Local day-care quality and maternal employment: Evidence from East and West Germany

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ABSTRACT

By investigating how locally available early childhood education and care quality relates to maternal employment choices, this study extended the literature which mostly focused on the importance of day-care availability or costs. We provided differentiated analyses by the youngest child's age and for West and East Germany to examine moderating influences, such as work-care cultures, in a market with strongly state-subsidized provision and near universal participation of preschool children. The empirical analysis linked the Socio-Economic Panel and the 'Families in Germany'-Study for 2010 and 2011 (N=3,301 mothers) with regional structural quality data and applied multivariate regression models. In East Germany, mothers with a child aged under three years who lived in districts with smaller day-care groups were more likely to be employed and to extend their work hours. For mothers in West Germany and those with older children, day-care quality was not significantly related to employment.

Keywords: Child care; child care arrangements; education; early childhood; family policy; maternal employment

Parents with young children who want to participate in the labor market usually must rely on non-parental child care for their children while they are at work. This care may take various forms ranging from day-care centers or family day-care to paid or unpaid care by relatives, friends, or nannies. A large international economic and sociological literature has explored how availability and costs of early childhood education and care (ECEC) services impact on maternal employment. Results generally suggest positive, albeit sometimes small, associations of greater state-subsidized day-care provision (e.g., Del Boca & Vuri, 2007; Havnes & Mogstad, 2011; Pettit & Hook, 2005; Steiber & Haas, 2009; Uunk et al., 2005) and lower child care costs (e.g., Anderson & Levine, 2002; Blau & Currie, 2006; Fitzpatrick, 2012) with maternal employment.

However, besides availability and costs there are other day care characteristics which might affect the employment of mothers as well, if we take into account that parents care about a positive development of their children: This is the quality of day care, which is shown to affect child development in various aspects (e.g., Anders et al., 2012a; Anders et al., 2012b; Sammons et al., 2008). Nevertheless, so far we know very little about the relationship between ECEC quality and maternal employment. Although sociological studies have frequently considered the importance of work-care attitudes or cultures for maternal employment (e.g., Steiber & Haas, 2009; Stier et al., 2001), they have given little thought to how this interacts with parental choices in terms of quality. The few existing studies on the relationship between ECEC quality and maternal employment are based on the US child care market, which constitutes a very specific context in terms of work-care cultures, relatively high and variable child care costs for parents and non-universal coverage (Blau, 2001; Immervoll & Barber, 2005). This provides a very different setting for parental work-care decisions than many European contexts with mostly public financing and a long-established tradition and near-universal provision for preschool children but not for infants and toddlers. The extent to which parents have a choice between

different institutions and the level of acceptance of formal care may be important for understanding how parents consider care quality in their employment decisions. By comparing East and West Germany and two age groups of children, we explore institutional contexts with varying day-care availability and care cultures, which allow us to investigate how these aspects may moderate the influence of ECEC quality on maternal employment.

BACKGROUND

Previous studies

Two earlier studies from the US found inconsistent or not significant associations of regional variations in child-teacher- ratios with maternal employment and day-care use, respectively (Hofferth & Collins, 2000; Hofferth & Wissoker, 1992). For other quality aspects, such as stability and flexibility of the care arrangement, they found negative associations with the employment exits of mothers with some differential effects by maternal incomes (Hofferth & Collins, 2000). Meyers (1993) evaluated the impact of the quality of child care used by single mothers who participated in a welfare-to-work program in the US on their continuation of education and job search activities. The most significant factors predicting program attrition were mothers' safety assessments of the child care arrangement and whether its child-teacher ratio met staffing recommendations by experts. Johansen et al. (1996) found that mothers who worked longer hours attached greater importance to educational and developmental attributes of their child care choice.

Moreover, some cross-sectional studies have provided evidence that mothers who were more satisfied with some aspects of child care quality reported better work-family balance and well-being (Erdwins et al., 2001; Payne et al., 2012; Press et al., 2006). Payne et al. (2012) found that satisfaction with caregiver convenience related to reduced turnover intentions and absenteeism

through lower time-based work-family conflict. For a sample of low-income mothers, Press et al. (2006) reported that employed mothers were more likely to feel depressed when they preferred different child care because of low quality of the care. Rigby et al. (2007) also showed moderate correlations between female labor force participation and the stringency of US state policies for child care centers in their sensitivity analyses. These studies, however, were based only on cross-sectional measures of quality regulations, maternal child care satisfaction, employment, or subjective well-being, which may be endogenous. Furthermore, many existing studies from the US were based on non-representative samples of mothers. We extend this literature by investigating how regional variations in day-care quality are associated with employment of a representative sample of mothers with young children in West and East Germany. We examine more in detail than previous studies how associations of day-care quality with maternal employment vary across population groups, which face varying day-care availability and hold different attitudes towards maternal employment and using formal care.

Conceptualization of ECEC quality

We conceptualize ECEC quality as characteristics of ECEC centers, for which a positive association with child well-being and satisfaction of parents has been found. Quality aspects must be observable or easy to enquire by mothers to affect their employment decisions. We concentrate on structural quality, which comprises mostly observable, quantifiable and regulable features of the ECEC context, such as group size, child-teacher ratio, and teacher education. They are assumed to affect child development directly and indirectly through the quality of the pedagogical process (Kuger & Kluczniok, 2008; NICHD Early Child Care Research Network, 2002). Although comparisons of parental reports of child-teacher ratios and information based on ECEC provider survey showed a high level of consistency (Hofferth & Collins, 2000), parents tend to overestimate the process quality of ECEC centers (Cryer & Burchinal, 1997; Mocan,

2007) and may be better able to assess easily observable indicators, such as child-teacher ratios and group sizes than teacher education (Hofferth & Wissoker, 1992).

The institutional setting of early childhood education and care in Germany

ECEC programs have been part of the child and youth welfare system in West-Germany before reunification and in the whole of Germany since then. Although, the federal government has legislative authority, the states are responsible for the implementation. The actual planning and provision of ECEC services takes place at the municipality level. Minimum child-teacher ratios are regulated across all German states but the level required for different ages varies between states. The formulation of minimum requirements for most other aspects of structural quality, such as maximum group size, training, and space, ranges from precise to very general to none at all. For instance, half of the German states do not regulate the maximum group size (Bock-Famulla, 2008). The costs for day-care centers are largely covered by municipalities (about 47 %) and by the state (about 31 %). Since 2009, the federal level also contributes a small portion. The rest is split between providers (about 5 %) and parents (on average about 14 %) (BMFSFJ, 2013; Spiess, 2008). Quality variation between ECEC centers within a state can arise via two channels: Firstly, some providers, such as church-related or other non-profit providers may allocate more funding to ECEC centers than the municipality, which is a provider itself. Secondly, due to political reasons or to budget constraints, municipalities vary in how much they spend on day-care provision. As a result, ECEC quality varies considerably across municipalities, providers, and individual centers.

Parents' fees are mostly income-dependent and relatively low compared to most other OECD countries (Immervoll & Barber, 2005). For-profit providers play a very limited role, as they receive no or limited subsidies in some German states (see Table 1 and Spiess, 2008). On average

parental fees amount to between 61 and 161 Euros per child and month depending on the child's age and whether attendance is half-day or full-day (Müller et al., 2013). Moreover some German states provide free ECEC services for children with very low household income and for all children from a certain age. Due to tightly regulated fees, parents generally cannot obtain higher quality by paying higher fees. At the same time, the market for family day care or private nannies is small. In 2010, only 3% of all children under the age of three attended family day-care (BMFSFJ, 2013) and 5 % were cared for by a nanny, au pair, or babysitter either instead or in addition to attending formal day-care (Schober, forthcoming).

Since 1996, all children aged three years to school age have been entitled to a slot in an ECEC center, whereas availability for children under three years has been traditionally very low, especially in West Germany (Spiess 2008). From age four, over 96 % of children attended formal ECEC services in Germany in 2012 (Statistisches Bundesamt, 2012). ECEC provision for children under three years of age has been expanded since two federal laws in 2005 ('Tagesbetreuungsausbaugesetz', Deutscher Bundestag, 2004) and 2008 ('Kinderförderungsgesetz', Deutscher Bundestag, 2008) provided extra funding, first granted prioritized access for children with parents in employment or education, and then stipulated a legal right to a day-care place for all children aged one year or over from August 2013. The attendance rates for children aged under three years subsequently increased from 7 to 22 % in West Germany and from 37 to 49% in East Germany between 2006 and 2012 (Statistisches Bundesamt, 2012).

Before the German reunification in 1990, West German family, tax and labor market policies favored male breadwinner/female carer families. By contrast, policies in the German Democratic Republic encouraged a fast and full-time return to the labor market for mothers by providing

shorter maternity leave and widely available state-subsidized day-care for young children (for details on East and West German policies between 1949 and 1990, see Rosenfeld et al., 2004). These historical differences are still reflected in more conservative attitudes of parents towards maternal employment and using formal day-care for young children in West Germany compared to East Germany (Cooke, 2006). Over the past two decades, relatively long maternal leaves followed by part-time return to the labor market has become the predominant arrangement how mothers with young children combine earning and caring in both parts of Germany. Mothers in East Germany, however, continue to return to their jobs faster and to work longer hours (Grunow & Müller, 2012; Keller & Haustein, 2012). We have summarized the main differences in the ECEC context between East and West Germany in Table 1.

<Table 1 about here>

Conceptual framework

We draw on economic rational choice models for considerations how household characteristics and ECEC characteristics influence maternal employment decisions. From sociological perspectives, we derive expectations about how work-care cultures and identities constrain maternal employment. Following an economic rational choice framework, the decision to enter or pursue employment over unpaid domestic activity depends upon the relative value of a mother`s time in the market compared to her time at home (Becker, 1981; Blau, 2001). The value of market time depends upon the potential wage of the mother and the cost of substitutes for her time. The quality of non-maternal care is assumed to affect mothers' decisions through altering the psychological costs and benefits of market work versus unpaid family care, although economic concepts have not considered this explicitly. Based on models of parental altruism and interest in children's lifetime well-being (e.g., Ermisch, 2003), one may expect that mothers will

aim to maximize the quality of care received by children in terms of emotional security as well as cognitive and social stimulation (Mason & Kulthau, 1989). Mothers are likely to consider higher-quality ECEC a more suitable substitute for their own care time (for a recent overview of conceptual frameworks of child care choices, see Chaudry et al., 2010). We therefore generally expect that the availability of higher quality ECEC will increase mothers' labor market participation because children are more likely to benefit from high-quality care *(Hypothesis 1)*.

Institutional moderators: work-care cultures, child age and ECEC availability

Several sociological and psychological perspectives, including the doing gender approach (West & Zimmerman, 1987) and identity theories (Stets & Burke, 2000), have suggested that individuals continuously reconstruct their identities by aligning their actions in terms of work and care arrangements with their own values and with social norms of relevant groups. Mothers' personal work and care attitudes have been found to be important predictors of employment alongside cost-benefit considerations and national context factors, such as day-care coverage or costs (Schober, 2013; Steiber & Haas, 2009). There is growing evidence that identities and employment decisions of mothers are influenced by institutional structures including family policies, labor market opportunities, and gender and care cultures (Kremer, 2007; Schober & Scott, 2012; Steiber & Haas, 2009; Stier et al., 2001).

Apart from this a number of studies have suggested that the child's age is an important factor in mothers' work-care choices (for a review see e.g.,Pungello & Kurtz-Costes, 1999). Mothers may attach greater importance to educational stimulation in ECEC for older children, whereas they may prefer home-like settings for younger children (Johansen et al., 1996). As formal employment of mothers and ECEC use has been more widely practiced and state-subsidized for children aged three to school age than for younger children in Germany, ideals of mother care are

assumed to be less salient in mothers' identities and benefits of formal care to be more widely accepted for the former than the latter group. Mothers with older children who use ECEC may be less subject to actual or perceived sanctions from their social networks than those with younger children. Therefore we expect the child's age to affect parental preferences for different levels of quality. Mothers of children under age three may be more sensitive to ECEC quality and more likely to decide against formal employment when their quality expectations in ECEC centers are not met (*Hypothesis 2a*).

Constraints in the availability of day-care places, however, may moderate the relationship between ECEC quality and maternal employment to the contrary. Limited day-care slots in their neighborhood may restrict parents' choice in terms of quality and may therefore attenuate the relationship between local ECEC quality and maternal employment. Excess demand of ECEC services is much larger for children under three years of age than for older children, of which almost all attend ECEC institutions. The lack of quality choice due to restricted availability is therefore more likely to keep parents from realizing their care preference for younger than for older children. As a result, higher ECEC quality may be less strongly associated with the employment decisions of mothers with a youngest child under the age of three than for those with older children (*Hypothesis 2b*).

Moreover, we expect differential effects of ECEC quality between East and West Germany among mothers with a youngest child under three years due to persisting differences in day-care availability, opening hours and work-care ideals. On the one hand, the employment decisions of West German mothers with a youngest child under the age of three may depend more strongly on whether they feel comfortable with the quality of care offered in local ECEC centers than of mothers in East Germany, where using ECEC institutions is more accepted (*Hypothesis 3a*).

On the other hand, excess demand for places for under three-year-olds is larger in West Germany than in East Germany and may constrain mothers' choices in terms of ECEC quality more in the former region. Several studies have shown that in West Germany parental demand for a day-care place for under three-year-olds exceeds supply considerably, even following the day-care expansion since 2005. In East Germany, demand is also slightly larger than supply but the discrepancy with available places is much smaller (Fuchs-Rechlin, 2011; Rauschenbach et al., 2012). As a result of constrained choice, higher ECEC quality may be less strongly associated with employment decisions of mothers with a youngest child under the age of three in West Germany than in East Germany (*Hypothesis 3b*). We formulate alternative hypotheses, as the relative importance of these opposing influences cannot be predicted apriori.

Other influences on maternal employment choices

Previous studies have provided evidence of number of other factors at the individual and regional level, which are associated with maternal employment choices. Mothers' likelihood of employment depends on their education levels and wages as measures of their opportunity costs of time outside the labor market (Grunow & Müller, 2012). Mothers usually are more likely to return to work as their youngest child grows older, the fewer children they have, when they are not living with a partner or when the partner has low earnings (Kreyenfeld & Hank, 2000; Steiber & Haas, 2009). Mothers in most migrant groups in Germany tend to be less attached to the labor market (Kreyenfeld & Hank, 2000). Informal help with child care from the partner or from relatives may also facilitate maternal employment (Dimova & Wolff, 2008). Furthermore, mothers' prenatal labor market status and work-care attitudes have been found to predict variations in employment rates of mothers with young children (Grunow & Müller, 2012; Steiber

& Haas, 2009). Some previous German studies also found positive associations with regional provisions of (full-day) ECEC services and regional unemployment rates (Büchel & Spiess, 2002; Grunow & Müller, 2012; Haan & Wrohlich, 2011) .

METHOD

Our empirical analysis uses data from the German Socio-Economic Panel Study (SOEP) and the 'Families in Germany'-Study (FiD). The SOEP is a representative annual household panel study, which started in 1984. The most recent wave covers about 20,000 respondents from 11,000 households (for a detailed description of the data set, see Wagner et al., 2007). We used the SOEP waves of the years 2010 and 2011 jointly with the FiD waves 2010 and 2011. FiD is an extension study of the SOEP, where families with young children and those with special needs have been surveyed. The FiD data cover information from about 4,500 households with a total of about 7,800 respondents (for further information, see Schröder et al., 2013). The two data sets can be analyzed jointly using specific weighting factors. This provided us with a representative and large enough sample for the purpose of our analysis. Some questions relating to the satisfaction with ECEC quality and attitudes towards maternal employment have only been asked in the FiD survey. Therefore, parts of our descriptive analyses only used the FiD data.

We matched the SOEP and FiD-data with information on ECEC quality at the county or municipality level. The statistics on child and youth welfare provide information on structural quality aspects of day-care institutions in each of 572 youth welfare office districts based on reports by each individual center in each district. 71 % of these districts correspond to counties and the rest to municipalities within counties (BMFSFJ, 2013). In 2010 these youth welfare office districts covered on average 3.565 children below the age of three and 3.622 children aged

three to six years. The regional quality data are compiled and distributed by the German Youth Institute at the Technical University of Dortmund.

Sample selection and non-response

The sample included all mothers with a youngest child aged one to seven years who did not yet attend primary school at the time of the interview in 2011. We excluded mothers with under one-year-olds because about 90% of German mothers were not employed before their child's first birthday and only 4 % of children attended ECEC institutions before the age of one year (Rauschenbach et al., 2012). We observed 1,311 and 385 mothers with a youngest child aged one to two years in West and East Germany, respectively. For children aged three years to school age, the sample included 1,605 West German mothers and 427 mothers in East Germany. We applied cross-sectional probability weights which combine design and non-response weights to account for overrepresentation of lone parents and low income families in the FID data and for differential non-response.

36 % and 28 % of mothers in West and East Germany, respectively, had some missing values for one or more of the dependent and independent variables. The individual-level variables with the largest number of missing responses were mothers' wages, household income, employment and child care of the partner, and the prenatal maternal employment status. Among the variables measured at the youth office district level, only the child-teacher ratio for under three-year-olds had considerable numbers of missing observations, as this information was not available for Berlin. We used multiple imputations by chained equations to impute the missing observations on the individual-level characteristics and reran all the models with the imputed variables. We used 20 and 50 imputation cycles for the OLS and logistic regression models, respectively. Multiple imputation methods assume missingness at random (Schafer, 1997). Given the rich information we have on mothers and their partners in the SOEP and FiD data, this seems a reasonable

assumption. As the results after imputations did not vary substantively from those based on the sample with complete information, only the former are shown. After imputations, the final samples consisted of 1,002 and 341 mothers with a one- or two-year-old youngest child in West and East Germany, respectively. For the group with a youngest child aged three years to school age, we observed 1,562 and 396 mothers in the two parts of Germany.

Estimation strategy

We assume that after the birth of a child, a mother will base her decision whether or not and for how many hours to re-enter employment on the ECEC quality available in her local area. If quality is poor, she may prolong her labor market interruption or reduce her work hours when her child does not seem happy in the ECEC setting. The empirical analysis focused on different measures of maternal employment. First, we used logistic regression models to estimate the probability of mothers' labor market participation in 2011. In a second step, we used an OLS regression model of changes in maternal weekly work hours from 2010 to 2011. We ran separate models for mothers living in East and West Germany and for those with a youngest child aged under and over age three, respectively. To better understand mothers' employment transitions, we also tested multinomial regression models of maternal labor market entry, exit, or no change. These, however, did not converge for mothers with children aged three to school age in East Germany due to the small numbers of exits. We also examined differences between full-time and part-time employment. As these specifications provided largely the same results as the logistic models of maternal employment, the latter are shown in Table 5. To test for non-linear relationships with work hours extensions or reductions, we also applied multinomial logistic regression models which distinguished between increases, decreases, and no change in work hours. These provided similar results as the OLS models of continuous change in work hours. The findings from these sensitivity tests are summarized in the results section. To account for the

nested data structure, we calculated robust standard errors clustered at the youth office district level, which has been found to be an effective strategy in nested samples with relatively large numbers of macro units like ours (Franzese Jr., 2005). Re-estimating the final models using random-intercept linear and logistic regressions provided substantively unchanged results (available on request from the authors).

Ideally we would have liked to examine how changes in day-care quality are associated with changes in maternal employment. Due to lack of comparability in the quality statistics with previous years (Hüsken, 2011), we can unfortunately only use the information for the year 2010. Compared to previous studies which measured ECEC quality using mothers' reports or considered maternal satisfaction with quality aspects, our approach of measuring quality at the youth office district level is less likely to suffer from reverse causation or unobserved heterogeneity. Maternal quality perceptions may be causing as well as resulting from maternal work behaviors or work and care orientations may affect both simultaneously. Our data, however, include only a small set of quality measures, which mainly relate to structural aspects influencing education and care conditions for children. There remains a risk of bias due to other unobserved quality characteristics, such as convenience factors, if these were positively or negatively correlated with our observed characteristics and with maternal employment. To reduce this risk, we included controls for availability of ECEC places and use of ECEC in addition to other information at the youth office district level. Local day-care quality at the youth office district level and most control variables were measured in 2010 to reduce the risk of endogeneity. Furthermore, focusing on change in maternal work hours and controlling for mothers' prenatal employment status should also reduce the risk of unobserved factors at the individual or regional level driving the correlation between local ECEC quality and individual mothers' employment decisions.

Operationalization of dependent and independent variables

Dependent variables

Our first dependent variable referred to a binary indicator of whether the mother was employed (full-time or part-time) at the time of the survey in 2011. Mothers who were on maternity or parental leave, in education, unemployed or staying home with family were categorized as not employed. The second dependent variable was a continuous measure of change in actual weekly hours of paid work from 2010 to 2011. Additional explorations showed that about half of the mothers changed their work hours between the two years. 26 % of mothers of toddlers entered the labor market, whereas 8 % extended their work hours. For mothers with older children, work hour increases occurred more frequently than labor market entries. In addition, around 14 % and 5 % of this group reduced their work hours or left the labor market, respectively.

Independent variables

Our key independent variables were three measures of average ECEC quality at the youth office district level: (1) child-teacher ratio, (2) group size in terms of number of children, and (3) teacher education measured as percentage of ECEC staff with less than a vocational degree. For the first two quality measures, district level means are provided separately for groups with children up to two years and for those from age three years to school entry. Information from the individual ECEC institutions was not available for data protection reasons. Fewer children per caregiver, smaller groups, and higher teacher education are generally considered to improve the quality of care because each child and his or her needs receive more adult attention (NICHD Early Child Care Research Network, 2002). The available measure of an ECEC-related vocational school degree (‘Fachschulabschluss’) may be more difficult for parents to assess than whether or not they have some vocational qualifications because not all ECEC teachers who completed vocational trainings necessarily obtained this degree. Due to data limitations, we

cannot take into account stability and reliability of care arrangements and convenience factors, which have also been found to correlate with maternal work or care decisions or perceived work-family conflict (Gordon & Högnäs, 2006; Gordon et al., 2008; Hofferth & Collins, 2000; Payne et al., 2012).

Average child-teacher ratios and group sizes in German day-care centers do not appear favorable when compared to recommended targets of the European Commission Child Care Network (1996). For children aged under two years, they recommend a child-teacher ratio of 3. For two-year-old children, this rises to a minimum level of 5 children per teacher and groups should not be made up of more than 8 children. The average child-teacher ratios are 4 and 6 children per teacher in West Germany and East Germany, respectively, and the average group size is 11 children under age three (see Table 2). According to the Child Care Network of the European Commission (1996), groups for older children up to school age should consist of a maximum of 15 children and at least one teacher for 8 children. For this age group, the average child-teacher ratios are 8 and 12 children per teacher and groups contain 23 and 17 children in West and East Germany, respectively.

<Table 2 about here>

In the regression models, we controlled for mothers' highest level of education, their hourly wages, net household income excluding maternal earnings and for the partner's employment status. Furthermore, we accounted for mothers' labor market status before the most recent birth distinguishing between full-time and part-time employment. We also controlled for number of children, age of youngest child and partnership status and considered whether mothers and, if applicable, their partners were first or second generation immigrants. Furthermore, partners' child care hours on a weekday and whether a grandmother of the youngest child lived within one hour

from the family's home were included as proxies for informal help with child care. We also tested controls for maternal work-care attitudes which were strongly associated with maternal employment but did not affect the associations with the ECEC quality measures. As attitudinal information was only available in the FiD data, we excluded it from the final models to be able to use a larger sample. Availability and access to ECEC services were captured by a regional measure of the percentage of children in the respective age group who attend ECEC institutions at the youth office district level. The percentage of all children in full-day care in the respective age group was included as a proxy for convenience in terms of opening hours and support for longer work hours of mothers. As measures of regional prosperity and necessity for mothers to contribute to the household income, we also controlled for the female unemployment rate and the rate of employed women who contribute to social insurance at the county level (Regionaldatenbank Deutschland, 2012).

RESULTS

Regional variance and pairwise correlations

In a first step, we observed the amount of variation across districts in ECEC quality aspects to see whether they exceeded state level minimum standards. For groups of under three-year-old children, the mean child-teacher ratios varied between 2.4 and 8 across districts. State level minimum regulations by contrast ranged from 5 children per teacher in Bavaria to 8 children in Bremen (MBJS Brandenburg, 2012). For children aged three years or older, the smallest child-teacher ratio observed in some districts was 6, while the largest was 15. State regulations of child-teacher ratios for this older age group ranged from 11 in Bavaria to 17 in Mecklenburg-West Pomerania (MBJS Brandenburg, 2012). This indicates a fair amount of variation with some

day-care centers offering structural quality well above the minimum demanded by state regulations.

Due to the lack of regulation of group sizes in some states, the observed regional variation is even larger than for child-teacher ratios. At the same time, average group sizes in some districts were significantly smaller than the regulated maximum. Observed group sizes varied from 5 to 18 children under three years across districts. State level minimum standards, where they existed, permitted a maximum of 8 to 15 children in Bremen and Lower Saxony, respectively**.** For children from age three to school entry, the districts with the smallest groups contained on average 14 children per group, whereas in the districts with the largest groups these consisted of 26 children. In terms of education, there was also considerable variation across districts from a minimum of 8 % to a maximum of 52 % of staff with no vocational degree in West Germany. In East Germany, the regional discrepancies were smaller ranging from only 2 % of staff without a vocational degree to a maximum of 12 %.

We inspected bivariate Pearson correlation coefficients between the three quality variables, as high correlations may point to various aspects of quality in each district being related and to an increased risk of correlations with other unobserved quality characteristics. Child-teacher ratios and group sizes for toddlers were only weakly correlated at .11 and .29 in East Germany and West Germany, respectively. Child-teacher ratios and group sizes for children aged three to seven were moderately correlated in West Germany (r =.45), and uncorrelated in East Germany (r =.08). The percentage of teachers with no vocational degree was weakly correlated with teacher-child ratios and groups sizes for older children in West Germany, whereas it was uncorrelated with these aspects for the younger age group and for East German districts.

In a second step, we explored for a subsample of mothers whose child of the respective age attended an ECEC institution how maternal satisfaction with various aspects of ECEC quality correlated i) with maternal employment (see Table 3) and ii) with regional averages of ECEC quality aspects (see Table 4). The sample sizes were much smaller than the overall sample because the questions on satisfaction with ECEC quality have only been asked in the FiD survey and only to mothers whose child attended ECEC institutions at the age of two or three years or at the age of five or six years. Mothers indicated their satisfaction with day-care aspects, such as group size or number of staff per group, on an eleven-point Likert scale. For mothers of toddlers in West Germany, higher satisfaction with the number of staff and with the group size correlated positively with employment as well as with the change in work hours. Furthermore, the relationships between maternal satisfaction and the local group sizes and child-teacher ratios were mostly negative as expected. The same was the case with respect to group size in East Germany. Surprisingly, employed mothers in East Germany were less satisfied with the number of staff and the group size than non-employed ones. The education level of the staff was not significantly correlated at the five percent-level with the quality satisfaction of mothers in any of the groups. For mothers with preschoolers, we observed few significant correlations between maternal employment and satisfaction with ECEC quality except that employed mothers in East Germany were more satisfied with the group size. Counterintuitively, in West Germany higher child-staff ratios correlated with greater maternal satisfaction. This may provide first hints that for preschoolers, mothers perceive the quality issue differently than for toddlers.

<Tables 3 and 4 about here>

Regression analyses

Table 5 presents average marginal effects of the three aspects of local day-care quality on the probability of maternal employment. Whereas none of the three indicators was significantly

associated with the employment probability of mothers with preschoolers, the models for mothers with toddlers in East Germany showed some statistically significant relationships. In East Germany, an increase in the median group size by one child was associated with a 6-percentage-point lower employment probability for mothers of toddlers (p=.001). The child-teacher ratio and the education of ECEC teachers showed no statistically significant correlations at the 5%-level. Combined models with interactions of quality characteristics and region (West vs. East) showed that only the association between group size and maternal employment was more significantly negative for mothers with toddlers in East Germany than in West Germany (available on request from the authors). All other interaction terms were not statistically significant.

Moreover, we found that once the local quality of the ECEC services was controlled, full-time ECEC attendance rates at the regional level were not statistically significant anymore, in contrast to former studies which could not control for quality (Büchel & Spiess, 2002). The other control variables, such as age and number of children, showed the expected associations. Mothers' prenatal employment status was correlated with the postnatal employment probability of mothers and a higher wage rate predicted greater employment probability.

The OLS regression models of changes in maternal paid work hours in Table 6 showed similar patterns. Of all quality indicators, only the group size was related to changes in work hours of mothers, and only for those with younger children in East Germany. East German mothers increased their work hours by two hours more if there was on average one child less in the group (p=.003). Teacher education and the child-teacher ratio showed no statistically significant relationship with the extent of change in maternal work hours. Again combined models with interaction terms showed that only the association of group size with changes in maternal work

hours was significantly different between East and West Germany (available on request from the authors).

<Tables 5 and 6 about here>

Among the other control variables, maternal employment status before the birth, wages, college education and household income showed the strongest relationships with change in maternal work hours. The negative association with mothers' wages probably reflected that mothers with higher wages were more likely to already work long part-time or full-time hours in 2010 and were less likely to further extend their hours.

Based on these results, Hypothesis 1 which assumed in general a positive association of higher ECEC quality with maternal employment and work hours had to be rejected. Instead we observed this relationship only for mothers with a youngest child under the age of three years, which lends support to Hypothesis 2a. It suggests that the employment decisions and work hour adjustments of mothers with toddlers were more sensitive to the level of ECEC quality in the local district compared to mothers with older children - possibly due to different cultural care norms and ideals for the two age groups. The larger constraints in ECEC availability for the younger age group possibly attenuated these effects but did not seem to offset them, as suggested in Hypothesis 2b. By contrast, the stronger and more significant effects of ECEC quality in East compared to West Germany for mothers with children under three years of age provided support for Hypothesis 3b rather than 3a. This may indicate that the excess demand for ECEC places for young children in West Germany mitigates the effects of regional ECEC quality variations by granting parents less choice.

Sensitivity analysis

We also examined multinomial logistic models of mothers entering, leaving or staying in employment. The results were in line with the findings from binary models of mothers' employment. To test for differences between maternal decisions to work full-time or part-time, we estimated multinomial logistic regression models additionally distinguishing between these forms of employment. These models showed that the associations of local child-teacher ratios and group sizes with maternal employment decisions were very similar with respect to part-time and full-time work for most subgroups and characteristics. Only a larger group size was even more strongly negatively associated with full-time compared to part-time employment among East German mothers with children under three years of age. These results suggest that in a setting such as East Germany, where ECEC services are widely accepted also for toddlers, ECEC quality aspects relate to mothers' decisions of being employed and of working full-time versus part-time. The latter was in line with our results of the change in working hours. An additional test using multinomial logistic models distinguishing between increases, reductions, and no change in work hours provided similar results as the OLS models in Table 6.

DISCUSSION

This study has explored how regional variations in three structural quality aspects of ECEC services relate to maternal employment and changes in work hours in Germany. It aims to fill a gap in existing research by considering ECEC quality aspects in addition to availability and cost issues for work-care choices of mothers. The results suggest that observable aspects of local ECEC quality, such as the group size, may influence the employment decisions of mothers with children aged under three years even after controlling for regional variations in the availability of ECEC services and in female employment patterns as well as for various individual and family characteristics. However, our findings of differential effects by the age of the youngest child and

between East and West Germany suggest that maternal quality concerns are stronger for younger children and influenced by the institutional provisions and culture regarding maternal employment and use of ECEC services. Our finding that neither maternal satisfaction with specific quality aspects nor maternal employment choices were significantly correlated with indicators of structural ECEC quality among German mothers with children over three years may indicate that mothers are less concerned about quality when ECEC attendance has become a predominant cultural norm in children's educational careers.

The stronger and more significant associations of maternal employment choices with the group size in East than West Germany may suggest that mothers of young children in West Germany are more restricted in their choices between ECEC institutions due to the lack of sufficient places. Whereas constraints for maternal employment through limited ECEC availability for this age group have been found previously, our results draw attention to a possible mechanism through restricted maternal choices in terms of quality of care. The estimated effects of an improvement in group sizes on the likelihood of maternal employment in East Germany are equivalent to an estimated increase by 15 percentage points in the rate of centers which provide full-day care (Büchel & Spiess, 2002) and larger than those of granting all employed mothers access to a day-care slot (Haan & Wrohlich, 2011). Due to methodological differences, however, these comparisons should be treated with caution.

Our results are generally in line with the US study by Hofferth and Collins (2001). They also did not find a significant association of local child-teacher ratios with the probability of employment exit among mothers with children under school age. By contrast, Meyers (1993) found that using a day-care center whose child-teacher ratios met accreditation requirements was positively

associated with the probability of single mothers continuing a welfare-to-work program in the US. One possible explanation for the discrepancy in results may be that the characteristics of the ECEC institutions which mothers actually use are more important than local area averages. In our findings, the highly significant bivariate correlations between local child-teacher ratios and satisfaction with the actual number of staff for mothers of toddlers in West Germany suggest that mothers are able to observe differences in child-teacher ratios and care about them. The less significant associations in the employment models with controls may point to other constraints, such as limited ECEC availability, restricting maternal choices in terms of quality. The stronger association of local group sizes compared to child-teacher ratios with ECEC quality satisfaction and with employment of mothers with young children in East Germany requires further investigation. Possible explanations may relate to regional differences in the amount of within-district variation for different ECEC quality aspects or in levels of information mothers have regarding recommended staffing and group size.

Our finding that educational qualifications of staff were generally not significantly associated with employment or ECEC quality satisfaction of mothers lends support to previous US studies which have shown that mothers have incomplete information on ECEC quality and have greater difficulties in assessing some characteristics than others (Cryer & Burchinal, 1997; Mocan, 2007). Our study suggests that the observability of quality may moderate the extent to which quality aspects influence parental employment decisions.

Two important limitations of this analysis have been the lack of available data to measure variation in quality over time and the restricted number of quality indicators. Unfortunately, we were unable to consider quality aspects which relate to flexibility and convenience of the care,

which have been found to be important predictors of maternal well-being and employment in the US (Hofferth & Collins, 2000; Meyers, 1993; Payne et al., 2012). As a result, there remains a risk that other unobserved characteristics at the district level which correlate with quality aspects and with maternal employment may bias our results. By examining district-level correlations between group sizes and child-teacher ratios and including other district-level controls, we have tried to reduce the risk of spuriousness in the significant associations of group size with maternal employment. Our quality measures at the youth office district level are less likely to suffer from endogeneity with maternal employment decisions at the individual level than subjective assessments of quality by mothers, as used in some previous studies (Meyers, 1993; Payne et al., 2012). They are, however, likely to represent incomplete information on the neighborhood context of ECEC quality and probably have a less direct effect on employment opportunities and work hour decisions of mothers than the characteristics of the ECEC institution that they actually use for their children.

From a broader policy perspective, our results provide evidence that investments on ECEC quality may not only benefit child development but may also facilitate the postnatal labor market return and reconciliation of paid and unpaid work and care among mothers with young children. However, further studies are needed which relate maternal work-care decisions to a wider range of characteristics of locally available ECEC quality and of the actually chosen ECEC institution. Ideally these measures should be based on quality information collected from both ECEC providers and mothers to be able to consider maternal quality perceptions and levels of information.

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Table 1: Overview of Differences in the ECEC Context in West and East Germany

	West Germany	East Germany
ECEC attendance rates in 2010:[a]		
Day-care attendance rate of children aged under three years	14	43
Family day-care attendance rate of children aged under three years	3	5
Day-care attendance rate for children aged 3 to school age	92	95
Types of ECEC providers in 2008:[b]		
% of public providers for children aged 0-3 years	30	39
% of public providers for children aged 3-6 years	35	42
% of non-profit providers for children aged 0-3 years	66	60
% of non-profit providers for children aged 3-6 years	65	57
% of for-profit providers for children aged 0-3 years	4	1
% of for-profit providers for children aged 3-6 years	0.4	1
Employment rates of mothers in 2011:[c]		
Employment rate of mothers with a youngest child aged 0-2 in %	30	38
Among them working part-time in %	76	49
Among them working full-time in %	24	50
Employment rate of mothers with a youngest child aged 3-5 in %	59	67
Among them working part-time in %	80	53
Among them working full-time in %	20	47
Attitudes towards working mothers (% of women who agree) in 2012:[d]		
A pre-school child is likely to suffer if his or her mother works	33	14
Family life suffers when the woman has a full-time job	36	14
Both the man and woman should contribute to the household income	80	92
Family members are best care providers for child under school age	47	18

Sources: [a] Statistisches Bundesamt, 2012; [b] Schilling, 2009; [c] Keller und Haustein, 2012; [d] own calculations based on International Social Survey Program 2012.

Table 2: Descriptive Statistics

	Children aged one to two years				Children aged three to school age			
	West Germany		East Germany		West Germany		East Germany	
	Mean/ Perc.	SD	Mean/ Perc.	SD	Mean/ Perc.	SD	Mean/ Perc.	SD
Dependent variables								
Mother employed 2011	38.51		47.35		64.61		72.03	
Change in maternal work hours 2010-11	2.50	16.99	7.31	19.47	2.10	10.80	3.07	12.98
Explanatory variables								
Child-teacher ratio	3.99	0.81	6.26	0.46	8.33	0.58	11.82	0.83
No. children in group	11.01	1.73	11.07	2.21	22.93	2.01	16.29	1.44
Percentage staff without vocational degree	28.02	10.05	6.96	2.26	27.10	10.01	6.52	2.05
Local ECEC take-up rate	17.60	6.18	47.05	6.59	92.37	3.95	95.22	2.48
Full-time ECEC take-up	10.49	6.02	37.03	23.42	68.03	22.34	85.48	11.51
Female unemployment rate	6.95	3.24	13.41	2.38	7.10	2.66	12.96	2.55
Female employment rate	46.76	3.72	51.45	4.64	46.65	3.79	53.56	4.22
Single mother	7.50		14.22		9.13		15.19	
Married	74.16		55.96		79.87		51.64	
Age of youngest child	1.93	0.53	1.96	0.54	4.85	1.22	4.89	1.25
Number of children	1.79	0.92	1.77	1.07	1.92	0.89	1.71	0.72
Age of mother	33.16	5.52	35.93	5.73	35.93	5.58	34.42	6.64
Migration background	33.12		7.61		35.36		4.57	
Vocational qualification	57.16		61.88		55.79		55.35	
College education	23.60		23.54		23.25		26.23	
Wage rate (EUR)	4.66	12.82	3.06	5.69	8.52	9.38	9.32	8.85
Household income excl. maternal earnings (EUR)	2,700.87	1,524.81	2,218.30	1,352.93	2,653.17	1,688.30	2,135.87	1,252.13
Employed partner	77.11		62.72		80.22		77.88	
Child care hours of partner	2.49	3.02	2.67	4.41	1.98	2.04	1.81	2.16
Grandmother lives nearby	74.49		72.24		72.03		81.70	
N mothers	1,002		341		1,562		396	

Note: All explanatory variables are measured in 2010 except the number of children and age of youngest child. Descriptive statistics are based on non-imputed data. Child-teacher ratios and group sizes are calculated separately for groups with children aged up to two years and for those from age three years to school entry.
Source: FiD v2.0 2010-11 & SOEP v28 2010-11 linked with youth office district data from 2010.

Table 3: Pairwise Pearson Correlation Coefficients of Maternal Employment and Satisfaction with ECEC Quality

	Satisfaction with no. staff	Satisfaction with group size
Youngest child aged 1-2 years		
West Germany (*n*=305)		
Change in maternal work hours	.12*	.16*
Mother employed	.08†	.12*
East Germany (*n*=128)		
Change in maternal work hours	-.08	.00
Mother employed	-.23*	-.17†
Youngest child aged 3 years to school age		
West Germany (*n*=444)		
Change in maternal work hours	-.00	-.06
Mother employed	-.05	-.04
East Germany (*n*=99)		
Change in maternal work hours	-.06	-.02
Mother employed	.11	.20*

*** p < 0.001, ** p < 0.01, * p < 0.05, † p < 0.1
Source: FID v2.0 2010-11.

Table 4: Pairwise Pearson Correlation Coefficients of Local ECEC Quality and Maternal Satisfaction

	Child-staff ratio	Group size	% staff without vocational degree
Youngest child aged 1-2 years			
West Germany (*n*=297)			
Satisfaction with number of staff	-.21***	-.13*	.04
Satisfaction with group size	-.30***	-.04	.06
East Germany (*n*=128)			
Satisfaction with number of staff	-.05	-.18*	.16†
Satisfaction with group size	.01	-.22*	.04
Youngest child aged 3 years to school age			
West Germany (*n*=450)			
Satisfaction with number of staff	.12*	.09†	.03
Satisfaction with group size	.13*	.02	.03
East Germany (*n*=97)			
Satisfaction with number of staff	-.12	-.04	.05
Satisfaction with group size	-.18†	-.07	.05

*** p < 0.001, ** p < 0.01, * p < 0.05, † p < 0.1
Source: FID v2.0 2010-11 linked with youth office district data from 2010.

Table 5: Average Marginal Effects Based on Logistic Regression Models of Maternal Employment in 2011, by Age of Youngest Child and Region

	Child aged 1-2 years				Child aged 3-school age			
	West Germany		East Germany		West Germany		East Germany	
	b	RSE	b	RSE	b	RSE	b	RSE
Child-teacher ratio	-0.05†	0.03	0.10	0.07	0.01	0.03	0.01	0.03
Group size	0.01	0.01	-0.06**	0.02	0.00	0.01	0.02	0.02
% staff without vocational degree	0.00	0.00	0.03	0.02	-0.00	0.00	-0.00	0.01
Local day-care attendance rate	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Local full-time attendance rate	0.00	0.01	-0.01	0.01	0.00	0.00	0.00	0.00
Employed part-time pre-birth	0.17**	0.06	-0.04	0.12	0.11**	0.03	0.08	0.06
Employed full-time pre-birth	0.19**	0.06	0.14*	0.07	0.06	0.04	0.12†	0.07
Vocational education	0.02	0.06	0.06	0.12	0.06†	0.03	-0.02	0.06
College education	0.16*	0.08	0.15	0.14	0.03	0.05	0.12	0.08
Ln wage of mother	0.04†	0.02	0.09*	0.04	0.16***	0.01	0.14***	0.02
Ln household income excl. mothers‘ earnings	0.10†	0.06	0.06	0.04	-0.02	0.03	0.01	0.06
Single mother	0.12	0.12	0.15	0.14	0.04	0.07	-0.09	0.10
Migration background	-0.01	0.05	-0.21	0.16	-0.05†	0.03	-0.01	0.19
Partner employed	0.12	0.09	0.25	0.13	0.07	0.06	-0.04	0.09
Child care hours of partner	0.02†	0.01	0.01	0.01	-0.00	0.01	-0.01	0.01
Grandmother lives nearby	0.07	0.05	0.14†	0.09	-0.03	0.03	0.04	0.06
Age of youngest child	0.08†	0.05	0.06	0.07	-0.01	0.01	0.04*	0.02
Number of children	-0.06*	0.03	-0.10*	0.04	-0.02†	0.01	-0.01	0.03
Age of mother	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Local unemployment rate for women	0.01	0.01	-0.00	0.01	-0.01	0.01	0.01	0.01
Local employment rate of women	0.00	0.01	-0.01	0.01	0.00	0.01	0.00	0.01
N Mothers	1,002		341		1,562		396	
Pseudo R-Squared	0.17		0.30		0.50		0.61	
N Clusters	200		63		288		79	

Note: All models are multiply imputed using chained equations with 50 imputation cycles. The Pseudo R-square is based on the sample with complete observations.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, † $p < 0.1$

Source: FID v2.0 2010-11 & SOEP v28 2010-11 linked with youth office district data from 2010.

Table 6: OLS Regression Models of Change in Maternal Hours in Formal Employment 2010 to 2011, by Age of Youngest Child and Region

	Child aged 1-2 years				Child aged 3-school age			
	West Germany		East Germany		West Germany		East Germany	
	b	RSE	b	RSE	b	RSE	b	RSE
Child-teacher ratio	-0.91	0.77	4.17	3.07	0.20	1.07	1.11	1.38
Group size	1.14†	0.62	-1.99**	0.63	-0.02	0.43	0.94	1.05
% staff without vocational degree	-0.04	0.08	-0.17	0.55	0.09	0.06	-0.21	0.64
Local day-care attendance rate	-0.07	0.28	-0.11	0.18	0.13	0.18	0.74†	0.36
Local full-time attendance rate	-0.07	0.26	-0.02	0.26	-0.01	0.03	-0.05	0.11
Employed part-time prebirth	4.55*	1.80	-0.36	3.93	1.82	1.33	6.31†	3.40
Employed full-time prebirth	3.20	2.03	9.13*	3.51	1.61	2.16	10.66*	3.69
Vocational education	-1.49	2.23	3.93	3.46	2.38	1.69	1.55	6.37
College education	2.21	2.66	10.48*	4.29	4.99*	2.08	10.64	6.99
Ln wage of mother	-5.76***	0.67	-8.63**	1.80	-2.13***	0.49	-5.81***	1.24
Ln household income excl. mothers‘ earnings	7.14***	1.92	3.44*	1.09	0.69	0.90	3.47	2.41
Single mother	6.45†	3.77	3.89	4.36	3.33	2.42	-7.44	7.01
Migration background	0.01	1.73	-2.73	5.95	-2.12	1.29	-10.65	8.17
Partner employed	0.46	2.72	4.61	3.54	1.01	1.55	-5.10	5.78
Child care hours of partner	0.55†	0.30	0.17	0.29	0.47	0.34	-0.20	0.50
Grandmother lives nearby	-1.17	2.17	5.51†	2.75	1.81	1.65	0.73	3.13
Age of youngest child	1.07	1.43	-0.53	2.67	-0.46	0.45	1.62	1.07
Number of children	-1.63*	0.71	-1.75	1.52	-0.07	0.67	2.29	1.57
Age of mother	0.10	0.14	0.02	0.20	-0.01	0.10	-0.34	0.23
Local employment rate of women	0.12	0.40	-0.32	0.38	0.18	0.23	0.39	0.79
Local unemployment rate of women	0.55	0.46	-0.02	0.55	0.62	0.40	0.16	0.80
Constant	-70.10*	25.07	-7.01	27.75	-31.06	26.72	-135.35	81.70
N Mothers	1,002		341		1,562		396	
Adj. R-squared	0.29		0.39		0.13		0.41	
N Clusters	200		63		288		79	

Note: All models are multiply imputed using chained equations with 20 imputation cycles. The adjusted R-squared is based on the sample with complete observations.

*** p<0.001, ** p<0.01, * p<0.05, † p<0.1

Source: FID v2.0 2010-11 & SOEP v28 2010-11 linked with youth office district data from 2010.