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Conference Paper

Two steps forward - one step back? Evaluating recent child care policies in Germany

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2014: Evidenzbasierte Wirtschaftspolitik
- Session: Child Care, No. C02-V2

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Wrohlich, Katharina; Müller, Kai-Uwe (2014) : Two steps forward - one step back? Evaluating recent child care policies in Germany, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2014: Evidenzbasierte Wirtschaftspolitik - Session: Child Care, No. C02-V2, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

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Two steps forward – one step back?

Evaluating recent child care policies in Germany

Kai-Uwe Müller* and Katharina Wrohlich**

(This version: March 1st 2014)

PRELIMINARY and INCOMPLETE!
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Abstract: In August 2013, two child care reforms have come into effect at the same time: First, a legal claim to formal child care has been introduced for all children aged one year or older. Second, a new benefit called ‘Betreuungsgeld’ has been introduced 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 both are unconditional on the parents’ income or employment status. In this paper, we present a structural model of mothers’ labor supply and child care choices that can be used to evaluate the joint effect of both reforms as well as the isolated effects if the two reforms had been introduced only one at a time. Our results show that the joint effect of both reforms is small but positive as far as mother’s labor supply and the use of full-time formal care is concerned. The use of part-time child care is slightly reduced, however. This joint effect is the result of a relatively large positive impact on mothers’ labor supply as well as the use of formal child care of the legal claim for child care that is largely offset by a negative effect on both outcomes resulting from the introduction of the ‘Betreuungsgeld’.

Key-Words: family policy, labor supply, child care, policy evaluation, structural model

JEL: J22, J18, H31

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1 Introduction

Family policy has been a dynamic field in recent years in Germany. Given that to this day Germany ranks relatively low on indicators such as fertility, mothers' labor force participation, child poverty as well as child well-being, policy makers introduced several reforms in the middle of the 2000s. These measures were explicitly aimed at reducing the relatively long work interruptions of mothers and increasing the number of children who attend formal child care. A more implicit goal inherent in those policies was to increase fertility.¹ One element was the reform of parental leave benefits ("Elterngeld") in 2007, where a means-tested benefit for families with children aged 0-2 years was replaced by a transfer tied to prior-to-birth earnings and paid for a much shorter period of time.² Since 2005 several child care reforms have complemented the new parental leave benefit.³ These reforms have successively increased the availability of subsidized child care for children below three years. While 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 29 slots (24 in West and 52 in East Germany). From August 2013 on, every child has a legal claim for a slot in a publicly subsidized child care institution after his or her first birthday.⁴

Both, the new parental leave benefit as well as increasing child care availability, clearly improved the incentives for mothers to return to work in the first three years after a child is born. In August 2013, however, at the same time as the legal claim for child care came into effect, a new benefit was introduced that is paid to parents with children aged 13-24 months who are not using public or publicly subsidized child care ('Betreuungsgeld'). This benefit has been motivated by distributive goals. Families who do not use publicly subsidized child care should also benefit from care subsidies in the form of cash. The incentives of this benefit counteract the positive work stimulus created by the legal claim to a child care slot. The benefit has thus been

¹ See, e.g. Ristau (2005).

² For more details and evaluations of this reform, see e.g. Bergemann and Riphahn (2011), Kluge and Tamm (2012), Geyer et al. (2014), Raute (2013) or Cygan-Rehm (2013).

³ For an overview of the child care reforms in the past 10 years, see Spiess (2011).

⁴ 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 Felfe et al., 2013).

criticized (i) for discouraging mothers to return to work, and (ii) 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.⁵

In this paper we want to assess the effects that the two policies introduced on August 1st 2013 induce on mothers' employment and the use of formal child care. Both, the legal claim for child care and the new 'Betreuungsgeld' are targeted at the same group, namely 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 for child care should increase mothers' labor supply and the use of formal child care. On the contrary, we expect the 'Betreuungsgeld' to have negative effects on the utilization of formal child care and – depending on the availability of informal care – also on the mothers' decision to supply labor.

Since both reforms have been introduced at the same time, we base our evaluation on a structural model of mothers' labor supply and child care choices. This approach allows us not only to evaluate both policy reforms at the same time, but also to disentangle the effects of the two reforms by simulating counterfactual scenarios, in which only one of the two measures is introduced at a time. Based on this simulation exercise, we find that the joint introduction of the legal claim of 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 (the labor force participation rate increases by 0.4 percentage points), a negative effect on the use of part-time formal care (minus 1 percentage point) and a positive effect on the use of full-time formal care (plus 0.8 percentage points). Separate simulations of the two scenarios in which each reform is introduced at a time shows that the relatively small positive labor supply effect overall is a combination of a comparatively large positive effect resulting from the introduction of the legal claim for formal child care (plus 2.3 percentage points), that is largely off-set by the negative effect of the introduction of the 'Betreuungsgeld' (minus 1.8 percentage points).

⁵ For a critical analysis of the 'Betreuungsgeld' from an economic perspective, see Boll and Reich (2012).

The remainder of the paper is organized as follows: In the next section, we give some more details on the two reforms that we are analyzing in this paper. Section 3 describes the structural model, while section 4 provides a description of the data. The empirical results are presented in section 5, section 6 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.⁶ In 2002 there were 2 slots available for 100 children in this age group (Table 1). In East Germany, the situation was different, and child care has been provided for more than a third of all children belonging to this age group. Beginning in 2005, several laws have been passed that aimed at increasing the supply of publicly subsidized child care for children below three years.⁷ In the following years, the availability of child care for children in this age group has been successively increased and has reached 24 percent in West and 52 percent in East Germany in the year 2013. In August 2013 a *legal claim* for a subsidized child care slot was introduced for all children after their first birthday. 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 the year 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. The data set “Familien in Deutschland” (FID) that is used here provides explicit information on

⁶ Note that for children aged three years, there has been a legal claim for formal child care already since 1996. See Bauernschuster and Schlotter (2013) for more details on this issue.

⁷For a detailed description of the several laws that have been passed concerning the expansion of child care, see Spiess (2011).

access restrictions to formal child care.⁸ According to this data the share of 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.

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 for 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 communities for not providing a child care slot, the current supply of child care slots apparently all in all satisfies the demand.

2.2 ‘Betreuungsgeld’

On the same day the legal claim for child care for children aged 1 year came into effect, the so-called ‘Betreuungsgeld’ has been introduced. This benefit is paid to parents of children in their

⁸ 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 the child is not attending. If parents answered “because we did not get a slot”, “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.

second and third year of life and amounts to 100 Euro per month (150 Euro per month from August 2014 on). 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 has 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, however it was paid only 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, these families would get a monthly benefit of 150 Euro, if they were attending part-time care, they would still get 75 Euro.⁹In addition, there was a sibling supplement of 50 Euro 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 for a child care slot and the 'Betreuungsgeld', we need to model mothers' labor supply and child care choices simultaneously.¹⁰ Although these are two separate decisions (we observe in the data that 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. This is particularly difficult

⁹ 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.

¹⁰ 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 in employment works full time (4 % of fathers work part time, 6 % are non-employed in our sample).

because we do not have information on the access to informal care in the data, but only on the actual use of such informal care. We therefore have to rely on several assumptions concerning which families have access to informal child care. We will provide more details on these assumptions below (see sub-section 3.2). Finally, the model needs to take into account that in the year 2010 (the reference year of the data set we use) there was still a considerable excess demand for subsidized child care. Access restrictions to formal child care therefore have to be explicitly taken into account.

The model presented here closely follows the approach developed in Wrohlich (2011). Besides a newer and broader data source (see section **Fehler! Verweisquelle konnte nicht gefunden werden.** below), 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 places. We can 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 overall effects of the two child care policies on labor supply and child care choices, not only on those children immediately targeted by the reforms, but also on older siblings.

The model is based on the assumption that the mother maximizes a utility function (u)¹¹ in the arguments of disposable income (Y^{DISP}), leisure (l) and the overall “quality” of her children (operationalized as sum of the “quality” for each child c : $Q = \sum q_c$ s) as well as socio-demographic characteristics (D), i.e.

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

Leisure time in this model is interpreted as time that is not spent with market work or child care. The “quality” of each child c in the family depends on the child care arrangement, that means hours of maternal care (m), hours of formal care (f) and hours of informal care (inf):

$$(2) \quad q_c = f(m_c, f_c, inf_c)$$

¹¹ We leave out sub-scripts referring to the household and particular alternative of the choice set to simplify the notation for this exposition.

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 implicitly assumed that all forms of paid child care have the same quality and 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.

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

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

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 via the budget constraint.¹² We assume that rationing only occurs with respect to subsidized child care, not with child care on the "private market", i.e. child care by nannies or babysitters. This follows the argument that at some (potentially very high) price, each family could find a person who would look after the children. "Expected costs of childcare" are thus calculated as weighted average of parents' fees to subsidized slots and the price of privately organized care, where the weights are chosen to reflect the probability of being restricted with respect to subsidized child care.

Expected costs of care per child ec^{13} 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.

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

¹² 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.

¹³ The subscript c is omitted for convenience.

We explain in the Appendix how the components c^s , c^{ns} and π in equation (4) are computed for each child.

The time constraints of mothers and each child c depends 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:

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

This equation states that a mother can allocate her time to three activities, which are market work h , maternal child care m and pure leisure l . A child has to be cared for over the whole day, therefore hours of maternal care m , formal care f and informal care inf must add up to T which is the total time per week available. Since we consider families with up to three children and these children might be in different care arrangements (see sub-section 3.2 below), we have to take this 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:

$$(6) \quad inf = \max(h - \min(f_c), 0)$$

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 market work hours, i.e. when $\min(f_c) > h$. For mothers and their children without access to informal care opportunities, the time constraint from equation 5 changes to

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

The time constraint of the mother is the same as in the unrestricted case, however the time of the child 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 childcare arrangements for up to three children in a family. Modeling labor supply and child choices jointly reflects the inherent link between those decisions: a mother can only choose to work when her little kid 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. This model considers decisions on childcare arrangements for up to the three children below the age of 12. We exclude households with more than three children from the sample. The choice set would be very large for this group and given the limited number of observations such a complex model could hardly be identified.

The number of choice categories depends thus on the number of children. The 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.¹⁴ 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).

¹⁴ Due to the limited number of observations we cannot distinguish between day nurseries and individual nannies coming to the house.

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 childcare 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. If households are affirmative, we assume that informal care is available to them. 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. Note that we use an indicator referring to the utilization, not the availability of informal child care. Restrictions to informal care are thus overestimated.

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.

On the other hand, we also observe mothers that state not to have access to informal care whose working hours are larger than amount of formal child care for at least on child. We exclude those

observations from the sample because we have no information on the source; 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 flexibility of the mother's choice and drastically reduce the number of alternatives in the choice set. The key assumption here is that the youngest child determines the minimum amount of formal care among all children in the family. Take the following example: in a family with two children aged three and five 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 case where the older child is maternal care at home. For the older kid the choice set is limited to part and full time formal care. Due to these restrictions the choice set for families with two children is limited to 24, for families with three children to 40 categories (see Tables 20 and 21 in the Appendix).

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 again 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. 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:

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

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. As taste shifters we include socio-demographic characteristics such as age of the mother, living in East Germany, single mother, 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.

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 childcare 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. Note that we do not restrict the model as far as the signs of the coefficients for income, leisure or the different care choices are concerned.

4 Data

We use a joint sample from two data-sets, the German Socio-Economic Panel Study (SOEP) and „Familien in Deutschland“ (FID) for the year 2010. The SOEP is a representative longitudinal household study that started in 1984 and contained 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 micro-data 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 SOEP (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	
<i>Thereof:</i>						
Families with children up to age 12	1,612	17.5	3,865	89.7	5,477	40.6
<i>Thereof:</i>						
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

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

4.1 Sample Characteristics

We estimate the model on the sample of all families with at least one and at most three children. We interact the amount of leisure and the time spent in formal care with the age of the youngest child. In the policy simulations we are primarily interested in the effect on mothers with children aged 2 and 3 years, as the considered reforms are focused 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 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 and Table 23 in the Appendix.

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 the Appendix. 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 microsimulation 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

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

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 and are reported in the Appendix.

5 Empirical Results

5.1 Estimation Results and Elasticities

Estimation results in terms of coefficients and standard errors for three different choice models are presented in Table 24 in the Appendix. Due to large number of interaction terms, coefficients cannot be interpreted easily. In the following, we therefore report results of the model in terms of (i) derivatives of the utility function with respect to income, leisure, formal and informal care as, (ii) elasticities that are simulated based on the estimated preferences and (iii) in-sample model fit.

To be completed: Derivatives of the utility function with respect to income, leisure, formal and informal child care

In order to analyze the predictions of the model in terms of the behavioral reaction to financial incentives with respect to labor supply and child care choices, we calculate labor supply elasticities as well as elasticities with respect to the demand for formal child care. These elasticities are obtained by simulating a 1 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 almost 0.4 percent (Table 5). We find the highest elasticities for the group of mothers with children aged 1-2 years (almost 0.5 percent increase of

average working hours) and the lowest in the group of mothers with children aged 7-12 years (0.33 percent).

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
All mothers	0.10	0.37
West Germany	0.10	0.40
East Germany	0.07	0.24
Mothers with 1 child	0.10	0.36
Mothers with 2 children	0.10	0.37
Mothers with 3 children	0.09	0.36
Youngest child 0-1 years	0.03	0.40
Youngest child 1-2 years	0.12	0.49
Youngest child 2-3 years	0.11	0.38
Youngest child 3-6 years	0.12	0.36
Youngest child 7-12 years	0.11	0.33
Single mothers	0.09	0.33
Mothers with partners	0.10	0.38

Source: SOEP 2010; FiD 2010; own calculations.

If child care costs increase by 1 percent, the reaction in terms of mothers' labor force participation rate is almost zero for all groups (Table 6). On average, mothers would reduce average working hours by 0.07 percent. Also in this case, we find higher elasticities for mothers with younger children (-0.26 percent for mothers with children aged 0-1 years) and no reaction for mothers with school-aged children. Single mothers have much lower labor supply elasticities with respect to child care costs than mothers with partners, however this might simply reflect that single mothers in Germany have on average older children than mothers with partners.

If wages or child care costs change, in our model labor supply is not the only margin that can be adjusted. Mothers could also react with respect to their child care choices. On average, the use of formal child care increases by 0.02 percentage points, if the mother's wage is increased by 1 percent (Table 7). This reaction is highest for mothers with children in their second and third year of life (0.06 and 0.05 percentage points, respectively). Comparing columns 2 and 3 of Table 7 shows that for children in this age group, part-time as well as full-time formal care increases, while for older children part-time care decreases and full-time care increases. We also see that

informal child care increases. For children aged 1-3 years, the use of informal child care increases by 0.05 percentage points.

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
All mothers	-0.01	-0.07
West Germany	-0.01	-0.08
East Germany	-0.01	-0.05
Mothers with 1 child	-0.01	-0.06
Mothers with 2 children	-0.01	-0.08
Mothers with 3 children	-0.02	-0.17
Youngest child 0-1 years	-0.01	-0.26
Youngest child 1-2 years	-0.04	-0.16
Youngest child 2-3 years	-0.03	-0.09
Youngest child 3-6 years	0.00	-0.02
Youngest child 7-12 years	0.00	0.00
Single mothers	0.00	-0.04
Mothers with partners	-0.01	-0.08

Source: SOEP 2010; FiD 2010; own calculations.

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). Also in this case, 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. Interestingly, however, informal care arrangements increase only slightly – if at all.

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
All mothers	0.02	-0.01	0.03	0.05
West Germany	0.03	-0.01	0.04	0.05
East Germany	0.01	-0.01	0.02	0.01
Mothers with 1 child	0.03	-0.01	0.04	0.07
Mothers with 2 children	0.02	-0.02	0.03	0.01
Mothers with 3 children	0.01	-0.02	0.03	0.02
Youngest child 0-1 years	0.00	0.01	0.00	0.02
Youngest child 1-2 years	0.06	0.03	0.02	0.05
Youngest child 2-3 years	0.05	0.01	0.04	0.05
Youngest child 3-6 years	0.02	-0.04	0.06	0.02
Youngest child 7-12 years	0.02	-0.02	0.04	0.06
Single mothers	0.02	-0.01	0.02	0.05
Mothers with partners	0.03	-0.01	0.04	0.04

Source: SOEP 2010; FiD 2010; own calculations.

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
All mothers	-0.02	0.02	-0.04	0.01
West Germany	-0.02	0.02	-0.05	0.01
East Germany	-0.01	0.01	-0.03	0.01
Mothers with 1 child	-0.02	0.01	-0.03	0.01
Mothers with 2 children	-0.02	0.02	-0.05	0.01
Mothers with 3 children	-0.02	0.03	-0.06	0.00
Youngest child 0-1 years	-0.02	-0.01	-0.01	0.00
Youngest child 1-2 years	-0.06	-0.03	-0.03	0.01
Youngest child 2-3 years	-0.06	-0.01	-0.05	0.02
Youngest child 3-6 years	-0.02	0.04	-0.05	0.01
Youngest child 7-12 years	-0.01	0.05	-0.05	0.01
Single mothers	-0.02	0.03	-0.04	0.01
Mothers with partners	-0.02	0.02	-0.04	0.01

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 (see Table 4 in section 4 for mothers with 1 child, 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 in the Appendix for mothers with 2, and Table 23 for mothers with 3 children). For example, for mothers with 1 child, we predict that 21 percent choose no participation, no formal and no informal care, while 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 overpredict 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 for a childcare slot as well as the ‘Betreuungsgeld’ we simulate three scenarios: First, we simulate the introduction of the legal claim for 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 as explained in the Appendix 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. For example, average household income in choice categories with part-time care thus increases by about 110 EURO (full-time care: 190 EURO) per month for families with one child, whereas income in all other choice categories stays constant. Second, we simulate the introduction of the ‘Betreuungsgeld’ amounting to 100 Euro per month for each child aged 1 to 3 years. This benefit is only added to disposable income in choice categories where no formal child care is used for children in this age group. 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. Thus, the interpretation of the results needs to take into account that we simulate the case that both reforms (separately or jointly, depending on the simulation scenario) were introduced already in 2010.

Table 9 shows the changes in mothers’ labor supply under the three different simulation scenarios. If only the legal claim for child care had been introduced, we find that mothers with children in the targeted age group (1-3 years) would increase their labor force participation rate

by more than 2 percentage points. Mothers whose youngest child is aged 1-2 years would increase their average working hours by 9 percent, mothers whose youngest child is 2-3 years by 6 percent. We also find a small positive reaction for mothers whose youngest child is under the age of 1, since these mothers might also have children in the targeted age groups. As expected, the elimination of rationing with respect to subsidized formal child care that leads to a decrease in child care costs faced by parents, leads to a substantial increase in mothers' labor supply.

Table 9 Change in labor force participation rate and average working hours – reforms: legal claim, 'Betreuungsgeld', legal claim + 'Betreuungsgeld'

	legal claim		'Betreuungsgeld'		legal claim + 'Betreuungsgeld'	
	Change in participation rate (pp.)	Change in average working hours (pct.)	Change in participation rate (pp.)	Change in average working hours (pct.)	Change in participation rate (pp.)	Change in average working hours (pct.)
Young. 0-1 y.	0.29**	9.58***	0.01	-0.26***	0.30***	9.29***
Young. 1-2y.	2.30***	9.02***	-1.78***	-6.85***	0.41*	1.57*
Young. 2-3y.	2.16***	5.72***	-1.58***	-4.22***	0.58*	1.42*

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

Source: SOEP 2010; FiD 2010; own calculations.

The opposite effect, as expected, is found for the simulation scenario of the isolated introduction of the 'Betreuungsgeld'. The introduction of this benefit leads to a decrease in mothers labor supply, that is a bit smaller of magnitude than the effect of the legal claim for child care. Mothers whose youngest child is in the targeted age group would decrease their labor force participation rate by 1.6 to 1.8 percentage points and their working hours by 4.2 to 6.9 percent. We also find a very small negative effect with respect to working hours for mothers whose youngest child is below the age of 1.

If both reforms are simulated simultaneously, as it was actually the case in August 2013, the overall effect on mothers' labor supply is still positive, albeit much lower than the effect of the isolated introduction of the legal claim for child care. In this scenario, mothers with children in the targeted age group would increase their labor force participation rate by 0.4 to 0.6 percent and their working hours by 1.4 to 1.6 percentage points.

Table 10 *Change in child care choices – reform: legal claim*

	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
Youngest child 0-1 years	0.48**	0.17	0.31*	0.00
Youngest child 1-2 years	2.34***	0.99**	1.35***	-0.44**
Youngest child 2-3 years	1.92***	-0.13*	2.05***	-0.56***

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

Source: SOEP 2010; FiD 2010; own calculations.

A similar pattern can be found as far as the changes in child care choices are observed, as is shown in Tables 10-12. The introduction of the legal claim for formal child care without the simultaneous introduction of the ‘Betreuungsgeld’ (Table 10) leads to an increase in the share of children attending formal child care (2.3 percentage points for children aged 1-2 years, 1.9 percentage points for children aged 2-3 years). There is an interesting difference between the age groups of children 1-2 and 2-3 years: While for the younger children, both part-time and full-time care increases, we find a small decrease in part-time formal care for children aged 2-3 but an even stronger increase in full-time care for this age group. For both age groups, we find that the share of children for whom parents use informal care arrangements decreases by 0.4 to 0.6 percentage points.

In contrast, the introduction of the ‘Betreuungsgeld’ – if the legal claim for child care had not been introduced at the same time – (Table 11) has a negative impact on the use of formal child care that is even larger than the positive effect that is induced by the legal claim for child care. We find that the share of children aged 1-3 who attend formal child care would decrease by more than 2.5 percentage points. On the other hand, informal care arrangements would increase by 0.5 to 0.8 percentage points.

In the simulation where both scenarios are introduced at the same time the overall effect of the use of formal child care for children in the targeted age group is negative (Table 12). The share of children attending formal child care decreases by 0.3 to 0.8 percentage points. Interestingly, this overall negative effect mainly comes from the decrease in the share of children attending part-time care. The share of children attending full-time care would increase in this scenario by roughly 1 percentage point (compared to 2 percentage points if only the legal claim had been introduced). The change in the use of informal care arrangements is small and only

significant for children aged 2-3 years. For them, informal care increases by 0.2 percentage points.

Table 11 Change in child care choices – reform: ‘Betreuungsgeld’

	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
Youngest child 0-1 years	-0.22**	-0.15**	-0.06*	0.01**
Youngest child 1-2 years	-2.52***	-2.02**	-0.49***	0.47*
Youngest child 2-3 years	-2.74***	-1.88**	-0.85***	0.79**

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

Table 12 Change in child care choices – reform: legal claim + ‘Betreuungsgeld’

	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
Youngest child 0-1 years	0.27*	0.03***	0.24*	0.01*
Youngest child 1-2 years	-0.27*	-1.06***	0.79***	0.06
Youngest child 2-3 years	-0.77*	-1.91***	1.14***	0.24**

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

To be completed: Heterogenous effects according to different socio-economic subgroups (low income / high income, education of the mother, nationality, number of siblings ...).

6 Conclusions

In the last decade, Germany has experienced several reforms in the field of family policy. Most reforms, such as the introduction of a new parental leave benefit (“Elterngeld”) or the successive expansions of publicly subsidized formal child care, explicitly aimed at encouraging mothers to reduce family-related employment interruption. Recently, however, a new benefit (“Betreuungsgeld”) has been introduced that clearly counteracts these incentives since it is only granted to families whose children do not attend publicly subsidized formal child care. This new benefit has been introduced at the same time as a legal claim for formal child care for all children aged one year or older in August 2013. Both reforms target children of the same age group and both 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 as far as mothers’ labor supply and use of formal and informal child care is concerned. In this paper, we present a structural model of labor supply and child care choices that is suitable for the evaluation of the joint effect of both reforms. Moreover, the model can be used in order to decompose this joint effect into the effects that the two reforms have had if they had been introduced only one at a time.

Our results show that both reforms jointly lead 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 0.5 percentage points and their average hours by 1.5 percent. If the legal claim for child care had been introduced without the ‘Betreuungsgeld’, the labor force participation would have been increased by more than 2 percentage points and working hours by almost 9 percent. This large positive effect is offset by the introduction of the ‘Betreuungsgeld’ as the simulation of the introduction of this benefit without the legal claim for child care reveals. In this scenario, mothers with children in the targeted age group would reduce their labor force participation rate by 1.8 percentage points and their average working hours by more than 6 percent.

Similar patterns can be found as far as the use of formal child care is concerned: A relatively large positive effect that results from the introduction of the legal claim – the share of children attending formal child care would increase by more than 2 percentage points – is totally

offset by the introduction of the ‘Betreuungsgeld’, that – if introduced without the legal claim – would have decreased the share of children attending child care by roughly the same amount.

Based on our empirical results we conclude that the introduction of the ‘Betreuungsgeld’ at the same time as the legal claim for child care has almost offset the positive effects that the latter could have had on mothers’ employment and children’s child care attendance. Motivated by distributional reasons – families who are not using public or publicly subsidized child care should also be rewarded for the care work that they provide at home or organize in private settings – this benefit clearly implies strong disincentives to work for mothers with children aged 1 to 3 years. It thus counteracts the reforms of the last years such as the introduction of the ‘Elterngeld’ or the successive increase in the availability of formal child care that explicitly aimed at reducing the employment interruptions of mothers.

To be completed: results for different socio-economic groups;

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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 childcare facilities in Germany in the year 2010, we have to calculate a measure of child care costs that takes rationing explicitly into account. In Germany, parents' fees to subsidized child care facilities are relatively low, however, access to these slots has been rationed in many regions in Germany. 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 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.

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

For the calculation of the expected costs of child care we need three components: we need 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' fees (c^s)

Unfortunately, information on parents' fees are 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 on 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 12 shows descriptive statistics of the sample that we use for the estimation of parents' fees.

Table 13 Descriptive statistics parents' fees for center-based childcare

	Parents' feesfor...		
	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 14 Estimation of parents' fees for center-based childcare (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 ist he reference category among the dummies for federal states.

Source: FiD 2010; own calculations.

In Table 13 we show the results of the estimations of the parents' fees. We estimated three separate 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 a Tobit model for the estimation of parents' fees since a relatively large share of parents does not have to pay for child care services.

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

As it is the case with the parents' fees, we observe the costs for private care arrangements only for families who use this kind of care. For all other families, these costs need to be imputed. Information on costs for private child care arrangements (nannies or babysitters) are 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 ($1-\pi$)

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 14 gives an overview on the incidence of formal care attendance and rationing for children in different age groups and regions.

In the SOEP, parents are not asked for the reasons that their children are not attending formal child care. For these children, therefore, the probability ($1-\pi$) is not directly available. 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 15 Share of children in formal care and incidence of rationing

	<i>Shares in percent</i>					
	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).

Table 15 shows the estimation results (probit model) of the probability of being rationed for children aged 0-6 years. Table 16 shows 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 17. For example, we find based on this model that 19 percent of one year old and 14 percent of two year old children are rationed with respect to formal child care.

Table 16 *Probit model: rationing probability children aged 0-6*

	<i>Coefficient</i>	<i>Standard error</i>
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.

Source: FiD 2010; own calculations.

Table 17 *Probit model: rationing probability children aged 7-12*

	<i>Coefficient</i>	<i>Standard error</i>
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
LowerSaxony	-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.

Source: FiD 2010; own calculations.

Table 18 *Predicted rationing probabilities by age and region*

<i>Age of children in years</i>	<i>Overall</i>	<i>East</i>	<i>West</i>
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 next step, we bring together all three components of the expected costs of child care. Table 18 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 19 Average expected costs of child care in Europ per month

<i>Age of children in years</i>	<i>Overall</i>	<i>East</i>	<i>West</i>
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 20 *Choice categories for families with two children*

Category	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 21 *Choice categories for families with three children*

Category	Mother'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	Maternal care first child	Maternal care second child	Maternal care third child	Mother'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 22 *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
0	0	0	1-8	1-8	0.197	0.169
minijob	0	0	9-20	9-20	0.083	0.052
Part-time	0	0	>20	>20	0.111	0.092
0	20	0	0	0	0.017	0.019
0	20	0	0	1-8	0.063	0.065
minijob	20	0	0	9-20	0.002	0.013
Part-time	20	0	9-20	>20	0.008	0.025
0	38	0	0	0	0.033	0.063
0	38	0	0	1-8	0.002	0.008
minijob	38	0	9-20	>20	0.003	0.013
Part-time	38	0	0	>20	0.015	0.049
0	20	20	0	0	0.002	0.007
0	20	20	0	0	0.013	0.029
minijob	20	20	0	0	0.095	0.102
Part-time	20	20	9-20	9-20	0.004	0.004
0	38	20	0	0	0.015	0.009
0	38	20	0	0	0.054	0.043
minijob	38	20	0	0	0.002	0.003
Part-time	38	20	0	9-20	0.009	0.013
0	38	38	0	0	0.041	0.025
0	38	38	0	0	0.004	0.007
minijob	38	38	0	0	0.004	0.007
Part-time	38	38	0	0	0.137	0.112

Source: SOEP 2010; FiD 2010; own calculations.

*Table 23 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

To be completed

A 4 Estimation results of the conditional logit model

Table 24 Conditional logit model: labor supply and child care choice

	Familywith 1 child		Familywith2children		Familywith3children	
	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
Leisuresquared	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 care2. child			8.5387***	1.5936	1.5470	4.1833
Formal care2. child squared			13.4062***	2.2612	-1.7574	3.6786
Formal care3. child					6.5303**	3.2995
Formal care3. 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.care2. child x youngest child 0-1 y.			-29.8206***	1.8742	4.4914	3.8510
Form.care2. child x youngest child 1-2 y.			-19.9535***	1.3329	5.1760	3.9194
Form.care2. child x youngest child 2-3 y.			-16.0049***	1.2573	7.2692	3.9823
Form.care2. child x young. child 7-12 y. ¹			-5.9280***	1.3293	5.5946	4.2182
Form.care2. child x East			5.7096***	0.7646	-0.9901	1.4708
Form.care2. child x German			0.4162	0.9318	-0.3913	1.5599
Form.care2. child x single			0.3511	0.6893	-1.7404	1.4834
Form.care2. child x youngest child 0-1 y.					-27.0577***	3.4893
Form.care2. child x youngest child 1-2 y.					-19.2898***	2.9957
Form.care2. child x youngest child 2-3 y.					-17.4378***	2.9043
Form.care2. child x young. child 7-12 y. ¹					-6.8896**	2.9150
Form.care2. child x East					3.3765**	1.3562
Form.care2. child x German					0.3032	1.5092
Form.care2. 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		30,467		13,957
Log Likelihood		-3,557		-3,484		-1,262
LR Chi ²		3,055		2,596		964

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

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

Source: SOEP 2010; FiD 2010; own calculations.