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## Conference Paper

# The Effects of Free Childcare on Labor Supply and Children

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# The Effects of Free Childcare on Labor Supply and Children

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Preliminary - Comments welcome

## **Abstract**

Many governments have introduced generous childcare subsidies to allow all children access to early childhood education. The effects of these costly programs are however still debated. In this paper, we use the introduction of free public childcare in several states in Germany to analyze its effects on children and their families. Our results suggest that the effects of public childcare depend on the child's age: free public childcare for 3-year-olds increases attendance and female labor supply, while it reduces childcare attendance for 5- and 6-year-olds. After the policy reforms, 3-year-olds improve their developmental skills in the short-run while there might be some detrimental effects for older preschool children.

**Keywords:** Childcare, Female Labor Supply, Family Policy, Germany

**JEL Classification:** J13, J22, J18

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# 1 Introduction

Female labor supply has increased dramatically in many countries over the past decades (Jaumotte (2003); Boeri (2005)). Employment among women in Germany or Portugal, for example, has increased from less than 50% in 1981 to over 70% in 2001. Despite these changes, large cross-country differences in female employment remain with above 80% of women working in Scandinavian countries, but only around 60% in Southern European countries like Italy or Spain.

Many view generous childcare policies as a key determinant of the observed cross-country differences (see Jaumotte (2003)), but also the dramatic growth of female employment over the last decades (Attanasio et al. (2008)). Proponents of such policies argue that affordable childcare is crucial to encourage female labor force participation and promote economic self-sufficiency, especially among single mothers. Pundits, in contrast, think that childcare subsidies distort the allocation of family resources and even may have negative consequences for child development.

In recent years, many governments have introduced costly programs to expand the availability of childcare or to reduce childcare costs through generous subsidies. Yet, there is still a vivid academic and public debate on how effective such measures are in raising female labor supply and whether it has possibly negative effects on children's development.

Previous research reports a wide range of estimates of the effect of childcare provision and prices on maternal employment for different countries. Analyzing an expansion of subsidized care in Canada, for instance, Baker et al. (2008) show that a 14.9 pp growth in childcare attendance is accompanied by a 7.7 pp increase in maternal labor supply. Studying a similar expansion of subsidized, universally accessible care during the late 1970's in Norway, Havnes and Mogstad (2011)

in contrast found much more modest effects: while subsidized childcare spaces expanded by 18 pp, female labor force participation increased by only 1.1 pp.

A similar range of estimates exists for the link between public childcare and children's development. Some studies have found detrimental effects (e.g. Baker and Milligan (2008)), while some show an improvement in child outcomes (e.g. Datta Gupta and Simonsen (2010); and Felfe and Lalive (2013)).

In this paper, we analyze how free public childcare affects attendance, maternal labor supply, and measures of child development in Germany. Germany is an interesting case for several reasons. Germany spends a lot of public money, about 200 billions per year, on family policy (Bonin et al. (2013)). At the same time, Germany has fertility rates below replacement levels, which has spurred a variety of policy proposals how to encourage family formation. Moreover, female labor force participation and the provision of childcare, especially for children under 3, have traditionally been low, at least in West Germany. In response, governments have made substantial efforts over the past years to improve the provision of early childhood education.

In particular, six states in Germany have adopted fully subsidized public childcare between 2000 and 2011. Some states introduced free childcare for the year prior to school entry. Others have adopted free public childcare for all 3-6 years-old children in their state. Here, free public childcare was phased in from older age groups to younger age groups. Hence, the policy reforms provide us with rich variation in access to free childcare between states, within states over time as well as between children of different ages.

Economic theory suggests that a price decline for public childcare would, through a substitution effect, encourage public childcare attendance and reduce informal care arrangements. At the same time, the income effect might reduce informal care arrangements even further (if it is not a normal good). In addition, parental

fees for public childcare are opportunity costs for female employment and full-time work. Hence, we would expect that eliminating parental fees increases female labor supply at the extensive but also at the intensive margin; the income effect would work in the opposite direction for families using public childcare.

The policy should also affect some families more than others. Low-income families should be not much affected by the new policy because they did not pay parental fees even before the new policy is introduced. Medium- and high-income families pay up to 800 Euros per month and childcare slot prior to the new policy. They should therefore benefit the most from the introduction of free childcare.<sup>1</sup>

Our findings suggest that childcare attendance grows by about 3.5 percentage points after the introduction of free daycare. However, the effects vary a lot across children's ages. 3-year-olds are much more likely to attend day care after the introduction of the policy, while 5- and 6-year-old children are actually slightly less likely to attend childcare when it is available for free. This effect is partly, but not entirely, explained by the fact that children in treatment states start school at younger ages after the policy change. This result is consistent with the idea that children who have attended daycare at a young age achieve school readiness earlier.

For female employment, we find overall no significant effect. In line with the increase in childcare attendance, mothers of 3-year-olds work more after the introduction of the policy. However, a 30 percentage point increase in attendance only leads to a 10 percentage point increase in maternal employment. Interestingly, mothers of 5-year-olds also increase their labor force participation though we find no effect on childcare attendance. In contrast, mothers of 4-year-olds are actually somewhat less likely to work when their pre-school child has access to free

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<sup>1</sup>There could be an indirect effect on low-income families however. If more high-income families send their child to public daycare after the reform, peer groups in the childcare centers would improve for all attending children.

childcare. Our findings for child development suggest that 3-year-old children indeed benefit from attending childcare earlier. In contrast, we tend to find negative effects for 5-year-old children which could be related to the decline in child care attendance.

The paper proceeds as follows. The next section discusses the related literature. Section 3 provides some background information and discusses the policy changes in the German states. Section 4 introduces the data and our empirical approach. We discuss the results for childcare attendance, labor supply and child outcomes in Section 5. Section 6 discusses the implications of our findings and concludes.

## 2 Related Literature

A sizable literature has exploited the expansion of childcare availability to study its impact for childcare attendance and female labor supply (see Cascio (2009); Gelbach (2002) for the United States; Lefebvre and Merrigan (2008) for Canada; Berlinski and Galiani (2007) for Argentina; Havnes and Mogstad (2011a) for Norway; Chiuri (2000) for Italy; Bauernschuster and Schlotter (2013) for Germany). Female labor supply does respond to the availability of childcare, but the elasticity is typically very small (Havnes and Mogstad (2011a), for example, report an elasticity of 0.06 for Norway; Chiuri (2000) an elasticity of zero for Italy). The only exception is Bauernschuster and Schlotter (2013) which reports very large labor supply elasticities for mothers of 3 years-old children.

Our analysis relies on variation in childcare prices rather than availability alone to understand the tradeoff between female labor supply, childcare and child well-being. The effects of a price decline might affect different families than of a expansion of childcare slots: availability should affect labor supply for those with the highest net gain from work and parents with the highest preference for child-

care outside the home. A decline in childcare prices in turn affects women on the margin between working and non-working; or mothers who currently use informal care but would prefer formal childcare if affordable. Furthermore, the response to childcare prices is the primary parameter of interest for policy-makers in the many countries where childcare is readily available.<sup>2</sup>

A growing number of studies in economics have also investigated how public childcare attendance affects children's development (see Almond and Currie (2011) for an excellent survey). A small literature studies the effects of non-parental care for children under 3 (Baker et al. (2008) for Canada; Noboa Hidalgo and Urzua (2010) for Chile; Datta Gupta and Simonsen (2010) for Denmark; and Felfe and Lalive (2013) for Germany). The results again vary a lot across studies.

Baker et al. (2008) find that lowering the out-of-pocket cost of public childcare crowds out existing private care arrangements. While stimulating maternal employment, the childcare subsidy led to more hostile parenting styles and thus to a deterioration of child well-being. However, the sample affected by the policy were mostly middle- and high-income parents because low-income families already had access to low-cost childcare before the price reduction was introduced in Quebec.

In contrast, Noboa Hidalgo and Urzua (2010), using regional variation in the availability of care centers, find short-run gains from center-based care among children aged 5-14 months, particularly in motor and cognitive skills (). Datta-Gupta and Simonsen (2010) also finds benefits from high-quality center-based care. Finally, Felfe and Lalive (2013) find positive effects of childcare expansion, especially

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<sup>2</sup>A related strand of the literature focuses on understanding the consequences of maternal employment on children's development. Some studies show that maternal employment may improve intellectual performance through increasing household income (Blau and Grossberg (1992)), other studies report a deterioration of children's cognitive outcomes (Baum (2003); James-Burdunny (2005)). Still others suggest that the effects may depend on the characteristics of mothers and families (see e.g. Ruhm (2004)). Several recent studies use reforms of parental leave to assess the role of parental time for children's long-run development outcomes (Baker and Milligan (2012); and Dustmann and Schönberg (2013) find no effects, while Carneiro et al. (2010) detect some positive outcomes in Norway).

for children with low-educated or immigrant parents.

Results for older preschool children (ages 3 to 6) suggest substantial positive effects of daycare in the longer-run (e.g. Berlinski and Galiani (2007); Felfe et al. (2012); Gormley Jr. et al. (2008); Havnes and Mogstad (2011b)) or no effect in the overall sample, but positive effects for specific subgroups (Dustmann et al. (2013) find a positive effect on school readiness for immigrant children; Fitzpatrick (2008) positive effects in fourth grade for disadvantaged children). Overall, preschool or kindergarten seem to boost measurable cognitive skills like reading and math; at the same time, childcare might also foster some behavioral issues (see e.g. Magnuson et al. (2007)) though the evidence here is not conclusive.

Our analysis focuses on short-run effects on cognitive (e.g. language skills) and non-cognitive skills (e.g. openness, anger or anxiety) before school. One advantage is that we can therefore analyze whether free public childcare has positive effects along some margins, but negative along others. In addition, we investigate the broader family context to see if free public childcare has spillover effects on younger or older siblings in the household. In case of positive spillover effects within the family, the benefits of providing free childcare might be much larger than the direct effect on the treated child would suggest.

## **3 Institutional Background**

### **3.1 The Supply of Childcare in Germany**

In Germany, public childcare is supplied by either the municipalities or free providers, mostly churches and non-statutory welfare services. Municipalities supply around one-third of the childcare slots, while free providers provide around two-thirds. Private childcare providers make up only a very small fraction of the market (around 2 percent for children under 3 and 0.3 percent for children between the ages 3 to

6 (Berger and Spiess (2008)).

The provision of childcare varies substantially across municipalities both within and across states. Traditionally, childcare in West Germany was relatively scarce, especially for children under 3. Free childcare might not affect family choices if the family does not get a childcare slot because of rationing. Rationing should be less of a problem for children aged 3 because childcare facilities ("Kindergaerten") for this age range are widespread. Since 1996, a federal law also introduced a legal claim for a daycare slot for children between the ages 3 and 6 in all states. Therefore, all children aged 3-6 who get eligible for free public childcare also have access to a childcare slot (though the slot might only be part-time).<sup>3</sup>

Overall, formal childcare in Germany is characterized by relatively high expenditures per child compared to large-scale programs in other countries. Germany ranks 6th place in terms of expenditures for formal childcare in the OECD (Jugendinstitut (2004)). The average yearly expenditure for a slot in formal childcare is approximately 6,500 Euros. These expenditures are substantially higher than the expenditures for the Head Start Program in the US, for instance.<sup>4</sup>

Publicly subsidized childcare in Germany is regulated by both the federal government and the individual states. The federal regulations are set down in the Public Assistance for Children and Youth Act (Kinder- und Jugendhilfegesetz) which defines the goals of public childcare as: providing care and custody ("Betreuung"), educating and learning ("Bildung") and developing social and noncognitive skills ("Erziehung"). To achieve these goals, the federal law explicitly requires the

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<sup>3</sup>The situation is different for children under 3, where traditionally few slots were available. The federal government passed a law in 2005 ("Tagesbetreuungsbaugesetz") to expand daycare capacities for children aged 0-2 years. This target was reinforced in December of 2008, when the federal government decided to provide high-quality daycare for all children after their first birthday starting in 2013. As a consequence, the supply of childcare, especially for children under 3, has expanded rapidly in all West German states since the early 2000s. Despite this expansion, rationing of childcare slots was still a major issue in West Germany for most of our study period (see e.g. Wrohlich (2008); Wrohlich (2011)).

<sup>4</sup>Head Start is aimed at low-income families and costs around USD 5,000 ( $\approx$  4,000 Euros) per year and slot (Currie (2001))

educational staff of the childcare centers to collaborate and interact closely with the child's parents.

Each childcare facility requires a permit ("Betriebserlaubnis") which is only granted (and possibly revoked) if certain standards regarding group sizes, training of the pedagogical staff, the physical environment and standards for hygiene and security are met. Similarly, facilities are only eligible for subsidies if they meet all the requirements and follow the federal and state guidelines. The local and state youth offices are responsible for monitoring the requirements and imposing sanctions in case of non-compliance (and even close the facility if standards are not met).

Details of the standards are laid down in state legislation and enforced by both state and local authorities. Parents have, for example, the right to elect a parental council which has to be informed in detail (and at least once a year) about, for example, the budget, pedagogical concept and other rules of operation in the childcare facility. Parents are directly involved in decisions about the food provided in the childcare facility and the pedagogical concept of the childcare facility.

State laws also define the requirements for the pedagogical staff. Looking at the actual training of childcare providers, 64% of all employees and 90% of the person heading a group have completed vocational training as a nursery-school teacher (Jugendinstitut (2004)), which involves a 2-year curriculum at a vocational school combined with more than one year of practical training. Many of the head teachers have a diploma in social pedagogy (involving a 3 to 4 years curriculum at a technical college) or related subjects. The group sizes are also regulated with the maximum set at 25 children; actual numbers vary across states (Deutsches Jugendinstitut (2008)).

Most of the actual operation costs of childcare (86%) are covered by municipi-

palties, states and free providers (Schilling (2008)). Parental fees only contribute about 14%. In principle, parental fees for municipal and non-municipal providers can be set by the municipalities (Goerres and Tepe (2013)). However, whenever there are higher authorities like district or state governments enacting fee schedules (like *for instance in the state of North Rhine-Westphalia*) these apply to all municipalities. Federal law mandates that parental fees vary with the number of children and parental income. Most importantly, low-income households do not pay parental fees.

As a consequence, there is substantial heterogeneity in prices for publicly provided day care across states and even across municipalities within states. Parental fees range between 0 and 450 Euros per month for a childcare slot; parental fees reach up to 800 Euros for high-income parents.

### 3.2 State-Level Adoption of Free Childcare

Between 2000 and 2011, six states in West Germany introduced free center based care for children in a certain age range.<sup>5</sup> In contrast, four states in West Germany did not offer free childcare at the state level. An overview of the policy changes in each state and the age group affected is provided in table 1.

The reforms differed in the timing of adoption and by the age group they affected. Four states eliminated public childcare fees in the last year in childcare - typically when the child is 5 or 6 years-old. Free childcare for 5-6 years-olds have been in place in *North-Rhine-Westphalia* since 2011, in *Schleswig-Holstein* starting with the 2009/10 school year, in *Hamburg* since 2009 and in *Lower Saxony* since 2007.

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<sup>5</sup>*Saarland* introduced free childcare in 2000 but we exclude it from the analysis because of small sample size and lack of pre-policy data. *Hesse* also planned to introduce free childcare in 2007; yet, it remains unclear whether all municipalities actually implemented it. We therefore do not include *Hesse* as a treatment state but keep it in the set of control states. If anything, that yields conservative estimates of the actual effect.

Table 1: State-Level Adoption of Free Childcare

	Treatment States			Control States
	RP	BE	NI, HH, SH, NW	HE, BY, BW, HB
Policy change	2-6-year-olds are free	last 3 years before school entry free	last year before school entry free	no changes
Extent	no cap specified	no cap specified	up to 8 hours per day (NI) up to 5 hours per day (HH) up to 5 hours per day (SH) no cap specified (NW)	-
Phasing-in starting-in	2006	2007	2006 (NI) 2009 (HH) 2009 (SH) 2011 (NW)	-
Fully in place from	2010	2011	2006 (NI) 2009 (HH) 2009 (SH) 2011 (NW)	-
Ended in	-	-	2010 (SH)	-
Accompanying measures	extension of legal claim to childcare to 2-year-olds	-	-	-

Abbreviations refer to RP: Rhineland-Palatinate, BE: Berlin, NI: Lower-Saxony, HH: Hamburg, SH: Schleswig-Holstein, NW: North Rhine-Westphalia, HE: Hesse, BY: Bavaria, BW: Baden-Wuerttemberg and HB: Bremen.

The two most comprehensive reforms were implemented in *Rhineland-Palatinate* and *Berlin*. *Rhineland-Palatinate* introduced free childcare for all children aged 2 to 6, while Berlin supplied free childcare for the last three years before entry into primary school. In *Berlin*, mandatory schooling starts in summer of the year a child turns six in, so children benefiting from this policy are between 2.5 and 6.5 years old. In both states, the policies were phased in from older cohorts to younger cohorts of pre-school children. *Rhineland-Palatinate* began to phase-in the policy in 2006, *Berlin* in 2007. The policies were fully in place for all eligible children in 2010 and 2011, respectively.<sup>6</sup>

The political discussion prior to the introduction of free childcare in the six states stressed equity concerns<sup>7</sup>. The main concern seemed to have been that all

<sup>6</sup>*Rhineland-Palatinate* introduced a legal claim to a childcare slot for 2-year-olds in August 2010.

<sup>7</sup>Compare for instance Abgeordnetenhaus Berlin Drucksache 16/2758 vom 10.11.2009. Vorlage zur Beschlussfassung: Gesetz zur Einfuehrung der beitragsfreien Foerderung im Kinder-

preschool children should have access to early childhood education - independent of their family background and parental resources. The political and media discussion does not indicate that these state policies were implemented in response to low female labor supply or children lagging behind in their development.

The policy reforms implied a substantial decline in childcare prices. The decline was largest for medium- and high-income families because low-income families did not pay parental fees even prior to the reform. We next discuss the data and empirical approach we employ to study the consequences of these policy reforms for families in Germany.

## 4 Data and Empirical Strategy

### 4.1 Data Sources

To analyze the effects of free childcare we use data from the German Socio-Economic Panel (GSOEP). The annual panel surveys around 12,000 households about their childcare choices, labor supply, income source and the household's demographic structure. We restrict the analysis to the roughly 9,000 households from West Germany (including Berlin) since employment opportunities, income levels and childcare provisions differ substantially between East and West Germany.<sup>8</sup>

To focus on the years around the policy change, we restrict the data to the 2001-2012 period which covers five years before the first policy change and six years after. We include in our sample all families in West Germany with at least one pre-school child aged 3 to 6. After imposing these restrictions, we are left with

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garten und zur Aenderung weiterer Vorschriften. and 'Landtag Nordrhein-Westfalen Drucksache 15/1929 vom 10.05.2011: Gesetzentwurf der Landesregierung. Erstes Gesetz zur Aenderung des Kinderbildungsgesetzes und zur Aenderung des Ersten Gesetzes zur Ausfuehrung des Kinder- und Jugendhilfegesetzes. among others.

<sup>8</sup>For example, female labor supply rates and childcare utilization for children under the age of three are substantially higher in East than in West Germany.

a sample size of around 1,000 observations per year.<sup>9</sup>

In the GSOEP, parents report whether their children attend public daycare, whether people from outside the household (e.g. relatives, friends, neighbors or a childminder) care for the child or whether childcare is exclusively provided in the home by a household member instead. Based on this information, we code an indicator variable whether a household uses public daycare or not.

We further know whether the responsible parent participates in the labor market or not.<sup>10</sup> We consider mothers with a working contract of all extents (i.e. full-time, part time, marginally, in-service training) and actually working at the time of the interview as participating in the labor force. Employed but non-working mothers (for instance mothers on parental leave) are not considered working.

To analyze the effects on child outcomes, we use a supplementary questionnaire to mothers with children born in 2003 or later. Since 2003, mothers of 3-year-olds are asked to assess their child's motor skills, language ability, social skills and skills in daily activities based on the (adapted) Vineland Social Maturity Scale.

Each of the four skill categories contains five questions covering different aspects of a skill. For each question, the mother states whether the child is able, not able or only partially able to perform a particular task (for example, forming a sentence with multiple words or drawing recognizable figures).<sup>11</sup> Rather than using all 20 items (which are described in more detail in the appendix), we construct a score for each category (language, motor skills etc.) as well as a total score across all categories. In each category, we calculate the unweighted sum of the responses to

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<sup>9</sup>The data appendix provides more details about the sample and the definitions of all variables used in the empirical analysis.

<sup>10</sup>The responsible parent is identified as the mother (using a unique identifier in the data), the father in case the mother is absent or another female adult in the household (like the grandmother) in case both parents are absent from the household. In 99% of the cases, the responsible parent is the mother or another female adult. Men are excluded from the analysis.

<sup>11</sup>Research has shown that maternal assessments yield reliable indicators of a child's abilities and are often more reliable than formal psychological tests, especially when the child is very young (Schmiade et al. (2011)).

the individual items. A larger score implies that a child is better able to perform the specific set of tasks.

A second child questionnaire asks mothers of 5-6 years-olds questions about her child's character and any developmental problems. On a scale from 0 to 10 mothers are asked to evaluate their children's anxiety level, openness etc. compared to children of the same age.<sup>12</sup> Details on the questions are found in the appendix.

We describe the treatment variables characterizing the new policy in the empirical strategy section below. To control for child, parent and household characteristics, we also use child age and sex, the demographic structure of the household (household size, number of adults and whether there is an infant (under age 1) living in the household) and characteristics of the responsible parent (age, gender, education, marital status, whether it is a single parent household and whether the parent has foreign citizenship).

We merge these data with administrative data on the supply and quality of public childcare from the Child and Youth Services Statistics (Deutsches Jugendinstitut). In addition, we use data on state unemployment and GDP growth rates from the Federal Statistical Office as well as the Statistical Offices of individual states to control for local economic conditions.

Table 2 shows descriptive statistics for our sample of families separately by treatment and control group and before and after the reforms.

Stars in columns (2) and (4) report statistically significant differences between treatment and control group in the regarding period. Overall, outcomes for the treatment and control states develop similarly. The share of mothers working increases by 12 to 15 percentage points in both groups over our study period, whereas the share of children attending daycare increases by around 16 percentage points in treatment and control group. Interestingly, we observe significantly more moth-

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<sup>12</sup>Questions, for instance, include: Compared to other children of the same age, how would you assess your own child? More anxious or less anxious; more open to others or less open?

Table 2: Descriptive Statistics

Outcome/Control Variable	Before		After	
	(Control)	(Treatment)	(Control)	(Treatment)
Share of Mothers Working	0.3968 (0.00)	0.3969 (0.00)	0.5474 (0.00)	0.5175*** (0.00)
Share of Children in Day Care	0.5638 (0.00)	0.5392*** (0.00)	0.7232 (0.00)	0.6960** (0.00)
Child Age	4.04 (0.01)	4.04 (0.01)	4.04 (0.02)	4.06 (0.02)
Girls	0.4874 (0.00)	0.4864 (0.00)	0.4834 (0.00)	0.5026 (0.00)
Maternal Age	33.1 (0.06)	32.9** (0.06)	35.2 (0.10)	34.3*** (0.09)
Maternal Years of Education	11.7 (0.03)	11.8** (0.03)	12.9 (0.05)	12.6*** (0.05)
Share of Non-Germans	0.2374 (0.00)	0.1799*** (0.00)	0.1476 (0.00)	0.0968*** (0.00)

Notes. \* p<0.1, \*\* p<0.05, \*\*\* p<0.001. Clustered standard errors are reported in parenthesis.

ers working in the control states after 2006. T-tests do not show any differences regarding child control variables, but indicate that some maternal characteristics change. Whereas mothers in the treatment state are younger in both periods, their advantage in education decreases such that mothers residing in control states have significantly more education in the after period. The share of female parents having a non-German citizenship decreases by 5 percentage points in both groups, but stays significantly higher in the control states over the whole period of observation.

## 4.2 Empirical Approach

To analyze the consequences of the staggered introduction of free childcare, we use variants of a differences-in-differences approach. Specifically, we estimate variants of the following model:

$$Y_{ist} = \alpha_s + \delta_t + \beta * Treatment_{ist} + \lambda' X_{ist} + \varepsilon_{ist} \quad (1)$$

where  $Y_{ist}$  represent outcome of individual (parent or child)  $i$  in state  $s$  and year  $t$ . Our outcomes of interest are childcare attendance, maternal labor force participation, and children’s development in terms of everyday skills and behavior.

The key independent variable  $Treatment_{ist}$  is a dummy variable equal to one if a child is eligible for free childcare. A child is eligible if it lives in a state offering free childcare in the post-policy period and is in the age range covered by the childcare policy.<sup>13</sup>

We include a set of control variables  $X_{ist}$ , such as child and maternal characteristics (child age and gender, maternal years of education, age, immigrant status) as well as economic controls like GDP and unemployment rates. In all specifications we control for state ( $\alpha_s$ ) and year ( $\delta_t$ ) fixed effects.

Thus, the effect of the policy change is identified by comparing changes of choices for an eligible child residing in a treatment state in the post-policy period to the choices for a child of the same age in a control state in the post-policy period relative to the pre-policy period. Our approach produces intention-to-treat effects capturing the full effect of the policy on all types of care arrangements of an eligible child.

An important concern of our identification strategy is whether the common trend assumption holds in our setting. Here, we provide graphical evidence for the pre-policy trends between treatment and control groups. Figure 1 shows that average childcare attendance exhibits an upward trend both in treatment and control states; yet, there is no visible difference in the trend between treatment and control group.<sup>14</sup>

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<sup>13</sup>For practical reasons, we further require that the family is interviewed during a month where the child is eligible for free childcare.

<sup>14</sup>The picture shows averages for five treatment states (*Rhineland-Palatinate*, *Schleswig-Holstein*, *North-Rhine-Westphalia*, *Lower Saxony* and *Hamburg*) and for four control states. The picture is somewhat less clear for Berlin. However, re-estimating our model excluding Berlin (reported below) provides evidence, that our results are not driven by an underlying differential trend between Berlin and the control group.

Figure 2 shows average maternal employment rates for *Rhineland-Palatinate*, *Schleswig-Holstein*, *Lower Saxony* and *North-Rhine-Westphalia*. Again, no differential trends are apparent for these states.<sup>15</sup>

Another important concern with difference-in-differences analysis is the correct computation of standard errors. To account for within state dependence, our baseline estimations rely on standard errors clustered at the state level (Bertrand et al. (2004)).<sup>16</sup>

## 5 Empirical Results

### 5.1 Childcare Attendance

Results from linear probability regressions are reported in table 3. Each column represents a separate regression. The baseline differences-in-differences specification reported in column 1 shows that introducing free child care indeed has a positive effect on child care utilization. The share of children attending day care increased by 3 percentage points in the treatment group compared to the control group over the study period.

However, the policy effect is rather heterogeneously distributed across age groups. Interacting the policy dummy with a child’s age reveals that there is a substantial increase (of 30 pp) in child care attendance among 3 years-olds (column 2). For children aged 4 and 5, the sum of the coefficients suggests a close to zero effect. Here, only the effect for 5-and 6-year-olds are significantly different from 0 and indicate that these age groups are slightly less likely to attend kinder-

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<sup>15</sup>The common trend assumption is less obvious for the large cities of Berlin and Hamburg. Below, we show however that our results cannot be explained by underlying differential trends between treatment and control states.

<sup>16</sup>We test alternative assumptions for getting correct standard errors in the results section below.

Figure 1: Childcare Attendance

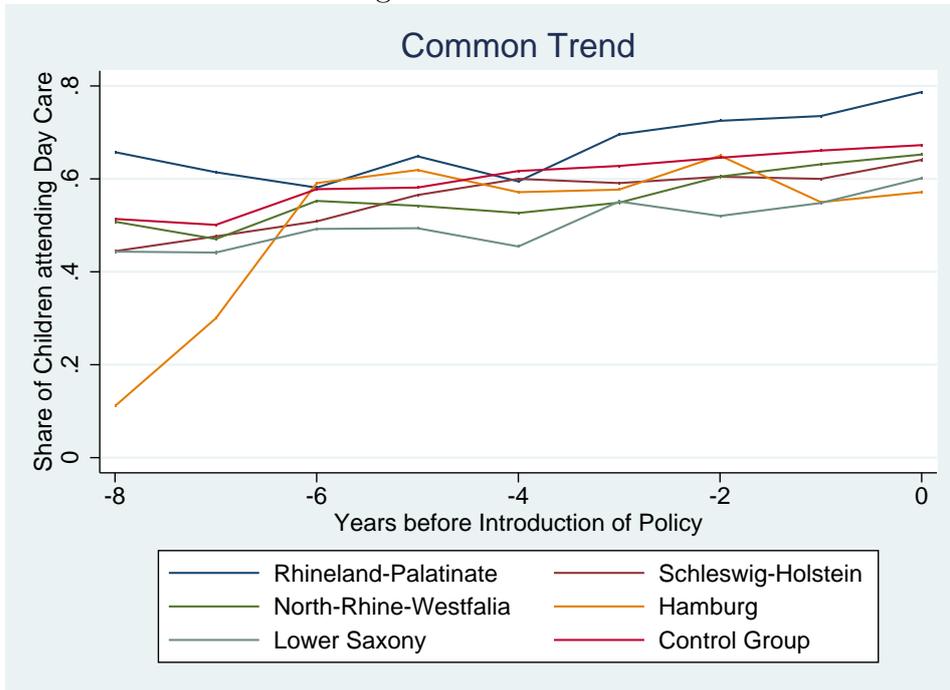
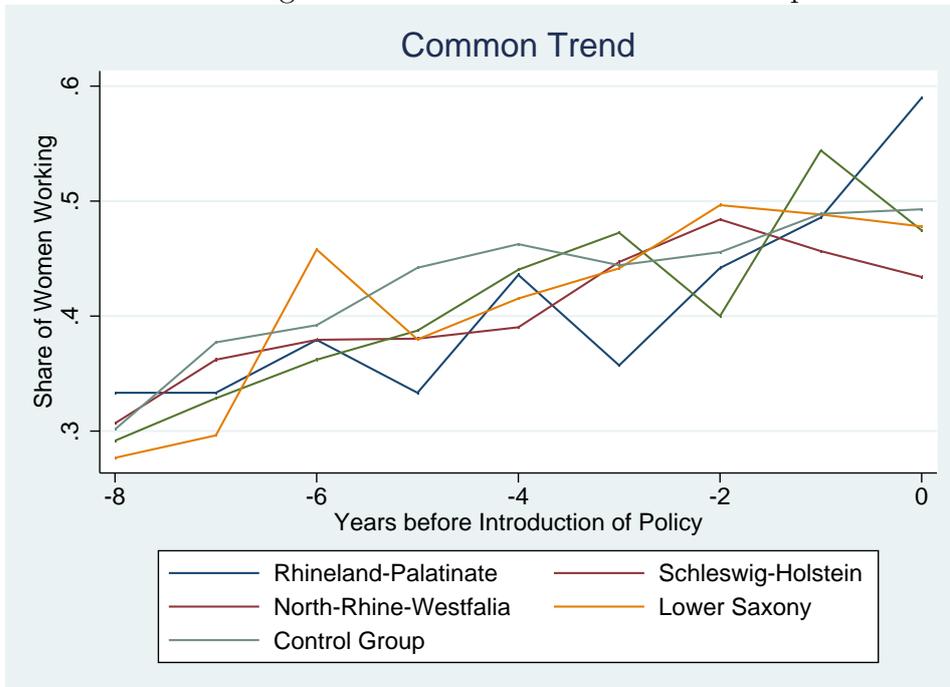


Figure 2: Maternal Labor Force Participation



garten after the introduction of free public childcare. This pattern is consistent with the fact that by age 5 almost all children attend day care even before the introduction of places and regardless of their state of residence. Part of the decrease in child care attendance for 5-and 6-year-olds can be explained by earlier school enrollment of children, possibly evoked by positive effects of earlier day care attendance on children's development.

These effects are very robust to alternative specifications. Including individual and state control variables (column 3) or controlling for state specific linear trends (column 4) does not affect the results. The same applies to specifications including places in kindergarten for children below the age of 6 as an additional control variable (column 6)<sup>17</sup>. However, the coefficients decrease substantially when doing so.

As discussed above, from the graphical evidence on the common trend it is not obvious that the common trend assumption is valid for Berlin and the control group. Column 5 shows that our results persist if Berlin is excluded from the regression.

Instead of clustering standard errors by state, Column 7 uses bootstrapping to estimate standard errors (see Cameron and Miller (2008)).

## 5.2 Maternal Labor Force Participation

The impact of free childcare on maternal labor force participation are in line with the changes in childcare utilization. However, they are clearly less pronounced. Results are reported in table 4. Column 1 to 7 refer to the same specifications as for table 3.

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<sup>17</sup>Additional information on the number of child care places per 100 children on district level is only available in 2002, 2007 and 2008 to 2012. Furthermore, the type of information surveyed changes between 2002 and 2007. To obtain comparable values we estimate supply per 100 children after 2002 based on total approved places and share of children in care. The underlying assumption is that the number of approved places is proportional to the share of children of that age group in care.

Table 3: Childcare Attendance

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Childcare Attendance	D-in-D	Age	FullModel	Trends	-Berlin	Places(U6)	Bootstrap
Overall/Baseline	0.034* (0.02)	0.322*** (0.03)	0.309*** (0.02)	0.252*** (0.05)	0.306*** (0.02)	0.184*** (0.05)	0.184 (0.11)
Free Childcare*4-Year-Olds		-0.374*** (0.04)	-0.379*** (0.07)	-0.372*** (0.06)	-0.333*** (0.03)	-0.278*** (0.03)	-0.278*** (0.08)
Free Childcare*5-Year-Olds		-0.481*** (0.04)	-0.485*** (0.06)	-0.468*** (0.05)	-0.443*** (0.04)	-0.354*** (0.04)	-0.354*** (0.07)
Free Childcare*6-Year-Olds		-0.435*** (0.04)	-0.416*** (0.04)	-0.385*** (0.04)	-0.399*** (0.04)		
4-Year-Olds		0.495*** (0.03)	0.498*** (0.03)	0.498*** (0.03)	0.511*** (0.02)	0.457*** (0.03)	0.457*** (0.02)
5-Year-Olds		0.622*** (0.03)	0.620*** (0.03)	0.620*** (0.03)	0.634*** (0.02)	0.547*** (0.03)	0.547*** (0.01)
6-Year-Olds		0.589*** (0.03)	0.596*** (0.03)	0.596*** (0.03)	0.611*** (0.02)		
Places (3 to 6 Year-Olds)						0.002* (0.00)	0.002* (0.00)
Maternal Age			0.000 (0.00)	0.000 (0.00)	0.001 (0.00)	0.000 (0.00)	0.000 (0.00)
Maternal Education			0.012*** (0.00)	0.012*** (0.00)	0.012*** (0.00)	0.013*** (0.00)	0.013*** (0.00)
Non-German			-0.038*** (0.01)	-0.037*** (0.01)	-0.036*** (0.01)	-0.059** (0.02)	-0.059*** (0.02)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	Yes	Yes	Yes	Yes
Trends	No	No	No	Yes	Yes	Yes	Yes
Observations	11733	11733	9627	9627	9324	3457	3457
Cluster	10	10	10	10	9	9	
R-sqr	0.033	0.361	0.381	0.382	0.396	0.366	0.366

Notes. \* p<0.1, \*\* p<0.05, \*\*\* p<0.001. Clustered standard errors are reported in parenthesis.

The first row in all specification shows that mothers of 3-year-olds are more likely to be employed (by about 10 pp) after free childcare is introduced. This result is consistent with the fact that daycare attendance of 3-year-olds increases. However, the response of maternal labor supply is much elastic than childcare utilization.

Interestingly, mothers of 5-year-olds also increase their labor supply more than in the control group, although we did not observe a corresponding effect in childcare attendance. Comparing the third row in specifications 3 to 5: summing the effects generates a slightly positive effect for children over 3, although the coefficients themselves are often not statistically significant. However, none of the effects of the policy introduction persists when standard errors are bootstrapped.

Table 4: Effects on Maternal Labor Force Participation

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Maternal LFP	D-in-D	Age	FullModel	Trends	-Berlin	Places(U6)	Bootstrap
Overall/Baseline	0.039 (0.03)	0.086** (0.03)	0.127*** (0.03)	0.108* (0.05)	0.144*** (0.04)	0.098* (0.05)	0.098 (0.13)
Free Childcare*4-Year-Olds		-0.148*** (0.01)	-0.157*** (0.02)	-0.166*** (0.02)	-0.149*** (0.01)	-0.135*** (0.01)	-0.135 (0.10)
Free Childcare*5-Year-Olds		-0.042 (0.04)	-0.062* (0.03)	-0.072** (0.03)	-0.074** (0.03)	-0.052** (0.02)	-0.052 (0.09)
Free Childcare*6-Year-Olds		-0.089 (0.08)	-0.120 (0.07)	-0.112 (0.07)	-0.172*** (0.04)		
4-Year-Olds		0.090*** (0.01)	0.082*** (0.01)	0.082*** (0.01)	0.086*** (0.01)	0.077*** (0.01)	0.077*** (0.02)
5-Year-Olds		0.125*** (0.01)	0.110*** (0.01)	0.110*** (0.01)	0.112*** (0.01)	0.096*** (0.01)	0.096*** (0.02)
6-Year-Olds		0.158*** (0.01)	0.142*** (0.01)	0.141*** (0.01)	0.144*** (0.01)		
Places(3 to 6 Year-Olds)						0.002 (0.00)	0.002 (0.00)
Maternal Age			0.008*** (0.00)	0.008*** (0.00)	0.008*** (0.00)	0.008*** (0.00)	0.008*** (0.00)
Maternal Education			0.024*** (0.00)	0.024*** (0.00)	0.023*** (0.00)	0.028*** (0.00)	0.028*** (0.00)
Non-German			-0.107*** (0.03)	-0.107*** (0.03)	-0.108*** (0.03)	-0.137** (0.05)	-0.137*** (0.03)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	Yes	Yes	Yes	Yes
Trends	No	No	No	Yes	Yes	Yes	Yes
Observations	11234	11234	9673	9673	9367	3485	3485
Cluster	10	10	10	10	9	9	
R-sqr	0.016	0.029	0.069	0.071	0.069	0.084	0.084

Notes. \* p<0.1, \*\* p<0.05, \*\*\* p<0.001. Clustered standard errors are reported in parenthesis.

An obvious concern is that mothers might be willing to take up a job, but

they might not find one because of low labor demand. The fact that the control variables for labor demand (state unemployment rates and state GDP per capita growth rates) do not have significant effects on labor force participation indicates that this is not the case. Single mothers react somewhat more elastic to the availability of free child care. Overall, these findings are in line with studies using Norwegian or Italian data.

### 5.3 Child Outcomes

The results for short-run changes in child outcomes are summarized in table 5.

Overall, they complement the previous results. It is important to note that the skill measures for 3 years-olds are different from those of older preschool children. Columns 1 to 3 report results for children aged 3. Our estimations imply that the introduction of free child care increases the scores on the Vineland Adaptive Behavior Scale by up to 0.185 standard deviations. Note that these are also intention to treat effects, so actual effects for children taking up day care are potentially a lot higher.

However, a different pattern is observed for 5-year-olds. Here the outcome is measured by the 10-item strength and difficulties indicator.<sup>18</sup> Results in columns 4 to 6 in table 5 indicate a deterioration for 5-year-olds. In the full model including trends and control variables reported in column 6 the strength and difficulties indicator decreases slightly but significantly by 0.124 standard deviations. This effect is potentially related to the decrease in child care attendance of this age group by mothers of 5 years-old children.

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<sup>18</sup>Additional details and a complete list of questions asked can be found in the data appendix.

Table 5: Effects on Children

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Vineland Score (1-3)/ SDQ (4-6)	3-year-olds	3-year-olds	3-year-olds	5-year-olds	5-year-olds	5-year-olds
Free Childcare	0.044*** (0.01)	0.034** (0.01)	0.185*** (0.04)	-0.157*** (0.04)	-0.124* (0.06)	-0.124* (0.07)
Girls		0.160*** (0.02)	0.163*** (0.02)		0.103*** (0.02)	0.102*** (0.02)
Maternal Age		-0.001 (0.00)	-0.002 (0.00)		0.002 (0.00)	0.002 (0.00)
Maternal Education		0.007* (0.00)	0.007* (0.00)		0.006 (0.01)	0.007 (0.01)
Non-German		0.009 (0.02)	0.017 (0.02)		0.016 (0.07)	0.021 (0.07)
Single Mother		-0.045 (0.03)	-0.039 (0.03)		-0.078 (0.06)	-0.084 (0.06)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	No	Yes	Yes
Trends	No	No	Yes	No	No	Yes
Observations	1307	1199	1199	795	739	739
Cluster	11	11	11	11	11	11
R-sqr	0.084	0.138	0.144	0.020	0.035	0.042

Notes. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$ . Clustered standard errors are reported in parenthesis.

## 5.4 Heterogeneity of Effects

To test for heterogeneity in treatment effects across population subgroups we use our baseline model. The dependent variable is child care attendance. Columns 1 to 4 of table 6 present results on how the effect of free public childcare differs for single mothers, children where the primary care taker has a non-German citizenship, the household income is less than the median income in Western German households and different educational groups. Here, maternal education is grouped into four different categories, 1 refers to the lowest educational attainment (no A-level or completed vocational training) and 3 to the highest (university degree or comparable). 4 is assigned to mothers still attending school.

The only statistically significant effect is for low-income families who respond less to the introduction of free child care. This result is consistent with the observation that low-income families did not pay parental fees even before the new policy of free childcare was introduced. As such, the result reflects the financial

incentives the policy introduced.

Table 6: Heterogeneity in Treatment Effects

Dependent Variable	(1)	(2)	(3)	(4)
Childcare Attendance	SingleMother	MigBackground	LowInc	Education
Free Childcare	0.276*** (0.06)	0.254*** (0.06)	0.289*** (0.05)	0.19 (0.11)
Free Childcare*Single Mothers	-0.044 (0.04)			
Single Mothers	0.016 (0.01)	0.014 (0.01)	0.016 (0.01)	0.015 (0.01)
Free Childcare*Foreigners		0.076 (0.05)		
Foreinger	-0.037** (0.01)	-0.038** (0.01)	-0.037** (0.01)	-0.038** (0.01)
Free Childcare*Lower Income Group			-0.044** (0.02)	
Lower Income Group	-0.022** (0.01)	-0.022** (0.01)	-0.022** (0.01)	-0.021** (0.01)
Free Childcare*Medium Skilled				0.104 (0.08)
Free Childcare*High Skilled				0.033 (0.08)
Free Childcare*Mothers in Education				0.030 (0.06)
Medium Skilled	0.058*** (0.01)	0.058*** (0.01)	0.059*** (0.01)	0.055*** (0.01)
High Skilled	0.092*** (0.02)	0.092*** (0.02)	0.092*** (0.02)	0.090*** (0.02)
Mothers in Education	0.173*** (0.03)	0.173*** (0.03)	0.176*** (0.03)	0.172*** (0.03)
Free Childcare*4-Year-Olds	-0.386*** (0.05)	-0.379*** (0.05)	-0.380*** (0.06)	-0.371*** (0.05)
Free Childcare*5-Year-Olds	-0.490*** (0.05)	-0.482*** (0.05)	-0.488*** (0.05)	-0.482*** (0.05)
Free Childcare*6-Year-Olds	-0.407*** (0.04)	-0.400*** (0.04)	-0.407*** (0.04)	-0.397*** (0.04)
Year FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Trends	Yes	Yes	Yes	Yes
Observations	9182	9182	9181	9182
Cluster	10	10	10	10
R-sqr	0.386	0.386	0.386	0.386

Notes. \* p<0.1, \*\* p<0.05, \*\*\* p<0.001. Clustered standard errors are reported in parenthesis.

## 5.5 Further Results and Specification Checks

If the introduction of free child care induces mothers to send their children to day care and take up work, it would be reasonable to assume that day care attendance behavior of untreated (younger) siblings of treated children changes as well. Interestingly, we do not observe any changes in child care utilization behavior of siblings. Results are reported in table 7.

Table 7: Spillover Effects on Siblings

	(1)	(2)	(3)	(4)	(5)	(6)
	D-in-D	Age	FullModel	Trends	-Berlin	Bootstrap
2-Year-Old Sibling	-0.008 (0.04)	0.102 (0.12)	0.101 (0.10)	0.070 (0.10)	-0.085 (0.11)	0.070 (0.08)
3-Year-Old Sibling		0.112 (0.10)	0.118 (0.12)	0.128 (0.12)	0.293 (0.16)	0.128 (0.11)
4-Year-Old Sibling		-0.090 (0.15)	-0.135 (0.13)	-0.103 (0.13)	0.081 (0.11)	-0.103 (0.11)
5-Year-Old Sibling		-0.253 (0.20)	-0.269 (0.21)	-0.234 (0.21)	-0.056 (0.21)	-0.234* (0.12)
3-Year-Olds		0.212*** (0.02)	0.213*** (0.02)	0.213*** (0.02)	0.211*** (0.02)	0.213*** (0.01)
4-Year-Olds		0.706*** (0.03)	0.712*** (0.03)	0.712*** (0.03)	0.723*** (0.03)	0.712*** (0.01)
5-Year-Olds		0.835*** (0.02)	0.836*** (0.02)	0.836*** (0.02)	0.846*** (0.02)	0.836*** (0.01)
Maternal Age			-0.000 (0.00)	-0.000 (0.00)	0.000 (0.00)	-0.000 (0.00)
Maternal Education			0.014*** (0.00)	0.014*** (0.00)	0.015*** (0.00)	0.014*** (0.00)
Non-German			-0.039** (0.01)	-0.040** (0.01)	-0.035** (0.01)	-0.040*** (0.01)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	Yes	Yes	Yes
Trends	No	No	No	Yes	Yes	Yes
Observations	11179	11179	9130	9130	8827	9130
Cluster	10	10	10	10	9	
R-sqr	0.037	0.512	0.525	0.526	0.537	0.526
dfres	9	9	9	9	8	

Notes. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$ . Clustered standard errors are reported in parenthesis.

The policy effects on child care attendance, maternal labor supply and children's outcomes are robust to alternative sets of control variables and different samples. The same applies to other measures for employment or alternative definitions for some of the control variables (for instance assigning a migration background to a child only if the primary caretaker does not hold an EU-15 or EU-28 citizenship; or grouping primary caretakers according to their education). These results are reported in an appendix but omitted here.

## 6 Conclusion

In this article, we investigate how the availability of free public day care affects child care attendance, maternal labor supply and children's development in Germany. To answer these questions, we exploit quasi-experimental variation in child care prices induced by the introduction of free public child care in several German states.

Our findings suggest that childcare attendance indeed increases by about 3.5 percentage points. However, the effects vary a lot across a child's age. Whereas attendance of 3-year-olds increases, child care utilization of 5- and 6-year-olds slightly decreases. Maternal employment is clearly much less elastic than childcare attendance. The low elasticity suggests that free childcare might not be a decisive policy aimed at increasing female labor supply.

An important goal of introducing free child care and early childhood education was to foster children's educational development. Our results for child development show that 3-year-old children indeed benefit from attending childcare earlier. In contrast, we find negative effects on the strength and difficulties of 5-year-old children, possibly related to them being less likely to attend day care. Overall, we cannot say anything whether these are merely short-run gains or indicate persistent

behavioral problems.

Free childcare affects most families in a similar way. The only exception are low-income families who respond much less to free childcare; this result can be explained by the fact that low-income families did not pay for childcare even before the policy was introduced. Given that their financial incentives did not change significantly, it is not surprising that we find few effects for poorer families. Yet, this result suggests that the introduction of free childcare mostly benefited middle- and high-income families and their preschool children.

## References

- Almond, D. and Currie, J. (2011). Human capital development before age five. In *Handbook of Labor Economics*, vol. 4b, chapter 15, pages 1315–1486. Elsevier.
- Attanasio, O., Low, H., and Sanchez-Marcos, V. (2008). Explaining changes in female labour supply in a life-cycle model. *American Economic Review*, 98:1517–52.
- Baker, M., Gruber, J., and Milligan, K. (2008). Universal childcare, maternal labor supply, and family well-being. *Journal of Political Economy*, 116(4):709–745.
- Baker, M. and Milligan, K. (2008). How does job-protected maternity leave affect mothers' employment? *Journal of Labor Economics*, 26, no.4:655 – 691.
- Baker, M. and Milligan, K. (2012). Maternity leave and children's cognitive and behavioral development. Technical report, NBER Working Paper.
- Bauernschuster, S. and Schlotter, M. (2013). Public child care and mothers' labor supply- evidence from two quasi-experiments. Technical report, University of Passau.
- Baum, C. (2003). Does early maternal employment harm child development? An analysis of the potential benefits of leave taking. *Journal of Labor Economics*, 21(2):409–448.
- Berger, E., G.-S. O. and Spiess, K. (2008). Die öffentlich geförderte bildungs- und betreuungsinfrastruktur in deutschland: Eine ökonomische analyse regional-spezifischer unterschiede. *Innocenti Working Paper*.
- Berlinski, S. and Galiani, S. (2007). The effect of a large expansion of pre-primary school facilities on preschool attendance and maternal employment. *Labour Economics*, 14:665–680.

- Bertrand, M., Duflo, E., and Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics*, 119(1):pp. 249–275.
- Blau, F. B. and Grossberg, A. J. (1992). Maternal labor supply and children’s cognitive development. *Review of Economics and Statistics*, 74(3):474–81.
- Boeri, T., editor (2005). *Women at work: an economic perspective*. Oxford University Press.
- Bonin, H., Fichtl, A., Rainer, H., Spiess, K., and Wrohlich, K. (2013). Zentrale Resultate der Gesamtevaluation familienbezogener Leistungen. *DIW Wochenbericht*, 40:3–13.
- Cameron, C. A., J. A. G. and Miller, D. A. (2008). Bootstrap-based improvement for inference with clustered standard errors. *Review of Economics and Statistics*, 90(3):414–427.
- Carneiro, P., Loken, K., and Salvanes, K. G. (2010). A flying start? Long-term consequences of time investments in infants in their first year of life. Technical report, NHH Working Paper.
- Cascio, E. U. (2009). Maternal labor supply and the introduction of kindergartens into American public schools. *Journal of Human Resources*, 44(1):140–170.
- Chiuri, M. C. (2000). Quality and demand of child care and female labour supply in Italy. *Labour*, 14(1):97–118.
- Currie, J. (2001). Early childhood education programs. *Journal of Economic Perspectives*, 15(2):213–238.
- Datta Gupta, N. and Simonsen, M. (2010). Non-cognitive child outcomes and universal high quality child care. *Journal of Public Economics*, 94(1-2):30–43.
- Deutsches Jugendinstitut (2008). *Zahlenspiegel 2007 - Kindertagesbetreuung im Spiegel der Statistik*. Technical report, Deutsches Jugendinstitut e.V., Abteilung Kinderbetreuung.
- Dustmann, C., Raute, A., and Schönberg, U. (2013). Does universal child care matter? Evidence from a large expansion in pre-school education. Technical report, University College London Working Paper.
- Dustmann, C. and Schönberg, U. (2013). The effect of expansions in maternity leave coverage on children’s long-term outcomes. *American Economic Journal: Applied Economics*, forthcoming.
- Felfe, C. and Lalive, R. (2013). Does early child care help or hinder children’s development? *Working paper, CESifo Conference on the Economics of Education*.
- Felfe, C., Nollenberger, N., and Rodriguez-Planas, N. (2012). Can’t buy mommy’s love? Universal child care and children’s long-run cognitive development. Technical report, University of St. Gallen.

- Fitzpatrick, M. D. (2008). Starting school at four: The effect of universal pre-kindergarten on children's academic achievement. *B.E. Journal of Economic Analysis and Policy*, 8(1):46.
- Gelbach, J. B. (2002). Public schooling for young children and maternal labor supply. *American Economic Review*, 92(1):307–322.
- Goerres, A. and Tepe, M. (2013). Für die Kleinen ist uns nichts zu teuer? Kindergartengebühren und ihre Determinanten in Deutschlands bevölkerungsreichsten Städten zwischen 2007 und 2012. *dms - Der moderne Staat* *Zeitschrift für Public Policy, Recht und Management*, 6(1):169–190.
- Gormley Jr., W. T., Phillips, D., and Gayer, T. (2008). The early years: Preschool programs can boost school readiness. *Science*, 320(5884):1723–1724.
- Havnes, T. and Mogstad, M. (2011a). Money for nothing? Universal child care and maternal employment. 95(4504):1455–1465.
- Havnes, T. and Mogstad, M. (2011b). No child left behind: universal child care and children's long-run outcomes. *American Economic Journal: Applied Economics*, 3:97–129.
- James-Burdunny, S. (2005). The effect of maternal labor force participation on child development. *Journal of Labor Economics*, 23(1):177–211.
- Jaumotte, F. (2003). Female labour force participation: Past trends and main determinants in OECD countries. Working Paper 376, OECD Economics Department.
- Jugendinstitut, D. (2004). Oecd early childhood policy review 2002–2004; hintergrundbericht deutschland. Technical report, Organisation for Economic Cooperation and Development.
- Lefebvre, P. and Merrigan, P. (2008). Child-care policy and the labor supply of mothers with young children: A natural experiment from Canada. *Journal of Labor Economics*, 26(3):519–548.
- Magnuson, K. A., Ruhm, C., and Waldfogel, J. (2007). Does prekindergarten improve school preparation and performance? *Economics of Education Review*, 26:33 – 51.
- Noboa Hidalgo, G. and Urzua, S. (2010). The effect of participation in public child-care centers: Evidence from Chile. Technical report, Northwestern University, Department of Economics Working Paper.
- Ruhm, C. (2004). Parental employment and child cognitive development. *Journal of Human Resources*, 39(1):155–192.
- Schilling, M. (2008). Kosten für kindertageseinrichtungen und kindertagespflege und ihre finanzierung. *DJI (2008): Zahlenspiegel 2007 München, Kapitel 9*.

Schmiade, N., Spieß, K. C., and Tietze, W. (2011). Zur Erhebung des adaptiven Verhaltens von zwei- und dreijährigen Kindern im Sozio-ökonomischen Panel. SOEP Papers 116, DIW Berlin.

Wrohlich, K. (2008). The excess demand for subsidized child care in germany. *Applied Economics*, 40(10):1217–1228.

Wrohlich, K. (2011). Labor supply and child care choices in a rationed child care market. Discussion Paper 1169, DIW.

## **A Data Appendix**

### **A.1 German Socio-Economic Panel (2001-2012)**

The German-Socio Economic Panel is a household survey that has been conducted annually since 1984. Our basic sample consists of all private households in West Germany that have at least one valid observation. To focus on the period around the policy changes, we restrict the data to the survey years from 2001 to 2012. Our broader sample consists of all households with at least one child aged 3 to 6.

*Childcare variables:* Our main dependent variables are from the longitudinal data on children (kidl.dta). In addition to gender and age, the survey asks what type of educational institution (school, kindergarten or other daycare facility) each child under the age of 16 currently attends (or if the child does not attend any). Based on this information, we code whether a child attends a public childcare facility or not. We denote all childcare facilities that are publicly subsidized as public facilities; publicly subsidized childcare facilities may in fact be provided by the local community, a church, company or other non-profit organizations.

If the child attends an educational institution, the parents are asked whether the child attends only in the morning, only in the afternoon or the whole day.

The survey also inquires about regular childcare provided by persons outside the household. These external providers could be relatives not living in the household, neighbors, friends or a paid child minder. We define an indicator variable equal to one if any type of informal childcare is used. The variable is coded as zero if no informal childcare is used. In some specifications, we also distinguish whether the care is provided informally by a relative, friend or neighbor or whether it is purchased on the informal market from a child minder or nanny. Information about these informal sources of childcare is available in each year except 2003.

Finally, we define the variable exclusive care at home as equal to one if no public or informal childcare outside the household is reported. Hence, home care does not necessarily imply that all childcare is provided by the parents because it includes childcare by people living in the same household (like grandparents, au-pairs or older siblings, for example). The variable is equal to zero if the child attends public childcare or is cared for by other people outside the household.

The wording of the childcare questions has changed slightly over time. Until 2004, the survey asked whether the child currently attends a childcare facility, is cared for by a child minder (“Tagesmutter”) or attends primary school. Later in the survey, the parents are then asked about childcare provided in addition to the ones mentioned. Since 2005, the survey only asks whether the child currently

attends a childcare facility or primary school and about any additional sources of childcare provision (friends, neighbors, relatives or additional paid care). To the extent that these changes have an impact on parents' responses, they are absorbed in our analysis by year fixed effects.

*Child outcomes:* Since 2003, mothers of newborn children (born in 2002 or later) answer an supplementary questionnaire about their pregnancy, their personal situation and the health, cognitive and non-cognitive skills of the newborn child (BIOAGE01). The children and their mothers are then followed over time. The data on child outcomes for 2-3 years-old are available since 2005 (in BIOAGE01 and BIOAGE03). We use the questions on social, language and motor skills and skills for daily life to assess the short-run effects of the new policy on outcomes for eligible 3 years-olds. The questionnaire asks: "For parents it is always a big event when their child learns something new. Please tell us what those new things are in the case of your child". Then, a list of skills is presented. The skills are a version of the Vineland Social Maturity Scale adapted to the constraints of a general household survey. Social skills cover the following tasks: child calls familiar people by name; child plays games with other children; child participates in role playing games; child shows liking for certain playmates; child calls his/her own feelings by name. For motor skills, the set of skills are: child walks down the stairs forwards; child uses door handle to open doors; child climbs jungle gyms and other high playground equipment; child uses scissors to cut paper; child draws recognizable figures; For language skills, we have the following items: child understands brief instructions; child forms sentences with at least two words; child speaks in full sentences of at least four words; child listens attentively to a story for at least 5 minutes; child can relate simple messages. And the set of skills in daily activities is: child eats with spoon without making a mess; child blows nose without assistance; child uses the toilet to do number two; child can put on pants and underpants correctly; child brushes teeth without assistance. For each question, the mother assesses the ability of her child on a 3-point scale: 1=yes, 2=to some extent and 3=no. From the individual items, we construct a score for the four categories by summing over the answers to each item coding as 0 if the child cannot perform the skill, as 1 if the child partially and as 2 if the child fully performs the skill. Each score ranges from a minimum of 0 to 10. We also calculate a total score as the unweighted sum over the four categories; the total score then ranges from 0 to 40.

To analyze the short-run effects on eligible children in older age groups we make use of the strength and difficulties questionnaire for 5 and 6 year-olds. These data are available since 2008 (in BIOAGE06). The questionnaire asks: "Compared to other children of the same age how would you assess your own child?". Then, a list of skills is presented. On a scale from 1 to 10 parents can choose whether their child is rather talkative or still, rather untidy or neat, good-natured or irritable, not interested or hungry for knowledge, has good confidence or is insecure, is withdrawn or outgoing, focused or distractable, defiant or obedient, understands quickly or needs more time and is anxious or not. We construct a measure from these answers by summing up the unweighted points for all questions, whereas more points refer to the positive outcome.

*Parental and household variables:* In addition to the child-level information, we use household characteristics like the number and age structure of the children

and the number of adults in the household. As a measure of household income, we use monthly disposable household income measured in euros (deflated to 2006 prices). The specific question asks about the total sum of all income sources of the household adjusted for taxes and other contributions (“verfügbares Haushaltseinkommen”). If the answer is missing, the person is asked to estimate the net monthly income of the household.

To control for characteristics of the parent (or caretaker), we also code the age, education, marital status and labor supply variables. For marital status, we distinguish three categories: single (never married), married or in a long-term partnership and divorced or widowed. Single parents are identified from variables characterizing the household type (typ1hh, typ2hh).

Educational attainment is defined as the highest educational level achieved. We define a person as low-skilled if she has no vocational training and no high-school degree (“Abitur”). A person is defined as medium-skilled if the highest educational degree is vocational training or a high-school degree (“Abitur”). Finally, the person is high-skilled if she has a tertiary degree from a university or technical college. Further, the observation is coded as foreign if the parent has a citizenship from a country outside Germany.

We code labor force participation equal to one if the individual works full- or part-time, is employed marginally (“geringfügig beschäftigt”), is currently in school or vocational training.

To merge the parental information to the child record, we need to define the relevant caretaker of the child in the household. The survey contains an identifier for the mother of each child; if the identifier and hence mother is missing, we select the father of the child; if both parents are absent in the household, we choose a female adult (presumably a relative or close friend). In our sample, in more than 99% of all cases the responsible parent is the mother or another female adult living in the household. Our main results consider females as primary care takers.

*Aggregate economic controls:* To control for state-specific labor market shocks, we include the state unemployment rate defined as percentage of registered unemployed people to the total number of employed persons. To control for the broader economic situation in each state, we also include the growth rate in GDP from the national accounts data. Both are available from the Federal Statistical Office.