

# From Dawn till Dusk

## Implications of Full-Day Care for Children's Development

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### Abstract

This study investigates the consequences of expanding the supply of care centers operating on a full-day basis on children's skills just before entering primary school. Identification relies on a substantial expansion of the number of full-day slots triggered by several reforms of the German child care system. Using unique administrative data covering almost 100'000 children in one German state, we find negative effects on children's socio-emotional maturity. These effects are mainly driven by children from educationally disadvantaged families and ethnic minorities. Nevertheless, children from ethnic minorities do benefit in terms of school readiness.

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# 1 Introduction

Nowadays, more children than ever attend some kind of child care institution. Across all OECD countries, more than 80 % of all three to five years old are enrolled in a child care program.<sup>1</sup> In most developed countries, this share even exceeds 90 %. The intensity of child care, however, varies considerably across countries and rarely covers a full working day. Even in countries that exhibit full coverage - such as Germany, the Netherlands or the United Kingdom -, child care institutions mainly function on a half-day basis. The available child care institutions thus only partially facilitate the combination of market work and family life. To overcome this shortcoming, many OECD countries are currently debating to expand the opening hours of the existing child care institutions.<sup>2</sup> Yet, what are the consequences for children when attending a child care center on a full-day basis in contrast to attending it on a half-day basis? Answering this question is particularly relevant in light of the fact that attending child care on a full-day basis deprives children from spending valuable time, if not even any time, with their primary caregiver - who in most cases is the mother.

This paper investigates to which extent expanding the opening hours of child care centers affects children's development. In particular, we study the effects of a substantial expansion of the number of full-day slots in one West German state - Schleswig Holstein - over the last decade. This expansion was triggered by several reforms of the child care system, in particular in 1999 and 2005. These reforms occurred subsequently to a large expansion in child care centers in the late 1990s, which predominantly offered half-day slots. Thus, our study analyzes the impact of moving from offering child care on a half-day basis to offering child care on a full-day basis. Importantly, the expansion of full-day slots did not occur at an equal pace, but the speed of the expansion varied considerably across municipalities. Our identification strategy exploits these municipality-specific deviations from the overall trend in the timing of the expansion. In particular, we rely on within-municipality variation in the supply of full-day slots over time net of the general trend in expanding the supply of full-day slots and net of any variation in the socio-economic and demographic composition of the municipalities over time. In addition, we allow for possible adjustments in child care centers' structural quality when expanding the opening hours.

Our analysis uses two new and exceptionally rich data sources: First, we use administrative data from school entrance examinations in Schleswig-Holstein from 2004 to 2012. This data provide us with administrative records on children's development, in particular their overall school readiness, their motor skills and their socio-emotional maturity, for almost 100'000 children at

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<sup>1</sup>All information on enrollment rates and opening hours are taken from the OECD Family Database ([www.oecd.org/social/family/database](http://www.oecd.org/social/family/database), accessed on November 18, 2014).

<sup>2</sup>For instance, Germany mandated an expansion of the opening hours of child care centers in the context of their Child Care Expansion Law in 2005 (some states did so already earlier), the Netherlands did so in the context of their Child Care Act in 2005, the United Kingdom in 2006 and in British Columbia (Canada) in 2010.

school entrance. Second we possess of administrative information on child care centers which allow us to construct a series of structural quality indicators. The latter information may be particularly relevant if rapid expansions in the child care system come along with adjustments in quality.

Our empirical analysis leads to the following results: First, subsidized full-day care has negative effects on children's socio-emotional development: full-day separation from the primary caregiver - who is most likely the mother - entails problems for children's social maturity and emotional stability. On average, there are no effects on children's school readiness and motor skills. Second, subgroup analysis reveals that results are strongest for children from educationally disadvantaged backgrounds, ethnic minorities and single parent households. Nevertheless, subgroup analysis also reveals that children from immigrant families benefit in terms school readiness: the more full-day slots are available, the more likely are children from immigrant families to be assessed ready for school.

Our study relates to a growing literature which investigates the effects of providing universal access to child care centers on children's skill acquisition and thus the effects of the extensive margin (providing child care versus not providing child care). Most of these studies base their identification strategy on a rapid expansion of the child care system. Findings from these studies are mixed and range from negative effects (Baker *et al.*, 2008), to neutral effects (Cascio, 2009; Datta-Gupta and Simonsen, 2010) and to positive effects (Berlinski *et al.*, 2009; Dustmann *et al.*, 2013; Felfe and Lalive, 2014; Felfe *et al.*, 2012; Fitzpatrick, 2008; Gormley Jr. *et al.*, 2008; Noboa Hidalgo and Urzúa, 2012; Havnes and Mogstad, 2011; Magnuson *et al.*, 2007). The reasons underlying these heterogeneous effects may range from methodological differences to contextual differences such as who are the compliers (which children react to the expansion), what are the counterfactual care modes or what is the design of the child care system.

Studies investigating the intensive margin, and thus expansions of the opening hours of child care centers, are scarce.<sup>3</sup> There are some earlier studies providing correlations between full-day child care and child development (Cryan *et al.*, 1992; Gullo, 2000; Walson and West, 2004).<sup>4</sup> Only recently there are a few studies that aim at providing causal estimates for the impact of attending child care on a full-day basis. Rathburn and West (2004) and DeCicca (2007), for instance, rely both on data from the Early Childhood Longitudinal Study and control for initial differences between children attending kindergarten (at age 5) on a half- and full-day basis. None of these studies reveal any significant gains from attending child care on a full-time

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<sup>3</sup>Notice that extrapolating from the findings of the above mentioned literature which focuses mostly on the effects of center-based care on a half-day basis is leading to wrong conclusions if the returns to time spent with alternative caregivers is non-linear.

<sup>4</sup>In addition, there exist several studies analyzing the impact of full-time maternal employment on child development (Waldfogel *et al.*, 2002; Brooks-Gunn *et al.*, 2002; Hill *et al.*, 2005). Similar to most existing studies on full-day kindergarten, these studies address endogeneity of maternal employment by controlling for a wide range of observable characteristics.

basis in terms of children’s academic achievement. Cannon *et al.* (2006) exploit differences in state policies regulating the opening hours of child care centers and find short-lived positive effects on children’s academic achievement. The study most closely related to ours is the one by Friesen *et al.* (2013). They exploit the staggered introduction of full-day kindergarten in British Columbia in Canada to analyze the impact of attending kindergarten on a full-day basis (age 5). Their results reveal some short-lived negative impact of full-day kindergarten on children’s development, in particular on parental reports of children’s behavior and emotional development.<sup>5</sup>

The contribution of our study is as follows: First, we study the shift from a half-day to a full-day schedule in child care available to children age 0-6 years. Thus, in contrast to previous studies, we study a much longer treatment (up to six years in contrast to only one year). As a consequence, resulting effects are potentially much stronger. Second, we simultaneously analyze a broad range of child development outcomes, including aspects of children’s overall school readiness, motor skills and socio-emotional maturity. Third, our study is the first in this context to rely on administrative records instead of survey data. Administrative data have two main advantages over survey data: first, they allow us to circumvent the problem of misreporting - an issue which is likely to arise if parents justify their decision to enroll their child into child care on a full-day basis; second, they cover the full population of children belonging to a school cohort and thus circumvent the problem of attrition or non-response - problems likely to arise in the case of survey data (in particular, if the usage of full-day child care comes along with increased parental labor force participation). Finally, we draw on administrative data on child care centers’ structural quality which allow us to assess the role of care centers’ quality when increasing opening hours.

The remainder of this study is structured as follows: the next section describes the child care system in Germany as well as the reform under study. In addition, it provides some thoughts about the expected effects of full-day care. Sections 3 and 4 introduce the data and empirical strategy, respectively. Section 5 presents our main findings as well as results from sensitivity and subgroup analysis. Section 6 finally concludes.

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<sup>5</sup>There is one further study which contrasts the development of primary school age children who attend after-school care with children who are taken care of by the mother in the afternoon hours (Felfe and Zierow, 2014). While this study does not find any effects on average, it finds beneficial effects for children from disadvantaged backgrounds.

## 2 Background

### 2.1 The Child Care System in Germany<sup>6</sup>

Germany offers child care at two levels. Early child care is available for children age 0 to 2 years, while later child care – the so-called kindergarten – is available for children age 3 to 6 years. Since 1996 every child turning 3 years is legally entitled to a slot in a child care center. As a result of this policy, since the early 2000s more than 90 % of children entering school have attended public child care for at least 2 years.<sup>7</sup> In contrast, early child care is a rather recent institution in West Germany. A legal claim on a slot in early child care only exists since 2013, but even then only 23 % of all West German 0-2-year-old children made use of it. In prior years, attendance rates were much lower: up to 2002 less than 3 % of all 0-2-year-old West German children attended a care center, in 2006 attendance rates rose to 6.8 % and in 2011 attendance rates amounted to 16.3 %. Nevertheless, child care centers are still mainly an institution for 3-6-year-old children: in 2002, only 3 % of all slots available in West German child care centers were taken by 0-2-year-old children, in 2006 this share amounted to 7 % and in 2011 to 17 %.<sup>8</sup>

Child care is mostly organized in child care centers.<sup>9</sup> Care centers are run by subsidized non-profit organizations, such as the municipality, the church or welfare organizations.<sup>10</sup> Subsidies come from three public entities: the state usually pays a large amount of the total operating costs. Schleswig-Holstein, for instance, pays an annual amount of 60-70 million Euros which corresponds to approximately 15 % of total operating costs. This money is distributed to the counties according to the number of children enrolled in care centers, the number of immigrant children enrolled in care centers and the opening hours of child care centers. Counties augment this amount by further 5% of the operating costs. The largest share of the operating costs is borne by the municipalities (around 40 % of operating costs). The remaining 40 % of the operating costs are paid by private organizations (10 %) and parents (30 %). Parental fees are differentiated according to family size, the number of siblings enrolled in child care and family income. The costs for a half-day slot range between 0 and 200 Euros/month and for a full-day slot between 0 and 420 Euros/month plus a separate fee for lunch (around 80 Euros/month).

States are in charge of regulating the quality of center-based care in Germany. Regulations

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<sup>6</sup>This section draws on our own calculations of the statistics provided by the German Child and Youth Services ("Kinder- und Jugendhilfe") as well as the official publications based on these statistics (Riedel *et al.* (2005), Lange *et al.* (2005), Huesken (2010) and Strunz (2011)).

<sup>7</sup>In West Germany in 2006, for instance, 75 % among 3-year-old children attended a child care center, while 92 % of all 4-5-year-old children did so. In 2011, the respective shares amounted to 85 % and 95 %.

<sup>8</sup>Our empirical analysis relies on birth cohort 1997/98-2005/06. Since we rely on children's birth year as the relevant year to merge information on child care centers (see Section 3 for more details on), this section refers mainly to this period and to the year 2006 in particular, when reporting statistical facts on the West German child care system.

<sup>9</sup>Since the child care expansion law in 2005, extra-familial childminders have gained increasing importance. Yet, in West Germany in 2006 only 1.2 % of all 0-2-year-old children have been taken care off by a childminder, in 2011 only 3.7 %. Among 3-6-year-old children this share is negligible (in 2011: 0.5 %).

<sup>10</sup>Only a negligible share is run by a private provider (in West Germany in 2006 1 %).

concern aspects such as opening hours, group sizes, staff-child ratios, but also staff qualifications. On average, care centers have to remain open for at least four hours on five days per week. Regulations regarding groupsize and child-staff ratio in the case of 3-6-year-old children are as follows: Playgroups can have at most 25 children age 3-6 years old and need to be supervised by at least one certified child care worker and one or two assistants. The degree as child care worker requires two years of theoretical training and at least two years of practice in a child care center. Care centers comply with these regulations: in 2006 groups accommodated on average 20 children age 3-6 years old. 62.3 % of the employed staff had a degree as a child care worker. Overall, about ten children were supervised by one staff member. Moreover, in line with the minimum required opening hours, in West Germany in 2006 53% of children attending a care center were taken care off on a half-day basis, while 47% had a full-day slot.

Subsequently to the mandate in 1996, which entitled every child age 3-6 years old to a slot in a care center, many German states revised their child care laws. Schleswig-Holstein, for instance, did so in 1999 (in its law on child care centers, the so-called Kindertagesstättengesetz, or short KiTaG). Revisions concerned mainly expansions of existing child care centers to accommodate also younger children (age 0-2-year-old children) and to offer longer opening hours. In 2005 then, the German government enacted a day care expansion law to deal with the remaining shortages in the child care system (Tagesbetreuungsausbaugesetz, §24(1), SGB VIII). Besides kicking off the expansion of slots available to 0-2-year-old children, this mandate triggered a strong expansion of full-day slots. Figure 1, Panel A illustrates this expansion for the region under study. In 1998, on average less than every third child enrolled in care center was offered a full-day slot.<sup>11</sup> The revision of the law on child care centers led to a slight increase in this share. Yet, following the 2005 mandate this share increased remarkably: in 2006 almost 40 % of all children enrolled in preschool were offered a full-day slot, in 2008 around 45 % and in 2011 more than half. Figure 1, Panel B shows the expansion in the number of slots in early care which was also mandated in 2005. The peak of the expansion in early care occurred slightly later, in particular from 2008 onwards. The underlying reason is the additional pressure to expand slots in early care due to the law on support for children in 2008 which announced the legal claim on a slot in early care from 2013 onwards.

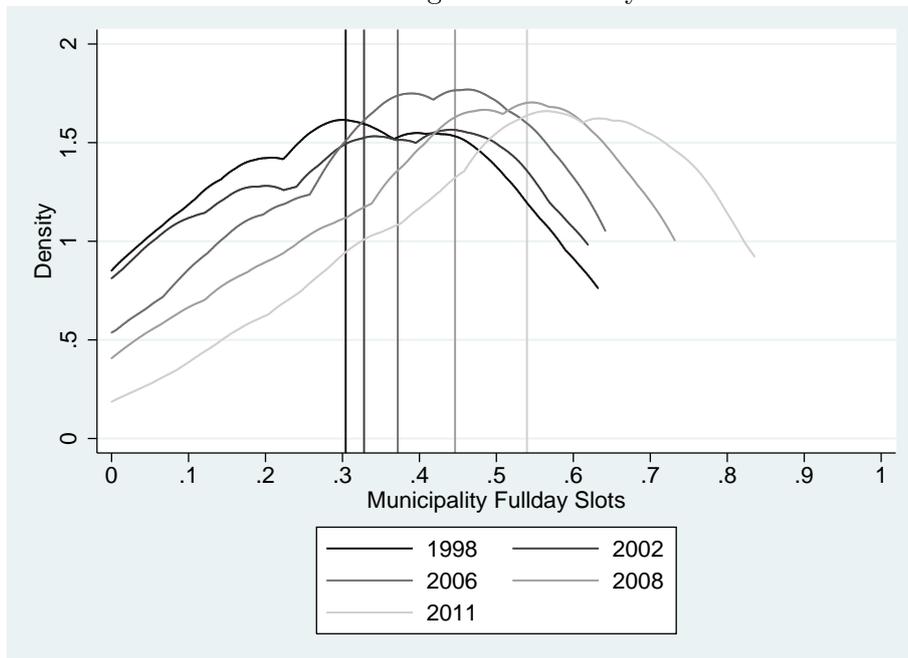
Who is responsible for expansions in the child care system? In Schleswig-Holstein the local organizations of the Child and Youth Services are obliged to annually assess the demand for child care slots and desired opening hours (§7, KiTaG). Key figures for the prediction of the demand for longer opening hours are the number of children in preschool age and the number of mothers working or desiring to work. Based on the demand and the existing supply, the Child and Youth Services then predict the required expansion and set a realistic horizon for

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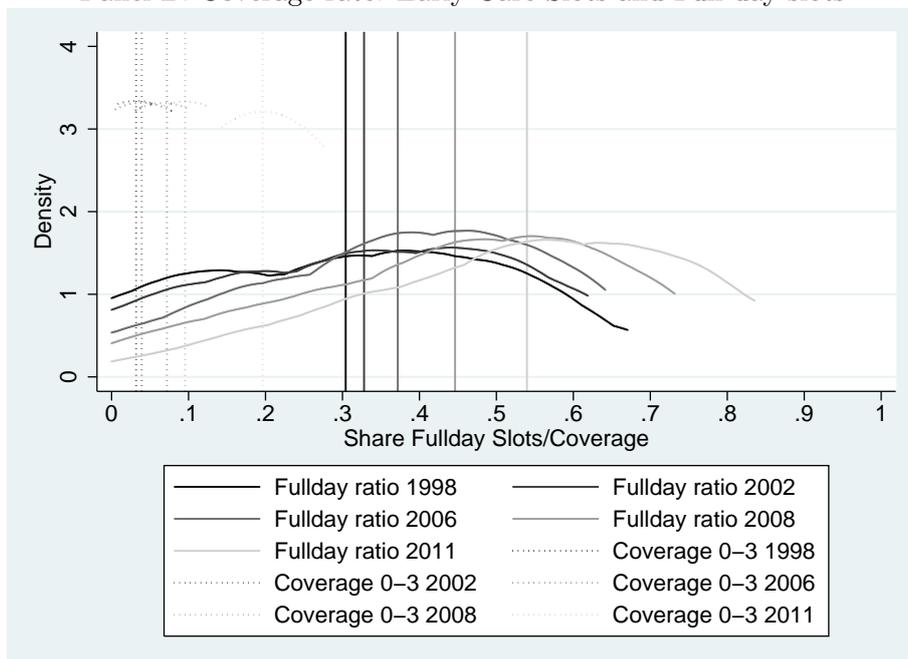
<sup>11</sup>Register data on child care centers are only available from 1998 onwards. We therefore cannot provide any previous trends on the supply of slots in child care centers.

Figure 1: Expansion of the Child Care System

Panel A: Coverage rate: Full-day slots



Panel B: Coverage rate: Early Care Slots and Full-day slots



Notes: Panel A graph plots the share of full-day slots over all slots in care centers available to children age 0-6 years old for the years 1998, 2002, 2006, 2008 and 2011 in the examined area in Schleswig-Holstein. Panel B plots additionally the coverage rate with slots in center-based care among 0-2 year olds. Both graphs are produced using kernel regression (Epanechnikov kernel, bandwidth of 0.1).

Source: Statistics of the Child and Youth Services in Germany 1998-2011, Own calculations.

implementation. Limiting criteria for expanding the opening hours of child care centers are mainly the existing infrastructure and qualified staff.

Who bears the additional costs due to expanding the opening hours? As described above there is some financial aid coming from the state as well as the federal government. Besides the direct transfer from the state of Schleswig-Holstein to child care centers, there are indirect transfers via equalization transfers between the municipalities within each state (regulated in the so-called *Finanzausgleichsgesetz*): municipalities are allowed to go into debt to venture bigger investments related to their child care system; indebted municipalities are then indirectly reimbursed for these investments through equalization transfers running from richer to poorer municipalities. Since 2009, the federal government additionally supports the creation of full-day slots via the financial stability act which dedicates money directly to the maintenance and expansions of existing child care centers. Finally, parental fees for a full-day slots are usually double as high than parental fees for a half-day slots.

## 2.2 School Entrance Examination

In Germany, children undergo several mandatory medical screenings between birth and primary school. These medical screenings promote children's health by diagnosing medical anomalies and providing necessary treatment as early as possible. An important medical screening is the school entrance examination (SEE). Besides documenting a child's health, the focus of this examination is to determine whether a child is "ready" to follow the school curriculum or not.

In the context of the SEE, pediatricians employed by the local health service examine all children in the year prior to entering primary school. They provide a medical diagnosis for several dimensions of children's state of development, among others, children's motor skills and socio-emotional maturity. The motor skills diagnosis concerns coordination and motor capacities of the child. Children have to stand on one leg, jump on one leg, jump left and right for a longer time span. The socio-emotional maturity assessment is based on the pediatrician's observations as well as on a questionnaire designed to identify emotional problems, behavioral problems, hyperactivity, peer relationships, and social behavior given to the accompanying caregiver (Goodman, 1997).<sup>12</sup>

The school readiness assessment evaluates whether a child is ready for school or not. This assessment is correlated with the medical diagnoses, but the correlations need not be perfect.

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<sup>12</sup>The assessment of socio-emotional maturity might be affected by subjective perceptions of the caregiver, or by non-response problems. Considering that the pediatricians re-assess children's socio-emotional maturity and that in 93 % of all cases a medical diagnoses regarding socio-emotional maturity is available, reporting bias and non-response bias are not a major concern in our context. One further concern may be that pediatricians are subjective in their assessment (and possibly consider children's family and institutional environment in their assessment). This, however, is unlikely to occur and given the rather low turnover of pediatricians can be accounted for by the municipality fixed-effects, which implicitly corresponds to a pediatrician fixed-effect (on average every pediatrician is assigned to 5-8 municipalities).

Pediatricians weigh the diagnoses concerning the different developmental domains, and they may include further aspects, i.e proficiency in German or cultural assimilation for immigrant children. The overall diagnosis thus needs not to be the sum of the different skill dimensions. Even if the school readiness diagnosis is (since 2007) not binding, it is an important piece of information regarding school enrollment and crucial for parents's decision whether to enroll their child in school or not.

Why should economists care about children's performance in the dimensions assessed in the school entrance examinations? There is a growing amount of research relating such early performance indicators to later success on the labor market. Gregg and Machin (1999, 2001), for instance, discuss the relevance of children's early cognitive abilities for their later success in the labor market. Duncan *et al.* (2007), moreover, show that dimensions assessed in the school entrance examination – such as intellectual skills and socio-emotional maturity – are key in predicting later educational achievements. Finally, motor skills are surprisingly very strong predictors for children's later achievements (Grissmer *et al.*, 2010).

### 2.3 Hypotheses

What are the a priori expectations about the effects of center-based care on a full-day basis on children's skill development? The literature on children's skill production postulates that time spent with either the parent or alternative caregivers are relevant inputs into the production function of children's skills (see, for instance the overview article by Cunha *et al.* (2006)). Spending time in a care center changes the distribution of time spent with the parent or any other alternative caregiver. This is the case if the child spends half-a-day in a care center and even more so if the child is enrolled in a care center on a full-day basis. Yet, extrapolating from previous findings on the effects of attending care centers on a half-day basis, may lead to wrong conclusions, in case returns to the time investments made by alternative caregivers are not linear. In turn, we therefore discuss what being enrolled in a care center on a full-day basis implies for time spent with alternative caregivers and what this may mean for children's development in different skill dimensions.

One one hand, being enrolled in a care center on a full-day basis implies spending the major part of the day under the guidance of the staff working in the care center. Care centers have the clear educational mission to develop children's motor, language, and pattern-recognition skills. Staff members support the development of these skills by engaging children in playful activities. As such we can expect positive returns to the time spent in a care center. Yet, there may be heterogeneity in the returns across different skill dimensions depending on the relative importance given by the staff members to the different skill dimensions.

On the other hand, being enrolled in a care center on a full-day basis implies a substantial if

not basically a complete reduction of time spent in an alternative care mode. What is the most prevalent alternative care mode in our setting? In our setting - one state in West Germany in the early 2000s -, more than 80 % of all 3-6 year old children attend a care center, while only around a third does so on a full-day basis. In addition, West Germany is characterized by a rather low labor force participation rate of women with young children: in 2012, for instance, only 62% of mothers with 3-6-year-old children were actively employed, 45% worked part-time and only 17% worked full-time. Thus, the counterfactual care mode to being enrolled in a care center on a full-day basis is likely to be being enrolled in a care center during the morning hours, complemented with care provided by the mother during the afternoon hours. As such, the effects of expanding the opening hours of care centers also depend on the returns to the time (not) spent with the mother. Obviously, there is a great deal of heterogeneity in these returns. First, there is likely to be heterogeneity across different mothers, for instance, across mothers with different levels of education. This statement is backed by a well-established literature in psychology and sociology on educational disparities in parenting styles (see Hsin and Felfe (2014) for an overview): children have more to gain (and more to lose) from (not) spending time with better-educated mothers.<sup>13</sup>

Second, there is likely to be heterogeneity in the returns to substituting time spent with the mother by time spent in a care center across the different skill dimensions: while center staff is well trained in stimulating the development of cognitive skills, center staff may be less successful in supporting the development of children's emotional skills. Attachment theory postulates that separation from the primary caregiver - who in most cases is the mother - causes anxiety and stress of children. In other words, the attachment theory establishes that time spent with the mother is crucial for the development of children's emotional skills (Bowlby, 1969; Mercer, 2006). As a consequence, we might expect negative returns to substituting time spent with the mother by time spent in a care center on children's emotional skills. Yet, again it is likely that these effects vary across different family backgrounds, as mothers from different backgrounds - for instance, in terms of their education - are not equally likely to be capable to compensate children for their absence during the remaining time.

Thus, to summarize, depending on the family background an expansion of care centers' opening hours is expected to exert neutral to positive consequences on childrens intellectual and motor skills, but neutral to negative returns to childrens emotional skills.

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<sup>13</sup>For example, better educated parents are more verbally engaged with their children (Hart and Risley, 1995), provide more cognitive stimulation at home (Davis-Kean (2005); Linver *et al.* (2002); Yeung *et al.* (2002)), and have higher academic expectations for their children (Davis-Kean, 2005). In contrast, the time children spend with less-educated mothers may be more conflictive. The stress induced by socioeconomic disadvantage is known to create harsh and inconsistent parenting (McLoyd, 1998). Less-educated parents are also more likely to hold jobs that accrue lower prestige, offer lower pay and fewer benefits, are more unstable, and expose workers to greater physical hazards and psychological stress (Felfe and Hsin (2012); Han (2005); Johnson *et al.* (2005); Raver (2003)), all of which are factors that are known to negatively correlate with child development.

## 3 Data and Descriptive Statistics

### 3.1 Data

Administrative records from *Schleswig-Holstein*'s school entrance examinations (SEE) are our main data source. The data is structured in school entrance cohorts. A school entrance cohort comprises all children who turn 6 years old between July of the previous year and June of the same year as school entrance.<sup>14</sup> This study draws on data for the school entrance cohorts 2004 to 2012. As described in the previous section SEE data contain medical assessments on, among other dimensions, children's motor skills and socio-emotional maturity. The medical diagnosis can take five forms: "normal development", "some problems, but no treatment is necessary", "some problems, already in treatment", "problems, treatment necessary", and "problems which will reduce the child's performance in school". Based on this diagnosis, we construct a binary indicator for each of the two dimensions assessed in the SEE (motor skills and socio-emotional maturity), which is equal to one if the child does not exhibit any problem in the assessed tasks. The SEE provides us furthermore with the pediatrician's assessment whether a child is ready to follow the school curriculum or not. The recommendation can take the following three forms: "ready for school", "school enrollment only with support provided by the teacher", and "special needs education required". We construct again a binary indicator which is one if the child is ready for school.

The SEE also contains parental reports on child and family background. Among other questions, parents answer a question regarding whether their child attended child care. Yet, they do not provide any information on the amount of hours their child attended child care. In other words, we do not possess of any direct information on the intensive margin on an individual basis - i.e. whether the child attended care on a full-day basis. Instead we rely on the average rate of full-day slots among all slots available in care centers on the municipality level provided by our second data source described in turn. Thus, similar to previous studies investigating the impact of universal child care on children's development (Baker *et al.*, 2008; Cascio, 2009; Felfe *et al.*, 2012; Fitzpatrick, 2008; Havnes and Mogstad, 2011), we can only provide estimates for the intention-to-treat effect (ITT), but not for the treatment effect itself.

Administrative records of all child care centers are our second data source (the so-called *Kinder- und Jugendhilfestatistik* or *Statistics on Child and Youth Services*). These records contain detailed information about the provider, the children enrolled and the staff employed and thus, allow us to construct the following series of indicators describing the care centers: coverage rates among 0-2-year-old children and 3-6-year-old children, the share of full-day and

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<sup>14</sup>Children who were not ready for school in one year undertake a special examination one year later and thus are not included in the baseline SEE. Parents whose children turn 6 years between July and December of the same year can ask their child to be examined a year before the official SEE would have taken place. We exclude these children from our analyses.

half-day slots, the provider (public provider vs. the church vs. other providers, which are mostly welfare organizations), as well as structural quality features such as group size and the staff composition in terms of age, gender, pedagogical degree and workload. All information is available at the care center level. Since a substantial share of care centers host children of different age groups,<sup>15</sup> we cannot distinguish between slots offered to 0-2-year-old children and slots offered to 3-6-year-old children. As such our treatment - the share of full-day slots – as well as any other information on care centers refer to children age 0-6. Nevertheless, as pointed out before, until 2006 only up to 7% of all slots in care centers are offered to 0-2-year-old children, while more than 93% of all slots in care centers are offered to 3-6-year-old children. In other words, the focus of our analysis lies on the effect of expanding full-day care which is mostly available to 3-6-year-old children.

The smallest regional level available in both data sources is the municipality.<sup>16</sup> Data protection, however, restricts the number of municipalities available for scientific research. First, administrative data on care centers are only released if municipalities contain at least three care centers, otherwise only averages of care centers in neighboring municipalities are available. Second, not all municipalities can be identified in the SEE data. In fact, counties - the second smallest regional level in Germany - are in charge of gathering the results of the SEE and delivering them to the respective state office (which is the *Ministry of Social Affairs, Health, Family and Equality* in Schleswig-Holstein). When delivering the data to the ministry, counties have the right to anonymize municipalities and some of them do so. In fact, we possess identifiers for 75 municipalities (belonging to 8 out of 15 counties) which allow us to merge the available administrative data on child care centers to the SEE data. In addition, we use the municipality identifiers to add information on the demographic and socio-economic composition of the municipalities.

The fact that information on our treatment – the share of full-day slots – is only available on the care center level which are accessible for children age 0-6 years old, rises the question of when to measure the share of full-day slots. In other words, we have the choice of measuring the supply of full-day slots at any age between zero and six. To circumvent any endogeneity of care center features to the parental decision of enrolling their child in child care and in particular, in child care on a full-day basis, we choose to control for the share of full-day slots available in children’s birth year and thus prior to children’s own enrollment in child care.

Restricting our sample to children for whom we possess information on all assessed dimensions – school readiness, motor skills and socio-emotional maturity - leads to a sample of 93,570 children belonging to nine school entrance cohorts and residing in 75 municipalities.

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<sup>15</sup>In 1998 25% care centers hosted children of different age groups, in 2011 55 %.

<sup>16</sup>We observe the municipality of residence of a child at the SEE date. As post-birth mobility is low in West Germany, the municipality of residence at the SEE date is likely to be the same as the municipality of residence when children attend center-based care for most children in our sample.

## 3.2 Descriptive Statistics

Table 1 provides descriptive statistics for the estimation sample which contains 93,570 children entering school between 2004 and 2012 (and thus born between July 1997 and June 2006).

How do these children perform in the various dimensions assessed in the SEE? As we can see in Panel A of Table 1, 81 % of all children exhibit motor skills which are age appropriate. 83 % of all children are assessed to be socio-emotionally mature. Finally, 87 % of all children are assessed to be ready for school, i.e. are able to follow the curriculum taught in primary school. While children perform on average quite high in all dimensions assessed in the context of the SEE, the rather high standard deviation (ranging between 0.34 and 0.39) points towards strong heterogeneity in the performance of children at the time of school entrance.

Panel B in Table 1 reports some information on the characteristics of children and their family background. On average children are 6 years and 2 months old, around half of them are boys (52 %), 12.5 % are immigrant children, 15 % live with one parent only, and on average they have one sibling. A third of all children grow up in a family where the mother possesses of intermediate education (32 %), more than a fifth of all children live in a family where the mother has a primary school degree (20 %) and more than a quarter where the mother possess of some higher education (27 %). The educational background for the remaining mothers is missing.

How is the provision with and the quality of child care in the region under study? Panel C in Table 1 displays the features of the child care centers located in the municipalities contained in our estimation sample, measured as the respective average at the municipality level of the year the child is born (and thus between 1998 and 2006). As described in Section 2, while the supply of slots in Kindergarten is basically fulfilling the legal mandate of full coverage (82 % of all children age 3-6 years old can attend kindergarten), the supply of slots in early child care is still quite low in the years under study (4.5 % of all children can attend early care). Yet, as shown in Figure 1 coverage with slots in early care has steadily grown over the last two decades and reaches in 2013 23 %. Regarding the share of available full-day slots, we observe the following: on average, one third of all children is offered a full-day slot (34 %). Again this share is steadily rising over the last two decades (see Figure 1) - a fact we base our identification strategy on (see Section 4 for details). Most child care centers are either run by the church (42 %) or by a welfare organization (37 %), but still a fifth of all care centers are run by the municipality (21 %). On average there are 20 children in one group, the staff working in the child care centers is on average 38 years old, most are female (96 %), more than half possesses of a pedagogical degree (62 %), and around a third works full-time (36 %).

Panel D in Table 1 finally provides some information on the municipalities the children live in (again merged to the SEE data for the year when children are born and thus measuring the average across the years 1998-2006). Female employment, the female fulltime-ratio, GDP

per capita, the local tax rates<sup>17</sup> and the percentage of children between 0 and 6 years old are comparable to the West German average. The region under study is a bit more densely populated – four of our counties are city counties. As a result, the region under study is less conservative – the vote share for the conservative parties is substantially lower than the West German average (by 5 ppt).

As discussed earlier, our data does not provide us with any information whether children attend child care on a full-day or on a half-day basis. As such we can neither assess the take-up rate nor compare children who attend center-based care on a full-day basis with children who attend center-based care on a half-day basis only. Yet, to provide some intuition whether children attending child care on a full-day differ from children attending child care on a half-day basis, and thus whether there might be endogenous selection into full-day care, we draw upon alternative datasets. Table A.1 in the Appendix provides a mean comparison of children in half-day and full-day care with respect to their health and socio-emotional development (see Panel A, based on data from SEE data in Hamburg, school entrance cohorts 2005 and 2011) and with respect to their own and their family characteristics (see Panel B, based on data from SEE data in Hamburg, school entrance cohort 2005 and 2011, and Panel C, based on data from the mother-child questionnaire contained in the German Socio-Economic Panel, birth cohorts 2002-2005 and thus school entrance cohorts 2008-2011).<sup>18</sup>

When being examined at school entrance, children who attended child care on a full-day basis suffer from more health problems than children who attended child care only on a half-day basis (by 2.5 percentage points, henceforth ppts). In the same vein, they have spent more nights in a hospital (0.29 nights more) and are assessed to be less socio-emotionally mature (by 0.01 ppts). Thus, the raw comparison points to some developmental deficits in terms of health and socio-emotional maturity when children are lacking maternal care during afternoon hours. Yet, there are also differences in terms of children’s socio-demographic background: children who attended full-day child care are more likely to be boys (0.02 ppts), weighted less at birth (48 grams), are less likely to have foreign parents (0.01 ppts), and have less siblings (0.27). Their mothers are less often married and cohabit less often (22 ppts and 8 ppts). There is also a slight tendency towards more educated mothers sending their children to full-day care (this difference is, however, not significant). Finally, mothers who are more likely to work for pay and mothers who work generally more hours (4 hours more on average) send their child to full-day care. Thus, while there is some sign for non-random selection into full-day care, it is not clear whether children stem from rather advantaged or disadvantaged background.

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<sup>17</sup>In Germany, municipalities have the legal right to annually decide on the tax rate of three different kinds of local taxes: business taxes, taxes on agrarian real property and taxes on other real property.

<sup>18</sup>We do not draw on these data for the following reasons: the SEE data for Hamburg do not contain municipality identifier and thus do not allow for any within-municipality analysis (in other words, we do not possess of any information about regional variation); the German Socio-Economic Panel, on the other hand, contains too few observations to break the data down to a municipality level.

Table 1: Descriptive statistics

|   | Mean     | SD      |
|---|----------|---------|
| <i>Panel A: Development Dimensions</i>                    |          |         |
| Socio-Emotional Maturity(D)                               | .825     | .38     |
| Motor Skills(D)   | .812     | .391    |
| School Readiness(D)                                       | .869     | .338    |
| <i>Panel B: Child characteristics</i>                     |          |         |
| Age (in month)  | 73.761   | 3.888   |
| Male (D)  | .524     | .499    |
| Immigrants (D)  | .125     | .331    |
| Birth weight (in gram)                                    | 3275.256 | 815.235 |
| Birth weight missing (D)                                  | .029     | .167    |
| Single parent (D)   | .151     | .358    |
| Single parent: missing (D)                                | .063     | .243    |
| Nr of siblings (excl. kid)                                | 1.023    | 1.047   |
| Siblings: missing (D)                                     | .136     | .343    |
| Mom's education: basic (D)                                | .199     | .4      |
| Mom's education: intermediate (D)                         | .322     | .467    |
| Mom's education: high (D)                                 | .274     | .446    |
| Mom's education: missing (D)                              | .173     | .378    |
| <i>Panel C: Care center characteristics</i>               |          |         |
| Coverage 0-3 years old (in %)                             | 4.538    | 2.543   |
| Coverage 3-6 years old (in %)                             | 82.139   | 6.683   |
| Share of public providers (in %)                          | 20.944   | 16.158  |
| Share of other providers (in %)                           | 37.387   | 17.974  |
| Share of church providers (in %)                          | 41.669   | 18.664  |
| Children per group  | 19.969   | 3.284   |
| Age of staff (years)                                      | 38.179   | 2.328   |
| Share of male staff (in %)                                | 4.355    | 3.281   |
| Share of staff with pedagogical degree (in %)             | 62.113   | 9.51    |
| Share of full-time staff (in %)                           | 35.813   | 14.678  |
| <i>Panel D: Regional Characteristics</i>                  |          |         |
| Citizens per km2 at Birth                                 | 1021.08  | 700.396 |
| Share 0-6-y-old children at Birth(in %)                   | 5.796    | .804    |
| Votes for CDU and FDP in % at Birth                       | 42.035   | 4.28    |
| Votes for other parties in % at Birth                     | 13.529   | 3.034   |
| Votes for social democrats county in % at Birth           | 44.436   | 3.73    |
| Log of GDPpc at Birth (in 1000Euro/Citizen)               | 3.211    | .226    |
| Local business tax rate                                   | 3.608    | .49     |
| Local tax rate on agrarian real property                  | 3.172    | .47     |
| Local tax rate on other real property                     | 3.573    | .823    |
| Employed female at Birth (in %)                           | 44.251   | 2.66    |
| Fulltime-Employed female at Birth (in % of total working) | 63.978   | 5.343   |

Notes: Descriptives are based on the full sample (2004-2012). All macro variables (at the center level and at the regional level) are measured in the year when children are born, all individual and family variables are taken from the date of the SEE. Source: Statistics of the *Child and Youth Services in Germany*/School entrance examination 2004-2012/INKAR/Statistik-Nord, own calculations.

## 4 Empirical Strategy

To estimate the causal effect of the supply of full-day slots in child care centers on children's development we rely on within-municipality variation in the supply of full-day slots. Our empirical specification looks as follows:

$$Y_{imc}^s = \beta F_{mc} + \gamma C_{mc} + \delta Z_{mc} + \eta X_i + \mu_c + \psi_m + \epsilon_{imc} \quad (1)$$

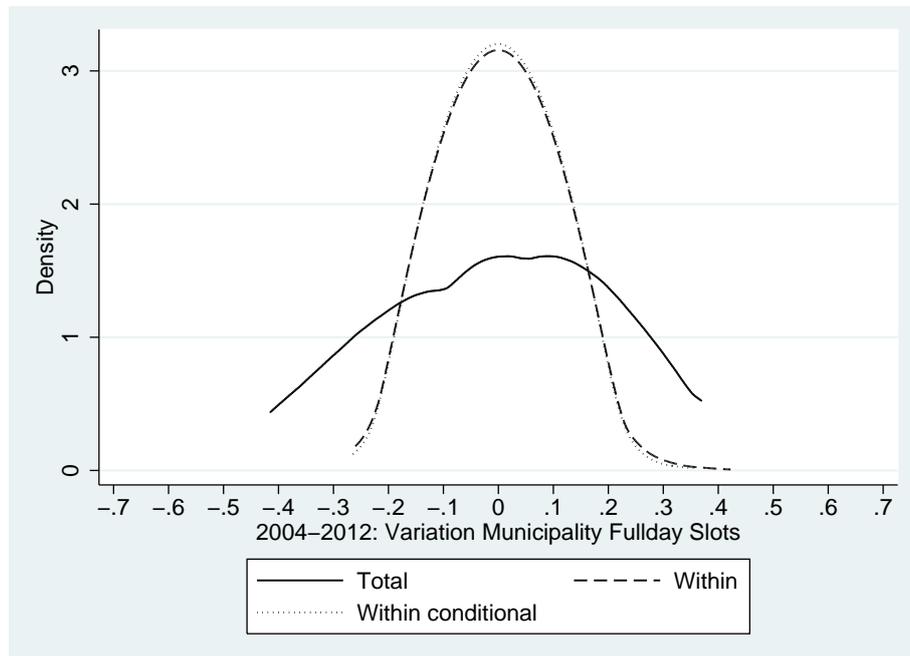
where  $Y_{imc}^s$  denotes skill dimension  $s$  of child  $i$  residing in municipality  $m$  and belonging to cohort  $c$ ,  $F_{mc}$  stands for the share of full-day slots available to children belonging to cohort  $c$  and residing in municipality  $m$ ,  $C_{mc}$  represents a set of care center features,  $Z_{mc}$  a set of municipality features, and  $X_i$  a set of individual background characteristics. The set of municipality dummies  $\psi_m$  allows us to control for the average level of full-day slots in the municipality, but also for any time-constant features of municipalities that may correlate with the timing of the expansion in full-day slots and with changes in children’s development. By controlling for a set of cohort dummies  $\mu_c$ , we abstract furthermore from the overall trend to expand full-day slots and exploit the variation in the timing of the expansion across municipalities. Finally,  $\epsilon_{imc}$  represents an idiosyncratic shock.

The key identifying assumption is that  $F_{mc}$  is conditionally independent of the unobserved determinants of children’s development  $\epsilon_{imc}$ . Ideally we would like to rely on exogenous supply shocks of full-day slots. Instead we rely on an expansion of the supply of full-day slots triggered by revisions of the child care law and exploit variation in the timing of expansions across municipality. In other words, our identification strategy relies on within-municipality variation of the supply of full-day slots. Two questions may arise when relying on this identification strategy: first, is there sufficient within-municipality variation in the supply of full-day slots even when conditioning on the set of control variables? Second, is the timing of expansions in the supply of full-day slots indeed exogenous within municipality?

Figure 2 discusses the extent to which the supply of full-day slots varies within and between municipalities. The figure reports the overall variation (net of the cohort trend), the within-municipality variation, and the within-municipality variation conditional on all control variables (child, family, care center and regional characteristics as well as a set of cohort fixed effects). Obviously, variation shrinks substantially when conditioning on municipality dummies, yet, the support of the supply of full-day slots is still remarkably large. Conditioning on the set of control variables, moreover, does not affect the variation by much.

Thus, within-municipality variation in the supply of full-day slots seems to be sufficient to analyze the impact of full-day care on children’s development using a municipality fixed-effect approach. Yet, is the timing of the expansions in the supply of full-day slots indeed exogenous? Expansions in full-day slots are determined by the demand of citizens for full-day slots and the ability and willingness of the providers and ultimately the municipality - as the municipality is stemming a large part of the costs - to expand the opening hours of child care centers. Proxies for the demand are the number of children eligible for child care (thus children who are 0-6 years old) and the share of employed women as well as the female fulltime employment ratio.

Figure 2: Variation in Share of Fullday Slots



Notes: This graph plots the variation in the share of full-day slots over all child care slots for the school entrance cohorts 2004-2012; the solid line plots the overall variation (net of the cohort trend), the dashed line plots the within municipality variation, and the dotted line plots the within municipality variation conditional on all control variables (child, family, care center and regional characteristics as well as a set of cohort fixed effects). The graph is produced using kernel regression (Epanechnikov kernel, bandwidth of 0.1, 100 grid points).

Source: Statistics of the Child and Youth Services in Germany/School entrance examination 2004-2012/INKAR/Statistik-Nord, Own calculations

Proxies for the ability of a municipality to expand full-day care are the economic standing of the municipality, which we proxy by the GDP per capita, and the population density. One concern may be that municipalities may cut down on other social expenditures or levy more taxes to finance the expansion of full-day slots. Individual taxes or social benefits, however, are set on the federal level. Thus, it is unlikely that the financial burden due to an expansion of the child care system is passed on to the citizens or crowds out other social expenditures. Municipalities, however, levy corporate taxes as well as taxes on real property and thus the financial burden may be passed on to the local economy. Yet, it is unlikely that municipalities are willing to damage its attractiveness as a business location in order to satisfy the demand for more full-day care. Municipalities may rather accept to go into debt and make use of equalization transfers provided to poorer municipalities. In addition, as described in Section 2, state subsidies are relatively larger for child care centers running on a full-day basis. Nevertheless, we include the local business tax rate and the tax rates on both agrarian and other real property. Those rates are determined by the local authorities annually and provide an instrument to increase their municipality's financial capacities. Finally, to proxy for the willingness of a municipality

to expand the supply of full-day slots, we additionally control for the election results in the last federal elections – there are clear differences regarding the expansion of child care centers between the more conservative parties (CDU and FDP) and the less conservative parties (SPD and Grüne).

Besides financial consequences of the expansions of full-day care, one may worry about concessions in care centers' quality: i) one way to finance more/longer child care is to sacrifice quality; ii) the more rapid the expansion, the higher the probability that quality may suffer. For instance, it may be difficult to recruit adequately trained staff or groups may be joined in the afternoon hours. We account for potential adjustments in care centers' quality by controlling additionally for a set of structural quality parameters.

To assess all mentioned concerns, we run a supplementary regression where the dependent variable is the share of full-day slots and the independent variables are the set of municipality and care center features (in addition to a set of cohort fixed effects and municipality fixed effects). For the regression results please refer to Table 2 below.<sup>19</sup>

In line with the revisions of the child care law we observe a strong trend in the share of full-day slots over time: in particular, the birth cohort 2005/06 faces a 23 ppt higher supply of full-day slots than the birth cohort 1997/98. Importantly, there is no sign that municipalities simultaneously plan the expansion of full-day slots and the expansion of slots in early care. There is also no indication that expansions in full-day care are correlated with changes in care provided to 3-6 year olds. The p-value resulting from an F-test for overall significance of coverage in early care and kindergarten is 0.765. The expansion in the share of full-day slots is also uncorrelated with basically all observable municipality features. The only exception is the political orientation of the municipality which can reflect both the attitude of the citizens as well as the priority given to child care by the political party. To be precise: in regions, where the citizens are more likely (by 1 ppt) to vote for a conservative party (either the CDU or the FDP), the share of full-day slots is likely to increase by 2 ppt less, in contrast to when the citizens are more likely to vote for the socialist party. Finally, there is no clear evidence for concessions in care centers' quality when expanding the opening hours. One exception is - not surprisingly - that care centers running on a full-day basis require more staff working on a full-time basis. Graphical evidence of potential concessions in centers' quality features is provided in Figure A in the Appendix. Again, there is not much to see, with the exception of the share of staff working full-time and the age of the staff – the more full-day slots, the younger the staff (probably given new hires).

Given this evidence, the only remaining threat to identification are municipality-specific changes over time that are orthogonal to the municipality and care center characteristics we already control for and that affect children belonging to one cohort and living within a given

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<sup>19</sup>In an alternative regression, shown in Table A.2 we control for all municipality features in the previous year. This accounts for possible planning of the expansion of full-day slots. Results are basically unchanged.

Table 2: Determinants of the Share of Fullday Slots

|   | Full-Day Ratio at Birth |
|---|-------------------------|
| Cohort 2005 (D)   | 0.015**<br>(0.007)      |
| Cohort 2006 (D)   | 0.031**<br>(0.015)      |
| Cohort 2007 (D)   | 0.049**<br>(0.021)      |
| Cohort 2008 (D)   | 0.098***<br>(0.029)     |
| Cohort 2009 (D)   | 0.119***<br>(0.030)     |
| Cohort 2010 (D)   | 0.139***<br>(0.031)     |
| Cohort 2011 (D)   | 0.215***<br>(0.054)     |
| Cohort 2012 (D)   | 0.229***<br>(0.057)     |
| Coverage 0-3 years old (in %)                             | 0.001<br>(0.008)        |
| Coverage 3-6 years old at Birth (in %)                    | -0.002<br>(0.003)       |
| Public provider at Birth(in %)                            | -0.000<br>(0.001)       |
| Other provider at Birth(in %)                             | -0.001<br>(0.001)       |
| Children per group at Birth                               | -0.003<br>(0.004)       |
| Age of staff at Birth(years)                              | -0.008<br>(0.007)       |
| Staff: male at Birth(in %)                                | -0.000<br>(0.003)       |
| Staff: pedagogical degree at Birth (in %)                 | -0.001*<br>(0.001)      |
| Staff: fulltime at Birth (in %)                           | 0.006***<br>(0.002)     |
| Citizens per km2 at Birth                                 | -0.001<br>(0.001)       |
| Employed female at Birth (in %)                           | 0.003<br>(0.005)        |
| Fulltime-Employed female at Birth (in % of total working) | -0.000<br>(0.001)       |
| Share 0-6-y-old children at Birth(in %)                   | 0.034<br>(0.025)        |
| Votes for CDU and FDP in % at Birth                       | -0.020**<br>(0.009)     |
| Votes for other parties in % at Birth                     | -0.007<br>(0.007)       |
| Log of GDPpc at Birth (in 1000Euro/Citizen)               | 0.079<br>(0.130)        |
| Local business tax rate at Birth                          | -0.120<br>(0.157)       |
| Local tax rate on agrarian real property at Birth         | 0.006<br>(0.073)        |
| Local tax rate on other real property at Birth            | -0.045<br>(0.060)       |
| Municipality FE   | Yes                     |
| Reference year/cohort                                     | 2004                    |
| Slots (p-Value)   | 0.765                   |
| Institution (p-Value)                                     | 0.887                   |
| Center (p-Value)  | 0.001                   |
| Regional (p-Value)  | .043                    |
| Adj. R2   | .939                    |
| Children  | 93570                   |

Notes: This table shows the coefficients of the OLS estimates of the share of fullday slots. Regressions control further for a full set of municipality dummies and a constant term. Standard errors are clustered at the municipality level and are shown in parenthesis: \*p < 0.10, \*\* p<0.05, \*\*\*p<0.010.

Source: Statistics of the *Child and Youth Services in Germany*/School entrance examination 2004-2012/INKAR/Statistik-Nord, Own calculations

municipality differentially. Yet, it is hard to come up with any systematic difference within a municipality over time that is likely to drive the expansion of full-day slots and affects children's development beyond the conditions we already account for. Finally, we are unaware of any further reform of the education system that might differentially affect children belonging to different cohorts. Yet, if there were one, the educational system is regulated at the state level and thus any change should be controlled for by the set of cohort fixed effects.

## 5 Results

### 5.1 Baseline results

What is the impact of extending the opening hours of child care centers from half-day to full-day on children's development? In other words what are the consequences of replacing a child care system where children spend the morning in a child care center and the afternoon with the mother by a system where children spend the whole day in the child care center? Table 3 shows the results of estimating equation 1 by OLS and clustering the standard errors at the municipality level. Panel A displays the estimates when not accounting for care centers' structural quality parameters and Panel B displays the estimates when accounting for care centers' structural quality parameters.

When not controlling for care center's structural quality - and thus neglecting potential adjustments in care center quality - we observe the following results: on the one hand, increasing the share of full-day slots prepares children better for school: converting one out of a 100 half-day slots into a full-day slot increases children's school readiness on average by 0.078 ppt or put it differently, by 0.002 standard deviations (henceforth sd). Thus, the observed expansion of full-day slots in the region under study - which amounts to 11 ppt or 11 out of a 100 slots between the school cohort 2004 (born 7/1997-6/1998) and the school cohort 2012 (born between 7/2005 and 6/2006) when we measure the share of full-day slots in the year of birth - leads to an improvement of children's school readiness by 0.858 ppt or 0.025 sd. This result is, however, only significant at the 10 % significance level. Accounting furthermore for care centers' quality decreases the point estimate and thus renders the effect of the supply of full-day slots insignificant. In other words, the parallel increase in full-time working staff - shown in Table 2 - seems to explain at least part of the positive effect on children's school readiness, while the mere supply of full-day care does not affect children's intellectual development, at least not on average. On the other hand, increasing the share of full-day slots negatively affects children's socio-emotional maturity: the observed expansion of 11 ppt deteriorates children's socio-emotional maturity by 2.5 ppts or 0.066 sd. In this case accounting for care centers' structural quality makes only a slight difference, which, however, does not affect the interpretation of our results. Finally, there are

Table 3: Effects of Share of Fullday Slots on Child Development

|                             | School<br>Readiness | Motor<br>skills  | Socioemotional<br>maturity |
|-----------------------------|---------------------|------------------|----------------------------|
| <i>Panel A - no quality</i> |                     |                  |                            |
| Share of fullday slots      | 0.078*<br>(0.041)   | 0.048<br>(0.068) | -0.251***<br>(0.081)       |
| Municipality Fixed Effects  | Yes                 | Yes              | Yes                        |
| Cohort Fixed Effects        | Yes                 | Yes              | Yes                        |
| Individual Controls         | Yes                 | Yes              | Yes                        |
| Regional Controls           | Yes                 | Yes              | Yes                        |
| Quality Controls            | No                  | No               | No                         |
| Adj. R2                     | 0.097               | 0.083            | 0.091                      |
| Children                    | 93570               | 93570            | 93570                      |
| <i>Panel B - quality</i>    |                     |                  |                            |
| Share of fullday slots      | 0.058<br>(0.043)    | 0.039<br>(0.066) | -0.222***<br>(0.078)       |
| Municipality Fixed Effects  | Yes                 | Yes              | Yes                        |
| Cohort Fixed Effects        | Yes                 | Yes              | Yes                        |
| Individual Controls         | Yes                 | Yes              | Yes                        |
| Regional Controls           | Yes                 | Yes              | Yes                        |
| Quality Controls            | Yes                 | Yes              | Yes                        |
| Adj. R2                     | 0.097               | 0.083            | 0.091                      |
| Children                    | 93570               | 93570            | 93570                      |

Notes: This Table displays the estimates resulting from an OLS regression of children's development at school entrance on the share of full-day slots measured in children's year of birth. In panel A, further controls are the full set of individual and regional characteristics as well as a set of municipality and cohort dummies. In panel B, we additionally control for a set of care center quality features. Standard errors are clustered at the municipality level.

Source: Statistics of the *Child and Youth Services in Germany*/School entrance examination 2004-2012/INKAR/Statistik-Nord, Own Calculations

no significant consequences for children’s motor skills.

What can explain the negative effect of full-day care on childrens socio-emotional maturity, while there is no effect on the other development dimensions? As already suggested in Section 2.3, professional child carers and mothers may differ in their skills and their methods to promote children’s development. Time spent with the mother may be particularly valuable for children’s socio-emotional development (Bowlby, 1969; Mercer, 2006). Thus, depriving children of this time may explain the negative effect on pediatricans’ assessment of children’ socio-emotional maturity. Professional child care workers, however, may be trained in stimulating children’s intellectual development, such as verbal or analytical skills, or childrens motor skill, and as such may be competent to substitute the mother at least when judging about the impact of center-based care on these developmental dimensions. In fact, some children may even benefit from spending time with professional child care workers, in particular children from educationally disadvantaged backgrounds. Moreover, some mothers may be capable to compensate children for their absence in the remaining hours of the day by engaging more actively (Hsin and Felfe, 2014). The next section therefore discusses to which extent effects may vary across different family backgrounds and thus across parents’ with potentially different child rearing skills.

## **5.2 Heterogeneity**

Table 4 shows the results of our baseline specification when stratifying the sample according to the following characteristics: gender (boys versus girls), immigrant background (native versus immigrant), parental education (both parents possess of a university-entrance diploma – Abitur – or not), and parental cohabitation status (single versus two parent household). Some interesting heterogeneities arise.

Table 4: Strata: Effects of Share of Full-day Slots on Child Development

|                             | School<br>Readiness | Motor<br>skills  | Socioemotional<br>maturity |
|-----------------------------|---------------------|------------------|----------------------------|
| <b>Panel A</b>              |                     |                  |                            |
| <b>Boys</b>                 |                     |                  |                            |
| Share of full-day slots     | 0.050<br>(0.063)    | 0.034<br>(0.095) | -0.244***<br>(0.091)       |
| Adj. R2                     | 0.097               | 0.059            | 0.086                      |
| Children                    | 49016               | 49016            | 49016                      |
| <b>Girls</b>                |                     |                  |                            |
| Share of full-day slots     | 0.070**<br>(0.032)  | 0.044<br>(0.044) | -0.195***<br>(0.072)       |
| Adj. R2                     | 0.075               | 0.040            | 0.076                      |
| Children                    | 44554               | 44554            | 44554                      |
| F-test (p-value)            | 0.695               | 0.890            | 0.358                      |
| <b>Panel B</b>              |                     |                  |                            |
| <b>Native</b>               |                     |                  |                            |
| Share of full-day slots     | 0.030<br>(0.040)    | 0.027<br>(0.065) | -0.206**<br>(0.078)        |
| Adj. R2                     | 0.089               | 0.088            | 0.092                      |
| Children                    | 77330               | 77330            | 77330                      |
| <b>Immigrant Background</b> |                     |                  |                            |
| Share of full-day slots     | 0.232**<br>(0.089)  | 0.073<br>(0.089) | -0.355***<br>(0.103)       |
| Adj. R2                     | 0.134               | 0.068            | 0.082                      |
| Children                    | 11690               | 11690            | 11690                      |
| F-test (p-value)            | 0.011               | 0.551            | 0.046                      |
| <b>Panel C</b>              |                     |                  |                            |
| <b>High Education</b>       |                     |                  |                            |
| Share of full-day slots     | 0.032<br>(0.039)    | 0.070<br>(0.081) | -0.114<br>(0.082)          |
| Adj. R2                     | 0.050               | 0.087            | 0.074                      |
| Children                    | 17864               | 17864            | 17864                      |
| <b>Low Education</b>        |                     |                  |                            |
| Share of full-day slots     | 0.065<br>(0.050)    | 0.038<br>(0.069) | -0.244***<br>(0.080)       |
| Adj. R2                     | 0.096               | 0.081            | 0.093                      |
| Children                    | 74856               | 74856            | 74856                      |
| F-test (p-value)            | 0.475               | 0.518            | 0.036                      |
| <b>Panel D</b>              |                     |                  |                            |
| <b>Cohabiting Parents</b>   |                     |                  |                            |
| Share of full-day slots     | 0.062<br>(0.046)    | 0.015<br>(0.066) | -0.215***<br>(0.080)       |
| Adj. R2                     | 0.097               | 0.083            | 0.085                      |
| Children                    | 73569               | 73569            | 73569                      |
| <b>Single Parents</b>       |                     |                  |                            |
| Share of full-day slots     | 0.034<br>(0.079)    | 0.162<br>(0.105) | -0.347***<br>(0.107)       |
| Adj. R2                     | 0.099               | 0.088            | 0.101                      |
| Children                    | 14102               | 14102            | 14102                      |
| F-test (p-value)            | 0.693               | 0.070            | 0.046                      |

Notes: This table displays the estimates resulting from an OLS regression of children's development at school entrance on the share of full-day slots measured in children's year of birth. Standard errors are clustered at the municipality level.

Source: Statistics of the *Child and Youth Services in Germany*/School entrance examination 2004-2012/INKAR/Statistik-Nord, Own Calculations

The expansion of full-day slots by 11 ppts leads to a deterioration in boys' socio-emotional development by 2.7 ppt and in girls's socio-emotional development by 2.1 ppt. Despite these losses in terms of socio-emotional maturity, girls benefit in terms of school readiness. The gender differences, however, are not significant at any conventional significance level.

Differences are much more striking in terms of ethnic background: immigrant children suffer much more in terms of their socio-emotional development than native children. While native children score on average 2.3 ppt lower when full-day care increases by 11 ppt, immigrant children score on average 3.9 ppt lower. This difference is significant at the 5 % significance level. There is one further difference in the effect of full-day care between native and immigrant children, which is highly policy relevant: immigrant children benefit substantially from the expansion of available full day slots in terms of how prepared they are for primary school. Immigrant children are on average 2.6 ppt more likely to be assessed ready for school. This improvement is substantial in light of the raw gap between immigrant and native children of 7.6 ppt in terms of school readiness (87.9 % of all native children are assessed to be ready for school, while only 80.3 % of all immigrant children are). An explanation for this differential gain between immigrant and native children might be the lack of language proficiency among immigrant parents and thus their relatively weaker competence to prepare children for school in compare to professional child care workers.

Similarly striking are the results when stratifying by parental education: while children from a more educated family background are not affected by the observed expansion in full-day slots, children from a less educated family background experience substantial losses in terms of their socio-emotional development (2.7 ppt). The significant differential effect of full-day care on children from differential family backgrounds are in line with the sociological literature postulating better abilities among more educated mothers/parents to compensate for environmental conditions than among low educated mothers/parents (Hsin and Felfe, 2014). Whether these differences are due to a better knowledge in how to foster children's skill development or due to fewer financial constraints and thus due to more possibilities to outsource chores robbing parents of further time they could spend with their children (e.g. cleaning or running errands) is unclear.

Finally we observe the strongest detrimental effects in terms of socio-emotional maturity among children from single parents (most likely single mothers): while children from two-parent households lose "only" 2.4 ppt in the assessment of their socio-emotional maturity, children residing with just one parent lose 3.8 ppt when full-day care increases by 11 ppt. Again this might be explained by the inability of single parents to compensate for their absence during the remaining time – most likely due to the fact that they have to cope alone with child care as well as with work at the labor market and at home and lack the financial means to outsource certain chores.

Overall, results are in line with the outlined hypotheses in Section 2.3: center-based care can make a difference in comparison to motherly care, yet only when center staff possess of better skills to train children’s skills than parents. This is, for instance, the case for immigrant children: center staff is likely to possess of a better competence in the German language. Moreover, the activities and games organized by the center staff may be pedagogical valuable and aim at training children’s cognitive skills. This might be fruitful if children are willing to follow the instructions of the center staff, which is more likely to be the case for girls. Nevertheless, as postulated by the attachment theory time spent with the mother is crucial for the development of children’s social and emotional skills: as we can see, expanding the supply of full-day slots is detrimental for the development of socio-emotional skills of almost all children – the exception being children from better educated parents.

## 6 Conclusion

What are the implications for children when expanding the supply of full-day slots in care centers? We analyze this question using two particularly rich administrative data sources for one West German state – school administrative data informing us about children’s development at the onset of primary school and care center records informing us about the supply and quality of center-based care. Our identification strategy relies on several reforms triggering the expansion of full-day slots in public child care. Specifically, we exploit the municipality-specific deviations from the overall trend in the timing of the expansion.

Our results show that on average longer opening hours of child care centers do not promote children’s cognitive skills or motor skills, but harm children’s socio-emotional development. Alternatively stated, spending less time with the mothers has a negative impact on children’s socio-emotional maturity. Subgroup analysis reveals that these effects are driven by children from disadvantaged backgrounds. Children from more advantaged backgrounds are not affected at all, which is most likely explained by their parents being more successful in compensating for the loss of time during the afternoon. Importantly, subgroup analysis also reveals that children from immigrant background are better prepared for primary school – a finding which is most likely explained by center staff being better prepared to train immigrant children’s language skills.

Our findings are interesting from two points of view: first, they highlight once again that the consequences of center-based care depend on the quality of the counterfactual care. Second, they make clear that the returns to time investments are likely to be non-linear and thus, one cannot just extrapolate from studies analyzing, for instance, the effects of center-based care functioning on a half-day basis.

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## A Appendix

Table A.1: Comparing children in full-day and half-day care using alternative data

|  | Overall | Full Day | Half day | Difference | t-stat.   |
|--|---------|----------|----------|------------|-----------|
| <i>Panel A: Child Development - SEE data Hamburg</i>     |         |          |          |            |           |
| Healthy (d)  | .877    | .863     | .888     | -.025      | (-5.566)  |
| Hospital overnight stays                                 | 1.452   | 1.557    | 1.362    | .196       | (5.524)   |
| Socio-emotional maturity (0-1)                           | .959    | .952     | .964     | -.012      | (-10.597) |
| Children   | 23778   | 9469     | 14309    |            |           |
| <i>Panel B: Child Characteristics - SEE data Hamburg</i> |         |          |          |            |           |
| Male (d)   | .518    | .528     | .511     | .016       | (2.395)   |
| Birth weight (gram)                                      | 33767   | 3349     | 3398     | -48        | (-5.729)  |
| Foreign nationality (d)                                  | .100    | .095     | .104     | -.009      | (-2.252)  |
| Nr of siblings (excl. kid)                               | 1.118   | .964     | 1.237    | -.273      | (-21.059) |
| Children   | 23778   | 9469     | 14309    |            |           |
| <i>Panel C: Mother Characteristics - GSOEP data</i>      |         |          |          |            |           |
| Married  | .666    | .564     | .781     | -.216      | (-5.173)  |
| Cohabits   | .887    | .848     | .93      | -.082      | (-2.846)  |
| Education: primary school(d)                             | .542    | .518     | .57      | -.053      | (-1.161)  |
| Education: secondary school(d)                           | .165    | .179     | .149     | .03        | (.883)    |
| Education: university school (d)                         | .216    | .245     | .184     | .061       | (1.627)   |
| Employment (d)   | .439    | .49      | .382     | .109       | (2.417)   |
| Work hours   | 13.693  | 15.606   | 11.536   | 4.071      | (2.634)   |
| Children   | 485     | 257      | 228      |            |           |

Notes: Descriptives shown in Panel A and B are based on the school entrance examination data in Hamburg (SEE 2005 and 2011). Note, the share of children being in a care center increases across school cohorts (school cohort 2005: 89 % versus school cohort 2011: 94 %). The share of children attending half-day stays stable at around 51-53 %, but the share of children attending full-day increases from 36 % to 43 %. Descriptives shown in Panel C are based on data from the German Socio-Economic Panel (GSOEP), specifically on the mother-child questionnaire when children are age 5-6 (birth cohorts 2002-2005). Note, while the share of children being in a care center is rather stable across cohorts, the share of children attending half-day decreases from 37 % to 21 %, while the share of children attending full-day increases from 46 % to 63 %

Source: School entrance examination Hamburg 2005 & 2011; German Socio-Economic Panel, mother-child questionnaires, 2008-2011; own calculations.

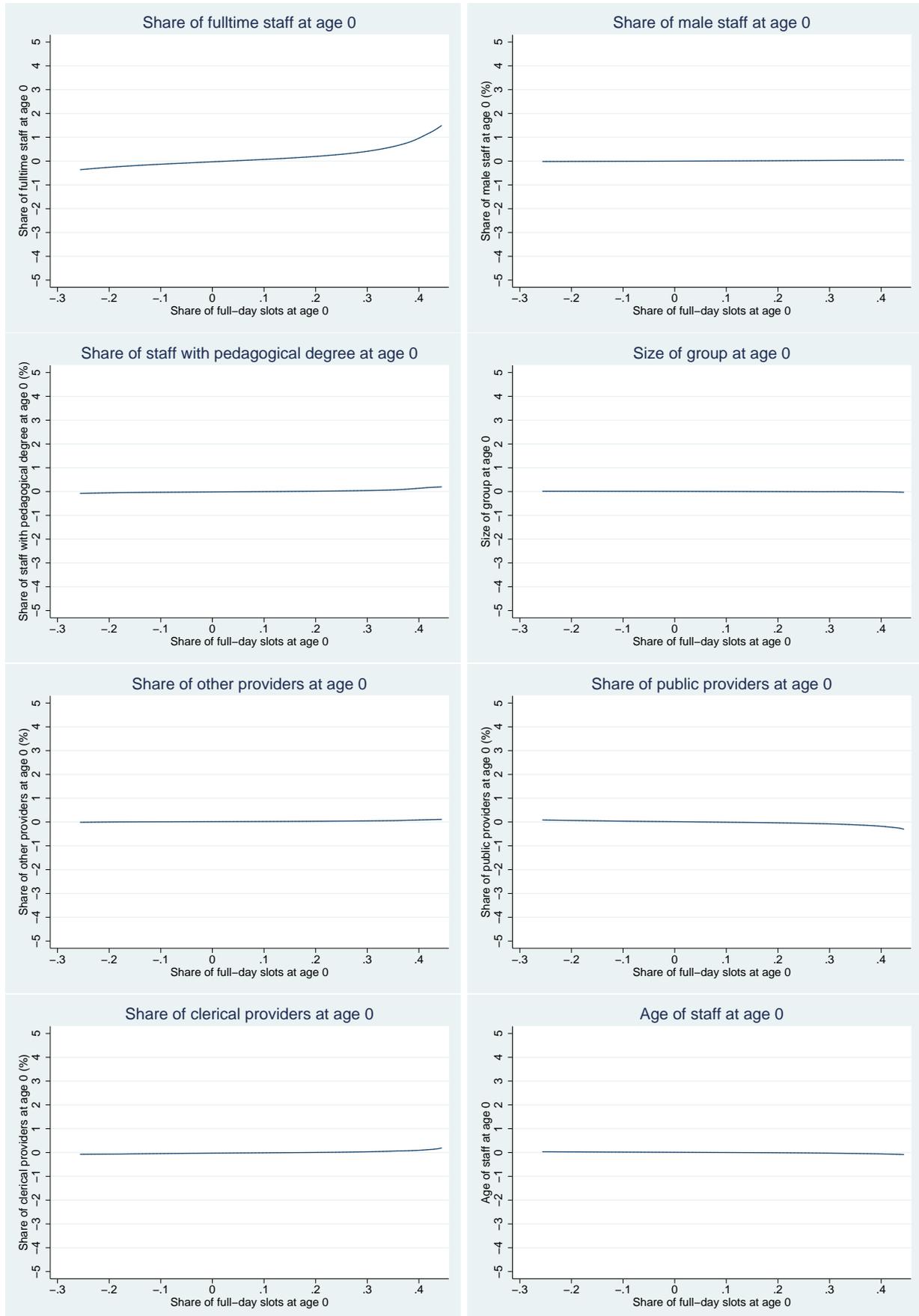
Table A.2: Determinants of the Share of Fullday Slots using lagged municipality features

|   | Full-Day-Ratio at Age 1 |
|---|-------------------------|
| Cohort 2005 (D)   | 0.014*<br>(0.008)       |
| Cohort 2006 (D)   | 0.027*<br>(0.015)       |
| Cohort 2007 (D)   | 0.046**<br>(0.021)      |
| Cohort 2008 (D)   | 0.094***<br>(0.025)     |
| Cohort 2009 (D)   | 0.113***<br>(0.026)     |
| Cohort 2010 (D)   | 0.130***<br>(0.027)     |
| Cohort 2011 (D)   | 0.205***<br>(0.048)     |
| Cohort 2012 (D)   | 0.255***<br>(0.053)     |
| Coverage 0-3 years old at Age 1 (in %)                    | 0.003<br>(0.006)        |
| Coverage 3-6 years old at Age 1 (in %)                    | -0.002<br>(0.003)       |
| Public provider at Age 1(in %)                            | -0.000<br>(0.001)       |
| Other provider at Age 1(in %)                             | -0.000<br>(0.001)       |
| Children per group at Age 1                               | -0.002<br>(0.003)       |
| Age of staff at Age 1(years)                              | -0.003<br>(0.005)       |
| Staff: male at Age 1(in %)                                | -0.002<br>(0.004)       |
| Staff: pedagogical degree at Age 1 (in %)                 | -0.001*<br>(0.001)      |
| Staff: fulltime at Age 1 (in %)                           | 0.005***<br>(0.001)     |
| Citizens per km2 at Birth                                 | -0.001<br>(0.001)       |
| Employed female at Birth (in %)                           | 0.006<br>(0.004)        |
| Fulltime-Employed female at Birth (in % of total working) | 0.001<br>(0.001)        |
| Share 0-6-y-old children at Birth(in %)                   | 0.024<br>(0.021)        |
| Votes for CDU and FDP in % at Birth                       | -0.017**<br>(0.008)     |
| Votes for other parties in % at Birth                     | -0.009<br>(0.006)       |
| Log of GDPpc at Birth (in 1000Euro/Citizen)               | 0.007<br>(0.103)        |
| Local business tax rate at Birth                          | -0.096<br>(0.146)       |
| Local tax rate on agrarian real property                  | -0.036<br>(0.065)       |
| Local tax rate on other real property                     | 0.035<br>(0.045)        |
| Municipality FE   | Yes                     |
| Reference year/cohort                                     | 2004                    |
| Slots (p-Value)   | 0.774                   |
| Institution (p-Value)                                     | 0.866                   |
| Center (p-Value)  | 0.001                   |
| Regional (p-Value)  | .213                    |
| Adj. R2   | .944                    |
| Children  | 93570                   |

Notes: This table shows the coefficients of the OLS estimates of the share of fullday slots. Regressions control further for a full set of municipality dummies and a constant term (not shown in the table). Standard errors are clustered at the municipality level and are shown in parenthesis: \*p < 0.10, \*\* p<0.05, \*\*\*p<0.010.

Source: Statistics of the *Child and Youth Services in Germany*/School entrance examination 2004-2012/INKAR/Statistik-Nord, Own calculations

Figure A.1: Changes of Care Quality over Changes of Share of Fullday Slots



Notes: These graphs are produced using Epanechnikov kernel regressions (bandwidth of 0.5). The share of full-day slots and the quality measures are expressed as deviations from municipality means.

Source: Statistics of the *Child and Youth Services in Germany*. Own calculations