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## Regulating Child Care Markets. Center-based Care vs. Family Day-Care in Germany

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# Regulating Child Care Markets

## Center-based Care vs. Family Day-Care in Germany

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### Abstract

This paper uses child care reforms in Germany to investigate the effects of the legal and economic environment on publicly provided early child care quantity and quality. Furthermore, the study provides insights on the effects of the resulting early child care quantity and quality on child development outcomes. The analysis is based on administrative data covering all child care centers and family day carers in Germany and school entrance examination data of one large German state. I find that regulations of staff quality have significant negative average effects on the quantity of provided care. Moreover, the results show that poorer counties are more likely to expand their early child care supply by increasing their share of family day care, which is a less expensive and more flexible care mode than center-based care, but is characterized by lower staff qualification standards. In contrast to the existing literature, the results show that a higher share of family day care is not detrimental for children's development. Instead, a larger share of family day care – when accompanied by care quality regulations – has positive effects on the development of children's socio-emotional stability and motor skills.

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# 1 Introduction

Public child care has been a prominent political and social topic in the last two decades. Subsidized universal care for the youngest is not only seen as an effective way to positively influence the development of all children, but also to foster maternal labor force participation.

While there is an increasing literature on the effect of child care on female employment and on its effect on children's educational outcomes (Berlinski *et al.*, 2009; Gormley Jr. *et al.*, 2008; Cascio, 2009; Datta-Gupta and Simonsen, 2010; Havnes and Mogstad, 2011; Noboa Hidalgo and Urzua, 2012) there is not much evidence yet on how political decisions – via regulations – shape the quantity and quality of early childhood institutions and by that the child care market (one of the few studies is Hotz and Xiao (2011)). Since the literature agrees that care quality matters for potential benefits children gain from early child care it is important to understand how legislation can affect quality measures.

In this paper, I investigate the link between the political goal to increase the supply of early child care on one hand, and the stringency of quality regulations on the other hand. How does the relation between the two affect the child care market? And, moreover, how do the resulting market characteristics affect child development?

For studying these questions, I use a federal reform in Germany that triggered a large expansion in early child care. In 2008, federal law stated that children younger than 3 years old would be entitled to a slot in child care from 2013 on (while 3-6-year-old children had already been entitled to a slot since the late 1990s). From then on, not only large investments in early child care centers were undertaken, but at the same time rules were established that allowed also slots in family day care homes to be regarded as a valid fulfillment of the legal entitlement. Both of these care modes are publicly subsidized and, importantly, parental fees are about the same size. At the same time, both care modes are very different in terms of regulation: While center-based care underlies stricter regulation with respect to staff education and facilities, family day carers only have to meet rather low educational standards and mostly provide care in their own homes.

In Germany, the provision of child care falls under the responsibility of municipalities and it was thus the task of local authorities to manage a care expansion sufficient to fulfill the legal claim. Meanwhile, formulating quality standards (staff-per-child-ratio, qualification of staff and annual training requirements) is done at the state level. In response to the federal law triggering the early care expansion the data reveal a large variation in how the different states reacted being confronted with a quantity-quality trade-off (e.g. lowering or increasing the staff-per-child-ratio).

In the first part of my analysis, I exploit this variation of state regulations in combination with unique administrative panel data on the universe of child care centers and on all family day care homes in Germany. In addition, I have access to detailed information on structural quality

indicators of both care modes for the years 2006-2011. I aggregate and merge this data at the county level with data on the regional socio-demographic characteristics. Using 2300 county-year-observations and building on the empirical approach of Hotz and Xiao (2011) I investigate whether state-specific quality regulations had an impact on the care mode that German counties established. Using a specification including state fixed effects as well as a set of regional control variables avoids biased results due to policy endogeneity. My findings suggest that family day care homes were established predominantly in counties with a lower GDP per capita, less living space per inhabitant, and more female employment. This shows that counties react to economic incentives that the expansion of family day care homes offers: for the local authorities, family day care is less expensive to establish than center-based care. Family day care therefore offers a suitable way for poorer regions to fulfill the federal requirement of increasing the supply of early child care slots according to demand. Stricter state regulations targeted at the quality of this care mode, however, can act as a disincentive to expansion: I find that especially in poorer regions, the average supply reaction to stricter staff qualification regulations is negative.

In the second part of my analysis, I look at the implications of an increase in a county's share of family day care on a set of child development outcomes measured by the school entrance examinations of one large German state. In contrast to previous literature and opposed to public opinion, results indicate that a larger share of family day care is not detrimental for child development. Children seem to benefit in terms of their socio-economic maturity and motor skills. Including quality measures of family day care in the regressions, however, also matters. A positive effect on children's socio-emotional maturity is only found when quality indicators such as group size and quality of staff are controlled for. This part of my analysis provides evidence that important features of non-parental care at an early age include small group sizes and a more family-like context. Consequently, family day care might indeed represent an efficient way to harmonize two policy targets when expanding early child care in a fast manner: not to put too much of a burden on public finance and not to harm children's wellbeing.

The study proceeds as follows: Section 2 presents an overview of previous literature on regulations in the child care market and the importance of child care quality. Section 3 provides information on the data used for my analysis and describes characteristics of the German child care system. Section 4 explains the empirical approach to estimate the effects of regulations on family day care and presents the results. Section 5 describes the empirical approach to estimate the effect of the family day care share on child development and presents the results. Section 6 concludes.

## 2 Literature

There is a growing literature in economics on the effects of child care. One strand of the economic literature deals with the effects of child care supply on female employment, i.e. asks whether the policy goal to increase the female labor market participation is achieved by providing more child care. Another strand of the economic literature is studying the effects of child care attendance on children's skills and later labor market outcomes. This literature finds that human capital is built from the very early years on and that, consequently, providing child care is a means to increase human capital in the whole economy if child care has positive effects on children (Cunha *et al.*, 2006; Blau and Currie, 2006).

Recent studies investigating the impact of an expansion of universal child care on children's skills differ in their findings. Felfe *et al.* (2015), Cascio (2009) and Havnes and Mogstad (2011) find positive effects on children's skills, Baker *et al.* (2008) find negative effects. Potential reasons for these differences are different methodological approaches or different educational systems, but may partly also be explained by differences in quality of care across the respective regions of study.<sup>1</sup>

Therefore, it is important to pay attention to the role of care quality when investigating potential benefits of child care on maternal labor market participation and children's skills. A recent study on the effects of care quality on maternal employment decisions finds that quality of child care indeed matters (Schober and Spieß, 2014). According to the authors, a lower staff-to-child ratio is negatively linked to maternal employment, i.e. it seems that mothers are more reluctant to use out-of-family care if the quality is low.<sup>2</sup> In line with the findings of Schober and Spieß (2014) the study of Simonsen (2005) finds that the provision of high-quality child care has a positive effect on mothers' employment. Yet, she also documents a negative price effect: the higher the cost (i.e. the lower the subsidies) of high-quality child care the lower maternal employment. Also Blau and Hagy (1998) who study determinants of the demand for child care quality find that lower-priced care modes have a higher demand. They report that a decreasing price of care leads to a decreasing demand for quality of that care.

As regards effects of child care quality on child outcomes existing studies agree that quality matters. Investigating this question in a situation where no structural quality parameters are at hand is feasible when differentiating between different child care modes (that have different

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<sup>1</sup>How is child care quality measured? The cleanest approach to measure quality would be to measure how staff working in child care is interacting with children, which skill-stimulating actions are undertaken, how the day is structured. It turns out, however, that it is very hard to get objective information on such process quality indicators. Therefore, existing literature proxies child care quality by structural quality parameters such as group size, staff-to-child ratio and staff training (see Blau and Currie (2006)). One of the earliest studies on the question how to measure quality of child care is the one by Blau (1997).

<sup>2</sup>Interestingly, even though maternal employment decisions are affected by the observable staff-to-child ratio they are not affected by other quality indicators like staff education. The authors conclude that only easily observable quality characteristics matter for mothers' decisions for or against using child care arrangements.

quality features). One recent study dealing with the care quality question in this manner is the one by Datta-Gupta and Simonsen (2015). They differentiate between center-based care and family-day care in Denmark. Both care modes are regulated by the Danish state in terms of educational content, safety and hygiene. Yet, care center staff must hold a pedagogical degree while family day carers only have to attend shorter vocational courses. In contrast to more formal center-based care, family day care is taking place at the home of a carer who minds a group of up to 5 children. The authors claim that center-based care dominates family day care in many quality dimensions. Using an instrumental variable approach they find that children benefit more from attending center-based care than from attending family day care.<sup>3</sup> The authors suggest that their findings are best explained by the different educational background of staff in the two modes of care.<sup>4</sup> Similar to these findings are those of an earlier study by Datta-Gupta and Simonsen (2010) in which the authors look at short-run effects of attending center-based care versus family day care using the SDQ average<sup>5</sup> of 5-year-old children as outcome of interest. Also for this age group they find that being enrolled in center-based care relative to family day care is beneficial for children.<sup>6</sup> The findings of Datta-Gupta and Simonsen (2015, 2010) are in line with Bernal and Keane (2011) who find that attendance of informal care reduces cognitive skills in contrast to attendance of center-based care.<sup>7</sup> They estimate that an additional year of informal care causes a 2.6% reduction in test scores whereas formal center-based care has no adverse effect on cognitive achievement and suppose that the reason for their finding is twofold: First, center-based care providers have better educated staff who may provide more cognitive stimulation to children than informal providers, and second, center-based care may enable more stimulating interaction with other children and more educational activity than informal care.

Given the important role of child care quality for reaching both main targets of child care policies – better child outcomes and higher maternal labor market participation – there is surprisingly little evidence yet on how political decisions influence the quality of early childhood care modes. Blau (2007) stresses that there could emerge unintended consequences of child care

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<sup>3</sup>Datta-Gupta and Simonsen (2015) exploit variation across municipalities in guaranteed access to center based care as an instrument for care mode and their results show that center based day care improves grades in Danish language in the final year of compulsory school with around 0.2 standard deviations.

<sup>4</sup>They argue that the characteristics of family day carers are similar to those of low educated mothers while staff in child care centers is more similar to the home environment of high educated parents providing more verbal interaction with the child.

<sup>5</sup>The *Strengths and Difficulties Questionnaire*, short SDQ, (Goodman, 1997) is a questionnaire designed to identify emotional problems, behavioral problems, hyperactivity, peer relationships, and social behavior.

<sup>6</sup>Especially male children of low educated mothers are positively affected by center-based care attendance. Interestingly, female children of high educated mothers are negatively affected by attending center-based care instead of family-day care. Apparently, there can be heterogeneous effects of care quality. Especially girls may profit from the smaller group and family-like atmosphere in family-day care settings.

<sup>7</sup>The definition of informal care by Johnson *et al.* (2015) is : "care provided on a regular basis to children from birth through age 5 by unlicensed, noncustodial caregivers. Other terms for informal child care are family, friend, and neighbor care; home-based care; kith and kin care; relative care; and license-exempt care." Therefore, family day care in the US can be seen as a subcategory of informal care.

regulations.<sup>8</sup> This is in particular important in the context of policy targets aiming at increasing the quantity of child care: Does increasing the supply of child care by imposing regulations such as a legal entitlement for a child care slot come along with a decrease in child care quality? Apparently, this was the case in Canada. Baker *et al.* (2008) find negative effects of an early child care expansion and stress that the slot creation was done too fast. As a consequence, the quality of care could not catch up simultaneously.

Hotz and Xiao (2011) study the consequences of US state regulations on the child care market. They estimate the effect of the introduction of stricter quality rules on the number of accredited child care centers and on the emergence of unregulated care (which is family-day care in the US case). For identification they use changes in the regulations of child care quality (minimum staff-to-child ratio, group size and staff qualification) exploiting panel data between 1987 and 1997. Hotz and Xiao (2011) show that stricter rules lead to a reduction of the number of accredited child care centers and to an increase in the number of children taken care of in unregulated family day care. As regards the remaining child care centers, the regulations indeed lead to an improvement in quality. Importantly, a reduction of the number of child-care centers rather took place in low income areas, while quality improvements took place in high income areas. Thus, the authors show that enforcing quality regulations worsen the situation for families and children in low income areas (by reducing the number of centers and worsening the conditions in family-day care), but improve the conditions in high income areas.

In the first part of this paper, I analyze the consequences of child care regulations for the provided care mode in a county. Following a federal reform aimed at increasing the supply of early child care the German states respectively reacted with quality regulations varying across states and in their timing. In the same way as Hotz and Xiao (2011), I use state and year fixed effects as well as regional control variables to mitigate the policy endogeneity bias problem when estimating the effects of regulations on the provided child care mode. In contrast to Hotz and Xiao (2011) I look at the effects of regulations in a country where private, non-regulated care is very uncommon so that there is no substitution between regulated and non-regulated care taking place when stricter regulations are imposed. In contrast to the US, the two child care modes in Germany – center-based care vs. family day care – differ in the stringency of regulations, but are both subject to quality audits of local authorities. A further difference to Hotz and Xiao (2011) is the use of the family day care share (i.e. provided slots in family day

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<sup>8</sup>Blau (2007) justifies the need for having regulations in the child care sector as follows: The need for regulation is given because child care markets are markets with asymmetric information. Since parents are ex ante not well informed about the actual quality of a provider and often do not have the means to assess the quality, the government should guarantee some minimum level of quality. Bastos and Cristia (2012), for example, find that – in the absence of regulations – low care quality comes along with low income of consumers: They use census data on child care providers from Sao Paulo, Brazil, and document that particularly in poor districts a high share of child care centers does not reach the recommended quality level. In richer districts, however, the share of private care suppliers is higher and their quality is increasing parallel to household income in these districts.

care out of all slots provided in public child care) as dependent variable instead of using the absolute number of family day carers as dependent variable.

In the second part of this paper, I look at the impact of a higher family day care share on children’s development. In contrast to Datta-Gupta and Simonsen (2010, 2015) I rely on a fixed-effect approach instead of relying on an instrumental variable approach to estimate this impact. Furthermore, my data only allow to estimate an intention-to-treat effect. Yet, opposed to their studies, I am able to include quality parameters such as group size and staff qualification in my analysis. This allows me to discuss the specific role of quality inputs in child care whereas Datta-Gupta and Simonsen (2010, 2015) can only speculate on which aspect of family day care is responsible for the detrimental effect on child development that they find.

Before presenting my empirical approach, the following section gives an overview of the data and the child care system in Germany.

### 3 Data and Institutional Framework

#### 3.1 Data

For my analysis of child care regulations in Germany, I exploit administrative data on all child care institutions in Germany for the years 2006-2011. The two main data sets I use are part of the Statistics of the *Child and Youth Services* in Germany (*Kinder- und Jugendhilfestatistik*). The data cover the universe of child care centers and all family day care homes in Germany. Not only information on the number of children and staff in each center is included, but also detailed information on structural quality indicators, such as group size, education of staff and staff-to-child ratio. Unfortunately, the individual centers and family day carers cannot be followed across years since the individual center identifier changes yearly. Due to this restriction and since data protection rules also prevent use of municipality averages, I rely on county averages of child care parameters in order to create a panel data set containing 411 county observations per year.

Via the county identifier I merge this panel of administrative child care data with regional socio-demographic characteristics (GDP per capita, unemployment, female employment, share of women working part-time, population density, living space per inhabitant, share of 0-3-year-olds in the population, migration inflows and outflows). These data are included in the so-called *INKAR-Raumordnungsdaten*, a data set on county characteristics published by the *Federal Institute for Research on Building, Urban Affairs and Spatial Development* (BBSR). I end up with with a panel consisting of 2,299 county-year-observations.

In order to investigate the implications of the expansion of family day care for children’s development in the second part of my analysis, I use another administrative data set provid-



ing information about children’s school readiness measured at the *School Entrance Examination (SEE)*<sup>9</sup> in one big German state, namely North Rhine-Westphalia.<sup>10</sup> SEE data contain medical assessments on, among other dimensions, children’s language skills, motor skills and socio-emotional maturity and can take five forms: ”normal development”, ”some problems, but no treatment is necessary”, ”some problems, already in treatment”, ”problems, treatment necessary”, and ”problems which will reduce the child’s performance in school”. Based on these categories, I construct binary indicators respectively for language and motor skills as well as socio-emotional maturity. The indicators are equal to one if the child does not exhibit any problem in the assessed tasks. The SEE data also contain the pediatrician’s assessment whether a child is ready to follow the school curriculum or not. The recommendation can take the following three forms: ”ready for school”, ”school enrollment only with support provided by the teacher”, and ”special needs education required”. I construct a binary indicator which equals one if the child is assessed ready for school. Additionally, I use obesity (a binary variable equal to 1 if a child is obese) as health outcome in my analysis. The SEE data from North Rhine-Westphalia have the advantage that they include almost 100,000 children every year who live in 53 different counties, i.e. there is sufficient statistical power to employ a county fixed effect approach. Via the county identifier I merge the SEE data with the two other data sets presented above. Variation of center-based care and family day care between counties and across time can then be used to measure the implications for children’s skills at school entrance age. The SEE data, however, do not include any direct information on the care mode a child attended (center-based care or family day care). I therefore can only provide estimates for the intention-to-treat effect (ITT), but not for the treatment effect itself.

### 3.2 Organization of Child Care in Germany

Child care in Germany is organized at the municipality and county level. In contrast to the US, child care is predominantly publicly provided. Less than 4% of all children attend a for-profit center (Schilling, 2009). Children are taken care of in three different types of center-based care depending on their age: Until the age of 3 they are attending early child care centers (*Krippen*). Children between 3 and 6 years are attending kindergarten and school-aged children are taken care of in after-school care. Alternatively, children can attend family-day care which mostly takes place at the private homes of family-carers and is mainly targeted at children between 0 and 3 years.

Compared to other OECD countries, parental fees for child care are very low in Germany,

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<sup>9</sup>School Entrance Examination data are also used by Felfe and Lalive (2014) and Cornelissen *et al.* (2016); all of these studies, however, are focusing on SEE data from different German states.

<sup>10</sup>The SEE dataset is subject to major restrictions concerning data protection legislation. Due to these regulations I had to analyze the data via on-site use at the *Landeszentrum Gesundheit Nordrhein-Westfalen*, part of the Ministry of Health, Equalities, Care and Ageing in North Rhine-Westphalia.

on average they lie between 61 and 161 Euro per month depending on age group and on hours of care (Müller *et al.*, 2013). Importantly, in contrast to other more private-market oriented child care systems, parents are in general not able to get their child a higher-quality child care experience by paying more money. This is due to a tight regulation of parental fees in public day care (Schober and Spieß, 2014).

According to data of the OECD (2012), the expenditures on early child care amounted to a bit more than 0.6% of GDP in Germany in 2009. This is slightly above the OECD average. Denmark, in contrast, spends more than 1% of GDP on early child care. That means, the studies by Datta-Gupta and Simonsen (2010, 2015) are presenting evidence on a child care system allocating significantly more resources on child care than the German system does. On the other hand, in the US, only 0.42% of GDP are paid on child care. Consequently, the studies by Blau (2007) and Hotz and Xiao (2011) are referring to a system with significantly fewer resources spent on child care. These different financial situations are mirrored in some of the structural quality indicators such as the staff-to-child ratio: In Denmark, the average kindergarten staff-per-child ratio is 1:7, in the US 1:12, and in Germany 1:10.

### 3.2.1 Center-based Care and Family-Day Care

Early child care is provided in two different modes: Care centers and family-day care.<sup>11</sup> As Table 1 shows, most 0-3-year-olds enrolled in early child care are attending center-based care. But, nonetheless, an increasing number of children is enrolled in family day care. In 2011 15% of all children aged 0-3 years in non-parental care were attending family-day care. While in 2007, on average 104 children were attending family day care per county, in 2011 already 192 children were using this care mode, which is an increase of 85 percent, see Tables 1 and 2.

Family day care differs from center-based child care in several ways. Average center-based care for 0-3-year-olds typically takes place in centers that accommodate about 40 children in total, split into smaller groups of about 13 children. Each center employs pedagogical employees, assistants and administrative employees. The average staff-to-child ratio is 1:5.<sup>12</sup> In order to work as a group leader an employee must have acquired two years of theoretical training and at least two years of practice in a child care center. Salary for those with an accomplished degree in child care is about 2400 Euro (gross) per month (Sell and Kukula, 2011). There is not much variation of salary across centers and counties since the employees are paid according to standards of the German TvöD (national general accord of salaries). The employees are furthermore subject to social insurance contributions, statutory health and accident insurance

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<sup>11</sup>Family day care is also offered to children older than 3 years, but this age group uses family day care less often. Only 0.9% of children aged 3-6 years are attending family day care (Strunz, 2011).

<sup>12</sup>These are indicators for the structural quality of centers which are regulated by law. There are also legal rules concerning process quality in the form of pedagogical content. Every center has to have a pedagogical concept that must be approved by local authorities. There are no big scale data about process quality in Germany available yet. One first step is the study by Tietze *et al.* (2012).

Table 1: Coverage for 0-3-Year-Olds over Time 2007-2011

Year	2007	2009	2011	2007-2011 Change
All Public Child Care Coverage - Mean	0.162	0.209	0.264	0.63
All Public Child Care Coverage - p25	0.066	0.117	0.166	1.51
All Public Child Care Coverage - p75	0.177	0.230	0.303	0.72
Family Day Care Coverage - Mean	0.020	0.028	0.036	0.85
Family Day Care Coverage - p25	0.005	0.010	0.015	2.34
Family Day Care Coverage - p75	0.023	0.033	0.047	1.09
Share of Family Day Care - Mean	0.140	0.152	0.154	0.10
Share of Family Day Care - p25	0.043	0.062	0.066	0.51
Share of Family Day Care - p75	0.207	0.220	0.216	0.04

Notes: *Family Day Care Coverage* is defined as share of 0-3-year-olds attending family day care out of the whole population in this age group. *All Public Day Care Coverage* is defined as share of 0-3-year-olds attending any kind of public child care out of the whole population in this age group. *Share of Family Day Care* is defined as as share of 0-3-year-olds attending family day care out of all 0-3-year-olds attending any kind of public child care.

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

Table 2: Expansion of Family Day Care over Time 2007-2011

Year	Family Day Care Homes per county	Family Day Care Homes Total (nationwide)	Family Day Care Children per county	Family Day Care Children Total (nationwide)
<b>2007</b>	81	32987	104	42385
<b>2009</b>	94	38424	148	60446
<b>2011</b>	103	42468	192	79111

Notes: Family day care is defined as publicly subsidized child care which takes place at the homes of family day carers. Before being allowed to take children in their care, family day carers are screened and interviewed by municipality officials.

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

as well as old-age provision. Additionally, the employees have the right to take a fixed amount of vacation days (around 30 days) and are entitled to full pay during sick days. The opening hours of centers vary; legally they are requested to offer opening hours according to demand and remain open for at least four hours five days per week. About half of the children are staying more than 7 hours in care (Lange *et al.*, 2007). While states (Bundesländer) are in charge of regulating the quality of center-based care in Germany, municipalities and counties are in charge of monitoring child care centers' compliance with these rules.<sup>13</sup>

In contrast to center-based care, family day care takes place in private homes of the family day carer. Again, the states are setting the rules concerning quality of this care mode and municipalities and counties are in charge of monitoring compliance. Depending on the state, there may be up to six children in each home (eventually including the carer's own children in the respective age group). The rules regarding facilities, security and hygiene are less clearly stated than in the case of center-based care (Schnock, 2009). In contrast to employees in center-based care family day carers are not required to have attained any degree in child care or pedagogy, but only have to get some training in short vocational courses with a minimum duration between 80-160 hours (depending on the state). Before being allowed to take children in their care, family day carers are screened and interviewed by district officials who assess the individual suitability and check the police clearance certificate of candidates (Schnock, 2009).

More than 90% of family day carers are self-employed (BMFSFJ, 2014). That means that they – in contrast to center-based staff – have to bear the complete cost of social insurance contribution, statutory health and accident insurance and old-age provision. In case of sickness, more than 50% of family day carers do not get paid for the missed days, i.e. they have a much higher risk of income loss than clerical employees in center-based care (Sell and Kukula, 2011). On top, family day carers are confronted with covering their operating costs.<sup>14</sup> In fact, family day carers are confronted with a hybrid job situation: They are self-employed in the sense that they have to take entrepreneurial risk, but they are not allowed to act as entrepreneurs in the sense that they are not free to negotiate their prices and services with families.<sup>15</sup>

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<sup>13</sup>The legal requirements for center-based care for 0-3 year-olds did, importantly, not change since the major reform in 2008. Thus, there is only variation across states in terms of family day care regulations.

<sup>14</sup>The following example may help to illustrate a family day carer's income situation: She can earn a gross income as high as a group leader working in center-based care. For this, however, she has to care for six children because she gets about 400 Euro per child per month. This way, she would get gross earnings of 2400 Euro per month. Her net earnings, however, would be much lower since she has to deduct her insurance and operating costs. A rough estimate of the monthly net income of family day carers caring for 6 children would thus be 1200-1400 Euro vs. center-based staff who end up at 1600 Euro monthly. Of course, these numbers depend on a couple of assumptions regarding operating costs, hours of care etc. To my knowledge, there are no data available to systematically compare the net earnings of both care modes.

<sup>15</sup>Sell and Kukula (2011) present the results of a survey among a representative group of family day carers in Germany. One of their findings is that family day carers can only cover all their living costs when caring for at least 5 children. Family day carers who are only taking in 3 children are thus dependent on their partner's earnings (about 70% only care for 3 children or less). In line with this fact, 51% of respondents would prefer to be clerical employees of the municipality rather than being self-employed but at the same time being subject to directives by municipality officials regarding quality and prices of their services.

Table 3: Quality in Family Day Care and Center-Based Care in 2011

	Family Day Care	Center-based Care
Children-per-Staff	2.85 (0.82)	4.96 (2.01)
Group Size	2.85 (0.82)	13.49 (4.43)
% of staff with pedagogical degree ( <i>Erzieherausbildung</i> )	19.04 (6.47)	63.74 (18.67)
% of staff with pedagogical diploma ( <i>Diplompädagoge</i> )	3.34 (1.15)	4.52 (6.23)
% of staff with short-term education degree	11.59 (3.23)	17.63 (15.38)
% of staff without degree	65.18 (6.90)	-- --
% of staff with family day care qualification	79.68 (11.50)	-- --
% of staff with family day care qualification $\geq 160$ hours	45.73 (22.81)	-- --

Notes: Family day care is defined as publicly subsidized child care which takes place at the homes of family day carers. Before being allowed to take children in their care, family day carers are screened and interviewed by municipality officials. Center-based care is public child care located in centers monitored by municipality officials. While in most states family day carers have to attend a qualification course, there are no requirements on the attainment of a degree or diploma in child care. This explains why 65% of family day carers do not have a degree. 80% of family day carers have attended a qualification course which shows that some of the family day carers hold both, a degree and a qualification course certificate, while some hold a degree only.

N=411, standard deviation in parenthesis.

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

When comparing the educational level of staff in center-based care versus family day care, it turns out that child care centers have higher qualified staff who is much more likely to have a degree in child care or pedagogy compared to family day carers (see Table 3). Yet, with respect to the children-per-staff ratio, the situation in family day care is better (at 1:3 instead of 1:5 in center-based care, cp. Table 3). Group size, consequently, is also much smaller in family day care with on average 3 children per group instead of 13 children per group (and even more per center). Due to the small group size, the opening hours of family day care are often quite flexible and care on week-ends is also offered. How does the situation for parents confronted with these two modes of public child care to choose from look like? Do prices of care differ depending on the care mode? Interestingly, in contrast to the US, parental fees in care centers and family day care are about the same in Germany. Independent of the care mode, parents pay on average between 61 and 161 Euro per month (Müller *et al.*, 2013).<sup>16</sup>

Since the fees for both care modes are about the same, parental demand should be driven by the perceived quality of care mode. Yet, it is not clear whether one of the care modes is actually of superior quality. While staff in center-based care is significantly better qualified, there is clearly more potential for individualized care in family day care because of the small

<sup>16</sup>In Germany, parents only have to bear a small proportion of the total costs of public child care. The biggest part is paid by the municipalities (about 47 %) and by the state (about 31 %). Providers, like churches and welfare organizations contribute about 5 % and parents about 14 % (Schober and Spieß, 2014).

group size.<sup>17</sup> Additionally, family day care offers more flexible opening hours and may therefore seem more attractive to families. Yet, the *perceived* quality of center-based care is apparently higher than that of family day care: According to a representative survey 77% of parents prefer center-based care, while only 11% prefer family day care (BMFSFJ, 2014).<sup>18</sup> This is in line with the study of Datta-Gupta and Simonsen (2010, 2015) who use for their identification that demand for family day care is lower despite of similar fees as center-based care. In the US, in contrast, family day care is an option for parents who cannot afford prices of center-based care as Hotz and Xiao (2011) show; the authors argue, however, that lower prices come along with lower quality since family day care is not regulated by the state.

In Germany, as Schober and Spieß (2014) point out, the quality of day care children are confronted with is not or only weakly dependent on their parents' ability to pay higher fees. The question I investigate in this paper is whether children's municipality's (resp. county's) ability to pay is linked with the quality of care they receive. While the costs for parents are the same independent of the care mode, the costs for the municipality are quite different for the following reasons: Maintaining a child care center involves large fixed costs, operating costs, staff salaries etc. – independent of the number of children attending the center. In the case of family day care, the municipality only has to pay a lump sum for each child who is actually taken care of. The municipality does not bear any operating cost and the entrepreneurial risk lies at the family day carer. Therefore, for a given municipality, the average yearly total costs of family day care are lower than those of center-based care while the parental fees are the same (Sell and Kukula, 2011). Consequently, municipalities face incentives to create child care slots in family day care rather than in center-based care in situations of economic distress and a contemporaneous high demand for early child care that legally has to be satisfied.

### 3.2.2 Reforms in the Child Care Market

In Germany, children are legally entitled to a slot in child care from their first birthday on. There were three major reforms in the child care sector that led to this entitlement: The first reform took place in the 1990s. Since 1996 every child turning 3 years old is legally entitled to a slot in a child care center.<sup>19</sup> As a result of this policy, since the early 2000s more than 90% of children entering school have attended kindergarten for at least 2 years. The second major reform in 2005 (the so-called "Tagesbetreuungsausbaugesetz") aimed at providing public child care also for younger children (between 0 and 3 years) of whom at this point in time only a very small

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<sup>17</sup>Tietze *et al.* (2012) did one of the first attempts to find large-scale evidence of the process quality of child care in Germany. In a (non-representative) evaluation of family day carers they find that family day care is apparently not of worse process quality than center-based care.

<sup>18</sup>6% would like to use a combination of care modes and the rest of parents has no preferences for one care mode.

<sup>19</sup>This reform's effects on child development are investigated by recent work of Cornelissen *et al.* (2016) and its effects on female employment are analyzed by Bauernschuster and Schlotter (2015).

percentage had access to early child care. The objective to make early child care universally accessible was reinforced in a third major reform ("Kinderförderungsgesetz") in December 2008, when the federal government announced that all children aged 1 year and older would be legally entitled to a child care slot from August 2013 on. It was specified that until then at least 35% of all children younger than 3 years old should have access to early child care. One important change that came together with this reform was the upgrading of family day care. The federal government proclaimed that family day care would be henceforth considered to be legally equal to center-based care. Consequently, the legal entitlement would be fulfilled regardless whether a municipality would offer a child a slot in center-based care or in family day care. The specific numerical target for each municipality was set such that 33% of all early child care slots should be slots in family day care.

In the following years, a strong expansion of the numbers of family day care took place. The first column of Table 2 shows that there was an expansion from on average 81 family day care homes per district in 2007 to 103 family day care homes in 2011 (which is an increase of almost 30 percent). In total, the number of family day care homes in Germany rose from around 33,000 to around 42,500. The number of children attending these homes almost doubled in the same period. In 2007, there were on average 104 children per district (around 42,000 in Germany) taken care of in family day care, while in 2011 already 192 children (around 79,000 in Germany) attended family day care. The increase of child care centers was not as large in the corresponding period. The average increase was only about 5 percent (in 2007 there were on average 110 child care centers per district while in 2011 there were on average 116, cp. Table A.1 in the appendix).

A look at the coverage rates of public child care in Table 1 reveals that the increase of slots per 100 children has been sizable in both care modes since the reforms. The coverage of all public child care (i.e. both care modes combined) rose from 16% in 2007 to 26% in 2011, while the largest increase took place in the lowest quartile (in the 25th percentile the coverage rate rose from around 7% to around 17% which is an increase of 150 percent). The major part of coverage is provided by center-based care, only 2 children out of 100 were taken care of in family day care in 2007 (while 14 children out of 100 were in center-based care). Until 2011, however, the coverage of family day care almost doubled and reached 3.6%. In the highest quartile the coverage was already at almost 5% in 2011. As stated above, the reform in 2008 aimed at providing at least 33% of all early child care slots in family day care by 2013. This has not yet been achieved in 2011 as the bottom part of Table 1 shows. Between 2007 and 2011, the share of family day care rose from 14% to 15.4%. Yet, comparing the lowest and highest quartile indicates that especially regions with low usage of family day care until 2007 started to expanding this care mode (with an increase of about 50 percent). The comparison between lowest and highest quartile also shows that there is large variation between regions with respect

Table 4: Family Day Care Regulations in Germany from 2007-2011

Year	2007	2009	2011
Mean: Staff-per-child ratio in law	0.13	0.17	0.17
Number of states without Staff-per-child ratio rule	4	1	1
Mean: Number of qualification hours in law	79.13	102.63	108.75
Number of states without qualification hours rule	11	7	6
Mean: Number of training hours in law	5.44	6.38	6.94
Number of states without training hours rule	11	8	7

Notes: These quality indicators were built by analyzing the regulation changes of public child care law for each German state. The table displays the average of each indicator as well as the number of states without any rule concerning this indicator. The indicators are weighted by the number of counties in each state.

Source: Regulation Codes of 16 German states. Own Calculations.

to their family day care share: In 2011 only every 20th child attended family day care in the lowest quartile, in the highest quartile every 5th child was taken care of in this mode (out of all children attending public child care).

While the federal government set the quantitative goal for the expansion of early care, it was up to the 16 German *Bundesländer* (states) to implement strategies to reach this goal. As in the US, states regulate the staff-to-child ratio, required qualifications and training of the staff, building and equipment safety etc. Interestingly, the *Bundesländer* did not change the quality regulation of center-based care after the 2008 reform. Regarding family-day care, though, they implemented the new role of family day care in their regulations after the reform, yet these regulations varied across states as regards their content and timing. For this paper, I collected information of regulation changes in family day care of the 16 German *Bundesländer* individually for the time span under study (by screening state laws and provisions dealing with child care provision and child care quality). I then coded the information in order to build indicators comparable to those in Hotz and Xiao (2011). Table 4 summarizes the changes in regulation displaying the means of state quality indicators for 2007, 2009 and 2011. It shows that rules became stricter, i.e. most of the *Bundesländer* started to regulate family day care more tightly in light of its new status (being legally equivalent to center-based care). While in 2007, on average up to 8 children were allowed to be taken care of in family day care, this was restricted to a maximum of 6 children per carer in 2011 in almost all states. There has been a significant increase in the number of required hours of qualification. In 2007, an amount of 80 hours of qualification was sufficient and in the major part of states there was not even a rule concerning the training. In 2011, the required amount of qualification hours was already at almost 110 hours on average and only 6 states did still not have any rule on this quality dimension. Furthermore, the number of required training hours per year increased. In 2007, about 5 hours annual training were reinforced by law in only 5 states, while in 2011 almost 7 hours annual training were requested by already 9 states.



Table 5: Quality of Family Day Care over Time 2007-2011

<b>Year</b>	<b>2007</b>	<b>2009</b>	<b>2011</b>
Children-per-Staff-Ratio	2.146 (0.719)	2.465 (0.727)	2.850 (0.822)
D: Groupsize smaller than 4	0.819 (0.192)	0.763 (0.190)	0.672 (0.214)
D: Groupsize between 4 and 6	0.174 (0.191)	0.206 (0.184)	0.266 (0.209)
D: Groupsize larger than 6	0.007 (0.022)	0.032 (0.046)	0.062 (0.084)
% of staff with any family day care qualification	54.05 (21.65)	69.31 (17.13)	79.68 (11.50)
% of staff with family day care qualification $\geq$ 160 hours	16.54 (19.50)	27.04 (21.18)	45.73 (22.81)
% of staff with pedagogical degree ( <i>Erzieherausbildung</i> )	21.92 (9.67)	20.44 (7.98)	19.04 (6.47)
% of staff with pedagogical diploma ( <i>Diplompädagoge</i> )	2.60 (1.20)	3.27 (1.87)	3.34 (1.15)
% of staff with short-term education degree	13.10 (4.98)	11.94 (3.07)	11.59 (3.23)
% of staff with no degree/diploma	61.42 (10.67)	63.36 (8.01)	65.18 (6.90)
Weekly Hours of care per child	29.272 (8.207)	28.483 (8.459)	28.779 (8.712)

Notes: This table shows the average quality characteristics of family day care establishments in Germany for 2007, 2009 and 2011. "D" indicates a binary variable. N=411, standard deviation in parenthesis.

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

Did the actual quality of family-day care change according to new regulations? I use the Statistics of the *Child and Youth Services in Germany* to (at least partly) answer this question: Table 5 shows in its first row that the children-per-staff-ratio has on average always been below the legally allowed maximum. The number of children per family day carer has increased from 2.1 to 2.9. This comes together with a decrease of groups with less than 4 children (in 2007 82% of family day care groups consisted of less than 4 children, in 2011 only 67%) and an increase of larger groups (in 2007 around 17% of groups consisted of 4-6 children, until 2011 this share had risen to 27%, in 2007 less than 1% of family day care groups included more than 6 children, in 2011 this share was already at 7%). Table 5 furthermore shows that staff in family day care got more qualified on average between 2007 and 2011. In 2007 only about 50% of family day carers had completed a family day care qualification course, in 2011 already 80% had completed such a course. Importantly, the share of those carers who attended a course of at least 160 hours – as recommended by the German Youth Institute – increased from 17% to 46% between 2007 and 2011. Table 5 shows furthermore that the average number of weekly hours children attend family day care stayed about the same in the respective time period.

In sum, descriptive statistics indicate that – following the reform on early child care in 2008 – family day care became more prevalent on average and its quality improved in terms of staff

qualification. In terms of group size and children-per-staff ratio there was a slight deterioration, however.

## 4 The Effects of Quality Regulations in Family Day Care

### 4.1 Estimating the Effects of Regulations

Measuring the impact of regulating the quality of family day care on the provided family day care share might lead to biased results when only relying on variation across states for identification. The reason is that regulations might be endogenous. Suppose, for example, that there are states with a traditionally high number of voters who give high-quality child care top priority and other states with a low number of voters with such preferences. If voters vote their preferences, then the establishment of stricter quality standards might be more likely in the former than in the latter. In addition, local authorities in counties of the former group of states might be more motivated to make sure stricter quality rules are complied with. Failure to control for the existence of such state-specific differences will bias the estimated effect of stricter qualification requirements on the provided family day care share.

My data – covering the 16 German Bundesländer (states) and the years 2006-2011 – allow, on the one hand, to control for regional characteristics such as GDP per capita and female employment, and on the other hand, to control for state and year fixed effects to net out any time-constant state-specific characteristics that could impact the establishment of family day care and also to control for the overall time trend to expand early child care coverage.

The following estimation approach relies on Hotz and Xiao (2011): In a first step, I estimate the following baseline specification.

$$Y_{cst} = \alpha_0 + \alpha_1 REG_{st} + \alpha_2 NoREG_{st} + \alpha_3 X_{cst} + \delta_t + \gamma_s + \epsilon_{cst} \quad (1)$$

where  $Y_{cst}$  is the share of family day care, measured as share of all 0-3-year-olds in family day care out of all 0-3-year-olds in public child care, in county  $c$  belonging to state  $s$  in year  $t$ .<sup>20</sup> The share of family day care is defined as share of 0-3-year-olds attending family day care out of all 0-3-year-olds attending public child care (i.e. either family day care or center-based care, see bottom part of Table 1 for descriptives.)

$REG_{st}$  is a vector of the family day care regulations in state  $s$  in year  $t$ .  $NoREG_{st}$  is a vector of binary variables that are equal to 1 if the state  $s$  did not have a family day care regulation in year  $t$  and are equal to 0 otherwise.

$X_{cst}$  is a vector of county-level population characteristics (citizens per square kilometer, the

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<sup>20</sup>Note that I am – due to data protection rules – not able to use municipality averages but have to aggregate the data on the second lowest regional level, the county.

population share of 0-3-year-old children, shares of immigration and emigration, the overall share of children between 0 and 3 years attending public child care, the share of non-public child care providers, i.e. church and welfare organizations) and economic conditions (log of GDP per capita, living space per inhabitant, unemployment, female employment and the share of part-time working women).<sup>21</sup> The sign of coefficients reflecting a county’s economics (proxied by the variables GDP per capita, living space per inhabitant, and unemployment) is especially interesting in light of cost advantages for the public providers when supplying a higher share of family day care instead of center-based care (as explained in Section 3.2). Finally,  $\delta_t$  are year fixed effects and  $\gamma_s$  are state fixed effects. As alternative specification to assess whether the inclusion of state fixed effects changes results, also estimates of a regression without state fixed effects are shown below.

In a second step, I investigate the heterogeneity of regulation effects by the following equation:

$$Y_{cst} = \alpha_0 + \alpha_1 REG_{st} + \alpha_2 NoREG_{st} + \alpha_3 REG_{st} \cdot C_{cst} + \alpha_4 NoREG_{st} \cdot C_{cst} + \alpha_5 X_{cst} + \delta_t + \gamma_s + \epsilon_{cst} \quad (2)$$

where  $C_{cst}$  is a specific characteristic of a county. In my analysis, I use a county’s GDP per capita and respectively, a county’s population density as such a characteristic for the following reasons:

By estimation of this equation the heterogeneity of regulation effects between wealthier and poorer areas (resp. between more and less densely populated areas) is analyzed. On one hand, the size and sign of coefficients of interactions between regulations and county’s GDP per capita indicate whether wealthier regions react differently to more stringent quality rules than poorer regions. Parents living in wealthier regions might be more demanding regarding quality aspects of care – and may thus put more pressure on local authorities to expand family day care only in the presence of stricter quality rules. On the other hand, looking at interactions between regulations and population density is of interest since establishing new child care centers is more expensive in urban areas because of lack of space.<sup>22</sup> Therefore, regulations may be more easily complied with in less densely populated areas.

As shown in Hotz and Xiao (2011), the estimation equations 1 and 2 do not only allow to estimate the *marginal effect* of a reform indicating the effect of a marginal change of an existing regulation. They also allow to calculate the *average effect* of a regulation established in a state where there had not been a regulation so far. Importantly, the marginal effect and the average

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<sup>21</sup>Table A.2 in the appendix shows the averages of all county-level socio-economic characteristics over time.

<sup>22</sup>Furthermore, urban areas face usually more constraints on the staff supply side than rural areas (Hüsken and Riedel, 2012). This is due to higher rental prices and higher cost of living in cities which hinder child care staff to move to cities or to qualify as child care staff when living in a city. In a follow-up version of my paper I plan to use average rental prices as proxy variable for constraints on the supply side of child care.

effect of a regulation need not to be of the same sign since they refer to two different aspects of a regulation. It could be that the introduction of a minimum requirement of staff qualification in a system with no existing rules on this standard has a positive effect on expanding care (thus, the average effect would have a positive sign). At the same time, increasing the requirement of staff qualification by 20 hours, for example, could have a negative effect on care expansion (thus, the marginal effect would be negative).

The average effect relying on the specification of empirical model (1) is calculated as follows:

$$E(Y_1 - Y_0 | REG = \tilde{R}) = \alpha_1 \tilde{R} - \alpha_2 \tilde{R} \quad (3)$$

where  $\tilde{R}$  is the mean of regulation  $REG$ .

The average effect relying on the specification of the empirical model (2) is given by:

$$E(Y_1 - Y_0 | REG = \tilde{R}) = \alpha_1 \tilde{R} + \alpha_3 \tilde{R} \tilde{C} - \alpha_2 - \alpha_4 \tilde{C} \quad (4)$$

where  $\tilde{R}$  is the mean of regulation  $REG$  and  $\tilde{C}$  is the mean of county characteristic  $C$ .

In sum, relying on the estimation approach of Hotz and Xiao (2011) I identify the marginal and average effects of state regulations on the family day care share expansion through the inclusion of state fixed effects and year fixed effects. By that, any time-invariant differences across counties due to being placed in different states are held constant and any shocks that affected all German states in the same year are held constant.<sup>23</sup>

## 4.2 Results: Effects on the Family Day Care Share

Table 6 shows the main results. Column 1 presents the estimated coefficients obtained with the empirical model (1). Columns 2 and 3 present the estimated coefficients following the estimation approach using interaction terms as in empirical model (2).

Overall, it shows that state regulations on the staff-to-child-ratio, staff qualification and training hours have significant effects on the counties' family day care share.<sup>24</sup>

The findings in Column 1 indicate that a stricter rule on the staff-to-child ratio exerts a significant positive marginal effect on a county's family day care share. Reducing the maximal number of children per staff by 1 leads to an increase of the family day care share by 1 percentage point (ppt).<sup>25</sup> The average effect of regulations on the staff-per-child ratio is also positive, but

<sup>23</sup>In case that there are state-specific changes over time that are correlated with the regulation variables and that affect the share of family day care a county provides, the estimates would still be biased. In order to rule out this possibility, an additional specification in a follow-up version of this paper will allow for state-specific time trends.

<sup>24</sup>The following interpretations of results rest upon assuming linearity of effects of quality regulations on the family day care share. Yet, it may make a difference whether a regulation increases the minimum amount of qualification hours from 80 to 100 hours or from 140 to 160 hours. In a follow-up version of this paper, non-linearities of effects will be tested by including quadratic terms of regulations' stringency in the empirical model.

<sup>25</sup>The calculation is as follows: Increasing the staff-per-child ratio from, e.g. 0.143 to 0.173 (i.e. an increase of

quite small and not significant.

As regards regulations concerning the minimum number of required qualification hours, Column 1 in Table 6 shows that increasing the required amount by 30 hours would lead to a 1.2 ppt increase in the family day care share. Yet, the average effect of this regulation is negative: Introducing a regulation on the staff-per-child ratio at the overall mean of this indicator leads to a 6.4 ppt decrease in the family day care share which is quite sizable given the family day care share average of around 15% (see Table 1).

Turning to the marginal effect of regulations on the number of required annual training hours, Column 1 in Table 6 indicates a negative marginal effect of stricter rules: If the number of required training hours increases by 2, for example, the family day care share decreases by almost 1 ppt. The average of this regulation is not significant.

Overall, results in Column 1 show that regulations indeed matter for the provided share of family day care in a county. Yet, as discussed in Section 3.2, not only the legal framework matters for a county's child care policy but also its economic situation. Table A.4 in the appendix shows the entire set of estimated coefficients of the baseline specification of the empirical model (1). It indicates that counties with a higher GDP per capita have a lower family day care share, i.e. they have a lower share of the less expensive child care mode. Moreover, Table A.4 in the appendix reveals that the family day care share is higher in counties with a higher population density, less living space per inhabitant, more female employment, less part-time female employment and a higher inflow of people.

In order to investigate the role of county characteristics and their interplay with state regulations, columns 2 and 3 of Table 6 show results of regressions including interaction terms of regulations and county's GDP per capita and, respectively, county's population density. As one can see, effects of state regulations are heterogeneous across counties. Column 2 shows that the interactions of county's GDP per capita and regulations on the staff-per-child ratio and on the required number of qualification hours have statistically significant coefficients. While a more stringent rule on the staff-per-child ratio has a smaller effect in wealthier counties, a more stringent rule on the number of qualification hours has a larger effect in wealthier counties – a puzzling finding that is discussed below. As regards the required amount of training hours, there is no significant difference across counties of different GDP per capita. Column 3 shows that more stringent rules on the staff-per-child ratio have larger effects in more densely populated counties. More stringent rules on the the number of qualification hours, however, have a smaller effect in more densely populated counties. Again, rules on the required amount of training hours have no significantly different effects across more or less densely populated counties.

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0.03), is equivalent to reducing the maximal number of children from 7 to 6. The effect of reducing the maximal number of children per staff by 1 would thus lead to an increase of the family day care share of approx. 1 percentage point ( $0.03 * 0.3 = 0.009$ ).

Table 6: Marginal and Average Effects of Quality Regulations on the Family Day Care Share

	(1)	(2)	(3)
Staff-per-child ratio in law	0.300** (0.114)	1.507*** (0.425)	0.204 (0.129)
No Staff-per-child ratio rule <sup>c</sup>	0.038* (0.022)	0.292*** (0.098)	0.024 (0.026)
Staff-per-child ratio in law x GDPpc (log)		-0.361*** (0.128)	
No Staff-per-child ratio rule x GDPpc (log)		-0.076** (0.029)	
Staff-per-child ratio in law x population density			0.025*** (0.007)
No Staff-per-child ratio rule x population density			0.004*** (0.001)
<i>Avg. Effect of regulation: minimum staff-per child ratio<sup>a</sup></i>	0.005	0.003	0.003
Number of qualification hours <sup>b</sup> in law	0.004** (0.002)	-0.005 (0.006)	0.006*** (0.002)
No qualification hours rule <sup>c</sup>	0.067** (0.028)	0.088 (0.080)	0.091*** (0.028)
Number of qualification hours <sup>b</sup> in law x GDPpc (log)		0.003* (0.001)	
No qualification hours rule x GDPpc (log)		-0.004 (0.021)	
Number of qualification hours <sup>b</sup> in law x population density			-0.0001* (0.00006)
No qualification hours rule x population density			-0.003*** (0.001)
<i>Avg. Effect of regulation: minimum qualification hours<sup>a</sup></i>	-0.064	-0.071	-0.070
Number of training hours in law	-0.004*** (0.001)	-0.012 (0.007)	-0.005*** (0.001)
No training hours rule <sup>c</sup>	-0.032 (0.020)	-0.228* (0.117)	-0.046** (0.019)
Number of training hours in law x GDPpc (log)		0.002 (0.002)	
No training hours rule x GDPpc (log)		0.060 (0.037)	
Number of training hours in law x population density			0.0001 (0.0001)
No training hours rule x population density			0.001 (0.002)
<i>Avg. Effect of regulation: minimum training hours<sup>a</sup></i>	0.006	0.387	0.010
Regional Controls	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adj. R2	0.477	0.479	0.478
Observations	2299	2299	2299

Notes: <sup>a</sup>The average effect of a regulation is calculated according to equations 3 and 4. It is the effect of introducing a new regulation on a specific quality indicator at the mean value of this indicator relative to having no regulation on this indicator. Estimates of the average effects in *italics* are statistically significant at the 5%-level. <sup>b</sup>The number of required qualification hours is divided by 10 for the purpose of readability. <sup>c</sup>This binary variable equals 1 if there is no regulation on this quality indicator (otherwise it equals 0). Standard errors are clustered at the state-year level and are shown in parenthesis:

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Source: Statistics of the *Child and Youth Services in Germany*/INKAR. Own Calculations.

### 4.3 Discussion: Effects on the Family Day Care Share

As results show, both the legal framework and the economic conditions play a role for a county's implementation of family day care. Overall, counties with a higher GDP per capita have a lower family day care share. This indicates that family day care – being the less expensive care mode – is indeed an option for poorer counties to expand their early child care system. In the appendix, I show a different approach to estimate the importance of a county's economics: I divide all counties into a *poor group* (all counties whose GDP per capita is below median GDP per capita in 2006) and a *rich group* (the rest of counties). Figure A.1 shows that poorer counties started with a much lower share of family day care in 2006, but expanded this care mode in the following years more strongly than counties of the rich group. I estimate the effect of belonging to the poor group with a simple Difference-in-Difference approach interacting the status *poor* with a dummy indicating the time span after the reform in 2008. Table A.3 in the appendix shows that the results of this approach are in line with the estimated coefficients of GDP per capita in table A.4. According to the Difference-in-Difference approach belonging to the poor group significantly increased the share of family day care by 1.9 ppt after the reform.

Overall, results of Table 6 in Column 1 show that more stringent rules on training hours have a negative effect on a county's family day care share. This could be due to the following: Offering training to family day carers creates costs for counties and, therefore, rules increasing the required amount of training hours might make it less attractive for local authorities to engage in the search for family day carers. At the same time, also family day carers bear additional costs when they have to attend to more training hours per year which makes it less attractive to work in family day care.

As regards regulations on the required amount of staff qualification, Table 6 shows a small positive marginal effect which is more pronounced in wealthier counties and less pronounced in more urban counties. Yet, the average effect of the regulation is negative and quite large. As discussed in Section 3.2 counties face several constraints when expanding their supply of early child care. One important constraint is the lack of qualified staff. This could be responsible for the finding that the introduction of a state regulation on staff qualification leads to a decrease of the family day care share at first (resulting in a negative average effect). Once such a rule is established, increasing the amount of required qualification hours might attract more parents to use family day care. This would explain the larger effect of this regulation's stringency in wealthier counties in which parents might be more demanding "consumers". Additionally, wealthier counties might be financially more able to fulfill the higher qualification standard by offering family day care qualification courses to interested persons.

Finally, a tougher regulation on the staff-to-child ratio has a positive effect on the family day care share. This might seem surprising at first, but could be due to the following: Since the *de*

*facto* average staff-to-child ratio was already at 1:3 and below from 2007-2011 (cp. Table 5) new regulations that (at the maximum) established a ratio of 1:5 should not have presented a big obstacle for increasing the share of family day care, in other words the new rule did not *bite*. On the contrary, family day carers who used to care for 3 children only were maybe encouraged by the legal staff-to child ratio of 1:5 to take care of more children once the new rule was established. Due to that, the overall family day care share would have increased, too. Table 5 underpins this view: Between 2007 and 2011 the number of family day carers with groups of less than 4 children decreased while the shares of groups of 4-5 and more than 6 children increased. Table 6, Column 2 displays smaller consequences of a more stringent regulation on the staff-to-child ratio in wealthier counties and Column 3 displays larger consequences in more densely populated (i.e. more urban) counties. In line with the explanation above this could follow from more financial resources being available in wealthier counties to establish center-based care instead of family day care and to keep existing family day care at a small group size. In more urban regions, however, lack of space might be responsible for not establishing center-based care and instead rely on an expansion of family-day care and, additionally, on an increase of family-day care's group size.

One major difference with respect to the findings of Hotz and Xiao (2011) is that the stringency of regulations exerts no negative, but positive effects on the family day care share in the case of staff qualification and staff-to-child ratio in Germany. Only in the case of more stringent regulations on the required staff training, I find a small negative effect on the family day care share. Meanwhile, Hotz and Xiao (2011) find that more stringent regulations of these indicators on average decrease the number of child care centers in the US. The difference between the findings might be due to a different *bite* of regulations. While the standards in the US were set comparatively high (with respect to the ex-ante status) the standards in Germany were easily achievable by market participants, especially in the case of the staff-per-child ratio. Importantly, the dependent variable in my approach is measured as share while Hotz and Xiao (2011) use absolute numbers of child care centers resp. family day care homes as outcome. In other words, I observe the impact of quality regulations as a switch in the relative supply of family day care, while Hotz and Xiao (2011) observe a decrease in the absolute number of centers. This means that also the different definition of outcome variables may be responsible for the different findings.

The main common finding of both studies is the importance of the economic standing of regions on the supplied care mode. Hotz and Xiao (2011) show that stricter regulations substitute formal care by informal care predominantly in poor areas. I find that especially poor counties expand their early child care system by means of expanding their family day care share, a much less expensive way for a county to supply child care. Moreover, I find that rules on staff qualification have a larger positive impact in wealthier regions which is also in line with Hotz



and Xiao (2011).

Further robustness checks of the findings presented in this section will include an investigation of potential non-linearities of regulation effects. Furthermore, in order to understand the role of a county’s existing child care provision for its reaction to stricter quality regulations, I plan to include interaction terms of regulation indicators with the existing composition and extent of child care in the empirical model.

## 5 Family Day Care and Child Development

### 5.1 Estimating the Effects of Family Day Care on Child Development

In this part of my analysis, I investigate the consequences of a county’s share of family day care on child development. Hotz and Xiao (2011) only assume that the reforms they investigate and that led to a crowding-out of center-based care by family day care would lead to detrimental effects on children. In contrast, I aim at providing an empirical answer to the question whether family day care is indeed the care mode with less beneficial, or more detrimental, effects on child development when it is accompanied by regulations on its quality that are evaluated in the first part of my analysis. Yet, my approach has some major limitations: The estimation of the effects of the family day care share on child development is done using data on children’s skills provided by *one* state only (North Rhine-Westphalia, see Section 3.1 for a description of the data). Thus, a replication of the empirical models (1) and (2) for this region of study is not feasible since state-fixed effects cannot be implemented. In order to find out whether North Rhine-Westphalia is a representative region for studying the effects of family day care, I investigate the differences in the development of family day care over time (see below, Section 5.2) and do not find major differences. Furthermore, I compare the estimation results for the whole of Germany resulting from a regression with state fixed effects and one without state fixed effects and contrast the latter to results from a regression using only data from North Rhine-Westphalia. Finally, in a follow-up version of this paper I will use nation-wide survey data to combine the empirical models (1) and (2) with child outcomes.

In contrast to Datta-Gupta and Simonsen (2010, 2015) I do not use an instrumental variable approach to identify the effects of family day care on child outcomes but make use of the expansion of family day care due to the major reform in 2008. Thus, identification relies on a fixed effect approach and is specified as follows:

$$Y_{ict}^s = \beta F_{ct-3} + \gamma C_{ct-3} + \delta X_{ct-3} + \eta Z_i + \mu_c + \psi_t + \epsilon_{ict} \quad (5)$$

where  $Y_{ict}^s$  denotes skill dimension  $s$  of child  $i$  residing in county  $c$  at school entrance age (6 years old) at time  $t$ .  $F_{ct-3}$  stands for the share of family day care offered to children 3 years

prior to school entrance, i.e. around the time when they have completed early child care and are about to switch to kindergarten care.  $C_{ct-3}$  represents a set of family day care quality features measured 3 years prior to school entrance,  $X_{ct-3}$  a set of county characteristics measured 3 years prior to school entrance, and  $Z_i$  a set of individual background characteristics.  $\mu_c$  are county fixed effects and  $\psi_t$  are year fixed effects.

Since the SEE data of North Rhine-Westphalia (for a description see Section 3.1) do not include information on the specific care mode a child was attending I can only estimate intention-to-treat effects, i.e. investigate whether a higher share of family day care in a given county leads to a higher or lower share of children being assessed ready for school (socio-emotionally mature/physically mature) in this county. Due to including county fixed effects, I control for any time-constant characteristics of counties that may correlate with the timing of the family day care share expansion and with changes in children’s development. By including year fixed effects, I also control for the overall trend to expand early child care.

The main identifying assumption of my approach is that  $F_{ct-3}$  is conditionally independent of the unobserved determinants of children’s development  $Y_{idt}^s$ . As Duncan and Gibson-Davis (2006) point out, the omitted-variable problem arises if unobserved characteristics of the child or family background are correlated with the choice of child care quality as well as child outcomes. I control for children’s individual and background variables usually defined as being important for their development: gender, immigrant background, parental education, number of siblings, and birth weight. Still, it could be that especially parents with higher or lower (unobservable) ability of parenting send their child to family day care instead of center-based care when early child care is expanding. I assume that parents in Germany are on average not able to choose either mode of child care because of the low supply of early child care being confronted with a high demand. As described in BMFSFJ (2014), in 2012 early child care coverage was at 28%, but 40% of parents stated that they would like to enroll their child in early care. Given that counties fulfill their legal entitlement independent of offering a slot in center-based care or family day care it seems plausible that parents are not given a choice between the care modes. In consequence, I assume that children in both care modes have on average similar unobservable characteristics. In order to test this assumption, in a follow-up version of this paper, I will use the FiD data set – representative survey data – which includes information on the actual care mode attendance of children.<sup>26</sup>

## 5.2 Effects of Family Day Care on Child Development

Using administrative data of the School Entrance Examinations in North Rhine-Westphalia – Germany’s territorial state with the highest population density and consisting of 53 counties –

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<sup>26</sup>Furthermore, I am working on an instrumental variable approach using pre-reform numbers of training locations for family day carers per county as instrument for the family-day care share.

I analyze the intention-to-treat effect of family day care on children’s skills at age 6.

Is the region of North Rhine-Westphalia representative for the rest of Germany with respect to its counties’ expansion of the family day care share? Table A.8 in the appendix shows that the expansion between 2007 and 2011 was about the same as for the whole of Germany: The coverage of family day care increased from 2% to 4%. The family day care share increased from 20% to 24% (which is a slightly larger increase than observed for the whole of Germany). Table A.6 in the appendix shows that – as observed for the whole of Germany (shown in Section 4) – also in North Rhine-Westphalia especially counties in more economic distress increased their family day care share by more.<sup>27</sup>

As regards the quality regulations of family day care in North Rhine-Westphalia in comparison to the average state’s quality regulations there are some, but no major, differences.<sup>28</sup> In sum, the state of North Rhine-Westphalia thus provides a useful exemplary region to investigate the implications of the expansion of family day care in Germany. Yet, when interpreting the effects one has to bear in mind that North Rhine-Westphalia’s expansion was a bit above average. Furthermore, while the quality regulations on the staff-to child ratio are below average, the quality regulations on staff qualification are above average. Note also that parental fees and employment schemes of family day carers are not different from the German average.<sup>29</sup>

Turning to the results, Table 7 displays the estimated coefficients of fixed effect regressions based on the empirical model (5) discussed in Section 5.1.<sup>30</sup>

Panel A in Table 7 shows that a higher county family day care share comes along with a higher county share of children being assessed ready to follow the school curriculum and having better motor skills. When a county’s family day care share increases by 10 ppt, this results in a 1.4 ppt increase in children’s average school readiness and in a 1.1 ppt increase in children’s average motor skills. The overall coverage of early child care (i.e. the sum of slots in center-based care and family day care divided by the sum of 0-3-year-old children) does not have a significant effect on children’s skills at school entrance. Importantly, Panel A displays estimates of regressions that do not contain controls for the quality of family day care.

As Panel B in Table 7 shows, controlling for the quality of family day care makes a difference:

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<sup>27</sup>There is a significant negative relationship between living space per inhabitant and the family day care share and also a negative (yet not significant) relationship between GDP per capita and the family day care share.

<sup>28</sup>The regulation of the staff-to-child ratio is less strict than in the average state. Furthermore, there is no regulation on the number of training hours family day carers have to attend. The regulation on required staff qualification hours, however, is stricter than in the average state (91 hours vs. 86 hours) and there are fewer years without any rule on this ratio than in the average state (42% of time vs. 64% of time between 2007 and 2011).

<sup>29</sup>Estimating the empirical model (1) for North Rhine-Westphalia would only make sense if state’s time-invariant characteristics do not play a role for the effect of child care regulations. In order to find out whether estimating the empirical model (1) without state fixed effects renders similar results as presented in Column 1 in Table 6 I present results of a regression without state fixed effects in Table A.5 in the appendix. It shows that the results are different and change signs when not controlling for state fixed effects. Consequently, from Column 3 in Table A.5, displaying results of estimating the empirical model (1) for the state of North Rhine-Westphalia only, might not be learned anything.

<sup>30</sup>Table A.7 in the appendix shows the descriptive statistics of the sample of children used for this analysis.

Table 7: Implications of an Increasing Family Day Care Share for Children's Development

	Adipositas	School	Language	Motor	SocioEmotional
<b>PANEL A:</b>					
<i>No Quality Controls</i>					
Share of Family Day Care at Age 3	-0.0016 (0.0106)	0.1392* (0.0692)	0.0353 (0.0925)	0.1076* (0.0601)	0.0231 (0.0336)
Coverage All Provided Child Care at Age 3	0.0114 (0.0228)	-0.0046 (0.1519)	-0.0886 (0.151)	-0.038 (0.1169)	-0.0751 (0.0842)
County FE	Yes	Yes	Yes	Yes	Yes
N	409323	288619	380920	383050	233459
Adj. R2	0.012	0.0491	0.0485	0.046	0.0571
<b>PANEL B:</b>					
<i>With Quality Controls</i>					
Share of Family Day Care at Age 3	0.0098 (0.013)	0.1176 (0.0783)	0.0263 (0.091)	0.1188* (0.0594)	0.0664* (0.0367)
Coverage All Provided Child Care at Age 3	0.0182 (0.0235)	0.0033 (0.1284)	-0.0937 (0.1539)	-0.0391 (0.1028)	-0.0829 (0.0734)
County FE	Yes	Yes	Yes	Yes	Yes
Cohort FE	Yes	Yes	Yes	Yes	Yes
N	409323	288619	380920	383050	233459
Adj. R2	0.012	0.0497	0.0485	0.0463	0.0572

Notes: This table displays the estimates resulting from a fixed effects regression of 5 child development indicators at school entrance on the family day care share measured when children are 3 years old. Outcomes are measured as binary variables and equal 1 if the pediatrician does not detect a problem in the respective skill dimension (except in the case of adipositas: a value of 1 indicates a positive diagnosis of obesity). Regressions include regional and individual characteristics as control variables and county fixed effects as well as year fixed effects. Standard errors are clustered at the county level and are shown in parenthesis:

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Source: Statistics of the *Child and Youth Services in Germany* and the School Entrance Examinations in North Rhine-Westphalia. Own Calculations.

The estimated effect of the family day care share on school readiness is no longer significant. Yet, the estimated effect on children’s socio-emotional stability gets more precise and significantly positive: When a county’s family day care share increases by 10 ppt, then children’s social-emotional maturity measure increases by 0.7 ppt. The estimated effect on motor skills is about the same size as in the regressions without quality controls (indicating a 1.2 ppt increase coming along with a family day care share expansion of 10 ppt). As regards estimates of the coefficient of the overall coverage of early child care there is no difference with respect to size and precision compared to the regressions without quality measures.

### 5.3 Discussion: Effects on Children’s Development

The finding of positive effects of an increasing share of family day care on children’s development is quite surprising given the results of previous studies discussed in Section 2. Datta-Gupta and Simonsen (2010, 2015) report negative effects of family day care on children’s socio-emotional development as well as on their later academic outcomes. Furthermore, Hotz and Xiao (2011) implicitly assume that family day care is of inferior quality to center-based care. Additionally, parents in Germany seem to be ignorant of potential beneficial effects of family day care attendance given their favoring of center-based care over family day care (see Section 3.2: 77% of parents prefer center-based care, while only 11% prefer family day care).

The identification strategy – using county fixed effects – relies on within-county variation of the family day care share over time. Results indicate that a positive change in a county’s family day care share leads to a positive change in child outcomes. Meanwhile, a change in the overall supply of early child care apparently does not have a significant effect on child outcomes. One explanation for this could be that the changes in regulations came along simultaneously with the expansion of the family day care share and that those are responsible for the positive impact on children. The differences between coefficients of the regressions with and without quality indicators (Panel A vs. Panel B in Table 7) support this view. As shown in Table 5, the quality of family day care changed between 2007 and 2011: Complying with state regulations, the average family day carer got more qualified. The qualification of a family day carer is potentially most important for fostering a child’s cognitive development as preparation to follow the school curriculum (measured via the school readiness indicator). Since family day carer’s qualification improved parallel to the expansion of family day care, this leads to a positive effect of family day care on school readiness when not controlling for staff qualification. In the same vein, a small group size might be especially important for a child’s socio-emotional development. Since group size increased parallel to the expansion of family day care I only find a positive significant effect of the family day care expansion when controlling for quality features. As stated before, the estimated effects are intention-to-treat effects since the actual family day care attendance is not

observed in the SEE data. Therefore, selection into family day care could also be responsible for the positive effect of family day care on children’s development if especially children from families with better parenting skills attended family day care, for example. In this case, however, it would be necessary to explain why including quality measures should then make a difference in effects’ size and significance. This would imply that selection into family day care changes according to altered quality features of family day care. To investigate the problem of potential selection, a future analysis will be based on the *FiD dataset* – a representative survey of children in Germany that includes information on actual family day care attendance.

In sum, evidence drawn from North Rhine-Westphalia’s SEE data indicates that the reform on family day care in Germany was quite successful. The combination of both quantity and quality targets led to an increase in counties’ family day care share and to a positive overall effect of the expansion on children’s motor and socio-emotional skills.

Why do the findings of this study differ from the evaluation of family day care in Denmark? One potential explanation could be the use of different estimation strategies: While Datta-Gupta and Simonsen (2010, 2015) rely on instrumental variable approaches to estimate the local treatment effect, I use a fixed effect method to estimate the intention-to-treat effect on the respective cohorts of children that were affected by an exogenous policy change. Furthermore, while Datta-Gupta and Simonsen (2010, 2015) look at effects of a well-established early child care system in Denmark, I investigate effects in a system that is only at the beginning of providing early child care to all children. This suggests non-linearities of the effects of the family day care share which will be investigated in a follow-up version of this paper. Finally, while quality of family day care in Denmark is comparable to quality of family day care in Germany, center-based care in Denmark is of higher quality compared to those in Germany. I.e. family day care might indeed be the less preferred option in Denmark while this does not have to be the case in the German child care system.

As regards the size of the effects presented in Table 7, effects are relatively small. An average expansion of the family day care share of 10 ppt would result in an increase of children’s skills of about 2-3% of a standard deviation (compare the descriptive statistics of child outcomes in Table A.7). Yet, in light of previous findings of detrimental effects of family day care in other countries it may be considered as relieving result that the expansion of family day care in Germany did at least not lead to negative consequences for children’s development.

## 6 Conclusion

In this paper, on the one hand, I analyze the effects of the economic and legal environment on publicly provided child care quantity and quality using administrative data covering all child care centers and family day carers in Germany. On the other hand, I analyze the effects of the

resulting child care quantity and quality on child development outcomes using administrative data covering four school entrance cohorts of Germany's territorial state with the highest population density (North Rhine-Westphalia) combined with data on provided slots in child care and child care quality.

In the first part of my analysis, I find that both the legal framework and the economic conditions play a role for a county's implementation of family day care. Overall, poorer counties establish a higher share of family day care. I furthermore find that rules on staff qualification have a stronger positive impact in wealthier regions. In the second part of my analysis, I find that effects of an increasing family day care share on child development are positive. Children seem to benefit in terms of their socio-economic maturity and motor skills. Including quality measures of family day care, however, matters. This indicates that reforms that rise the quantity of child care can have positive effects on child development if quality is regulated simultaneously.

This study provides evidence that important features of non-parental care at an early age are a small group size and a more family-like context. Due to that, family day care might indeed represent a good option for harmonizing two public policy targets when flexibility is needed in expanding early child care in a fast manner: not to put too much of a burden on municipalities' financial situation and not to harm children's development.

However, one should keep in mind that the provision of this kind of care at a larger scale probably necessitates a different employment scheme for family day carers. At the moment, this care mode might not be attractive enough for staff to expand the family day care share by more in the future (Sell and Kukula, 2011). In a follow-up version of this study I will therefore look at the longer run impact of the child care reform in 2008 using most recent data and investigate the development of the family day care share until 2014. This future analysis will also include tests on the non-linearity of the effect of the family day care share.

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## A Appendix

Table A.1: Expansion of Center-Based Care over Time 2007-2011

<b>Year</b>	Child Care Centers per district	Child Care Centers Total (nationwide)
<b>2007</b>	110	45219
<b>2009</b>	113	46635
<b>2011</b>	116	47580

Notes: Center-based care is defined as care taking place in publicly subsidized child care centers that are monitored by district officials.

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

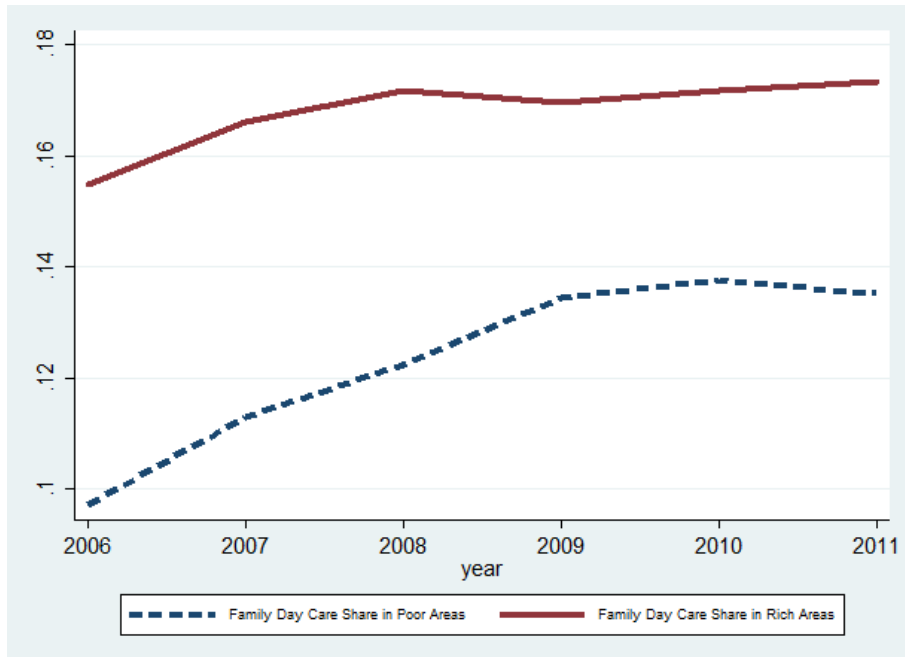
Table A.2: Regional Characteristics over Time 2007-2011

<b>Year</b>	<b>2007</b>	<b>2009</b>	<b>2011</b>
Citizens per km2	519.808 (672.276)	518.350 (672.963)	519.650 (678.946)
Living Space per inhabitant in m2	43.061 (3.853)	43.847 (4.060)	44.497 (4.278)
Share 0-3-y-old children (in %)	2.432 (0.255)	2.421 (0.245)	2.402 (0.256)
Log of GDPpc	3.270 (0.332)	3.263 (0.314)	3.201 (0.304)
Unemployed (in %)	8.860 (4.369)	7.863 (3.522)	6.947 (3.169)
Employed female (in %)	45.354 (4.247)	47.597 (4.573)	49.094 (4.856)
Parttime-Employed female (in % of total working)	12.440 (4.384)	19.548 (7.117)	20.924 (7.480)
To migration per 1000 inhabitants	38.447 (14.822)	39.474 (15.269)	40.318 (16.054)
Out migration per 1000 inhabitants	38.972 (11.750)	40.304 (12.893)	38.375 (12.440)
<b>N</b>	<b>411</b>	<b>411</b>	<b>411</b>

Notes: This table shows the regional characteristics (county averages) which are used as control variables in the main regressions displayed in Table 6. Standard deviation shown in parenthesis.

Source: INKAR. Own Calculations.

Figure A.1: Family Day Care Share by County Income



Notes: This graph plots the family day care share over time for two groups of counties: The *poor group* (dotted, blue) consists of all counties whose GDP per capita is below median GDP per capita in 2006. The *rich group* (red) consists of the rest of counties.

Source: Statistics of the *Child and Youth Services in Germany* 2006-2011/INKAR. Own calculations.

Table A.3: DiD Approach: Exploiting Different Expansion Paths due to Income Differences

	Family Day Care Share
After reform (post)	0.039*** (0.013)
County GDPpc below median (treat)	-0.031*** (0.007)
Interaction (post*treat)	0.019** (0.007)
Regional Controls	Yes
State FE	Yes
Year FE	Yes
Adj. R2	0.478
Observations	2299

Notes: Standard errors are clustered at the state-year level. \*p < 0.10, \*\* p<0.05, \*\*\*p<0.010.

Source: Statistics of the *Child and Youth Services in Germany*/INKAR. Own Calculations.

Table A.4: Regulations and Family Day Care Share: Full Results

Staff-per-child ratio in law	0.300** (0.114)
No Staff-per-child ratio rule <sup>c</sup>	0.038* (0.022)
Number of qualification hours <sup>b</sup> in law	0.004** (0.002)
No qualification hours rule <sup>c</sup>	0.067** (0.028)
Number of training hours in law	-0.004*** (0.001)
No training hours rule <sup>c</sup>	-0.032 (0.020)
Population density (citizens per km2 in 100s)	0.001** (0.001)
Living Space per inhabitant in m2	-0.003*** (0.001)
Share 0-3-y-old children (in %)	0.014 (0.013)
Share of 0-2y-olds in day care center or family day care(excl. 3y-olds)	-0.248*** (0.047)
Share of church providers	-0.027*** (0.010)
Share of other providers	0.002 (0.012)
Log of GDPpc	-0.018* (0.010)
Unemployed (in %)	0.001 (0.001)
Employed female (in %)	0.002*** (0.001)
Parttime-Employed female (in % of total working)	-0.001*** (0.000)
To migration per 1000 inhabitants	0.002*** (0.001)
Out migration per 1000 inhabitants	-0.001 (0.001)
Year: 2007 (D)	0.019* (0.011)
Year: 2008 (D)	0.037** (0.014)
Year: 2009 (D)	0.047*** (0.014)
Year: 2010 (D)	0.055*** (0.015)
Year: 2011 (D)	0.063*** (0.016)
cons	0.249*** (0.063)
State FE	Yes
Year FE	Yes
Adj. R2	0.477
Observations	2299

Notes: The dependent variable is the family day care share. <sup>b</sup>The number of required qualification hours is divided by 10 for the purpose of readability. <sup>c</sup>This binary variable equals 1 if there is no regulation on this quality indicator (otherwise it equals 0). Standard errors are clustered at the state-year level and are shown in parenthesis:

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Source: Statistics of the *Child and Youth Services in Germany*/INKAR. Own Calculations.

Table A.5: Effects of State Regulations on the Family Day Care Share – Alternative Specifications

	(1)	(2)	(3)
Staff-per-child ratio in law	0.300** (0.114)	-0.476*** (0.161)	
No Staff-per-child ratio rule <sup>c</sup>	0.038* (0.022)	-0.069** (0.035)	
Number of qualification hours <sup>b</sup> in law	0.004** (0.002)	-0.007*** (0.001)	-0.001 (0.002)
No qualification hours rule <sup>c</sup>	0.067** (0.028)	-0.040*** (0.011)	
Number of training hours in law	-0.004*** (0.001)	0.001 (0.001)	
No training hours rule <sup>c</sup>	0.025 (0.020)	0.027 (0.027)	
Regional Controls	Yes	Yes	Yes
State FE	Yes	No	No
Year FE	Yes	Yes	Yes
Adj. R2	0.477	0.402	0.212
Observations	2299	2299	260

Notes: The dependent variable is the family day care share. In the first column, results of the baseline empirical model (1) are shown. In the second column, results of the the baseline empirical model (1) without the inclusion of state fixed effects are shown. In the third column, results of the the baseline empirical model (1) for the region of North Rhine-Westphalia are shown. In this state there was only a change of the stringency of the rule on required qualification hours. Therefore, relying only on variation across time (and not across states) in column (3), only the coefficient for this rule is estimated.

<sup>b</sup>The number of required qualification hours is divided by 10 for the purpose of readability.

<sup>c</sup>This binary variable equals 1 if there is no regulation on this quality indicator (otherwise it equals 0).

Standard errors are clustered at the state-year level and are shown in parenthesis:

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Source: Statistics of the *Child and Youth Services in Germany*/INKAR. Own Calculations.

Table A.6: Which regional characteristics change simultaneously with the family day care share in North Rhine-Westphalia?

	Family-Day Care Share at Age 3
Citizens per km2 at age 3	0.0002 (0.0003)
Employed female (in %) at age 3	0.004 (0.0177)
Unemployed (in %) at age 3	-0.0073 (0.0104)
Log of GDPpc at age 3	-0.1802 (0.1557)
Parttime-Employed female (in % of total working) at age 3	-0.0077* (0.0042)
Living Space per inhabitant in m2 at age 3	-0.0848* (0.0435)
To migration per 1000 inhabitants at age 3	-0.1049*** (0.033)
Out migration per 1000 inhabitants at age 3	0.0154 (0.0349)
Share 0-3-y-old children (in %) at age 3	-0.007 (0.0851)
Share of 0-3y-olds in day care center or family day care at age 3	-0.5196*** (0.1819)
Pediatricians per 100 000 children at age 3	0.0026 (0.0025)
% of employed persons holding university degree at age 3	0.0001 (0.0003)
Self-employed per 100 employed persons at age 3	-0.0275 (0.0509)
% of employed persons with immigrant background at age 3	0.0021 (0.004)
Cohort 2011 (D)	0.0658* (0.036)
Cohort 2012 (D)	0.1373*** (0.0457)
Cohort 2013 (D)	0.1994*** (0.0547)
County Fixed Effects	Yes
N	409323
Adj. R2	0.8793

Notes: Standard errors are clustered at the county level and shown in parenthesis.

\*p < 0.10, \*\* p<0.05, \*\*\*p<0.010.

Source: Statistics of the *Child and Youth Services in Germany*/INKAR. Own Calculations.

Table A.7: Descriptive Statistics: Children at School Entrance Examinations in North Rhine-Westfalia (School Entrance Cohorts 2010-2013)

	Mean	SD
<i>Child Development Indicators</i>		
Adipositas (D)	0.046	(0.209)
School Readiness(D)	0.941	(0.236)
Socio-Emotional Maturity(D)	0.915	(0.279)
Language Skills(D)	0.685	(0.465)
Motor Skills(D)	0.829	(0.376)
<i>Individual Characteristics</i>		
Age (in months)	70.629	(3.533)
Male (D)	0.518	(0.5)
Birth weight (in gram)	2669.070	(1448.414)
Mom's education: basic	0.091	(0.288)
Mom's education: high	0.154	(0.361)
Nr of siblings (excl. kid)	0.895	(0.998)
Single parent	0.062	(0.241)
One/both parents foreigner	0.257	(0.437)
<i>Supply of Early Child Care</i>		
Share of Family Day Care at Age 3	0.189	(0.082)
Coverage All Provided Early Child Care at Age 3	0.134	(0.058)
<i>Family Day Care Characteristics</i>		
% of staff with completed family day care course at Age 3	0.668	(0.084)
% of family day care open more than 5 hours per day at Age 3	0.521	(0.133)
% of family day care with fewer than 4 children at Age 3	0.428	(0.134)
N	409323	

Notes: This table shows the descriptive statistics of children examined at the school entrance examination 2010-2013 in Northrhine Westfalia (birth cohorts 2004/2005-2007/2008). The five child development indicators are measured as binary variables and equal 1 if the pediatrician does not detect a problem in the respective skill dimension (except in the case of adipositas: a value of 1 indicates a positive diagnosis of obesity).

Source: Statistics of the School Entrance Examinations in North Rhine-Westfalia and the *Child and Youth Services in Germany*. Own Calculations.

Table A.8: Expansion of Early Child Care in North Rhine-Westfalia (2007-2011)

Year	Family Day Care Coverage	All Public Day Care Coverage	Share of Family Day Care	Share of Family Day Care (Minimum)	Share of Family Day Care (Maximum)	Family Day Carers per County (abs.)
2007	0.02	0.07	0.20	0.03	0.39	171
2008	0.02	0.11	0.16	0.01	0.43	201
2009	0.03	0.13	0.19	0.05	0.42	217
2010	0.04	0.14	0.21	0.07	0.40	231
2011	0.04	0.15	0.24	0.11	0.42	259

Notes: This table shows the average expansion of early child care in North Rhine-Westfalia from 2007-2011. Minimum and Maximum values display the smallest resp. the largest county average of the family day care share.

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