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ABSTRACT

Free Daycare and Its Effects on Children and Their Families

Many governments invest substantial public funds to foster early childhood education. And yet, there are still many open questions who responds to and who benefits from public investments into early childcare. We use the introduction of free public daycare in German states to analyze its effects on children and their families. Our results suggest that effects of the policy differ by child age, gender and socio-economic status. Free daycare increases attendance among 2-3 year olds with little response among older children. Yet, even with access to free daycare, we find few effects on maternal labor supply. Responses are generally stronger for poorer households and other vulnerable families. Child development, in turn, shows gender-specific effects that are in part explained by the differential choices parents of boys make compared to parents of girls.

JEL Classification: J13, J22, J18
Keywords: childcare, labor supply, family policy, child outcomes

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1 Introduction

Many governments have expanded their social policies in the area of early childhood care and education. While countries like France, Sweden, Norway or Denmark have long offered universal access to public childcare, others like Germany, Spain, Canada or the US have expanded public daycare and pre-K programs more recently, beginning in the 1990s. Proponents of such policies argue that money invested in early childhood education is well spent as it would simultaneously boost the human capital development of preschool children and encourage female labor supply.

Empirical support for these arguments are often based on targeted programs like Head Start or the Perry Preschool Project, which have indeed generated large gains for participating children (e.g. Currie and Thomas, 1995, 1999; Heckman et al., 2010, 2013). Recent surveys of the existing evidence show, however, sizable treatment heterogeneity depending on the type of public intervention and the socio-economic background of the child (see e.g. Baker, 2011; Duncan and Magnuson, 2013; Cornelissen et al., 2018; Kottelenberg and Lehrer, 2017). It is therefore unclear whether the benefits for children from disadvantaged families generalize to the average child. One reason is that the empirical evidence on the consequences of universal childcare is more limited than for targeted programs. More generally, we still require a better understanding how tax money should be spent on early childhood education. Should a government offer generous childcare subsidies to some families or provide childcare even for free to all families?

In order to answer these questions and make policy recommendations, we need more and better evidence on who responds to and benefits from universal childcare programs; and how families react to changes in childcare costs rather than mere availability. If childcare is rationed, the allocation of slots could be determined by criteria such as prices, location or family income. The families responding to an expansion of availability might then be very different from families responding to childcare subsidies. In addition, responses to price declines might be faster than when childcare becomes available at all. Finally, childcare subsidies generate substitution as well as income effects; the latter might play an important role, esp. in low-income households.

To shed light on the consequences of universal childcare subsidies, we make use of the recent adoption of free daycare policies for preschool children in most West German states between 2000 and 2015.[1] The policy generates three types of variation: whether a state adopts a free

[1]Public daycare includes facilities for preschool children mostly provided by municipalities or private, non-profit providers like churches or welfare services. The share of private, for-profit providers is very low. Even

daycare policy, the timing of the reforms and which age group of children gets access to a free daycare slot. Eligibility by age is determined by the birth date of the child and the state's cutoff rule for school entry. Hence, a child born in June of 2003, for instance, would enter school in August of 2009 and hence, start its last year of daycare in August of 2008. Eligibility to earlier years of daycare is defined accordingly.

While all reform states adopted free childcare for the year prior to school entry ("kindergarten"), a few states introduced more comprehensive reforms covering children aged between 2 and 5 ("pre-K"). A child born in *Hamburg*, for instance, is eligible for free daycare from age 2 on since 2014. Hence, a 2-year-old child in *Hamburg* in 2015 may attend daycare free of charge for up to four years, while a child of the same age in *Bremen* has no access to free daycare and would have access to just one free daycare year in *Bavaria* in the same year. Hence, the free daycare policies provide us with rich variation in access to free childcare, the intensity of treatment and the age groups affected by the policy. We use this variation to provide a comprehensive analysis how free daycare affects childcare arrangements, maternal labor supply, as well as the short-run cognitive and non-cognitive development of children.

Our setting has a number of attractive features: first, the free daycare policy affected all families with preschool children. We can therefore analyze whether such a policy benefits the average child or whether the effects are concentrated in children from disadvantaged backgrounds. Second, the policies adopted cover children between the ages of 2 and 6. We can therefore compare the impact of a free daycare slot for different age groups of children. Behavioral responses might be larger for younger children, for instance, because daycare attendance is lower for 3 year olds than 5-6 year olds. Further, the German context is an interesting case to analyze childcare policies. Germany spends a lot of public resources, about 200 billions per year, on various family policy measures (Bonin et al., 2013). And while female participation rates and labor market attachment have increased substantially over the past decades, many women in Germany still drop out of the labor force or remain in part-time work once they have children. Many people argue that affordable childcare, esp. for children under 3, is crucial to further boost female labor force participation and promote economic self-sufficiency, especially for economically disadvantaged families.

Our empirical analysis yields four main findings. First, the effects of a free daycare policy are highly age-dependent: it raises attendance for very young children with no effects on children

private providers comply with state daycare regulations; otherwise, they would lose the very generous public subsidies which cover around 80% of the facility's variable costs.

above age 3. Attendance for 2-3 year olds increases by a sizable 9.7 percentage points or by 16% relative to the pre-policy period. These estimates imply a highly sensitive demand for daycare with an price elasticity of 2.9. Mirroring the changes in daycare attendance, we find a decline in exclusive care at home for 2-3 year olds but only weak effects on informal childcare by relatives, friends or neighbors. If anything, informal childcare seems to increase with a free daycare policy suggesting that informal and public daycare are complements in the German context. Second and somewhat surprisingly, we find no increase in female labor supply at the extensive or intensive margin. If anything, female labor supply actually goes down as families spend some of the saved income to buy parental time.

Third, we document gender-specific effects of free daycare on short-run child development. For 5-6 year olds, for instance, boys have fewer behavioral problems than girls, while the reverse pattern is observed among 2-3 year olds. One explanation for these gender- and age-specific effects on child skills is that the parental decisions in response to the free daycare policy differ for boys and girls. While the labor supply of mothers with boys declines for older preschool children, there is no labor supply adjustment for mothers of girls. In turn, parents of girls purchase more informal childcare than parents of boys. If boys benefit from more time spent with their mothers while girls do not benefit from time spent in informal childcare, these gender-specific adjustments in childcare and labor supply choices can explain the differences in behavioral problems among 5-6 year-old children.

Fourth, we find substantial heterogeneity in the treatment effect: most importantly, poor households respond much more to a free daycare policy than the average family. Daycare attendance and informal childcare among poorer children increases almost twice as much as for the average child. Interestingly, despite more intense use of outside childcare, female labor supply actually declines among poor families. Also, we document that a free daycare policy not only has consequences for the eligible child, but also for the daycare choices of their siblings. These results highlight that a free daycare policy "works" in part through an income effect. Furthermore, that income effect might be spent by families in many ways: to buy parental time, to rely more on informal care or to send younger siblings to daycare.

Our analysis contributes to three related literatures. There is a long-standing debate how childcare costs affect female labor supply. Recent studies have exploited changes in childcare subsidies as exogenous source of variation to identify labor supply effects. The results seem to suggest modest responses if at all. While a decline in childcare prices has little effect on female labor supply in Sweden (Lundin et al., 2008), Norway (Black et al., 2014) or the United States

(Fitzpatrick, 2010). Yet, low-income mothers in the United States show a modest response with estimated elasticities ranging from -0.1 to -0.3 (Blau and Tekin, 2007); in East Germany, the price elasticity of female labor supply is around -0.2 (Gathmann and Sass, 2018). We add to this literature by studying how access to free daycare affects attendance, labor supply and child development.

We also touch on a sizable literature how the availability of public childcare for preschool children affects maternal labor supply (see e.g. Cascio, 2009; Gelbach, 2002; Lefebvre and Merrigan, 2008; Baker et al., 2008; Havnes and Mogstad, 2011a). The results are again not clear-cut. Havnes and Mogstad (2011a) and Fitzpatrick (2010) find little impact on parental employment from an expansion of public childcare in Norway and the US respectively. In contrast, Nollenberger and Rodriguez-Planas (2015) and Bauernschuster and Schlotter (2015) find that access to daycare for 3 year-old children increases maternal labor supply in Spain and Germany respectively. We complement this literature by studying family responses to childcare subsidies rather than availability.

The third related literature studies how maternal employment and childcare outside the home affect child development (see e.g. Almond and Currie, 2011; Baker, 2011; Duncan and Magnuson, 2013, for recent surveys). Given that the policy has been introduced very recently, our study focus on the short-run effects on children. Earlier studies suggest that maternal employment in the first year is associated with lower verbal and math test scores though the results are not always robust (Baum, 2003; Berger et al., 2005; Blau and Grossberg, 1992; Ruhm, 2004). After a child's first birthday, the effects of non-parental childcare appear to be negligible or positive (see e.g. James-Burdumy, 2005). One empirical challenge here is that mothers who return to work very early after giving birth might differ from mothers who do not along unobservable dimensions. As such, it is difficult to separate the effects of non-parental care from other circumstances that may slow down child development. Recently, studies have used changes in maternity leave policies or public daycare as sources of variation in maternal labor supply or daycare attendance. Most studies find few short-run effects of maternity leave extensions (Baker and Milligan, 2010); yet, negative effects were found for children of low-income mothers who increased their labor force attachment (Bernal and Keane, 2011). An expansion of daycare availability, in turn, benefits some, but not all children (Blanden et al., 2016; Datta Gupta and Simonsen, 2010; Cornelissen et al., 2018; Felfe and Lalive, 2017)[2]

[2]Another literature studying longer-term consequences for children's educational attainment and skill development (see e.g. Black et al., 2014; Carneiro et al., 2015; Dustmann and Schönberg, 2012; Havnes and Mogstad, 2011b, for examples).

Closest to us is a study by Black et al. (2014) who use income thresholds for daycare subsidies in Norway to identify the effect on child outcomes in junior high school. Like us, the authors provide a comprehensive analysis of childcare subsidies, including female labor supply, daycare attendance and effect on siblings. Our study relies, however, on a different source of identification, the adoption of free daycare at the state level, allowing us to compare children in the same age group and with similar family background. We further explore the heterogeneity of effects across child age, gender and socio-economic status which has shown to be important (see e.g. Kottelenberg and Lehrer, 2017; Fort et al., 2017).

The article proceeds as follows. Section 2 discusses the theoretical mechanisms, while section 3 provides relevant background information on public daycare, the reforms and determinants of the adoption decision. Section 4 discusses the variation and our estimation approach, while section 5 introduces the data sources. We discuss our main results in section 6 and report robustness checks in section 7. Finally, section 8 concludes.

2 Theoretical Mechanisms

Childcare subsidies are equivalent to a price decline of public daycare relative to other childcare options. As the price decline is uncompensated, there will be both income and substitution effects on childcare and labor supply choices.

To understand how the provision of "free" daycare affects family choices, we need to distinguish two cases. The first case applies to families who would have sent their child to daycare even in the absence of the policy. These parents pay no daycare fees after the reform, but can spend the saved money on other goods and services. The reform has then primarily an income effect which would reduce maternal labor supply if leisure is a normal good; alternatively, parents might prefer to spend more time with their child rather than to enjoy pure leisure. Furthermore, the additional income could be used for other activities (like going to the local zoo, for instance) or buying goods that benefit child development. Hence, we might observe beneficial effects for the child even if the family does not change its childcare arrangement or labor supply after the free childcare policy is adopted.

The second case applies to families who would not have sent their child to daycare in the absence of the policy. These parents do not benefit from the reform unless they adjust their childcare choices. We expect daycare attendance to increase as daycare has now become

cheaper relative to other childcare modes.[3] At the same time, childcare subsidies also reduce the opportunity costs of work (or increases the net returns to work) which might encourage maternal labor supply both at the extensive and intensive margin. How the policy affects other childcare modes like informal daycare or care in the home depends on whether they are substitutes or complements to public daycare. Caring for the child at home (without relying on any other form of childcare) is by definition a substitute for using public daycare. We would therefore expect exclusive childcare at home to go down after free childcare is adopted.

The theoretical prediction for using informal care is less clear: if most parents use informal care by relatives, friends or neighbors as a substitute for public daycare, we expect a decline in informal childcare. However, if parents need to combine public daycare with informal care in order to cover a full workday, for instance, then informal care and public daycare may be complements instead. In that case, reliance on informal care could actually increase when daycare subsidies are introduced. In addition, parents who would have sent their child to daycare even in the absence of a free daycare slot might use some of the additional income to buy additional hours of informal care which would increase the demand for informal care. Which of these effects dominates is ultimately an empirical question.

Which reform effects do we expect on average? In the pre-reform period from 2000 to 2006, about 83% of children aged between 2 and 6 attended daycare in West Germany.[4] Therefore, most families belong to the first group of families which experience an income effect. Hence, we would expect a modest increase in public daycare attendance among eligible children (as the uncompensated price effect is non-positive). Further, we expect that exclusive home care goes down in response, while the effect on informal care is a priori ambiguous. The labor supply response is a priori ambiguous as well because incentives to work increase for the families who decide to switch to public daycare after the reform (the second case discussed). In contrast, the income effect for parents who do not change their childcare arrangements (the first case discussed) might actually reduce work efforts.

Finally, we anticipate some heterogeneity in responses by child age, for example: most states introduce a free daycare policy for the last preschool year ("kindergarten") where attendance is very high (97%) even before the reforms. Hence, families with 5-6 year-old children will mostly experience an income effect. Attendance rates are with 33% much lower for 2-3 year-old children in the pre-reform period; hence, there is much more room for improvement in

[3]Parents who send their child to public daycare on a part-time basis also face a price reduction which might induce them to switch to a full-time slot instead.

[4]Only about 21% of children in public daycare attend full-time, i.e. 8 hours or more per day.

attendance. There is another reason why we expect stronger effects for parents with younger children: younger children were eligible for up to four years of free daycare in states that introduced childcare subsidies for several years of daycare. Hence, the family of a 2-year-old child, for instance, could benefit in some states from 4 years of free daycare which implies a larger financial benefit than eligibility for one year prior to school entry.

The reduced-form effect of eligibility for free daycare in the current and possibly future years on childcare choices and female labor supply allows us to identify a price elasticity for public daycare. In addition, we can estimate the elasticity of maternal labor supply with respect to the uncompensated price decline. All are behavioral parameters of interest for researchers and policy makers alike. We next introduce the childcare market in Germany and the timing and nature of the free daycare reforms.

3 Institutional Background

3.1 Public Daycare in Germany

To understand how childcare subsidies affect family choices empirically, we start out with discussing the basic characteristics of the childcare market in Germany. We focus hereby on the eleven states in West Germany as childcare provisions and female labor supply still differ between East and West Germany. Daycare outside the home is supplied by either the municipalities or private, non-profit providers, mostly churches and non-statutory welfare services. Municipalities supply around one-third of the childcare slots, while private, non-profit agencies provide around two-thirds. Private, for-profit childcare providers cover only a very small share of the market - around 2% for children under 3 and 0.3% for children from 3-6 years of age (Berger et al., 2008).

Federal regulations explicitly define three goals of public daycare: providing care and custody for preschool children; developing their social and non-cognitive skills; and to foster their education and learning. All three goals are intended to further the welfare of both children and their families. In practice, many different educational approaches (like Montessori, Waldorf etc.) exist side-by-side. Most popular in center-based daycare is the situation-oriented approach, a social pedagogy tradition that stresses flexible schedules, problem-solving and social skills through play, social interaction and informal learning. This tradition contrasts with a more school-oriented approach that focuses on teaching cognitive skills and basic knowledge

(see Sohns (2009) for a more detailed discussion).

Germany's childcare system is considered of intermediate quality in terms of public expenditures, but of relatively homogeneous quality thanks to detailed regulations on quality standards and the high educational qualification of the childcare staff. Combined public and private expenditures on early childhood education are around 0.6% of Germany's GDP which is similar to the EU average though below the expenditure share in France, the UK and some Scandinavian countries (OECD, 2013). Detailed regulations by the federal as well as state governments are in place to ensure quality standards in daycare centers. All childcare facilities require a permit which may be revoked if standards regarding group sizes, educational background of the staff, the physical environment and standards for hygiene and security are not met. Even private, for-profit childcare providers comply with these regulations as they would otherwise not obtain the generous public subsidies that cover most of the facility's variable costs. The local and state youth offices are responsible to monitor the requirements and impose sanctions in case of non-compliance, up to the point of closing a facility.

The educational standard of childcare staff is high in international comparison. Each facility must have at least one professionally trained educator. Training as a child educator involves two years at a vocational school in combination with practical training followed by one year of practical training in a childcare facility. Many of the head teachers have a diploma in social pedagogy or related subjects involving a curriculum of 3-4 years at a technical college with a focus on early childhood education. Aggregate data illustrate the high educational qualifications of childcare staff: 64% of all employees and 90% of the person heading a group have obtained vocational training as an educator (OECD, 2017). Regulations in each state further regulate group sizes with the maximum set at 25 children. In reality, the child-staff ratio is with 12 children much lower (OECD, 2013).

While our study focuses on changes in prices for public daycare, the time period we study also saw some changes in the availability of public daycare, especially for very young children. Figure 1 shows the number of childcare slots offered per 100 children separately for 3-6 year-old children (measured on the left y-axis) and for children under 3 (measured in the right y-axis). For 3-6 year-old children, the supply of public daycare hovers around 100% and does not change much over time.[5] The situation is different for children under the age of 3, however. Traditionally, few slots covering less than 10% of the children in that age range were available in

[5]Since 1996, a daycare slot is granted to all children between 3-6 years of age in all states. See Bauernschuster and Schlotter (2015) for an analysis of the female labor supply effects of this policy.

West Germany. Starting in the early 2000s, the federal government has invested substantially in expanding the number of daycare slots for children under the age of 3.[6] Figure 1 reflects this large-scale expansion with childcare slots increasing from under 10% in 2002 to more than 30% in 2015. In the empirical analysis below, we will use district-level data on the supply of childcare slots to check that changes in the availability of daycare slots do not explain our results.

Another concern of the supply expansion might be that it has potentially negative effects on daycare quality by increasing child-staff ratios or the number of staff without proper educational credentials in childcare facilities, for instance. Lower quality in areas with large expansion of childcare slots could then result in an upward or downward bias in our estimates depending on how the expansion of slots is related to the free daycare reforms. Figure 2 plots the available data on the child-staff ratio separately for 0-3 and 3-6 year-old children. There is little evidence for a worsening of child-staff ratios between 2006 and 2014. If anything, the number of children per childminder falls over time with an average of about 8 children at the ages 3-6 and around 4 for children under the age of 3. Aggregate statistics also show no change in the qualifications over time: the share of childminders with at least vocational training in early childhood education remains at 80% throughout our sample period. As such, decline in daycare quality does not seem a concern in our context.

3.2 Parental Fees and the Adoption of Free Public Daycare

Public daycare is heavily subsidized in Germany. Parental fees cover less than 20% of the variable costs with the remainder being financed by generous state and local subsidies (OECD, 2017; Schilling, 2008). Parental fees are mostly set at the municipal level which creates substantial variation in daycare prices both within a state and across states. Unfortunately, there is no data sources that allows to trace daycare prices over time or its variation across space. As a general rule, the cost of a daycare slot to parents varies with the number of children in the household and parental income (Goerres and Tepe, 2013). A typical range is between 0 and 220 euros per month for a part-time slot in daycare. Low-income parents (with a gross annual income of less than 25,000) are exempt from or pay reduced parental fees in some places. Fees for a full-time slot in daycare can be as high as 800 euros per month for high-income parents in

[6] In 2008, the federal government decided to offer a daycare slot for all children after their first birthday from 2013. As a result, the supply of childcare, esp. for children under age 3, has grown over time.

urban areas.[7] On average, parents in our data pay around 90 euros per month for a childcare slot between 2002 and 2014. Similarly, parents surveyed in the National Educational Panel Study (NEPS), a large panel study covering preschool and school children also report paying around 86 euros per month for a childcare slot in 2011.

Between 2000 and 2015, nine states in West Germany introduced public daycare slots free of charge to eligible children. Two West German states in turn have never offered free childcare over our sample period. Table 1 provides an overview of the implemented reforms: States differ both in the timing of policy adoption and how comprehensive the reforms are. Six of the nine states abolished parental fees only for the last year of daycare prior to school entry ("kindergarten") - when the child is 5 or 6 years old. Starting with the *Saarland*, a small state bordering on France, in 2000, the following states introduced a free last childcare year: *Lower Saxony* (2007), *Hesse* (2008), *Hamburg* and *Schleswig-Holstein* (2009), *North-Rhine-Westphalia* (2011) and *Bavaria* (2013).

Three states (*Berlin*, *Hamburg* and *Rhineland-Palatinate*) introduced more comprehensive reforms. *Berlin*, for instance, offers free public daycare for all children aged between 3 and 6. The policy was initially adopted in 2007 for the last year of daycare prior to school entry, then extended to two years of daycare in 2010 and further expanded to three years of public daycare in 2011. *Rhineland-Palatinate* phased in free daycare for all preschool children from 2-6 years of age between 2007 and 2010. *Hamburg*, in turn, abolished parental fees for the last daycare year in 2009 and extended the policy to all children aged 2 and above in 2014.

In order to use the policy variation, the reforms and their timing have to be unrelated to our outcomes of interest, in particular female labor supply and childcare. We further want to rule out that omitted variables, like voter preferences, for instance, account for both policy reform and family choices. One might think that a free childcare is more of a left-wing, redistributive policy. Yet, six states were governed by a conservative state government when they adopted a free childcare policy. At the same time, the three states that introduced the most comprehensive reforms were governed by a left-wing coalition under the lead of the social democratic party. The political discussion prior to the introduction of free childcare in the nine states stressed equity concerns. The main concern was to provide access to early childhood education for all preschool children - independent of their family background and parental resources.[8] The political and media discussion does not indicate, for instance, that the reforms

[7]Expenditures for formal childcare are tax-deductible up to a limit of 4,000 euros per year; hence, net expenditures for childcare after taxes are somewhat lower.

[8]See State Parliaments of *Berlin* (State Parliament Papers No. 16/2758 from November 10, 2009) or *North-*

were implemented in order to increase female labor supply or to assist children lagging behind in their cognitive development.

3.3 Determinants of Adoption

To investigate the adoption decision more systematically, we regress in appendix table A1 whether a state adopts any free childcare policy in year t (in columns (1)-(3)) and whether a state adopts a comprehensive free daycare policy in year t (in columns (4)-(6)) on basic socio-economic conditions (unemployment rate, GDP per capita, population, the shares of medium- and high-skilled employees and the share of women in the labor force) in addition to state and year fixed effects. The second specification (in columns (2) and (5)) adds the number of slots available per 100 children separately for children under 3 and children between 3 and 6. The third specification (in columns (3) and (6)) adds the vote share of conservative and left-wing parties in state elections to the specification. All explanatory variables are lagged two years in order to account for a time lag in political decision-making.

Table A1 shows some interesting patterns: first, larger states and states with higher unemployment rates are less likely to adopt any or a comprehensive free daycare policy. High unemployment rates reduce a state's financial capacity because of higher welfare payments and lower tax revenues. In the analysis below, we control for the unemployment rate and GDP per capita to rule out confounding changes in local economic conditions. Second, the female share in the workforce is unrelated to the adoption of free childcare. This result ensures that any changes in female labor supply we might observe is a consequence rather than a driver of the reforms. Third, states with better supply of daycare slots are more likely to adopt a free childcare policy. Changes in the provision of daycare is not an issue for children aged 3 and older as supply reaches almost 100% (see figure 1). States who have invested more in daycare slots for children under 3 are more likely to adopt any free daycare policy (see columns (2) and (3)) but not more likely to adopt free daycare for children under 3 (see columns (5) and (6)). In Section 7.1 below we show that controlling for the local supply of daycare slots does not change our empirical findings. Finally, there is no systematic relationship between electoral preferences as expressed in state elections and adopting a free daycare policy (see column (3)). This result makes it unlikely that some omitted shift in voter preferences in the years prior to the reform can account for both the policy and changes in family choices. Yet, a stronger left-wing vote share encourages the adoption of a comprehensive childcare reform

Rhine-Westphalia (State Parliament Papers No. 15/1929 from May 10, 2011) for two examples.

(see column (6)). Supplementary regressions however, show that controlling for the vote shares in state elections as a proxy for electoral preferences does not affect our results on childcare arrangement or female labor supply (not reported). We next discuss how we exploit the policy reforms to study the consequences of free daycare for families in Germany.

4 Empirical Strategy

4.1 Sources of Variation Induced by the Reforms

The free daycare reforms create three sources of variation we can exploit in the empirical analysis: (1) which states adopted a free daycare policy, (2) the timing of the reforms and (3) which age group of children is eligible for free daycare. The first two sources of variation are straightforward: nine states adopted a reform, while two did not adopt any. In addition, the nine states adopted the reforms in different years (between 2000 and 2014); hence, we can use late adopting states as additional control group for early adopting ones within a standard difference in differences framework. The third source of variation arises because the reforms cover children of different ages. Nine states adopted a policy of free daycare in the last year before school entry ("kindergarten"), while three states adopted more comprehensive reforms which abolished daycare fees for younger children ("pre-K") as well. Below, we will run our analyses separately for free daycare in the last daycare year and for the more intensive treatments available to younger children.

To understand the variation across child ages, we first explain how states define eligibility for a free daycare slot. As for school entry, states employ birthday cutoff rules to determine when a child attends a certain daycare year. The last year of public daycare, for example, is defined as the 12 months preceding the school year in which the child turns six before the cutoff month.[9] Hence, a child born in June of 2003, for instance, would enter school in August of 2009 and hence, start its last year of daycare in August of 2008. States differ in the cutoff month they apply: five states use June 30, five states September 1 and one state uses December 31 of the year a child turns six to define school entry. Hence, all children born by June 30 of a given calendar year enter their last daycare year in the year they turn five. Children born on July 1 or later, in turn, only enter their last daycare year in the year they have turned five if

[9]The school year typically starts sometime in August and lasts until July of the following year. There is some variation as most states engage in rotating summer breaks of six weeks starting as early as late June and as late as early August. As each state will start the summer break early in some years and later in some others, this rotating scheme will, if anything, introduce some measurement error in our estimation.

they live in a state with a cutoff month of September or December.

Figure 3 illustrates the birth date ranges that determine the predicted public daycare years for an exemplary school year (2009 to 2010). Children born between July 1, 2003 and June 30, 2004 are eligible for the last daycare year in a state with a June cutoff, while those born between September 1, 2003 and August 31, 2004 are eligible in a state with a September cutoff. States use these same rules to determine eligibility for earlier years of daycare (see figure 3). Eligibility for the youngest group of children (aged between 2 and 3) is determined by their second birthday. Accordingly, we use the birth date range from a child's second birthday to its predicted entry into public daycare to define eligibility for 2 year-old children.[10]

In our empirical analysis, we condition on the predicted daycare year for each child which ensures that two children born on the same date but living in different states are eligible for the same daycare year. A child predicted to attend a certain daycare year is then eligible for a free slot if a such a policy was in place in its state of residence in the current year and for the specific daycare year.[11] A child is not eligible if no such policy exists for its predicted daycare year in its state and year. Note that in principle parents may choose to enroll their child in public daycare at any time during the year. In practice, however, most children start public daycare at the beginning of the school year. The main reason is that daycare slots become widely available once older children enter primary school in August or September.[12]

Children in the same predicted daycare year differ in age, however, for two reasons: first, the cutoff rules make some children enter their last daycare year earlier than others. Children in states with a cutoff rule in June, for instance, will be slightly older when they enter their last daycare year than children in states with a September or December cutoff rule. A regression of the cutoff month on whether a state adopts any free childcare and year dummies reveals that treatment states have their cutoff date somewhat earlier in the year. Hence, children in treatment states are slightly older when they enter their last daycare year than children in

[10]In *Hamburg* children are eligible once they turn one. Yet, we have only about 10 children in our data which would be affected by this policy. We thus focus in our analysis on preschool children aged 2 and older.

[11]Note that the policy is typically adopted in January. Only *Rhineland-Palatinate* and *Schleswig-Holstein* introduced the policy with the beginning of the school year (in August or September). The timing of adoption will not affect our estimates as children in the last year of childcare, for instance, are in these cases eligible for the period from January to August only (rather than the full year from August to July). As long as parents know about the adoption of the policy by the time children typically enroll in daycare, the timing of adoption does not affect our estimation strategy.

[12]Kühnle and Oberfichtner (2017) show in their figure 2 that over 70% of children enter daycare when the school year starts in August or September. The remaining children enter at the 10 other months of the year roughly in the same proportion. Earlier or later entry into daycare will not invalidate our estimates as it only implies that we do not observe a child in daycare at the beginning of the predicted daycare year (in the case of late entry); or that we observe a child attending an even earlier daycare year (in the case of early entry).

non-adopting states. Such age differences are likely to affect daycare and labor supply choices as well as a child's cognitive skills even independently of the reforms (see e.g. Black et al., 2011, for evidence from Norway). We therefore control non-parametrically for child age in our estimation below.[13] The second reason for age differences conditional on predicted daycare year is that we observe households in different months because the survey is undertaken year-round (though 90% of the interviews are done from January until August). As the school year lasts around 11 months, two children born on the same date may differ in age by up to 11 months depending on the date of the interview.[14] We therefore include in our estimation interview month fixed effects. We now turn to our estimation strategy.

4.2 Estimation Strategy

We begin with an analysis of access to free daycare prior to school entry ("kindergarten"), the most common policy adopted (see table 1). Focusing on this group of children, we can work within a standard difference-in-differences framework comparing changes in outcomes of individuals in treatment states in the post- and pre-policy period to changes of individuals in control states. In particular, we estimate variants of the following model:

$$Y_{iasmt} = \beta * Eligible_{ast} + f(Age_{at}) + \lambda' X_{iast} + \alpha_s + \theta_t + \delta_m + \varepsilon_{iasmt} \quad (1)$$

where Y_{iasmt} represents outcome of child (or parent) i of age a in state s observed in month m and school year t. Our main outcomes are childcare choices, maternal labor supply and child skills. We estimate equation (1) on the sample of children aged between 5 and 6 who would be in their final year of childcare according to the rules for school entry in their state of residence. The key independent variable $Eligible_{ast}$ is equal to one if a child is eligible for a free daycare slot and zero otherwise. As discussed in the previous section, eligibility is defined on the basis of the predicted daycare year and whether a state has adopted a free daycare policy in year t. As children in the same predicted daycare year differ in age which itself affects daycare attendance and skills, we also control flexibly for interview month fixed effects (δ_m) and child age $f(Age_{at})$ by including fixed effects for three-month age intervals (60-62 months,

[13] If we only conditioned on child age instead, children could have higher attendance rates in treatment states than children of the same exact age in control states because they enter the last daycare year at a slightly older age - even independently of the free daycare slot.

[14] The raw data suggest that treated households are interviewed somewhat later. A regression of the interview month on our baseline specification (child, parent and household demographics, year and state fixed effects as well as child age and predicted daycare year) yields, however, no statistically significant relationship between treatment and interview month.

63-65 months etc.).

All specifications also include state (α_s) as well as school year (θ_t) fixed effects to allow for differential childcare attendance across states and aggregate time trends in daycare attendance. We further include a number of control variables X_{iast} for child gender, the responsible parent (education, age, marital status and whether the parent is foreign-born) and the household (size, number of dependent children, number of infants and whether household income is above the poverty line).[15] To adjust for changes in local economic conditions, we control flexibly for state GDP per capita and unemployment rate. The key parameter of interest, β, then identifies the ITT effect of free daycare on families with 5-6 year-old children relative to children in the same daycare year and age range in the control states.

In a second step, we investigate the adoption of free daycare for younger preschool children (ages 2-5). Recall from table 1 that three states (*Rhineland-Palatinate*, *Berlin* and *Hamburg*), adopted very comprehensive reforms which extended free daycare slots from older to younger children over time. Here, we estimate variants of the following model:

$$Y_{iastm} = \beta * YrsEligible_{ast} + f(Age_{at}) + \lambda' X_{iast} + \alpha_s + \theta_t + \delta_m + \varepsilon_{iastm} \tag{2}$$

where Y_{iast} is the outcome of interest defined as in equation 1 above.

The key difference to equation (1) is the definition of the treatment variable $YrsEligible_{ast}$ and the sample of children used for estimation. The treatment variable $YrsEligible_{ast}$ is now equal to the total number of years a child is eligible for a free daycare slot in the treatment states. A child born in *Hamburg*, for instance, has been eligible for free daycare from age 2 on since 2014. Hence, a 2-year-old in *Hamburg* in 2015 may attend daycare free of charge for up to four years, while a child of the same age in *Bremen* has no access to free daycare and would have access to just one free daycare year in *Bavaria* in the same year. The treatment variable then varies from zero years for children in non-adopting states up to four years in the states with the most comprehensive free daycare policy after the phase-in (see table 1). Using the cumulative number of years of eligibility to free daycare as treatment variable accounts for the intertemporal decision-making of households.[16]

As before, we include state (α_s), school year (θ_t) and interview month (δ_m) fixed effects,

[15] A household is above the poverty line if total income (adjusted for household size using equivalence scales) is above 60% of the median household income in Germany in a given year.

[16] If our measure would reflect only current eligibility (but not eligibility for free daycare in future years), we would impose that households make myopic decisions about childcare arrangements and maternal labor supply ignoring the fact that a child might have access to free daycare in future years as well.

parental and household characteristics, controls for local economic conditions (X_{iast}), child gender and child age (measured in 3-month intervals). In addition, we now include fixed effects for the predicted daycare year based on the child's birth date and the state's cutoff rule. In variants of equation (2), we also allow the effect of the treatment variable to vary by predicted daycare year. As we control for predicted childcare year rather than actual entry, the childcare year is exogenous conditional on state fixed effect and child age. The underlying logic is very similar to the school entry literature which uses predicted school entry age rather than actual entry (see e.g. Elder and Lubotsky, 2009; Black et al., 2011).[17]

The effect of free daycare in (2) is identified by comparing changes for an eligible child residing in a treatment state to the changes for a child in the same predicted childcare year in a control state between the post- and pre-policy period. The standard identifying assumption of the estimator in equation (1) is that outcome variables have evolved similarly in treatment and control states in the absence of the policy ("parallel trend assumption"). We provide some graphical evidence and more systematic support for this assumption in Section 7.1. Another concern with difference-in-differences analysis is the correct computation of standard errors. To account for within state dependence, our baseline estimations cluster standard errors at the state level (Bertrand et al., 2004). In Section 7.3 below, we demonstrate that using alternative estimators for the variance-covariance matrix does not affect our inference; estimated standard errors are similar or even slightly smaller than those reported in the main tables.

5 Data Sources

5.1 The Socio-Economic Panel

To investigate the consequence of free daycare policies on preschool children and their families we use data from the Socio-Economic Panel (SOEP). The annual panel surveys around 12,000 households about their childcare choices, labor supply, income source and the household's demographic structure (Wagner et al., 2007). We focus in our analysis on 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.[18] We restrict our sample to the period from 2000 to 2015 which includes at least six pre-policy years

[17] In principle, one could use the cutoff rules and birth date information to use a RDD design for estimation (as in Fitzpatrick, 2010; Gormley and Gayer, 2005). In practice, however, our sample sizes are to small for such a data-intensive procedure.

[18] East and West Germany differ in female employment and childcare utilization for very young children.

and up to nine years after a policy change.[19] We include in our sample all families in West Germany with at least one preschool child aged between 2 and 6.[20]

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 by members of the household instead. Note that home care does not imply that all care is provided by the parents; it also includes childcare by others living in the same household like older siblings, au-pairs or grandparents. Based on this information, we code an indicator variable whether a household uses public daycare or not, whether the household uses informal care (as alternative or in addition to public daycare) and whether the household does not use any childcare outside the home. To test whether access to free childcare encourages mothers with preschool children to enter the labor market or work more hours, we use information on labor force participation and working hours of the responsible parent.[21] Employment here comprises full- or part-time employment, employment for less than 400 euros per month (which is exempt from social security contributions) and vocational training. Mothers on parental leave are considered not employed. Working hours are measured per week including overtime. We use a number of socio-demographic characteristics of the child, the responsible parent and the household to control for other influences on childcare arrangements or labor supply. Finally, we merge our data on families with preschool children from the SOEP with administrative data on the supply public daycare slots from the Child and Youth Services as well as with data on state-level unemployment and GDP per capita from the Federal Statistical Office.

Table A2 shows descriptive statistics for our sample of families with preschool children in West Germany separately for the pre-reform period (2000-2006) and the post-reform period (2007-2015). More than 80% in our sample of preschool children aged between 2 to 6 attend public daycare but the vast majority attends for less than 8 hours per day. Informal care is still common and often combined with public daycare in order to cover childcare needs. Maternal employment is with around 50% still relatively low compared to the United States, for example; and most working mothers work part-time, i.e. less than 30 hours per week. To see how childcare arrangements vary by child age, figures 4a and 4b trace the evolution of attendance in public daycare and home care over time separately by predicted daycare year.

[19] While the (*Saarland*) introduced a free daycare year in 2000, this state has less than one million inhabitants and constitutes less than 1% of our sample of preschool children.

[20] The data appendix provides more details about our sample and the variables used in the empirical analysis.

[21] The responsible parent is the mother (99 %) or another female adult like the grandmother.

Figure 4a shows that enrollment in daycare has been increasing for the two youngest age groups (ages 2-4). For older children, attendance rates are high and do not change much over time. Figure 4b mirrors figure 4a in that reliance on exclusive care at home has been declining for the two youngest age groups (ages 2-4) over time.

5.2 Supplementary Information on Child Outcomes

To analyze child outcomes for 2-3 year-old children, we use a supplementary questionnaire of mothers with children born in 2002 or after which has been available since 2005. The survey uses an adapted Vineland Adaptive Behavior Scale (VABS) which measures four skill categories: motor skills, language ability, social skills and skills in daily activities (see Sparrow et al., 2005, for more details). In each category, five questions are used for assessment, e.g. whether the child can form a sentence with multiple words (for language skills) or draw recognizable figures (for motor skills). For each question, the mother reports whether the child is able (2 points), not able (0 points) or only partially able (1 point) to perform a particular task. We construct a score for each category (language, motor skills etc.) by summing the responses to the individual items. We further calculate a total VABS score across all four categories which ranges from 0 to 40 (mean: 28.5, standard deviation: 8.2 in our sample). Finally, we standardize the score to have mean zero and standard deviation of one. A larger score implies that a child is better able to perform the specific tasks.

To assess child outcomes for older children, we rely on a questionnaire which has surveyed mothers of 5-6 year-old children since 2008. Here, child outcomes are measured by an adapted version of the Strengths and Difficulties Questionnaire (SDQ) proposed by Goodman (1997). Mothers assess emotional and conduct problems, hyperactivity/inattention and peer relationship issues of their child relative to other children in the same age range. The four dimensions are summed to a total SDQ score which ranges from 0 to 23 (mean: 6.1, standard deviation: 4.1 in our sample). Finally, we measure pro-social behavior of the child based on additional questions. As for younger children, we standardize the total score and the sub-scores to have mean zero and standard deviation of one. Larger values indicate more behavioral problems.

Parental assessments, often the only source of information on skills of very young children, may suffer from systematic biases. Caregivers may be positively or negatively biased in their perception, may give socially desired answers, or may report some behavior only because they are asked in the survey (e.g. Schwarz, 1999). Yet, external validation studies of

parent-reported data indicate that they are informative about the skills they are intended to measure. There is also little evidence that any bias in parent-based reports is correlated with the socio-economic characteristics of parents (De Los Reyes and Kazdin, 2005; Treutler and Epkins, 2003). Furthermore, a recent validation of the VABS used in the SOEP showed that maternal assessments are highly correlated with scores on an examiner-administered test of infant development (Sandner and Jungmann, 2016).

Maternal assessments of their child may also be affected by the time a mother spends with the child. Mothers might become less critical, for instance, as they care for their child at home and observe the child's eating habits or language capacity throughout the day. In that case, a change in maternal assessments might be the result of changes in childcare arrangements induced by the free childcare policy - and not the result of an actual change in the child's skill. In the absence of formal tests from developmental psychologists, we cannot address this concern directly. However, we can provide some indirect evidence that mere changes in perception are unlikely to drive our results. If maternal assessments mostly reflect the time spent with the child, they should not differ for children who attend formal or informal care (holding hours of care outside the home constant). Table A3 shows regressions where the dependent variable is the total VABS score (in columns (1)-(3)) and the total SDQ score (in columns (4)-(6)). Key independent variables are the types of childcare used in addition to a number of socio-demographic characteristics. The results for children aged between 2 and 3 show that mothers assess their children more favorably if they attend public daycare than informal care (column (1)). The same pattern holds even if a child spends more time in formal than in informal care (column (2)). Finally, column (3) includes separate indicators for informal and formal care where the reference category is exclusive care at home. If there was a positive correlation between maternal assessments and care at home, we should see negative coefficients. Yet, we find the opposite pattern with positive coefficients for both formal and informal childcare.

The patterns are similar, but statistically much weaker for children aged between 5 and 6 (shown in columns (4)-(6)). Recall that a higher SDQ score indicates more behavioral problems. Formal childcare is negatively correlated with behavioral problems (see columns (4) and (5)). The final column shows only a weak correlation between informal or professional care (relative to home care) and behavioral problems. One explanation for this weaker correlation is that only about 3% of the 5-6 year-old children in our sample are cared for exclusively at home which leaves with little variation. Overall, the evidence in table A3 indicates that maternal assessments do indeed reflect child competencies. We now turn to our main results.

6 Empirical Results

6.1 Childcare Arrangements

We first assess how access to free daycare in the year prior to school entry ("kindergarten") affects childcare arrangements. The sample is restricted to 5-6 year-old children who, according to the state's cutoff rules for school entry, are predicted to be in their last daycare year. Results from linear probability models are reported in table 2 where the dependent variables are binary indicators whether a child attends public daycare (columns (1)-(2)), informal childcare by friends, relatives, neighbors or a childminder (columns (3)-(4)), or whether the child is exclusively cared for at home (columns (5)-(6)) respectively. The main independent variable is equal to one if a child has access to a daycare slot free of charge and zero otherwise. Table 2 reveals no behavioral responses to the free daycare slot for 5-6 year-old children: there is neither increase in attendance for the free public daycare nor any substitution patterns from other modes of childcare. We also find no evidence that parents are more likely to use a full-time daycare slot or reduce their exclusive reliance on informal care (results are available upon request).[22] A potential explanation for the absence of an effect is shown in the last row: 96.8% of children actually attend daycare in the year before school entry prior to the reforms. Hence, there was very little room for improvement in daycare attendance after the reforms.

We next explore whether more comprehensive policies offering multiple free daycare years for younger children affect childcare arrangements. Table 3 reports the results. The dependent variables are again binary indicators equal to one if the family uses a certain childcare mode and zero otherwise. The sample is restricted to 2-5 year-old children predicted to be in daycare in the three years prior to the last year. The empirical model contains the same control variables as in table 2. In addition, we also include a dummy for the predicted childcare year. The second specification (in even columns) also interacts the predicted daycare year with our treatment variable to allow reform effects to vary with daycare year.

The estimates in table 3 show that children with access to multiple years of free daycare are more likely to attend public daycare (column (1)) and less likely to be cared exclusively at home (column (5)). The evidence further shows that informal care seems to increase (column (3)). The exclusive reliance on informal daycare declines, however (not reported). These opposite effects for some and exclusive use of informal care suggest either that public daycare

[22]The number of observations is lower for informal and home care because we have no information whether a household uses informal childcare in 2003.

and some informal care are complements; or that parents spend the additional income on purchasing more informal daycare.[23] The second specification reveals that a free daycare policy encourages earlier entry into daycare: daycare attendance for 2-3 year-old children increases by 8 percentage points. Compared to the mean attendance of 51% in the pre-policy period, the reform effect is with 15.7% quite large. In contrast, there is no change in childcare arrangements of children aged between 3 and 5, probably because most children attend daycare.[24] While attendance at the extensive margin increases, the likelihood of attending daycare full-time actually decreases by about 3 percentage points (not reported). One explanation for the decline is that parents who send their child to daycare in response to the new policy are more likely to use a part-time slot than parents who would have used a daycare slot even in the absence of the policy. The decline in exclusive care at home is the mirror image of the changes in daycare attendance: 2-3 year-old children are 4 percentage points less likely to be exclusively cared for at home. Relative to the 26.7% cared for at home in the pre-policy period, the effect amounts to a decline of 15%. As for public daycare, we find no responses for older preschool children.[25] The absence of an effect for home care among older preschool children is not too surprising given that only about 10% of families with children aged 3 and older care for their child exclusively at home (see also figure 4b).

Overall then, free daycare has the strongest effect on very young children. Access to free daycare speeds up entry into public daycare for children aged between 2 and 3 and reduces exclusive care at home instead. Using our estimates, we can calculate the price elasticity of daycare demand. Parents in our sample pay around 82 euros per month in daycare fees in the pre-policy period. Based on the estimates in table 3, column (1), the price elasticity of daycare demand is with 2.9 (0.023*1.25*82/0.803) highly price elastic. Demand for daycare is inelastic for older preschool children, esp. in the year before school entry, as attendance rates have been high even before free daycare was adopted.

One might be concerned that the reason we find no effect for the last daycare year (in table 2) is the small sample size. To assess this concern, we re-estimate equation (2) using the full sample of children aged between 2 and 6. Estimates allowing for differential effects by daycare

[23]Evidence for East Germany (Gathmann and Sass, 2018) suggests that public daycare and informal care are complements as daycare is often part-time or not flexible enough to cover the working hours of parents.

[24]The cumulative number of free daycare years is 1.43 for 2-3 year-old children; hence, 0.055*1.43=0.08. The cumulative number of free daycare years for 3-4 and 4-5 year-old children is 1.33 and 1.18 respectively. We thus obtain a slightly negative effect of 2 percentage points ((0.08-0.075)*1.33=-0.02) for 3-4 year-old children and of 4 percentage points ((0.08-0.10)*1.18=-0.04) for 4-5 year-old children.

[25]For 2-3 year olds, we have: -0.028*1.43=-0.04. For older children, we have -0.04+0.031*1.33=0.001 (3-4 year-old children) and -0.04+0.039*1.18=0.006 (for 4-5 year-old children) respectively.

year are shown in table A4. We find the same result as before: attendance in public daycare increases for the youngest daycare group, but is not statistically different from zero for all other daycare year (column (1)). Similarly, we find no robust effect on informal care (column (4)) of table A4), while home care is reduced for the youngest children with again no effect for older children (column (7) of table A4). Hence, a free last daycare year does not affect the childcare choices of families.[26]

A second question is whether a free last daycare year might have an effect on younger children in previous daycare years. Parents might use the additional resources to enroll their child into public daycare earlier. Such an effect would not be picked up by the estimates in table 2 because we restricted the sample to children eligible for the last daycare year. To test this, we re-estimate equation (1) for children aged between 4 and 5 who are not yet eligible for the last daycare year. To avoid spillover effects among siblings, we further restrict the sample to 4-5 year-old children with no older siblings. The treatment variable is defined as one if they will have access to a free last daycare year and zero otherwise. Columns(2), (5) and (8) show that access to a free last daycare year has no effect on younger children not yet eligible.[27] As there is no effect for 4-5 year-old children, we can use this age group as an additional control group for eligible 5-6 year olds within a triple differences estimator. Our difference-in-differences estimates in table 2 might be biased if there are state-specific trends in childcare attendance. By using an additional control group within the same state, we can eliminate that bias as long as the state-specific trend in attendance is constant across age groups. We rerun the baseline in equation (1) on the sample of 4-6 year-old children where only the older age group (5-6 year-old children) are eligible for a free daycare year (we drop the three states who adopted more comprehensive reforms covering younger children). The triple differences estimates reported in columns (3), (6) and (9) of table A4 are very similar to the estimates in table 2 suggesting no behavioral responses among kindergarten children.

6.2 Maternal Labor Supply

We next turn to the question whether access to free childcare has any immediate effect on the labor supply of mothers with preschool children. Table 4 investigates labor force participation

[26]One might be worried that there is no effect because children observed in the last daycare year have been eligible for free daycare in earlier years. Yet, we find no effects on attendance in the last daycare year if we drop the three states with free daycare policies for younger children (not reported).

[27]Supplementary regressions show no evidence for early entry into daycare; 4-5 year-old children are equally likely to attend daycare in the first eight months of the year than in later months after the school year started.

(in columns (1)-(3)), whether the mother works full-time (in columns (4)-(6)) and the number of contractual working hours (in columns (7)-(9)). The first specification (reported in columns (1), (4) and (7)) estimates equation (1) for children in their last daycare year ("kindergarten"). Here, as in table 2, the treatment variable is a binary indicator equal to one if whether a child is eligible for the last daycare year free of charge and zero if the child is not eligible. The second and third specification (in columns (2)-(3), (5)-(6) and (8)-(9)) report the results for younger preschool children aged between 2 and 5. As in table 3, the treatment variable here is the total number of free daycare years a child is eligible for in its state and zero if the child is not eligible for a free daycare slot. The control variables are the same as in tables 2 or 3: parental and household characteristics, controls for local economic conditions, state, school year and interview month fixed effects as well as controls for child age and gender.

For the last daycare year, we find little response in maternal labor supply both along the extensive (column (1)) and the intensive margin (columns (4) and (7)). We also find no effect on labor force participation in the following year (not reported). Together with the absence of behavioral responses on childcare choices (see table 2), these findings indicate that parents use the additional income (not spent on daycare fees) for activities other than parental time or informal care. For mothers of younger children, we do not find an effect on labor force participation or working hours on average (see columns (2), (5) and (8)). Yet, we find some effect if we allow the treatment effect to vary across childcare years. Mothers of very young children (2-3 year-old) do not adjust their labor supply though we did find that their children were more likely to attend daycare and less likely to be cared for at home (see table 3). Hence, labor supply of mothers with very young children is highly inelastic to price changes in our context. A comparison with evidence from East Germany reveals that East German women with preschool children have not only higher employment rates than their West German counterparts but are also more responsive to daycare prices - with estimated price elasticities of between -0.1 and -0.2 (Gathmann and Sass, 2018). For children aged between 4 and 5 in turn, we find that the labor force participation of mothers decreases if their child has access to free daycare. Such an effect is expected if the income effect raises the demand for maternal leisure. However, the decline is with 2.2 percentage points or 3.9% ((0.01-0.029)*1.18/0.57=0.039) quite modest.

Taken together, the provision of free daycare has little effect on daycare choices for older children but reduces their mothers' labor supply. For very young children in turn, a free daycare policy encourages earlier entry into public daycare rather than home care; yet, that does not

encourage additional labor supply by mothers. These findings support the notion that daycare utilization and maternal labor force participation are not that closely linked in Germany - which is also reflected in the fact that, though close to 100% of 5-6 year-old children attend public daycare, the labor force participation of their mothers is only 54%.

6.3 Short-Run Child Outcomes

Given the results on daycare attendance and female labor supply, the question arises whether free daycare would benefit eligible children in terms of their cognitive or non-cognitive development. Given the data available, we can only assess the short-run consequences on child development up to age 6. We use the model in equation (2) where the treatment variable is the cumulative number of years a child is eligible for free daycare. We include the same set of control variables (child, parental, household and local labor market characteristics) as in table 3. Note that our sample for child skills is much smaller than our main sample for childcare choices because skill development has only been assessed for 2-3 year-old children since 2005 and for 5-6 year-old children since 2008.

Each entry in table 5a is an estimate of the treatment variable from a separate regression. The first column reports results for the whole sample of 2-3 year-old children. The findings for the total Vineland score and its four subcategories do not indicate that a free daycare policy had any short-run effects on 2-3 year-old children. The second and third column rerun the same specification separately for boys and girls respectively. The surprising result is that a free daycare policy seems to have some harmful effects for boys, but not girls. For girls, most of the coefficients are positive but do not reach statistical significance. For boys, most of the coefficients are negative instead. The effect for skills in daily activities is statistically significant and suggests a decline of 0.11 of a standard deviation in mastering daily skills.

Why do we see some negative consequences of the free daycare policy for boys but not girls? There are two potential explanations: the first argument could be that boys benefit less from daycare attendance than girls. Evidence from the psychological literature suggests that maternal employment in the first years of life is associated with more behavioral problems for boys but not girls (e.g. Desai et al., 1989; Youngblade, 2003)). A second explanation for the observed effects is that parents of boys respond differentially to the free daycare policy than parents of girls. To shed light on this second explanation, we rerun the baseline for childcare choices and maternal labor supply separately for boys and girls. The results in the

top panel of table A5 show that for 2-3 year olds parents of boys and girls do not differ in their behavioral responses to a free daycare policy. Hence, the more likely explanation for the worse skill development of boys documented in table 5a is that young boys seem to benefit less from daycare attendance than girls. Additional evidence supporting this conjecture comes from two other studies that also document differential benefits of daycare by child gender in Germany (Gathmann and Sass, 2018) and Canada (Kottelenberg and Lehrer, 2017).

We next investigate whether the free daycare policy has had any effects for 5-6 year-old children using the SDQ scores. Table 5b shows the results using the same controls and set of specifications as above. The dependent variables are now the total SDQ score (in the top row) and its four sub-components (conduct problems, emotional problems, problems with peers and attention problems). Note that now higher values now imply more behavioral problems. The bottom row shows the effect for pro-social behavior where higher values are associated with less behavioral problems. In contrast to the younger children, we find that older boys have fewer behavioral problems with access to free childcare than older girls. For girls, coefficients are positive but not statistically significant from zero except for emotional problems. The last row also shows that boys are socially more apt with access to free childcare.

In order to assess whether the heterogeneity in skill development across gender may be accounted for by differential responses to the policy, we again rerun the baseline specification for childcare choices and labor supply separately by child gender. The bottom panel of table A5 indeed shows some gender-specific responses to the new policy: Parents of older boys seem to use the additional funds to reduce maternal labor supply (compare bottom panel of table A5, columns (7) and (8)). Parents of girls, in turn, seem to spend the money to obtain more informal care for girls (compare bottom panel of table A5, columns (3) and (4)). If boys benefit more from spending more time with their mothers (in addition to attending daycare), while girls do not benefit much from the additional time spent in informal care, these changes could explain why boys have less and girls more behavioral problems. Overall, these results are consistent with the idea that parents of 5-6 year-old children face gender-specific benefits or preferences for spending the additional income. Potential reasons for this gender-specific response are that investments in skills have higher monetary or non-monetary returns for boys, for example, because men are still more attached to the labor force than women. An alternative explanation is that mothers enjoy spending time with their son, for example, because they have a preference for sons (see Dahl and Moretti, 2008; Ichino et al., 2014).[28] Given the data available

[28]Consistent with our evidence in column (7) of table A5, Ichino et al. (2014), for instance, show that

to us, we cannot distinguish between these alternative explanations.

Overall, the evidence for older preschool children highlights that a free daycare policy has effects for eligible children and their families - even if there is no direct behavioral response in terms of childcare choices. Families who do not adjust daycare use might still employ the additional financial resources to foster their child's human capital (through buying other goods and services) or by reducing labor supply.

6.4 Heterogeneity and Indirect Effects

Policy-makers often favor subsidies for public daycare less because of higher female labor supply or more favorable skill development for the average child but out of equity concerns (see Section 3.3). Access to free daycare with its trained educators, toys and a stimulating environment might boost skill development - especially for children from disadvantaged family backgrounds. Yet, do we actually see any leveling of the playing field for vulnerable subgroups like poor, single or low-skilled households after the reforms?

Disadvantaged families might respond more to free daycare than the average family because parental fees constitute a larger share of their total household income, for instance.[29] At the same time, poorer families also pay lower childcare fees and even no fees in some municipalities which might make them less responsive to the free daycare policy. In the end, it is an empirical question whether the policy benefits poorer families more than other households. Single parents might also benefit more than other families because a free daycare slot offers them a cheap childcare option and frees up parental time. To test for heterogeneity in treatment effects across population subgroups we use our baseline model in equation (2) but allow the coefficient on the treatment variable to vary for population subgroups defined by household income, marital status and education of the responsible parent.

The results in table 6 show several interesting patterns: first, poor households respond much more to the free daycare policy than medium- and high-income households (see the first specification in table 6). Public daycare for 2-5 year-olds increases by 4.6 percentage points in poor households, almost twice the effect than in the average household (compare column (1) in table 3 and column (2) in table 6).[30] Mirroring the sharp increase in daycare attendance,

mothers with first born sons are less likely to work and work fewer hours. They attribute this to increased marital stability when having a boy and thus a reduced need for additional income.

[29] As noted above, poor households as households with an income of 60% or less of the median household income which is the official definition of poverty in Germany.

[30] On average, a 2-5 year-old child is eligible for 1.25 years of free daycare in our treatment sample; hence, we get (0.02+0.017)*1.25=0.046. For the average household, we get in turn: 0.023*1.25=0.029.

there is also a much stronger decline in exclusive care at home by 4.5 ((-0.012-0.022)*1.25) percentage points compared to 1.9 (-0.015*1.25) percentage points in the average household (compare to table 3, column (3)). Finally, poorer households use some of the additional funds to buy informal care: informal daycare increases by 5.6 (0.033*1.25) percentage points in poor households, but only by 2.3 (0.018*1.25) percentage points in the average family.[31] Interestingly, poorer parents seem to be using some of the saved income to reduce the labor supply of mothers (see table 6, columns (7) and (8)). The fact that maternal labor supply declines at the same time as public daycare and informal care use actually increases provides further support for the notion that female labor supply and childcare choices are not strongly linked in Germany. Finally, we also find no statistically evidence that children from low-income households benefit more from access to free daycare (see column (9) for the total SDQ score; and column (10) for the total VABS score).

For single parents, we find that they use a free daycare slot to reduce the exclusive reliance on home care (see table 6, columns (6)) by 3.3 ((-0.015-0.011)*1.25) percentage points compared to 1.8 percentage points in the average family (compare to table 3, column (5) multiplied by 1.25 years). Finally, low-skilled mothers with children in the last daycare year mostly use the additional income to reduce their labor force participation. While access to free daycare is negatively correlated with the cognitive and non-cognitive skills of 5-6 year-old children (see column (9)), the coefficients do not reach statistical significance. Overall then, vulnerable families with preschool children are also more responsive to a free daycare policy than the average family. The available data do not indicate that children of poor, single or low-skilled parents benefit more than the average child despite the much larger response in daycare utilization among low-income families, for instance. Yet, the estimates are quite noisy as the sample sizes are probably too small to uncover modest effects.

Finally, the policy might have indirect effects on siblings of eligible children for two reasons. First, the additional income could be used to send younger siblings to public daycare as well; a second reason is that parents who start sending their eligible child to daycare in response to the policy might do the same for other siblings in order to increase market work, for instance. To investigate spillover effects, we re-estimate equation (2) for all preschool children aged between 2 and 6 but restrict the sample to households with at least two preschool children. We further drop all children eligible for free daycare in the household. The sample then consists of siblings

[31] We find no heterogeneous effect for the exclusive use of informal care (not reported). It seems that poorer parents send their child earlier to daycare if it is free of charge; and use some of the additional income to purchase more informal care than the average household.

of eligible children who are not themselves eligible for free daycare. The control variables are otherwise the same as in the baseline analysis for eligible children (reported in tables 2 to 4). The results in appendix table A6 indicate that there are indeed strong spillover effects on siblings: a free daycare policy for one preschool child in the family raises the likelihood that a 2-3 year-old sibling attends daycare (see column (1)) and makes it less likely that the sibling is cared for at home (see column (3)). There is also a decline in informal care for siblings in the last daycare year (see column (2). Otherwise, we find no effect for the childcare of older children just like in the analysis of eligible children.[32]

7 Robustness Analysis and Standard Errors

Section 7.1 reports a range of specification checks to demonstrate the robustness of our findings to alternative identifying assumptions. Section 7.2 discusses selective migration, while Section 7.3 reports alternative ways of estimating standard errors.

7.1 Testing for Prior Trends

Key to our identification strategy is the parallel trend assumption between eligible families in adopting states compared to families with children in the same daycare year in states that have not (yet) adopted the policy. A graphical comparison of treatment states and never adopters is shown in figures 5a-d. The x-axis denotes the years prior to and after the adoption with year zero denoting the reform year. For never adopters, we assign the mean reform year among treatment states as year zero. Figure 5a (daycare), figure 5b (exclusive care at home) and figure 5c (informal care) show similar pre-reform development in treatment states compared to never adopters; the evidence in figure 5d (female labor supply) is less conclusive as the data for never adopting states appear quite noisy. However, figures 5a-d are only partially informative about parallel prior trends as they only compare states and never adopters thus ignoring that our estimation strategy uses late reformers as additional control.

To test the parallel trend assumption more directly, we estimate placebo reforms where we shift the introduction of the free daycare policy in adopting states two, four and six years prior to the actual reform. The top part of table 7 shows the results: the first specification (in odd columns) reports the results for the last daycare year; the second specification (in

[32]The effects are similar, though in some cases even stronger than the effects for eligible children. The reason is that table A6 restricts the sample to households with at least two preschool children where responses, even for eligible children, are more pronounced than for the average family.

even columns) for younger children. Most of the coefficients are very close to zero. Of the 24 coefficients reported, two turn out to be statistically significant at the 10 percent level which is consistent with the coefficients being significant by chance at a 10% significance level. Overall then, the evidence on placebo reforms supports the validity of our identification strategy as the parallel trend assumption seems valid.

Even if treatment and control states exhibit similar trends in the pre-policy period, there might be other changes or shocks occurring around the reform date. One such change is the expansion of daycare slots for children under the age of three as discussed in Section 3.1. If treatment states expand their daycare slots for young children around the same time as the introduction of free daycare and more than control states, our estimation strategy would identify the combined effect of more slots supplied and lower daycare prices. To check whether changes on the supply side have an effect on our estimates, we re-estimate our baseline from equations (1) and (2) but also include the supply of daycare slots per 100 children at the district level to our specification. The results reported in the bottom part of table 7 show that our estimates are hardly affected by controlling for supply changes. Therefore, the increase in daycare attendance and decline in home care with no effects on female labor supply are indeed behavioral responses to the price decline and not a reaction to the availability of daycare.

There might be other changes or differences across states that could influence our results. Most importantly, the dynamics of daycare attendance for younger and older children might evolve differentially over time (e.g. younger children are more likely to attend daycare in 2015 than in 2000) or across individual states. Treatment states seem to have somewhat lower attendance among very young children (aged 2-3), for instance. By imposing a common attendance pattern by predicted daycare year, we abstract from such changes. To assess these concerns, we re-estimate our baseline for 2-5 year-old children but add school year x daycare year fixed effects to allow for arbitrary changes in daycare attendance over time. The estimates in the second specification in the bottom panel of table 7 are unaffected by this very flexible specification though the statistical significance becomes slightly weaker. As another test, we add state x daycare year fixed effects to allow for arbitrary attendance patterns in each state. The last specification of table 7 shows that the estimates are similar but lose statistical significance for public daycare and home care. This pattern is not too surprising as we absorb a considerable share of the variation used to identify the reform effects.

Yet another way to test for the importance of underlying differential developments in treatment and control states is to allow for flexible state-specific time trends in the specification.

Table 8 shows estimates of equations (1) and (2) with no trend (our baseline) and then add state-specific linear, quadratic and cubic trends. If childcare choices or female labor supply differed between treatment and control states over some period, the inclusion of higher-order time trends specific to each state would change our estimates. The results for all outcomes are remarkably similar to the baseline (shown in the first row). Alternatively, the last row in table 8 allows the state-specific linear trend to vary before and after the reforms. Note that this specification restricts time trends to be the same in all control states but allows for a trend break with the reform. We again obtain very similar estimates as in our main tables.

Together with our results from the triple difference estimates (discussed in Section 6.1), the evidence presented shows that a free daycare policy indeed triggers behavioral responses only among very young children with few effects on maternal labor supply.

7.2 Selective Migration of Eligible Families

One might be worried that families with preschool children selectively migrate into states that adopt a free daycare policy.[33] If there is selective migration into adopting states, our estimates on childcare arrangements, for instance, might not reflect behavioral responses of eligible families, but rather a change in the mix of eligible households residing in reform states.

To assess this concern, we collected migration statistics by detailed age groups from the State Statistical Offices. We obtained comparable information for six of the nine reform states.[34] The net inflow of families with children under the age of 6 into adopting states increases after the reform. Controlling for state and school year fixed effects as well as local economic conditions, a free daycare slot in the last year attracts around 630 additional families with preschool children. At the same time, however, migratory flows of families with young children are extremely low (only about 4-5%) relative to total in- and outflows across state borders over the 2000-2015 period. Furthermore, if we compare the number of net inflows to the stock of families with preschool children in each state using the 2011 Census data, the total inflow of preschool children makes up only about 0.5-1% of the population in that age range. As such, we think that the somewhat higher inflows of preschool children following a free daycare reform does not pose a serious challenge to the interpretation of our findings.

[33]There is some anecdotal evidence that some local governments indeed aim to attract families with young children by providing free daycare slots in addition to other benefits.

[34]Data are available for *Bavaria*, *Berlin*, *Hamburg*, *North-Rhine-Westphalia*, *Rhineland-Palatinate* and *Schleswig-Holstein*.

7.3 Alternative Estimates of Standard Errors

Our main analysis clusters standard errors at the state level as the reforms were introduced by state governments. As our clustering strategy might be sensitive to the small number of clusters, we report in table A7 alternative strategies to estimate standard errors. We first run variants of equation (1) with standard errors clustered at the state-year level. Further, we include separate state clusters for the pre- and post-policy period to allow for breaks in the temporal dependence of the error terms over time. For comparison, the first row reports the baseline estimates and standard errors for our three childcare arrangements and female labor force participation. For both alternative calculations, the resulting standard errors are very similar to the baseline. Most importantly, our conclusion that a free daycare policy has statistically significant effects on childcare choices for younger children (raising daycare attendance and informal care, while reducing care at home), but little effect on female labor supply is supported for alternative clustering procedures.

Finally, we implement a wild bootstrap procedure to estimate standard errors with state-dependent errors and a small number of clusters (Miller et al., 2008). This procedure again generates p values that are similar to the baseline. The only exception is the coefficient on informal care which is no longer statistically significant; yet, we also saw in table 3 that the effects on informal care are quite weak once we allow for effects to differ across childcare years (see column (4) of table 3). Overall then, our extensive set of robustness checks confirms that our qualitative conclusions from Section 6 remain valid.

8 Conclusion

We study how the introduction of free public day care affects child care attendance, maternal labor supply and short-run child development. For estimation, we exploit quasi-experimental variation in childcare prices induced by childcare subsidies in nine West German states.

Our findings suggest that childcare attendance indeed increases for the youngest children (2-3 year olds) with few effects on older preschool children. An increase in daycare utilization for young children is mirrored by the decline in exclusive care at home. Informal care typically also increases suggesting that formal and informal daycare are complements in the German context. Despite the increase in daycare attendance among young children, we do not find evidence that more mothers work or work more hours in response to the policy. The lack of a labor supply response, despite low levels of participation of mothers with preschool children,

suggests that free childcare might not be a key policy instrument to boost female labor supply in Germany, at least not in the short-run.

A second important goal of early childhood education is to foster the cognitive and non-cognitive skills of eligible children. Our results for child development show that 2-3 year-old girls benefit from attending childcare earlier, while boys do not. These gender-specific effects are quite similar to those reported in response to the home care subsidy which implicitly raised daycare prices in East Germany. In contrast, we find positive effects of free daycare on the cognitive and non-cognitive skills of 5-6 year-old boys, but not girls. These behavioral outcomes seem to be explained by gender-specific responses to the policy: parents of boys reduce maternal labor supply, while parents of girls rely on more informal daycare. Such a behavior is consistent with a preference for sons or higher monetary or non-monetary returns to human capital investments in boys. Unfortunately, we cannot say whether the differential effects on child development are merely short-run benefits or losses - or indicate persistent differences. Finally, we also document sizable heterogeneity in the estimated effects with poorer households responding much more to the free daycare policy than the average household.

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A Data Appendix

A.1 German Socio-Economic Panel (2000-2015)

Childcare variables: The main dependent variables are the type of educational institution (school, kindergarten or other daycare facility) each child under the age of 16 currently attends if 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 daycare; publicly subsidized childcare may be provided by the local community, churches, companies 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 childminder. 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 for all years 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.

Child outcomes: Data on child outcomes for 2-3 year-old children are taken from a supplementary questionnaire answered by the mother and available annually since 2005. 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 children. The skills elicited come from a version of the Vineland Adaptive Behavior Scale which has been adapted to the time constraints of a general household survey. *Social skills* cover the following tasks: whether the child calls familiar people by name; whether the child plays games with other children; whether the child participates in role playing games; whether the child shows liking for certain playmates; whether the child calls his/her own feelings by name. For *motor skills*, the survey asks to assess whether the child walks down the stairs forwards; whether the child uses door handle to open doors; whether the child climbs jungle gyms and other high playground equipment; whether the child uses scissors to cut paper; whether the child draws recognizable figures; For *language skills*, the following items are assessed: whether the child understands brief instructions; whether the child forms sentences with at least two words; whether the child speaks in full sentences of at least four words; whether the child listens attentively to a story for at least 5 minutes; and whether the child can relate simple messages. Finally, the set of *skills in daily activities* comprises: whether the child eats with spoon without making a mess; whether the child blows his/her nose without assistance; whether the child uses the toilet to do number two; whether the child can put on pants and underpants correctly; and whether the 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. We then normalize the score to have zero mean and a standard deviation of one in our sample of 2-3 year-old children in West Germany from 2005-2015. A higher score means that the child is better able to perform

a specific (set of) task(s).

To analyze the short-run effects on eligible children in older age groups we make use of a shorter version of the Strengths and Difficulties Questionnaire for 5-6 year-old children which has been available since 2008. The questionnaire asks: "Compared to other children of the same age how would you assess your own child?". Then, a list of 17 skills is presented. On a scale from 1 to 7 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 total score from these items by first recoding the answers using the original Goodman scale (does not apply, applies somewhat, applies fully); we then calculate the unweighted sum over all items and several subcategories. Finally, we standardize the score to have zero mean and a standard deviation of one in our sample of 5-6 year-old children in West Germany for 2008-2015. A higher score reflects more behavioral problems.

Maternal labor supply: We code labor force participation equal to one if the individual works full- or part-time, is marginally employed ("geringfügig beschäftigt"), is currently in school or vocational training. Working hours refers to the contractual hours per week; a person is working full-time if she works 30 or more hours per week.

Control variables: As additional control variables, we use household characteristics like household size, the number of children and whether there is an infant under the age of one in the household. As a measure of household income, we use monthly disposable household income measured in euros (deflated to 2010 prices). The specific question asks about the total sum of all income sources of the household adjusted for taxes and other contributions ("verfügbares Haushaltseinkommen"). A household is considered poor if the household income (adjusted for size using OECD equivalence scales) is below 60% of the median household income, the official definition of poverty in Germany.

To control for characteristics of the parent (or caretaker), we also code the age, education and marital status. For marital status, we distinguish three categories: single (never married), married or in a long-term partnership and divorced or widowed. 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. 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 does not have German citizenship.

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 caretakers.

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 GDP per capita. Both variables are available from the Federal Statistical Office.

Table 1: Introduction of Free Childcare in West Germany

	Age Group Affected	Year Adopted	State of Adoption
Last Year of Public Daycare	Ages 5-6	2000	Saarland
		2007	Rhineland-Palatinate
		2007	Berlin
		2007	Lower Saxony
		2008	Hesse
		2009	Hamburg
		2009-2010	Schleswig-Holstein
		2011	North-Rhine Westphalia
		2013	Bavaria
2nd Year of Public Daycare	Ages 4-5	2008	Rhineland-Palatinate
		2010	Berlin
		2014	Hamburg
1st Year of Public Daycare	Ages 3-4	2009	Rhineland-Palatinate
		2011	Berlin
		2014	Hamburg
Public Childcare (pre-K)	Ages 2-3	2010	Rhineland-Palatinate
		2014	Hamburg
No Change in Policy	All ages		Baden-Württemberg
			Bremen

Notes: The table shows which states adopted free childcare in which year and for which age group of children. All states adopted the policy in January of the adoption year with the exception of *Rhineland-Palatinate*, *Hamburg* and *Schleswig-Holstein* which adopted the policy in August or September (the beginning of the school year). *Schleswig Holstein* abolished free childcare in July of 2010. In Hamburg and Schleswig-Holstein, access to free childcare applies to a part-time childcare slot (up to 5 hours a day). In *Lower Saxony*, free childcare applies to a slot up to 8 hours per day (full-time slot). All other states have no regulations whether free childcare is restricted to a part-time or full-time slot.

Table 2: Free Last Year of Public Daycare and Childcare Arrangements

	Public Daycare		Informal Childcare		Exclusive Care at Home	
	Ages 5-6		Ages 5-6		Ages 5-6	
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible for Free Daycare	-0.003	-0.004	0.011	0.010	0.002	0.003
	[0.006]	[0.006]	[0.020]	[0.021]	[0.006]	[0.007]
School Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Parental Controls	Yes	Yes	Yes	Yes	Yes	Yes
Household Controls	Yes	Yes	Yes	Yes	Yes	Yes
Child Age Fixed Effects (3 months)	Yes	Yes	Yes	Yes	Yes	Yes
Interview Month Fixed Effects	No	Yes	No	Yes	No	Yes
Observations	3,895	3,895	3,744	3,744	3,703	3,703
R Squared	0.030	0.037	0.075	0.078	0.033	0.040
Mean Dependent Variable (in the pre-policy period, 2000-2006)	0.968	0.968	0.357	0.357	0.018	0.018

Notes : The table reports how childcare arrangements change if the last year of public daycare ("kindergarten") is offered free of charge. The sample is restricted to children in the last daycare year (i.e. 12 months prior to school entry). The dependent variables are all binary indicators: in columns (1) and (2), it is equal to one if a child attends public daycare and zero otherwise; in columns (3) and (4), the dependent variable is equal to one if the parent uses informal childcare by relatives, neighbors or friends and zero otherwise. In columns (5) and (6), the dependent variable is equal to one if the child is exclusively cared for at home and zero otherwise. The key independent variable "Eligible for Free Daycare" is equal to one if a child is eligible for free public childcare in the last year before school entry and zero otherwise. Eligibility depends on a child's state of residence, year, birth date and the cutoff rules for school entry (see main text for details). All specifications include fixed effects for the state of residence, the school year and month of interview. In addition, we control for household characteristics (household size, number of children, whether there is a child under age 1, whether the household is above the poverty line), parental characteristics (age, education and marital status of the responsible parent) as well as child gender and child age (in 3-month intervals). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05 and * p<0.1.

Source : Socio-Economic Panel (2000-2015).

Table 3: Access to Free Public Daycare and Childcare Arrangements for Younger Children

	Public Daycare Ages 2-5		Informal Childcare Ages 2-5		Exclusive Childcare at Home Ages 2-5	
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible for Free Daycare (# Years)	0.023***	0.055***	0.018*	0.015	-0.015**	-0.028**
	[0.007]	[0.017]	[0.009]	[0.009]	[0.006]	[0.010]
1st year of public daycare* Eligible		-0.075***		0.006		0.031**
		[0.018]		[0.012]		[0.011]
2nd year of public daycare* Eligible		-0.100***		0.009		0.039**
		[0.025]		[0.014]		[0.014]
School Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Parental Controls	Yes	Yes	Yes	Yes	Yes	Yes
Household Controls	Yes	Yes	Yes	Yes	Yes	Yes
Child Age (3-month intervals)	Yes	Yes	Yes	Yes	Yes	Yes
Interview Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Daycare Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,827	16,827	15,939	15,939	15,989	15,989
R Squared	0.299	0.272	0.066	0.066	0.182	0.184
Mean of Dependent Vairiable (in the pre-policy period 2000-2006)	0.803	0.803	0.404	0.404	0.112	0.112

Notes : The table reports how the adoption of free public childcare for younger children affects childcare arrangements. The dependent variables are binary indicators: in columns (1) and (2), it is equal to one if the child attends public daycare and zero otherwise; in columns (3) and (4), the dependent variable is equal to one if the parent uses informal childcare by relatives, neighbors and friends and zero otherwise. In columns (5) and (6), the dependent variable is equal to one if the child is exclusively cared for at home and zero otherwise. The key independent variable "Eligible for Free Daycare (# Years)" is equal to the number of years a child is eligible for free public childcare in its state of residence. A 5-year-old child may be eligible for one year, while a 2-year-old child may be eligible up to 4 years if it lives in one of the three states that implemented free childcare from ages 2 to 6. The variable is zero for children in non-adopting states and in treatment states prior to adoption. Eligibility depends on a child's state of residence, school year and age (see main text for details). All specifications include state, school year and interview month fixed effects. We also control for household characteristics (number of children, whether there is a child under age 1, whether the household is above the poverty line), parental characteristics (age, education and marital status of the responsible parent), child gender, child age (in 3-month intervals) and the predicted childcare year (which is calculated based on the child's birthdate and the cutoff rules of the state of residence). The specifications in even columns (2), (4) and (6) interact the treatment variable with the predicted childcare year. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05 and * p<0.1.

Source : Socio-Economic Panel (2000-2015).

Table 4: The Effect of Free Childcare on Female Labor Supply

	Labor Force Participation			Work Full-time			Actual Hours Worked		
	Ages 5-6	Ages 2-5		Ages 5-6	Ages 2-5		Ages 5-6	Ages 2-5	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Mother of Treated Child	-0.006	0.004	0.010	-0.001	-0.001	0.013	0.940	-0.039	-0.101
	[0.032]	[0.010]	[0.009]	[0.020]	[0.020]	[0.011]	[0.807]	[0.339]	[0.362]
1st year of public daycare* Treated			-0.010*			-0.011**			0.175
			[0.005]			[0.004]			[0.146]
2nd year of public daycare* Treated			-0.029***			0.004			0.032
			[0.008]			[0.009]			[0.205]
School Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Parental Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Child Age (3-month intervals)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interview Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Daycare Year Fixed Effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	3,931	17,090	17,090	2,313	9,023	9,023	2,275	8,805	8,805
R Squared	0.177	0.170	0.170	0.088	0.063	0.063	0.118	0.108	0.108
Mean of Dependent Variable (in the pre-policy period 2000-2006)	0.537	0.480	0.480	0.192	0.174	0.174	21.71	21.37	21.37

Notes : The table reports how the adoption of free public childcare affects maternal labor supply. The dependent variables in columns (1)-(3) is a binary indicator equal to one if the mother is in the labor force and zero otherwise; in columns (4)-(6), a binary indicator equal to one if the mother works more than 30 hours per week; and in columns (7)-(9), the dependent variable is actual working hours conditional on being employed. The sample in columns (1), (4) and (7) consists of children eligible for the last childcare year (when they are 5-6 year-olds). The key independent variable "Mother of Treated Child" is here equal to one if the child is eligible for a free last year of public childcare and zero otherwise. Eligibility depends on a child's state of residence, year and age (see main text for details). The sample in columns (2)-(3), (5)-(6) and (8)-(9) consists of all preschool children aged between 2 and 5. The key independent variable "Mother of Treated Child" is equal to the number of years the child is eligible for free daycare years (ranging from one to up to four years). The treatment variable in all samples is equal to zero in the non-adopting states and in treatment states prior to adoption. All specifications include state, school year and interview month fixed effects; we also control for state unemployment and GDP per capita (linear and squared terms) to adjust for local labor market shocks. All specifications control for parental characteristics (age, education and marital status of the responsible parent), household controls (household size, number of children, whether there is a child under age 1, whether the household is above the poverty line) and child controls (gender, age measured in 3-month intervals and the child's predicted childcare year). The specifications in columns (3), (6) and (9) further interact the treatment variable with the predicted childcare year. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05 and * p<0.1.

Source : Socio-Economic Panel (2000-2015).

Table 5a: Eligibility for Free Childcare and Child Outcomes

		2-3 Year-old Children	
	All Children	Boys	Girls
	(1)	(2)	(3)
Vineland Adaptive Behavior Scale	-0.031	-0.061	0.011
	[0.035]	[0.048]	[0.036]
Motor Skills	0.001	-0.028	0.042
	[0.028]	[0.047]	[0.028]
Skills in Daily Activities	-0.065	-0.115**	0.012
	[0.041]	[0.047]	[0.067]
Language Skills	-0.007	-0.026	0.021
	[0.032]	[0.041]	[0.041]
Social Skills	-0.034	-0.034	-0.041
	[0.024]	[0.035]	[0.026]
Observations	3,372	1,775	1,597

Notes: The dependent variables are child outcomes (shown on the left) of 2-3 year-old children living in West Germany between 2005 and 2015. The data on non-cognitive skills come from the supplementary "mother-child" and the "your child between age 2 and 3" questionnaires, which ask additional questions of mothers with children born in 2003 or later. Mothers report whether a child is not able (=0), partly able (=1) or fully able (=2) to perform a certain skill. The adapted Vineland Maturity Scale consists of 20 items in total where each of its four subcategories (social skills, motor skills, daily activities, language skills) contains 5 questions. All scores are standardized to mean 0 and standard deviation of 1 in our sample. Larger scores mean that a child is better able to perform the specified skill. The table reports the coefficients on the number of years eligible for free childcare in treatment states; the variable is zero in non-adopting states and treatment states prior to adoption. The coefficient is the change in the reported skill in terms of a standard deviation. The first specification in column (1) shows estimates for the whole sample. Column (2) and (3) show the same regressions separately for boys and girls respectively. All specifications include as controls: child gender and age (measured in 3-month intervals), predicted daycare year of the child; the mother's age, marital status, foreign citizenship and education as well as household size, the number of children, whether there is an infant under 1 in the household and an indicator whether household income is above the poverty line. We also include state, school year and interview month fixed effects. All standard errors are clustered at the state level. * p<0.1, ** p<0.05 and *** p<0.01.
Source : Socio-Economic Panel (2005-2015).

Table 5b: Eligibility for Free Childcare and Child Outcomes

		5-6 Year-old Children	
	All Children	Girls	Boys
	(4)	(5)	(6)
Strengths and Difficulties Questionnaire	0.043	0.279**	-0.159
(SDQ Score)	[0.039]	[0.104]	[0.098]
Conduct Problems	-0.051	0.181*	-0.239**
	[0.071]	[0.095]	[0.093]
Emotional Problems	0.004	0.023	0.017
	[0.057]	[0.094]	[0.082]
Problems with Peers	0.071	0.311**	-0.089
	[0.045]	[0.099]	[0.144]
Attention Problems	0.043	0.168*	-0.128*
	[0.043]	[0.077]	[0.064]
Pro-social Behavior	0.120*	-0.013	0.241***
	[0.059]	[0.103]	[0.068]
Observations	1,833	893	940

Notes : The dependent variables are child outcomes (shown on the left) of 5-6 year-old children living in West Germany between 2008 and 2015. The data on non-cognitive skills come from the supplementary questionnaire answered by mothers which elicits a version of the Strengths and Difficulties Questionnaire (SDQ) suggested by Goodman (1997). Mothers answer 'not true', 'somewhat true' and 'certainly true' to 17 statements on socio-emotional behavior over five separate dimensions: Emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. The first four dimensions are summed to a Total Difficulties Score (SDQ Score). Each score is normalized to have mean zero and a standard deviation of one in our West German sample between 2008 and 2015. Larger scores mean that a child has more problems in the specific socio-emotional dimension. The table reports the coefficients whether a child is eligible for free childcare in treatment states; the variable is zero in non-adopting states and treatment states prior to adoption. The coefficient is the change in the reported socio-emotional dimension in terms of a standard deviation. The first specification in column (1) shows estimates for the whole sample. Column (2) and (3) show the same regressions separately for boys and girls respectively. All specifications include as controls: state, school year and interview month fixed effects; household characteristics (household size, number of children, whether there is a child under the age of one in the household and an indicator whether household income is above the poverty line); parental characteristics (mother's age, marital status, foreign citizenship and education) and child characteristics (child gender and age measured in 3-month intervals). All standard errors are clustered at the state level. * p<0.1, ** p<0.05 and *** p<0.01.

Source : Socio-Economic Panel (2008-2015).

Table 6: Heterogeneity of Effects for Population Subgroups

	Public Daycare		Informal Childcare		Childcare at Home		Female LFP		Child Skills	
	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treated Child	-0.003	0.020**	0.010	0.012	0.004	-0.012*	0.006	0.010	0.047	-0.010
	[0.007]	[0.007]	[0.019]	[0.009]	[0.007]	[0.006]	[0.037]	[0.011]	[0.043]	[0.023]
Treated Child*Low-Income HH	-0.005	0.017**	-0.006	0.033**	-0.002	-0.022***	-0.100*	-0.039***	-0.015	-0.037
	[0.018]	[0.006]	[0.049]	[0.011]	[0.024]	[0.003]	[0.054]	[0.011]	[0.129]	[0.027]
Treated Child	-0.001	0.023***	0.017	0.016*	0.002	-0.015**	0.003	0.009	0.059	-0.012
	[0.006]	[0.007]	[0.022]	[0.009]	[0.007]	[0.006]	[0.028]	[0.011]	[0.043]	[0.024]
Treated Child*Single Mother	-0.033*	0.005	-0.064	0.018	0.022	-0.011**	-0.091	-0.026	-0.076	-0.005
	[0.017]	[0.009]	[0.046]	[0.019]	[0.014]	[0.005]	[0.064]	[0.022]	[0.131]	[0.039]
Treated Child	-0.002	0.023***	0.025	0.019	0.004	-0.015**	0.015	0.015	0.079	-0.016
	[0.007]	[0.007]	[0.024]	[0.011]	[0.008]	[0.007]	[0.032]	[0.011]	[0.044]	[0.030]
Treated Child*Low-skilled HH	-0.007	-0.000	-0.086*	-0.004	-0.004	-0.002	-0.122***	-0.042	-0.253	-0.040
	[0.020]	[0.005]	[0.041]	[0.021]	[0.017]	[0.006]	[0.037]	[0.025]	[0.150]	[0.051]

Notes : The dependent variables in columns (1) to (6) are childcare choices of households with preschool children living in West Germany between 2000 and 2015; the dependent variable in columns (7)-(8) is female labor force participation, the SDQ total score in column (9) and the Vineland Adaptive Behavior total score in column (10). The sample in odd columns is restricted to children eligible for the last daycare year, while even columns report results for children eligible for earlier daycare years. The treatment variable is an interaction term between an indicator for the population subgroup specified on the left (low-income households, single parents and low-educated mothers) and whether the child is eligible for a free last daycare year (in odd columns) or the cumulative number of years eligible for free daycare (in even columns). Low-income households have an income of less than 60% of the median income in West Germany (which defines the official poverty line). Household income is adjusted for household size using OECD equivalence scales. Single parents live in households with no other adult. Low-educated parents have not completed a high school degree or vocational training. All specifications include as controls: age and sex of the child and for the predicted daycare year (in even columns only); age, marital status, foreign citizenship and education of the parent. We further control for household size, number of children and number of newborn children in the household. To control for aggregate economic conditions, we further include state unemployment and GDP per capita (linear and squared terms), state and school year fixed effects as well as interview month fixed effects. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05 and * p<0.1.

Source : Socio-Economic Panel (2000-2015).

Table 7: Placebo Tests and Alternative Specifications

	Public Daycare		Informal Childcare		Childcare at Home		Female LFP	
	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Placebo Reform (t-2)	-0.013	-0.007	-0.016	-0.002	0.009	0.004	-0.041	0.008
	[0.012]	[0.004]	[0.020]	[0.010]	[0.010]	[0.006]	[0.026]	[0.006]
Placebo Reform (t-4)	-0.005	-0.016*	-0.057	-0.002	0.007	0.010	-0.008	0.015
	[0.013]	[0.007]	[0.035]	[0.009]	[0.011]	[0.009]	[0.022]	[0.011]
Placebo Reform (t-6)	0.010	-0.010	-0.010	-0.008	0.000	0.011	0.034	0.018*
	[0.013]	[0.008]	[0.040]	[0.012]	[0.014]	[0.010]	[0.024]	[0.009]
Control for Daycare Supply	0.003	0.024***	0.001	0.015	0.001	-0.014**	-0.002	0.012
	[0.007]	[0.006]	[0.018]	[0.013]	[0.008]	[0.006]	[0.042]	[0.011]
Allow for Year*Daycare Year FE		0.016**		0.018*		-0.013*		0.004
		[0.007]		[0.009]		[0.007]		[0.010]
Allow for State*Daycare Year FE		0.012		0.019*		-0.01		0.001
		[0.007]		[0.009]		[0.007]		[0.010]

Notes : The table reports informal validity tests for the parallel trend assumption of the difference-in-differences estimates reported in the main tables. The dependent variables are the three childcare choices and female labor supply decision shown in the top row. In the top panel, we show estimates from placebo reforms. Each coefficient and standard error (in square brackets) come from separate regressions where the independent variables are whether a child is eligible for a free last daycare year (odd columns) and the cumulative years a child is eligible for free daycare (even columns) two years (row (1)), four years (row (2)) or six years (row (3)) prior to the actual reform. The sample is restricted to families with 5-6 year-old in odd columns (last daycare year) and 2-5 year-old children in even columns (earlier daycare years) children in West Germany. In the bottom row, we add in the first specification the supply of daycare slots (for 3-6 year-old and 0-3 year-old children per 100 children and district) to the baseline. The second and third specifications in the bottom row add school year x predicted daycare fixed effects and state x predicted daycare year fixed effects to allow for differential time or state trends in childcare choices or female labor supply. All specifications include state, school year and interview month fixed effects, the unemployment rate and GDP per capita (linear and squared terms). The individual and household controls are the same as in tables 2 and 3. See notes to tables 2 and 3 for details. Standard errors are clustered at the state level. *** p<0.01. ** p<0.05 and * p<0.1.
Source : Socio-Economic Panel (2000-2015).

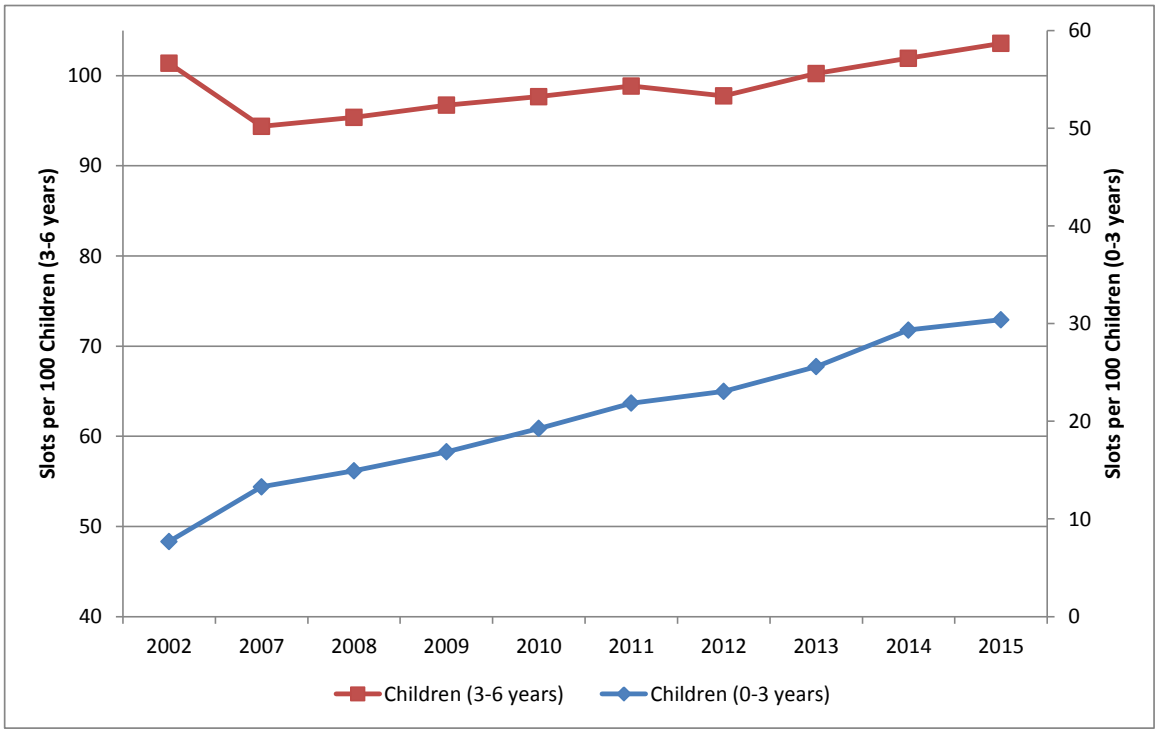
Table 8: Specification Checks

	Public Daycare		Informal Childcare		Childcare at Home		Female LFP	
	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
No State-Specific Trend	-0.004	0.023***	0.010	0.018*	0.003	-0.015**	-0.006	0.004
	[0.006]	[0.007]	[0.021]	[0.009]	[0.007]	[0.006]	[0.032]	[0.010]
Linear State-Specific Trend	-0.006	0.048***	-0.006	-0.009	0.009	-0.023**	0.001	0.006
	[0.011]	[0.013]	[0.028]	[0.009]	[0.008]	[0.008]	[0.039]	[0.016]
Quadratic State-Specific Trend	-0.006	0.048***	-0.006	-0.009	0.009	-0.023**	0.001	0.006
	[0.011]	[0.013]	[0.028]	[0.009]	[0.008]	[0.008]	[0.039]	[0.016]
Cubic State-Specific Trend	-0.006	0.048***	-0.006	-0.009	0.009	-0.023**	0.001	0.006
	[0.011]	[0.013]	[0.028]	[0.009]	[0.008]	[0.008]	[0.039]	[0.016]
Treatment-Specific Trend	-0.004	0.023***	0.010	0.018*	0.003	-0.015**	-0.006	0.004
	[0.006]	[0.007]	[0.021]	[0.009]	[0.007]	[0.006]	[0.032]	[0.010]

Notes : The table reports several specification checks for the dependent variables shown in the top row. The sample is restricted to 5-6 year-old children in odd columns and to 2-5 year-old children in even columns. The coefficient is shown for an indicator whether the child is eligible for a free last childcare year (odd columns) and the cumulative years a child is eligible for free daycare (even columns). Each coefficient and standard error (in square brackets) come from a separate regression which includes the same controls as in table 2 (for odd columns) and table 3 (in even columns). Rows (1)-(4) go from no state-specific trend to a cubic state-specific trend. Row (5) includes a separate state trend for the pre- and post-reform period. All specifications also include state, school year and interview month fixed effects, unemployment rate and GDP per capita (linear and squared terms). The individual and household controls are the same as in tables 2 and 3 respectively. See notes to tables 2 and 3 for details. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05 and * p<0.1.

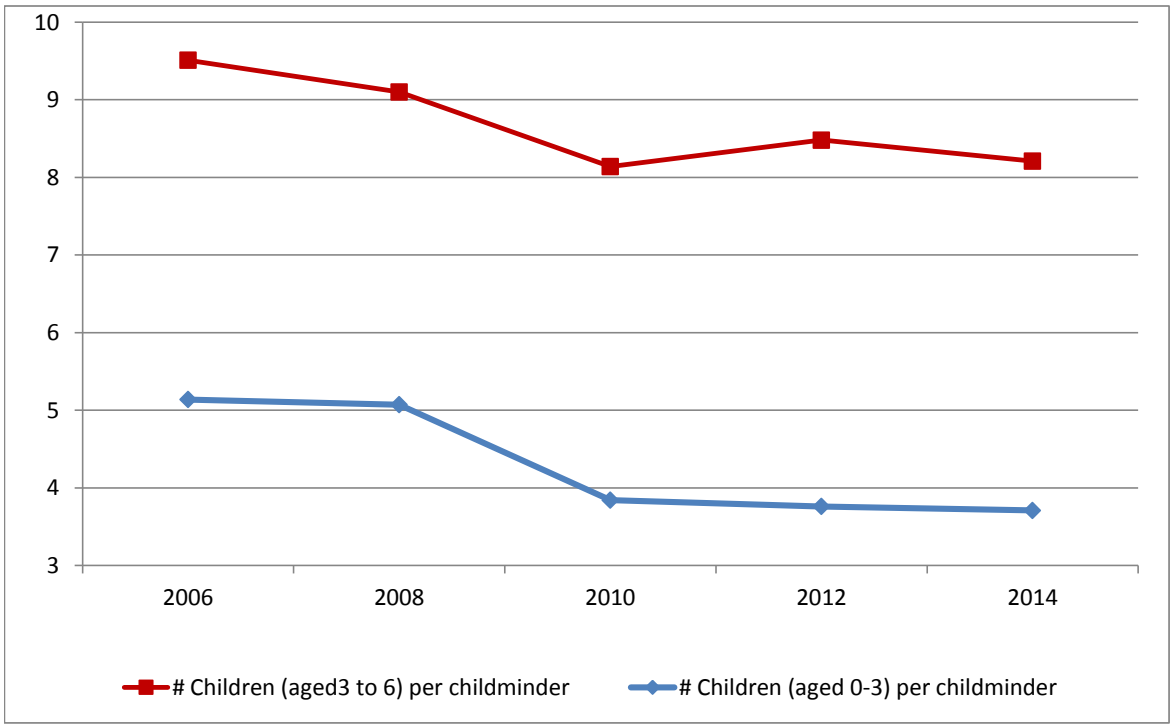
Source : Socio-Economic Panel (2000-2015).

Figure 1: Provision of Public Daycare Slots



Sources : Federal Statistical Office, Child and Youth Welfare Service Statistics

Figure 2: Evolution of Proxy for Childcare Quality



Source : Ländermonitor

Figure 3: Eligibility for Free Childcare

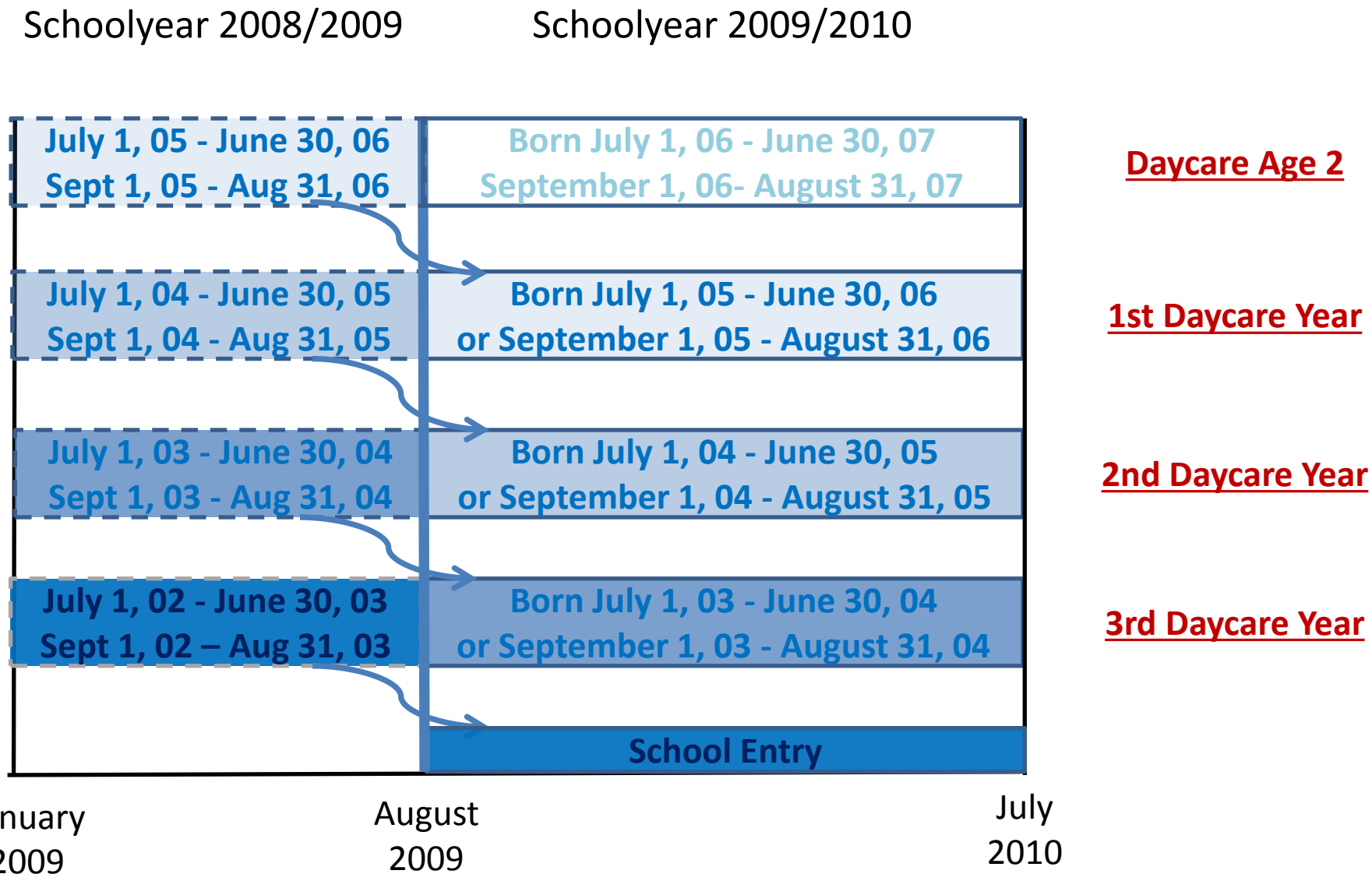
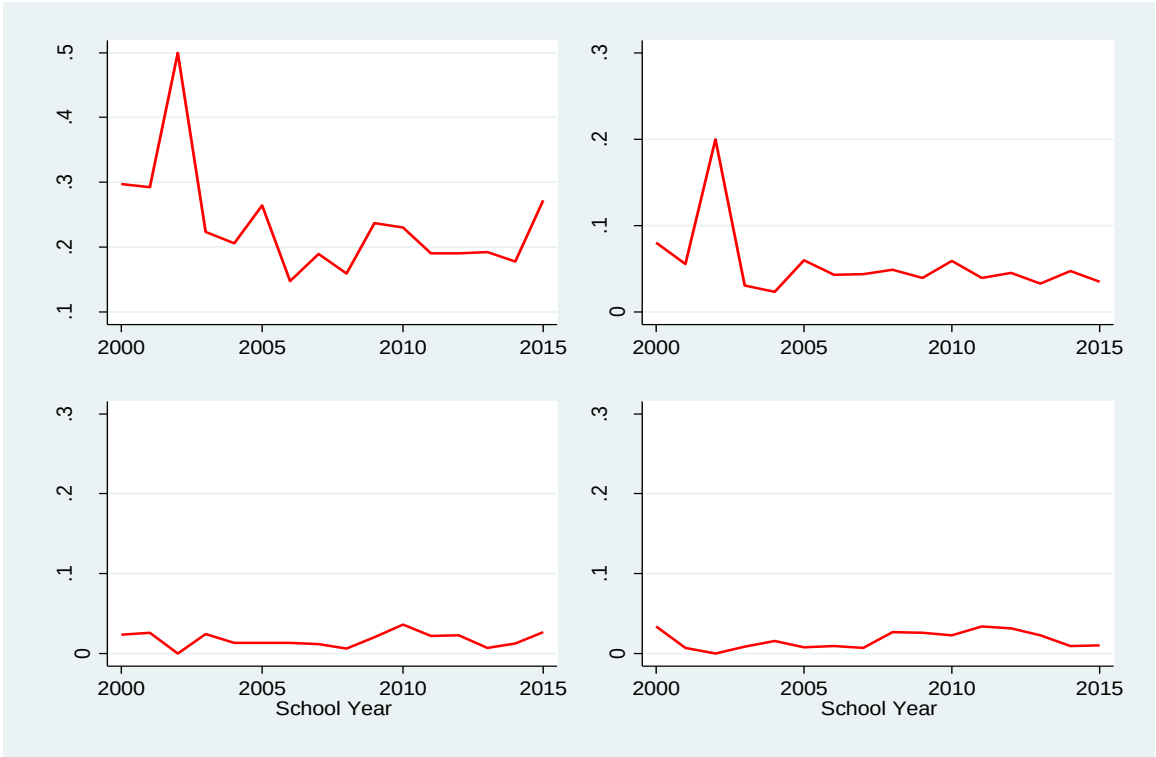


Figure 4a: Evolution of Daycare Attendance

Figure 4b: Evolution of Exclusive Care at Home



Source : Authors' calculations based on Socio-Ecnomic Panel (2000-2015).

Figure 5a: Pre-Policy Trends in Daycare Attendance

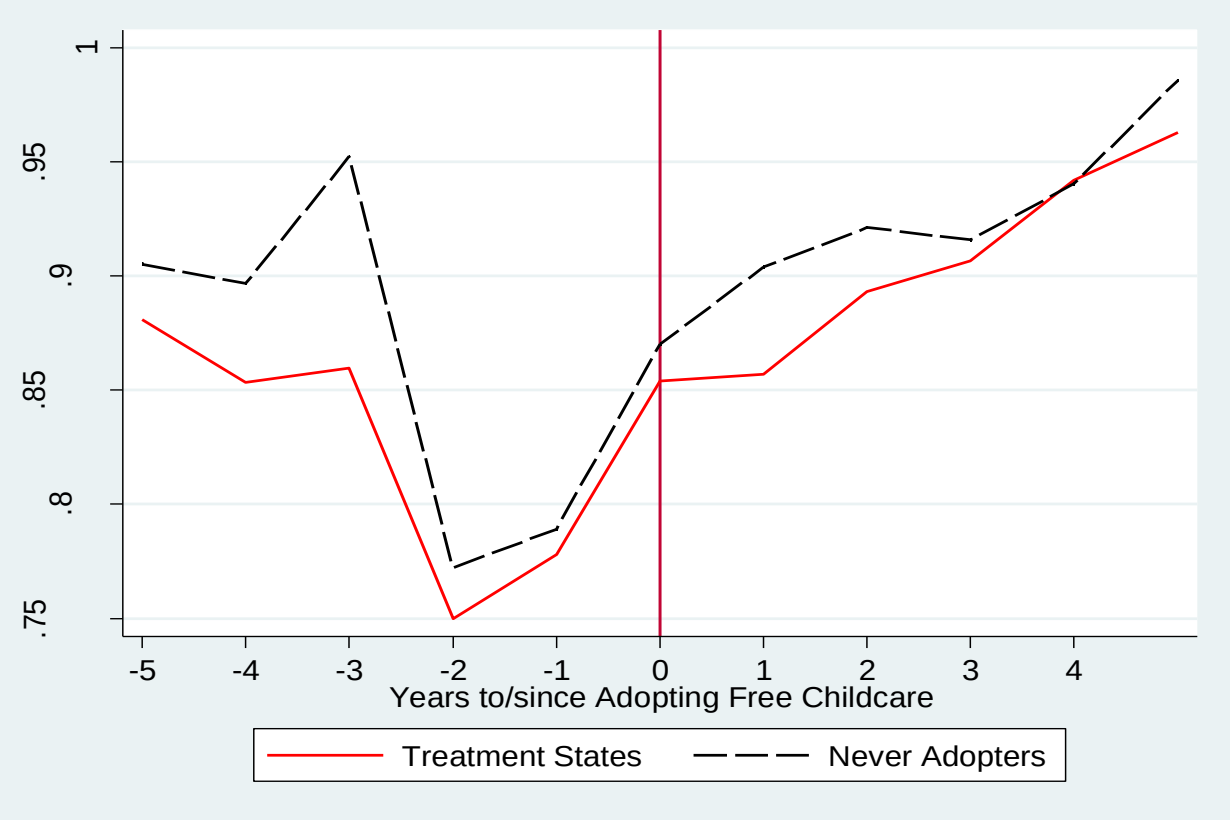
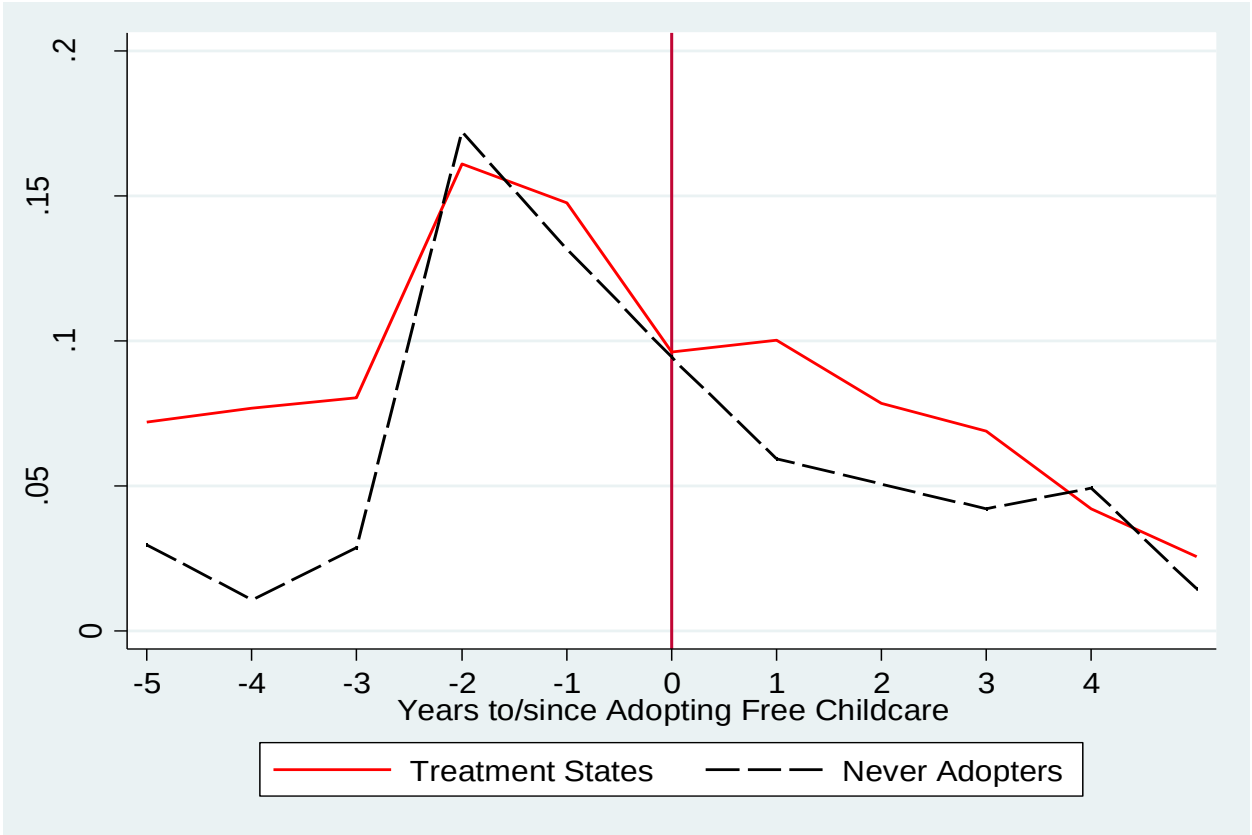


Figure 5b: Pre-Policy Trends in Exclusive Care at Home



Source : Authors' calculations based on Socio-Ecnomic Panel (2000-2015).

Figure 5c: Pre-Policy Trends in Informal Daycare Use

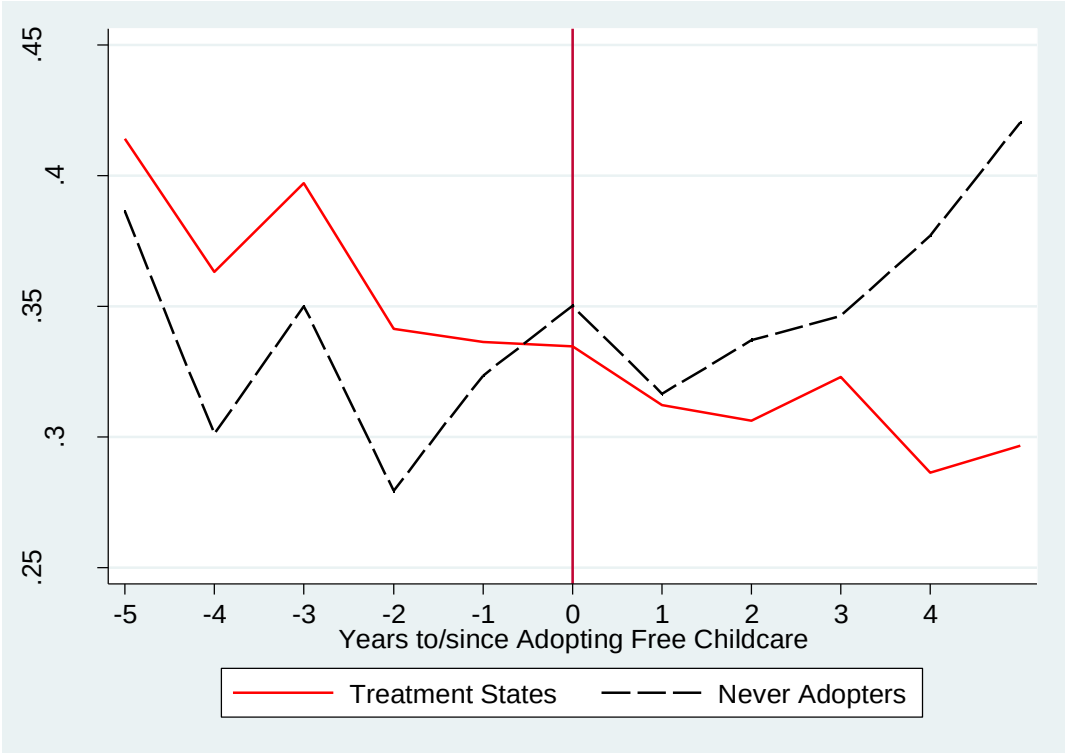
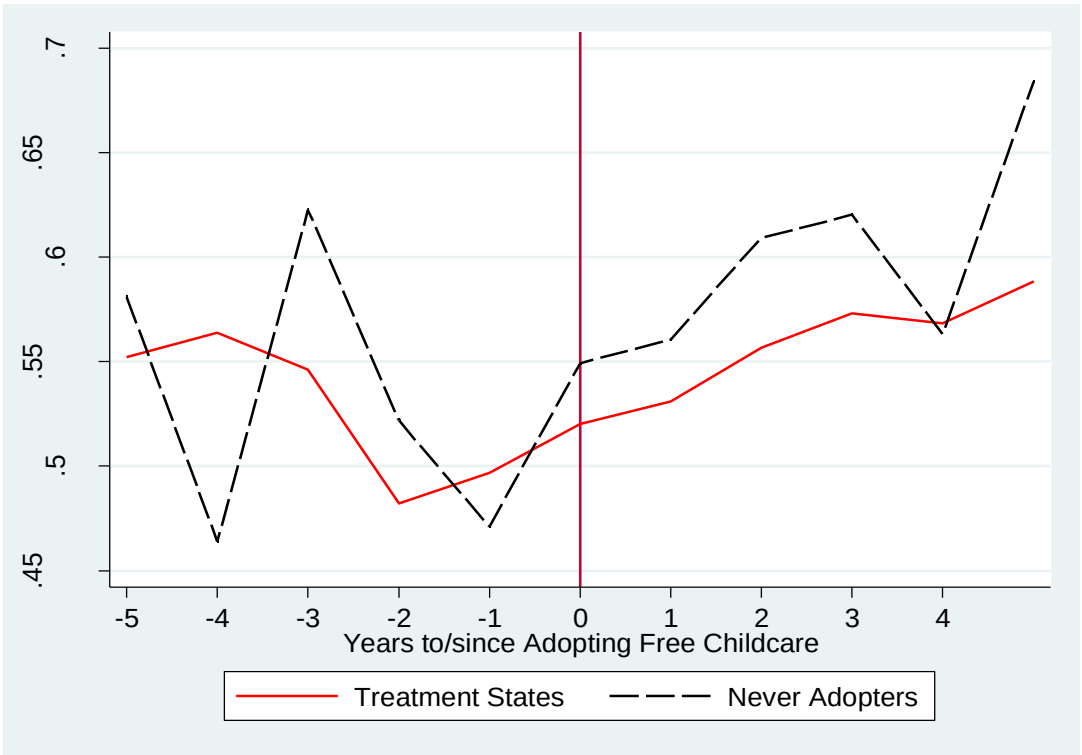


Figure 5b: Pre-Policy Trends in Female Labor Force Participation



Source : Authors' calculations based on Socio-Ecnomic Panel (2000-2015).

Table A1: Determinants of Policy Adoption

	Adoption of Any Free Childcare Policy (9 out of 11 states)			Adopt Comprehensive Reform (3 out of 11 states)		
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment Rate (%)	-0.102	-0.148**	-0.169**	-0.181***	-0.165***	-0.217***
	[0.064]	[0.065]	[0.067]	[0.061]	[0.061]	[0.057]
GDP per capita (Euros)	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000*
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
State Population (in 100,000)	-0.138***	-0.187***	-0.194***	-0.203***	-0.223***	-0.198***
	[0.043]	[0.045]	[0.046]	[0.045]	[0.046]	[0.043]
Medium-Skilled Employees (%)	0.138	-0.048	-0.086	0.256***	0.152	0.123
	[0.088]	[0.098]	[0.105]	[0.0874]	[0.097]	[0.097]
High-Skilled Employees (%)	0.179**	0.043	0.021	0.323***	0.165*	0.116
	[0.080]	[0.088]	[0.090]	[0.080]	[0.089]	[0.085]
Women in Workforce (%)	0.079	0.055	0.044	0.074	0.113	0.029
	[0.089]	[0.088]	[0.092]	[0.085]	[0.085]	[0.083]
Slots for Children aged 3-6 (per 100 children)		0.014**	0.015**		0.022***	0.018***
		[0.006]	[0.007]		[0.007]	[0.007]
Slots for Children under 3 (per 100 children)		0.045***	0.052***		0.021	0.018
		[0.016]	[0.018]		[0.017]	[0.017]
Conservative Vote Share in State Elections (%)			0.001			0.012*
			[0.008]			[0.007]
Left-Wing Vote Share in State Elections (%)			0.002			0.027***
			[0.010]			[0.009]
Time Period	2000-2014	2000-2014	2000-2014	2000-2014	2000-2014	2000-2014
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130	130	122	120	120	112
R Squared	0.691	0.726	0.739	0.711	0.746	0.794

Notes : The dependent variable in columns (1)-(3) is an indicator equal to one if a state has adopted any free childcare policy in year t and zero otherwise; in columns (4)-(6), the dependent variable is equal to one if a state has adopted a comprehensive reform where preschool children are eligible for multiple years of free daycare. The sample consists of all West German states including Berlin over the period 2000-2014. All independent variables are lagged two years. Vote shares are taken from state election results and assigned the value of the last state election in non-election years. In addition to the variables shown in the table, the specifications also include state and year fixed effects. *** p<0.01, ** p<0.05 and * p<0.1.

Sources : Aggregate Statistics from the Federal Statistical Office, Social Security Data and German Youth Office

Table A2: Summary Statistics

	Pre-Policy Period (2000-2006)		Post-Policy Period (2007-2015)	
	Mean	Std. Dev.	Mean	Std. Dev.
Childcare Attendance	0.828	0.378	0.886	0.318
Full-time Attendance	0.205	0.404	0.034	0.182
Informal Childcare	0.397	0.489	0.325	0.468
Exclusive Care at Home	0.098	0.297	0.077	0.266
Maternal Employment	0.482	0.500	0.555	0.497
Full-time Work	0.178	0.382	0.182	0.386
Actual Hours of Work	43.09	11.10	42.79	12.45
Child is a Girl	0.491	0.500	0.482	0.500
Age of Child	4.72	1.05	4.51	1.14
Household Size	4.13	1.09	4.31	1.19
Number of Children	2.13	0.890	2.34	1.06
Infants under age 1 in Household	0.024	0.154	0.052	0.221
Age of Mother	34.40	5.16	35.53	5.67
Mother Low-Skilled	0.196	0.397	0.179	0.383
Mother Medium-skilled	0.644	0.479	0.560	0.496
Mother High-skilled	0.144	0.351	0.227	0.419
Single Mother	0.066	0.248	0.110	0.313
Mother Married	0.883	0.321	0.840	0.366
Mother Divorced/Widowed	0.051	0.220	0.050	0.217
Foreign Mother	0.166	0.372	0.159	0.365
Unemployment Rate	8.345	2.417	6.408	2.285
GDP per capita (Euros)	28758	4252	35697	5074
Observations	6,621		17,064	

Notes : The table reports summary statistics of our sample of preschool children (2-6 year olds) and their parents in West Germany over the period from 2000 to 2015. The first two columns report summary statistics in the pre-policy period; the last two columns do the same for the 2007-2015 period. Childcare arrangements are binary indicators equal to one if the family uses a certain childcare arrangement and zero otherwise. Low-skilled parents are those without a high school or vocational degree; medium-skilled parents have a high school or vocational degree and high-skilled parents a tertiary degree from university or technical college.

Source : Socio-Economic Panel (2000-2015).

Table A3: Are Maternal Assessments of Child Behavior Reliable?

	Vineland Adaptive Behavior Scale			Strengths and Difficulties Questionnaire		
	(1)	(2)	(3)	(4)	(5)	(6)
Professional Childcare	0.134***			-0.138*		
(relative to Informal Care)	[0.031]			[0.065]		
Mainly Professional Care		0.136***			-0.132**	
(more than Informal Care)		[0.020]			[0.051]	
Informal Childcare			0.048**			-0.004
			[0.019]			[0.051]
Professional Childcare			0.175***			-0.015
			[0.027]			[0.054]
Child is a Girl	0.216***	0.220***	0.198***	-0.303***	-0.310***	-0.305***
	[0.023]	[0.023]	[0.021]	[0.038]	[0.038]	[0.049]
Mother's Age	-0.007**	-0.008**	-0.007***	-0.010**	-0.010**	-0.013***
	[0.003]	[0.003]	[0.002]	[0.004]	[0.004]	[0.004]
Mother Medium-skilled	0.085	0.079*	0.084*	-0.181**	-0.183**	-0.215**
	[0.048]	[0.043]	[0.042]	[0.064]	[0.069]	[0.078]
Mother High-skilled	0.082	0.084	0.079*	-0.342***	-0.359***	-0.375***
	[0.048]	[0.050]	[0.042]	[0.086]	[0.091]	[0.087]
Mother in School	0.118*	0.114	0.109*	-0.363**	-0.371**	-0.397**
	[0.062]	[0.065]	[0.055]	[0.122]	[0.125]	[0.153]
Mother Married	0.048	0.048	0.015	-0.070	-0.044	-0.081
	[0.079]	[0.081]	[0.079]	[0.097]	[0.103]	[0.097]
Mother Separate/Widowed	0.110**	0.103*	0.116**	0.068	0.093	0.038
	[0.048]	[0.051]	[0.039]	[0.176]	[0.179]	[0.187]
Mother Foreign-born	-0.115**	-0.114**	-0.099**	0.062	0.067	-0.008
	[0.049]	[0.050]	[0.041]	[0.069]	[0.071]	[0.066]
Household Size	-0.003	-0.005	-0.020	0.073	0.071	0.071
	[0.044]	[0.051]	[0.042]	[0.077]	[0.073]	[0.074]
Number of Children in HH	0.022	0.026	0.042	-0.133	-0.145*	-0.141
	[0.042]	[0.048]	[0.042]	[0.081]	[0.078]	[0.083]
Newborn Child in Household	-0.059*	-0.065*	-0.074*	-0.128	-0.113	-0.065
	[0.031]	[0.035]	[0.035]	[0.099]	[0.099]	[0.098]
Non-poor Household	-0.005	-0.002	0.007	-0.160***	-0.151***	-0.141***
	[0.035]	[0.034]	[0.030]	[0.019]	[0.020]	[0.023]

Notes : The sample in columns (1)-(3) are 2-3 year-old children whose mothers answered the supplementary questionnaire between 2005 and 2015 (N=3372); the sample in columns (4)-(6) are 5-6 year-old children whose mothers answered the supplementary questionnaire between 2008 and 2015 (N=1833). In columns (1)-(3), the dependent variable is a standardized score on the Vineland Adaptive Behavior Scale. See notes for table 5a for a more detailed description of the dependent variable and controls included. In columns (4)-(6), the dependent variable is the standardized score of the Strengths and Difficulties Questionnaire (SDQ). The main independent vatriables are: in columns (1) and (4), an indicator variable equal to one if a child attends public daycare and zero if the child attends informal care; in columns (2) and (5), an indicator variable equal to one if the child spends more hours in public daycare and zero if it spends more time in informal care; and in columns (3) and (6), indicator variables equal to one if the child attends informal care (public daycare) and zero if the child is cared for at home or in public daycare (informal daycare). The control variables are the same as in tables 5a and 5b. All standard errors are clustered at the state level. * p<0.1, ** p<0.05 and *** p<0.01.
Source : Socio-Economic Panel (2005-2015) for columns (1)-(3); Socio-Economic Panel (2008-2015) for columns (4)-(6).

Table A4: Alternative Specifications for Eligibility to Free Daycare

	Public Daycare			Informal Childcare			Exclusive Care at Home		
	All Ages DiD (1)	Ages 4-5 DiD (2)	Ages 4-6 DDD (3)	All Ages DiD (4)	Ages 4-5 DiD (5)	Ages 4-6 DDD (6)	All Ages DiD (7)	Ages 4-5 DiD (8)	Ages 4-6 DDD (9)
Eligible for Free Daycare	0.064***			0.007			-0.031**		
	[0.018]			[0.009]			[0.011]		
1st year of Public Daycare*Eligible	-0.074***			0.006			0.031**		
	[0.018]			[0.011]			[0.011]		
2nd year of Public Daycare*Eligible	-0.095***			0.006			0.038**		
	[0.025]			[0.013]			[0.014]		
3rd year of Public Daycare*Eligible	-0.091**			0.033			0.034*		
	[0.030]			[0.019]			[0.017]		
Eligible for Free Last Year of Daycare		0.003	0.004		0.027	-0.029		-0.001	-0.001
		[0.010]	[0.008]		[0.027]	[0.022]		[0.012]	[0.006]
3rd year of Public Daycare*Eligible			0.004			0.055**			-0.008
			[0.009]			[0.019]			[0.010]
School Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Parental Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Child Age Fixed Effects (3 months)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interview Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Daycare Year Fixed Effects	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Observations	20,722	2,277	5,521	19,683	2,186	5,254	19,692	2,163	5,235
R Squared	0.300	0.045	0.026	0.064	0.107	0.078	0.177	0.048	0.025
Mean Dependent Variable (in the pre-policy period, 2000-2006)	0.828	0.968	0.968	0.397	0.380	0.372	0.828	0.968	0.968

Notes : The dependent variables are childcare choices shown in the top row. The first specification (in columns (1), (4) and (7)) reruns equation (2) for the whole sample of preschool children aged between (including children in the last daycare year). The treatment variables are the total number of years a child is eligible for free childcare (ranging from 0 to 4) and their interactions with the predicted daycare year of the child. The second specification (in columns (2), (5) and (8)) restricts the sample to 4-5 year-old children who would attend the second year of public daycare and drops children in the three states that adopted more comprehensive reforms (Berlin, Hamburg and *Rhineland-Palatinate*). The treatment variable is whether a child is eligible for a free last daycare year in a given year and state and zero otherwise. The third specification (in columns (3), (6) and (9)) restricts the sample to children aged between 4 and 6. The treatment variables are whether a child is eligible for a free last daycare year (the main effect) and their interaction with an indicator whether the child is predicted to attend the last daycare year. The indicator is zero if the child is predicted to attend the second daycare year instead. As before, children in states that adopted more comprehensive reforms are dropped. Control variables are the same as in the main tables: child age and gender, parental and household characteristics (see table 2 for details), state and school year fixed effects, interview month fixed effects and controls for local economic conditions (linear and squared terms of the state unemployment rate and GDP per capita). All specifications except the second specification (in columns (2), (5) and (8)) also control for the predicted daycare year. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05 and * p<0.1.

Source : Socio-Economic Panel (2000-2015).

Table A5: Free Childcare and Effects for Boys and Girls

	Public Daycare		Informal Childcare		Childcare at Home		Female LFP	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ages 2 and 3								
Eligible for Free Daycare (# Years)	0.006	0.001	0.025	0.014	-0.020	-0.001	0.020	0.012
	[0.014]	[0.011]	[0.018]	[0.013]	[0.015]	[0.008]	[0.017]	[0.010]
Observations	4,508	4,227	4,284	4,009	4,294	4,013	4,604	4,316
R Squared	0.267	0.285	0.069	0.086	0.171	0.189	0.160	0.188
Ages 5 and 6								
Eligible for Free Daycare	0.002	0.001	-0.001	0.022**	0.005	-0.007	-0.051***	-0.004
	[0.008]	[0.005]	[0.022]	[0.010]	[0.007]	[0.006]	[0.009]	[0.028]
Observations	3,938	3,718	3,755	3,530	3,749	3,507	3,973	3,748
R Squared	0.033	0.046	0.070	0.075	0.036	0.051	0.181	0.182
School Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Parental Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Child Age (3-month intervals)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interview Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Daycare Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes : The table reports how access to free public childcare affects childcare arrangements and maternal labor supply for boys (odd columns) and girls (even columns). The dependent variables are binary indicators for public daycare attendance (in columns (1)-(2)), informal childcare (in columns (3)-(4)), exclusive care at home (in columns (5)-(6)) and maternal labor force participation (in columns (7)-(8)). The sample in the top panel is restricted to 2-3 year-old children, while the sample in the bottom panel is restricted to 5-6 year-old children. The key independent variable "Eligible for Free Daycare" is equal to the number of years a child is potentially eligible for free public childcare; the variable is zero for non-adopting states and in treatment states prior to adoption. The number of years eligible depends on a child's state of residence, year and age (see main text for details). The interaction effects (like 1st year of public daycare*Treated) is an interaction effect between the cumulative years of eligibility and the predicted childcare year. All specifications include state, school year and interview month fixed effects in addition to household controls (household size, number of children, whether there is a child under age 1, whether household income is above the poverty line), parental characteristics (age, education and marital status of the responsible parent) and controls for child gender, child age (in 3-month intervals) and the predicted childcare year of the child. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05 and * p<0.1.

Source : Socio-Economic Panel (2000-2015).

Table A6: Effect of Free Public Daycare on Siblings in Treated Families

	Public Daycare	Informal Care	Childcare at Home
	All Ages	All Ages	All Ages
	(1)	(2)	(3)
Spillover on Sibling of Treated Child	0.096**	0.015	-0.052*
	[0.031]	[0.073]	[0.025]
1st year of public daycare* Spillover	-0.102**	0.030	0.056*
	[0.045]	[0.066]	[0.027]
2nd year of public daycare* Spillover	-0.104***	0.002	0.058**
	[0.031]	[0.066]	[0.021]
3rd year of public daycare* Spillover	-0.165**	-0.110*	0.122
	[0.061]	[0.053]	[0.068]
School Year Fixed Effects	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes
Parental Controls	Yes	Yes	Yes
Household Controls	Yes	Yes	Yes
Child Age (3-month intervals)	Yes	Yes	Yes
Interview Month Fixed Effects	Yes	Yes	Yes
Daycare Year Fixed Effects	Yes	Yes	Yes
Observations	12,623	11,597	11,627
R Squared	0.343	0.064	0.196

Notes : The table reports how the adoption of free public childcare affects childcare choices of preschool children aged between 2 and 6 shown in the top row (public daycare, informal care and home care) when the sibling of the child is eligible for free daycare (but not the child itself). The key independent variable "Spillover on Sibling of Treated Child" is here equal to one if the child has a sibling who is eligible for free public childcare (for one up to four years). Eligibility depends on the child's state of residence, year and age (see main text for details). The treatment variable in all samples is equal to zero in the non-adopting states and in treatment states prior to adoption. All specifications include state, school year and interview month fixed effects; we also control for state unemployment and GDP per capita (linear and squared terms) to adjust for local labor market shocks. All specifications also control for parental characteristics (age, education and marital status of the responsible parent), household controls (household size, number of children, whether there is a child under age 1, whether household income is above the poverty line) and child controls (gender, age measured in 3-month intervals and the child's predicted childcare year). The specifications in columns (3), (6) and (9) further interact the treatment variable with the predicted childcare year of the child. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05 and * p<0.1.

Source : Socio-Economic Panel (2000-2015).

Table A7: Alternative Estimators for Variance-Covariance Matrix

	Public Daycare		Informal Childcare		Childcare at Home		Female LFP	
	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5	Ages 5-6	Ages 2-5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Baseline Estimates (from Table 2-4)	-0.004	0.023***	0.010	0.018*	0.003	-0.015**	-0.006	0.004
	[0.006]	[0.007]	[0.021]	[0.009]	[0.007]	[0.006]	[0.032]	[0.010]
	3,895	16,827	3,744	15,939	3,703	15,989	3,931	17,090
	0.037	0.299	0.078	0.066	0.040	0.182	0.177	0.170
State and Year Cluster	-0.004	0.023***	0.010	0.018*	0.003	-0.015***	-0.006	0.004
	[0.010]	[0.007]	[0.023]	[0.010]	[0.008]	[0.005]	[0.025]	[0.007]
	3,895	16,827	3,744	15,939	3,703	15,989	3,931	17,090
	0.037	0.299	0.078	0.066	0.040	0.182	0.177	0.170
State and Pre-/Post Policy Cluster	-0.004	0.023*	0.010	0.018**	0.003	-0.015**	-0.006	0.004
	[0.006]	[0.011]	[0.018]	[0.008]	[0.007]	[0.007]	[0.026]	[0.010]
	3,895	16,827	3,744	15,939	3,703	15,989	3,931	17,090
	0.037	0.299	0.078	0.066	0.040	0.182	0.177	0.170
Wild Bootstrap	-0.001	0.036	0.003	0.004	-0.0002	-0.023	-0.007	-0.013
	[-0.011; 0.009]	[0.016; 0.059]	[-0.032; 0.042]	[-0.024; 0.037]	[-0.013; 0.011]	[-0.044; -0.002]	[-0.057; 0.042]	[-0.038; 0.013]
	0.86	0.03	0.99	0.83	0.98	0.07	0.89	0.45

Notes : The table reports several alternative estimators to account for dependent standard errors: cluster by state and year and cluster by state and the period before and after the policy change. In addition, we report estimates, the 95% confidence interval and the p-value from a wild bootstrap with 300 repetitions. The dependent variables are childcare and female labor supply choices (shown in the top row) of families with 5-6 year-old (odd columns) and 2-5 year-old children (even columns) in West Germany. The table shows the coefficients on the indicator whether a child is eligible for a free last daycare year (odd columns) and the cumulative number of years a child is eligible for free daycare (even columns). All specifications include as controls: age and sex of the child; age, marital status, foreign citizenship and education of the parent. We further control for household size, number of children, whether there is a child under 1 in the household and whether household income is above the poverty line. To control for aggregate economic conditions, we further include state unemployment and GDP per capita (linear and squared terms) as well as state, school year and interview month fixed effects. Even columns also control for the predicted daycare year. *** p<0.01, ** p<0.05 and * p<0.1.

Source : Socio-Economic Panel (2000-2015).