

An Evaluation of Recent Child Care Reforms in Germany

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Preliminary Version.

Comments are Welcome!

Abstract: This paper examines how different child care policy reforms currently discussed in Germany affect maternal employment and child care decisions. I use a discrete choice panel data model controlling for unobserved heterogeneity to simultaneously estimate labor supply and child care choices of German mothers with at least one child aged less than six years. The model explicitly takes into account access restrictions to subsidized child care. Thus, policy reforms with respect to both, availability and costs of child care can be evaluated. The results show that targeting public expenditures at an extension of child care slots has greater effects on the demand for child care as well as on maternal employment than a reduction of parents' fees to existing slots.

Keywords: child care, labor supply, discrete choice, panel study, Germany

JEL-classification: J22, J13, C35

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1 Introduction

While child care has long been a neglected issue in German family policy, recently the availability and costs of child care have been moving to the very center of the political discussion. In 2005, the German government passed a law that aims at extending the provision of child care for children under three years. In the beginning of 2006, reform proposals aiming at decreasing the parents' fees to existing child care slots as well as extending the possibilities to deduct child care costs as expenses within the income tax have been discussed. This paper suggests an analytic framework for the estimation of the demand for child care and maternal labor supply simultaneously, taking into account access restrictions to subsidized child care. Based on this model, simulations of various policy reforms can be undertaken. My results show that public spending is more effective in increasing maternal labor supply and the demand for child care when targeted at extending the provision of child care slots at the given parents' fee rather than decreasing the parents' fees to existing slots.

Compared to other countries, the child care situation in Germany is rather peculiar: On the one hand, child care facilities are highly subsidized, and the share of costs that parents have to bear is relatively small, lying between zero and thirty percent of total cost. Therefore, in comparative studies on child care costs, Germany usually ranges at the lower end of the distribution of child care costs as percent of household income (see, Immervoll and Barber (2005)). On the other hand, availability of child care slots is limited compared to other European countries, especially in west Germany. In 2002, there were only 3 child care slots available per 100 children under the age of 3 in west Germany. In east Germany, where availability of child care is traditionally higher, there were 36 slots per 100 children of the same age group in 2002. West Germany clearly falls behind the target of the Barcelona summit, where EU countries agreed on an increase in child care availability for the youngest children up to a rate of 30 percent. The picture is different for children between 3 years and school age (usually 6 years). For children in this age group, part-time care is available in all parts of Germany. Full-time slots, however, are limited also for this older age group of children in most parts of west Germany. For children who are in primary school (age 6 - 10) covering 4 - 5 hours in the morning, the availability of child care slots for afternoon-care is also relatively limited in west Germany. Table 1 gives an overview of availability of child care by age group and region in Germany. The low availability of subsidized child care facilities leads to potentially high actual child care costs that parents are facing. While the average parents' fee for a full-

time slot in a subsidized child care facility is about 110 Euro per month, the costs of private child care provided by a nanny or a child minder lie above 800 Euro per month.

[Table 1 about here]

In the past couple of years, the German federal government has been emphasizing the importance of child care opportunities, not least due to the declining fertility rates and the low labor force participation of mothers. Recently, as a consequence of the poor performance of German pupils in the PISA study, also the positive effects of child care on later school outcomes have been emphasized. As a reaction, the government passed a law in 2005 that aims at an increase in the provision of child care slots for children under three years such that all children in this age groups who have working parents can be offered a slot¹. More recently, two other reform proposals have been discussed. On the one hand, the new German government plans to increase the possibility to deduct child care costs from taxable income as deductible expenses, and on the other hand, the free provision of child care for children between three and six years, has been discussed.

This paper aims at evaluating these policies and policy reforms with respect to their effects on married and cohabiting mothers' labor supply and child care decisions from an ex ante perspective. Following an approach that has been used in several studies for different countries², mothers' labor supply and child care choices are estimated jointly on the basis of a structural utility model. Drawing on data from the German Socio-Economic Panel (SOEP) a discrete choice panel model controlling for unobserved heterogeneity is estimated. Based on this method, the influence of wages and child care costs on labor supply and child care choices can be analyzed. My analysis extends the previous literature in several ways. First, net household incomes for all possible choice categories are calculated using a detailed tax-benefit microsimulation model, which allows to pursue policy reforms aiming at changes in taxes, transfers and child care policies. Second, the model explicitly takes into account access restrictions to subsidized child care by increasing the actual child

¹This law is called "Tagesbetreuungsbaugesetz - TAG" and has been passed in January 2005.

²See, among others, Michalopoulos, Robins, and Garfinkel (1992), Ribar (1995) and Blau and Hagy (1998) for the US, Duncan, Paull, and Taylor (2001) and Parera-Nicolau and Mumford (2005) for the UK, Powell (2002) for Canada, Chone, le Blanc, and Robert-Bobee (2003) for France, Del Boca, Locatelli, and Vuri (2004) for Italy, Lokshin (2004) for Russia and Kornstad and Thoresen (2006) for Norway.

care costs according to the probability of being restricted to formal child care. This is a very important aspect in the German context, since there is evidence for a large excess demand for subsidized child care.

Up to now, the demand for child care and maternal labor supply have not been estimated simultaneously on German data. There are several reduced form models estimating the effect of child care costs *or* the availability of child care on the demand for child care *or* mothers' employment (see, for example Buechel and Spiess (2002), Spiess (1998), Ondrich and Spiess (1998) or Kreyenfeld and Hank (2000)). The contribution of this paper is therefore twofold. First, it contributes empirical findings on potential effects of current policy reforms and reform proposals on mothers' labor force participation, mothers' working hours and the demand for child care in Germany. Second, it suggests a methodological framework for the analysis of labor supply and child care choices in the presence of access restrictions to child care, which might be of use also for studies on other countries facing similar problems.

2 Theoretical issues and the econometric model

The estimation of labor supply and child care demand for Germany requires a model that takes several peculiarities of the German context into account. First, we observe many children who are in formal child care at least part of the day even though their mothers are not working. Traditionally, the link between mother's employment and the use of child care is not very strong in west Germany. As Table 2 shows, about one third of all mothers whose youngest child is in child care is not working. For mothers whose youngest child is between three and six years and in child care, the non-participation rate is even 39 percent. The reason for this is that part-time care for children aged 3 - 6 is seen as preschool education and not so much as a means to provide the possibilities for both parents to work. Working mothers often have to rely on informal care arrangements, either paid babysitters or unpaid care by relatives, to be able to take up a full-time job. These informal care arrangements, especially unpaid care by relatives, seem to play an important role in west Germany, as can be also seen from Table 2. Thus, a model that would not explicitly allow non-working mothers to purchase child care (such as the models used by Ribar (1995), Powell (2002), Del Boca, Locatelli, and Vuri (2004) or Lokshin (2004)) would not be appropriate for Germany. Second, not all working mothers purchase (paid) child care, indicating that many households makes use of some sort of informal, unpaid

child care arrangements. A model that assumes that all households have to purchase child care at least for the time the mother is working (such as used by Kornstad and Thoresen (2006) or by Duncan, Paull, and Taylor (2001)), would thus also be inappropriate. Unfortunately, I have no information on access to these unpaid care arrangements in the data. Information is only available on the utilization of these care arrangements, and this information is not very detailed as far as frequency and hours of care are concerned. Therefore, I will assume that all households have the possibility of unpaid care, which can be care by relatives or friends, or - in the worst case - leaving the child alone.

[Table 2 about here]

The third empirical finding that has to be considered when estimating maternal labor supply and demand for child care in the German context is that subsidized child care is rationed in many regions for children of certain age groups, as has been shown by Wrohlich (2005). In two recent studies, access restrictions to formal child care have been modeled by restricting the choice set of those households who report to be restricted (Lokshin (2004) and Kornstad and Thoresen (2006)). In the German data set, however, there is no information on access restrictions to child care facilities reported by households. Therefore, I will use a different approach: Instead of restricting the choice set for some households, I will assume that every household can purchase paid child care at some "expected price". This "expected cost of child care" consists of the parents' fees to subsidized child care slots times the probability of getting a slot and a price of child care that is charged by private child minders (a sort of "market price of child care") times the probability of not getting a subsidized slot. As a proxy for these probabilities, the availability of subsidized child care slots on the local level will be used.³

Mothers' labor supply and child care choices will be estimated on the basis of a structural utility model using discrete choice technique. Both, mother's working hours and child care hours will be modeled as categorical rather than metric variables. As

³In a recent study, Del Boca and Vuri (2005) suggest a theoretical discrete choice model of labor supply and child care, where access restrictions to formal child care are modeled by a probabilistic distribution of availability of formal child care slots, i.e. a probabilistic distribution of the household's choice set. However, since I want to emphasize the distinction between paid and unpaid care rather than between formal and informal care, and I argue that at some (potentially very high) cost, there is paid child care in form of private day care available for every child, I chose to model access restrictions via a probabilistic term of child care costs.

far as working hours are concerned, this form of modeling takes into account the fact that hours of work are heavily concentrated at particular hours. Further, the specification of a relatively small number of hours categories leads to a substantial reduction in computational burden, as the budget set has to be calculated for a few selected points only. This simplification is in fact a prerequisite for an adequate specification of the budget set given the complexities and the non-linearities of the German tax-benefit system. This is important for the purpose of the estimation of women's labor supply, since e.g. the joint income taxation of married couples or eligibility to means-tested benefits may result in high marginal tax rates for women from low working hours on. The reason to model child care hours as a discrete variable is that in German child care facilities, it is the general practice to offer either part-time or full-time child care. Further, also in the data set I will use for the estimation, information of child care hours is available according to these two states.

In the following analysis, I only consider two-parent families where the father is working full-time. The choice set of a family in my model consists of 9 categories: Apart from non-participation, a mother can choose to work full-time or part-time. For each working hours category, there are three possible child care choices, which are no paid child care, full-time or part-time paid child care. Implicitly, it is assumed that in the case that mother's working hours are greater than zero but no paid child care is used, the family makes use of informal care. In the data set I will use for the estimation, it is not possible to distinguish between maternal and other informal unpaid child care. Therefore it is assumed that in the categories where the mother is not working, maternal care is the primary child care choice, whereas in categories in which the mother's working hours are greater than zero and paid care is not observed, informal care is used at the amount of the mother's working hours. Further, it is assumed that a mother cannot work and care for the child herself at the same time. Since I only include families with full-time working fathers, part-time or full-time child care by the father is not considered to be an option.

The utility function specified in this paper is similar to the one used by Blau and Hagy (1998), although in contrast to Blau and Hagy, I do not explicitly model quality characteristics of paid child care.⁴ The mother's utility U is assumed to depend on disposable household income y , her leisure time l , "child quality" Q , and

⁴Formal child care facilities are strictly regulated in Germany as far as measurable quality characteristics such as staff/child ratio, other equipment and education of staff are concerned.

a vector of demographic characteristics such as age and number of children (D), formally

$$U = u(y, l, Q; D) \tag{1}$$

where utility is assumed to be increasing in leisure, income and child quality. The "quality" of a child (Q) depends on the hours of maternal care m , hours of formal (paid) child care f and hours of informal (unpaid) child care⁵ inf ,

$$Q = q(m, f, inf) \tag{2}$$

and is assumed to be increasing in the hours of maternal care and formal care and decreasing with the amount of informal care. The hypothesis to be tested in the empirical analysis is that the marginal utility of informal child care is smaller than the marginal utility of formal child care, otherwise one could not explain the fact that so many households use paid child care when at the same time it is assumed that all households have access to informal care. Note that the "child quality" Q is only defined for the youngest child. For simplification, it is assumed that in the case that more more than one child is living in the household, all children have the same values of maternal, formal and informal care, which are those of the youngest child.

Let us now turn to the household's budget constraint. The household's disposable income y can be formally written as

$$y = t(h \cdot w, Z) - ec \cdot f \tag{3}$$

where $t(\cdot)$ 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 wage income. ec

⁵In the following, I will use the terms formal and paid child care as synonyms. The same applies to the terms informal and unpaid child care. Strictly speaking, this is not correct, since informal child care can also be paid for, e.g. in the case of babysitters, whereas formal child care can be for free, as it is the case for many low income families in Germany who live in communities who have an income-dependent fee scheme to child care facilities. For simplification, in my model, the term "formal" includes all sorts of paid child care, either in facilities (subsidized or private) or home-based, as well as care in facilities that is for free, whereas "informal" only includes non-institutional, unpaid care arrangements.

denotes expected costs of child care and f is hours of formal child care. Disposable household income, which is a function of mother’s market and non-market income and the tax-benefit system, is calculated for all possible choice categories using the tax-benefit simulation model STSM (see section 5).

In the previous literature, the prevalent measure of child care costs has been the expenses reported by families who are actually using child care or official statistics on average parents’ fees for child care slots. However, using these concepts, child care costs are only measured appropriately for households who have access to a child care slot when they are demanding one. For households facing access restrictions to child care slots, this measure is not appropriate. Most studies mention that in addition to child care costs (as defined above) also availability of child care plays a role in mothers’ employment decision, however, are unable to quantify this effect. To be able to assess both dimensions, child care costs as parents’ fees as well as accessibility of child care, I will suggest a measure of child care costs (“expected costs of child care”) that explicitly takes into account rationing of child care slots in facilities. I will do so by arguing that rationing occurs only 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. By weighting the parents’ fees with the probability that the family has access to subsidized child care for a particular child and adding the market price of child care (i.e. wage of a babysitter or child minder) weighted by the probability not to get access to subsidized child care, expected costs of child care are calculated.

Formally, expected costs of child care ec 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 child minder (c^{ns}), weighted by the probability to get a child care slot (p) and $(1 - p)$, respectively. The probability to get a part-time slot is much higher than the probability to get a full-time slot. It is assumed that in the case that parents do not get a full-time slot for their child, they opt for a part-time slot (if available) and use “market-price” child care only for the second half of the day. Child care fees for part-time (pt) and full-time (ft) slots can thus be stated as follows:

$$ec_{pt} = c_{pt}^s \cdot p_{pt} + c_{pt}^{ns} \cdot (1 - p_{pt}) \quad (4)$$

$$ec_{ft} = c_{ft}^s \cdot p_{ft} + (c_{pt}^s + c_{pt}^{ns}) \cdot (p_{pt}) + (1 - p_{pt} - p_{ft}) \cdot c_{ft}^{ns} \quad (5)$$

The parents' fee c^s is estimated on the basis of information about child care expenditures of households for the two categories. Since there are only very few observations in the data set who use private child care, the market price c^{ns} is not estimated but assumed to be the national average for all households. The probability of getting a slot in a subsidized child care facility is assumed to be the age-specific availability ratio of child care slots in the county of residence.⁶ For a more detailed description of the calculation of expected costs of formal child care, see section 5.

The time constraint of the mother can be written as

$$h + m + l = m + f + inf = 80 \quad (6)$$

Equation 6 states that a mother can allocate her time to three activities, which are market work h , maternal child care m and pure leisure l . Since a child has to be cared for over the whole day, hours of maternal care m , formal care f and informal care inf must add up to 80, which is assumed to be the total time per week available. I 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 hours of formal care, i.e.

$$inf = \max(h - f, 0) \quad (7)$$

From equations 6 and 7, it follows that the mother's pure leisure⁷ only takes on positive values in the case that formal child care hours exceed the mother's market work hours, i.e. $f > h$.

Substituting equations 2, 3 and 6 into the utility function as stated in equation 1 yields the mother's maximization problem

⁶There are 440 counties ("Kreise") in Germany.

⁷Household activities other than child care are not explicitly modeled. Thus, "pure leisure" might include household activities that a mother undertakes while the child(ren) is(are) cared for by another person. To be more precise, the term "pure leisure" in the context of this model defines non-market work time without children.

$$\max_{h,f} u = u\{[t(h \cdot w, Z) - ec \cdot f], (80 - h - m), Q(m, f, inf); D\} \quad (8)$$

subject to the additional constraint stated in 7 and non-negativity of the choice variables. Table 3 shows the values of the choice variables (market work and paid child care) and the values of the variables that are given by the constraints (unpaid care, maternal care and pure leisure).

[Table 3 about here]

The discrete choice model used for the estimation is based on the households' utility comparisons of the 9 different choice categories in every period. Concerning the parametric specification of the utility function, I will assume that the terms of the "child quality" function enter the utility function as stated in equation 8 linearly. The utility function itself is assumed to have a quadratic form. Thus, the utility index U of mother i for a particular working/child care hours category k at time period t can be stated as follows:

$$U_{ikt} = X'_{ikt}\beta + X'_{ikt}A \cdot X_{ikt} + \epsilon_{ikt} \quad (9)$$

with

$$X_{ikt} = (m_{ikt}, f_{ikt}, inf_{ikt}, l_{ikt}, y_{ikt})' \quad (10)$$

The components of X_{ikt} are disposable household income y , the mother's pure leisure time l , hours of maternal care m and hours of formal and informal care, f and inf , which all vary by household (i), choice category (k) and time period (t). ϵ_{ikt} is an unobserved error term that is assumed to follow an extreme value distribution and to be independent over time, households and choice categories. The variables that do not vary across choice categories, i.e. the socio-demographic variables such as age of the youngest child, number of children, age and nationality of the mother, are interacted with net income, leisure, paid child care and maternal care.

Each household is observed at least two periods, some of them three periods. Variation over time in disposable income comes from various sources. First, since child care costs are a decreasing function of a child's age, disposable household income changes due to the fact that children grow older every year. Second, in the observed

period from 2000 - 2002, several reforms have been implemented also lead to variation in disposable household income, such as the German tax reform (see Haan and Steiner (2005)), and a reform of the child benefit, which has been increased in 2001.

In the model as stated in equation 9, variation in choices across households can only be explained by differences in the levels of disposable household income and its interactions with demographic variables. However, there are many other possible sources of heterogeneity, in particular differences in access to formal and informal care arrangements and differences in attitudes towards formal child care, which are unobserved. I will account for this unobserved heterogeneity by letting the preference parameter on the linear term of hours of formal child care vary across households. Vector β from equation 9 therefore is replaced by vector β_i , which consists of parameters that are constant and an individual-specific parameter β_{f_i} , i.e.

$$\beta_i = (\beta_y, \beta_{f_i}, \beta_m, \beta_l, \beta_{inf})' \quad (11)$$

with

$$\beta_{f_i} = \beta_f + \nu_i \quad (12)$$

Following Heckman and Singer (1984), it is assumed that ν is described by an arbitrary discrete probability distribution G with a small number of mass points $M^r, \forall r(r = 1, 2, \dots R)$ and corresponding probabilities π^r , where

$$E(\nu) = \sum_{r=1}^R \pi^r M^r = 0 \quad (13)$$

and

$$\sum_{r=1}^R \pi^r = 1 \quad (14)$$

Mass points and their probabilities are jointly estimated with the parameters of the model using maximum likelihood. The estimation is based on the assumption that unobserved heterogeneity is independent of the explanatory variables. According to this specification, the decision rule for an individual i to choose alternative k in period t , conditional on β_i , becomes

$$P_{ikt} = \frac{\exp(X_{ikt}\beta_i)}{\sum_{j=1}^J \exp(X_{ijt}\beta_i)}; \quad k \in J \quad (15)$$

Since β_i is not known to the researcher, the unconditional probability P_{ikt} has to be estimated using

$$P_{ikt} = \sum_{r=1}^R \pi^r(M^r) \frac{\exp(X_{ikt}\beta^r)}{\sum_{j=1}^J \exp(X_{ijt}\beta^r)}; \quad k \in J \quad (16)$$

Since I observe each household in at least two periods, the individual likelihood contribution becomes

$$L_i = \sum_{r=1}^R \pi^r(M^r) \prod_{t=1}^{T_i} \prod_{j=1}^J \left(\frac{\exp(X_{ikt}\beta^r)}{\sum_{j=1}^J \exp(X_{ijt}\beta^r)} \right)^{d_{ikt}}; \quad k \in J \quad (17)$$

where d_{ikt} is a dummy variable that takes on value 1 if the household i chooses category k in time period t and 0 otherwise.

3 Description of the Data

The model outlined in section 4 above is estimated on three waves (2001 - 2003) of the German Socio Economic Panel (SOEP). The SOEP is a representative sample of households living in Germany with detailed information on household incomes, working hours and household structure.⁸ While there is information on formal child care utilization in all waves, the 2002 wave also includes detailed information on child care expenditures. Information on child care availability on the county level is matched to household data, for which special permission was given by DIW Berlin.

The sample used for the analysis in this paper is constrained to married and cohabiting couples with at least one child aged up to 6 years and not yet enrolled in school. Further, the sample only includes families with a full-time working father. The reason for this restriction is to keep the child care possibilities simple. In the case that the father is working full-time, it seems plausible to assume that he cannot provide part-time or full-time child care. Households with self-employed mothers, mothers

⁸For more information on the SOEP, see <http://www.diw.de/english/sop/>.

who are still in education or training or are severely disabled are also dropped. Further, I only include households that are observed in at least two waves. This gives a sample size of 913 households, of which 387 are observed in two waves and 526 are observed in three waves. In total, this adds up to 2352 observations.

Table 4 shows some basic descriptive statistics, such as the distribution of households across categories and the corresponding average number of children as well as the age of the youngest child. More than a third of all households are observed in the category with zero child care and zero working hours of the mother. As expected, in this category the average age of the youngest child (1.3 years) is lower than in all other categories, while the average number of children per household (1.8) is among the highest. In all categories with positive child care hours, the average age of the youngest child is above three.

[Table 4 about here]

3.1 Net household income

Net household income is calculated for the actual working hours category and simulated for alternative hours categories on the basis of the microsimulation model STSM.⁹ 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 households, earnings from dependent employment is the most important source of income. These earnings are calculated by multiplying gross hourly wages by the respective working hours in each category. For non-working individuals, wages are estimated on the basis of a Heckman (1979) type selection correction model.

Gross household income is the sum of all income components of all household members. Taxable income is calculated by deducting child allowances and other expenses from gross household income. The income tax is computed by applying the income tax formula to the individual incomes of unmarried spouses; for married spouses, income is taxed jointly, with an income splitting factor of 2. Income tax and social security contributions are deducted from gross income, and social transfers such as child benefits, child-rearing benefits, unemployment compensation, housing benefits

⁹For a detailed documentation of the STSM, see Steiner, Haan, and Wrohlich (2005).

and social assistance are added to get net household income. It should be mentioned that STSM uses retrospective information of income components in order to compute net household incomes for a given year. Thus, the incomes computed on basis of the SOEP waves 2001-2003 are in fact incomes for the years 2000-2002.

3.2 Child care costs

From this net household income, expected child care costs as stated in equations 4 and 5 are deducted according to the child care category in order to calculate the household's disposable income. The monthly parents' fee for child care in a subsidized facility is estimated separately for part-time slots and full-time slots. The 2002 wave of the SOEP provides information on child care expenditures and hours. A Tobit model is used for the estimation, since a considerable part of parents does not have to pay for child care slots. As explanatory variables only the age of the child, the region ("Bundesland") and the size of the county are used. The details of this estimation can be obtained from the author upon request. For the waves of 2001 and 2003, for which information on child care expenditures is not existent in the SOEP, the estimated coefficients are used in order to predict the parents' fees for part-time and full-time care slots.

As already stated above, the market costs of child care cannot be estimated on the basis of the SOEP data. Therefore, I set the market price of child care at 5 Euro per hour for all households, which seems to be the national average of the price charged by childminders.¹⁰

The probability of getting a slot in a child care facility is assumed to be the availability ratio by age group on the county level. There are three different age groups for which data are available, namely 0-2, 3-6 and for schoolchildren aged 7-10. For preschoolers, availability ratios differ considerably for full-time and part-time slots, as was already described in section 2.¹¹ It is assumed here that even if full-time slots are available, parents can choose to purchase a part-time slot only. Therefore, the probability to get a part-time slot is simply the overall availability of child care slots by age group. While there is information on the overall availability rates by age group on a county level¹², the share of full-time slots by age group is available

¹⁰see <http://www.tagesmutter.de>.

¹¹Obviously, for schoolchildren, who are in school at minimum 4 hours in the morning, only part-time care slots are needed.

¹²These administrative data are collected and provided by the Deutsches Jugendinstitut (DJI)

only on the more aggregate level of regions ("Bundeslaender"). Therefore, the probability to get a full-time slot is calculated as the product of the overall availability of child care slots on the county level and the share of full-time slots on the regional level for each age group.

In order to illustrate by how much the "expected" costs of child care differ from parents' fees that subsidized institutions charge, table 5 shows the average subsidized and expected child care costs by age group.

[Table 5 about here]

By definition, the difference between expected child care costs and parents' fees for a subsidized slot is highest for those groups of children who face the lowest supply of subsidized care facilities. While parents' fees and expected costs do not differ so much for part-time slots for children of the older age group, the difference between fees for a subsidized slot and expected child care costs is large for full-time slots in both age groups and also for part-time slots for children of the younger age group.

After expected child care costs are calculated for every child ¹³, the sum over child care costs for all children in the household is subtracted from net household income according to child care hours. Table 6 lists net household incomes for all choice categories before and after deducting child care costs. This table gives some interesting hints about work incentives induced by child care costs for secondary earners with small children in Germany.

Let us start with the group of families whose youngest child is less than three years. If a mother starts working part-time (i.e. she moves from choice category 1 to 4, 5 or 6), net household income on average increases by 435 Euro per month. If we assume that in this case the household has to purchase part-time child care (i.e. the household switches from choice category 1 to 5), the increase in household

in Munich. I would like to thank Hiltrud Bayer for the provision of these data. Special permission was granted by DIW Berlin to use the regional code of the SOEP data.

¹³In the case that there are also children aged 7-10 years in a household, child care costs for these children are considered in the calculation of net household income in those categories where the youngest child is in full-time care. The calculation of expected child care costs for children aged 7-10 follows the same framework as those for younger children, i.e. the probability that a child does not get a child care slot in a subsidized facility is taken into account. For more details on the calculation of child care costs for children of this age group see Beblo, Lauer, and Wrohlich (2005). For children who are older than ten years, no child care costs are assumed.

income only amounts to 22 Euro per month. If the youngest child in the household is between three and six years, child care costs are considerably lower, therefore the average increase in net income after deducting child care costs is 363 Euro per month. In the case that a woman with a child less than three years starts working full-time and we consider that full-time care has to be purchased (change from choice category 1 to 9), net household income on average even decreases by 66 Euro per month: The net gain from full-time employment amounts to 941 Euro, whereas more than 1000 Euro per month have (on average) to be spent on child care. This very high amount of child care costs reflects the low availability of subsidized child care slots for children in this age group. The picture is different for families with the youngest child between three and six years: On average, families with these characteristics can increase their net household income by 990 Euro per month if the woman starts working full-time (switch from choice category 1 to 7, 8 or 9), of which only 403 Euro have to be spent on full-time child care.

[Table 6 about here]

4 Results

4.1 Estimation Results

Table 7 presents the coefficients from the estimation of the model. The coefficients can be interpreted as influence of the respective variable on the mother's utility. The coefficients of the linear terms of income, leisure and formal child care have a positive sign, whereas the coefficient of informal care has a negative sign. One has to be cautious with the interpretation of these coefficients due to the large number of interaction terms. For example, the negative sign of the interaction term between formal child care and youngest child less than three years leads to a negative influence of formal care on the mother's utility of households in this group. Living in east Germany, on the other hand, increases the utility of formal child care.

A comparison with estimation results of a model without unobserved heterogeneity shows that unobserved heterogeneity is present in this model. The Akaike Information Criterion is larger for the model with unobserved heterogeneity than for the one without unobserved heterogeneity.¹⁴ For the distribution of β_f , two mass points

¹⁴ Estimates of the model without unobserved heterogeneity are available from the author upon

could be identified. The corresponding probabilities can be interpreted as respective shares of groups of households in the population. There is one large group for whom the coefficient of formal child care hardly changes, however for the smaller group, the positive effect of formal child care on utility is much larger than for the other group.

The calculation of second and first derivatives of the utility function with respect to income, leisure, formal and informal child care allows to check whether the estimates are in line with predictions based on theory. It turns out that the model yields plausible estimates: The first derivatives of the utility function with respect to income and leisure are positive for all households, while the second derivatives of these variables are negative. The first derivative of the utility function with respect to formal child care is positive for about 50 percent of all households, for the other 50 percent it is negative. The first derivative of informal child care is negative for all households. This suggests that some households consider formal child care to be a good, whereas other households consider formal child care as a "bad", i.e. having a negative influence on the mothers' utility. Informal child care seems to have a negative influence on the mothers' utility in all cases, which is also in line with what the theoretical predictions of the model outlined in section 2 suggest.

[Table 7 about here]

In order to compare the estimation results with the previous literature, I calculate wage elasticities and child care costs elasticities of labor supply by simulating a one percent increase in gross hourly wages and expected child care costs, respectively. These elasticities are presented in Table 8. The labor supply elasticities that result from my model are somewhat higher than what previous studies found for Germany, which might be due to the fact that the estimation is based on a sample of mothers with children less than six years only. Beblo, Lauer, and Wrohlich (2005), who estimate a labor supply model of German mothers with children from 7 to 10 years, find a 0.2 percentage point increase of participation and a 0.5 percent increase of working hours in the case that gross hourly wages increase by 1 percent for mothers in West Germany. Similar values are found by Steiner and Wrohlich (2004) for the request. I also estimated several models with different specifications of unobserved heterogeneity, such as a parametric specification of the random term of formal child care and both a parametric and a semi-parametric specification of a random term on net income. All these specifications lead to very similar results as the ones reported here.

group of mothers of children aged less than 6, based on a labor supply model that is estimated on the whole sample of married women.

Labor supply elasticities with respect to child care costs are found to be relatively low, compared to previous estimates in Germany and also compared to estimates for other countries: A one percent increase in expected costs of child care would lead to less than 0.1 percent decrease in average working hours. For Germany, Beblo, Lauer, and Wrohlich (2005) estimate a decrease in average working hours by 0.11 percent in east and 0.25 percent in west Germany in the case that child care costs increase by one percent. These results however, have been estimated on a sample of mothers with children aged 7 to 10 years. Second, Beblo et al. use a model that does not allow the option of unpaid non-parental child care, which also leads to higher elasticities than the more flexible model used here. Compared to the international literature, the estimated elasticities of labor supply with respect to child care costs lie at the lower end of what different authors find for various countries. For example, Kornstad and Thoresen (2006) find for Norway that the mothers' participation rate would fall by 0.12 percentage points in the case of a one percent increase in child care costs. Similar results are reported for Russia by Lokshin (2004). For the French case, however, Chone, le Blanc, and Robert-Bobee (2003) find values more similar to those for Germany, amounting to -0.04 percentage points. For the US, different authors report a wide range of values lying between -0.03 and -0.09 such as reported by Ribar (1995) up to -0.20 found by Blau and Hagy (1998). The reason for the relatively low child care costs elasticities of maternal labor supply in Germany might be the relatively weak link between employment and child care for children aged less than six years, as has been described in section 2.

[Table 8 about here]

The model estimated here also allows to calculate elasticities of the demand for child care, which are also shown in Table 8. The demand for child care is positively influenced by wage increases, a one percent increase of the gross hourly wage leading to an increase of the demanded hours of formal child care by 0.2 to 0.3 percent. The own-price elasticities of the demand for child care are quite large, a one percent increase in expected child care costs leading to a decrease in the demanded hours of formal child care between 0.4 and 0.6 percent.

4.2 Results from Policy Simulations

In the following, three different policy reforms are simulated. The results of these simulations are summarized in Table 9. The first reform refers to the law on an increase in the supply of subsidized child care for children under three years that has been passed in January 2005 ("Tagesbetreuungsbaugesetz - TAG", see section 1). According to this law, child care slots have to be provided for all children in this age group whose parents both work or wish to work. I therefore simulate this reform by setting the probability of getting a subsidized child care slot in the calculation of expected child care costs to 1 for those choice categories in which the mother has positive working hours.

The results show that the demand for formal child care increases by more than 3 percentage points (i.e. among families whose youngest child is less than three years, "child care participation" increases by about 3 percentage points). The reform also affects labor supply decisions of mothers with children in this age group. The participation rate of mothers whose youngest child is less than three years increases by more than 3 percentage points, and average working hours in this group increase by more than 10 percent.

The second reform is the free provision of existing child care slots for children between three and six years. This implies the abolishment of parents' fees for child care slots in kindergartens. This reform has been proposed several times in the past years, e.g. by the German Council of Economic Advisors in 2004 ¹⁵, by the Expert Commission on Children and Youth in 2005 ¹⁶ and most recently by the Federal Ministry of Family Affairs in January 2006 ¹⁷. In contrast to the reform described above that decreases disposable incomes of families with at least one child less than three years, this reform favors families with children between three and six years of age. Further, this reform not only subsidizes child care for children from two-earner families, but for all children between three and six years, regardless of the working status of the parents. The simulation results show that also in this case, the demand for child care, i.e. children participating in formal child care, would increase by 1.4 percentage points, however the effects on mothers' employment decisions are moderate. Both, the effect on working hours and the effect on participation lie below one

¹⁵see Sachverstaendigenrat (2004)

¹⁶see BMFSFJ (2005)

¹⁷see, e.g. "Von der Leyen fordert Verzicht auf Kita-Gebuehren", in: Sueddeutsche Zeitung 15.01.2006).

percent and one percentage point, respectively. This result is not surprising given that in this case, the subsidies are not linked to the mothers' employment status.

Thirdly, I simulate a reform of the tax treatment of child care expenses. Under the current legislation, child care costs - if they exceed a yearly amount of 1,548 Euro per child - can be deducted from taxable income up to a ceiling of 1,500 Euro per child per year. This is only possible if both parents are working or in education.¹⁸ The Federal Government plans to increase the amount of deductible expenses up to 4,000 Euro per child per year. For children under the age of six, only two thirds of all expenses shall be deductible, whereas for children between 6 and 14 years, expenses shall be deductible from the first Euro on. For children between three and six years, child care expenses shall be deductible regardless of the parents' employment status, for all other age groups, child care costs shall only be deductible if both parents are working.¹⁹ As the results in Table 9 show, this reform would lead to an increase of the participation rate of mothers whose youngest child is less than three years of almost one percentage point; average working hours would increase by about 3 percent. The effect of the demand for child care is lower ("participation" in child care would increase by 0.5 percentage points for families whose youngest child is less than three years), suggesting that - due to the link of the tax allowance to mothers' employment status - in addition to a small amount of mothers taking up jobs and child care, also mothers who are already using paid child care but are not working would take up jobs.

[Table 9 about here]

5 Conclusion and Policy Implications

In this paper, I develop a model to analyze labor supply and child care choices of mothers with preschool-aged children in Germany. Since access restrictions to subsidized child care are explicitly taken into account, the effect of parents' fees and availability of child care on the demand for child care and maternal employment decisions can be disentangled. Results from the policy simulations based on the

¹⁸This was introduced in 2002. Before 2002, there was only an allowance for child care and education that amounted to 1,080 Euro per year and was granted to everyone, regardless of whether a family chose to use paid or unpaid child care. This allowance still exists under the new legislation since 2002.

¹⁹For details of this reform, see BMFSFJ (2006).

model estimates show that a reform aiming at increasing the provision of child care has a greater impact on both, the demand for paid child care and maternal employment, than a reduction of parents' fees to existing child care slots. This result is influenced by the design of the two proposals, in particular the idea of the first reform to provide slots to children from two-earner families (or working single parents) only, whereas the second reform, i.e. the reduction of parents' fees of existing slots would be granted to everybody. The possibility to deduct child care costs from taxable income up to certain thresholds such as the most recent family policy reform discussed in 2006, also has positive effects on mothers' employment and the demand for child care. It is not possible, however, to directly compare the results of this latter reform to those of the first two reforms, since the costs for these reforms are much higher than those of the third reform. It has been estimated by the Expert Commission on Children and Youth that the first policy reform, i.e. the increase of child care slots for children under the age of three with two working parents or a single working parent, would cost about 2 billion Euro per year.²⁰ Reform 2, the abolition of parents' fees to existing child care slots, has also been estimated to cost about 2 billion Euro per year.²¹ The third reform, however, has been estimated by the Federal Ministry of Finance to cost only about 460 Million Euro per year.²²

Given that the first two reforms would cost roughly the same, my results show that investing in the provision of child care at the existing parents' fee structure would lead to a higher increase in maternal labor supply and a higher demand for child care than a reduction of fees to existing slots. If the goal of family policy is to facilitate work-life balance of two-earner families and to boost the demand for formal child care for educational reasons, policy reforms aiming at an extension of child care slots should be the government's choice.

²⁰See BMFSFJ (2005).

²¹See Staedtetag (2006).

²²See e.g. "Koalition vereinbart Kompromiss bei Familienfoerderung", in: Financial Times Deutschland, 31.01.2006.

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Table 1: Availability of child care slots in subsidized facilities

	Children aged 0-2		Children aged 3-6		Children aged 7-12	
	East	West	East	West	East	West
Slots per 100 children	37	2.7	105.1	88.1	4.5	40.8
<i>thereof: full-time slots</i>	<i>96%</i>	<i>79%</i>	<i>98%</i>	<i>18%</i>	-	-

Source: Statistisches Bundesamt 2004.

Table 2: Different forms of child care and maternal employment in Germany

Child Care Utilization			
Age of child	Paid child care: centre-based	Paid child care: private care	Regular unpaid child care (relatives, friends, etc.) ¹
0-2 years	10%	3%	35%
3-6 years	79%	1%	44%
7-10 years	7%	1%	34%

Employment of Mothers(All)			
Age of youngest child	Not working	Full-time working	Part-time working (including "Marginal Employment")
0-2 years	70%	8%	22%
3-6 years	43%	13%	44%
7-10 years	31%	17%	52%

Employment of Mothers with youngest child in paid child care			
Age of youngest child	Not working	Full-time working	Part-time working (including "Marginal Employment")
0-2 years	31%	31%	38%
3-6 years	39%	15%	46%
7-10 years	29%	20%	51%

Employment of Mothers with youngest child not in paid child care			
Age of youngest child	Not working	Full-time working	Part-time working (including "Marginal Employment")
0-2 years	75%	5%	20%
3-6 years	55%	8%	37%
7-10 years	32%	16%	52%

Source: SOEP, wave 2002. All numbers refer to the whole sample of mothers in the SOEP, including single mothers and mothers with non-working partners.

¹ *Question in the questionnaire:* "Are there additionally (to the utilization of child care facilities and paid nannies) other persons outside the household who regularly watch or take care of your children?" Unfortunately, there is no information on hours and frequency of these care arrangements in the SOEP.

Table 3: Values of market work, pure leisure and hours of child care by choice category

Choice Category	Working hours (h)	Paid child care (f)	Unpaid child care (up)	Maternal care (m)	Pure leisure (l)
1	0	0	0	80	0
2	0	18	0	62	22
3	0	40	0	40	40
4	18	0	18	62	0
5	18	18	0	62	0
6	18	40	0	40	22
7	40	0	40	40	0
8	40	18	22	40	0
9	40	40	0	40	0

Source: Own calculation.

Table 4: Descriptive Statistics

	Choice Categories		Frequency	age of youngest child	number of children
	working hours	child care hours			
1	0	0	872 (37%)	1.3	1.8
2	part-time	0	332 (14%)	1.7	1.7
3	full-time	0	27 (1%)	2.1	1.5
4	0	part-time	342 (15%)	4.1	1.7
5	part-time	part-time	473 (20%)	4.1	1.6
6	full-time	part-time	67 (3%)	3.7	1.4
7	0	full-time	30 (1%)	3.4	1.4
8	part-time	full-time	103(4%)	3.4	1.3
9	full-time	full-time	106(5%)	3.3	1.3

Source: Own calculation based on SOEP, waves 2001-2003.

Table 5: Average estimated parents' fees for a subsidized slot and expected costs of child care

	Children aged 0-2		Children aged 3-6	
	parents' fees	expected costs	parents' fees	expected costs
	<i>part-time care</i>			
<i>east Germany</i>	74	261	57	60
<i>west Germany</i>	82	332	64	76
	<i>full-time care</i>			
<i>east Germany</i>	115	515	70	83
<i>west Germany</i>	161	664	110	354

Note: All numbers are Euro per month.

Source: Own calculations on basis of SOEP, wave 2002.

Table 6: Average Net household income by choice categories

Choice Categories			Youngest child 0-2 years		Youngest child 3-6 years	
working hours	childcare hours		net household income		net household income	
			before	after	before	after
			child care costs		child care costs	
1	0	0	2623	2623	2803	2803
2	part-time	0	3058	3058	3255	3255
3	full-time	0	3549	3549	3778	3778
4	0	part-time	2623	2202	2803	2713
5	part-time	part-time	3067	2645	3256	3166
6	full-time	part-time	3559	3137	3778	3687
7	0	full-time	2623	1627	2803	2400
8	part-time	full-time	3072	2067	3269	2866
9	full-time	full-time	3564	2557	3793	3390

All amounts refer to Euro per month.

Source: Own calculations on basis of SOEP, wave 2001-2003 and the microsimulation model STSM.

Table 7: Estimation Results

Explanatory Variables	Coefficient	Standard Error
net income	.292849	.0305836
net incom squared	-.00097	.0003304
leisure	.0060755	.0257486
leisure squared	-.0009326	.0002879
formal child care	.0627229	.0172945
formal child care squared	-.003149	.0002079
informal child care	-.0923756	.0083001
informal child care squared	-.0014463	.0002798
leisure * age	.0008472	.0005637
leisure * youngest child u3	-.0033266	.0105127
leisure * youngest child 3 to 6	.009456	.0136805
leisure * east Germany	-.0008437	.0073226
formal child care * youngest child u3	-.1404871	.0102385
formal child care * youngest child 3 to 6	.0194431	.0109547
formal child care * east Germany	.0931928	.0088178
formal child care * German nationality	.0063431	.0099355
net income * leisure	.0007063	.0003459
net income * formal child care	-.0006085	.0002749
Probabilities and locations of random effects		
loc1: -.01366, .17777		
var(1): .00242755		
prob: 0.9287, 0.0713		
number of households = 913		
log likelihood = -3230.0671		

Source: Estimations based on SOEP, wave 2001-2003.

Table 8: Elasticities of Labor Supply and Demand for Child Care

Elasticities of Labor Supply		
	1% increase in gross hourly wage	1% increase in expected child care costs
<i>Change in participation rates (in percentage points)</i>		
All mothers	0.23	-0.02
Mothers with children less than 3	0.21	-0.02
<i>Change in working hours (in percent)</i>		
All mothers	0.65	-0.06
Mothers with children less than 3	0.70	-0.08
Elasticities of the Demand for Child Care		
	1% increase in gross hourly wage	1% increase in expected child care costs
<i>Change in participation rates (in percentage points)</i>		
All mothers	0.04	-0.05
Mothers with children less than 3	0.03	-0.07
<i>Change in hours of formal child care (in percent)</i>		
All mothers	0.20	-0.38
Mothers with children less than 3	0.30	-0.63

Source: Estimations based on SOEP, wave 2001-2003.

Table 9: Results of the Policy Simulations

Changes in Labor Supply			
	Reform 1	Reform 2	Reform 3
<i>Change in participation rates (in percentage points)</i>			
All mothers	1.7	0.3	0.7
Mothers with children less than 3	3.1	0.2	0.9
<i>Change in working hours (in percent)</i>			
All mothers	5.8	0.8	2.2
Mothers with children less than 3	10.7	0.8	3.1
Elasticities of the Demand for Child Care			
	Reform 1	Reform 2	Reform 3
<i>Change in participation rates (in percentage points)</i>			
All mothers	1.7	1.4	0.3
Mothers with children less than 3	3.2	0.8	0.5
<i>Change in hours of formal child care (in percent)</i>			
All mothers	18.6	4.5	3.0
Mothers with children less than 3	33.9	5.9	5.2

Source: Estimations based on SOEP, wave 2001-2003.