749	0.2700
Baden-Wuerttemberg	-0.0098	0.2761
Hamburg / Bremen	1.0606**	0.4393
Hesse	0.5938**	0.2653
Lower Saxony	-0.6098	0.4245
Rhineland P. / Saarland	-0.1777	0.5006
Schleswig-Holstein	0.3417	0.3692
East German States	-0.8371**	0.3980
Constant	-1.6034*	0.8548
Observations	827	
Log-Likelihood	-127	

Notes: North Rhine-Westphalia is the reference category among the dummies for federal states.
            *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: FiD 2010; own calculations.

Table 19   Predicted rationing probabilities by age and region

Age of children in years	**Overall**	**East**	**West**
0	0.14	0.11	0.14
1	0.19	0.16	0.20
2	0.14	0.12	0.14
3	0.10	0.08	0.10
4	0.09	0.08	0.10
5	0.09	0.07	0.10
6	0.07	0.06	0.07
7	0.03	0.01	0.04
8	0.04	0.01	0.05
9	0.04	0.01	0.05
10	0.07	0.01	0.09
11	0.07	0.01	0.08
12	0.07	0.01	0.09

Source: SOEP 2010; FiD 2010; own calculations.

Calculation of the expected costs of child care

In the final step, we bring together all three components of the expected costs of child care. Table 20 summarizes expected costs of child care for part-time and full-time care for children in different age groups and regions. These are the costs (per child) that are deducted from net household income such as indicated in equation (3) (section 3.1).

Table 20   Average expected costs of child care in Euro per month

Age of children in years	Overall	East	West
Children aged 0-2, part time care	180.8	154.2	188.6
Children aged 0-2, full time care	301.3	253.8	315.2
Children aged 3-6, part time care	100.5	86.0	104.3
Children aged 3-6, full time care	182.2	152.2	190.1
Children aged 7-12, afternoon care	85.2	33.8	97.7

Source: SOEP 2010; FiD 2010; own calculations.

A 2 Additional Tables on the Choice Set for Families with 2 and 3 children

Table 21   *Choice categories for families with two children*

Cate-gory	Mother's working hours	Formal care first child	Formal care second child	Informal care first child	Informal care second child	Maternal care first child	Maternal care second child	Mother's leisure
1	0	0	0	0	0	80	80	0
2	8	0	0	8	8	72	72	0
3	20	0	0	20	20	60	60	0
4	38	0	0	38	38	42	42	0
5	0	20	0	0	0	60	80	0
6	8	20	0	0	12	60	72	0
7	20	20	0	0	20	60	60	0
8	38	20	0	18	38	42	42	0
9	0	38	0	0	0	42	80	0
10	8	38	0	0	8	42	72	0
11	20	38	0	18	38	42	60	0
12	38	38	0	0	38	42	42	0
13	0	20	20	0	0	60	60	20
14	8	20	20	0	0	60	60	12
15	20	20	20	0	0	60	60	0
16	38	20	20	18	18	42	42	0
17	0	38	20	0	0	42	60	20
18	8	38	20	0	0	42	60	12
19	20	38	20	0	0	42	60	0
20	38	38	20	0	18	42	42	0
21	0	38	38	0	0	42	42	38
22	8	38	38	0	0	42	42	30
23	20	38	38	0	0	42	42	18
24	38	38	38	0	0	42	42	0

Notes: According to our assumption about available care arrangements for children of different ages, an older child cannot receive less formal child care than any younger sibling.
The grey-shaded areas mark households with no access to informal care. The number of choice categories thus depends on the availability of informal care.
Source: Own illustration.

Table 22 Choice categories for families with three children

Cate-gory	Mo-ther's working hours	Formal care first child	Formal care second child	Formal care third child	In-formal care first child	In-formal care second child	In-formal care third child	Ma-ternal care first child	Ma-ternal care second child	Ma-ternal care third child	Mo-ther's leisure
1	0	0	0	0	0	0	0	80	80	80	0
2	8	0	0	0	8	8	8	72	72	72	0
3	20	0	0	0	20	20	20	60	60	60	0
4	38	0	0	0	38	38	38	42	42	42	0
5	0	20	0	0	0	0	0	60	80	80	0
6	8	20	0	0	0	8	8	60	72	72	0
7	20	20	0	0	0	20	20	60	60	60	0
8	38	20	0	0	18	38	38	42	42	42	0
9	0	38	0	0	0	0	0	42	80	80	0
10	8	38	0	0	0	8	8	42	72	72	0
11	20	38	0	0	0	20	20	42	60	60	0
12	38	38	0	0	0	38	38	42	42	42	0
13	0	20	20	0	0	0	0	60	60	80	0
14	8	20	20	0	0	0	8	60	60	72	0
15	20	20	20	0	0	0	20	60	60	60	0
16	38	20	20	0	18	18	38	42	60	42	0
17	0	38	20	0	0	0	0	42	60	80	0
18	8	38	20	0	0	0	8	42	60	72	0
19	20	38	20	0	0	0	20	42	60	60	0
20	38	38	20	0	0	18	38	42	42	42	0
21	0	38	38	0	0	0	0	42	42	80	0
22	8	38	38	0	0	0	8	42	42	72	0
23	20	38	38	0	0	0	20	42	42	60	0
24	38	38	38	0	0	0	38	42	42	42	0
25	0	20	20	20	0	0	0	60	60	60	20
26	8	20	20	20	0	0	0	60	60	60	12
27	20	20	20	20	0	0	0	60	60	60	0
28	38	20	20	20	18	18	18	60	60	42	0
29	0	38	20	20	0	0	0	42	60	60	20
30	8	38	20	20	0	0	0	42	60	60	12
31	20	38	20	20	0	0	0	42	60	60	0
32	38	38	20	20	0	18	18	42	60	42	0
33	0	38	38	20	0	0	0	42	42	60	20
34	8	38	38	20	0	0	0	42	42	60	12
35	20	38	38	20	0	0	0	42	42	60	0
36	38	38	38	20	0	0	18	42	42	42	0
37	0	38	38	38	0	0	0	42	42	42	38
38	8	38	38	38	0	0	0	42	42	42	30
39	20	38	38	38	0	0	0	42	42	42	18
40	38	38	38	38	0	0	0	42	42	42	0

Notes: According to our assumption about available care arrangements for children of different ages, an older child cannot receive less formal child care than any younger sibling.
The grey-shaded areas mark households with no access to informal care. The number of choice categories thus depends on the availability of informal care.

Source: Own illustration.

Table 23   *Actual and predicted distribution of households across choice categories: Families with 2 children*

Working hours of the mother	Formal child care child 1	Formal child care child 2	Informal child care child 1	Informal child care child 2	Observed share	Predicted share
0	0	0	0	0	0.086	0.071
Minijob	0	0	1-8	1-8	0.197	0.169
Part-time	0	0	9-20	9-20	0.083	0.052
Full-time	0	0	>20	>20	0.111	0.092
0	20	0	0	0	0.017	0.019
Minijob	20	0	0	1-8	0.063	0.065
Part-time	20	0	0	9-20	0.002	0.013
Full-time	20	0	9-20	>20	0.008	0.025
0	38	0	0	0	0.033	0.063
Minijob	38	0	0	1-8	0.002	0.008
Part-time	38	0	9-20	>20	0.003	0.013
Full-time	38	0	0	>20	0.015	0.049
0	20	20	0	0	0.002	0.007
Minijob	20	20	0	0	0.013	0.029
Part-time	20	20	0	0	0.095	0.102
Full-time	20	20	9-20	9-20	0.004	0.004
0	38	20	0	0	0.015	0.009
Minijob	38	20	0	0	0.054	0.043
Part-time	38	20	0	0	0.002	0.003
Full-time	38	20	0	9-20	0.009	0.013
0	38	38	0	0	0.041	0.025
Minijob	38	38	0	0	0.004	0.007
Part-time	38	38	0	0	0.004	0.007
Full-time	38	38	0	0	0.137	0.112

Source: SOEP 2010; FiD 2010; own calculations.

Table 24   *Actual and predicted distribution of households across choice categories:*
             Families with 3 children

Working hours of the mother	Formal child care child 1	Formal child care child 2	Formal child care child 3	Informal child care child 1	Informal child care child 2	Informal child care child 3	Observed share	Predicted share
0	0	0	0	0	0	0	0.009	0.007
Minijob	0	0	0	1-8	1-8	1-8	0.078	0.074
Part-time	0	0	0	9-20	9-20	9-20	0.241	0.200
Full-time	0	0	0	>20	>20	>20	0.098	0.060
0	20	0	0	0	0	0	0.031	0.017
Minijob	20	0	0	0	1-8	1-8	0.022	0.041
Part-time	20	0	0	0	9-20	9-20	0.011	0.007
Full-time	20	0	0	9-20	>20	>20	0.111	0.090
0	38	0	0	0	0	0	0.018	0.016
Minijob	38	0	0	0	1-8	1-8	0.058	0.055
Part-time	38	0	0	0	9-20	9-20	0.000	0.001
Full-time	38	0	0	0	>20	>20	0.000	0.009
0	20	20	0	0	0	0	0.013	0.021
Minijob	20	20	0	0	0	1-8	0.025	0.064
Part-time	20	20	0	0	0	9-20	0.000	0.002
Full-time	20	20	0	9-20	9-20	>20	0.002	0.004
0	38	20	0	0	0	0	0.004	0.006
Minijob	38	20	0	0	0	1-8	0.000	0.008
Part-time	38	20	0	0	0	9-20	0.002	0.014
Full-time	38	20	0	0	9-20	>20	0.009	0.054
0	38	38	0	0	0	0	0.000	0.001
Minijob	38	38	0	0	0	1-8	0.002	0.007
Part-time	38	38	0	0	0	9-20	0.002	0.016
Full-time	38	38	0	0	0	>20	0.054	0.062
0	20	20	20	0	0	0	0.002	0.001
Minijob	20	20	20	0	0	0	0.000	0.002
Part-time	20	20	20	0	0	0	0.011	0.005
Full-time	20	20	20	9-20	9-20	9-20	0.004	0.005
0	38	20	20	0	0	0	0.011	0.011
Minijob	38	20	20	0	0	0	0.060	0.048
Part-time	38	20	20	0	0	0	0.000	0.000
Full-time	38	20	20	0	9-20	9-20	0.000	0.003
0	38	38	20	0	0	0	0.005	0.008
Minijob	38	38	20	0	0	0	0.018	0.011
Part-time	38	38	20	0	0	0	0.000	0.001
Full-time	38	38	20	0	0	9-20	0.002	0.002
0	38	38	38	0	0	0	0.005	0.001
Minijob	38	38	38	0	0	0	0.004	0.004
Part-time	38	38	38	0	0	0	0.002	0.002
Full-time	38	38	38	0	0	0	0.089	0.060

Source: SOEP 2010; FiD 2010; own calculations.

A 3   Wage Estimation

The wage estimations are based on pooled SOEP and FiD data for the years 1999-2009. The sample includes all persons aged 18 to 65 years. Estimations were performed separately for men and women and people in East and West Germany. Using a two-step Heckit model we take the selection into employment into account.

Since there are no observed hourly wages in the SOEP and the FiD, we calculate hourly wages for dependently employed on the basis of the monthly gross income and the monthly working time that are raised in these surveys. We include information on paid and unpaid overtime in order to bring paid working time in line with paid working hours and calculate a precise hourly wage.

Variable definitions are given in Table 25; Table 26 documents the coefficients from the selection and wage equations for the four different estimation samples: men in East, women in East, men in West, and women in West Germany.

Table 25   Variable definitions for the wage regressions

Variable	Definition
lwhr2	Log hourly wage rate in euro (dependent variable)
alter	Age
alter2	Age squared
isced1	Dummy education: no school certificate
isced2	Dummy education: primary school certificate
isced3	Dummy education: secondary school certificate
isced4	Dummy education: higher education entrance qualification
isced5	Dummy education: completed vocational training
isced6	Dummy education: university degree
vollz	Number of years in full time employment
vollz2	Number of years in full time employment, squared and divided by 100
teilz	Number of years in part time employment
teilz2	Number of years in part time employment, squared and divided by 100
exp	Number of years in time employment (part and full time)
exp2	Number of years in time employment (part and full time), squared and divided by 100
ten	Job tenure in years
ten2	Job tenure in years, squared and divided by 100
hkabbau	"Depriciation of human capital": years of being not in employment nor apprenticeship in the last 10 years, i.e. years of unemployment or out of the labor force
erwm	Degree of disability
erwm2	Degree of disability squared and divided by 100
ehe	Dummy: married
child1	Number of children aged < 3 years in household
child2	Number of children aged 3-6 years in household
child3	Number of children aged 6-16 years in household
child4	Number of children aged > 16 years in household
health1	Dummy current health status: very well
health2	Dummy current health status: well
health3	Dummy current health status: sufficient
health4	Dummy current health status: rather bad
health5	Dummy current health status: bad
ysonst	Other household income
deutsch	Dummy: nationality German
xx_dt	Denotes an interaction with a dummy variable that indicates German nationality
size1	Dummy: firm size: self-employed or < 5 employees
size2	Dummy firm size: 5-19 employees
size3	Dummy firm size: 20-199 employees
size4	Dummy firm size: 200-1999 employees
bran1	Dummy industry: Maschinenbau, Elektro, Feinmechanik
bran2	Dummy industry: mining and energy
bran3	Dummy industry: chemical industry, wood, paper
bran4	Dummy industry: clay, stones, earthes, construction
bran5	Dummy industry: iron, steel, heavy industry
bran6	Dummy industry: clothes, food
brn7	Dummy industry: wholsale trade
bran8	Dummy industry: train, post, communication
bran9	Dummy industry: public services
bran10	Dummy industry: private services
bran11	Dummy other industries
bran12	Dummy industry: forestry, agriculture

Table 25 (ctd.)   *Variable definitions for the wage regressions*

Variable	Definition
occ1	Dummy occupation: blue-collar worker
occ2	Dummy occupation: skilled manual worker
occ3	Dummy occupation: foreman, gang leader, foreman
occ4	Dummy occupation: white-collar worker, simple tasks without vocational degree
occ5	Dummy occupation: white-collar worker, simple tasks with vocational degree
occ6	Dummy occupation: white-collar worker, qualified tasks
occ7	Dummy occupation: white-collar worker, highly qualified tasks, leadership role, managerial functions
occ8	Dummy occupation: civil servant, lower-/middle-level service
occ9	Dummy occupation: upper-middle-level and higher service
bula1	Dummy state: Schleswig-Holstein and Hamburg
bula2	Dummy state: Lower Saxony und Bremen
bula3	Dummy state: Nordrhine-Westphalia
bula4	Dummy state: Hesse
bula5	Dummy state: Rhineland-Palatinate, Saarland
bula6	Dummy state: Baden-Württemberg
bula7	Dummy state: Bavaria
bula10	Dummy state: East-Berlin
bula11	Dummy state: Mecklenburg-Western Pomerania
bula12	Dummy state: Brandenburg
bula13	Dummy state: Saxony-Anhalt
bula14	Dummy state: Thuringia
bula15	Dummy state: Saxony
d1999	Dummy year: 1999
d2000	Dummy year: 2000
d2001	Dummy year: 2001
d2002	Dummy year: 2002
d2003	Dummy year: 2003
d2004	Dummy year: 2004
d2005	Dummy year: 2005
d2006	Dummy year: 2006
d2007	Dummy year: 2007
d2008	Dummy year: 2008
d2009	Dummy year: 2009
_cons	Constant

Source: own definitions.

Table 26   *Heckit model, wage regressions*

	Men East		Women East		Men West		Women West	
	Coeff.	Std.E.	Coeff.	Std.E.	Coeff.	Std.E.	Coeff.	Std.E.
Wage								
alter	0.0101**	0.0043	0.0385***	0.0034	0.0118***	0.0019	0.0278***	0.0017
alter2	0.0000	0.0001	-0.0005***	0.0000	0.0000	0.0000	-0.0003***	0.0000
isced2	0.0997	0.0622	0.1750**	0.0766	0.0204	0.0159	0.0584***	0.0202
isced3	0.1000	0.0612	0.1982***	0.0760	0.0113	0.0157	0.0689***	0.0201
isced4	0.1074	0.0644	0.2797***	0.0785	0.0440**	0.0174	0.1048***	0.0214
isced5	0.1210	0.0634	0.2529***	0.0776	0.0466***	0.0170	0.0963***	0.0215
isced6	0.1588**	0.0644	0.3645***	0.0777	0.1322***	0.0177	0.2248***	0.0217
vollz			0.0033*	0.0019			0.0130***	0.0023
vollz2			0.0015	0.0039			-0.0109	0.0068
teilz			0.0068***	0.0024			0.0070**	0.0033
teilz2			-0.0118	0.0081			-0.0248*	0.0149
exp	0.0120***	0.0020			0.0152***	0.0017		
exp2	-0.0389***	0.0050			-0.0470***	0.0040		
ten	0.0092***	0.0013	0.0207***	0.0014	0.0212***	0.0020	0.0249***	0.0028
ten2	-0.0146***	0.0034	-0.0341***	0.0038	-0.0402***	0.0062	-0.0580***	0.0089
hkabbau	-0.1656***	0.0072	-0.0709***	0.0056	-0.0687***	0.0087	-0.0059	0.0065
erwm	-0.0014	0.0009	-0.0009	0.0009	0.0001	0.0004	0.0011**	0.0005
erwm2	0.0023*	0.0013	0.0005	0.0013	-0.0009	0.0006	-0.0020**	0.0008
ausbj_dt					0.0071***	0.0009	0.0116***	0.0010
vollz_dt							-0.0017	0.0023
vollz2_dt							-0.0074	0.0071
teilz_dt							-0.0087***	0.0033
teilz2_dt							0.0306**	0.0151
exp_dt					-0.0021	0.0016		
exp2_dt					0.0064	0.0039		
ten_dt					-0.0100***	0.0021	-0.0116***	0.0028
ten2_dt					0.0272***	0.0064	0.0419***	0.0091
hkabb_dt					-0.0730***	0.0094	-0.0236***	0.0066
size2	-0.1930***	0.0130	-0.1888***	0.0104	-0.1634***	0.0081	-0.1512***	0.0059
size3	-0.0115***	0.0025	-0.0010	0.0031	-0.0176***	0.0017	-0.0033*	0.0019
size4	0.1089***	0.0071	0.1067***	0.0068	0.0590***	0.0028	0.0888***	0.0041
bran2	0.1460***	0.0195	0.1766***	0.0388	0.0413***	0.0120	0.2077***	0.0267
bran3	0.0628***	0.0151	0.0564**	0.0240	0.0713***	0.0060	0.0526***	0.0093
bran4	0.0378***	0.0089	-0.0078	0.0220	-0.0081	0.0056	-0.0315**	0.0156
bran5	0.0390***	0.0125	0.0243	0.0304	0.0642***	0.0059	0.0844***	0.0150
bran6	-0.0976*	0.0517	-0.1109***	0.0366	-0.0916***	0.0211	-0.0921***	0.0208
bran7	-0.0932***	0.0109	-0.0635***	0.0091	-0.0884***	0.0056	-0.0718***	0.0047
bran8	0.0050	0.0119	0.0381**	0.0178	-0.0343***	0.0062	0.0550***	0.0110
bran9	0.0149	0.0073	0.0527***	0.0043	-0.0371***	0.0041	0.0249***	0.0029
bran10	-0.0330***	0.0106	-0.0411***	0.0087	-0.0015	0.0052	-0.0101**	0.0048
bran11	-0.0635***	0.0135	-0.0982***	0.0122	-0.0404***	0.0071	-0.0620***	0.0076
bran12	-0.2364***	0.0189	-0.2409***	0.0298	-0.1544***	0.0164	-0.1773***	0.0283
occ2	-0.1206***	0.0060	-0.1517***	0.0121	-0.0935***	0.0038	-0.1123***	0.0121
occ3	0.0069	0.0124	0.0241	0.0417	-0.0074	0.0068	-0.0527*	0.0288
occ4	-0.2195***	0.0216	-0.1859***	0.0145	-0.3065***	0.0120	-0.2124***	0.0071
occ5	-0.0995***	0.0147	-0.0800***	0.0084	-0.1581***	0.0089	-0.0595***	0.0052
occ6	0.0518***	0.0093	0.0599***	0.0047	0.0318***	0.0038	0.1020***	0.0029
occ7	0.3386***	0.0092	0.3254***	0.0098	0.2935***	0.0040	0.2985***	0.0071
occ8	-0.0017	0.0241	0.1434***	0.0277	-0.1148***	0.0100	0.1162***	0.0161
occ9	0.3176***	0.0185	0.2920***	0.0202	0.1133***	0.0079	0.3055***	0.0103
bula2					0.0120	0.0157	0.0609***	0.0180
bula3					-0.0038	0.0101	-0.0117	0.0120
bula4					-0.0453**	0.0202	-0.0349	0.0223
bula5					0.0131	0.0094	0.0090	0.0111
bula6					0.0407***	0.0104	0.0392***	0.0123
bula7					-0.0047	0.0112	0.0010	0.0133
bula8					0.0543***	0.0098	0.0597***	0.0116
bula9					0.0129	0.0097	0.0266**	0.0113
bula10					0.0115	0.0159	-0.0253	0.0190
bula12	-0.0996***	0.0128	-0.1161***	0.0130				
bula13	-0.1062***	0.0147	-0.1053***	0.0147				
bula14	-0.1628***	0.0112	-0.1766***	0.0116				
bula15	-0.1588***	0.0125	-0.1857***	0.0130				
bula16	-0.1585***	0.0124	-0.1829***	0.0131				

Table 26 (ctd.) Heckit model, wage regressions

	Men East		Women East		Men West		Women West	
	Coeff.	Std.E.	Coeff.	Std.E.	Coeff.	Std.E.	Coeff.	Std.E.
d2000	0.0227	0.0147	0.0387**	0.0159	0.0058	0.0075	0.0150	0.0096
d2001	0.0700***	0.0146	0.0662***	0.0156	0.0661***	0.0073	0.0693***	0.0092
d2002	0.0953***	0.0152	0.0820***	0.0161	0.1015***	0.0076	0.0880***	0.0095
d2003	0.1140***	0.0151	0.1065***	0.0159	0.0939***	0.0076	0.0973***	0.0095
d2004	0.1068***	0.0156	0.0790***	0.0164	0.0928***	0.0078	0.0926***	0.0097
d2005	0.1076***	0.0157	0.0848***	0.0164	0.0668***	0.0078	0.0683***	0.0096
d2006	0.0947***	0.0154	0.0676***	0.0161	0.0748***	0.0077	0.0824***	0.0095
d2007	0.1171***	0.0158	0.0893***	0.0166	0.0833***	0.0080	0.0832***	0.0098
d2008	0.1214***	0.0154	0.1119***	0.0162	0.0866***	0.0078	0.1069***	0.0095
d2009	0.1220***	0.0148	0.0963***	0.0155	0.0955***	0.0072	0.0844***	0.0090
_cons	1.9945***	0.0993	1.2287***	0.1003	2.0142***	0.0412	1.4397***	0.0411
Selection								
alter	0.1474***	0.0132	0.0777***	0.0103	0.1431***	0.0077	0.0668***	0.0051
alter2	-0.0030***	0.0002	-0.0022***	0.0001	-0.0024***	0.0001	-0.0016***	0.0001
isced2	0.8702***	0.1256	0.5663***	0.1337	0.4059***	0.0494	0.1324***	0.0449
isced3	1.2100***	0.1196	0.9382***	0.1297	0.6848***	0.0469	0.3878***	0.0439
isced4	1.7370***	0.1369	1.4724***	0.1391	0.9710***	0.0585	0.6481***	0.0482
isced5	1.8239***	0.1297	1.5174***	0.1363	1.0537***	0.0579	0.5610***	0.0497
isced6	2.4036***	0.1247	1.7620***	0.1314	1.4603***	0.0524	0.9025***	0.0463
vollz			0.0849***	0.0047	0.0849***	0.0047	0.0691***	0.0023
vollz2			0.0452***	0.0124	0.0452***	0.0124	0.0149***	0.0070
teilz			0.1753***	0.0064	0.1753***	0.0064	0.2094***	0.0030
teilz2			-0.2328***	0.0292	-0.2328***	0.0292	-0.4529***	0.0119
exp	0.0412***	0.0064			0.0294***	0.0036		
exp2	0.1474***	0.0160			0.0762***	0.0091		
ehe	0.5465***	0.0298	0.1891***	0.0263	0.3422***	0.0218	-0.2269***	0.0163
child1	-0.2047***	0.0576	-1.3268***	0.0470	-0.1204***	0.0422	-1.6944***	0.0277
child2	0.0211	0.0685	-0.6310***	0.0515	-0.1374***	0.0441	-1.1294***	0.0269
child3	-0.0932**	0.0370	-0.3431***	0.0337	-0.1379***	0.0247	-0.6777***	0.0184
child4	-0.0722	0.0478	-0.1947***	0.0429	-0.0999***	0.0321	-0.2698***	0.0246
erwm	-0.0176***	0.0030	0.0012	0.0030	-0.0048***	0.0016	0.0023	0.0016
erwm2	0.0256***	0.0044	0.0024	0.0043	0.0019	0.0021	-0.0067***	0.0023
health2	0.1201**	0.0478	0.0361	0.0422	-0.0088	0.0309	0.0033	0.0218
health3	-0.0078	0.0507	-0.1090**	0.0443	-0.1863***	0.0329	-0.0521***	0.0232
health4	-0.4063***	0.0601	-0.3568***	0.0523	-0.5769***	0.0379	-0.1993***	0.0282
health5	-0.8346***	0.0934	-0.6670***	0.0883	-1.1229***	0.0555	-0.7291***	0.0502
ysonst	-0.0003***	0.0000	-0.0001***	0.0000	-0.0002***	0.0000	-0.0001***	0.0000
deutsch					0.4875***	0.0253	0.2444***	0.0208
bula2					0.0257	0.0751	0.0477	0.0592
bula3					0.1340***	0.0494	-0.0019	0.0373
bula4					-0.1522*	0.0904	0.0786	0.0735
bula5					0.0729	0.0453	-0.0727**	0.0343
bula6					0.1400***	0.0510	0.0233	0.0385
bula7					0.0896	0.0552	-0.1162***	0.0409
bula8					0.3851***	0.0490	-0.0161	0.0360
bula9					0.2146***	0.0472	0.0296	0.0352
bula11					0.1208	0.0782	-0.1035*	0.0573
bula12	-0.3564***	0.0475	-0.1222***	0.0428				
bula13	-0.3382***	0.0548	-0.1360***	0.0482				
bula14	-0.2726***	0.0434	-0.1532***	0.0386				
bula15	-0.2429***	0.0480	-0.2469***	0.0424				
bula16	-0.1445***	0.0480	-0.1993***	0.0422				
d2000	-0.0714	0.0554	-0.0521	0.0505	-0.1088***	0.0406	-0.0912***	0.0287
d2001	0.0209	0.0550	0.0992*	0.0505	-0.0081	0.0395	0.0686**	0.0280
d2002	-0.1176	0.0555	-0.0400	0.0513	-0.1786***	0.0400	-0.0576**	0.0288
d2003	-0.0174	0.0561	0.0756	0.0513	-0.1592***	0.0401	-0.0341	0.0290
d2004	-0.0546	0.0573	-0.0129	0.0522	-0.1956***	0.0405	-0.0368	0.0298
d2005	-0.0406	0.0574	0.0463	0.0526	-0.2051***	0.0400	-0.0847***	0.0293
d2006	0.1566***	0.0590	0.1872***	0.0536	-0.0049	0.0425	0.0149	0.0300
d2007	0.2440***	0.0616	0.2184***	0.0555	0.0157	0.0441	0.0239	0.0312
d2008	0.3891***	0.0609	0.3912***	0.0549	0.0279	0.0423	0.1381***	0.0307
d2009	0.4037***	0.0578	0.2824***	0.0485	-0.1081***	0.0376	0.0296	0.0264
_cons	-2.1597***	0.2577	-1.0414	0.2232	-2.0378***	0.1515	-0.2931***	0.1104
Mills λ	-0.0607***	0.0214	0.0649***	0.0211	-0.1158***	0.0119	0.0478***	0.0099
Obs.	16512		18354		49059		58103	

Notes: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: SOEP 2010; FiD 2010; own calculations.

A 4   Estimation results of the conditional logit model

Table 27   Conditional logit model: labor supply and child care choice

	Family with 1 child		Family with 2 children		Family with 3 children	
	Coeff.	Std.E.	Coeff.	Std.E.	Coeff.	Std.E.
Net income	2.1296***	0.2698	2.5861***	0.2650	33.1178***	5.7578
Net income squared	-0.0615**	0.0268	-0.1211***	0.0205	-17.1902***	3.9833
Leisure	-7.5829***	1.6875	-5.3991***	1.7390	7.4997**	3.8134
Leisure squared	20.9320***	2.2039	16.9530***	2.0263	1.8844	3.6152
Formal care 1. child	9.1228***	1.1494	0.6743	1.7716	13.0013**	5.3137
Formal care 1. child squared	-24.6798***	1.8135	-41.0758***	2.3880	-59.2132***	7.2111
Formal care 2. child			8.5387***	1.5936	1.5470	4.1833
Formal care 2. child squared			13.4062***	2.2612	-1.7574	3.6786
Formal care 3. child					6.5303**	3.2995
Formal care 3. child squared					18.7810***	4.0619
Informal care	-3.0504***	0.8769	-9.3869***	1.6412	-5.5265	9.9732
Informal care squared	-6.6355**	2.6925	2.9095	6.2744	-14.5858	53.1697
Leisure x age	0.0480	0.0332	0.0482	0.0375	-0.0616	0.0843
Leisure x youngest child 0-1 years	1.7360	3.0903	13.0938***	1.6971	7.6503***	2.6870
Leisure x youngest child 1-2 years	1.5763	1.1443	4.0313***	0.9400	1.6051	2.0140
Leisure x youngest child 2-3 years	0.5953	0.8741	2.8785***	0.8049	2.3038	1.9245
Leisure x youngest child 7-12 years [1]	-0.2768	0.5532	1.8538***	0.6417	1.4323	1.5018
Leisure x East	-2.7878***	0.4908	-3.1389***	0.5708	-3.0088**	1.2936
Leisure x single	0.5901	0.6725	-0.6135	0.7992	-0.6979	2.1254
Form. care 1. child x young. child 0-1 y.	-28.2571***	1.8821	-0.7174	2.0789	1.5249	4.3007
Form. care 1. child x young. child 1-2 y.	-12.8466***	0.8759	8.7905***	1.5689	4.9805	3.9706
Form. care 1. child x young. child 2-3 y.	-6.5399***	0.7453	12.2101***	1.5506	4.3030	3.9859
Form. care 1. child x young. child 7-12 y.[1]	1.9669***	0.6554	6.3860***	1.5611	1.2122	3.8946
Form. care 1. child x East	10.1599***	0.6643	8.5198***	0.9737	10.4063***	2.3516
Form. care 1. child x German	0.3532	0.7985	1.0899	0.8238	0.0033	2.0220
Form. care 1. child x single	1.3705**	0.5304	1.9307**	0.9601	0.8403	2.5636
Form. care 2. child x youngest child 0-1 y.			-29.8206***	1.8742	4.4914	3.8510
Form. care 2. child x youngest child 1-2 y.			-19.9535***	1.3329	5.1760	3.9194
Form. care 2. child x youngest child 2-3 y.			-16.0049***	1.2573	7.2692	3.9823
Form. care 2. child x young. child 7-12 y.[1]			-5.9280***	1.3293	5.5946	4.2182
Form. care 2. child x East			5.7096***	0.7646	-0.9901	1.4708
Form. care 2. child x German			0.4162	0.9318	-0.3913	1.5599
Form. care 2. child x single			0.3511	0.6893	-1.7404	1.4834
Form. care 3. child x youngest child 0-1 y.					-27.0577***	3.4893
Form. care 3. child x youngest child 1-2 y.					-19.2898***	2.9957
Form. care 3. child x youngest child 2-3 y.					-17.4378***	2.9043
Form. care 3. child x young. child 7-12 y.[1]					-6.8896**	2.9150
Form. care 3. child x East					3.3765**	1.3562
Form. care 3. child x German					0.3032	1.5092
Form. care 3. child x single					1.0147	1.3404
Net income x leisure	-0.0853	0.1892	-0.1937	0.1565	-0.7407**	0.3191
Net income x single	0.3477	0.2305	-0.5308**	0.2404	-1.5674**	0.7805
Observations		22,944		30467		13,957
Log Likelihood		-3,557		-3484		-1,262
LR Chi²		3,055		2,596		964
Positive 1st Derivatives (in %)						
Income	99.9		99.4		98.9	
Leisure	21.8		65.6		100.0	
Formal child care 1st child	36.7		10.0		4.5	
2nd child			53.5		95.8	
3rd child					44.0	
Informal child care	0.0		0.0		0.0	

Notes: [1] reference category: interaction with youngest child 4-6 years.

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: SOEP 2010; FiD 2010; own calculations.