



From dawn till dusk: Implications of full-day care for children's development

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ABSTRACT

An important issue on the political agenda of many developed countries is the intensive margin of formal child care and, consequently, the effects of expanding the operating hours of child care institutions. We add to this debate by studying the effects of offering full-day child care on child development. Specifically, we analyze the consequences of a substantial increase of full-day slots at the expense of half-day slots and hence, when holding the extensive margin constant. The conversion was triggered by several reforms to the German child care system. Using unique administrative data covering the full population of eight birth cohorts in one West German state, we find that more hours have a negative effect on children's socio-emotional well-being. Subgroup analysis suggests that this result is driven by children from disadvantaged family backgrounds, especially those from low-education backgrounds, single-parent households and migrant families. On a brighter note, we find that full-day care has a positive effect on the school readiness of immigrant children.

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 six-year-olds are enrolled in a child care program.¹ The intensity of child care, however, varies considerably across countries and rarely covers a full working day. Even in countries that offer full coverage, child care institutions mainly function on a half-day basis. In Germany, for example, since the early 2000s more than 90% of all children attend kindergarten (hosting three- to six-year-olds) prior to starting school, but many only on a half-day basis. The available child care institutions thus only partially facilitate parents' or, more precisely, mothers' participation in the labor market. To overcome this shortcoming, the current debate turns around the question whether to expand the operating hours of existing child care institutions.² Yet, what are the consequences for children's development of attending a child care center on a full-day basis compared to attending it on a half-day basis? The answer likely depends on the child development dimensions under study as well as on how well

the child care center cares for a child compared to the alternative mode of care during the additional hours, in our setting home care or, more precisely, motherly care.

We study the effects of offering full-day child care on a variety of skills – cognitive, motor, and socio-emotional skills – for children from various family backgrounds. To do so, we rely on several reforms to the German child care system that led to a conversion of half-day slots into full-day slots. Importantly, this conversion took place in a situation where full coverage of half-day kindergarten was commonplace.³ We are thus able to study the child development effects of the intensive margin of formal child care – a change in the amount of hours – in isolation from the extensive margin of formal child care – a change in the supply of slots.

In the early 2000s, Germany channeled substantial funding to child care centers so that they could increase the number of slots offering full-day care. Importantly, they did so by converting existing half-day slots into full-day slots. The funding, and thus the timing, of the expansion depended on centers' readiness to increase their supply of full-day slots and their administrative capabilities. As such, there is substantial variation in the available full-day slots across centers and time. We exploit this variation to identify the child development effects of a child care

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¹ All information on enrollment rates and opening hours are taken from the OECD Family Database (www.oecd.org/social/family/database, accessed on November 1, 2016).

² For instance, in 2005, Germany mandated an expansion of the opening hours of child care centers in the context of its Child Care Expansion Law, the Netherlands did so that same year in the context of its Child Care Act, the United Kingdom followed suit in 2006, as did British Columbia (Canada) in 2010.

³ Furthermore, the full-day care reforms took place before a more recent reform that granted each child turning one year old a subsidized slot in early child care targeted at 1- and 2-year-olds.

system operating mainly on a full-day basis. To abstract from underlying stable differences between neighborhoods and a general time trend, we control for a set of municipality and cohort dummies. In addition, we control for a set of demographic and socioeconomic municipality characteristics entering the annual predictions of local demand for full-day care. The remaining source of variation are thus various barriers to expansion, such as the lack of appropriate infrastructure, qualified staff or administrative delays, all likely to be orthogonal to children's development.

While not random, the timing of the expansion is plausibly exogenous. Consistent with this, the supply of full-day slots in late-expanding centers began to increase shortly after the supply in early-expanding centers. In addition, the average supply of full-day slots in early- and late-expanding centers converged over time. The timing of the expansion is also unrelated to the demographic and socio-economic structure of centers' neighborhood as well as care center features prior to the reform. The exceptions are the initially available share of full-day slots and the share of child care staff working full-time, both criteria for funding. The supply of full-day slots is also unrelated to region-specific trends in care center quality as well as changes in the local demographic and socio-economic structure, the exception being the relative power of the political parties, which we control for in our baseline specification. Finally, we are unaware of any other reform or policy change during the period we analyze that may have affected centers differentially.

Our main analysis is based on two unique data sources. First, we use administrative records of school entrance examinations (SEE) in Schleswig-Holstein, the most northern state in Germany. Specifically, we draw upon the 2004 to 2011 SEE and thus, the full population of children born between 1997 and 2005. The SEE include pediatricians' assessments of children's development, especially their overall school readiness, motor skills and socio-emotional maturity, at the onset of primary school. Our second source of information is register data on child care centers providing us with information on care centers' organization, full-day slots and structural quality.

Merging the two data sources via a unique municipality identifier, we calculate the full-day share – the share of full-day slots among all available child care slots – at the municipality level. We then estimate the effect of converting half-day slots into full-day slots (i.e. the effect of offering more slots operating on a full-day basis while holding overall supply of slots constant) on a series of child development outcomes. In our analysis, we distinguish between the following policy-relevant subgroups: children of high-educated native parents, children of low-educated native parents, children of single native parents, and children of immigrant parents. This distinction is based on the public policy debate which frequently promotes child care as a tool to combat inequality of opportunities. Drawing upon an additional source of data – the *Families in Germany* survey – we discuss counterfactual care modes, take-up rates as well as underlying mechanisms.

Overall, we find that an increase in the full-day share by 20 percentage points (ppt) – the magnitude of the reform under study – increases the prevalence of socio-emotional problems by 5.4 ppt (or 0.18 standard deviations, henceforth sd). This negative effect is most pronounced for children from a low-education background, single-parent household and migrant families. At the same time, immigrant children benefit in terms of school readiness: after the expansion under study, immigrant children were on average 7.4 ppt (or 0.19 sd) more likely to be assessed ready for primary school.

Our study relates to a large literature on the child development effects of universal access to child care centers. Findings from these studies are mixed and range from negative effects (Baker et al., 2008; Fort et al., 2017), neutral effects (Cascio, 2009; Datta-Gupta and Simonsen, 2010), to positive effects (Berlinski et al., 2009; Felfe and Lalive, 2018; Felfe et al., 2015; Fitzpatrick, 2008; Gormley Jr. et al., 2008; Havnes and Mogstad, 2011; Magnuson et al., 2007; Noboa Hidalgo and Urzúa, 2012; Schoenberg et al., 2018). The reasons for these heterogeneous effects likely have to do with both methodological and contextual differences,

such as the compliers (i.e., which children react to the expansion), the counterfactual care modes (e.g., informal paid arrangements, extended family members, or the mother), or the design of the child care system (e.g., in terms of opening hours, staff-child ratio, group sizes, and peer composition). Table A.1 in the Appendix provides an overview of the various child care systems, with a focus on the respective opening hours, that have been studied in the literature to date.

Extrapolating from the findings of these studies may lead to ill-informed conclusions regarding the effects of full-day child care if the effects of hours spent in child care on child development are non-linear. Studies on the effects of the intensive margin of child care are scarce. There is some evidence of a positive correlation between full-day child care and child development (Cryan et al., 1992; Gullo, 2000; Walson and West, 2004).⁴ A few recent studies aim to test the causality of this correlation. Most of these focus on the United States, a country with several, equally prevalent alternative care modes, such as maternal care, center-based care, informal paid care, and home care (Blau and Currie, 2006). For example, using the Early Childhood Longitudinal Survey, Rathburn and West (2004) and DeCicca (2007) compare children attending kindergarten (at age five) on a half-day basis with children attending kindergarten on a full-day basis – controlling for initial differences between the groups. They find no significant effect of full-time attendance on children's school performance. Using the same data, Cannon et al. (2006) exploit differences in U.S. state regulation of hours spent per day in kindergarten (at age five) and find short-lived positive effects on children's school performance. Focusing on Canada, a similar setting as the U.S. with various alternative care modes (Friesen et al., 2013; Sinha, 2014) exploit the staggered introduction of full-day kindergarten in British Columbia to analyze the impact of attending kindergarten on a full-day basis (at age five). 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.⁵

Our study makes several contributions to the literature investigating the intensive margin of formal care. In contrast to existing studies, we focus on Germany, a country with mainly one counterfactual care mode, motherly care, and thus a setting that allows for an easier interpretation of the (underlying reasons for the) estimated effects (Kirkeboen et al., 2014). Furthermore, the German setting allows to study the intensive margin in absence of any simultaneous changes of the extensive margin as there was full coverage with half-day slots during the time of study. Moreover, administrative data covering the universe of several school cohorts allow us to circumvent problems of non-response and misreporting, issues that can plague survey data as parents may be difficult to reach if working and justify their decision to enroll their child into full-day care. Finally, administrative data aggregated at the municipality level describing the universe of available child care centers allow us to deal with possible adjustments in child care centers' structural quality during times of a substantial child care reform.

The reminder of this study is structured as follows: the next section describes the German child care system, the expansion of full-day care under study, as well as potential mechanisms. Sections 3 and 4 introduce the data and the conceptual framework, respectively. Section 5 presents our main findings as well as results from the sensitivity analysis. Section 6 concludes.

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

⁵ There is one other study that 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 of after-school care for children from disadvantaged backgrounds.

2. Background

Pre-reform Scenario. In Germany, since the early 2000s, more than 90% of all three- to six-year-old children attend formal child care. This is the result of a federal mandate (§24, 1, SGB VIII) enacted in 1996 granting every child turning three years old access to a highly subsidized half-day slot in child care.

The predominant form of formal child care are care centers which are run by subsidized non-profit organizations, such as the municipality, the church, or welfare organizations.⁶ Care centers have to adhere to strict quality regulations which are given by the states and supervised by the local youth welfare services (located at the county level). Regulations concern aspects such as group size, staff-child ratios, staff qualifications, and operating hours. There are between two and five groups per center, each hosting up to 20 children and being supervised by two to three child carers on (about 60% of them hold a child care worker degree⁷). Care centers operate five days a week and children are all enrolled five days a week (details on the application and enrollment procedure are given below).⁸ Allocation across groups is independent of children's schedule, half-day and full-day children are both in the same group, with the former being picked up at noon and the latter staying during the afternoon. Table A.3 in the Appendix describes a typical day in a kindergarten group.

Child care slots are heavily subsidized. Parental fees cover only 30% of the total operating costs. The exact fee depends on family income and the number of siblings enrolled in child care and ranges between 0 and 200 Euro/month for a half-day slot and between 0 and 420 Euro/month (plus approximately 80 Euro/month for lunch) for a full-day slot. Importantly, parents are only entitled to subsidies in their municipality of residence. Subsidies come from three public entities. First of all, the state contributes a significant amount. For example, in Schleswig–Holstein, the state subsidy amounts to 60–70 million Euros/year, which covers approximately 15% of the total operating costs. This money is distributed to the counties based on the number of children enrolled in care centers, the number of immigrant children among them, and the operating hours of child care centers. Counties then contribute additional 5% to the operating costs. Municipalities bear the largest share of operating costs (around 40%). The remaining 40% of operating costs is paid by private organizations (10%) and, as mentioned above, parents (30%).

Prior to the reform, the majority of children was enrolled on a half-day basis. Given the German institutions – mothers are entitled to a maternity leave of up to three years, for institutional standards only a low share of them is working after maternity leave⁹ and most of them work on a part-time basis only – it was mainly the mother taking care of children during the afternoon. We provide more details on the counterfactual care situation below.

Expansion of Full-Day Care. When implementing the 1996 federal mandate, many German states revised their child care laws by requiring existing child care centers to expand their hours of operation.

⁶ Specifically, in West Germany in 2006, the private share was at 1% (own calculations based on the Statistics of the *Child and Youth Services in Germany*). Subsidized extra-familial child minders have become increasingly important since the 2005 day care expansion law, described further below. For the latest cohort under study, however, that is, those born between 07/2004 and 06/2005, this care mode was still of negligible importance: in West Germany, in 2006 only 1.2% of all zero- to three-year-old children were taken care off by a child minder. For three- to six-year-old children, this care mode was basically nonexistent (in 2011: only 0.5% of all three- to six-year old children residing in West Germany were cared for by a child minder).

⁷ In Germany, to qualify as a child care worker requires two years of theoretical training and at least two years of practice in a child care center.

⁸ Slot sharing is an uncommon practice in Germany.

⁹ In 2001, for instance, only 60% of all mothers with children in kindergarten age were working, see Bauenschuster and Schlotter (2015).

Schleswig–Holstein, the state under study, did so in 1999, specifically in the Schleswig–Holstein law on child care centers (the so-called *Kindertagesstättengesetz* or *KiTaG*). In 2005, the federal government followed and enacted the day care expansion law (*Tagesbetreuungsbaugesetz*, §24(1), SGB VIII). These reforms led to a conversion of a major share of existing half-day slots into full-day slots. As a consequence the number of full-day slots increased considerably between 2005 and 2011, while the number of half-day slots decreased (see Fig. 1, upper part). The daily routine and group structure in the care centers stayed the same, the only change being the number of children staying in the center during the afternoon. For these children, lunch, recreation and more activities were added to the daily routine (see Table A.3 in the Appendix).

Importantly, the overall number of slots available for three-to-six-year-olds stayed rather constant. Given the legal claim on a slot in kindergarten the share of children under study attending kindergarten was very high: 93.2% of the first cohort under study attended kindergarten, while 97.6% of the last cohort under study did so (see Table A.2 in the Appendix). The 2005 federal mandate also envisaged a sufficient supply of slots in *early* child care, i.e. care for 0-2-year-old children. Yet, it was only in 2013 that every child turning one year old was legally entitled to a slot in early care. As such, the cohorts under study were still confronted with a low supply of early care, none of them enjoying a legal claim on a slot in early care and only few of them enrolling in early care (3.4% of the cohort 2004 and 8.0% of the cohort 2011, see Table A.2 in the Appendix). Thus, our setting allows us to isolate a change in the intensive margin – hours of operation – from a change in the extensive margin – available slots. To rule out any related concerns, our estimations still control for the total number of early care slots and kindergarten slots per 100 children.

The expansion of full-day slots was heavily subsidized by the federal and state governments. Funds were allocated to centers in two steps. In the first step, the state government allocated subsidies to counties based on their predictions of existing demand for full-day care. These predictions were made annually by the counties' child and youth welfare services (§7, *KiTaG*). Key to these predictions were the number of children of kindergarten age and the number of mothers working full-time or desiring to work full-time. In the second step, centers applied for subsidies to the respective child and youth welfare service. Priority was given to centers with a low supply of full-day slots prior to the reform, a large number of kindergarten-age children, and a convincing expansion plan.¹⁰ Centers faced two main challenges when setting up their expansion plan: infrastructure and staff. Centers wanting to offer full-day care were required to have cooking and recreation facilities that complied with specific hygienic standards. These regulations limited the number of appropriate properties. Moreover, Germany lacked sufficient child care workers, especially full-time workers (e.g., in 2002, only 35% of the staff in child care centers in Schleswig–Holstein worked full-time). As a result, some centers were immediately ready to present a convincing expansion plan and receive subsidies, while other centers took considerably longer to meet the eligibility requirements. The responsible child and youth welfare services used lotteries or waiting lists to decide about the centers they were able to fund within a calendar year. All centers eligible for subsidies, but not served within the calendar year of application were short-listed for the following calendar year.

Applications and particularly approval of applications happened discontinuously at the center level. For reasons of data confidentiality, data are aggregated at the municipality level. We thus observe the average expansion of available slots at the municipality level – a smoothed version of the expansion at the center level – and our identification strategy

¹⁰ This discussion is based on several interviews with the officials who were in charge of implementing the expansion. Administrators provided us with rich personal information on the allocation process.

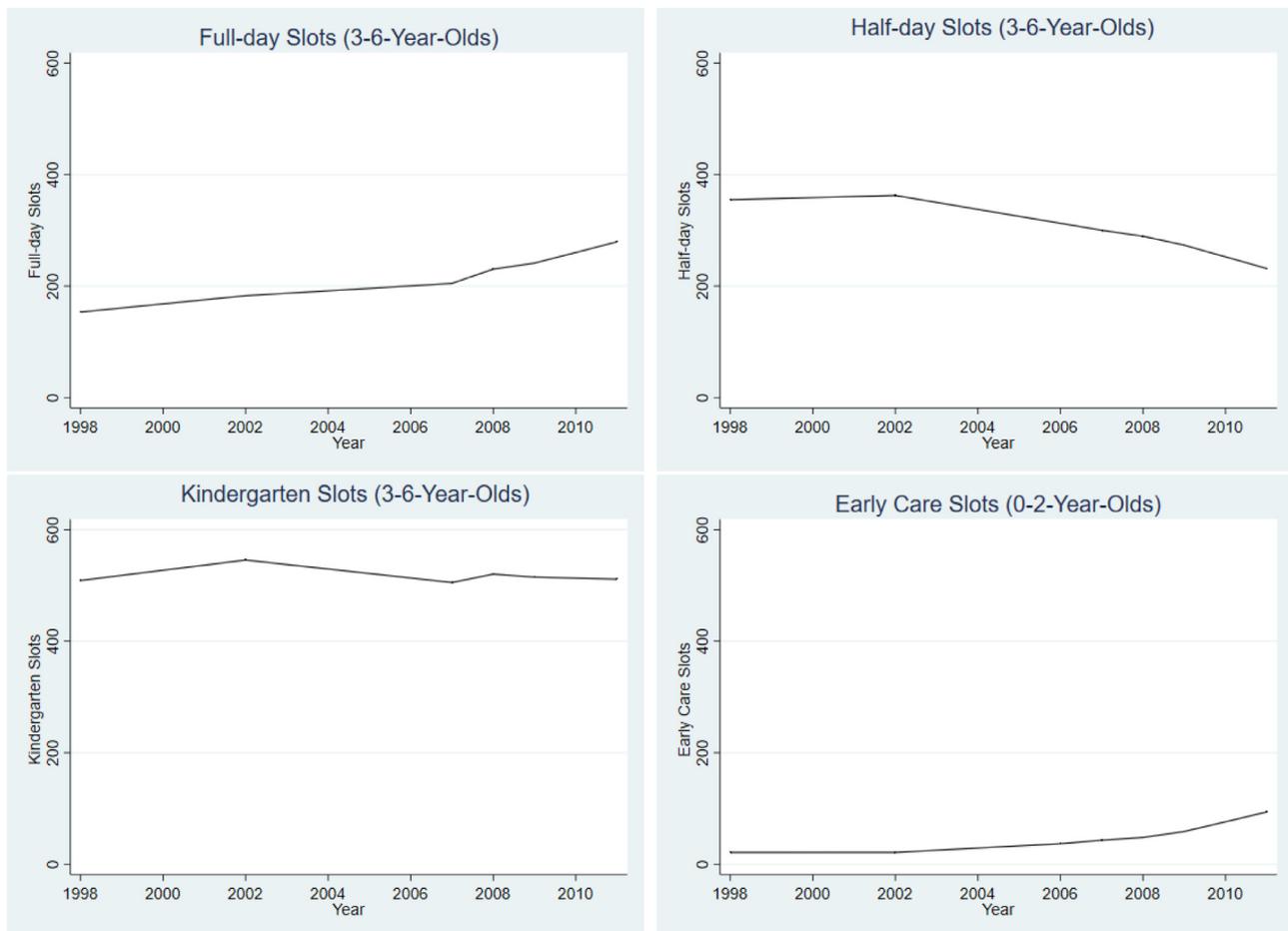


Fig. 1. Expansion of the Number of child care slots Note: The graphs show the average absolute number of slots per municipality. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany* 1998–2011. Own calculations.

rests upon the municipality-specific timing when converting half-day into full-day slots (see Section 4 for details).

Application and Enrollment. Parents apply for a slot directly at the center up to six months prior to enrollment. Slots are assigned five days a week, but parents decide whether to apply for a half-day slot or a full-day slot. This choice set reflects the most common work schedules in Germany, full-time or part-time (working 4 h a day, 5 days a week). If there is excess demand for full-day slots, care centers prioritize two-earner households, single parents and families with migration background.

To provide some intuition about take-up, we draw on the *Families in Germany* (FiD) data, survey data on four-to-five-year-old children born in West Germany between 2004 and 2007.¹¹ Table 1 shows take-up rates for the pooled sample as well as for the subgroups of interest. They result from a series of OLS estimations where we regress individual enrollment in full-day care on the locally available full-day share as well as all other control variables except the set of municipality dummies.¹²

The overall take-up rate amounts to 47.4%, i.e. on average, one of every two full-day slots is used, a situation which likely reflects the final stage of the expansion under study where supply met or even exceeded

¹¹ We restrict the analysis to West Germany and thus, to 1103 children living in 251 counties. Table A.4 in the Appendix shows descriptive statistics of the child characteristics in the FiD data and compares them with those in the SEE data.

¹² The smallest regional unit in the *Families in Germany* survey we can identify are counties. We thus merge all regional characteristics including the full-day share at the county level.

demand. In line with the priority scheme, the take-up rate is highest for children from immigrant families, in particular from the low educated ones (57.3%). Children of high-educated native parents exhibit a take-up rate of 40.0%, children of low-educated native parents a slightly lower take-up rate of 36.7%. The difference by parental education likely reflects the fact that high-educated parents likely (want to) work both and thus get priority when full-day slots are assigned (see Table 2, Panel D for supportive evidence). Children of single parents exhibit lowest take-up, but still 32.8% react to the newly opened full-day slots. The lack of precision for the sample of children from single parents is likely due to the sample size of this subgroup. Overall, take-up rates are pretty comparable across subgroups.

Counterfactual Situation. The main alternative care modes over the early years in a child's life are the mother and formal care. This is due to the German institutions – a parental leave up to 36 months and highly subsidized formal child care – and the still conservative societal understanding of the mother being best in taking care of the child. Using the FiD data, we provide some numbers regarding the usage of alternative care modes, where mothers are the default option (and thus not reported). Panel A in Table 2 shows the differences in the actual number of hours children are taken care of by alternative care providers between children enrolled on a half-day basis and a full-day basis, conditional on the full set of controls.¹³

¹³ Table A.5 in the Appendix shows the mean and standard deviation of the various variables of interest of the *Families in Germany* survey.

Table 1
Take-up rate across subgroups.

	Pooled sample	Native high-edu. parents	Native low-edu. parents	Native single parents	All immigr. parents	Low-edu. immigr. parents
Full-Day share	0.474*** (0.0761)	0.400* (0.224)	0.367** (0.181)	0.328 (0.270)	0.394** (0.163)	0.573*** (0.111)

This table shows evidence from the *Families in Germany*-survey conducted by the *DIW Berlin*. The data stem from parents' interviews, conducted between the years 2010–2013, on 1103 children living in 251 counties in West Germany who were born between 2004 and 2007. The table shows the coefficients of regressions of the actual full-day care attendance on the county's full-day share (i.e. the take-up rate). Individual and regional characteristics, and year fixed effects are included. Standard errors are clustered at the county level and shown in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.010$. Source: *Families in Germany*. RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany* 1998–2011. INKAR. Statistik-Nord. Own calculations.

By definition, children enrolled on a full-day basis spend more time in a care center than children enrolled on a half-day basis. This difference varies across subgroups and ranges between 13.9 h per week (or almost 3 h per day) for children from a high-educated family background to 19 h per week (or almost 4 h per day) for children from a single parent household. Strikingly, there are no further notable differences in the hours children spent with other care providers – the exception being native fathers who take over some, but not significantly more child care duties (about 3 h per week) and extended family members in the case of low-educated immigrant families (about 2 h per week). Taken together, our setting is a setting where care is provided by the mother and the care center – an important difference to previous studies focusing on the US or Canada, settings of more private market oriented child care systems.

Mechanims. Substituting motherly care by formal care may affect children in several ways. First of all, there is the direct effect of substituting one care mode by another – motherly care by center-based care. Care modes may differ in the capacity to foster different dimensions of children's development. As mentioned before, care centers are required to adhere to strict quality regulations and thus, variation in quality across care centers should play a minor role (for further discussion please refer to Section 4). Staff in care centers follow a strict curriculum tailored to foster children's cognitive and motor skills. Attending child care on a full-day basis may thus exert a positive effect on these skill dimensions.

Parents play a crucial role in fostering children's socio-emotional development. Attachment theory postulates that the separation from the primary caregiver – who in most cases is the mother – causes anxiety and stress of children (Bowlby, 1969; Mercer, 2006). While the attachment theory primarily applies to children of younger ages, it may still hold true for slightly older ages, in particular when it comes to the marginal time spent with the primary caregiver. Spending time in formal care may cause a lot of emotional stress for children, from which they need time to recover. Mothers might be differently capable of offering their child the necessary time and emotional support, especially when only a few hours are left after picking their child up from full-day care. Less-educated mothers are likely to work in jobs that offer low pay, are unstable and expose workers to physical hazards and psychological stress, all factors which are known to correlate negatively with good parenting and child development (Felfe and Hsin, 2012; Han, 2005; Johnson et al., 2005; McLoyd, 1998; Raver, 2003). High-educated mothers, in contrast, may be more capable to provide their children with stimulating and supportive care in the remaining hours after a full working day.

In addition to the direct effect there may be indirect effects of full-day care on children's development. As previously discussed, center-based care frees maternal time and may thus help mothers to engage in employment. Indeed, evidence from the FiD data points to a positive correlation of full-day care and employment at both the extensive and the intensive margin, in particular in the case of high-educated mothers (see Panel B of Table 2). Mothers whose children are enrolled on a full-day basis earn on average 290 Euro/month (net) more than mothers whose children are enrolled on a half-day basis. This likely exerts a

positive effect on children's skill development (Dahl and Lochner, 2012; Gonzalez, 2013).

Finally, mothers might adjust the type of activities undertaken with the children. Descriptive evidence from the FiD data on the frequency (on a daily basis) of a range of child-mother interactions does not reveal any major adjustments (see Panel C in Table 2).

3. Data and descriptive statistics

This section describes the data and provides first descriptive statistics of our sample.

3.1. Data

Data sources: We rely on two administrative data sources, official records from *school entrance examinations (SEE)* and the *statistics of the child and youth services (Kinder- und Jugendhilfestatistik, KJHS)*.

The SEE form part of a series of mandatory medical screenings between birth and primary school. They are meant to promote children's health by diagnosing medical anomalies and providing necessary treatment as early as possible. They are conducted by pediatricians employed by the local health service who document children's development including their "readiness" for primary school. The SEE take place in the year prior to entering primary school when children are on average six years old. For our study, we use data on SEE 2004 to 2011 and thus on children born between 07/1997 and 06/2005 – a school cohort comprises all children who turn six between July of the previous year and June of the school entrance year.¹⁴ We choose these cohorts for our analysis as they have all equal access to early care and kindergarten (see Table A.2), but differential access to full-day care. While parents answer a series of questions regarding child and family background, there is no question regarding the number of hours that children spend in child care and we thus have no information on individual full-day child care attendance.

The KJHS is register data on all German child care centers provided by the principals of the care centers on an annual basis. It informs on the number of slots available in each care center, the share of slots offered on a full-day basis, as well as a series of care center structural quality characteristics (see below). While collected at the center level, for data confidentiality reasons this data is released at the municipality level only – in fact, for a group of neighboring municipalities if municipalities have less than three care centers. We identify 75 municipalities on which level we merge the KJHS data with the SEE data. By that we

¹⁴ Note that each child is only once included in the data. Children who are assessed to be not ready for school have to undertake a special examination one year later. Parents may ask their child to be assessed one year earlier than scheduled (possible for all children turning six between July and December). Importantly, there is no correlation between parental decision to send their child earlier to school and the expansion of full-day care. Nevertheless, to circumvent any endogeneity problem, we have excluded these children from our analysis.

Table 2
Conditional differences between children in full-day vs. half-day care.

Treatment variable	Pooled		High education		Low education		Single		Low education		All	
	Full-day	s.e.	natives		natives		natives		immigrants		immigrants	
			full-day	s.e.	full-day	s.e.	full-day	s.e.	full-day	s.e.	full-day	s.e.
Dependent variable												
Panel A: Care Modes other than maternal care (Hours per week)												
Public child care	15.81***	(0.510)	13.93***	(0.726)	16.57***	(0.669)	19.00***	(1.669)	16.17***	(1.165)	15.67***	(1.109)
Father	2.448*	(1.430)	4.354	(3.737)	3.355*	(1.810)	-0.167	(0.148)	-0.271	(3.182)	-0.439	(3.048)
Extended family 6	0.596	(0.453)	-0.601	(0.671)	0.754	(0.649)	-1.177	(2.039)	2.071*	(1.094)	1.589	(1.441)
Others	0.0682	(0.0881)	0.0855	(0.224)	0.152	(0.107)	0.544	(0.405)	-0.106	(0.136)	-0.0999	(0.126)
Panel B: Maternal labour market participation												
Employment	0.186***	(0.0333)	0.166**	(0.0738)	0.183***	(0.0437)	0.0373	(0.107)	0.162**	(0.0797)	0.156*	(0.0804)
Fulltime	0.0960***	(0.0277)	0.127*	(0.0649)	0.0981***	(0.0366)	-0.103	(0.106)	0.0653	(0.0673)	0.0328	(0.0614)
Working hours	7.298***	(1.108)	7.852***	(2.562)	7.812***	(1.414)	1.958	(3.390)	5.285*	(2.731)	3.540	(2.791)
Net income (Euro/month)	290.1***	(77.74)	425.4*	(247.4)	229.1***	(64.51)	-27.91	(179.1)	338.5**	(149.9)	256.8*	(143.7)
Panel C: Mother-Child activities (with 0 never/rarely and 1 often/regularly)												
Outdoor activities	-0.0361*	(0.0211)	-0.0408	(0.0455)	-0.0240	(0.0259)	-0.0693	(0.0932)	-0.0776	(0.0666)	-0.0797	(0.0646)
Indoor activities	-0.0156	(0.0152)	0.0186	(0.0341)	-0.0146	(0.0206)	-0.0160	(0.0514)	-0.0835	(0.0574)	-0.0759	(0.0515)
Passive activities	0.0229	(0.0309)	0.113*	(0.0584)	0.0141	(0.0391)	0.192*	(0.0983)	-0.0951	(0.0847)	-0.108	(0.0783)
Panel D: Reasons forusing public child care (from no (1) to absolutely (4))												
Employment	0.631***	(0.0816)	0.931***	(0.193)	0.569***	(0.103)	0.748***	(0.268)	0.361*	(0.215)	0.229	(0.198)
Workload	0.145**	(0.0589)	0.176	(0.154)	0.124*	(0.0722)	-0.0200	(0.296)	0.0307	(0.182)	0.0211	(0.176)
Further education	0.122**	(0.0538)	0.191*	(0.112)	0.0758	(0.0688)	0.430***	(0.161)	0.0802	(0.155)	0.104	(0.141)
Child development	-0.0783**	(0.0393)	-0.0762	(0.117)	-0.0691	(0.0570)	0.0346	(0.188)	-0.208*	(0.110)	-0.165	(0.101)
Time for oneself	-0.0762	(0.0490)	-0.265**	(0.117)	0.0475	(0.0610)	-0.0529	(0.157)	-0.350***	(0.127)	-0.256**	(0.121)
Panel E: Satisfaction of mothers with public child care (from low (0) to high (10))												
Satisfaction activities	0.411**	(0.160)	0.635*	(0.374)	0.145	(0.216)	-0.989	(0.685)	0.585	(0.389)	0.866**	(0.400)
Overall satisfaction care	-0.0906	(0.133)	0.0831	(0.282)	-0.272	(0.177)	-0.0427	(0.482)	0.124	(0.315)	0.361	(0.314)

Notes: This table shows evidence from the *Families in Germany*-survey conducted by the *DIW Berlin*. The data stem from parents' interviews, conducted between the years 2010–2013, on 1103 children living in 251 counties in West Germany who were born between 2004 and 2007. The table shows the differences between children enrolled in full-day resp. half-day care. The difference is conditional on regional controls and individual characteristics as well as state and cohort fixed effects. Standard errors are clustered at the county level and shown in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.010$. Source: *Families in Germany*. Own calculations.

combine individual-level data on child development with average characteristics of the care centers available to a cohort in their municipality of residence.¹⁵

Restricting our sample to children for whom we possess information on all child development measures leaves us with a sample of 86,901 children belonging to eight school entrance cohorts and residing in 75 municipalities. Below, we describe in detail our child development measures, the available measures for the full-day share, and a set of individual and regional background characteristics.

Child Development Measures: The SEE provides us with several child development measures. The "school readiness" assessment is our first outcome measure and is based on a pediatricians' diagnoses concerning various developmental domains. Notwithstanding this, it does not necessarily correspond to the (weighted) sum of these domains as it may also include pediatricians' impressions on other not directly assessed aspects relevant to being ready for primary school (e.g., an immigrant child's proficiency in German or cultural assimilation). Even if not binding, the school readiness diagnosis is an important piece of information in parents' decision about whether or not to enroll their child in school at the conventional age for doing so. The "motor skills" diagnosis, our second outcome, concerns the child's coordination and motor capacities. For example, children are asked to stand on one leg, jump on one leg, jump left and right, and so forth. The "socio-emotional maturity" assessment is based on pediatricians' observations as well as on a parental questionnaire – the well-established *Strengths and Difficulties Questionnaire* or SDQ (Goodman, 1997) – and designed to identify emotional problems, behavioral problems, hyperactivity, peer relationships, and social behavior.¹⁶

There is a growing body of research relating such early performance indicators to later success in 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) show that dimensions assessed in the SEE – such as intellectual skills and socio-emotional maturity – are key in predicting later educational achievement. Additionally, motor skills are surprisingly strong predictors of children's later achievements (Grissmer et al., 2010).

Treatment: The KJHS allows us to build a measure for the full-day share among all child care slots available to a given cohort in a given municipality. Several points need to be mentioned. First, we do not have information on the number of hours that children stay in the center, but only on the respective share of full-day and half-day slots. As a result, we focus on the effect of half-day care versus full-day care and not on the marginal effect of spending one more hour in formal care.¹⁷ Second, the KJHS informs on the number of slots operating on a full-day basis in a given care center, but does not allow differentiating between full-day slots offered to children of a specific age. As such, we need to decide at

¹⁵ 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.

¹⁶ There might be concern that the assessment of socio-emotional maturity could be affected by subjective perceptions of the caregiver, or by non-response problems. Considering that the pediatricians reassess children's socio-emotional maturity and that in 93% of all cases a medical diagnosis regarding socio-emotional maturity is available, reporting and non-response biases 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 making an assessment). This is unlikely, however, and can be accounted for by the municipality fixed effects, which, given the low turnover of pediatricians, implicitly corresponds to a pediatrician fixed effect: on average, every pediatrician is assigned between five and eight municipalities.

¹⁷ On average, half-day care means four hours of center-based care per day, and full-day care means an average of seven hours of center-based care per day.

which age to measure the available full-day share. In our baseline specification we opt for the average across all years prior to school entrance and thus for the average full-day share between ages zero and six. Our results are robust to alternative age brackets (see Section 5.2).

Controls: *Individual characteristics* – Using parental reports on child and family background provided by the SEE data, we consider the following individual-level controls: gender, age, birth weight, number of siblings, parental education, immigrant background, and living with a single parent.

Care center characteristics – The KJHS allows us to construct the following series of indicators describing the formal care situation at the municipality level: the coverage rate among zero-to-two-year-old children and three-to-six-year-old children, the provider (public provider vs. the church vs. other providers), as well as structural quality features such as group size and staff composition in terms of age, gender, pedagogical degree, and workload.

Regional characteristics – Finally, we add information on municipality's demographic and socioeconomic composition such as population density, share of zero-to-six-year olds in the population, GDP per capita, female employment and female full-time employment, vote shares, and local tax rates. These data are provided by the *Federal Institute for Research on Building, Urban Affairs and Spatial Development* and the statistical office of Schleswig-Holstein.

3.2. Descriptive statistics

Table 3 provides descriptive statistics for the pre-reform cohorts of our sample (SEE 2004 and 2005). We look separately at the full sample and at the different subgroups: children of high-educated native parents (17.3% of the full sample), children of low-educated native parents (55.9%), children of native single parents (12.8%), and children with a migrant background (12.1%). We also investigate immigrant children with low-educated parents separately as they constitute the majority of all immigrant children (8.4% of the full sample) and represent a more homogeneous group.

Panel A of Table 3 displays the mean values of the different child development measures for the pooled sample and the various subgroups. All measures are binary, being 1 if a child performs age-appropriate, and 0 otherwise.¹⁸

As can be seen in Panel A of Table 3, on average, 88.1% of children are assessed ready for primary school. Among the children of high-educated native parents a much higher share is assessed to be ready for primary school than is the case for children of low-educated native parents (95.7% vs. 88.3%). The assessments of school readiness among children of single parents (85.2%) and immigrant parents (83.2%) are even lower. In other words, there are large gaps between the different socioeconomic subgroups: 7.4 ppt when stratifying by parental education and 4.9 ppt when stratifying by immigrant background (conditional on parental education).

As regards motor skills, children of high-educated native parents again fare best; 86% of them do not have any problems in this skill dimension. Among immigrant children, 84% have age-appropriate motor skills, while only 80.5% of children of low-educated native parents and 79.1% of single parents are so assessed. Thus, we again find substantial

¹⁸ The medical diagnosis can take five forms: "normal development," "some problems, but no treatment is necessary," "some problems, already in treatment," "problems, treatment necessary," or "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 1 if the child does not exhibit any problem with the assessed tasks. The school readiness recommendation can take the following three forms: "ready for school," "school enrollment only with support provided by the teacher," or "special needs education required." We also construct a binary indicator that equals 1 if the child is ready for school.

Table 3
Descriptive statistics on individual skills and characteristics (for Pre-Reform Cohorts).

	Pooled sample	Native high-edu. parents	Native low-edu. parents	Native single parents	All immigr. parents	Low-edu. immigr. parents
Panel A: Skills						
School readiness(D)	0.881 (0.324)	0.957 (0.203)	0.883 (0.322)	0.852 (0.355)	0.832 (0.374)	0.834 (0.373)
Motor skills(D)	0.817 (0.387)	0.860 (0.348)	0.805 (0.396)	0.791 (0.406)	0.840 (0.367)	0.839 (0.368)
Socio-emotional maturity(D)	0.900 (0.299)	0.944 (0.230)	0.892 (0.311)	0.856 (0.352)	0.917 (0.275)	0.919 (0.272)
Panel B: Characteristics						
Male (D)	0.525 (0.499)	0.532 (0.499)	0.522 (0.500)	0.528 (0.499)	0.520 (0.500)	0.518 (0.500)
Age (in month)	74.405 (3.713)	74.032 (3.627)	74.493 (3.718)	74.596 (3.717)	74.549 (3.723)	74.504 (3.672)
Birth weight (in gram)	3381.539 (599.530)	3439.026 (583.928)	3379.600 (600.228)	3329.638 (613.731)	3362.913 (584.130)	3363.725 (588.361)
Nr of siblings (excl. kid)	1.203 (1.033)	1.142 (0.838)	1.122 (0.979)	1.004 (1.088)	1.574 (1.206)	1.586 (1.226)
N	23,453	3716	14,321	3068	1970	2684

Notes: These individual descriptives are based on the cohorts 2004 and 2005 of the school entrance examination (SEE) data, i.e. those cohorts that went to kindergarten before the full-day care expansion started. For Panel A, we construct a binary indicator which equals one if the child is assessed to be ready for school. Based on the medical diagnoses in the SEE, we construct a binary indicator for each of the two dimensions motor skills and socio-emotional maturity, which is equal to one if the child does not exhibit any problem in the assessed tasks. Standard deviations in parentheses. Source: Statistics of the school entrance examination 2004–2005. Own calculations.

socioeconomic disparities, but a negligible gap between native and immigrant children (conditional on parental education). Finally, children of high-educated parents also feature the highest probability of having no problems in terms of their socio-emotional maturity (94.4%). On average, children of immigrant parents do not fare much worse in this dimension (91.7%). Yet, only 89.2% of children of low-educated native parents and 85.6% of children living in a single-parent household are assessed to be socio-emotionally mature, thus revealing the potential role of the parent-child interaction for children's socio-emotional maturity.

Panel B in Table 3 contains demographic information about the children under study. On average, the children are 74.4 months (6.2 years) old and around half of them are boys (52–53%). There are no major differences between the subgroups in terms of birth weight (ranging from 3362 to 3439 g). Children of immigrant parents have on average more siblings (1.6) than children in the other subgroups. Children of single parents have the lowest number of siblings (1.0).

4. Empirical framework

Effect of interest. Our aim is to estimate the effect of expanding the operating hours of child care centers on children's development. For this purpose, we estimate the following equation:

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

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 among all child care slots offered to cohort c in municipality m . Z_{mc} represents the set of municipality demographic and socioeconomic features, among them the criteria entering the prediction of the expected full-day share. Specifically, we control for the respective municipality's share of child care providers, the child care coverage rates for zero- to three-year-olds as well as for three- to six-year-olds, the population density, the share of zero- to six-year-olds in the population, GDP per capita, female employment and full-time female employment, vote shares, as well as local tax rates. All of them are measured in the birth year of the respective cohort. X_i represents a set of individual background characteristics including child's gender, age, birth weight, number of siblings, parental education, migration background, and living with a single parent. In addition, we control for a set of cohort dummies μ_c which allows us to abstract from an overall trend in child development outcomes that

may co-move with an overall trend in the share of available full-day slots. The set of municipality dummies ψ_m allows us to get hold of any time-constant municipality characteristics that may correlate with the municipality specific expansion path of the full-day share and with the evolution of children's development over time. Finally, ϵ_{imc} represents an idiosyncratic shock.

Given the absence of individual attendance data, we can only provide an estimate for the intention-to-treat (ITT) effect of full-day child care attendance. This is a caveat common to many studies on the impact of child care on children's development, e.g. Baker et al. (2008), Cascio (2009), Felfe et al. (2015), Fitzpatrick (2008), Havnes and Mogstad (2011).

Identification. Identification is based on the municipality-specific timing of the conversion of existing half-day slots into full-day slots as required by the reforms to the German child care system. Two questions may arise when relying on this identification strategy. First, is there sufficient variation across municipalities in the timing of the expansion of full-day slots? Second, is the municipality-specific timing of the expansion of full-day slots indeed exogenous?

The conversion of half-day into full-day slots happened discontinuously at the center level at different points in time. Due to our data structure we observe the average increase of the full-day share at the municipality level over time which likely is a smoothed version of the increase at the center level. Notwithstanding this, Fig. 2 shows that there is still substantial variation in the timing of expansion at the municipality level. Specifically, Fig. 2 displays the expansion of the full-day share from 1998 to 2011 for two groups of municipalities, those that expand full-day care early and those that do so later. Importantly, all municipalities adjusted their child care system at some point during the first decade after the first reform and early- and late-expanding municipalities exhibit a similar full-day share in the medium run.

Whether the municipality-specific expansion path is exogenous is a challenging question. If we think along the lines of a difference-in-differences analysis, the necessary assumption for identification is one of parallel trends – in the absence of the reform, average child development should evolve similarly in both early- and late-expanding municipalities. In other words, the timing of the expansion must not be correlated with any variables confounding with child development.

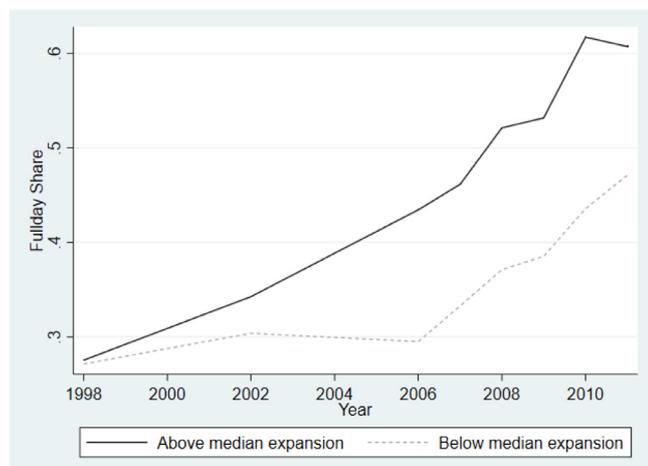


Fig. 2. Expansion of the share of full-day slots of early and late expanders. Notes: The share of full-day slots is expressed as municipality mean weighted by the number of children. The group of early expanders includes those municipalities that experienced an above median growth between 1998 and 2006. The group of late expanders includes the other municipalities. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the Child and Youth Services in Germany 1998–2011. Own calculations.

As described in Section 2, the decisive factor in the receipt of funding bycenters was their readiness to convert half-day into full-day slots. As such, one may be concerned that municipalities in which centers were lobbying strongly enough were the first to receive fund. Municipalities' economic standing may also have played a role, not least because municipalities contribute substantially to the operating costs of child care centers. Moreover, municipalities might have cut back on other social expenditures or increase taxes, to the extent feasible (the only margin municipalities can act on are corporate taxes and property taxes), so as to finance the expansion of operating hours of care centers. Finally, despite strict quality regulations, a rapid conversion into full-day slots may have come at the expense of quality, for example, due to an adjustment phase when new staff was hired.

While such scenarios are unlikely to unfold rapidly and thus are likely captured by the set of municipality dummies, we provide some empirical assessment of potential confounders of the expansion process. Table 4 sheds some light on the driving forces behind the municipality-specific expansion of the full-day share. Specifically, the table shows the resulting estimates when regressing municipalities' expansion in the available full-day share on a series of municipality and care center characteristics prior to the expansion under study (i.e., in 1998). In line with the criteria for determining priority in receiving funding, the full-day share expansion was particularly strong in municipalities exhibiting an initially low share of full-day slots (i.e., those that had to catch up) and those with a higher share of child care staff already working on a full-time basis (i.e., those that had fewer constraints on the supply side). Importantly, none of the above discussed potentially confounding municipality characteristics correlate with the municipality-specific expansion path.

A second concern relates to a co-movement of variables confounding with children's development. Table 5 addresses this issue empirically and provides an assessment of which variables change along with the share of full-day slots over time. To start with, there is no correlation between the share of full-day slots and the coverage of early care slots (for zero- to two-year-olds) and the coverage of kindergarten slots (for three- to six-year-olds). The p-value resulting from an F-test for overall significance of coverage in early care and kindergarten is 0.745, providing empirical support to our claim that we can isolate the effect of the intensive margin from the extensive one. None of the remaining observed municipality features correlate with the full-day share, with

Table 4
Pre-Reformdeterminants of the expansion of the full-day share.

	Expansion of the full-day share
<i>All explaining variables measured in 1998</i>	
Full-day share	-0.983*** (0.103)
Coverage 0–2 years old	-0.021 (0.020)
Coverage 3–6 years old	0.006 (0.006)
Public provider	0.001 (0.001)
Other provider	0.001* (0.001)
Children per group	-0.004 (0.003)
Age of staff	-0.007 (0.005)
Staff: male	0.001 (0.002)
Staff: pedagogical degree	-0.000 (0.001)
Staff: full-time	0.005*** (0.001)
Citizens per km ²	-0.000 (0.000)
Share 0–6-year-old children	-0.010 (0.016)
Log of GDPpc	-0.001 (0.010)
Employed female	0.002 (0.004)
Fulltime-employed female	0.001 (0.001)
Vote share for social democrats	-0.024 (0.018)
Vote share for other parties	0.024 (0.028)
Local business tax rate	0.203 (0.129)
Local tax rate on agrarian real property	-0.082 (0.113)
Local tax rate on other real property	-0.003 (0.084)
Adj. R2	0.781
Children	86,901

Notes: This table shows the coefficients of the OLS estimates of the expansion of the full-day share between 1998–2011 on regional characteristics in 1998. Standard errors are clustered at the municipality level and are shown in parentheses: *p < 0.10, ** p < 0.05, ***p < 0.010. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the Child and Youth Services in Germany 1998–2011/School entrance examination 2004–2011/INKAR/Statistik-Nord. Own calculations.

one exception, the political landscape. Municipalities in which the Social Democrats enjoy a relatively stronger representation than the more conservative Christian Democrats (by 1 ppt), have a 1.8 ppt higher full-day share. Similarly, municipalities in which smaller parties enjoy a 1 ppt stronger representation, have a 1.4 ppt higher full-day share. In sum, the evidence presented so far mitigates the concerns on potentially confounding municipality characteristics correlating with the municipality-specific expansion path. Nevertheless, our baseline specification controls for the full set of demographic and socioeconomic municipality features. We will furthermore test the robustness of the baseline results by adding municipality-specific trends capturing any unobserved municipality-specific developments, see Section 5.2.

Finally, there is no evidence in Table 5 for any adjustment in care centers' structural quality when expanding the share of full-day slots (with the exception of a small reduction in the share of pedagogical staff). This is likely due to care center quality being strictly regulated and constituting one of the eligibility criteria for receiving funding.

Table 5
Correlates of the expansion of full-day slots.

	Full-day share
<i>All explaining variables measured simultaneously</i>	
Cohort 2005 (D)	0.012 (0.008)
Cohort 2006 (D)	0.026* (0.016)
Cohort 2007 (D)	0.042* (0.021)
Cohort 2008 (D)	0.081*** (0.030)
Cohort 2009 (D)	0.099*** (0.031)
Cohort 2010 (D)	0.118*** (0.032)
Cohort 2011 (D)	0.180*** (0.051)
Coverage 0–2 years old	0.003 (0.008)
Coverage 3–6 years old	–0.002 (0.003)
Public provider	–0.000 (0.001)
Other provider	–0.001 (0.001)
Children per group	–0.003 (0.004)
Age of staff	–0.011 (0.007)
Staff male	0.002 (0.004)
Staff: pedagogical degree	–0.002** (0.001)
Staff: full-time	0.004** (0.002)
Citizens per km ²	–0.000 (0.001)
Share 0–6-year-old children	0.021 (0.023)
Log of GDPpc	0.053 (0.125)
Employed female	0.001 (0.004)
Fulltime-employed female	–0.001 (0.001)
Vote share for social democrats	0.018** (0.008)
Vote share for other parties	0.014** (0.007)
Local business tax rate	–0.226 (0.142)
Local tax rate on agrarian real property	–0.061 (0.095)
Local tax rate on other real property	0.143 (0.117)
Municipality FE	Yes
Reference cohort	2004
Care Coverage (p-Value)	0.745
Provider (p-Value)	0.820
Quality (p-Value)	0.005
Regional (p-Value)	0.023
Adj. R ²	0.946
Children	86,901

Notes: This table shows the coefficients of the OLS estimates of the share of full-day slots on simultaneously measured center quality and regional characteristics. 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 parentheses: *p < 0.10, ** p < 0.05, ***p < 0.010. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany 1998–2011/School entrance examination 2004–2011/INKAR/Statistik-Nord*. Own calculations.

Figs. A.1 and A.2 in the Appendix provide further empirical evidence supporting the claim that trends in care center quality were largely uncorrelated with the timing of expansion: early and late expanding municipalities exhibit parallel trends in a series of structural quality measures. Beyond structural quality, process quality plays a crucial role. While it is hard to measure, evidence based on the FiD data speaks against a correlation of process quality and hours of care (see Table 2, Panel E). If anything, mothers of children enrolled on a full-day basis express a higher satisfaction with the care center than mothers of children enrolled on a half-day basis. Nevertheless, we can not rule out a deterioration of process quality parallel to the expansion process, in particular not during the initial adjustment phase. For instance, staff might have not been able to spend enough time and connect with the children when training newly hired staff. We address this issue in a robustness check where we exclude the cohorts attending kindergarten right after the reform was ratified (i.e., SEE cohorts 2006–2008).

Thus, to sum up, the only remaining threat to identification relates to non-linear municipality-specific changes over time that are orthogonal to the assessed municipality-specific time-varying characteristics, but correlate with the municipality-specific variation in the share of full-day slots and children's development – a scenario hard to imagine. We are also unaware of any further reform of the education system during the time under study. In any case, any reform of the education system occurs at the state level and would thus be captured by the cohort dummies. The timing of the expansion of the share of full-day slots is therefore likely to be caused – conditional on the controls presented above – by exogenous events. Examples of such events are unplanned, non-systematic delays in the conversion of half-day into full-day slots such as difficulties in finding qualified staff, delays in remodelling the infrastructure or the administrative process.

5. Results

5.1. Baseline results

We now present our estimates of the child development effects of converting half-day child care slots into full-day child care slots. Table 6 shows the results for the pooled sample and the various subgroups when estimating Eq. (1) using OLS and clustering the standard errors at the municipality level.¹⁹

Table 6 shows first that there are no significant effects of the full-day share on children's school readiness or motor skills for the pooled sample. In contrast, there is a sizeable negative effect on the average child's socio-emotional maturity. Considering the expansion under study, which on average led to an increase of 20 full-day slots per existing 100 child care slots, the effect corresponds to a deterioration in children's socio-emotional development by 5.4 ppt or 0.18 sd.²⁰

The results stratified by children's family background reveal the following. First, there is substantial heterogeneity in the effects by parental education. Native children from a more educated family background are insensitive to an increase in operating hours of child care centers, at least in terms of the assessed skill dimensions. In contrast, native children from a less educated family background are unaffected in terms of school readiness and motor skill development, but experience a substantial loss in terms of their socio-emotional development: the expansion under study causes a deterioration in their socio-emotional skills of 5.4 ppt or 0.17 sd. Similar to children from less educated backgrounds, children growing up in a single-parent household experience a detrimental effect on their socio-emotional development: in their case, the expansion under study leads to a deterioration of their socio-emotional skills

¹⁹ Table A.8 in the Appendix displays the full set of results.

²⁰ The calculation is as follows: 20*0.268 gives the impact of increasing the full-day share by 20 ppt; dividing the result (5.4ppt) by the standard deviation of the overall mean of the socio-emotional development indicator taken from Table 3 being 29.9 results in 0.18.

Table 6
Baseline results: effects of the share of full-day slots on child development.

	School readiness	Motor skills	Socio-emotional maturity
Pooled sample			
Full-day share btw. Age 0 and 6	0.043 (0.065)	0.044 (0.120)	−0.268** (0.125)
Adj. R2	0.090	0.083	0.088
Children	86,901	86,901	86,901
Native high-educated parents			
Full-day share btw. Age 0 and 6	0.006 (0.051)	−0.176 (0.125)	−0.120 (0.117)
Adj. R2	0.037	0.087	0.073
Children	15,056	15,056	15,056
Native low-educated parents			
Full-day share btw. Age 0 and 6	0.033 (0.073)	0.044 (0.141)	−0.272** (0.134)
Adj. R2	0.088	0.088	0.091
Children	48,546	48,546	48,546
Native single parents			
Full-day share btw. Age 0 and 6	0.011 (0.093)	0.127 (0.200)	−0.509*** (0.128)
Adj. R2	0.091	0.090	0.096
Children	11,114	11,114	11,114
All immigrant parents			
Full-day share btw. Age 0 and 6	0.197 (0.151)	0.152 (0.189)	−0.506** (0.247)
Adj. R2	0.111	0.070	0.081
Children	10,523	10,523	10,523
Low-educated immigrant parents			
Full-day share btw. Age 0 and 6	0.370** (0.173)	0.208 (0.211)	−0.469 (0.328)
Adj. R2	0.106	0.071	0.083
Children	7304	7304	7304
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

Notes: This table displays the estimates resulting from an OLS regression of the three respective children's development indicators (dummies equal to one if there is no development problem) at school entrance on the full-day share measured as average across all years prior to school entrance and thus as average full-day share between ages zero and six. The regressions include individual characteristics, regional characteristics (measured at child's birth) as well as a set of municipality and cohort dummies. The table shows the regression results for the pooled sample as well as for four mutually exclusive subgroups – native children with high educated parents, native children with low educated parents, native children with single parents and immigrant children with low educated parents. Additionally, we show the results for children of all immigrant parents. Testing whether the effects between subgroups are significantly different from each other reveals the following: the effect on socio-emotional maturity is significantly different for children with high and low-educated native mothers (at the 1% significant level), between children from two-parents and single-parent households (at the 5% significant level). While immigrant children do not experience significantly stronger effects on their socio-emotional skills than native children, they benefit significantly more from attending child care on a full-day basis in terms of school readiness (at the 1% significance level). Standard errors are clustered at the municipality level and are shown in parentheses: *p < 0.10, ** p < 0.05, ***p < 0.010. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany* 1998–2011/School entrance examination 2004–2011/INKAR/Statistik-Nord. Own Calculations.

by 10.2 ppt or 0.29 sd. These subgroup results point to the possibility that mothers are differently capable of offering their child the emotional support, especially when only a few hours are left after a full day in formal care (see our discussion in Section 2).

A slightly different picture emerges for immigrant children. On average, immigrant children suffer from the expansion of full-day care in terms of their socio-emotional development, an effect that is even more

Table 7
Robustness tests.

	School readiness	Motor skills	Socio-emotional maturity
Panel A:			
With municipality trend			
Pooled Sample			
Full-Day Share btw. Age 0 and 6	−0.015 (0.054)	−0.016 (0.091)	−0.087 (0.071)
Native high-educated parents			
Full-Day Share btw. Age 0 and 6	−0.001 (0.032)	−0.026 (0.098)	0.011 (0.084)
Native low-educated parents			
Full-Day Share btw. Age 0 and 6	−0.031 (0.059)	−0.018 (0.096)	−0.054 (0.067)
Native single parents			
Full-Day Share btw. Age 0 and 6	−0.059 (0.090)	−0.025 (0.140)	−0.236* (0.127)
All immigrant parents			
Full-Day Share btw. Age 0 and 6	0.207* (0.121)	0.041 (0.156)	−0.298* (0.163)
Low-educated immigrant parents			
Full-Day Share btw. Age 0 and 6	0.188 (0.134)	0.131 (0.208)	−0.203 (0.207)
Panel B:			
With structural quality controls			
Pooled sample			
Full-Day Share btw. Age 0 and 6	0.051 (0.059)	0.056 (0.124)	−0.284** (0.121)
Native high-educated parents			
Full-Day Share btw. Age 0 and 6	0.016 (0.054)	−0.151 (0.133)	−0.115 (0.118)
Native low-educated parents			
Full-Day Share btw. Age 0 and 6	0.033 (0.070)	0.052 (0.147)	−0.298** (0.132)
Native single parents			
Full-Day Share btw. Age 0–6	0.014 (0.100)	0.114 (0.217)	−0.545*** (0.144)
All immigrant parents			
Full-Day Share btw. Age 0–6	0.190 (0.148)	0.157 (0.199)	−0.464*** (0.161)
Low-educated immigrant parents			
Full-Day Share btw. Age 0–6	0.348** (0.164)	0.234 (0.213)	−0.411* (0.219)
Panel C:			
Without Early Expansion Cohorts			
Pooled Sample			
Full-Day Share btw. Age 0–6	0.091** (0.044)	0.049 (0.098)	−0.333*** (0.121)
Native high-educated parents			
Full-Day Share btw. Age 0–6	0.019 (0.064)	−0.169 (0.121)	−0.194 (0.131)
Native low-educated parents			
Full-Day Share btw. Age 0–6	0.069 (0.065)	0.058 (0.123)	−0.341*** (0.126)
Native single parents			
Full-Day Share btw. Age 0–6	−0.025 (0.127)	−0.039 (0.177)	−0.606*** (0.169)
All immigrant parents			
Full-Day Share btw. Age 0–6	0.207* (0.119)	−0.099 (0.165)	−0.542*** (0.170)
Low-educated immigrant parents			
Full-Day Share btw. Age 0–6	0.332** (0.133)	−0.069 (0.181)	−0.602*** (0.177)
Municipality Fixed Effects	Yes	Yes	Yes
Cohort Fixed Effects	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes
Regional Controls	Yes	Yes	Yes

Notes: This table displays the estimates resulting from an OLS regression of the three respective children's development indicators at school entrance on the full-day share. In Panel A, municipality trends are added to the baseline specification. In Panel B, structural quality features of the care centers (groupsize, share of staff with a pedagogical degree, share of male staff, age of staff) are controlled for. In Panel C, the school entrance cohorts 2006–2008 are excluded to account for potential quality deteriorations during the early years of full-day care expansion. Standard errors are clustered at the municipality level and are shown in parentheses: *p < 0.10, ** p < 0.05, ***p < 0.010. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany* 1998–2011/School entrance examination 2004–2012/INKAR/Statistik-Nord. Own Calculations.

Table 8
Placebo regression: birth weight as outcome.

	Pooled sample	Native High-Edu. parents	Native Low-Edu. parents	Native Single parents	All Immigr. parents	Low-Edu. Immigr. parents
Full-day share	56.669 (66.872)	-75.653 (124.740)	64.607 (98.217)	982.310 (1103.303)	-416.069 (1514.792)	-96.012 (1277.002)
N	82,046	14,391	46,464	8305	5088	6995
Adj. R ²	0.019	0.017	0.017	0.027	0.016	0.017

This table displays the estimates resulting from an OLS regression of the placebo outcome birth weight of children (measured in gram) on the full-day share. All regressions include regional characteristics (measured at child's birth) as well as a set of municipality and cohort dummies. Standard errors are clustered at the municipality level and shown in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.010$. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany 1998–2011*/School entrance examination 2003–2012/INKAR/Statistik-Nord. Own Calculations.

pronounced for them than for their native peers: the expansion under study implies a deterioration of immigrant children's socio-emotional maturity by 10.1 ppt or 0.28 sd. On the bright side, full-day care fosters their school readiness, at least for immigrant children from a less educated family background: the observed expansion led to an increase in these children's overall school readiness of 7.4 ppt or 0.19 sd. This improvement is substantial in light of the raw immigrant and native children gap in school readiness (4.9 ppt when conditioning on parental education).

It is important to point out that the effects presented so far are ITT effects of full-day care attendance on child development. The ITT is an interesting effect especially for policy design. It resembles the overall effect of a reform, i.e. the effect what politicians actually can decide on. Yet, the ITT does not allow for a straight-forward interpretation of the treatment effect of full-day child care attendance. This difficulty is even more severe when it comes to interpreting differences in the reform effect across subgroups. There may be several reasons explaining the observed effect heterogeneity across subgroups. In addition to differences in the actual treatment effect of attending a care center on a full-day basis, children from different backgrounds may differ in their prevalence to actually use full-day care. As shown in Section 2, the overall take-up rate amounts 47.4% (see Table 1) and take-up varies across subgroups. Nevertheless, the observed variation in take-up across subgroups does not seem sufficiently big to fully explain the heterogeneity in effect size across subgroups.

5.2. Robustness

Results from our baseline specification rest upon several assumptions. First and foremost, while our baseline specification considers a series of regional characteristics entering predictions of local demand for full-day care (and thus measured in a child's year of birth), it abstracts from possible municipality-specific changes over time that may correlate with the share of available full-day slots in a municipality and influence children's development. In an augmented specification, we explicitly allow for this possibility and account for municipality-specific trends, see Panel A in Table 7. The results exhibit the same pattern as in the baseline with the following exception: the estimated effects on the socio-emotional maturity of the pooled sample of children as well as of children with native low-educated parents loose size and significance. As regards school readiness, the effect on low-educated immigrant parents' children gets smaller and insignificant, but the effect on immigrant children in general is significant and about the same size as in the baseline regression.

Second, our baseline specification does not include structural quality measures of child care centers as these could change in reaction to the conversion of half-day into full-day slots, i.e., they might be bad controls. Panel B in Table 7 shows the estimates when including a series of structural quality measures (children per group, average age of the

employed staff, share of male employees, and share of pedagogically trained staff, all measured as average between ages zero and six of each cohort). Overall, results are comparable to the baseline results, speaking against a concession in quality or selection upon quality, at least in structural quality, driving our results.

Third, we dig deeper into the role of quality and address the concern of possible concessions in process quality, particularly in the initial phase of full-day expansions. To do so, we exclude the early post-reform cohorts, i.e. cohorts enrolled in kindergarten right when the reform kicked-off (SEE 2006–2008). As we can see in Panel B, Table 7, results barely alter. If anything, they get stronger when leaving out the cohorts experiencing the early expansion stage. This speaks against a deterioration of process quality during this period.

Fourth, we probe the robustness of our results to alternative age brackets when measuring the full-day share available to a specific cohort. On the one hand, we use the average full-day share across the ages of one to five years, which should capture the facts that the earliest children can start attending child care is at age 1 and that most children start primary school at age six. On the other hand, we use the full-day share in the birth year of each cohort, a choice that is intended to account for possible endogeneity of parental demand for full-day care. Results are robust and shown in Table A.9 in the Appendix.

Finally, we conduct a placebo analysis with children's birth weight, a pre-treatment outcome, as the dependent variable (obviously excluding it from the set of controls). Results in Table 8 show that there is no significant effect of the share of full-day slots on the birth weight of children.

6. Conclusion

This study investigates the consequences for children's skill development when converting a child care regime offering care mostly on a half-day basis into one offering care mostly on a full-day basis. Notably, the setting under study is one where the counterfactual care to public child care is care provided by the mother. In addition, the intensive margin of formal child care is analyzed in absence of any simultaneous changes of the extensive margin as the supply of half-day child care slots remained unchanged during the time of study.

The analysis reveals that children suffer in terms of their socio-emotional development when spending more hours in child care. This negative impact on children's socio-emotional development is most pronounced among children from disadvantaged backgrounds, such as native children with low-educated parents, children living in a single-parent household, and children with a migration background. This finding might be due to center staff being less successful in supporting the development of children's emotional skills than mothers and mothers of different subgroups being differently successful at compensating for the reduction of time with their child. As regards cognitive skills, the results show that children with a migration background are better prepared for

primary school after attending center-based care on a full-day basis instead of attending it on a half-day basis – a finding most likely explained by center staff having a relative advantage in supporting children’s language skill development compared to immigrant parents.

The findings emphasize three important aspects of center-based care and its impact on child development. First, they highlight that the consequences of center-based care on child development depend on the quality of the alternative modes of care. Second, they make clear that the returns to time investment in children’s skills are likely to be nonlinear and thus one cannot simply rely, for example, on findings from studies analyzing the effects of half-day center-based care to extrapolate expected effects of full-day care on children’s skill development. Third, the heterogeneity of effects indicates that there is no “one fits all” policy of full-day care. Formal care quality has to be adjusted to the respective subgroup’s needs if the policy goal is to make every child gaining from the additional hours in child care.

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Appendix A

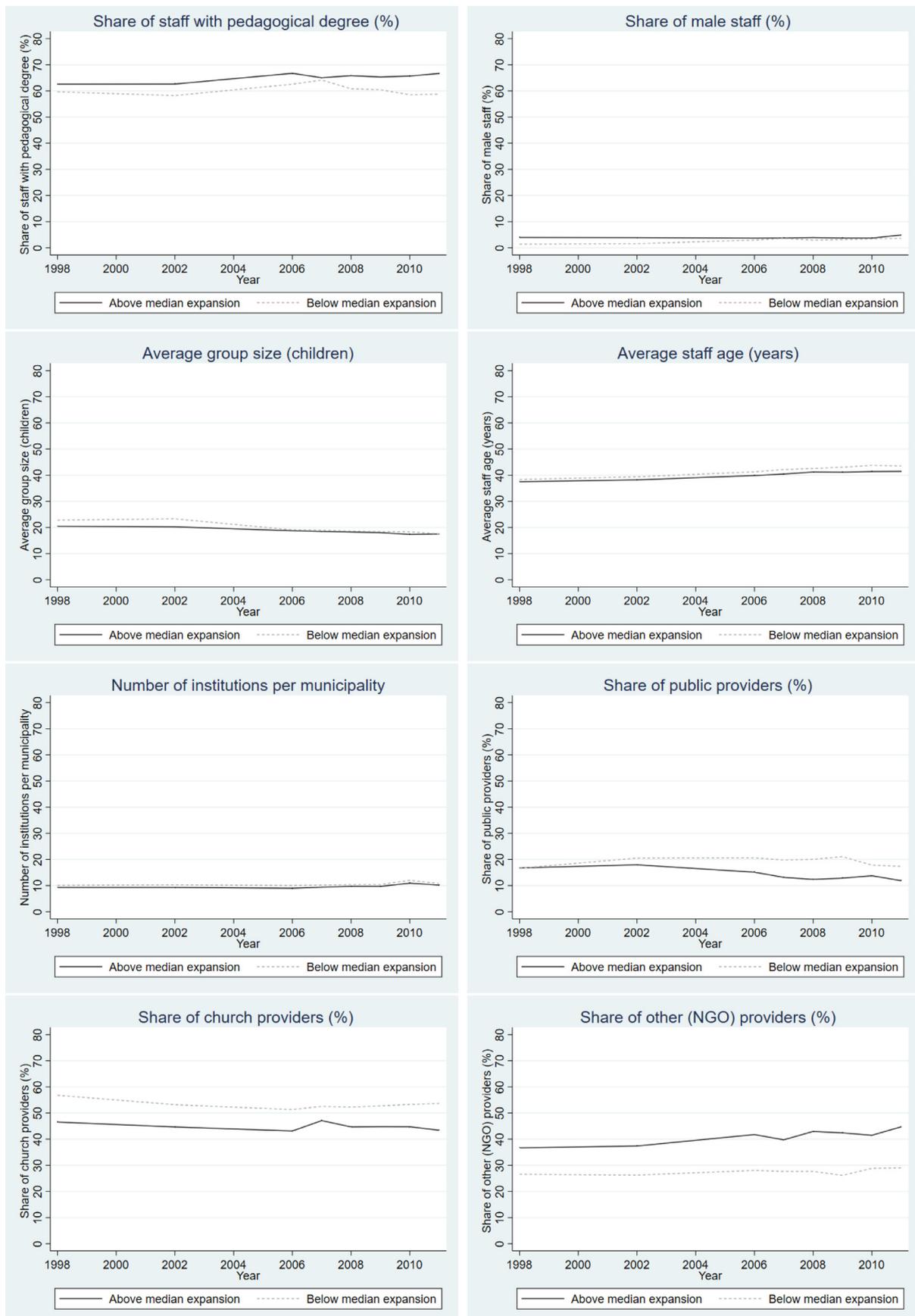


Fig. A1. Structural features of child care during the expansion Note: The group of above-median expanders includes those municipalities that experienced an above median growth between 1998 and 2006. The group of below-median expanders includes the other municipalities. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany* 1998–2011. Own calculations.

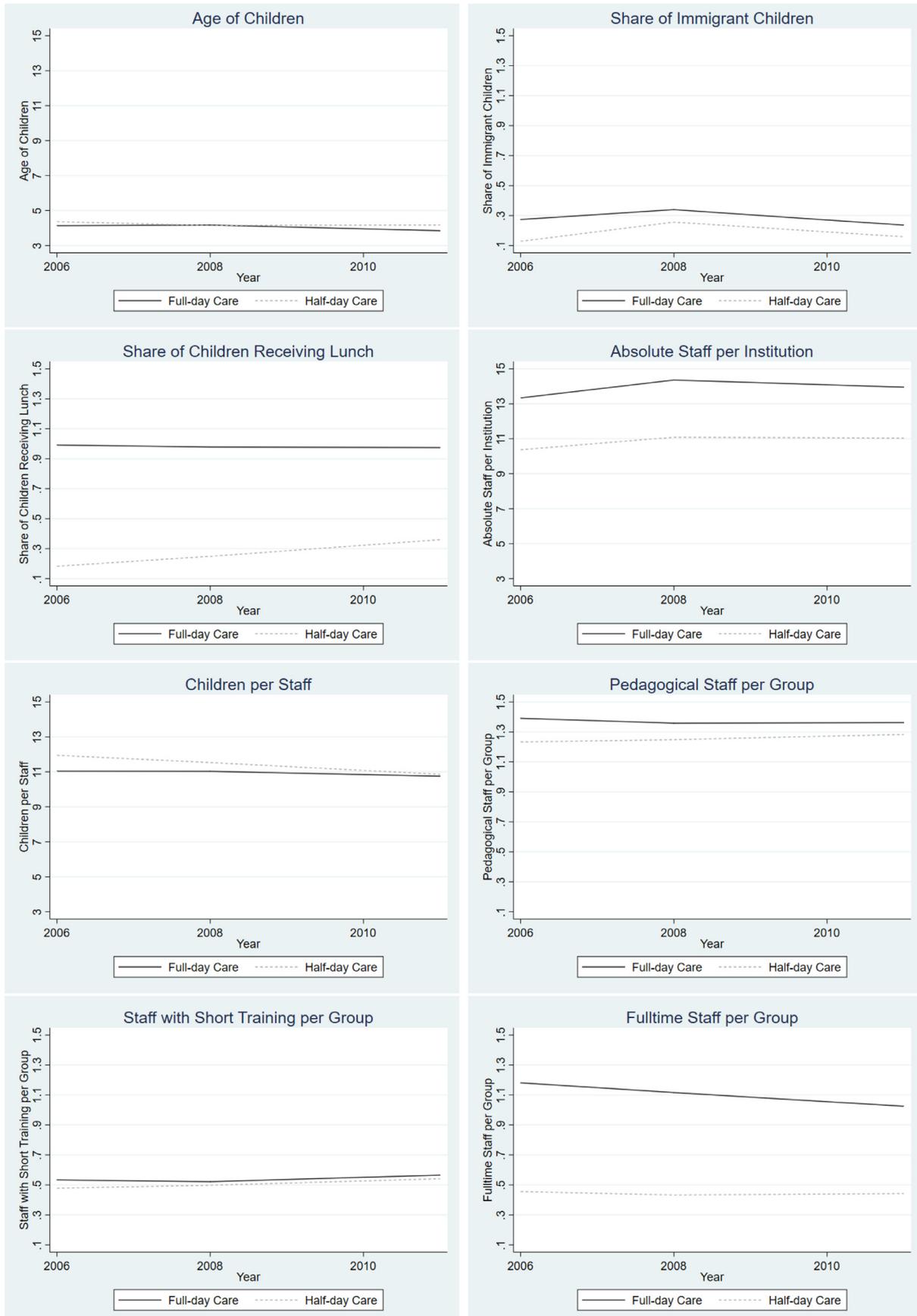


Fig. A2. Individual characteristics and care features for children in half-day vs. full-day care. Note: The graphs contrasts individual characteristics and care features of children in full-day care with the situation of children in half-day care. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany 1998–2011*. Own calculations.

Table A1
Overview – Studies on universal child care by intensity of the care system.

Article	Country	Time of care	Age of children in care	Identification strategy	Data
Baker et al. (2008)	Canada	half-day or full-day	0-4 years	DiD: Introduction of universal subsidies for child care over 1997–2000	National Longitudinal Survey of Children and Youth (NLSCY) Exogenous variation at the province level
Cascio (2009)	US	half-day or full-day	5 years	Event Study approach using variation in introduction of state fundings for public kindergarten programs in 1960s and 1970s	Four Decennial Censuses 1970 to 2000 (Public Use Microdata Samples) Exogenous variation at the state level
Datta-Gupta and Simonsen (2010)	Denmark	full-day	3-6 years	Selection on observables and exogenous variation through waiting lists	Danish Longitudinal Survey of Children (DALSC) Data used at the individual level
Berlinski et al. (2009)	Argentina	half-day	3-5 years	DiD-like: Variation in treatment intensity across regions and cohorts of kindergarten construction program 1993–1999	National Educational Assessment Operation (ONEE) Exogenous variation at the municipality level
Schoenberg et al. (2018)	Germany	half-day	3-6 years	MTE based on kindergarten expansion in late 1990s due to legal entitlement to kindergarten slot	Administrative data from school entrance examinations in Lower Saxony Exogenous variation at the municipality level
Felfe and Lalive (2018)	Germany	half-day or full-day	0-2 years	MTE based on early child care expansion until 2013 triggered reforms in 2005 and 2008	Administrative data from school entrance examinations in Schleswig–Holstein Exogenous variation at the municipality level
Felfe et al. (2015)	Spain	full-day	3 years	DiD: Expansion of childcare in Spain in the early 1990s	PISA 2000,2003,2006,2009 Exogenous variation at the state level
Fitzpatrick (2008)	US	full-day	4 years	DiD: Introduction of universal Pre-Kindergarten in Georgia	National Assessment of Educational Progress (NAEP) Exogenous variation at the state level
Fort et al. (2017)	Italy	no differentiation	0–2 years	RDD: Exploiting admission thresholds to early day care	Administrative data of the City of Bologna matched with own interviews in the field Data used at the individual level
Gormley Jr. et al. (2008)	US	half-day or full-day	4 years	RDD: Exploiting strict age cut-off rules for enrollment	Own data collection: 3 cognitive tests and surveys filled out by parents Data used at the individual level
Havnes and Mogstad (2011)	Norway	no differentiation	3-6 years	DiD: Expansion of childcare in Norway in 1970s	Statistics Norway Exogenous variation at the municipality level
Magnuson et al. (2007)	US	no differentiation	4-5 years	Selection on observables and IV: state expenditures as instrument	Early Childhood Longitudinal Study Kindergarten Class of 1998-99 Data used at the individual level
Noboa Hidalgo and Urzúa (2012)	Chile	no differentiation	5-14 months	IV and CF using variation through national early childhood development policy increasing early day care supply	JUNJI Longitudinal Study and administrative data on centers Exogenous variation at the municipality level

Source: Own literature review.

Table A2
Legal situation regarding child care of the cohorts under study.

School entrance cohort	Born between	Legally entitled to kindergarten slot (age 3–6)	Legally entitled to early care slot (age 0–2)	Kindergarten attendance in % of cohort	Early care attendance in % of cohort	Full-day share in% of all slots
2004	07/1997-06/1998	YES	NO	93.2	3.4	33.2
2005	07/1998-06/1999	YES	NO	94.6	3.6	34.8
2006	07/1999-06/2000	YES	NO	94.0	3.9	35.6
2007	07/2000-06/2001	YES	NO	95.2	4.4	39.6
2008	07/2001-06/2002	YES	NO	95.2	5.2	44.6
2009	07/2002-06/2003	YES	NO	96.3	5.9	45.8
2010	07/2003-06/2004	YES	NO	97.0	7.5	52.5
2011	07/2004-06/2005	YES	NO	97.6	8.0	54.0

Source: Statistics of the school entrance examination 2004–2011. RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany* 1998–2011. Own calculations.

Table A3
Kindergartens' daily routine in region under study.

Who	Time	Daily routine	Examples of activities
<i>Half-day and Full-day children</i>	7-9am	Arrival of all children, free play	Painting, reading, Listening to music
	9am	Morning circle	Welcome and talking About plans for the day
	9.30am	Breakfast	
	10-12am	Activities, projects	Playground, walks Reading, singing Crafting, baking
<i>Full-day children</i>	12am	Lunch	
	12.30-2pm	Recreation	Reading to children Listening to music, Quiet activities
	2pm	Teatime	
	2-5pm	Free play	Painting, crafting Reading, playground
	5pm	Kindergarten closes	

Source: Pedagogical concepts of representative kindergartens in the region of Schleswig-Holstein.

Table A4
Comparison of SEE and FiD data.

	SEE data	FiD data		
	Pooled (N=86,901)	Full-Day (N=489)	Half-day (N=614)	Full- vs. Half-Day
Socio-emotional maturity(D)	.833 (.373)	.863 (.345)	.889 (.315)	-.026
Age (in month)	73.798 (3.874)	52.877 (17.526)	59.349 (16.363)	-6.471***
Male (D)	.524 (.499)	.54 (.499)	.502 (.500)	.038
Immigrants (D)	.121 (.326)	.176 (.381)	.187 (.390)	-.011
Single parent (D)	.149 (.356)	.139 (.346)	.073 (.261)	.066***
Mom's education: high (D)	.270 (.440)	.333 (.472)	.221 (.416)	.112***

Notes: Individual characteristics in column 1 are based on the full sample (2004–2011) of the SEE data. Column 2 and 3 display the individual characteristics for children in the *Families in Germany*-survey; the means for children in full-day care and half-day care are shown respectively. Standard deviations are shown in parenthesis. In column 4, the raw difference between column 2 and column 3 is calculated. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.010$. Source: School entrance examination 2004–2011 and *Families in Germany*-Survey. Own calculations.

Table A5
Descriptives: FiD data.

Variable	Pooled		High education		Low education		Single		Low education		All	
	Mean	SD	natives		natives		natives		immigrants		immigrants	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Panel A: Care modes												
Hours: Father cares	13.592	21.383	16.187	22.188	12.833	20.908	.091	.64	12.055	20.79	12.627	21.648
Hours: Extended family	4.272	6.949	3.24	5.297	4.755	7.383	5.374	7.689	3.744	5.743	4.08	7.291
Hours: Public child care	25.988	10.595	27.958	8.794	25.416	10.949	28.404	11.689	24.378	11.629	25.244	11.306
Hours: Others care	.403	1.372	.679	1.615	.367	1.388	.697	1.495	.128	.837	.154	.801
Panel B: Satisfaction of mothers with public child care												
Satisfaction activities,low(0)-high(10)	7.495	2.285	7.373	2.292	7.489	2.298	7.292	2.768	7.867	2.16	7.684	2.229
Overall Satisfaction Care,low(0)-high(10)	8.117	1.858	8.004	1.882	8.05	1.9	7.561	2.036	8.568	1.611	8.477	1.645
Panel C: Reasons for Using Public Child Care												
Care because of employment,no(1)-absolutely(4)	2.354	1.219	2.708	1.267	2.255	1.18	2.674	1.241	2.113	1.168	2.19	1.189
Care because of workload,no(1)-absolutely(4)	1.579	.886	1.702	1.012	1.509	.817	1.713	1.001	1.657	.927	1.642	.902
Care because of studies,no(1)-absolutely(4)	1.314	.729	1.308	.79	1.279	.668	1.315	.755	1.426	.795	1.44	.82
Care because of pos.impact,no(1)-absolutely(4)	3.412	.685	3.189	.777	3.45	.651	3.417	.691	3.61	.568	3.596	.575
Care because of time for me,no(1)-absolutely(4)	1.366	.679	1.408	.735	1.311	.612	1.355	.67	1.486	.791	1.491	.787
Panel D: Activities of Mother and Child												
Outdoor Activities	.89	.313	.874	.332	.894	.308	.798	.404	.909	.289	.9	.3
Indoor Activities	.944	.23	.95	.218	.944	.231	.929	.258	.927	.261	.935	.247
Passive Activities	.737	.44	.672	.47	.764	.425	.737	.442	.738	.441	.736	0.442
Panel E: Maternal labour market participation												
Mother works	.627	.484	.737	.441	.633	.482	.697	.462	.439	.498	.463	.5
Actual working hours of mother	16.046	16.472	21.753	17.248	14.989	15.565	18.24	15.144	11.021	15.804	11.93	16.374
Net income of mother	755.517	1101.606	1417.313	1634.211	562.76	708.337	743.232	727.147	447.177	867.708	499.92	903.559
Fulltime-Employed	.18	.384	.288	.454	.147	.355	.194	.397	.129	.336	.14	.348

Notes: Standard deviations are shown in parentheses. Source: Families in Germany (FiD). Own Calculations.

Table A6
Descriptivestatistics on child care and regional characteristics.

	Mean (SD)
Panel A: Child care intensity and quality between Age 0 and 6	
Full-Day share	.366 (.196)
Children per group	19.432 (2.365)
Age of staff (years)	39.243 (2.103)
Staff male (in %)	4.632 (3.155)
Staff: pedagogical degree (in %)	62.302 (8.394)
Panel B: Child care structure at birth	
Coverage 0–2 years old	4.283 (2.319)
Coverage 3–6 years old	81.681 (6.573)
Public provider (in %)	20.804 (16.082)
Church provider (in %)	42.141 (18.515)
Other provider (in %)	37.055 (17.864)
Panel C: Regional characteristics at birth	
Citizens per km ²	1001.4 (694.934)
Share 0–6-year-old children (in %)	5.833 (.813)
Log of GDPpc	3.201 (.222)
Employed female (in %)	44.26 (2.648)
Fulltime-employed female (in % of total working)	64.216 (5.306)
Vote share for CDU and FDP in %	41.946 (4.21)
Vote share for social democrats in %	44.814 (3.521)
Vote share for other parties in %	13.24 (2.864)
Local business tax rate	3.597 (.492)
Local tax rate on agrarian real property	3.147 (.458)
Local tax rate on other real property	3.543 (.813)

Notes: Panel A provides descriptive statistics on our treatment variable, the full-day share, as well as on child care center quality characteristics used as control variables in an augmented specification. These variables are measured as average across all years prior to a child's school entrance (i.e. as average between ages zero and six). Panel B provides descriptive statistics on structural characteristics of child care centers which we use as control variables in all specifications. These variables are measured at child's birth. Panel C shows regional characteristics measured at child's birth that we include in all specifications. Standard deviations in parentheses. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany 1998–2011/INKAR/Statistik-Nord*. Own calculations.

Table A7
Descriptive statistics on care centers and regional characteristics by subgroups.

	Pooled sample	Native high-edu. parents	Native low-edu. parents	Native single parents	All immigr. parents	Low-edu. immigr. parents
Panel A: Childcare intensity and quality between Age 0 and 6						
Full-Day share	.366 (.196)	.383 (.188)	.344 (.196)	.409 (.19)	.44 (.174)	.433 (.168)
Children per group	19.432 (2.365)	19.12 (2.202)	19.657 (2.588)	19.293 (2.234)	19.007 (1.804)	19.115 (1.884)
Age of staff years)	39.243 (2.103)	39.148 (2.095)	39.174 (2.107)	39.034 (2.042)	39.022 (2.012)	38.959 (1.983)
Staff male in %)	4.632 (3.155)	4.867 (3.238)	4.451 (3.144)	5.259 (3.218)	5.53 (3.166)	5.397 (3.088)
Staff: pedagogical degree (in %)	62.302 (8.394)	62.969 (8.528)	62.185 (8.774)	61.708 (7.932)	62.156 (7.297)	62.277 (7.266)
Panel B: Childcare structure at birth						
Coverage 0–2 years old	4.283 (2.319)	4.487 (2.284)	4.002 (2.244)	4.472 (2.435)	4.794 (2.501)	4.67 (2.453)
Coverage 3–6 years old	81.681 (6.573)	81.955 (6.389)	81.208 (6.464)	82.412 (6.997)	83.666 (6.511)	83.226 (6.554)
Public provider (in %)	20.804 (16.082)	20.029 (16.14)	20.489 (16.639)	21.583 (14.616)	20.852 (13.718)	20.783 (13.783)
Church provider (in %)	42.141 (18.515)	41.224 (18.987)	43.411 (18.997)	39.586 (16.979)	38.856 (16.038)	39.669 (15.949)
Other provider (in %)	37.055 (17.864)	38.746 (17.522)	36.1 (18.481)	38.83 (16.762)	40.292 (15.868)	39.548 (16.109)
Panel C: Regional characteristics at birth						
Citizens per km ²	1001.4 (694.934)	1007.418 (707.809)	939.945 (701.961)	1161.265 (676.877)	1352.407 (616.021)	1346.664 (609.986)
Share 0-6-year-old children (in %)	5.833 (.813)	5.807 (.825)	5.919 (.852)	5.714 (.747)	5.663 (.701)	5.709 (.718)
Log of GDPpc	3.201 (.222)	3.195 (.226)	3.179 (.222)	3.241 (.232)	3.268 (.226)	3.257 (.225)
Employed female (in %)	44.26 (2.648)	44.554 (2.583)	44.338 (2.722)	44.313 (2.569)	44.497 (2.598)	44.634 (2.605)
Fulltime-Employed female (in % of total working)	64.216 (5.306)	64.309 (5.354)	64.266 (5.734)	64.3 (4.553)	64.111 (3.663)	64.134 (3.607)
Vote share for CDU and FDP in %	41.946 (4.21)	42.118 (4.191)	42.228 (4.065)	40.979 (4.408)	40.765 (4.44)	40.842 (4.334)
Vote share for social democrats in %	44.814 (3.521)	44.434 (3.396)	44.845 (3.391)	45.445 (3.485)	45.153 (3.711)	45.262 (3.666)
Vote share for other parties in %	13.24 (2.864)	13.447 (2.888)	12.927 (2.802)	13.576 (3.093)	14.081 (3.15)	13.896 (3.084)
Local business tax rate	3.597 (.492)	3.568 (.503)	3.548 (.478)	3.693 (.487)	3.729 (.467)	3.72 (.463)
Local tax rate on agrarian real property	3.147 (.458)	3.095 (.464)	3.109 (.46)	3.233 (.438)	3.298 (.41)	3.295 (.407)
Local tax rate on other real property	3.543 (.813)	3.489 (.823)	3.46 (.795)	3.707 (.802)	3.784 (.761)	3.768 (.756)
N	86,901	15,056	48,546	11,114	10,523	7304

Notes: The table shows the descriptive statistics for the pooled sample as well as for four mutually exclusive subgroups – native children with high educated parents, native children with low educated parents, native children with single parents and immigrant children with low educated parents. Additionally, we show the results for children of all immigrant parents. Panel A provides descriptive statistics on our treatment variable, the full-day share, as well as on child care center quality characteristics used as control variables in an augmented specification. These variables are measured as average across all years prior to a child's school entrance (i.e. as average between ages zero and six). Panel B provides descriptive statistics on structural characteristics of child care centers which we use as control variables in all specifications. These variables are measured at child's birth. Panel C shows regional characteristics measured at child's birth that we include in all specifications. Standard deviations in parentheses. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the Child and Youth Services in Germany 1998–2011/INKAR/Statistik-Nord. Own calculations.

Table A8
Pooled sample results: coefficients of main controls.

	School readiness	Motor skills	Socio-emotional skills
Full-Day share btw. Age 0 and 6	0.043 (0.065)	0.044 (0.120)	-0.268** (0.125)
Age (in month)	0.012*** (0.001)	0.010*** (0.001)	0.006*** (0.001)
Male (D)	-0.081*** (0.005)	-0.158*** (0.008)	-0.093*** (0.010)
Birth weight (in gram)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Mom's education: basic	-0.054*** (0.005)	-0.045*** (0.005)	-0.040*** (0.007)
Single parent	-0.041*** (0.003)	-0.035*** (0.005)	-0.060*** (0.006)
Nr of siblings (excl. kid)	-0.023*** (0.003)	-0.006*** (0.001)	-0.005** (0.002)
Both parents migrants	-0.036** (0.016)	0.031*** (0.006)	0.047*** (0.006)
Coverage 0–2 years old at Birth	-0.009** (0.004)	0.003 (0.008)	-0.005 (0.007)
Coverage 3–6 years old at Birth	0.000 (0.001)	0.006 (0.004)	0.001 (0.003)
Public provider at Birth(in %)	-0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
Other provider at Birth(in %)	0.001 (0.000)	0.001 (0.001)	0.000 (0.001)
Citizens per km ² at Birth	-0.002* (0.001)	0.002** (0.001)	-0.003** (0.001)
Employed female at Birth (in %)	-0.000 (0.002)	-0.001 (0.004)	0.005 (0.003)
Fulltime-employed female at Birth (in % of total working)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)
Share 0-6-y-old children at Birth(in %)	0.007 (0.009)	-0.003 (0.019)	0.052*** (0.016)
Vote share for CDU and FDP in % at birth	-0.018*** (0.006)	-0.012 (0.009)	0.010 (0.012)
Vote share for other parties in % at birth	-0.017*** (0.004)	-0.011** (0.006)	-0.004 (0.007)
Log of GDPpc at Birth	-0.106 (0.087)	-0.379*** (0.122)	-0.103 (0.144)
Local business tax rate at Birth	0.064 (0.049)	-0.072 (0.085)	-0.247** (0.097)
Local tax rate on agrarian real property at Birth	-0.055* (0.032)	-0.012 (0.042)	0.040 (0.058)
Local tax rate on other real property at Birth	0.041 (0.036)	0.097** (0.044)	-0.050 (0.056)
Adj. R2	0.090	0.083	0.088
Children	86,901	86,901	86,901

This table displays the estimates resulting from an OLS regression of the three respective children's development indicators (dummies equal to one if there is no development problem) at school entrance on the full-day share measured as average across all years prior to school entrance and thus as average full-day share between ages zero and six. All regressions include a set of municipality and cohort dummies. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.010$. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany* 1998–2011/School entrance examination 2004–2011/INKAR/Statistik-Nord. Own Calculations.

Table A9
Alternative age brackets.

	School readiness	Motor skills	Socio-emotional maturity
Panel A:			
Full-Day share btw. Age 1 and 5			
Pooled sample			
Full-Day share btw. Age 1 and 5	0.135*** (0.049)	0.054 (0.113)	-0.202* (0.113)
Native high-educated parents			
Full-Day share btw. Age 1 and 5	0.008 (0.036)	-0.176* (0.095)	-0.111 (0.090)
Native low-educated parents			
Full-Day share btw. Age 1 and 5	0.131** (0.051)	0.099 (0.133)	-0.228* (0.116)
Native single parents			
Full-Day share btw. Age 1 and 5	0.134** (0.060)	0.071 (0.180)	-0.385** (0.149)
All immigrant parents			
Full-Day share btw. Age 1 and 5	0.196 (0.130)	0.088 (0.144)	-0.318* (0.166)
Low-educated immigrant parents			
Full-Day share btw. Age 1 and 5	0.253* (0.142)	0.071 (0.166)	-0.234 (0.192)
Panel B:			
Full-Dayshare at birth			
Pooled sample			
Full-Day share at age 0	0.078* (0.041)	0.048 (0.068)	-0.251*** (0.081)
Native high-educated parents			
Full-Day share at age 0	0.030 (0.035)	0.025 (0.085)	-0.152** (0.073)
Native low-educated parents			
Full-Day share at age 0	0.045 (0.047)	0.019 (0.076)	-0.272*** (0.087)
Native single parents			
Full-Day share at age 0	0.052 (0.075)	0.152 (0.126)	-0.408*** (0.117)
All immigrant parents			
Full-Day share at age 0	0.319*** (0.089)	0.123 (0.084)	-0.341*** (0.106)
Low-educated immigrant parents			
Full-Day share at age 0	0.341** (0.136)	0.108 (0.118)	-0.270** (0.110)
Municipality fixed effects	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes
Regional controls	Yes	Yes	Yes

Notes: This table displays the estimates resulting from an OLS regression of the three respective children's development indicators (dummies equal to one if there is no development problem) at school entrance on the full-day share. Panel A shows regressions that use the full-day share measured as average between ages one and five of a child. Panel B shows regressions that use the full-day share measured as at child's birth. All regressions include regional characteristics (measured at child's birth) as well as a set of municipality and cohort dummies. The table shows the regression results for the pooled sample as well as for four mutually exclusive subgroups – native children with high educated parents, native children with low educated parents, native children with single parents and immigrant children with low educated parents. Additionally, we show the results for children of all immigrant parents. Standard errors are clustered at the municipality level and are shown in parentheses: *p < 0.10, ** p < 0.05, ***p < 0.010. Source: RDC of the Federal Statistical Office and Statistical Offices of the Laender, Statistics of the *Child and Youth Services in Germany 1998–2011/School entrance examination 2003–2012/INKAR/Statistik-Nord*. Own Calculations.

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