Does subsidized care for toddlers increase maternal labor supply?

Evidence from a large-scale expansion of early childcare

Kai-Uwe Müller and Katharina Wrohlich*

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Expanding public or publicly subsidized childcare has been a top social policy priority in many industrialized countries. It is supposed to increase fertility, promote children's development and enhance mothers' labor market attachment. In this paper, we analyze the causal effect of one of the largest expansions of subsidized childcare for children up to three years among industrialized countries on the employment of mothers in Germany. Identification is based on spatial and temporal variation in the expansion of publicly subsidized childcare triggered by two comprehensive childcare policy reforms. The empirical analysis is based on the German Microcensus that is matched to county level data on childcare availability. Based on our preferred specification which includes time and county fixed effects we find that an increase in childcare slots by one percentage point increases mothers' labor market participation rate by 0.2 percentage points. The overall increase in employment is explained by the rise in part-time employment with relatively long hours (20-35 hours per week). We do not find a change in full-time employment or lower part-time employment that is causally related to the childcare expansion. The effect is almost entirely driven by mothers with medium-level qualifications. Mothers with low education levels do not profit from this reform calling for a stronger policy focus on particularly disadvantaged groups in coming years.

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JEL classification: J22; J13; H43

* Corresponding author: German Institute for Economic Research Berlin (DIW Berlin), Mohrenstr. 58, D-10117 Berlin, Tel.: +49 30 89789 164, Fax: +49 30 89789 114, E-mail: kwrohlich@diw.de

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1 Introduction

In light of low fertility and female employment rates the provision of public childcare has been on the agenda of many countries (Immervoll and Barber, 2006). The expansion of public childcare is supposed to increase fertility, mothers' labor market attachment, and promote childrens' development in early life. Therefore, many countries have been increasing availability of public or publicly subsidized childcare, in particular for children aged below three years. On average, OECD countries increased enrollment to formal childcare in this age group from 29 to 34 percent, i.e. by 5 percentage points, between 2006 and 2014[1]. Germany is among the countries with the strongest increase in child care coverage: enrollment more than doubled from 14 to 32 percent over that time span.[2]

A positive effect of public childcare on maternal employment can be rationalized within an economic model of the family (Blau, 2003). The implied decrease in costs of childcare changes the relative utilities of consumption and leisure. Yet, income effects, preferences for the quality of care, or the availability of alternative modes of childcare loosen this relationship. In particular, subsidized childcare may crowd-out private or informal care, keeping maternal employment constant.

Given the theoretical ambiguity, an empirical literature on the employment effects of subsidized childcare has emerged. Evidence from early reduced-form studies and structural models unequivocally points to a significant impact of costs and availability of childcare on mothers' labor supply (Anderson and Levine, 2000; Blau and Currie, 2006). A different type of approach exploits quasi-experimental variation induced by policy reforms. Results from those studies are mixed. Although a majority of findings confirms the significant effect of childcare,[3] several analyses report negligible or insignificant estimates.[4] Moreover, effects are often found to be heterogeneous: the impact is larger for singles (compared to married moth-

[1] OECD family database, http://www.oecd.org/els/family/database.htm

[2] According to the OECD Family Database, only Lithuania and Korea experienced larger increases in child care enrollment for children aged 0-2 years.

[3] See Gelbach (2002), Blau and Tekin (2007), Berlinski et al. (2011), and Felfe et al. (2014) for examples using an instrumental variables (IV) approach and Berger and Black (1992), Berlinski and Galiani (2007), Baker et al. (2008), Lefebvre and Merrigan (2008), Lefebvre et al. (2009), Simonsen (2010), Havnes and Mogstad (2011), Nollenberger and Rodríguez-Planas (2011), and Schlosser (2011) for estimates from a difference-in-difference (DD) framework.

[4] See Fitzpatrick (2010) for an exemplary IV study and Lundin et al. (2008) and Havnes and Mogstad (2011) for the DD approach.

ers), women without additional young children (compared to mothers with multiple young children), for less educated mothers (compared to high-skilled women with lower elasticities), and it increases with the age of the youngest child.

In this study, we follow the quasi-experimental approach to identify potential effects of childcare availability on mothers' labor supply. We make use of two comprehensive policy reforms in Germany from 2005 and 2008 that created a suitable quasi-experimental setting. Starting from very low levels, childcare coverage for children aged 0 to 3 in West Germany increased dramatically. In our observation period, from 2007 to 2014, it increased from about 8% in 2007 to more than 27% seven years later. We are thus able to work with a substantial increase in the provision of childcare and not only marginal changes in childcare costs. At the same time the level of public care for children aged 4 to 6 remained largely constant (90% in 2007 and 94 % in 2014, see Figure A1 in the Appendix). Peculiarities of the administrative process and frictions in the market for childcare led to regional variation over time. We argue that – conditional on covariates – this variation can be considered exogenous and used for identification. Exploiting this variation, we assess whether there is a causal link between the provision of publicly subsidized childcare and the labor supply of mothers with children aged 1 to 3 in West Germany.

Quasi-experimental approaches sidestep some identification issues arising in structural or reduced-form estimations: decisions on a childcare arrangement and mother's labor supply are, for instance, not made independently; costs and availability of informal care are usually not observed. In the quasi-experimental approach, however, variation in the costs or provision of childcare is used that is generated by processes exogenous to mothers' employment and childcare choices. Our study contributes to the branch of this literature which is based on regional variation in the supply of childcare (see, e.g., Havnes and Mogstad, 2011).

Several papers on Germany have exploited the cross-sectional part of this variation. It serves as exclusion restriction for the determination of childcare costs in structural models (Haan and Wrohlich, 2011; Müller and Wrohlich, 2014), or is used directly in reduced-form employment equations (Kreyenfeld and Hank, 2000; Büchel and Spieß, 2002; Schober and Spieß, 2015). Cross-sectional differences in the supply of childcare may be endogenous, however: Parents with given preferences could demand a certain amount of childcare. Childcare providers (parents) could select

into a municipality with a specific demand for (supply of) childcare. Municipalities could use the provision of childcare to attract high quality labor. Relying only on within-region variation may be less restrictive when the expansion of childcare as a result of policy reforms is subject to implementation frictions.

In this paper we exploit the variation across regions and over time in the supply of childcare to identify the causal effect of childcare availability on mothers' labor supply. In order to account for unobserved regional differences that might confound the causal relationship between the availability of childcare and mothers' labor supply, we control for year and county fixed effects. The empirical analysis is based on eight waves of the German Microcensus. This data set does not contain information on the individual choice of a childcare arrangement, however, we can estimate intention-to-treat effects (ITT) of the provision of public childcare on maternal labor supply. In particular, we analyze whether the expansion of subsidized childcare has affected mothers' labor force participation, part time and full time employment. Moreover, we estimate the models on the full sample of mothers with children aged one to three years as well as several subgroups of mothers with different socio-economic characteristics.

With this analysis we contribute to the literature in several ways. First of all, this is the first study to use the regional variation in the childcare expansion on a county level to analyze the ITT effect of this most recent and very large expansion of subsidized childcare for very young children in West Germany. Second, in contrast to other studies that have analyzed similar childcare expansions in other countries, we not only look at effects on total labor market participation but on different types of employment. Moreover, our data set allows us to control not only for the increase in the total availability of childcare slots but also on the share of full-time slots. Finally, our analysis by socio-economic subgroup contributes to the literature on distributional consequences of public policies.

Our findings show a statistically significant intention to treat effect of the expansion of subsidized childcare for children under the age of three on mothers' labor supply. An increase in availability of subsidized childcare slots by one percentage point increases mothers' participation rate by 0.2 percentage points, which transfers to an elasticity of 0.04. This is slightly below the findings from an evaluation of a comparable policy reform in the 1990s that affected older children (Bauernschuster

and Schlotter, 2015) but virtually identical to simulations results of the expansion of childcare for children aged 1-3 years based on a structural model (Geyer et al., 2015).

Our estimations show that the whole increase in mothers' employment is due to an increase in part-time employment ranging from 20 to 35 hours per week. Part-time employment up to 20 hours per week or full time employment rates have not been increasing due to the expansion of subsidized childcare. Full-time employment is also not affected by a rising share of full-time slots (i.e. childcare of more than 6 hours per day). Differentiating socio-economic groups, we find that neither high-skilled nor low-skilled mothers react to the reform. Mothers with medium skill levels (who make up about 60 percent of all mothers in our sample) are driving the aggregate effect.

The remainder of the paper is organized as follows. Section 2 briefly sketches theoretical predictions on the relationship between the availability of public childcare and mothers' labor supply and gives an overview of the empirical literature. It also provides a detailed description of the childcare market and policy reforms in Germany. Data used for the empirical analysis are described in section 3. Section 4 explains the empirical approach and the identification strategy. Results are presented in section 5, section 6 concludes.

2 Provision of childcare and maternal labor supply

2.1 Theoretical considerations

We interpret the causal impact of public childcare on the employment decision of mothers within an economic framework of the family (Becker, 1981; Blau, 2001). Mothers decide simultaneously on their labor supply and a care arrangement for their children by maximizing a utility function in the arguments of consumption, leisure, and quality of care subect to bugdet and time constraints. In terms of childcare modes a complete choice set includes maternal care, (unpaid) informal care by relatives or friends, private formal care (by nannies or for-profit providers), and formal care in publicly subsidized/financed care centers. Households might be constrained with respect to informal as well as public childcare whereas private care can always be obtained at market prices.

The provision (subsidization) of public childcare affects the budget constraint by reducing costs for this form of care. The number of alternatives in the choice set of households constrained in certain care dimensions increases. As a consequence absolute and relative prices for different modes of care are altered which affects utility in the corresponding alternatives. The substitution effect leads ceteris paribus to a higher utilization of public childcare and increased maternal labor supply. This is the main channel for the supposed positive relationship between subsidized childcare and mothers' employment. As Blau (2003) points out the associated income effect goes in the opposite direction. It depends on her preferences which effect dominates and whether a given woman will increase or reduce labor supply. This is one of the sources of ambiguity or heterogeneity in empirical estimates (Gelbach, 2002; Cascio, 2009).[5]

Including (unpaid) informal care in the analysis provides another margin of adjustment. Blau (2003) notes that the provision of subsidized childcare changes relative costs of formal and informal care conditional on employment. Likewise households might substitute between different modes of care with the labor supply of mothers remaining constant. This is one of the mechanisms cited regularly in the empirical literature for explaining small or insignificant estimates for the effect of childcare on

[5]This ambiguity is particularly relevant for the intensive labor supply margin and larger in case of non-linear subsidies (Blau, 2003).

maternal labor supply (Havnes and Mogstad, 2011).

The different reasons for a loose link between childcare and employment can be qualified in terms of effect heterogeneity related to incentives or preferences. The aforementioned factors might be only binding for different sub-groups. For example, womens' level of qualification relates to heterogeneity in incentives and preferences. Empirical evidence supports these different aspects (Anderson and Levine, 2000; Blau and Currie, 2006).

To sum up, there are several reasons why the impact of publicly subsidized childcare on maternal employment might be ambiguous. Whether or not there is a significant effect depends on the empirical application. In addition to economic incentives and preferences, to the market for childcare and 'care culture', it depends on the population of mothers and children considered.

2.2 Empirical literature

Empirical studies of the relationship between public(ly subsidized) childcare and mothers' labor supply exploit different sources of variation. Childcare costs may vary at the household level, across regions, or as a result of childcare policy (reforms). Using individual or regional variation of childcare costs reduced-form and structural studies estimate employment elasticities for mothers. Structural models are also used to simulate the outcomes of existing or proposed policies. Evaluation studies exploit quasi-experiments that generate exogenous variation in the costs or provision of public childcare.[6]

Early empirical studies are based on *reduced-form* employment *regressions* with the utilization of public childcare as main explanatory variable. The main methodological challenges are the endogeneity of childcare in this estimation as well as selection problems related to employment and public childcare. The literature is dominated by studies on the U.S. (Blau and Robins, 1991; Connelly, 1992; Ribar, 1992; Kimmel, 1995; Powell, 1997; Kimmel, 1998; Anderson and Levine, 2000; Han and Waldfogel, 2001; Baum II, 2002; Meyers et al., 2002). Virtually all studies find a significant relationship between costs of childcare and maternal employment with

[6]See Blau (2003) and Blau and Currie (2006) for an overview of comparable methodological approaches on other outcomes like utilization of childcare or childrens' development. Outcomes for women include fertility (see Haan and Wrohlich (2011) for an exemplary study on Germany) or welfare receipt (see, e.g., Connelly and Kimmel, 2003).

elasticities ranging between close to zero and below -3. Blau and Currie (2006) argue that this can be explained by methodological discrepancies (specification, exclusion restrictions, controls) and much less by different data sources and samples.

Structural approaches directly model the decisions on a childcare arrangement and maternal labor supply. Simultaneity of the care and employment choices, selectivity issues, different modes of care, and rationing on the childcare market are addressed within this framework. Most of the studies again refer to the U.S. (Heckman, 1974; Blau and Robins, 1988; Michalopoulos et al., 1992; Ribar, 1995; Averett et al., 1997; Blau and Hagy, 1998; Michalopoulos and Robins, 2002; Connelly and Kimmel, 2003; Tekin, 2007). More recently structural evidence is also available for Sweden (Gustafsson and Stafford, 1992), the UK (Duncan and Giles, 1996; Blundell et al., 2000a,b; Duncan et al., 2001; Parera-Nicolau and Mumford, 2005), Canada (Michalopoulos and Robins, 2000; Powell, 2002; Michalopoulos and Robins, 2002), Italy (Del Boca, 2002; Del Boca and Vuri, 2007; Del Boca and Sauer, 2009), France (Choné et al., 2003), and Germany (Müller and Wrohlich, 2014; Geyer et al., 2015). Although smaller in magnitude compared to reduced-form work, the vast majority of those studies finds significant employment elasticities. Main challenges in this framework include the endogenous access to different types of care with respect to mothers' employment and the unobserved costs or availability of informal care.

Quasi-experimental settings generated by policy reforms have been used increasingly in more recent years to circumvent some of the identification issues.[7] When individual information on the utilization of subsidized childcare is available, the exogenous variation is used to instrument the childcare choice within an IV framework. This variation, for example, is generated by birth thresholds for the enrollment into childcare or preschool programs (Gelbach, 2002; Fitzpatrick, 2010; Goux and Maurin, 2010; Berlinski et al., 2011; Fitzpatrick, 2012). The staggered introduction or expansion of subsidies (provision of public care) across regions serves as alternative instrument (Blau and Tekin, 2007; Felfe et al., 2014).

Without household information on the choice of childcare, quasi-experimental variation is used in a DD or panel framework to identify intention-to-treat effects. Some studies exploit exogenous variation within a single state (Berger and Black,

[7]Yet another branch of the literature is based on social experiments and demonstration projects; see Gennetian et al. (2001), Blau (2003), Blau and Currie (2006), and Blau and Tekin (2007) for further references.

1992) or the difference between a single treated region vs. the rest of the country (Baker et al., 2008; Lefebvre and Merrigan, 2008; Lefebvre et al., 2009). In the most common setting, childcare or preschool policies induce exogenous variation between and within several regions of a country. The effect can then be estimated in a (generalized) DD design with a region-time-specific treatment indicator, region and time fixed effects and control variables at the individual and regional level. Evidence is available for a number of different institutional contexts; see Cascio (2009) for the U.S., Berlinski and Galiani (2007) for Argentina, Lundin et al. (2008) for Sweden, Simonsen (2010) for Denmark, Havnes and Mogstad (2011) for Norway, Dujardin et al. (2018) for Belgium, and Schlosser (2011) for Israel. The empirical work of this paper is conducted within this framework.

Quasi-experimental studies have put the unequivocal findings from the earlier literature into perspective. A sizeable portion of papers fails to identify statistically or economically significant effects (Fitzpatrick, 2010; Lundin et al., 2008; Havnes and Mogstad, 2011). Results are often heterogeneous: employment effects turn out to be more often significant for single than married or cohabiting mothers (Goux and Maurin, 2010; Cascio, 2009). The impact on maternal employment is also repeatedly found to be absent with younger siblings in the family (Gelbach, 2002; Berlinski et al., 2011; Cascio, 2009). Related to that effects tend to be higher for mothers with older children (Goux and Maurin, 2010).

The *evidence for Germany* is based on all three approaches. In two early studies cross-sectional variation in childcare coverage is included in reduced-form employment equations. Using the SOEP for 1996 Kreyenfeld and Hank (2000) do not get a significant effect for mothers with children below the age of 12 in West Germany. Büchel and Spieß (2002) use SOEP data for 1998, restrict the sample to preschool children and include the share of full-time slots as additional regressor. They find more significant effects for part-time employment and larger estimates for older children. Schober and Spieß (2015) use data from the SOEP and 'Families in Germany' ('Familien in Deutschland', FiD) for 2010/11. In addition to quantitative childcare indicators they include quality measures at the county level (available for one year) in an identical research design. They get insignificant quantity effects and partially significant coefficients for quality. Signs of those coefficients partially change between West and East Germany and are not always consistent with theoretical

expectations.[8]

There are several structural models estimated on German data. Müller and Wrohlich (2014) develop a framework for the joint decisions on childcare and mothers' labor supply. The authors estimate the model based on SOEP and FID Data from 2010 and deal with rationing in the childcare market by exploiting regional variation on childcare coverage. They find rather small but significantly positive effects of a reduction in childcare costs (-0.08). These findings are plausible given the significant rationing in the West German market for childcare (Wrohlich, 2008). Haan and Wrohlich (2011) estimate a model that jointly determines a women's labor supply and fertility decision and includes feedback effects. Geyer et al. (2015) estimate a labor supply model (without the fertility decision) and use the model for a simulation of an increase in public childcare similar to the one evaluated here. Bick (2011) calibrates a life-cycle framework with a detailed depiction of childcare decisions. These three studies simulate substantial employment effects as a consequence of an extended provision of care.

Most closely related to this paper are studies that exploit quasi-experimental variation at the regional (county) level.[9] Bauernschuster and Schlotter (2015) analyze the effect of publicly subsidized childcare for 3 to 4 year olds on their mothers' employment in the 1990s. They exploit regionally varying cut-off rules for the access to a kindergarten place during the implementation of a reform-induced expansion of care. Although they do not observe the actual distribution of rules, they take the eligibility criterion as an instrument in the first stage of an IV model. According to their results a 10 percentage point increase in public childcare increases maternal employment 3.5 percentage points.

How does our study line up with the literature? It is based on commonly used quasi-experimental variation at the regional level. In terms of treatment intensity the policy reform is midtable, comparable to Havnes and Mogstad (2011), above Lundin et al. (2008), and below Nollenberger and Rodríguez-Planas (2011). Although being standard in the international literature, accounting for regional fixed effects in a DD

[8]Part of the problem could be that the model specification of aggregate 'quality indicators' is too restrictive. There could be an interaction effect between the the overall provision of care and the care quality. This applies also to the share of full-time slots in Büchel and Spieß (2002).

[9]See Coneus et al. (2008) and Bauernschuster and Schlotter (2015) for alternative instruments and Bauernschuster et al. (2016) for an alternative control group.

or fixed effects panel framework has not been done so far in empirical studies for Germany.[10] We analyze the effects in the West-German context with low pre-reform levels of fertility, public childcare coverage and maternal employment. This might mostly resemble the Spanish case analyzed by Nollenberger and Rodríguez-Planas (2011). Moreover, we focus on children aged 1 to 3, which has not been so much in the focus of international studies that mostly look at children above the age of 3. Finally we distinguish between the availability of part-time and full-time childcare.

2.3 The childcare market and policy reforms

Germany has traditionally been characterized by low fertility and labor force participation; the latter holds in particular for mothers with young children (Figure A2 in the Appendix). Besides incentives of the tax and transfer system, social norms or attitudes towards motherhood and women's employment, the low supply of formal childcare is often quoted as an important cause. Peculiar for Germany is a stark regional contrast: Women and mothers in the East have been much better integrated into the labor market than their peers in the West. Due to the division of the national family policies have diverged historically. Childcare coverage has therefore been much lower in West Germany, in particular for children under the age of three (Figure A1 in the Appendix).

Except for the legal claim to a kindergarten place in the child and adoloscent support law (*"Kinder- und Jugendhilfegesetz"*) of 1996, policy reforms have only been initiated since the middle of the 2000s (Spieß, 2011). The day care expansion law (*Tagesbetreuungsausbaugesetz*, TaG) adopted in 2005 explicitly addresses the demand-oriented expansion of care for children under the age of three. The law particularly aims at enhancing the quality of care by childminders (*Tagespflege*). It formulates explicit quality standards to render these equivalent to alternative childcare facilities. In December 2008 the law on support for children (*Kinderförderungsgesetz*,

[10] The work by Bauernschuster et al. (2016) is the only study for Germany that closely resembles the DD/panel design of our study (section 4). They are interested on the impact the expansion of childcare for children in the age of 0 to 3 years had on fertility. A DD specification similar to Havnes and Mogstad (2011) is used where regions with an above-median increase in childcare coverage during the period of analysis are considered as treated. Alternatively a standard fixed effects linear panel model is estimated. They use administrative data aggregated at the county level and find a significantly positive effect – a 10 percentage point increase in care lead to 1.4 more births per 1000 women (3.2%). A recent study by Boll and Lagemann (2017) uses the same methodology, however only exploits variation on the State Level rather than the county level. As the authors state, based on this variation they cannot claim to identify a causal effect.

KiFöG) was adopted that commits states to a gradual expansion of childcare supply for children under the age of three. A binding deadline was defined when local supply has to meet demand for childcare. As of 1 August 2013 each child under the age of three is legally entitled to a subsidized childcare slot.[11]

These reforms lead to a large expansion of publicly subsidized childcare in both, East and West Germany. In West Germany, the increase started from an average level of about 8% in 2002 reaching 27% in 2014 (Figure A1 in the Appendix). In East Germany, coverage rates increased from 37 to 52% in the same time period. Coverage for children aged 3 to 6 was already very high at the end of the 1990s in both parts of the countries.[12]

Public childcare in Germany is provided by communities. Private providers include religious non-profit, non-religious non-profit, or commercial institutions. Public together with non-religious and religious non-profit providers cover almost the entire market; in 2009 roughly 2% of slots were owned by commercial providers (Mühler, 2010). Market composition varies across regions (Mühler, 2010; Hüsken, 2010, 2011). For children under the age of three, religious and commercial centers provide the majority of slots, especially for full-time care. The government also subsidizes certified child minders that take care of children outside of their homes. This comes at considerably higher cost. The share of public funding in the German childcare system is quite low compared to other European countries. Parents pay income-dependent fees with rules varying across municipalities.

The expansion of subsidized childcare following the aforementioned reforms is financed in part by the federal government and partly by the states. The amount and composition of funds vary by state-specific contracts. The general objective, strategy and funding are determined at the federal and state level. Youth welfare offices (*Jugendämter*) and/or municipal governments do most of the operational planning. Arrangements vary between states (Hüsken, 2010, 2011). Local authorities estimate the number of additional slots (and amount of daily care) needed and develop

[11] Children under the age of one only have this legal right, if their parents are working, currently searching for work or in education.

[12] Coverage for the respective age group is defined as the percentage of children being in childcare. The German care market for children under the age of three has been characterized by excess demand (Wrohlich, 2008). Although its degree has declined, rationing still persists as demand increased parallel to supply. According to newly available data it amounts to 16% in West and 14% in East Germany (Müller and Wrohlich, 2014). We thus assume a full take-up of newly created childcare slots for children under the age of three for the subsequent empirical analysis.

an appropriate expansion strategy. They refer to residents' registration statistics (*Einwohnermeldestatistiken*), use childcare facilities' waiting lists and information on past years. Almost half of the youth offices declared to interview parents with respect to their care preferences (BMFSFJ, 2011, 2012, 2013). This process is not codified by federal or state laws and subject to projection error. The vast majority of municipalities report financial, personnel and spatial shortages when trying to meet local demand (BMFSFJ, 2011, 2012, 2013). There are thus substantial frictions in the implementation of those reforms. We exploit this type of variation arising from the reform-induced expansion of publicly subsidized childcare for identification (sub-section 4.2).

3 Data & sample

For our empirical analysis, we match regional information on the availability of childcare to a large micro data set. The German Microcensus (MC) is a one-percent sample of the German population and contains detailed information on family and employment status of women (sub-section 3.1). Information on childcare is available at the level of German counties. These data are provided by the German Statistical Office. Additional indicators driving the local demand for childcare and affecting maternal labor supply are also available at this level of aggregation (sub-section 3.2).

3.1 German Microcensus

The German Microcensus (MC) is the largest household survey of all European countries (Lengerer et al., 2005; Lotze and Breiholz, 2002a,a). It is a representative one percent sample of the German population and has a particular focus on demographic and labor market related topics. It annually collects data from roughly 830.000 individuals living in 370.000 households.

The MC does not contain information on the individual choice of a childcare arrangement. However, it provides indicators for the extensive and intensive labor supply margin of individuals as well as the current contract status of those in employment. In addition, most of the individual-level control variables are available.[13]

3.2 Regional data

Information on the supply of childcare[14] are only available at the level of counties (*Kreise*) which add up to a total number of 440 in Germany. Since 2006 data on childcare coverage is provided by the German Statistical Office. The indicator is defined as the percentage of children using subsidized formal childcare in this period.[15]

[13] In 2005 the survey design changed from the consideration of a fixed reference week per year to the collection of information during a year (Afentakis and Bihler, 2010). This discontinuity in the questionnaire affected particularly variables related to the employment status. We therefore restricted the sample to the period after this conceptual break (sub-section 3.3).

[14] Actually, the indicator that we use does not contain information on the childcare slots offered per 100 children but the share of children enrolled in childcare. Since excess demand for childcare is still very high in all regions of Germany (see, e.g. Müller and Wrohlich (2016)), we argue that this indicator can be interpreted as the supply of childcare.

[15] For the years 1994, 1998, and 2002 these data were gathered by German Youth Institute based on material by the Statistical Offices of federal states. The analysis in this paper is, however,

From 2007 onwards there is separate information available for full-time and part-time childcare slots. We therefore use data from 2007 to 2014 (which is currently the most recent available MC wave) for the empirical analysis. We restrict the analysis to West Germany. The main reason for this is that there exists no consistent county panel due to reorganizations of local governments.

In addition, we use several control variables that are collected and edited jointly by the German Statistical Office with the Federal Institute for Research on Building, Urban Affairs and Spatial Development within the Federal Office for Building and Regional Planning. The dataset "Indicators and Maps on the Spatial Development" ("Indikatoren und Karten zur Raumentwicklung", INKAR, see Helmcke, 2008) allows longitudinal comparisons at different regional levels for Germany. The information used here is aggregated at the county level. In particular, we use indicators on population density, female employment rate, fertility rate and GDP per capita as regional control variables. These indicators as well as childcare data are merged with the Micro Census using county identifiers.

3.3 Sample & descriptive statistics

As indicated above we restrict the period of observation from 2007 to 2014. We not only avoid the conceptual break with the MC data in 2005, but also sidestep varying parental leave regimes that affect the labor supply incentives in the first years after giving birth. Moreover, information on full-time childcare coverage is only available from 2007 onwards.

Our main sample consists of mothers with at least one child aged 1-3 in West Germany. We focus on mothers with children of this age group because this group was targeted by the above-mentioned policy reforms that tried to overcome the substantial access demand on the market for childcare. For historical reasons the situation in East Germany was fundamentally different from the West. Moreover, administrative reforms changed the alignment of counties in the East, complicates the creation of a consistent panel data on the provision of childcare. We therefore run the empirical analysis on a sample of mothers from West Germany only.

Descriptive statistics for all dependent and independent variables are provided in

not affected by this change, as the sample is restricted to the observation period 2007-2014 (sub-section 3.3).

Table A1 in the Appendix. It shows that we have about 7,500 observations per year. Participation of mothers with children in the relevant age group increased from 46% in 2007 to 53% in 2014. While full-time employment rates and the prevalence of part-time employment up to 20 hours per week remained fairly stable, part-time employment with weekly hours from 20 to 35 hours increased by 10 percentage points.

4 Empirical methodology

4.1 Specification

Mothers i's employment outcome y_{ijt} in region j at time t is explained by exogenous variables at the individual level denoted by the vector $\boldsymbol{X_{ijt}}$, and at the regional level denoted by the vector $\boldsymbol{X_{jt}}$ as well as time fixed effects γ_t. The variable of interest throughout this paper is the regional childcare coverage cc_{jt} which varies at the county level and over time. In this setting the identification of the effect on mothers' labor supply is based on quasi-experimental variation in the provision of childcare. The main difference is whether specifications include regional fixed effects μ_j which rule out time-invariant unobserved confounders affecting childcare and mothers' employment:

$$y_{ijt} = \alpha + \delta cc_{jt} + \boldsymbol{X_{ijt}}\boldsymbol{\beta_1} + \boldsymbol{X_{jt}}\boldsymbol{\beta_2} + \gamma_t + \varepsilon_{ijt} \tag{1}$$

$$y_{ijt} = \alpha + \delta cc_{jt} + \boldsymbol{X_{ijt}}\boldsymbol{\beta_1} + \boldsymbol{X_{jt}}\boldsymbol{\beta_2} + \mu_j + \gamma_t + \varepsilon_{ijt} \tag{2}$$

where $\boldsymbol{\beta_1}$ and $\boldsymbol{\beta_1}$ are parameter vectors for individual and regional controls, respectively, and δ denotes the parameter of interest. These equations are estimated by OLS, respectively; Angrist (2001) discusses the adequacy of the linear probability model for binary outcomes which applies in our case to all dependent variables (sub-section 4.3).

The underlying assumption of specification (1) is that variation in childcare coverage cc_{jt} is exogenous conditional on observables $\boldsymbol{X}$ and a general time trend γ_t. However, several (unobserved) mechanisms lead to a correlation between cc_{jt} and ε_{ijt}. The selection of childcare providers into certain counties with higher demand for childcare (or vice versa) is an example for such a relation. The observed cross-sectional variation in childcare coverage may thus be (in part) a result of the spatial matching between childcare providers and mothers with high labor market attachment. The effect of childcare on maternal employment (as measured by the parameter $\delta^{(1)}$ from equation (1)) would be biased when this part of variation is used for estimation.

In contrast, the two-way fixed effects specification (2) can be interpreted as a generalized difference-in-differences approach. The inclusion of county fixed effects controls for time-invariant unobserved factors that might be correlated with regional

childcare provision. Identification is only based on within-county differences over time and therefore related to the quasi-experimental variation induced by policy reforms. Therefore the estimate of $\delta^{(2)}$ from equation (2) can be interpreted causally.

In order to investigate sub-sample heterogeneity, we run regressions with interaction terms between the availability of childcare and socio-economic characteristics (educational background and the presence of additional children). In order to correct for possible serial correlation of the error terms, we cluster standard errors at the county-year level.

4.2 Identification

This approach, that bases identification on spatial and temporal variation in the publicly subsidized provision of childcare at the level of (West) German counties, has several threats to identification (Felfe et al., 2014; Havnes and Mogstad, 2011):

- Macro-shocks might affect the treatment and control groups differently.
- Childcare providers (parents) locating (migrating) to areas with high female labor force participation and a sufficient demand for (supply of) childcare may lead to a two-sided selection process.
- Municipalities are interested in attracting qualified labor by offering or subsidizing childcare slots of sufficient magnitude and quality.
- Parents are equipped with certain beliefs towards child-rearing and employment. They demand a certain amount of care and lobby or vote for local childcare policies according to their preferences.
- The new childcare laws explicitly call for a demand-oriented expansion of childcare. Regions that are doing better economically might face less shortages initially. Counties where excess demand is particularly high may thus initiate the largest expansion of childcare.[16]
- The gradual increase in childcare availability opens the door for differential long-term trends in treatment and control counties.

[16] This is a problem in many of the studies based on regional variation in childcare expansion (see, e.g., Havnes and Mogstad, 2011 or Nollenberger and Rodríguez-Planas, 2011).

The first four processes are more of general nature whereas the two last ones relate to childcare policy reforms. This does not preclude the former to affect childcare expansion induced by reforms. All are related to two common problems in treatment/control setups: differential time trends unrelated to the treatment and compositional changes between those groups. Moreover, reverse causality plays an important role as childcare supply might adjust to demand. The crucial difference between specifications in this paper is whether or not fixed regional effects are controlled for. According to this distinction different parts of the variation in childcare coverage are exploited for identification. All of the listed problems apply unconditionally to cross-sectional analyses. Assumptions with respect to the temporal within-county part are less demanding.

Childcare expansion is assumed to be exogenous conditional on a number of intervening variables. Covariates in the estimations (sub-section 4.4) are supposed to control for several of the mechanisms depicted above. Mother- and household-specific characteristics (e.g. marital status, the number and age of children, other household income as well as age, qualification and labor market experience of the mother) reflect heterogeneity in preferences, financial incentives and capabilities in terms of mothers' labor market participation and utilization of childcare. These variables control primarily for compositional changes across the treatment and control units which might lead to shifts in maternal labor supply and demand for public childcare. Regional variables (population density, gross domestic product, female employment rate, fertility) approximate structural differences between counties. These might account for systematic differences in the demand for and supply of childcare which could lead to differential trends between treatment and control groups.

We argue that conditional on these covariates, the variation emanating from childcare reforms can be considered exogenous. This is a result of the implementation process in Germany (sub-section 2.3). Implementation involves a lengthy process at different administrative levels that consists of planning and projection of demand, applications for state-funding filed by local providers, and approval of proposal by state authorities:

– There is substantial error in local projections of childcare demand which has

been documented (Hüsken, 2010, 2011). Planning is organized at the local level and those errors are not evenly distributed.

– Municipalities are capacity-constrained in terms of financial scope, qualified personnel, or suitable construction grounds (BMFSFJ, 2011, 2012, 2013). Targets are therefore rarely met in the projected time frame.

– There are often considerable delays in the approval within the state administration (Stoy, 2015).

These different reasons generate exogenous variation between the municipalities which we observe at the county level and exploit for identification. The panel specifications with county fixed effects explicitly rely on this part of the variation.

Descriptive evidence illustrates the substantial increase in childcare coverage for children aged under 3. The average coverage rate has increased monotonically between 2007 and 2014 in West Germany (Tables A2 and A3 in the Appendix). Overall (full-time) coverage has doubled from 16% (7%) to almost 32% (16%). This poses a marked supply shock, i.e. a treatment of significant magnitude across West Germany. An expansion of publicly subsidized childcare for children under the age of 3 started already at the beginning of the 2000s, but the tempo increased considerably in the middle of the 2000s (Figure A1 in the Appendix). The monotonic increase holds for each single state which demonstrates that compliance has been comprehensive.

Regional heterogeneity has been reduced in relative terms as measured by the Theil index during this period of expansion (bottom of Table A2).[17] Not only have childcare slots become more equally distributed across all of West Germany, but also between and within federal states. Inequality in childcare provision has decreased more within than between states. This holds for overall and full-time coverage. As of 2014 there is still considerable regional variation between and within West German states in the provision of childcare, considerably more so for full-time slots.

It is hard to pin down empirical evidence that the implementation of reforms generated idiosyncratic variation in the provision of childcare. A detailed visualization

[17] Bauernschuster et al. (2016) argue that heterogeneity increased as measured by standard deviations. Yet, this is rather a mechanical effect depending on the level of childcare coverage. This is a question of relative and absolute heterogeneity; it is not a priori clear what is more relevant for identification.

of how the spatial distribution of childcare coverage has evolved over the post-reform period provides some guidance in that regard (Figure A3 in the Appendix). The considerable within- and between-state variation in the cross-section, but also over time is confirmed. In 2007 certain counties start from a much higher level than others. There are several regional clusters with high coverage in the beginning of our observation period, e.g. the north of Bavaria, somewhat the south of Rhineland Palatinate or the middle of Hesse, but also large cities as Hamburg or Munich. More importantly the expansion does not proceed with uniform tempo. Certain counties move faster than others that catch up the following year or later. Nevertheless between and within state differences among counties remain.

Comparing the development of overall and full-time coverage also reveals some important insights. Some of the counties/regions with above-average overall coverage also provide a high number of full-time slots (e.g. large cities as Hamburg or Munich). There are others, however, with high overall care that rarely offer full-time slots. The Bavarian north-south divide does not exist for full-time care. Some counties/regions that proceeded more quickly in expanding overall childcare coverage also have invested more in full-time slots. On the other hand, certain counties, in some instances regions or whole states (e.g. North-Rhine Westphalia), which have long lagged behind in overall coverage, moved to/near the top in terms of full-time care. These findings underline the erratic spatial pattern during the expansion and provide evidence for exogenous variation in childcare supply.

4.3 Dependent variables

The effect of subsidized childcare for the group of mothers with young children will likely be heterogeneous for different margins of labor supply (sub-section 2.1). We therefore estimate the relationship for various outcome variables y_{ijt}:

(i) *Participation*: $y_{ijt}^{(i)}$ is a dummy variable where $y_{ijt}^{(i)} = 1$, if the mothers hours of work are positive, i.e. $h_{ijt} > 0$, and $y_{ijt}^{(1)} = 0$ otherwise. This is an overall indicator for mothers' labor supply at the extensive margin.

(ii) *Full-time participation*: $y_{ijt}^{(ii)}$ is a dummy variable where $y_{ijt}^{(ii)} = 1$, if $h_{ijt} > 35$, i.e. the weekly working hours are 35 or more; $y_{ijt}^{(ii)} = 0$ otherwise. This outcome

measures the influence of public childcare the share of mothers working full-time share.

(iii) *High part-time participation*: $y_{ijt}^{(iii)}$ is a dummy variable where $y_{ijt}^{(iii)} = 1$, if $20 \leq h_{ijt} < 35$, i.e. the mother works at least 20 but no more than 35 hours per week.

(iv) *Low part-time participation*: $y_{ijt}^{(iv)}$ is a dummy variable where $y_{ijt}^{(iv)} = 1$, if $0 < h_{ijt} < 20$, i.e. the mother works up to 20 hours per week.

Descriptive statistics for all dependent variables and sample periods can be found in Table A1 in the Appendix.

4.4 Explanatory variables

The explanatory variable of interest measures the provision of childcare for children aged 1 to 3 at the county level. The childcare coverage rate cc_{jt} is defined as the percentage of children of this age group using subsidized formal childcare county j in year t. In some specifications, we add the share of full-time slots among all slots cc_{jt}^{FT} as an additional variable in order to check whether this has an (additional) effect on mothers' employment. Descriptive statistics on childcare coverage during the observation period are documented in Tables A2 and A3 in the Appendix.

The general set of individual control variables for the mother includes her age (included in linear and quadratic form in all specifications), the level of qualification, her marital status and nationality. Moreover, a variable indicating the presence of other children in the age group under three and a variable indicating the number of children in the household in the age group 3 to 6. In order to control for regional differences that might correlate with childcare availability, we use the degree of urbanity, GDP per capita, the female employment rate as well as fertility as time-varying control variables on the regional level.[18]

[18]See Hüsken (2010) for a study on regional determinants of the childcare coverage in Germany.

5 Results

5.1 Main specification

All estimations of this sub-section are based on our main sample that includes mothers with children aged 1-3 in West Germany from 2007 to 2014. We find strongly significant and very robust positive associations between childcare coverage and overall labor force participation, full-time employment and part-time employment with long hours (20 to 35 hours per week) in all specifications without regional fixed effects (Table 1, columns (I) to (III)).[19] As far as the outcome variable part-time employment with short working hours (1 to 20 hours per week) is concerned, we find significant negative effects of the childcare coverage rate. The negative sign for part-time employment with low hours reflects a lower share of this type of employment in counties with better childcare coverage. The pattern of results remains constant when we add individual and regional covariates (column (II)) and additionally time fixed effects (column (III)). As argued above, a causal interpretation of these associations is problematic for a number or reasons.

Credible exogenous variation is generated, however, through implementation frictions over time across different counties which corresponds to specification (IV) (Table 1). In this specification, results change in terms of coefficient size and statistical significance.[20] The positive and strongly significant effect of local childcare coverage on overall employment decreases and amounts to 0.204 in our preferred specification that includes county fixed effects. This means that an increase of the childcare coverage rate by 1 percentage point increases the employment rate of mothers by roughly 0.2 percentage points. Interestingly, this specification reveals that this effect is solely driven by an increase of part-time employment with weekly working hours from 20-35 percent. We neither find effects of the childcare coverage rate on full-time employment nor part-time employment with shorter working hours.

These results conform to the simulation results of previous structural studies for Germany. For example, Geyer et al. (2015) use their model to simulate a 31 percentage points expansion of public childcare for children under three years and

[19] Full regression results for the main specification and all dependent variables without county fixed effects can be found in Table A4 in the Appendix.

[20] Full regression results for the main specification and all dependent variables without county fixed effects can be found in Table A5 in the Appendix.

Table 1: Regression estimates, effects of local childcare availability on mothers' employment, main specification with different controls

	(I)	(II)	(III)	(IV)
Participation				
Childcare coverage	0.505***	0.344***	0.305***	0.204*
	(0.037)	(0.044)	(0.065)	(0.122)
Full-time employment				
Childcare coverage	0.165***	0.070**	0.152***	0.030
	(0.030)	(0.032)	(0.041)	(0.092)
Part-time employment with long hours				
Childcare coverage	0.574***	0.428***	0.365***	0.195*
	(0.073)	(0.034)	(0.051)	(0.114)
Part-time employment with short hours				
Childcare coverage	-0.233***	-0.154***	-0.212***	-0.021
	(0.049)	(0.033)	(0.051)	(0.094)
Observations	59,567	59,567	59,567	59,567
Controls				
Covariates		✓	✓	✓
Time fixed effects			✓	✓
County fixed effects				✓

Notes: Standard errors in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: RDC of the Federal Statistical Office and Statistical Offices of the Länder: Microcensus, waves 2007-2014; German Statistical Office: data on subsidized childcare; Federal Office for Building and Regional Planning: Indicators and Maps on the Spatial Development; own calculations.

find that the participation rate of mothers with children in this age group increases by almost 5 percentage points. Assuming linearity, their simulation results suggest that the participation rate of mothers increases by 0.16 percentage points if childcare availability is increased by 1 percentage point. For older children, i.e. children aged 3 to 6 years, however, Bauernschuster and Schlotter (2015) have found larger effects. Based on quasi-experimental variation from the introduction of a legal claim for kindergarten slots in the late 1990s in West Germany for children aged 3 to 6, the authors find that an increase of childcare slots by 1 percentage point increases mothers' employment by 0.34 percentage points.

In the next step, we additionally include the share of full-time slots available among all childcare slots for children under the age of three in our preferred specification including individual and regional control variables as well as time and country fixed effects (Table 2). We find that including the share of full-time slots does hardly change the results as compared to our main specification above (Table 1). The point estimates for the coefficients of the childcare coverage rate in estimations for all dif-

ferent dependent variables remain virtually constant. While the overall coverage rate has a positive and significant effect on the participation rate, the share of full-time slots does not affect this outcome variable.

Table 2: Regression estimates, effects of local childcare availability on mothers' employment, including share of full-time slots

	Participation	**Full-time**	**Part-time (20-35h)**	**Part-time (1-20h)**
Childcare	0.207*	0.030	0.203*	-0.026
coverage	(0.121)	(0.092)	(0.108)	(0.093)
Share of	0.025	-0.005	0.080**	-0.051
full-time slots	(0.042)	(0.033)	(0.037)	(0.035)
Observations	59,567	59,567	59,567	59,567
Controls				
Covariates	✓	✓	✓	✓
Time fixed effects	✓	✓	✓	✓
County fixed effects	✓	✓	✓	✓

Notes: Standard errors in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: RDC of the Federal Statistical Office and Statistical Offices of the Länder: Microcensus, waves 2007-2014; German Statistical Office: data on subsidized childcare; Federal Office for Building and Regional Planning: Indicators and Maps on the Spatial Development; own calculations.

However, both variables positively affect part-time employment with long weekly working hours (20 to 35 hours). If childcare coverage increases by 1 percentage point, the share of mothers working in this hours category increases by 0.2 percentage points (as in our main specification). If – ceteris paribus – the share of full time slots is increased by 1 percentage point, the share of mothers in this group increases by 0.08 percentage points. As far as part-time employment with shorter working hours (less than 20 hours per week) is concerned, we do not find any effects of any of the two childcare variables.

5.2 Effect heterogeneity

To shed light on the question to what extent different socio-economic groups contribute to the overall employment effect (and thus benefit most from the expansion of subsidized childcare), we interact the local childcare availability with different socio-economic characteristics (Table 3). We are interested in effect heterogeneity in terms of mothers' skill level, their marital status and the presence of other children in the households.

Table 3: Regression estimates, effects of childcare provision on mothers' employment, effect heterogeneity

	Participation	**Full-time**	**Part-time (20-35h)**	**Part-time (1-20h)**
Main specification without interactions				
Childcare coverage	0.204*	0.030	0.195*	-0.021
	(0.122)	(0.092)	(0.114)	(0.094)
Interaction with skill-level dummies (high and low skilled, reference category: medium skilled)				
Childcare coverage	0.303**	0.044	0.285**	-0.025
	(0.122)	(0.100)	(0.113)	(0.095)
Mother low skilled	-0.147***	-0.041***	-0.017**	-0.089***
	(0.013)	(0.009)	(0.009)	(0.010)
Mother low skilled ×	-0.435***	-0.083	-0.451***	0.100*
childcare coverage	(0.069)	(0.047)	(0.043)	(0.053)
F-statistic of				
joint significance	0.88	0.17	2.04	0.51
Mother high skilled	0.182***	0.066**	0.138***	-0.022
	(0.017)	(0.013)	(0.014)	(0.015)
Mother high skilled ×	-0.195***	-0.013	-0.140**	-0.043
childcare coverage	(0.071)	(0.065)	(0.063)	(0.067)
F-statistic of				
joint significance	0.73	0.10	1.43	0.42
Interaction with mother's marital status				
Childcare coverage	0.258**	0.036	0.220**	0.002
	(0.123)	(0.094)	(0.108)	(0.095)
Mother unmarried	0.008	0.017*	0.036***	-0.045***
	(0.015)	(0.010)	(0.012)	(0.011)
Mother unmarried ×	-0.052	0.032	-0.003	-0.082*
childcare coverage	(0.066)	(0.043)	(0.059)	(0.049)
F-statistic of				
joint significance	2.33	0.43	2.86*	0.61
Interaction with presence of additional children aged under 6 years				
Childcare coverage	0.221*	0.082	0.242**	-0.103
	(0.125)	(0.101)	(0.115)	(0.096)
Additional children	-0.127***	-0.022***	-0.049***	-0.056***
	(0.012)	(0.008)	(0.009)	(0.010)
Additional children ×	0.070	-0.111	-0.065	0.246***
childcare coverage	(0.069)	(0.046)	(0.049)	(0.050)
F-statistic of				
joint significance	5.10**	0.11	2.73*	2.03
Observations	59,567	59,567	59,567	59,567
Controls				
Covariates	✓	✓	✓	✓
Time fixed effects	✓	✓	✓	✓
County fixed effects	✓	✓	✓	✓

Notes: Standard errors in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: RDC of the Federal Statistical Office and Statistical Offices of the Länder: Microcensus, waves 2007-2014; German Statistical Office: data on subsidized childcare; Federal Office for Building and Regional Planning: Indicators and Maps on the Spatial Development; own calculations.

For comparison purposes the first panel of Table 3 repeats estimates from the main specification without interactions. In the first specification, we interact childcare availability with educational characteristics. To this end, we define three education groups: High skilled are defined as those mothers who have obtained a tertiary education. Medium skilled are those mothers who have received A-levels and/or vocational training. Low skilled mothers have accumulated less than 12 years of schooling (and no vocational education). The results from this specification show that significant effects of childcare availability on mothers' labor supply in terms of their overall participation probability and for large part-time employment can be found for the medium skill group (Table 3, second panel). Point estimates are larger than the overall estimates for all mothers. On the contrary the expansion of childcare availability did not have a statistically significant effect on the employment status of mothers with higher education (high-skilled group) or mothers with less than twelve years of schooling (low-skilled group). The respective F-Tests on the joint significance of the main effect of childcare coverage plus the interaction term turn out to be insignificant. The effect of childcare coverage on participation and large part-time is substantially smaller for low- and high-skilled in comparison to medium-skilled mothers as the negative interaction terms indicate that are statistically significant in three out of four instances.

In the second specification, we interact the indicator for local childcare availability with a dummy variable that is equal to one for all unmarried (i.e. single, divorced or widowed) mothers. We find the main effect of childcare availability on the participation probability and on part-time employment above 20 hours per week to be significant for married mothers (Table 3, third panel). Again, point estimates for this group are slightly large than for all mothers. For unmarried mothers, the effect on participation is not statistically significant, neither is the difference between married and unmarried mothers. However, childcare availability positively and significantly affects the probability to be part-time employed with long hours also for unmarried mothers as the significant F-test indicates.

In a third specification we test whether mothers with additional children aged below 6 years are affected by local childcare availability in a different way than mothers with only one child in that age group. As the estimation results show, we find the same pattern for both groups: Childcare availability positively affects

the outcome variables labor force participation and long part-time hours. That the effect of the childcare expansion is larger in magnitude for mothers without additional children is larger in magnitude for mothers with no additional children is consistent with theoretical expectations. However, we cannot identify significant differences between those groups. Full-time employment and part-time with short hours are not affected in either group.

5.3 Alternative specification as Difference-in-Difference Estimation

In our main specification, identification of the effect of local childcare availability on labor supply outcomes of mothers is based on the variation of childcare availability over time and county fixed effects. In their seminal paper, Havnes and Mogstad (2011), use a different identification strategy: Although they have a similar setting in the sense that there was a regionally staggered increase in childcare availability over several years, they only use the first and the last year of observations (pre- and post-reform). Havnes and Mogstad build two groups of counties: those with an above-median increase in childcare availability are defined as 'treatment group' and those with a below-median increase in childcare availability fall into the 'control group'. Based on these data, they estimate the following difference-in-difference model for mothers i's employment outcome y_{ijt} in region j at time t:[21]

$$y_{ijt} = \alpha + \pi_1 Treat_{ij} + \pi_2 Post_t + \delta\left(Treat_{ij} * Post_t\right) + \boldsymbol{X_{ijt}}\boldsymbol{\beta_1} + \boldsymbol{X_{jt}}\boldsymbol{\beta_2} + \mu_j + \varepsilon_{ijt} \quad (3)$$

Again, vectors $\boldsymbol{X_{ijt}}$ and $\boldsymbol{X_{jt}}$ represent individual- and county-level controls with $\boldsymbol{\beta_1}$ and $\boldsymbol{\beta_2}$ being the respective parameter vectors. the specification contains a fixed county effect μ_j. $Treat_{ij}$ denotes a dummy variable for the treatment status and $Post_t$ for the treatment period. Therefore unobserved differences in mothers employment outcomes between different years and the treatment and control group are controlled. The parameter δ of the interaction term $(Treat_{ij} * Post_t)$ measures the effect of interest. Under the assumptions that monthers' employment in treated and untreated counties would have evolved similarly without the expansion of childcare, δ can be interpreted as the causal effect of a 'relatively large' increase in the

[21] The same identification strategy has also been used by other authors, most recently for example by Dujardin et al. (2018) in a study for Belgium.

availability of childcare on mothers' labor supply as compared to a 'relatively low' increase. Estimating this model on the first and the last year of our data, i.e. 2007 and 2014, and controlling for covariates at the individual and the regional level, we find that the outcome variable part-time employment with long hours is positively and significantly affected by the interaction term between treatment and post-reform period (Table 4).

Table 4: Regression estimates, difference-in-difference specification

	Participation	**Full-time**	**Part-time (20-35h)**	**Part-time (1-20h)**
"Reform"	0.037	-0.017	0.063***	-0.009
	(0.016)	(0.011)	(0.012)	(0.013)
"Treatment"	0.009	0.008	0.003	-0.002
	(0.012)	(0.008)	(0.009)	(0.010)
"Reform" + "Treatment"	0.018	0.002	0.025*	-0.008
	(0.017)	(0.012)	(0.013)	(0.014)
Observations	14,872	14,872	14,872	14,872
Controls				
Individual Covariates	✓	✓	✓	✓
Regional Covariates	✓	✓	✓	✓

Notes: Standard errors in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: RDC of the Federal Statistical Office and Statistical Offices of the Länder: Microcensus, waves 2007-2014; German Statistical Office: data on subsidized childcare; Federal Office for Building and Regional Planning: Indicators and Maps on the Spatial Development; own calculations.

Mothers who experienced an above-median increase in the availability of childcare in their counties between 2007 and 2014 have a 2.5 percentage points higher probability to be part-time employed with more than 20 hours per week than mothers living in counties with a below-median increase childcare coverage . The magnitude of the effect of childcare availability on part-time employment with long hours is comparable to what we have found in the fixed effects model: The treatment intensity in this difference-in-difference setting amounts to 12 percentage points (the mean of the childcare availability rate in 2007 in counties with below-median increase rates was 19.4 percent, the mean in 2014 in counties with above-median increase rates was 31.1 percent). Assuming linearity, this implies that an increase of local childcare availability by 1 percentage point increases the probability that mothers are part-time employed working 20-35 hours per week by 0.21 percentage points, which is very similar to what we found in our preferred specification (see Table 1 in

sub-section 5.1).

For all other outcome variables, the interaction term is not statistically significant. This also holds for the overall participation probability, although the point estimate is almost of similar magnitude compared to the estimate for large part-time employment (Table 4). This pattern is consistent with the more efficient generalized difference-in-difference specification above where the effect on overall participation was only weakly significant (Table 1 in sub-section 5.1).

6 Discussion and conclusion

Our empirical analysis of the expansion of subsidized childcare and the employment of mothers with young children has shown that there is a positive and significant impact of the local childcare coverage on mothers' labor force participation. According to our preferred specification that accounts for time and regional fixed effects, an increase in the local childcare coverage rate by one percentage points leads to an increase in mothers' participation rate by 0.2 percentage points. We find the effect to be almost entirely driven by the increase in part-time employment of 20-35 hours per week. Full-time employment and part-time employment with less hours are not affected. Interestingly, the rise in the share of full-time slots additionally increases part-time employment of 20-35 hours; it does not affect full-time employment. Differentiating mothers by their level of education, we find that neither highly educated mothers (with a university degree), nor mothers with low education are affected by an increase of the local childcare coverage rate as far as their employment is concerned. The effect found in the whole sample is mainly driven by mothers with a medium education level.

Overall, our results suggest that a large part of the increase in mothers' employment that has been observed in recent years in Germany can be causally attributed to the expansion of subsidized childcare : In West Germany, the employment rate of mothers with children aged 1 to 3 has been increasing by 7 percentage points (from 46 to 53 percent) in our observation period ranging from 2007 to 2014. Childcare coverage for children in this age group has been increased by 17.6 percentage points (from 9.8 to 27.4 percent) in the same period. Assuming linearity, this means that a 3.5 percent increase in the participation rate of mothers with toddlers can be causally explained by the childcare expansion. This amounts to about half of the total increase in mothers' labor supply observed over this period.

The massive expansion of subsidized childcare for children under three years was one of the most important family policy reforms in Germany in the past decades. In total, public expenditures for childcare (including care for children older than three years) increased by 115 percent in the last ten years (Spieß, 2017). A first explicit goal of this policy change was to provide early education opportunities for all children. A second policy objective was to facilitate re-entry into employment

for mothers after a family-related employment break due to child birth. This should increase the employment rate of mothers with young children. As our results show, the second goal was achieved. The employment rate of mothers increased significantly. Germany used to rank below the EU average as far as employment rates of mothers are concerned. In 2007 the average EU employment rate of mothers with one child aged 0-14 was 66.7 percent, while it was only 63 percent in Germany. As of today Germany has exceeded the EU average and is among the countries with the highest employment rate of mothers (OECD, 2018)).

On the other hand, the share of mothers working part-time is still very high and above the EU average. As our results show, however, the strong increase in part-time employment has been exclusively due to an increase in employment contracts of 20-35 hours per week, which should have more positive implications on future earnings and career perspectives of mothers than part-time employment with lower weekly working hours. Another policy-relevant finding is that mothers with low education levels have not profited from the expansion in subsidized childcare. This is a clear indication that additional additional policy measures are needed since an improved supply of subsidized childcare does not seem to suffice to integrate this group with notoriously low participation rates into the labor market.

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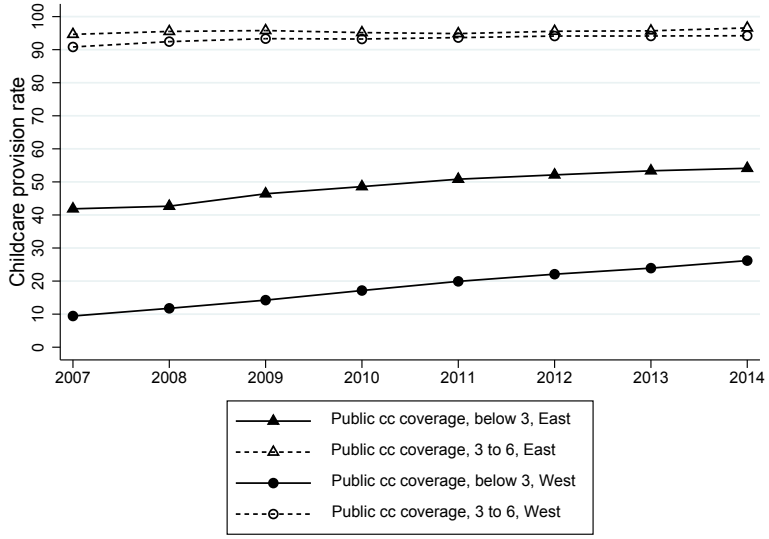
Appendix

Additional figures

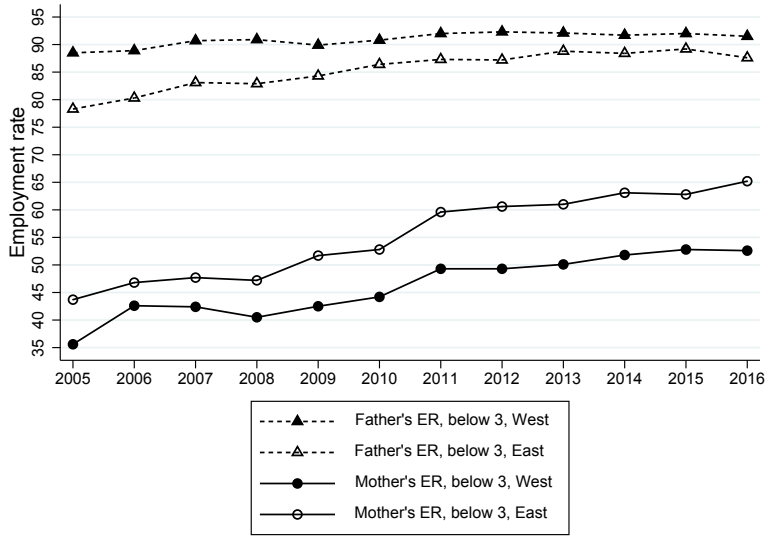
Figure A1: Provision of public childcare in West and East Germany



Notes: cc=childcare, below 3=children aged below 3, 3 to 6=children aged 3 to 6, FT=full-time, publ.=public, cov.=coverage, data for full-time care only available from 2002 onwards.

Source: German Statistical Office: data on subsidized childcare.

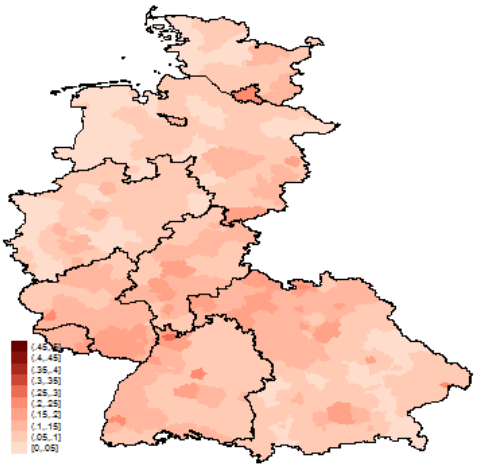
Figure A2: Mothers' and fathers' employment rates in West and East Germany



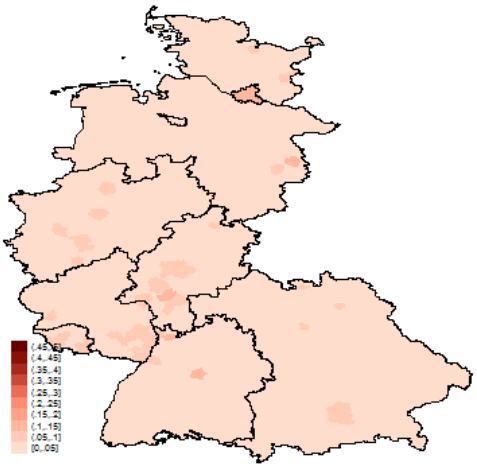
Notes: ER=employment rate, below 3=mothers with children aged 0 to 3.

Source: Federal Statistical Office of Germany , Aggregate statistics based on Microcensus, own calculations.

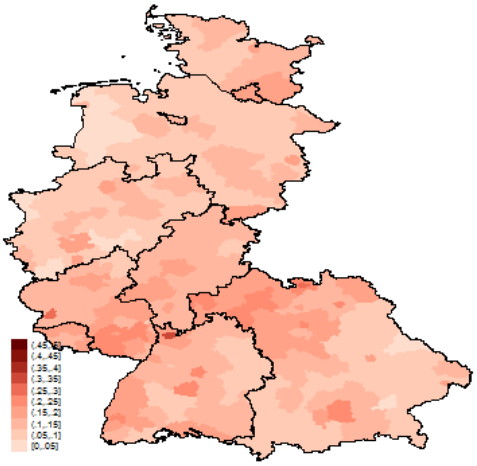
Figure A3: Childcare coverage (in %) at the county level, 2007-2014, West Germany



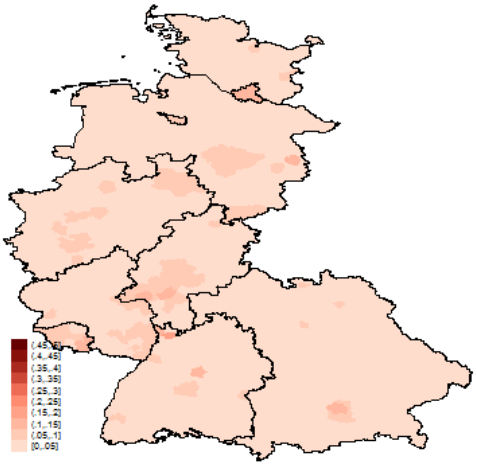
(a) Overall, 2007



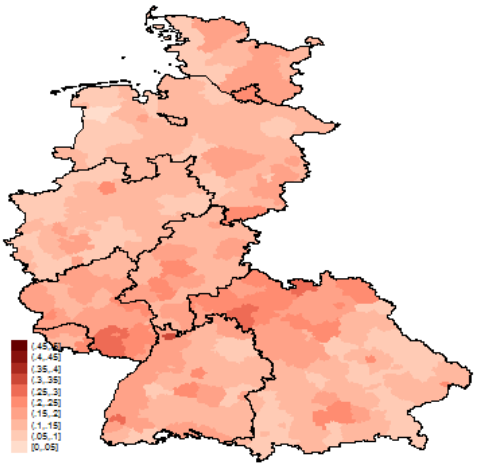
(b) Full-time slots, 2007



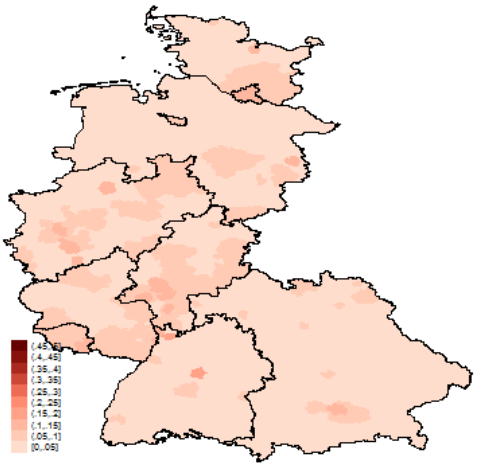
(c) Overall, 2008



(d) Full-time slots, 2008

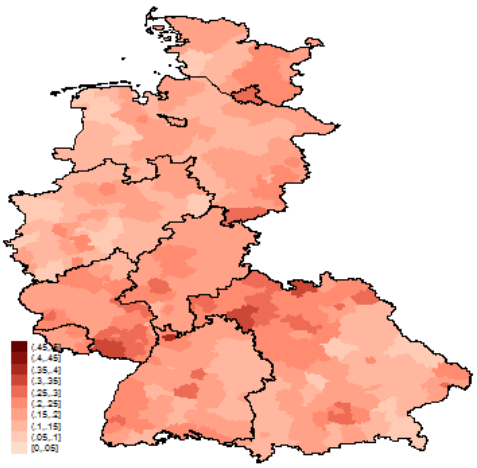


(e) Overall, 2009

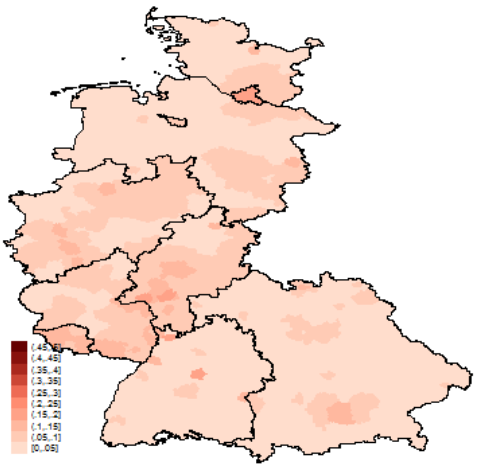


(f) Full-time slots, 2009

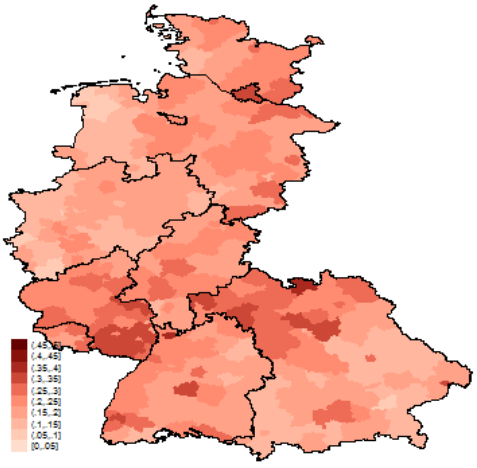
Notes: Childcare coverage measured at the county level. Thick lines mark state borders.
Source: German Statistical Office: data on subsidized childcare, own calculations.



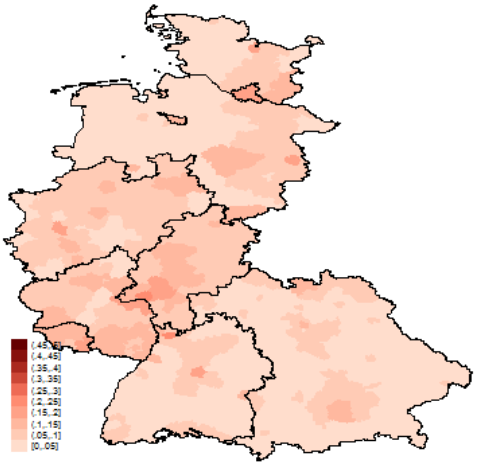
(g) Overall, 2010



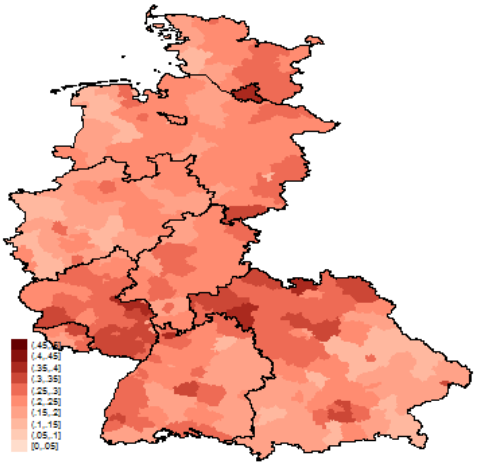
(h) Full-time slots, 2010



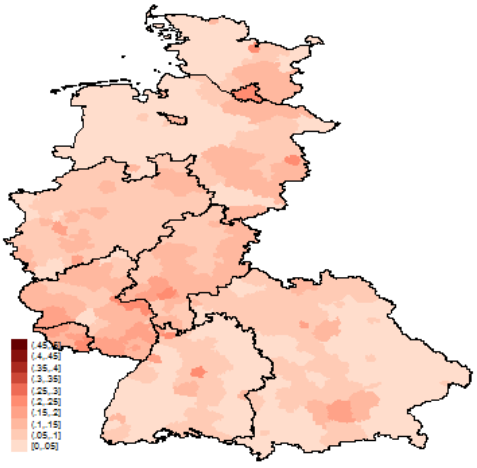
(i) Overall, 2011



(j) Full-time slots, 2011

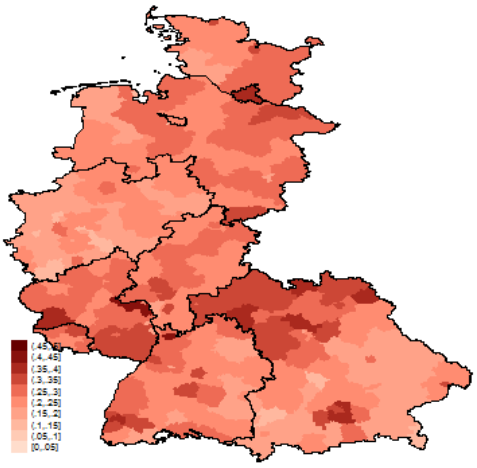


(k) Overall, 2012

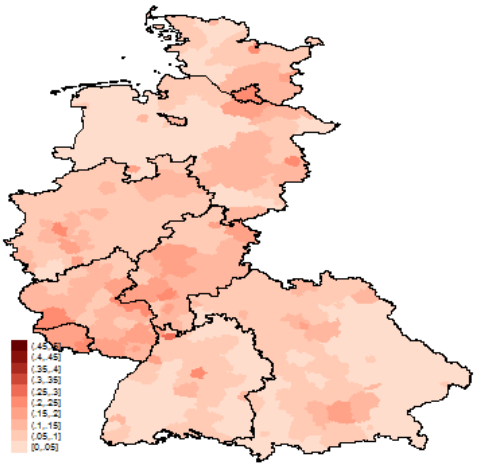


(l) Full-time slots, 2012

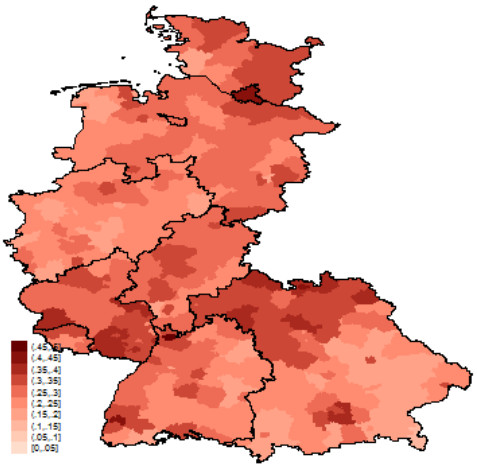
Notes: Childcare coverage measured at the county level. Thick lines mark state borders.
Source: German Statistical Office: data on subsidized childcare, own calculations.



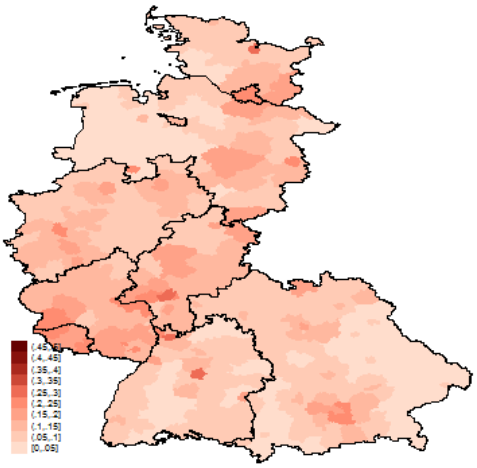
(m) Overall, 2013



(n) Full-time slots, 2013



(o) Overall, 2014



(p) Full-time slots, 2014

Notes: Childcare coverage measured at the county level. Thick lines mark state borders.
Source: German Statistical Office: data on subsidized childcare, own calculations.

Additional tables

Table A1: Descriptive statistics, overall provision of subsidized childcare, 2007-2014

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Dependent variables								
Participation	0.46	0.43	0.46	0.48	0.51	0.51	0.52	0.53
Full-time employment	0.13	0.10	0.11	0.12	0.13	0.12	0.12	0.13
Part-time employment (1-20h)	0.13	0.14	0.16	0.17	0.19	0.21	0.22	0.23
Part-time employment (20-35h)	0.20	0.20	0.19	0.20	0.19	0.18	0.18	0.18
Explanatory variables regional childcare coverage								
Childcare coverage (< 3 years)	9.93	12.11	14.51	17.43	20.28	22.38	24.17	26.63
Full-time coverage (< 3 years)	3.18	3.99	5.15	6.48	7.80	9.19	10.34	11.48
Part-time coverage (< 3 years)	6.76	8.12	9.36	10.95	12.48	13.19	13.82	15.16
Explanatory variables individual level								
Siblings aged < 3 years	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Sibling aged $3 - 6$ years	0.33	0.34	0.34	0.33	0.32	0.32	0.32	0.33
Mother's age	32.4	32.5	32.5	32.8	32.7	32.6	32.7	32.8
Mother low-skilled	0.20	0.20	0.20	0.20	0.19	0.20	0.19	0.18
Mother medium-skilled	0.64	0.63	0.61	0.61	0.63	0.61	0.59	0.60
Mother high-skilled	0.16	0.17	0.19	0.19	0.19	0.20	0.22	0.22
Mother married	0.84	0.84	0.83	0.82	0.80	0.80	0.80	0.80
Mother German	0.81	0.81	0.80	0.81	0.81	0.80	0.80	0.80
Explanatory variables regional level								
Population density	817.5	839.2	855.1	876.4	865.7	847.8	869.9	872.1
Women's employment rate	44.2	45.6	46.2	46.7	48.4	49.4	50.5	51.6
Fertility rate	1.40	1.40	1.37	1.40	1.40	1.42	1.43	1.49
Women's unemployment rate	7.33	6.30	6.84	6.65	5.99	5.83	6.04	5.89
GDP per capita	33.0	33.7	32.7	34.4	36.7	37.0	38.0	38.9
Number of observations	7,832	7,616	7,605	7,517	7,422	7,353	7,203	7,321

Source: RDC of the Federal Statistical Office and Statistical Offices of the Länder: Microcensus, waves 2007-2014; German Statistical Office: data on subsidized childcare; Federal Office for Building and Regional Planning: Indicators and Maps on the Spatial Development; own calculations.

Table A2: Descriptive statistics, overall provision of subsidized childcare, 2007-2014

	2007	2008	2009	2010	2011	2012	2013	2014
West Germany								
Mean	0.156	0.177	0.204	0.232	0.258	0.278	0.296	0.315
Minimum	0.022	0.034	0.036	0.071	0.096	0.109	0.109	0.133
Maximum	0.590	0.584	0.615	0.616	0.643	0.634	0.626	0.634
Schleswig-Holstein								
Mean	0.083	0.114	0.141	0.175	0.219	0.239	0.260	0.292
Minimum	0.039	0.058	0.079	0.084	0.116	0.122	0.157	0.163
Maximum	0.147	0.164	0.191	0.226	0.273	0.297	0.312	0.347
Hamburg								
Mean	0.216	0.198	0.220	0.284	0.328	0.356	0.381	0.412
Minimum	0.216	0.198	0.220	0.284	0.328	0.356	0.381	0.412
Maximum	0.216	0.198	0.220	0.284	0.328	0.356	0.381	0.412
Lower Saxony								
Mean	0.065	0.087	0.115	0.151	0.183	0.217	0.240	0.262
Minimum	0.022	0.037	0.036	0.071	0.096	0.125	0.137	0.155
Maximum	0.160	0.183	0.211	0.266	0.288	0.319	0.343	0.346
Bremen								
Mean	0.082	0.104	0.114	0.137	0.174	0.192	0.209	0.232
Minimum	0.049	0.070	0.080	0.101	0.135	0.161	0.176	0.196
Maximum	0.116	0.139	0.148	0.174	0.212	0.223	0.242	0.269
North Rhine-Westphalia								
Mean	0.066	0.087	0.109	0.134	0.156	0.176	0.192	0.225
Minimum	0.032	0.034	0.060	0.079	0.097	0.115	0.127	0.152
Maximum	0.143	0.178	0.223	0.237	0.245	0.255	0.275	0.325
Hesse								
Mean	0.116	0.135	0.157	0.189	0.211	0.231	0.252	0.277
Minimum	0.075	0.097	0.108	0.136	0.142	0.159	0.174	0.190
Maximum	0.184	0.199	0.212	0.251	0.286	0.287	0.320	0.344
Rhineland-Palatinate								
Mean	0.123	0.152	0.178	0.204	0.246	0.267	0.280	0.298
Minimum	0.073	0.093	0.120	0.136	0.152	0.170	0.174	0.186
Maximum	0.205	0.254	0.285	0.331	0.349	0.377	0.408	0.396
Baden-Wuerttemberg								
Mean	0.110	0.132	0.154	0.179	0.206	0.224	0.242	0.263
Minimum	0.058	0.072	0.087	0.100	0.135	0.146	0.163	0.184
Maximum	0.284	0.340	0.344	0.360	0.373	0.394	0.436	0.456
Bavaria								
Mean	0.099	0.123	0.150	0.180	0.202	0.222	0.239	0.257
Minimum	0.028	0.046	0.061	0.073	0.096	0.109	0.109	0.133
Maximum	0.236	0.252	0.294	0.349	0.377	0.391	0.392	0.430
Saarland								
Mean	0.127	0.150	0.161	0.185	0.213	0.237	0.261	0.281
Minimum	0.107	0.121	0.127	0.151	0.172	0.188	0.204	0.224
Maximum	0.170	0.194	0.203	0.234	0.264	0.307	0.310	0.338
Degree of variation – Theil index								
Overall	0.315	0.234	0.192	0.149	0.121	0.101	0.087	0.070
Between states	0.276	0.202	0.165	0.124	0.100	0.082	0.070	0.056
Within states	0.039	0.033	0.027	0.025	0.021	0.019	0.017	0.014

Notes: The Theil index is decomposable into a weighted sum of between- and within-subgroup inequality. For a definition and the relation to other inequality measures, see Cowell (2000).

Source: German Statistical Office: data on subsidized childcare, own calculations.

Table A3: Descriptive statistics, provision of subsidized full-time childcare, 2007-2014

	2007	2008	2009	2010	2011	2012	2013	2014
West Germany								
Mean	0.073	0.080	0.094	0.110	0.124	0.138	0.150	0.162
Minimum	0.000	0.001	0.002	0.004	0.005	0.004	0.006	0.013
Maximum	0.458	0.422	0.464	0.497	0.522	0.522	0.545	0.551
Schleswig-Holstein								
Mean	0.023	0.030	0.040	0.053	0.071	0.082	0.096	0.111
Minimum	0.004	0.005	0.008	0.011	0.019	0.013	0.017	0.022
Maximum	0.071	0.083	0.101	0.134	0.185	0.212	0.238	0.274
Hamburg								
Mean	0.107	0.115	0.136	0.159	0.184	0.209	0.213	0.209
Minimum	0.107	0.115	0.136	0.159	0.184	0.209	0.213	0.209
Maximum	0.107	0.115	0.136	0.159	0.184	0.209	0.213	0.209
Lower Saxony								
Mean	0.014	0.019	0.027	0.037	0.049	0.060	0.071	0.081
Minimum	0.001	0.001	0.003	0.004	0.006	0.007	0.013	0.013
Maximum	0.101	0.113	0.132	0.147	0.187	0.204	0.209	0.231
Bremen								
Mean	0.034	0.044	0.053	0.063	0.093	0.111	0.124	0.143
Minimum	0.022	0.031	0.044	0.050	0.084	0.110	0.124	0.136
Maximum	0.046	0.057	0.061	0.076	0.103	0.113	0.124	0.149
North Rhine-Westphalia								
Mean	0.030	0.040	0.051	0.062	0.072	0.083	0.091	0.105
Minimum	0.006	0.007	0.013	0.025	0.029	0.045	0.049	0.063
Maximum	0.066	0.089	0.116	0.131	0.155	0.180	0.200	0.214
Hesse								
Mean	0.038	0.050	0.064	0.088	0.104	0.120	0.137	0.151
Minimum	0.010	0.012	0.021	0.037	0.051	0.061	0.065	0.070
Maximum	0.108	0.123	0.134	0.178	0.201	0.227	0.247	0.272
Rhineland-Palatinate								
Mean	0.034	0.042	0.055	0.072	0.093	0.118	0.128	0.143
Minimum	0.006	0.009	0.016	0.019	0.033	0.043	0.058	0.083
Maximum	0.086	0.093	0.107	0.143	0.180	0.201	0.218	0.234
Baden-Wuerttemberg								
Mean	0.023	0.029	0.034	0.045	0.054	0.064	0.073	0.083
Minimum	0.001	0.003	0.006	0.009	0.013	0.017	0.022	0.029
Maximum	0.136	0.155	0.166	0.192	0.200	0.226	0.262	0.270
Bavaria								
Mean	0.018	0.022	0.028	0.037	0.046	0.060	0.067	0.074
Minimum	0.000	0.001	0.002	0.004	0.005	0.004	0.006	0.013
Maximum	0.091	0.102	0.109	0.123	0.141	0.172	0.189	0.211
Saarland								
Mean	0.046	0.062	0.083	0.102	0.126	0.150	0.175	0.196
Minimum	0.024	0.036	0.063	0.072	0.098	0.114	0.151	0.172
Maximum	0.085	0.103	0.112	0.144	0.171	0.205	0.242	0.246
Degree of variation – Theil index								
Overall	0.774	0.670	0.605	0.519	0.453	0.380	0.349	0.319
Between states	0.691	0.590	0.535	0.454	0.390	0.321	0.294	0.265
Within states	0.083	0.080	0.070	0.065	0.064	0.058	0.055	0.054

Notes: The Theil index is decomposable into a weighted sum of between- and within-subgroup inequality. For a definition and the relation to other inequality measures, see Cowell (2000).

Source: German Statistical Office: data on subsidized childcare, own calculations.

Table A4: Full regression estimates, main specification, without county fixed effects

	Participation	**Full-time**	**Part-time (20-35h)**	**Part-time (1-20h)**
Childcare	0.305***	0.152***	0.365***	-0.212***
availability	(0.065)	(0.041)	(0.051)	(0.051)
Presence of siblings	-0.124***	-0.011	-0.059***	-0.054***
< 3 years	(0.010)	(0.007)	(0.007)	(0.008)
Presence of sibling	-0.098***	-0.039***	-0.054***	-0.005
$4 - 6$ years	(0.004)	(0.003)	(0.003)	(0.004)
Mother's age	0.044***	-0.002	0.028***	0.018***
	(0.004)	(0.003)	(0.003)	(0.003)
Mother's age	-0.001***	0.000	0.000	-0.000***
squared	(0.000)	(0.000)	(0.000)	(0.000)
Mother	0.224***	0.056***	0.096***	0.072***
medium-skill	(0.007)	(0.004)	(0.004)	(0.005)
Mother	0.368***	0.119***	0.209***	0.040***
high-skill	(0.009)	(0.005)	(0.007)	(0.007)
Mother married	-0.020**	-0.030**	-0.047***	0.057***
	(0.006)	(0.004)	(0.005)	(0.005)
Mother German	0.170***	0.034***	0.080***	0.056***
	(0.006)	(0.004)	(0.005)	(0.006)
Population	-0.000	-0.000	0.000	-0.000*
density	(0.000)	(0.000)	(0.000)	(0.000)
Womens'	0.001	0.001*	0.002***	-0.003***
employment rate	(0.001)	(0.001)	(0.001)	(0.001)
Fertility rate	0.040	0.015	0.026	-0.000
	(0.087)	(0.018)	(0.028)	(0.026)
Unemployment	-0.004**	0.003***	0.005***	-0.012***
rate	(0.001)	(0.001)	(0.001)	(0.001)
GDP/capita	-0.001***	0.000	-0.000***	-0.000
	(0.000)	(0.000)	(000)	(0.000)
Year 2008	-0.037***	-0.037***	0.005	-0.005
	(0.007)	(0.005)	(0.005)	(0.005)
Year 2009	-0.019**	-0.032***	0.010*	0.002
	(0.008)	(0.005)	(0.006)	(0.007)
Year 2010	-0.010	-0.032***	0.011	0.0111
	(0.009)	(0.006)	(0.007)	(0.008)
Year 2011	0.000	-0.022***	0.016**	0.006
	(0.001)	(0.007)	(0.007)	(0.009)
Year 2012	-0.006	-0.041***	0.027***	0.009
	(0.011)	(0.008)	(0.009)	(0.010)
Year 2013	-0.007	-0.040***	0.020**	0.012
	(0.012)	(0.008)	(0.010)	(0.010)
Year 2014	-0.010	-0.042***	0.016	0.016
	(0.014)	(0.008)	(0.011)	(0.012)
Observations	59,567	59,567	59,567	59,567
Adjusted r^2	0.118	0.025	0.069	0.028

Notes: Standard errors in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: RDC of the Federal Statistical Office and Statistical Offices of the Länder: Microcensus, waves 2007-2014; German Statistical Office: data on subsidized childcare; Federal Office for Building and Regional Planning: Indicators and Maps on the Spatial Development; own calculations.

Table A5: Full regression estimates, main specification, with county fixed effects

	Participation	**Full-time**	**Part-time (20-35h)**	**Part-time (1-20h)**
Childcare	0.204*	0.030	0.195*	-0.021
availability	(0.229)	(0.092)	(0.114)	(0.094)
Presence of siblings	-0.124***	-0.012*	-0.059***	-0.053***
< 3 years	(0.010)	(0.007)	(0.007)	(0.007)
Presence of siblings	-0.098***	-0.039***	-0.054***	-0.006*
$4 - 6$ years	(0.004)	(0.003)	(0.003)	(0.004)
Mother's age	0.044***	-0.002	0.028***	0.018***
	(0.004)	(0.003)	(0.003)	(0.003)
Mother's age	-0.001***	0.000	-0.000***	-0.000***
squared	(0.000)	(0.000)	(0.000)	(0.000)
Mother	0.224***	0.056***	0.097***	0.071***
medium-skill	(0.006)	(0.004)	(0.004)	(0.005)
Mother	0.369***	0.120***	0.209***	0.041***
high-skill	(0.009)	(0.005)	(0.007)	(0.007)
Mother married	-0.018***	-0.029***	-0.046***	0.057***
	(0.006)	(0.004)	(0.005)	(0.005)
Mother German	0.169***	0.033***	0.008***	0.056***
	(0.006)	(0.004)	(0.005)	(0.006)
Population	-0.000	-0.000	0.000	-0.000**
density	(0.000)	(0.000)	(0.000)	(0.000)
Female	0.000	-0.001	-0.000	0.001
employment rate	(0.004)	(0.003)	(0.003)	(0.003)
Fertility rate	-0.073	0.037	0.004	-0.114***
	(0.052)	(0.035)	(0.045)	(0.040)
Unemployment	-0.007	-0.010**	-0.005	0.008*
rate	(0.006)	(0.004)	(0.005)	(0.005)
GDP/capita	-0.002**	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Year 2008	-0.037***	-0.045***	0.001	0.007
	(0.011)	(0.007)	(0.008)	(0.008)
Year 2009	-0.019	-0.030***	0.017*	-0.006
	(0.013)	(0.008)	(0.001)	(0.010)
Year 2010	-0.001	-0.029***	0.023*	0.005
	(0.016)	(0.010)	(0.012)	(0.012)
Year 2011	0.013	-0.017	0.033*	-0.003
	(0.023)	(0.014)	(0.018)	(0.017)
Year 2012	0.012	-0.034*	0.048**	-0.002
	(0.027)	(0.017)	(0.021)	(0.020)
Year 2013	0.016	-0.026	0.049*	-0.007
	(0.032)	(0.021)	(0.025)	(0.023)
Year 2014	0.026	-0.024	0.053*	-0.003
	(0.037)	(0.023)	(0.029)	(0.027)
Observations	59,567	59,567	59,567	59,567
Adjusted r^2	0.122	0.027	0.072	0.033

Notes: Standard errors in parentheses; *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Source: RDC of the Federal Statistical Office and Statistical Offices of the Länder: Microcensus, waves 2007-2014; German Statistical Office: data on subsidized childcare; Federal Office for Building and Regional Planning: Indicators and Maps on the Spatial Development; own calculations.