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Center-Based Care and Parenting Activities

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Abstract

We estimate the effects of center-based care on parenting activities with children using data from time diaries and a family survey for Germany. Our estimates imply that usage of center-based care reduces the amount of time that a parent spends with their enrolled child, but only small negative effects on the amount of time spent on parenting activities. Correspondingly, center-based care increases parenting activities as a share of time spent with the child. Our estimates of direct (center hours) and indirect effects (evening and weekend) are more pronounced for parents in households where the mother has lower educational attainment.

Key words: child care, child development, time use, parenting investments, day care
JEL Codes: D13; I21; J13

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1 Introduction

Children in high-income countries are spending more time in child care centers than ever before: not only is the age of first entry decreasing over time, but also the hours spent in daily care is increasing (i.e. OECD 2017). Nevertheless, parents are spending more time on activities with their children than they did in the 1960s (Dotti Sani and Treas, 2016).² Based on these trends, it is far from obvious that parenting activities are reduced as a result of the increasing usage of center-based care. Parental interactions play a key role in children’s development, independent of the role of learning institutions, such as child care centers (e.g. Cunha et al., 2006; Todd and Wolpin, 2007; Bono et al., 2016; Kim et al., 2018). Specific activities, such as reading to the child, are particularly valuable (e.g. Kalb and Van Ours, 2014; Price and Kalil, 2018). Therefore, knowing whether center-based care increases, decreases, or has no effect on parenting activities is important for understanding the effects on child development (we discuss each possibility in Section 3).

Our study asks: what is the effect of using center-based care on parenting activities? Although there is a huge economic literature on the effects of center-based care programs on various outcomes, evidence on the effect of center-based care on parenting activities is rather limited. Research mainly focuses on the effects of center-based care on maternal labor supply (for an overview i.e. Müller and Wrohlich, 2020) and child development (i.e. Havnes and Mogstad, 2011; Datta Gupta and Simonsen, 2012; Havnes and Mogstad, 2015; Blanden et al., 2016; Cornelissen et al., 2018; Felfe and Lalive, 2018; Kuehnle and Oberfichtner, 2020) with a few further studies looking at other outcomes like maternal well-being (i.e. Schmitz 2020), child abuse (Sandner and Thomsen, 2020) and fertility (i.e. Bauernschuster et al., 2016). Studies by Baker et al. (2008) and Herbst and Tekin (2010) are some of the few economic studies to

² Moreover, the type of parents who see the largest increases in parenting activities—i.e. more educated parents, according to Dotti Sani and Treas (2016)—are those who have seen the largest increases in usage of center-based care (e.g. see Jessen et al., 2018 for Germany).

look at the effects of child care programs (in Canada and the U.S., respectively) on the style and quality of parental interaction (among other outcomes). However, while important, quality and style of parenting are not necessarily closely related to the absolute and relative time spent on parenting activities.

Depending on the context, many studies find positive child development effects, especially for children from less-educated parents, while others show zero or even negative effects (e.g. Baker et al., 2019). The direction and size of the effect is most commonly thought to be related to the educational opportunities offered at the child care center relative to the home environment, with some studies focusing specifically on the role of center quality (e.g. Baumüller et al., 2014). However, this institutional channel typically takes the educational environment at home as a fixed consideration (e.g. Guryan et al., 2008, Kalil et al., 2012).³ A much less-explored channel is whether usage of center-based care might lead to child development by changing the home environment, for instance, by affecting parenting activities.

Our main contribution is to use time-diary data to estimate effects of center-based care usage on parenting activities in Germany, a country with a universal child care system. We do this by estimating the effects separately on (i) parents' overall time spent together with the child, (ii) the absolute amount of time spent on parenting activities, and (iii) the relative time spent of parenting activities (i.e. as a share of the time spent together with the child).⁴ We estimate the activities share both for parenting activities in general and for specific types of activities such as reading and primary care. In doing so, we follow the child development literature, which distinguishes between activities that involve different levels of interaction (Kalil et al., 2012;

³ One of the few studies not to take the home environment as given is Kuger et al. (2019), which shows that the quality of center-based care affects the quality of the home environment, using established quality measures for both environments.

⁴ Our analysis is restricted to families with one child below the age of ten for data reasons. Using a household survey, we show in a complementary analysis in Appendix C.2 that results hardly differ when we apply the same sample restriction there.

Fort et al., 2020). We contribute to a very sparse literature addressing our question.⁵ The only existing economic study is Kröll and Borck (2013), which uses data from the German Socio-Economic Panel (SOEP) and finds that center-based care increases maternal interactions with children. However, the analysis is based on how often mothers report having undertaken specific activities with their children in the past fortnight, rather than precise time diary data. The few studies from other social sciences that examine the relationship between center-based care and parent-child interactions tend to find small decreases that come mostly through primary care rather than development-enhancing activities (e.g. Booth et al., 2002; Folbre and Bittman, 2004; Craig and Powell, 2013; Habibov and Coyle, 2014). However, these studies do not attempt to address selection on unobservables. None of these studies examine parenting activities as a share of time spent with the child, and few emphasize on the specific types of activities carried out.

Another major contribution of our study is to outline a framework of mechanisms and apply it to the data. We distinguish between direct effects, which are changes in parenting activities that occur while the child is at the child care center, and indirect effects, which are changes to parenting activities outside of center hours while the child is at home (e.g. in the evenings and on weekends). Indirect effects may be either positive or negative depending on whether center-based care is a complement or a substitute for parenting activities, which itself depends on changes to parental motivation or time constraints. We apply the framework empirically by estimating effects on parenting activities at specific times of the day: during typical care center hours or outside of those hours. We explore whether the effects likely reflect changes to motivation or to time constraints by additionally looking at effects on non-parenting activities (such as paid work and leisure). Previous studies neither distinguish between direct

⁵ Interestingly, some studies focusing on the impact of maternal employment on parenting activities, showing that parental quality time with children does not need to decline with increases in maternal employment (e.g. Bono et al., 2016).

and indirect effects, nor attempt to systematically explore mechanisms.⁶ In doing so, our study contributes to a literature on the economics of parenting that tries to explain parenting decisions as rational choices that may be affected by the policy environment (e.g. Doepke et al. 2019; Doepke and Zilibotti 2017).

A further contribution is that we do not just focus on center-based care usage, *per se*, but on the effect of the dosage as well: We complement our main analysis with an examination of the effects of full-day vs. half-day care on parenting activities. We do this using the same time-use data and further survey data, the German Family Panel (*pairfam*). The dosage of center-based care is an important margin since the literature finds quite differing effects on child development by hours of center-based care (e.g. Loeb et al., 2007; Datta Gupta and Simonsen, 2010; Felfe and Zierow, 2018).

Our method involves regressing time spent on parenting (and non-parenting) activities on an indicator for center-based care usage. We estimate an unconditional model and a conditional model with a rich set of controls for child, parent, and household characteristics. To account for potential selection on unobservables into center-based care, we implement the coefficient stability approach of Oster (2019). Selection on unobservables is accounted for by assuming it relates to the degree of selection on observables, which itself is measured based on coefficient movements (and changes in the R-squared) that occur when including control variables. We present ‘identified sets’ that are estimate bounds based on assumed upper and lower limits for the degree of selection on unobservables. In general, we find that our coefficients are relatively stable to the inclusion of controls, thus suggesting fairly limited selection bias. In a further check, we show that our coefficients are also similar to those estimated when using a fuzzy difference-in-differences (DD) model that makes use of exogenous variation in center-based care usage from the different timing of roll-out of places by age group. Overall, while we do

⁶ A previous study that also analyzes the effect of center-based care on parenting activities also finds evidence of the impact of center-based care on non-parenting outcomes like housework (Craig and Powell, 2013).

not claim to estimate ‘causal’ effects, we are comfortable using the word ‘effect’ to describe our estimates since we believe them to be a fairly close proxy.

Our estimates imply that center-based care usage reduces the overall time that parents spend with their child but that there are only small effects on the time spent on parenting activities with the child and on educational activities, specifically. As a result, center-based care usage increases the time spent on parenting activities as a share of the overall time spent together with the child. The effects come through households where the mother has lower education attainment, through both mothers and fathers. For households with higher maternal education, mothers increase their share of parenting activities but fathers decrease it, resulting in no effect overall. Our results are consistent with the few existing studies that find only small decreases in parenting activities (see above). However, our additional finding of an increase in parenting activities when expressed as a share of overall time suggests an improvement in educational opportunities within the home environment. Overall, this result is consistent with the majority of the literature on the effects of center-based care on child development (which find stronger effects for children from lower educational backgrounds) but provides an additional channel not previously explored in much detail.

By estimating effects at different times of the day, we are able to show why the overall decrease in parenting activities is relatively small: First, there is a direct effect since center-based care tends to replace time with the child during times of the day where parents are more busy with non-parenting activities (e.g. housework) in the counterfactual and, second, there is an indirect effect where parents offset the decrease in parenting activities during the day with increases in the evening. For households with lower maternal education, both direct and indirect effects are positive for both mothers and fathers. We find that the increases in parenting activities for these households partly reflects an increase in reading to the child and coincides with a reduction in leisure, suggesting parental motivation (rather than an easing of time constraints) as a mechanism. For households with higher maternal education, there are no direct

effects, and the positive indirect effect for mothers is outweighed by a negative indirect effect for fathers. A potential explanation for these findings is if child care centers encourage activities with children (such as reading) and if less educated mothers are specifically targeted or differentially affected by such encouragement, for various reasons (Cornelissen et al., 2018; Kuger et al., 2019).

Finally, our results show that full-day care, in comparison to half-day care, does not provide additional positive effects on parenting activities. We find decreases in the frequencies of certain parenting activities, although the effect sizes are small. This is potentially in line with the literature that finds more limited child development effects at this margin (e.g. Felfe and Zierow, 2018).

2 Institutional background

In 2019, 34 percent of children in Germany under three and 93 percent of those aged three to five were enrolled in center-based care. For both age groups, just over half of the enrolled children were in full-time care, defined as 35 hours or more per week (Autorengruppe Bildungsberichterstattung, 2020). The child care system in Germany can be characterized as a virtually universal, strongly state-subsidized system. For-profit providers play a very limited role, with only 2.6 percent of institutions in 2017 being private and non-charitable (Destatis, 2017). Parental fees are mostly income-dependent and relatively low compared to most other OECD countries (OECD, 2020), with many states having even abolished fees altogether for older age groups at least (Huebener, Pape and Spiess, 2019). In 2012, average fees amounted to 144 Euros per month and family, on average (Schröder et al., 2015). In general, parents cannot obtain higher quality by paying higher fees, which weakens the link between family income and center-based care quality compared with countries using a market-based system.

Figure 1 shows enrollment rates in center-based care for under and over three year olds separately for East and West Germany over the time period covered by our analysis. For over-

threes, the majority of the expansion in child care center slots took place in the 1990s in response to the 1996 introduction of a legal entitlement to a place for children over three years and a general trend in Europe to expand center-based care for children three years and older (see e.g. Spiess et al., 2008). In both East and West Germany, enrolment rates for over-threes have been above 80 percent since before 2000. Despite a strong increase in full-day enrollment in West Germany in the 2010s (Jessen et al., 2018), full-day rates there remain below 50 percent. In East Germany, full-day enrolment rates are much higher, covering 74 percent of over-threes children in 2018.

In contrast, for under three year olds, enrollment rates were very low well into the mid-2000s, particularly in West Germany. In 2008, a federal law (KiföG) was passed, extending the legal claim to a place at a child care center to children of at least one year of age, coming into effect in 2013. The legal change and the accompanied increased provision came in response to a long-lasting over-demand for center-based care, in particular by parents with infants and toddlers (i.e. Wrohlich 2008, Spiess and Wrohlich, 2005). However, while enrolment rates for under-threes subsequently climbed, demand increased further still resulting in a continuation of shortages (Jessen et al., 2020).

Parents in Germany make frequent use of informal care, especially by grandparents. In 2017, between 50 percent and 60 percent of all children from six months old until the age of six years had grandparents as caregivers; for older children, grandparents were mainly used in addition to center based care. Other private caregivers looked after between only 10 percent and 30 percent, of children, depending on child age. Nevertheless, informal care, such as that offered by grandparents, is typically for only a few hours per week and complementary to formal care. This is shown in Tables B4 and B5: informal care is higher for children who attend a child care center, suggesting that informal care may have been used to extend hours of formal care, rather than to substitute it.

Parental care in Germany is characterized by a strong gender divide, with mothers acting as the primary caregivers. Parenting activities (and housework), therefore, are carried out to a much larger degree by mothers despite a slight narrowing of the gender gap since the 1990s, as illustrated in Appendix Figure B2. Consistent with the ‘male-breadwinner’ model, evidence shows that the roll-out of center-based care, as described above, had an employment effect for mothers but made no difference for fathers (Müller and Wrohlich, 2020). In addition, parenting activities (in minutes per day) exhibit a strong upwards time trend for both mothers and fathers, which is broadly comparable to that found in other countries (Dotti Sani and Treas, 2016).

3 Adjustment mechanisms

This section discusses ways in which center-based care usage might affect parenting activities. We focus on the amount of time spent on activities as an outcome rather than any measure of parenting quality or style. We define *direct effects* as changes that occur during the time that the child spends at the child care center, and *indirect effects* as changes that occur outside of center hours as a result of parental adjustments. We describe effects in *absolute terms*, the total time in a day spent on parenting activities, and in *relative terms*, the changes to the time spent on parenting activities as a share of time spent with the child.

3.1 Direct effects

The direct effect of center-based care on parenting activities in *absolute terms* may be as follows:

- Negative: if center-based care usage reduces the time that a parent spends with their child, when they would have otherwise engaged in some parenting activities in the counterfactual.
- No effect: if center-based care usage does not reduce the time spent with parents. This could be if it fully crowds out informal care, by grandparents, for instance, or if despite

being with the child, no parenting activities are done in the counterfactual.

- Positive effects are not possible due to the way we define direct effects as occurring during hours when the child is at the day care center.

Direct effects are most likely negative in absolute terms, as informal care in Germany is typically complementary care rather than a substitute for center-based care (see Section 2). Moreover, it is unlikely that no parenting activities at all are done in the counterfactual. Thus, we expect negative effects to prevail, although they may reflect some differences in the distributions of activities across the day in the counterfactual and some adjustments to informal care.

The direct effect on time spent on parenting activities in *relative terms* may be as follows:

- Positive: if center-based care reduces the parent's time spent together with the child during a certain period of the day but does not reduce parenting activities as much relatively since they are more concentrated in another period of the day in the counterfactual.
- Negative: if center-based care replaces a period of the day with many parenting activities in the counterfactual.
- No effect: if parenting activities are equally concentrated across parts of the day in the counterfactual.

Direct effects are most likely positive in relative terms since center-based care typically occurs during the morning and afternoon. These are times when, on average, parents spend less time on parenting activities compared to the evening (this is what we see in our data; see Figure 2).

3.2 Indirect effects

Indirect effects in *both absolute and relative terms* may occur as follows:⁷

⁷ Substitution effects leave time spent with child (i.e. the denominator in the 'care share') unaffected, so all changes in relative terms come about through absolute changes to time spent on child care (i.e. the numerator).

- Positive: if center-based care is a complement to parenting activities. This could be if center-based care reduces parental time-constraints or increases parental motivation to interact with their child. Time-constraints may be reduced if parents use the center-based care hours to complete other tasks, such as paid work or housework, thereby freeing up evening time for parenting activities. Furthermore, not being at home with a child may mean there is less cleaning and tidying to be done in the evening.⁸ Motivation may be increased if spending less time with the child overall means that parents try to ensure that they do more activities with the child in the remaining time. Further, it could be that center-based care inherently encourages parents to interact with their child, e.g. through teacher recommendations (see e.g. Cornelissen et al., 2018; Kuger et al., 2019).⁹ Moreover, if center-based care has a direct effect on children's cognitive or socio-emotional development, parents could adjust their inputs in response to this and increase their time spent on specific parenting activities (see Nicoletti and Tonei, 2020).
- Negative: if center-based care is a substitute for parenting activities. This could be the result of a decrease in parental motivation, e.g. if parents feel that certain activities are no longer necessary since they are already done with child in center-based care. This might be the case in particular if there is a notable positive effect of center-based care on child development. Furthermore, substitution could occur through a worsening of parental time constraints, e.g. if parents use center-based care hours to take on significant extra activities, such as paid work, meaning they have more tasks to do in

⁸ One thing to note is that if increased activities are due to a reduction of time constraints, then this may reflect lower parental stress and a higher quality of interaction than captured by a simple increase in the activity share in time spent with child. Sandner and Thomsen (2020) find evidence that the expansion of center-based care in Germany led to a reduction in cases of child abuse and neglect. They propose a reduction of mental and physical overburdening of parents as the driving mechanism underlying this. Additionally, Schmitz (2020) finds that provision of public child care in Germany directly increases maternal well-being.

⁹ This holds especially true if care center staff observe developmental deficiencies, if they believe that educational activities are performed too rarely and / or if they believe that parents are unaware of the benefits associated with them.

the evenings instead of parenting activities.

- No effect might arise if center-based care is neither a substitute nor a complement, i.e. if there are no motivation and time-constraints effects or if they are counterbalanced.

While we have priors for the direct effects, there is little evidence on which to base hypotheses regarding the direction of the indirect effects. A separate question is what direction the overall effect might be (i.e. direct and indirect together). Plausibly there might be positive indirect effects on parenting activities that are large enough to overcompensate for a negative direct effect in relative, and, even potentially, absolute terms. Again, we have little guidance to form any priors in this regard. In Appendix A, we provide some stylized examples to further illustrate the mechanisms with specific cases.

4 Data and empirical approach

4.1 German Time-Use Survey

We use diary data from three waves of the German Time-Use Survey, which is a repeated cross-section of around 5,000 households taken in 1991/92, 2001/02 and 2012/13 (Maier, 2014; Destatis, 2015). The diary data records the main and (optional) secondary activity of each adult household member in five- or ten-minute slots over two or three days using a three-digit classification (see Appendix Tables B2 and B3 for further details).¹⁰ An example of a three-digit activity is ‘reading to child’, which is from the two-digit activity of ‘child care’, which belongs to the broad one-digit category of ‘work in the household’. We use the activities recorded under ‘child care’ as our parenting activities. In addition to recording specific activities, the survey indicates for each time slot whether it was spent with a child under the age of ten years present. Importantly, the parent need not necessarily record a parenting activity as

¹⁰ The first wave consists of two successively recorded days that are uniformly distributed, meaning that about three quarters of the days in the sample are weekdays. In the two last waves, individuals’ activities are recorded over three days, two weekdays and one weekend day.

the main or secondary activity while spending time with the child.¹¹

We use the data to define three measures of parental involvement: (1) *time with child*, as the number of minutes that a parent spends together with their child; (2) *parenting activities*, as the number of minutes spent on parenting activities as the main activity; and (3) *parenting activities share*, as the proportion of the overall time spent with a child that is spent on parenting activities as the main activity. We think of *time with child* as capturing a more basic form of childcare than *parenting activities*, since the latter involves specific interactions with the child, which may better foster child development (see e.g. Kalil et al., 2012). Thus, we think of *parenting activities* and the *parenting activities share* as being the relevant measures of the educational potential of the home environment, the first as an absolute measure and the second as a relative measure. In some specifications, we also distinguish between particular types of parenting activities: reading to their child, playing, talking with their child, and primary care.¹² We also estimate effects on non-parenting activities, like ‘paid work’, ‘housework’, and ‘leisure’ to investigate mechanisms.

The data also includes information on households—such as usage of center-based care, age of youngest child, number of children, single-parent household, and location in East Germany. At the respondent-level, the data includes information on age, gender, education, marital status, and economic activity. In our analysis, we look at effects for mothers and fathers separately and we differentiate households by maternal education. We follow the common practice in the literature (e.g. Fiorini and Keane, 2014; Nicoletti and Tonei, 2014) of grouping households by maternal education, both because it is highly correlated with paternal education and also because mothers are usually the primary caregivers in our context. We define the educational background as higher if the mother (or, very rarely, male single parent) in the

¹¹ For example, a parent may record ironing as the main activity and watching television as the secondary activity, while also indicating that the time was spent with a child

¹² ‘Primary care’ covers bodily hygiene, feeding and clothing the child, as well as passive supervision (i.e. ‘keeping an eye on’ the child).

household holds a secondary school certificate from the upper educational track, which ends with a university entry degree (*Abitur*) and lower otherwise. The education split is motivated by differential effects of center-based care on child development found in the literature and well-established differences in parenting activities by education (see e.g. Bradley et al., 2001; Guryan et al., 2008; Kalil et al., 2012; Gimenez-Nadal and Molina, 2013; Dotti Sani and Treas, 2016).

We use parent-days as the unit of observation for our analysis. We restrict our sample to parents whose youngest child is of the enrollment age for center-based care (i.e. under six years old). Furthermore, we drop all parents who have more than one child under ten years old. This restriction reduces the sample by 58% but ensures that *time with child* measures effects on the enrolled child and not any potential indirect effects on time with an older child (who is also under ten years).¹³ We do not expect the effects to be dramatically different for the dropped households (with further children under ten) since it is enrollment of the youngest child in center-based care that usually makes the key difference in terms of the child care responsibilities of parents. Indeed, we show in Appendix C.2 that imposing the same restriction when using the household survey data (where we see activities for each child) result in similar coefficients. After these restrictions, the main sample comprises 4,295 parent-days and 1,785 person observations. Table 1 presents summary statistics of the main sample.

To illustrate the diary data, Figure 2 plots the number of minutes per hour of the day spent doing different activities by usage of center-based care. In these descriptive plots we focus only on mothers observed on weekdays, since this subsample of parent-days demonstrates the

¹³ In principle, there remains a problem with *parenting activities* since, unlike time with child, these may also refer to children older than ten. In Appendix C.2, we show that imposing a restriction of one child of any age barely changes the coefficients but it does result in some loss of precision. Therefore, we proceed with the one child under ten as the best compromise between sample size and external validity.

clearest differences in terms of direct and indirect effects.¹⁴ However, in our analysis, the baseline specifications pool mothers and fathers as well as weekdays and weekend days, to give a clearer picture of effects on parenting activities overall. The descriptive plots show that center-based care is associated with mothers spending less time with their children on weekdays during regular care center hours (08:00-16:00), especially in the morning. There is also a lower share of parenting activities, although it is less pronounced and followed by an apparent increase in the evening (16:00-20:00). Paid work is higher for center-based care users, while both housework and leisure are lower during center-based care hours. Finally, we see that mothers with their child in center-based care wake up earlier.

4.2 The German Family Panel

For an additional analysis of the effects of full-day vs. half-day center-based care, we use the German Family Panel (pairfam), which is a longitudinal household survey collected annually since 2008 and used for researching partnership and family dynamics.¹⁵ The survey records the frequency of specific parenting activities, but only for older children (over three) and only since 2013. Therefore, we restrict our sample to data between 2013 and 2019 for children over three years of age. While the survey does not collect precise diary data, it gives us around ten times as many observations as does the time-use sample for the full-day vs. half-day care analysis, allowing for greater precision in estimation. We cannot use pairfam to examine day-care vs. no day-care since the activity-questions are only available for children over three who nearly all attend center-based care.

For each child of a parent, the survey asks: *How often have you done the following things*

¹⁴ Figure B1 shows pooled results for mothers and fathers on all days. Figure B2 shows the average daily duration of the activities shown in Figure 2 separately for fathers and mothers by sample wave. Note that the decrease in time spent in paid work by mothers after the first sample wave (1991/92) is driven by mothers in East Germany in the aftermath of German reunification.

¹⁵ See Bürderl et al. (2020) for a data documentation.

with your child during the past 3 months? An overview of frequencies of shared activities for children in half-day and full-day center-based care is shown in Figure B3. We code indicator variables for whether each activity is carried out at least daily as outcomes variables. The data also include information on the type of care each child uses, as well as parent, child, and household characteristics. We code children as being in full-day care if they are in center-based care in the morning *and* afternoon and half-day if they are at center-based care in the morning *or* afternoon.¹⁶ Appendix Table B1 shows summary statistics for children attending half-day or full-day care and for their families and households.

4.3 Empirical approach

We start with an unconditional estimation, whereby we regress parenting activities on center-based care usage controlling only for a set of indicators of child age in years.¹⁷ This unconditional model corresponds to the daily sum of the differences plotted in Figure 2. Next we estimate a conditional model that accounts for selection into center-based care based on observable characteristics: the child age indicators, plus child gender, parent age, parent age squared, parent gender, parental education indicators for secondary school track (upper, middle, or lower) and for university degree, marital status, single parent status, number of kids in household, as well as an indicator for weekday observations.¹⁸ We also include indicators for survey wave \times region (East/West) to control for the different institutional settings described in section 2. Despite having a fairly rich set of controls, it remains possible that selection into usage of center-based care is driven by unobservable parent characteristics that also affect

¹⁶ As an alternative measure for full-day care, we use the hours spent in center-based care. Similar to Loeb et al. (2007), we define full-day care as being in care for more than 30 hours per week and half-day is defined for children with 15-30 hours. As the question on hours is available only from wave 2014 forward, we present those results in the appendix. Both definitions imply that the analysis is restricted to children attending center-based care.

¹⁷ Given near zero usage rates in the first year of center-based care age range and near full usage in the last two years, the relationship between child age and usage has a relatively large deterministic component. Therefore, we include it in the unconditional model. Similar choices are made by Oster (2019) to include, for example, weeks of gestation in the unconditional model for birth weight.

¹⁸ We do not include parental employment as a control since it is a potential outcome of center-based care usage.

parenting activities. For the conditional model estimates to be interpreted causally, we must assume that, had they not used center-based care, that user-parents would spend a similar amount of time on parenting activities as non-user-parents, controlling for the institutional context and observables characteristics. This may be reasonable if the difference between usage and non-usage is somewhat exogenous due to the pervasive shortages in the period we cover with our data.

To account for possible selection on unobservables, we examine coefficient stability across unconditional and conditional models. We follow Oster (2019) in making assumptions regarding (i) the maximum achievable R^2 , i.e. R_{max}^2 , and (ii) the extent of selection on unobservables relative to selection on our set of included controls, i.e. δ . Our main specification assumes $R_{max}^2 = 1.3\widehat{R}^2$ where \widehat{R}^2 is the R-squared of the conditional model. We assume that δ is bounded such that $\delta \in [0,1]$. At the most ‘optimistic’ bound of $\delta = 0$ there is no selection on unobservables. At the most ‘pessimistic’ bound of $\delta = 1$, selection on unobservables plays an equal role to selection on the included controls. This seems a reasonable upper bound given we have a fairly rich set of controls. The corresponding identified set of estimates gives us the upper and lower bound for the true effect assuming that the real δ falls between the two extremes. Finally, we provide the δ that would be required based on the coefficient movements and R_{max}^2 for the true coefficient to be zero. A very large δ here indicates that the true coefficient is zero only if selection on unobservables is very large relative to selection on our controls.

To further address potential selection, in Appendix C.3 we estimate a fuzzy-DD that makes use of differences in the timing of the roll-out of center-based care by age group over the waves. We compare these estimates to those from our conditional regression.

5 Results

5.1 Effect of center-based care usage

First, we describe the effect of center-based care usage on parenting activities. Table 2 reports the results for all parents together, for mothers only, and for fathers only, each differentiated by the educational attainment of the mother in the household. For the group of households with lower maternal education, center-based care reduces *time with child* for both mothers and fathers. The reductions in *parenting activities* by comparison are relatively small (around 15 minutes for mothers) and, correspondingly, we see that the *parenting activities share* increases. We see this effect for both mothers and fathers from households with lower maternal education—while fathers reduce their time with child by less than mothers they do not decrease parenting activities at all and, thus, have a comparable increase in parenting activities share of about five percentage points (ppt). For households with higher maternal education, conversely, center-based care reduces time with child for mothers only (and by a smaller amount compared with mothers from lower education households). Since the reductions in parenting activities are similar in absolute size (or higher) compared with households with lower maternal education, there is no increase in the parenting activities share overall. The lack of overall effect is made up of a relatively small increase for mothers that is completely offset by a large negative difference for fathers.

The coefficients are fairly stable to the inclusion of control variables: in most cases, the identified sets suggest relatively tight ranges suggesting. While center-based care usage is related to certain observable characteristics (evident in Table 1), the stability of the coefficients in Table 2 suggests that these differences are not, on average, associated with very different patterns of time use. Nevertheless, one may worry that selection on unobservables is, in reality, unrelated to the degree of selection on unobservables, as assumed by the Oster method. As a further check, Appendix Figure C5 shows that using exogenous variation in center-based care usage based on differences in the timing of the roll-out by age group does not result in

significantly different coefficients. We proceed using the Oster-bounds since the fuzzy-DD estimates are quite imprecise.

In Appendix C.1, we explore heterogeneities for mothers and father beyond the household split by maternal education. We find that the effects on parenting activities share are driven mostly through mothers' interactions with daughters and partly also by fathers' interaction with sons, but that there is no effect on different-sex interactions (mothers with sons, fathers with daughters). This is consistent with research for the U.S. that show fathers carry out more activities with sons and mothers more with daughters (e.g. Baker and Milligan, 2016; Lundberg et al., 2007), except our result relates to changes in activities from center-based care usage. We also find increasing effects over the survey wave, consistent with the increasing time that children spend in center-based care over the period. The effects are also greater during weekdays, as one would expect, but there does appear to be some spillover to the weekends, thus justifying the pooling of these observations for the main analysis.

5.2 Direct and indirect effects

In order to explore the mechanisms, Figure 3a plots estimates (identified sets and 90 percent confidence intervals) by time of the day and maternal education (circles for lower, squares for higher maternal education). The effects during typical care center hours (8am-4pm) aim to capture direct effects, whereas changes in the evening (4-8pm) better reflect indirect effects. In Appendix Table C2, we present the full regression table, which also includes effects for the nighttime that are not plotted here but discussed as relevant. The figures illustrate that both direct and indirect effects play an important role in explaining the differences in effects between households with lower and higher maternal education. During center hours, mothers and fathers in those households with lower maternal education reduce their *time with child* more than mothers and fathers in household with higher maternal education, but without reducing their *parenting activities* by as much. As a result, there is an increase in the *parenting activities share*

during center hours for the lower maternal education group but not for the higher maternal education group. This represents a positive direct effect. Indirect effects, however, are just as important. For the lower maternal education group, there is an evening increase in parenting activities by both mothers and fathers, while their time with child is unaffected, resulting in an increase in the parenting activities share.¹⁹ In Appendix Table C3, we additionally show which specific childcare activities are affected: for the lower maternal education households there are evening increases in reading to their child as well as talking to their child and primary care. In contrast, for the higher maternal education households, there is no evening increase in parenting activities in minutes or as a share of time with child, since the increase by mothers is offset by a decrease by fathers, on average.²⁰

To gain further understanding of these differences, Figure 3b presents the effects of center-based care for four non-parenting activities: paid work, housework, leisure, and sleep by time of day and maternal education. The figures show that paid work increases during center hours (a direct effect) are largely driven by mothers, with effects that are similar in size to the decreases in time with the child. Further, there are decreases in housework and sometimes other activities (leisure and sleep) that presumably would have been done during time with the child had it been at home. This is consistent with evidence that mothers use day-care to take up paid work instead of multi-tasking childcare and housework (Müller and Wrohlich, 2020). While the effects come mostly through mothers, fathers from the lower maternal education group also increase their paid work and reduce housework (although it is not statistically significant). The decrease in housework for fathers and the decrease in leisure for mothers from the household

¹⁹ For the lower maternal education households there is an additional indirect effect of spending less time with the child at ‘night’ (8pm-8am), which appears to be driven by an earlier bedtime that is not fully outweighed by an earlier alarm clock.

²⁰ While there is no increase in parenting activities share overall, the higher education group does have some small indirect effects on the specific activities playing and reading, the latter of which appears in the ‘night’ category, perhaps reflecting a small increase in bed time reading.

with lower maternal education show that, for this group in particular, center-based care reduces time that is spent with the child doing non-parenting activities, helping to explain the positive direct effect on *parenting activities share*.

Turning to evening estimates (indirect effects), the figures provide an insight into whether the increases or decreases in parenting activities are driven by effects on parental motivation or by changes to parental time constraints. For the lower maternal education households, the evening decrease in leisure suggests an increase in parental motivation (rather than an easing of time constraints) is responsible for the evening increase in parenting activities.²¹ For the higher maternal education households, there is a reduction in housework and an increase in leisure, which could imply a combination of an easing of time constraints (e.g. if there is less housework to be done since the child is home less often or if paid work enables paying a cleaner) and increased motivation. For fathers from the higher maternal education households, there is a large evening increase in leisure suggesting that (a worsening of) parenting motivation may explain the decrease in parenting activities rather than a tightening of time constraints.

5.3. Effects of full-day vs. half-day center-based care

Thus far, the analysis focuses on the effects on parenting activities of using center-based care compared with not using it, irrespective of the number of hours of care used per day. The full-day vs. half-day margin may have different effects on parenting activities, which we explore in this section. Knowing the effects of full-day care on parenting activities is important since this is the relevant decision for many parents (i.e. children over three years and older in Germany, nearly all of which use center-based care —see Figure 1). It may also contribute to our understanding of the child development effects for full-day care, which tend to be differently beneficial for children from socially disadvantaged backgrounds depending on the analyzed

²¹ There is also an increase in paid work at ‘night’ for the low education group; this appears to reduce sleep, as shown in Appendix Table C2.

skills (e.g. Loeb et al., 2007, Felfe and Zierow, 2018).

The 2012/13 wave of time-use data contains hours of center-based care normally used. Figure 4 plots the full-day vs. half-day effects (i.e. conditional on usage of center-based care) on parenting (Figure 4a) and non-parenting activities (Figure 4b). As before, we plot estimates by time of day for both parents, mothers and fathers, and by maternal education. The effects of full-day care differ substantially by maternal education: For households with lower maternal education, there appears to be no change in time with child, and no significant changes to parenting activities as a share or absolute amount, for mothers and fathers. For households with higher maternal education, full-day care reduces time with child and parenting activities during center-based care hours, particularly for mothers. However, in contrast to usage vs. non-usage, here the reductions in activities are proportionate to the reduction in time with child such that there is no increase in the activities share. Overall, full-day care does not lead to any increase in the parenting activities share, neither directly nor indirectly. In Figure 4b, we show the direct effects for higher educated mothers; they increase their time on paid work, while decreasing their housework and leisure.

In order to investigate full-day effects with greater precision, along with effects on specific parenting activities, we turn to the German Family Panel (pairfam).²² Using this data, we estimate effects of full-day vs. half-day care on the probability of carrying out specific parenting activities on at least a daily basis. Table 3 shows the effects of full-day care on specific parenting activities (Panel A). We think of the first four activities (reading, music, art, and playing) as *educational activities* and the last three (outdoors, sports and TV) as *recreational activities*. For households with lower maternal education,²³ reading and playing is negatively

²² Focusing on one wave and only parents who use center-based care in the time-use data means the sample in the time-use survey is too small to focus on specific parenting activities.

²³ As in the time-use data, the household education level is defined by the mother's or single parent's formal education level.

affected by usage of full-day care, with effects being driven by fathers. Music and arts are unaffected for mothers and fathers in lower educated households. In higher educated households, in contrast, reading is not reduced, but negative effects for arts and playing come from mothers. Finally, the frequency of musical activities is not reduced for either household type. For recreational activities, daily outdoor activities become less likely with full-day care, but sports and TV are unaffected. The negative effects come through mothers rather than fathers.

Consistent with the time-use data, full-day care also allows for an increase in paid work that is larger for mothers with higher educational attainment (Panel B) and non-existent for fathers from either group. We also find that mothers with higher education are more likely to feel stressed and feel that they spend too little time with their child when full-day care is used, but this effect is smaller for mothers with lower education. These findings point to greater time constraints faced by mothers whose children are in full-day care compared to half-day care, potentially reducing the capacity to be involved in parenting activities. This effect seems most prominent for mothers with higher educational attainment. The last three rows of Table 3b look at child outcomes. We see evidence for a reduction in children's nightly sleep.²⁴ Looking at two measures of children's well-being, as reported by parents, we find that irritability is not affected whereas perceived happiness of children of lower educated households is somewhat reduced, in line with evidence of negative effects of full-day care on disadvantaged children (Loeb et al., 2007, Felfe and Zierow, 2018).

6 Conclusion

This paper asks: what is the effect of using center-based care on parenting activities? We outline a framework of potential mechanisms that involve direct effects occurring during center hours and indirect effects outside of those hours. Overall, our analysis shows that using center-based

²⁴ We were unable to examine children's sleep in the time-use data.

care results in relatively small decreases in parenting activities in absolute terms and an increase in relative terms, an effect that is more pronounced for parents from households with higher maternal education. The absolute effects are relatively small (15 minutes for mothers and smaller or no effects for fathers) because of both a direct effect, whereby center-based care replaces time with child when parenting activities are less frequent, and an indirect effect, whereby activities increase in the evening. Our analysis of non-parenting activities shows that the extra evening parenting activities are achieved by decreasing leisure, suggesting an increase in motivation (rather than an easing of time constraints) as a possible explanation. Parents from higher educated households do not see an increase in the parenting activities share, overall. There is an increase for mothers (perhaps reflecting an easing of constraints as well as increased motivation) that is offset by a decrease for fathers (which may reflect lower motivation). A specific analysis of the full-day vs. half-day margin, however, finds that using center-based care for 31 hours or more does not seem to be associated with increased parenting activities in relative terms. Analysis using survey data shows small reductions in the frequency of certain activities (e.g. 5-12 ppt reduction of daily playing) as a result of using full-day care over half-day care, as well as increases in parental stress, as measured in the data, and some evidence for reduced happiness for children from households with lower maternal education.

Our findings imply a need for greater awareness that development effects of center-based care may come through changes in the home environment not just through the usage of center-based care *per se* or through quality of this care. Thus, policymakers may want to consider strengthening the home environment channel through the following four measures: (1) Allowing center-based care to ease parental time-constraints. Our analysis covers a period when usage of center-based care was expected to facilitate paid employment, and, in many cases, this was even the condition for a place. While such conditions may increase the employment effects

of center-based care, they may do so at the expense of child development by shutting out one of the mechanisms, i.e. the easing of parental time-constraints. (2) Placing a policy focus on the interaction between parents and child care center staff. Care center teachers can help to advise parents with regards to their child's specific developmental progress and challenges. This may be strengthened by ensuring that care center teachers have adequate time for interaction with parents. The data in Appendix Table B6 reveal that most parents have either never sought advice from care center teachers or have done so just once or twice, despite 84 percent of parents reporting a high desire to exchange information about the child. (3) Encouraging usage of center-based care by households with lower educational backgrounds. Our findings imply that the home environment channel is strongest for these households, however, these households are less likely to be enrolled in center-based care with children under 3 years. Research suggests that enrollment gaps with respect to maternal education are best addressed in Germany by improving availability of places and a reduction of parental fees (Jessen et al., 2020). (4) Improving the quality of center-based care.

While our findings highlight an alternative channel for child development effects of center-based care, they should not detract from the importance of child care center quality as one policy priority. Instead, they suggest a complementary way of achieving similar policy goals. Indeed, there is evidence that qualitatively good center-based care can have positive effects on the quality of the home environment (e.g. Kuger et al. 2019).

Data acknowledgments

Main analyses are based on the German Time-Use Survey. Access to scientific use files for all three waves was granted by the Research Data Centre of the Federal Statistical Office.

Further analyses in this paper are based on data from the first eleven waves of the German Family Panel (pairfam), release 11.0 (Brüderl et al., 2020). A detailed description of the study can be found in Huinink et al. (2011).

This paper also uses data from the National Educational Panel Study (NEPS): Starting Cohort Kindergarten, doi:10.5157/NEPS:SC2:8.0.1. From 2008 to 2013, NEPS data was collected as part of the Framework Program for the Promotion of Empirical Educational Research funded by the German Federal Ministry of Education and Research (BMBF). As of 2014, NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi) at the University of Bamberg in cooperation with a nationwide network.

Finally, access to BiKS-3-10 was granted by the Research Data Centre of the IQB.

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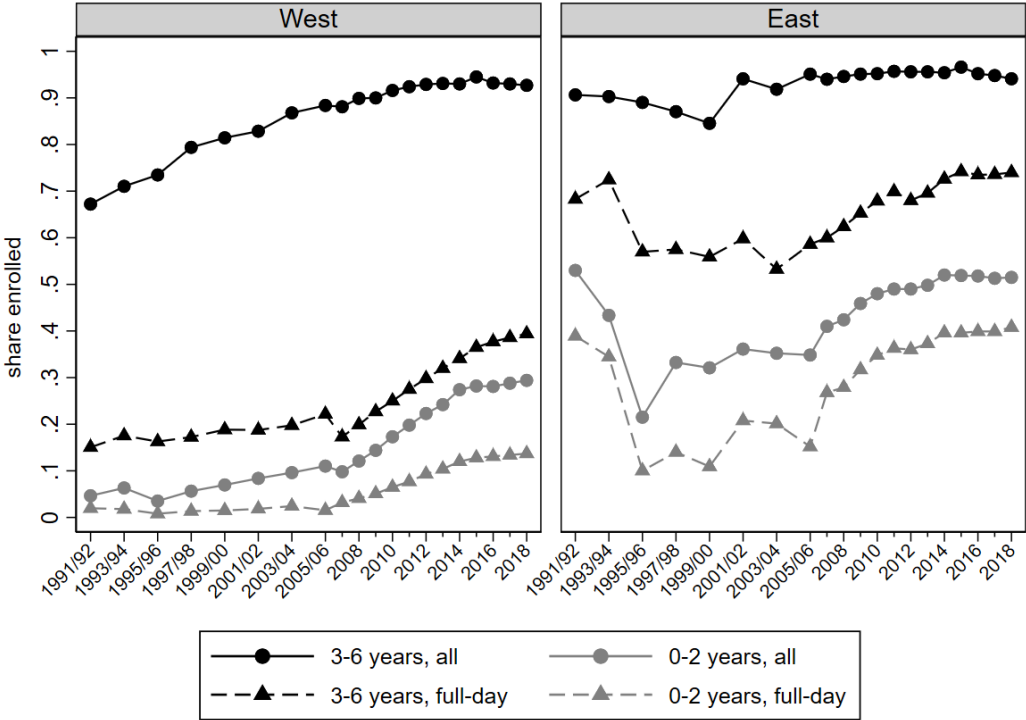
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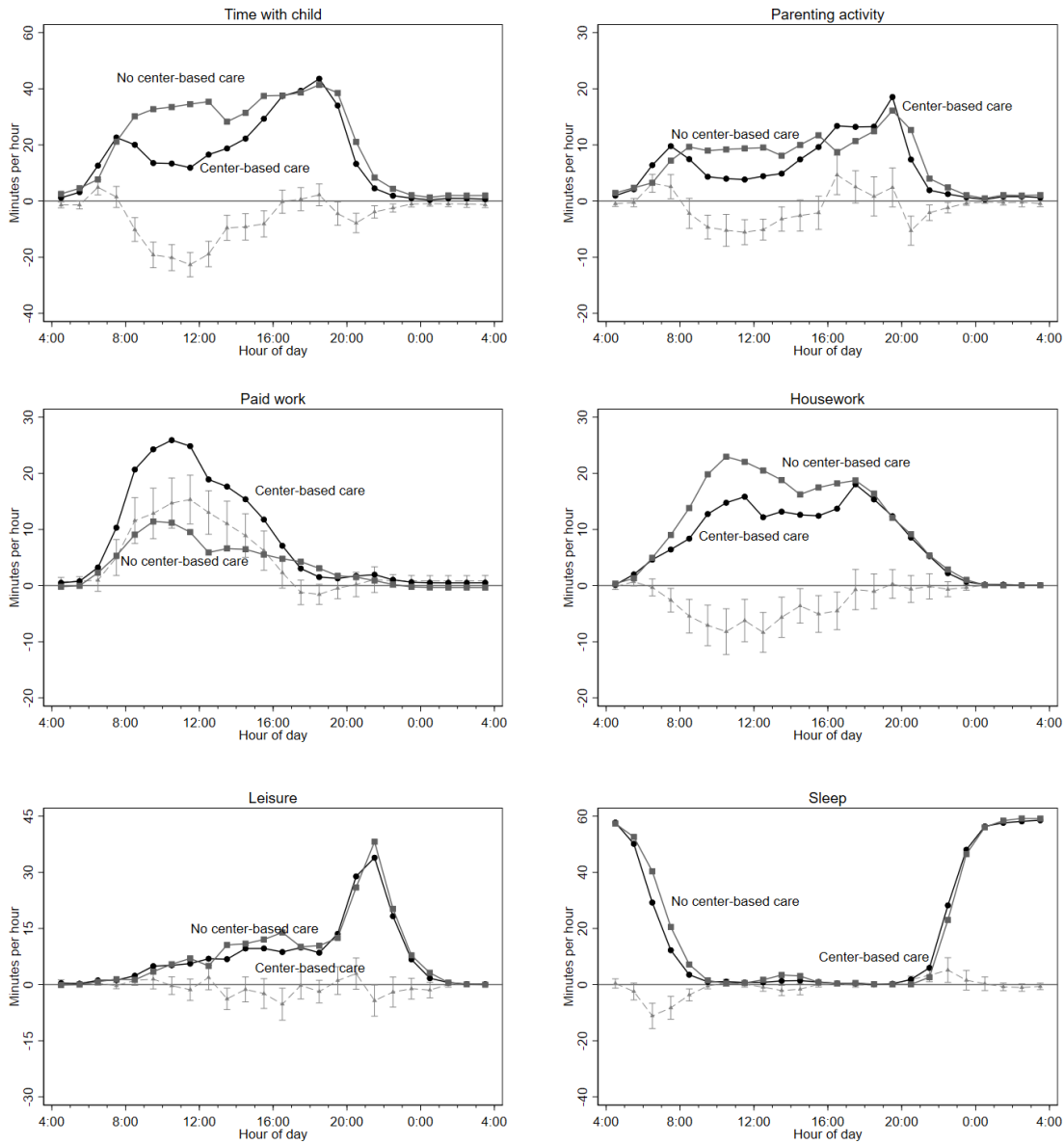
Figures

Figure 1: Share enrolled in center-based care by region, age group, and time



Note: Figure shows the share of children aged 0-6 years enrolled in center-based care and in full-day care by region (West vs. East Germany) and age group over time. Enrollment includes formal child care centers and care by qualified child minders. Data for 1991/92-2005/06 from the German Socio-Economic Panel (SOEP v35), which is a long-running household survey containing information on about 15,000 households per year (Goebel et al., 2019). For precision, data is pooled in two-year bins. Annual statistics since 2007 from the German Federal Statistical Office (starting that year, official statistics contain the share in full-day care).

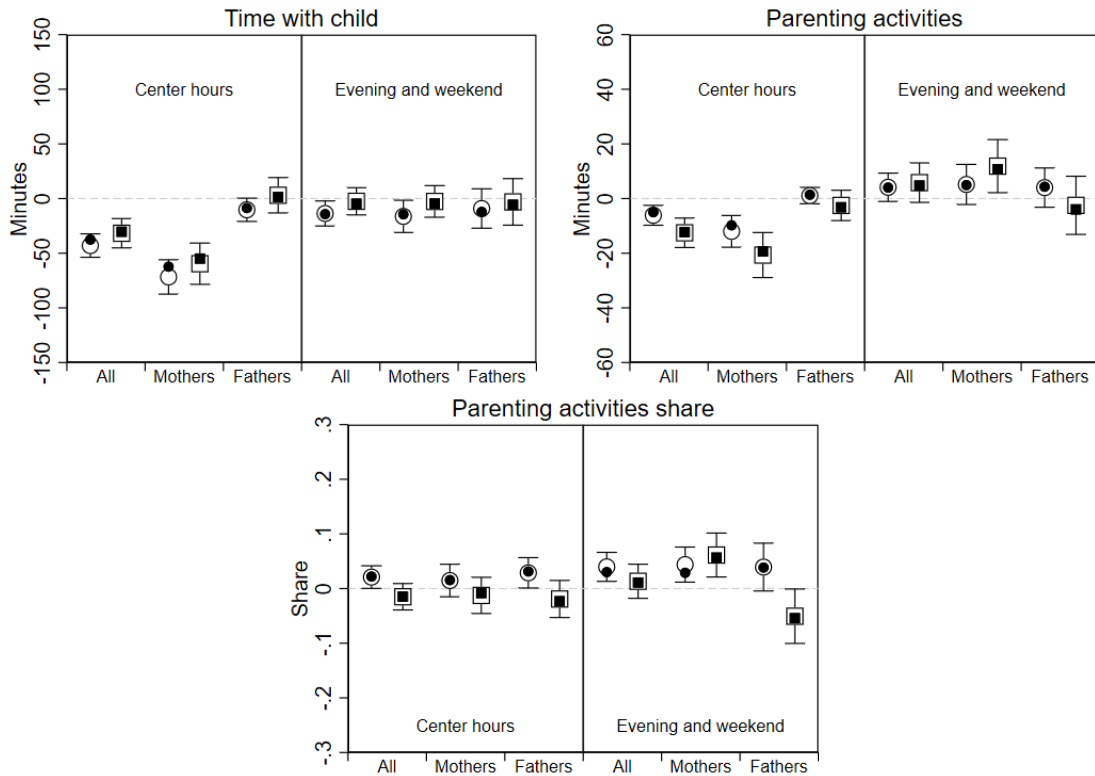
Figure 2: Mothers' activities on weekdays by usage of center-based care



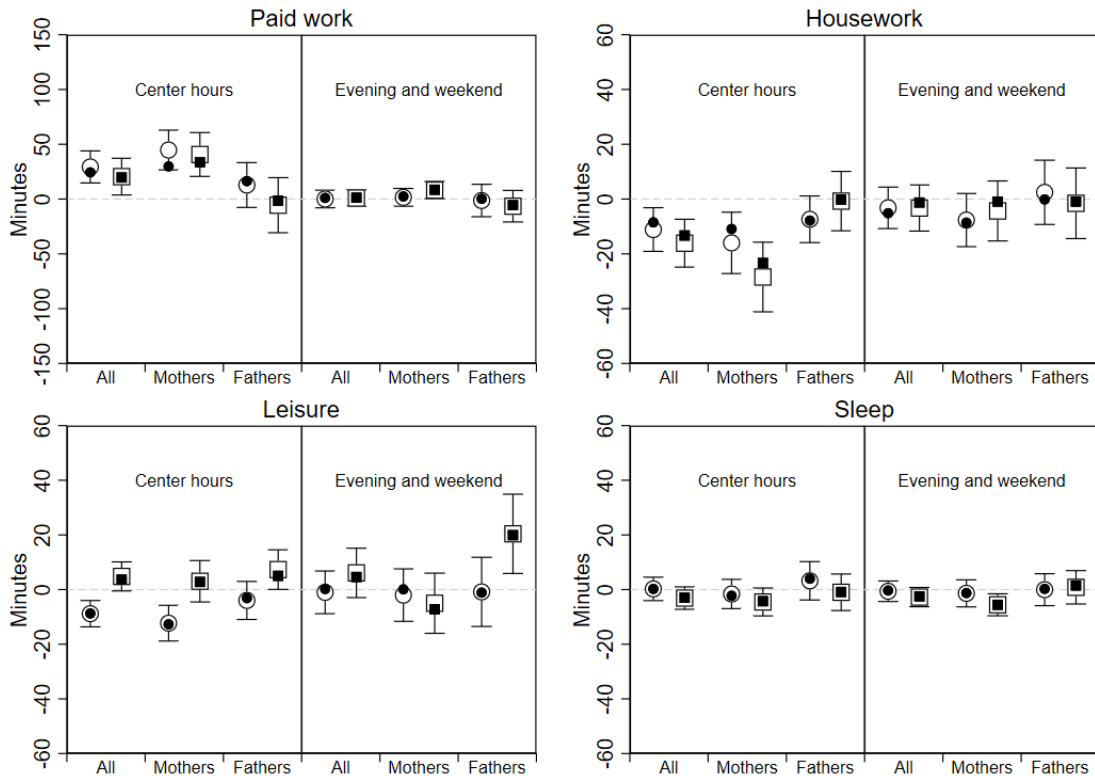
Notes: Black circles denotes mothers with a child in center-based care, gray squares those without. Differences and averages are estimated in weighted regressions with indicators for child age and evaluated at mean values. Whiskers indicate 95% confidence intervals. Data consists of time slots in ten minute intervals (five in the first survey wave), which then are aggregated by hour of day. Sample includes mothers on weekdays only and consists of all three waves of the time-use survey (1991/02, 2001/02 and 2012/13). Figure B1 shows results for fathers and mothers pooled over all days. Source: German Time-Use Survey

Figure 3: Effects by time of day and education

(a) Parenting

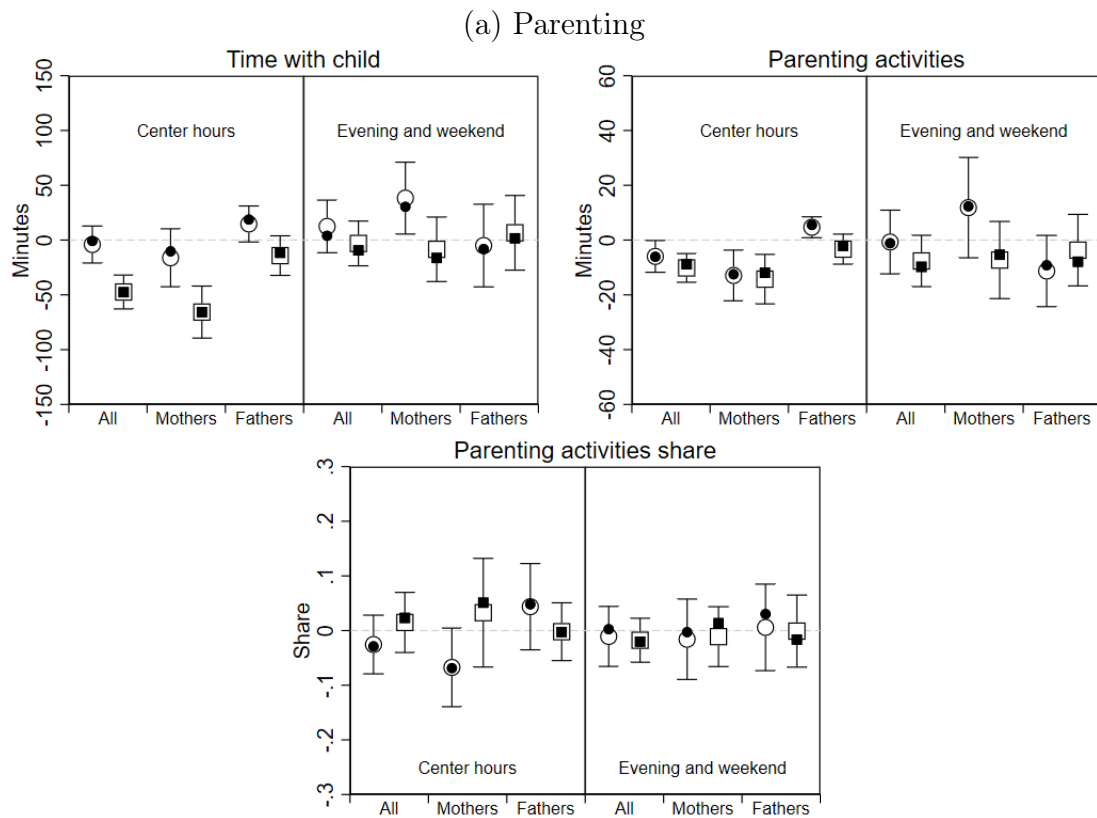


(b) Other activities

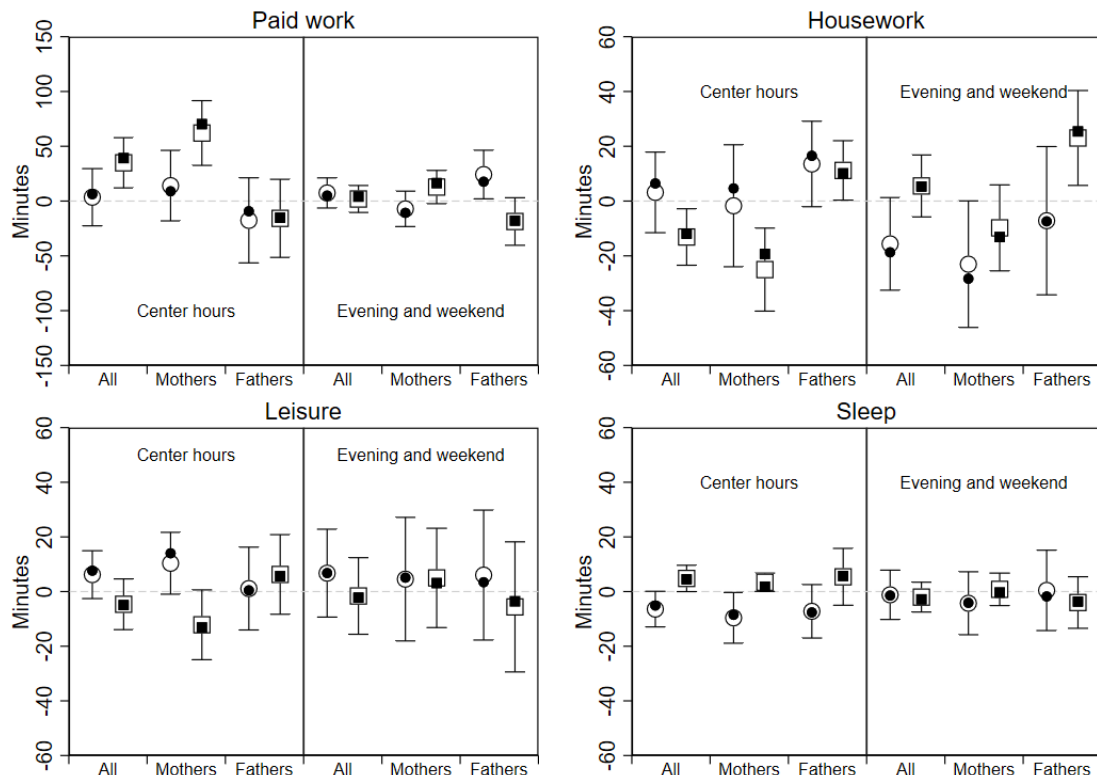


Notes: Center hours are from 8am-4pm on weekdays, evening is from 4pm to 8pm on weekdays. Evening and weekend pools evening hours and weekend days (8am to 8pm). Circles denotes lower education households, and squares denotes higher education. Education level of the household is based on whether the mother in the household (or the single parent) has a secondary school degree from the higher track (*Abitur*). The plots show the conditional difference in outcome variables by center-based care usage. Each estimate is based on a separate regression of the outcome summed for a given time of day on an indicator for usage of center-based care and controls (see notes to Table 2 for details) using all three waves of the time-use survey (1991/02, 2001/02 and 2012/13). The hollow shapes and whiskers indicate the conditional coefficient ($\delta = 0$) and the 90% confidence intervals. The filled shapes indicate estimates under the assumption of $\delta = 1$, i.e. equally large selection on unobservables as on observables. The filled and hollow shapes indicate the identified set. Table C2 reports coefficients along with means of the outcome variables, and the δ required for zero coefficient, as well as the residual time frame (night, 8pm-8am). Source: German Time-Use Survey

Figure 4: Full-day vs half-day care effects by time of day and education, wave 3 only (2012/13)



(b) Other activities



Notes: Center hours are from 8am-4pm on weekdays, evening is from 4pm to 8pm on weekdays. Evening and weekend pools evening hours and weekend days (8am to 8pm). Circles denotes lower education households, and squares denotes higher education. Education level of the household is based on whether the mother in the household (or the single parent) has a secondary school degree from the higher track (*Abitur*). Each estimate is based on a separate regression of the outcome summed for a given time of day on an indicator for usage of full-day center-based care (> 30 vs 10-30 hours per week) and controls (see notes to Table 2 for details) using only the 2012/13 wave of the time-use survey, which contains information on hours of center-based care used. The hollow shapes and whiskers indicate the conditional coefficient ($\delta = 0$) and the 90% confidence intervals. The filled shapes indicate estimates under the assumption of $\delta = 1$, i.e. equally large selection on unobservables as on observables. The filled and hollow shapes indicate the identified set. Table C4 reports coefficients along with means of the outcome variables, and the δ required for zero coefficient, as well as the residual time frame (night, 8pm-8am). Source: German Time-Use Survey

Tables

Table 1: Time-use survey participant characteristics by enrollment in center-based care

Variable	(1)	(2)	(3)
	Center-based care		Difference
	No	Yes	
<i>Parent characteristics</i>			
Female	0.54 (0.02)	0.55 (0.01)	0.010 (0.025)
Age	33.22 (0.25)	36.25 (0.21)	3.035*** (0.325)
Higher educated	0.36 (0.02)	0.42 (0.01)	0.052** (0.024)
Married	0.82 (0.02)	0.79 (0.01)	-0.030 (0.020)
Single parent	0.08 (0.01)	0.10 (0.01)	0.016 (0.014)
Economically active	0.57 (0.02)	0.66 (0.01)	0.089*** (0.024)
Economically part-active	0.10 (0.01)	0.15 (0.01)	0.054*** (0.016)
East Germany	0.12 (0.01)	0.35 (0.01)	0.229*** (0.019)
<i>Child characteristics</i>			
Girl	0.49 (0.02)	0.52 (0.01)	0.023 (0.025)
Age in years	1.30 (0.05)	3.62 (0.04)	2.315*** (0.061)
Person-day observations	1529	2766	4295
Person observations	640	1145	1785

Pooled time-use surveys for 1991/92, 2001/02 and 2012/13. Robust standard errors in parentheses.*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: German Time-Use Survey

Table 2: Effects of center-based care on parenting activities

	Households with lower maternal education			Households with higher maternal education		
	All parents (1)	Mothers only (2)	Fathers only (3)	All parents (4)	Mothers only (5)	Fathers only (6)
<i>Outcome: Time with child (minutes per day)</i>						
Unconditional	-83.4*** (12.7)	-134*** (15.9)	-24.8 (16.4)	-34.1** (14.8)	-70.5*** (17.5)	8.91 (20.9)
Conditional	-74.5*** (11.6)	-110*** (16.5)	-32.1** (15.4)	-35.5*** (13)	-62.9*** (17.4)	-2.43 (19)
Mean	352	434	247	376	455	277
Identified set	[-74.5, -70.8]†	[-110, -89.6]†	[-34.8, -32.1]†	[-36, -35.5]†	[-62.9, -57]†	[-7.2, -2.43]†
δ for 0 coefficient	9.73	3.13	-26.7	27.4	5.16	-5.5
<i>Outcome: Parenting activities (minutes per day)</i>						
Unconditional	-8.23* (4.54)	-15.9** (6.25)	1.38 (5.1)	-8.8 (6.31)	-14.5* (8.32)	-2.49 (8.05)
Conditional	-5.88 (4.35)	-12.2* (6.45)	3.25 (5.18)	-10.3* (6.23)	-13 (8.92)	-7.81 (8.42)
Mean	94.5	128	52	111	143	70.7
Identified set	[-5.88, -4.31]†	[-12.2, 3.38]†	[3.25, 4.27]†	[-11.4, -10.3]†	[-13, -4.32]†	[-12.5, -7.81]†
δ for 0 coefficient	3.13	.841	-4.31	-60.8	1.23	-2.15
<i>Outcome: Parenting activities share</i>						
Unconditional	.0605*** (.0153)	.0804*** (.0216)	.0344* (.0197)	.00293 (.0242)	.0377** (.017)	-.0406 (.0496)
Conditional	.0513*** (.0151)	.0557*** (.0197)	.0468** (.0222)	-.00642 (.0275)	.0283 (.0186)	-.049 (.0559)
Mean	0.297	0.327	0.259	0.317	0.339	0.290
Identified set	[0.044, 0.051]†	[0.037, 0.056]†	[0.047, 0.058]†	[-0.013, -0.006]†	[0.021, 0.028]†	[-0.054, -0.049]†
δ for 0 coefficient	4.35	2.45	-7.41	-1.19	2.86	-34.9
Observations	2378	1338	1040	1917	1068	849

Notes: Table shows coefficients from OLS regressions of the outcome variables on an indicator variable for usage of center-based care. Unconditional coefficients are from a regression that includes only indicators for child age in years. The conditional coefficients are from regressions that include the child age dummies, and additionally child gender, parent age, parent age squared, parent gender, parental education indicators for secondary school track (upper, middle, or lower) and for university degree, marital status, single parent status, number of kids in household, a weekday indicator, and wave \times region indicators. Households with higher maternal education are where the mother in the household (or single parent) was in the upper secondary school track (required to enroll in university) and those with lower educated mothers are where the mother took the lower or middle track. The identified set shows coefficients obtained using the method developed by Oster (2019), where $R_{max}^2 = \min \{1.3 \times \tilde{R}^2, 1\}$ assuming selection on unobservables is between zero ($\delta = 0$) and a level equal to selection on observables ($\delta = 1$). † denotes that the identified set excludes zero. The last row for each outcome variable shows how large the relative selection on unobservables must be to obtain a coefficient of 0. Appendix table C1 shows the identified set for $R_{max}^2 = \min \{2.2 \times \tilde{R}^2, 1\}$. Robust standard errors reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Source: German Time-Use Survey

Table 3: The effect of full-day care on parenting and non-parenting activities - pairfam

	Households with lower maternal education			Households with higher maternal education		
	All parents (1)	Mothers (2)	Fathers (3)	All parents (4)	Mothers (5)	Fathers (6)
<i>Panel A: Parenting activities</i>						
Reading books or telling stories (daily)	-0.050*** (0.019)	-0.040* (0.023)	-0.073** (0.031)	0.001 (0.015)	0.005 (0.016)	-0.011 (0.026)
Singing or playing instruments (daily)	-0.004 (0.017)	0.019 (0.024)	-0.035 (0.022)	-0.016 (0.017)	-0.013 (0.024)	-0.023 (0.021)
Painting, building or drawing (daily)	-0.018 (0.017)	-0.029 (0.024)	0.003 (0.023)	-0.043*** (0.016)	-0.082*** (0.023)	0.003 (0.022)
Playing games together (daily)	-0.095*** (0.019)	-0.082*** (0.024)	-0.116*** (0.030)	-0.055*** (0.017)	-0.121*** (0.023)	0.021 (0.026)
Outdoor activities (daily)	-0.069*** (0.019)	-0.093*** (0.024)	-0.026 (0.029)	-0.054*** (0.017)	-0.088*** (0.024)	-0.012 (0.025)
Gymnastics, sports (daily)	-0.011 (0.019)	0.004 (0.025)	-0.029 (0.031)	-0.009 (0.018)	0.008 (0.024)	-0.035 (0.027)
Watching television or videos (daily)	-0.030 (0.020)	-0.043* (0.025)	-0.010 (0.032)	0.009 (0.019)	-0.001 (0.025)	0.024 (0.027)
<i>Panel B: Non-parenting activities and other outcomes</i>						
Paid work (at least 10 h/w)	0.115*** (0.016)	0.170*** (0.024)	0.027 (0.017)	0.105*** (0.014)	0.185*** (0.023)	0.000 (0.013)
Weekly hours in paid work	3.821*** (0.582)	6.123*** (0.754)	0.451 (0.914)	4.384*** (0.547)	8.232*** (0.752)	-0.244 (0.786)
Personal monthly net income	164.487*** (33.305)	261.447*** (37.959)	24.083 (58.274)	227.728*** (60.269)	419.873*** (51.238)	48.345 (126.902)
Too little time with child (0/1)	0.066*** (0.024)	0.092*** (0.029)	0.026 (0.042)	0.082*** (0.022)	0.186*** (0.028)	-0.050 (0.033)
Feeling stressed (1-5)	0.007 (0.047)	0.057 (0.060)	-0.088 (0.080)	0.145*** (0.041)	0.264*** (0.052)	-0.005 (0.065)
Hours of sleep (parent)	-0.008 (0.047)	-0.002 (0.061)	-0.041 (0.075)	0.001 (0.035)	-0.049 (0.050)	0.049 (0.050)
Hours of sleep (child)	-0.174*** (0.051)	-0.193*** (0.067)	-0.131* (0.078)	-0.129*** (0.041)	-0.153*** (0.054)	-0.110* (0.064)
Child is happy and content (1-5)	-0.071** (0.028)	-0.094** (0.037)	-0.032 (0.043)	0.041* (0.023)	0.018 (0.031)	0.064* (0.034)
Child is irritable and cries often (1-5)	-0.032 (0.044)	-0.035 (0.059)	-0.026 (0.067)	-0.033 (0.039)	-0.005 (0.052)	-0.074 (0.058)
Observations	2864	1764	1100	3137	1725	1412

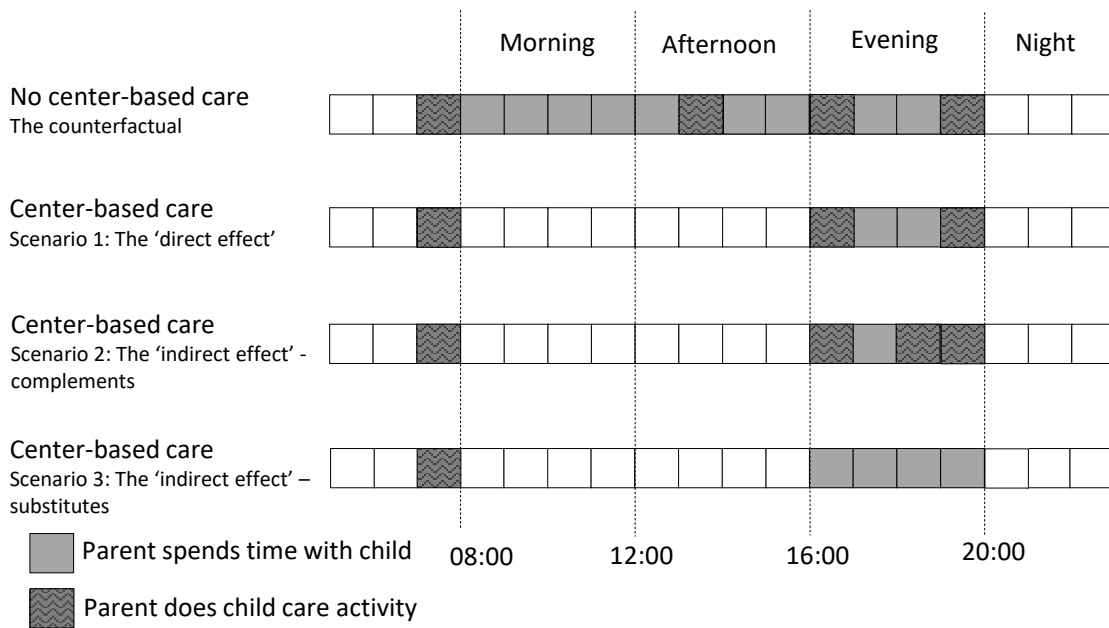
Notes: Table shows conditional coefficients from OLS regressions of the outcome variables on an indicator variable for full-day care (defined as attending center-based care in the morning *and* afternoon). Additional controls; dummies for child age, number of children in family, parent and child gender, age of parent, indicator for migration status, single parent indicator, education dummies. See Appendix Tables C5 and C6 for unconditional coefficients and Oster-bounds. Appendix Table C7 shows coefficients for an alternative full-day assignment (by hours of usage). Source: pairfam survey 2013-2019.

APPENDIX

A Stylized examples of adjustment mechanisms

Figure A1 presents some stylized examples to illustrate various adjustment effects discussed in section 3. The direct effect is illustrated by comparing the ‘no center-based care’ timeline (i.e. the counterfactual) to the second timeline (scenario 1). In the ‘no center-based care’ scenario, the parent spends 13 hours with the child, and four of these are spent on parenting activities throughout the day. As a result, parenting activities in the home environment occur over the day with a share of $4/13 = 0.31$. In scenario 1, the child attends center-based care from 08:00 until 16:00. As a result the child is no longer present with the parent during these hours.¹ The direct effect is a decrease in parenting activities in absolute terms of 1 hour. In relative terms, there is an increase in the share of parenting activities from 0.31 to $3/5 = 0.6$ equaling an increase of 0.29. The increase comes about because center-based care occurs during a time of day when parenting activities are less-concentrated in the counterfactual.

Figure A1: Adjustment of parenting activities with use of center-based care



Notes: Figure illustrates adjustments of time with the child and of parenting activities when center-based care is being used under different scenarios. The upper line shows time use when no center-based care is being used, the bottom three lines show different scenarios when the child is in center-based care. See text for additional details.

The second mechanism is the indirect effect. If center-based care is a complement for parenting activities (scenario 2), it results in an increase of parenting activities in the

¹In this simplified framework, we assume a direct relationship between usage of center-based care and time spent with the child. As discussed though, in reality the relationship may be less strong, e.g. in cases where center-based care displaces informal care.

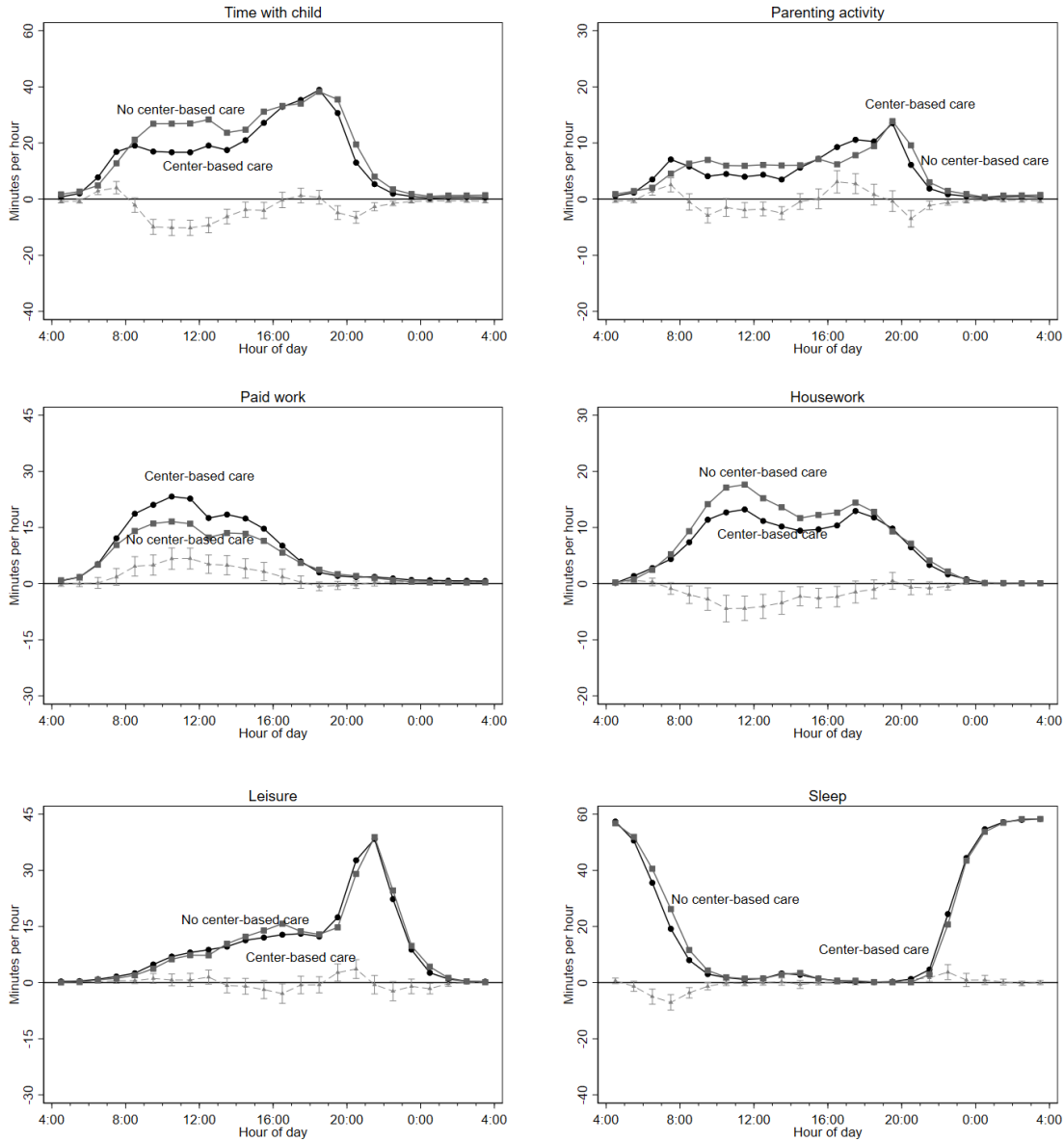
evening period by 1 hour in absolute terms. This corresponds to a positive effect in relative terms, too. Overall, in scenario 2 the absolute effect is zero since the reduction by 1 hour of parenting activities in afternoon and the increase by 1 hour of parenting activities in the evening cancel each other out. However, the overall relative effect is positive with the share of parenting activities increasing from 0.31 to 0.8 (since both direct and indirect effects are positive in relative terms). Scenario 3 shows the indirect effect in the substitute case, where there is a reduction by 2 hours in the evening. The overall absolute effect then is a reduction of parenting activities by 3 hours. Furthermore, the relative effect is also negative with the share of parenting activities decreasing from 0.31 to 0.2. Thus, the large negative indirect effect in relative terms outweighs the positive direct effect in relative terms.

Another aspect not covered by the examples is that center-based care may affect the *type of parenting activities*: Parents might change the share of specific types of parenting activities that are most greatly associated with child development (e.g. reading to the child, see Kalb and van Ours, 2014; Price and Kalil, 2018) This change could work in ways similar to the previous two effects. The usage of center-based care may displace parenting activities of a certain type from one period of the day to another (e.g. if reading tends to be done before sleep rather than during the day). Likewise, usage may result in positive or negative indirect effects on particular activities.

B Data

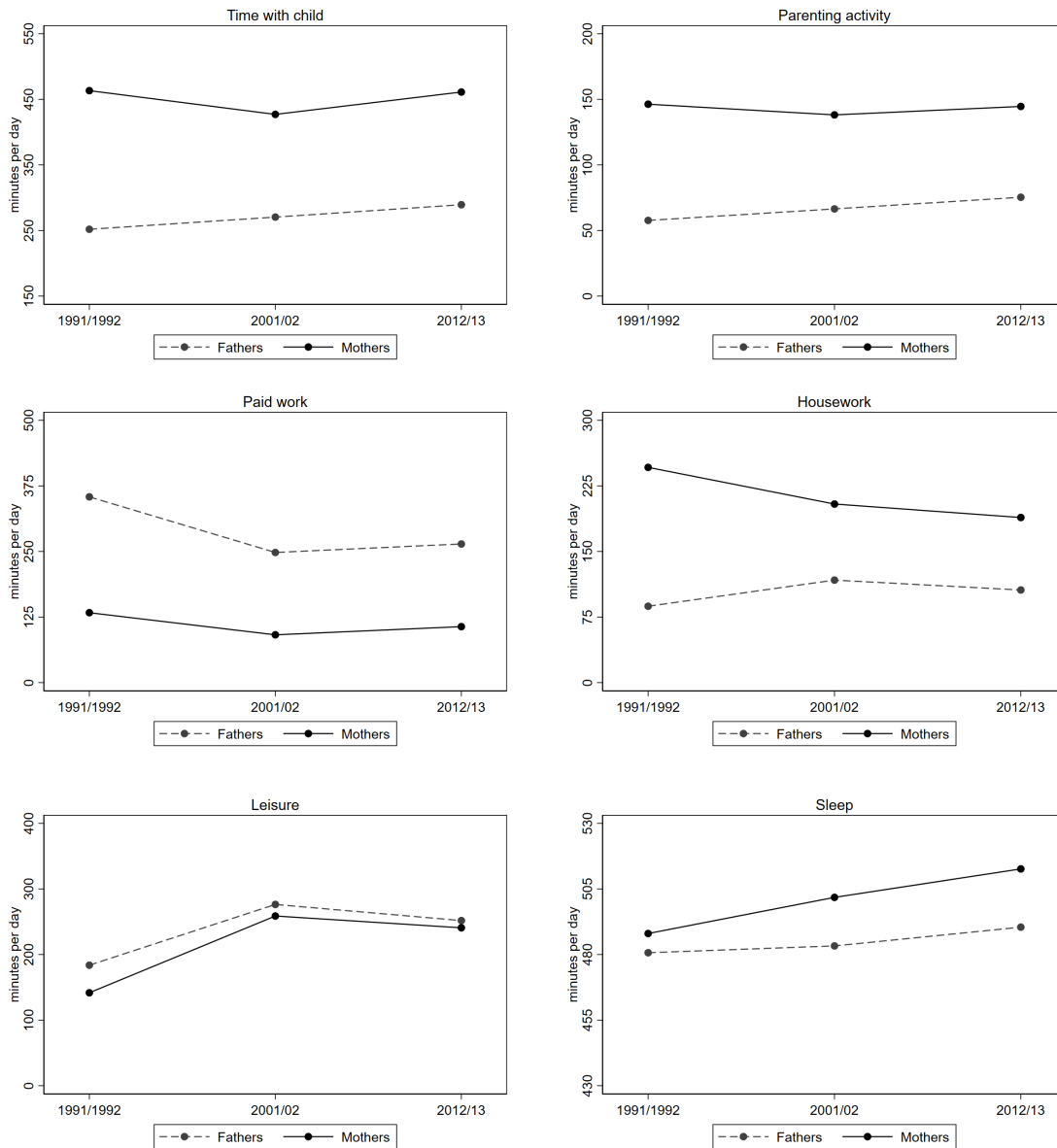
B.1 Additional descriptives for time-use data and pairfam

Figure B1: Parents' activities by usage of center-based care



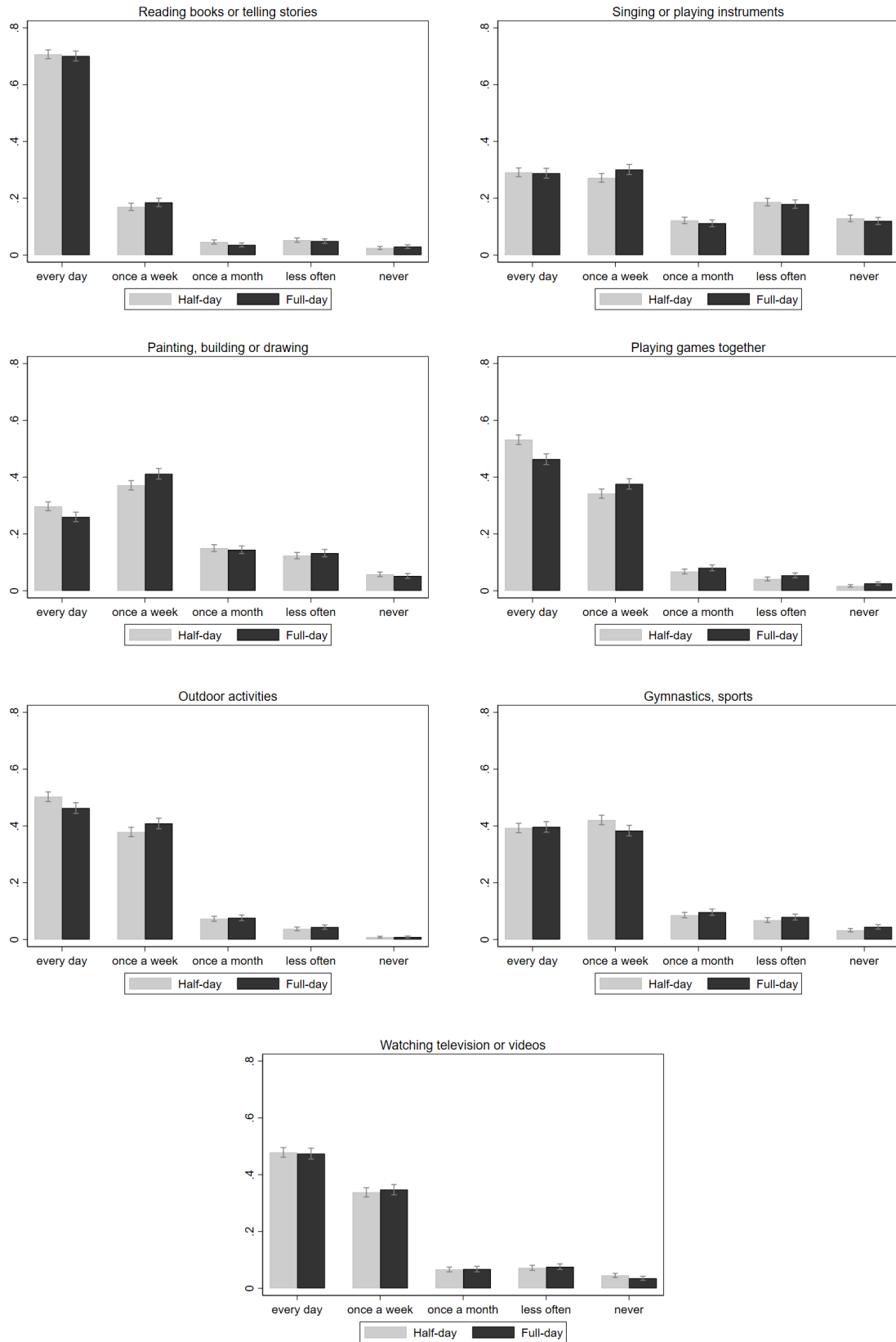
Notes: Black circles denotes parents with a child in center-based care, gray squares those without. Differences and averages are estimated in weighted regressions with indicators for child age and evaluated at mean values. Whiskers indicate 95% confidence intervals. Data consists of time slots in ten minute intervals (five in the first survey wave) which then are aggregated by hour of day. Sample includes weekdays (68%) and weekend days (32%), pools mothers and fathers and consists of all three waves of the time-use survey (1991/02, 2001/02 and 2012/13). Source: German Time-Use Survey

Figure B2: Average time use for mothers and fathers by survey wave



Notes: Coefficients are obtained by regressing activities on an indicator for mothers (vs. fathers) with child-age indicators and then evaluating means at average values (regressions are weighted). Sample consists of weekdays and weekend days. Source: German Time-Use Survey

Figure B3: Shared activities by half- or full-day usage of center-based care - pairfam



Notes: Figure shows the frequency of activities of anchors with their children in the previous three months. Whiskers show 95% confidence intervals. Source: pairfam, 2013-2019.

Table B1: Characteristics of pairfam participants

Variable	(1)	(2)	(3)
	Amount of center-based care		Difference
	Half-day	Full-day	
<i>Parental characteristics</i>			
Female	0.58	0.58	-0.005 (0.013)
Age	35.72	36.15	0.422*** (0.135)
Migration background	0.22	0.19	-0.037*** (0.010)
Higher educated	0.46	0.53	0.076*** (0.013)
Married	0.81	0.70	-0.106*** (0.011)
Paid work (at least 10 h/w)	0.71	0.83	0.117*** (0.011)
Weekly hours in paid work	25.66	30.81	5.151*** (0.477)
Personal net income	1426.15	1602.27	176.113*** (40.560)
Household net income	3538.35	3638.63	100.281* (59.046)
<i>Child characteristics</i>			
Girl	0.49	0.50	0.013 (0.013)
Age in years	4.52	4.57	0.052** (0.022)
Siblings	1.43	1.28	-0.153*** (0.025)
Observations	3345	2660	6005

Notes: Pooled over pairfam 2013-2019. Full-day child care indicates usage of center-based care in the morning *and* afternoon. Half-day care morning *or* afternoon. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: pairfam, 2013-2019

B.2 Activities categories in time-use data

Table B2: Overview of activities in time-use data, 2012/13 wave

Broad activity (1-digit)	German title (original)	# of 3-digit activities	Examples
Personal care	"Persönlicher Bereich / Physiologische Regeneration"	5	Sleep, eating and drinking, washing and dressing, ...
Paid work	"Erwerbstätigkeit"	9	Main work, secondary work, On-the job training, ...
Qualifications / Education	"Qualifikation / Bildung"	29	German lessons, higher education, training outside of work hours, ...
Household and family care	"Haushaltsführung und Betreuung der Familie"	43	Preparing meals, shopping, small repairs, ...
Voluntary work	"Ehrenamtliche Tätigkeit / Freiwilligenarbeit / Unterstützung für andere Haushalte / Teilnahme an Versammlungen"	5	Voluntary work, supporting other households, political events, ...
Social life and entertainment	"Soziales Leben und Unterhaltung"	14	Talking (with friends), cinema, relaxation, ...
Sport, hobbies and games	"Sport / Hobbys / Spiele"	20	Going for a walk, hunting / fishing, computer games, ...
Media usage	"Mediennutzung"	13	Reading newspaper, watching TV, communication with computer or smartphone, ...
Travel time	"Zweckbestimmte Wegezeiten und Hilfscodes"	27	Travel time to main work, travel time to school, travel time to visit friends, ...

Notes: Table summarizes the broad (1-digit) activities that are reported in the time-use data set. The English-language activity labels are our own translation from the tables available with the time-use survey data for 2012/2013. Full tables for each wave (in German) can be accessed at website for the research data center of the German Federal Statistical Office:

<https://www.forschungsdatenzentrum.de/de/haushalte/zve>

Table B3: List of detailed parenting activities in time-use data, 2012/13 wave

Code	Activity	German (original)
<i>2-digit category</i>		
47	Child care	"Kinderbetreuung im Haushalt"
<i>3-digit category</i>		
471	Primary care, hygiene and supervision	"Körperpflege und Beaufsichtigung"
472	Assisting homework / giving instructions to child	"Hausaufgabenbetreuung/Anleitungen geben"
473	Playing and doing sports with child	"Spielen und Sport mit Kindern"
474	Talking with child	"Gespräche mit Kindern im Haushalt"
475	Accompanying child / realising appointments with child	"Kind begleiten/Termine mit dem Kind wahrnehmen"
476	Reading to child / telling stories	"Kindern vorlesen/Geschichten erzählen"
479	Other activities with child	"Sonstige Aktivitäten im Bereich Kinderbetreuung"

Notes: Table reports the detailed (3-digit) parenting activities reported in the time-use data set, 2012/13 wave. The English-language activity labels are our own translation from the tables available with the time-use survey data for 2012/2013. Full tables for each wave (in German) can be accessed at website for the research data center of the German Federal Statistical Office:
<https://www.forschungsdatenzentrum.de/de/haushalte/zve>

B.3 Data on informal care

Table B4: Weekly hours in care - SOEP

Variable	Obs	Mean	Std. Dev.	P25	P50	P75
<i>All care types</i>	14311	21.447	20.145	1	20	37
<i>Informal care</i>	14311	5.055	9.433	0	2	6
>0 hours (0/1)	14311	.554	.497	0	1	1
>20 hours (0/1)	14311	.05	.217	0	0	0
>30 hours (0/1)	14311	.02	.141	0	0	0
Family	14311	4.622	8.943	0	1	6
Other informal	14311	.433	3.114	0	0	0
<i>Formal care</i>	14311	16.392	17.28	0	15	30
>0 hours (0/1)	14311	.52	.5	0	1	1
>20 hours (0/1)	14311	.416	.493	0	0	1
>30 hours (0/1)	14311	.243	.429	0	0	0
Center-based care	14311	15.614	16.846	0	0	30
Center-based care (conditional)	7218	31.325	8.784	25	30	40
<i>Age of child (in months)</i>	14311	33.588	23.072	12	31	63

Notes: Sample consists of children aged 0-72 months. Averages are calculated using survey weights. All care types include all forms of care indicated besides care provided by the respondent or the partner. Family care consists of care by the partner (if not living in the household), grandparents, older siblings and other relatives. Other informal care arrangements are nannies or a residual *other* category. Formal care reflects hours spent at either center-based care (95.1%) or with qualified child-minders (4.9%). Sample covers survey years 2010-2018. Data from the German Socio-Economic Panel (SOEP v35), which is a long-running household survey containing information on about 15,000 households per year (Goebel et al., 2019).

Table B5: Usage of formal and informal care - pairfam

	Below 3		Above 3		Below 3		Above 3		All
	Center-based care				Full-day care				
	No	Yes	No	Yes	No	Yes	No	Yes	
Weekly hours at center-based care	0.00 (0.00)	28.56 (12.06)	0.00 (0.00)	28.80 (11.01)	23.60 (11.27)	33.71 (10.62)	24.93 (9.76)	33.61 (10.57)	21.26 (15.91)
Family care in morning	0.18 (0.39)	0.03 (0.18)	0.14 (0.35)	0.03 (0.16)	0.05 (0.21)	0.02 (0.15)	0.03 (0.16)	0.03 (0.16)	0.07 (0.25)
Family care in afternoon	0.23 (0.42)	0.25 (0.43)	0.21 (0.41)	0.28 (0.45)	0.28 (0.45)	0.22 (0.42)	0.31 (0.46)	0.24 (0.43)	0.26 (0.44)
Family care - any time	0.25 (0.44)	0.26 (0.44)	0.24 (0.43)	0.28 (0.45)	0.29 (0.45)	0.22 (0.42)	0.31 (0.46)	0.24 (0.43)	0.27 (0.44)
Other informal care in morning	0.02 (0.12)	0.00 (0.05)	0.03 (0.16)	0.00 (0.05)	0.00 (0.05)	0.00 (0.06)	0.00 (0.05)	0.00 (0.04)	0.01 (0.08)
Other informal care in afternoon	0.02 (0.14)	0.03 (0.17)	0.04 (0.20)	0.04 (0.20)	0.03 (0.18)	0.03 (0.16)	0.04 (0.20)	0.04 (0.19)	0.03 (0.18)
Other informal care - any time	0.02 (0.14)	0.03 (0.17)	0.04 (0.20)	0.04 (0.20)	0.03 (0.18)	0.03 (0.16)	0.04 (0.20)	0.04 (0.19)	0.03 (0.18)
Observations	2560	1871	226	5991	963	908	3336	2655	10648

Notes: Sample consists of children aged 0-72 months. Columns are split by age of the child (0-2 vs. 3-5 years) and by usage of center-based care. Full-day care is defined as using center-based care in the morning and afternoon in contrast to only one of these. Family care includes grandparents, siblings and other relatives. Other informal care arrangements consist of friends, a nanny in-house, and other non-relatives. Source: pairfam, 2013-2019.

B.4 Center-based care quality

This appendix section examines the educational environment children are exposed to at center-based care.² We use two data sets for this; first, the National Educational Panel Study *NEPS*, in which the Starting Cohort Kindergarten (SC2) contains interviews with educators and heads of child care centers (Blossfeld and von Maurice, 2011). This allows for looking at the regularity of various activities performed at the institutions. As a second data source we use the data set *Educational Processes, Competence Development and Selection Decisions in Preschool and School Age (BiKS-3-10)*, which started in two German states (Hesse and Bavaria) in 2005. The starting sample consisted of 550 children from 97 child care centers (Weinert et al., 2013). Educators were asked about the children’s development, regularity, and duration of extracurricular activities as well as the broader institutional environment. Parents were further asked detailed questions about their children and their assessment of the child care centers.

In Panel A of Table B6 the frequency of regular activities are shown. The activities listed are all arguably enhancing cognitive development (e.g. books, puzzles, number games, musical activities) or motor skills (e.g. tinkering, sports). Although no information on the minutes per activity are included in the data, it is evident that the educational content is relatively high, as many activities are being performed daily or even several times per day. Panel B displays the frequency of extracurricular activities and — conditional on offerings — the average length of these. Most institutions offer extra activities, usually once or twice a week. Although these findings are not nationally representative, as the BiKS-3-10 data stems from two wealthier West German states, it suggests that children are not merely being supervised at center-based care but that they are often exposed to an at least partly enriching environment.

²There are some obvious caveats to this; we do not know how often and how long children take part in activities if they are performed at the group level and they will less frequently experience one-to-one interactions (Clarke-Stewart et al., 1994). Many activities can also be less beneficial for children if they are conducted in groups rather than in one-on-one interactions (thus perhaps requiring more exposure time at center-based care compared to at home).

Table B6: Activities in center-based care - NEPS and BiKS

	(1)	(2)	(3)	(4)
<i>Panel A: NEPS SC2</i>				
Frequency of regular activities (share)	Several times per day	Daily	Several times per week	Weekly
Books / letter games	0.445	0.086	0.102	0.009
Puzzles	0.515	0.065	0.067	0.003
Number games	0.408	0.089	0.127	0.015
Building things / tinkering	0.581	0.046	0.027	0.001
Musical activities	0.195	0.241	0.173	0.039
Sports	0.203	0.160	0.202	0.082
Experiencing nature	0.091	0.134	0.183	0.071
Observations	2775	2775	2775	2775
<i>Panel B: BiKS-3-10</i>				
Extra curriculum activities	Offered (share)	Weekly frequency	Minutes per offering	Minutes per week
Any activity	0.919			
Sport	0.760	1.205	29.338	32.891
Foreign languages	0.349	1.377	11.446	9.422
Craft activities	0.327	1.688	11.774	17.008
Nature studies	0.524	1.015	36.868	24.610
School preparation	0.837	2.018	60.583	79.240
Musical activities	0.645	1.705	16.100	19.800
Observations	172	172	172	172
<i>Panel C: BiKS-3-10</i>				
Parental responses to center-based care attendance				
Center-based care attendance enriched relationship with child	No	Yes		
	0.297	0.703		
Have sought advice for child rearing by care center staff	Never	Once or twice	Several times	
	0.334	0.417	0.248	
Desire to exchange information about child	Unwilling	Rather high	High	
	0.025	0.139	0.836	
Observations		438	438	438

Notes: Panels A shows the frequency of regular group activities in child care centers. Activities are coded on a seven point scale from less than once a month to several times a day. Panel B shows extra curriculum activities offered at child care centers. Columns (2) and (3) in Panel B are conditional on offerings. Panel C show parental reactions to care center enrollment of their child. Source: NEPS SC2 and BiKS-3-10.

C Results

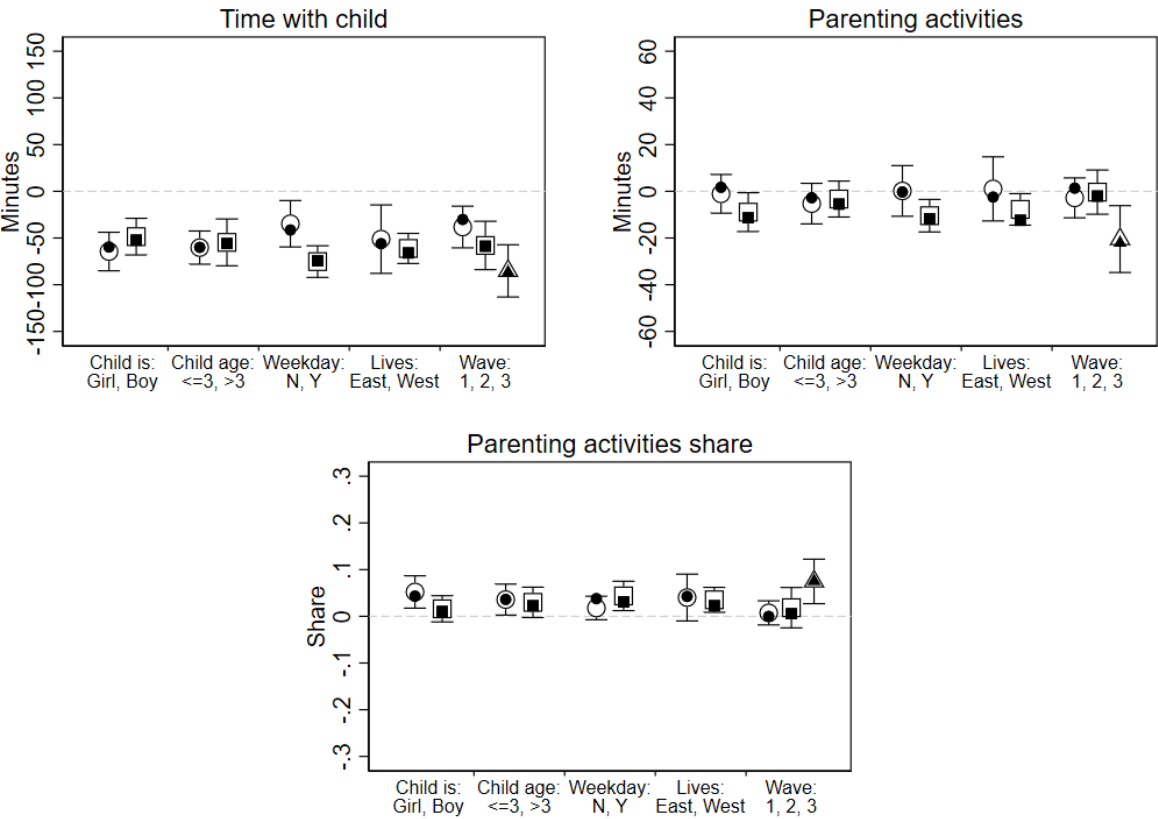
C.1 Heterogeneous effects

We explore further heterogeneities of the effect of center-based care on parenting activities. In Figure C1, we split the sample by sex of the child, (male/female), by child age (under/over three years), by day of the week (weekdays, weekend days) by location (East/West Germany), and by survey wave (1991/92, 2001/02, 2012/13). Some of these sample splits are motivated by the different center-based care environments for different age groups, different regions and over time (see section 2): in East Germany enrollment rates have always been substantially higher and, since the mid-2000s, the whole of Germany has seen a strong increase in enrollment for under threes and in full-day care for all age groups.

The heterogeneity analysis reveals that a larger part of the overall effects on the share of parenting activities come through girls. For both boys and girls, using center-based care reduces time spent with the child but for boys there is a nearly proportionate decrease in parenting activities whereas, for girls, parents continue to maintain the same absolute level of child care. In Figure C2, we investigate this further, finding that the effect for girls is driven by a large evening and weekend increase in parenting activities by mothers that compensates for the decrease during the day. For boys there is no evening and weekend increase by mothers (although interestingly there is a small but insignificant increase by fathers). This result may be explained by research from the U.S. that shows mothers spend more time on activities with daughters and fathers spend more time on activities with sons (Lundberg et al., 2007).

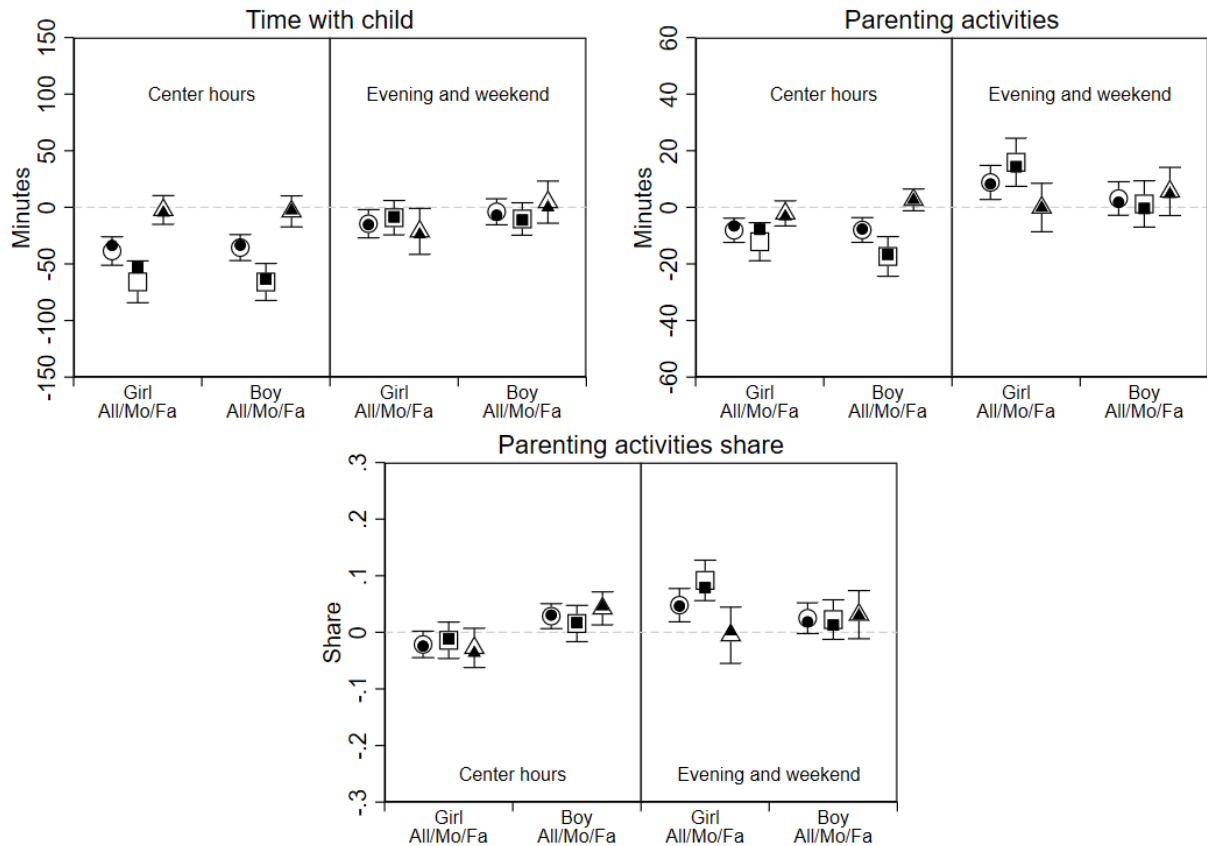
In Figure C1 there is little heterogeneity by child age, nor by region. For survey wave, we observed increased magnitude of effects for later waves, consistent with more child care center places and longer average hours of care in more recent years.

Figure C1: Heterogeneity in overall effects on parenting activities – mothers and fathers pooled



Notes: Plots show heterogeneities in effects of center-based care on parenting activities. Circles denotes the respective first, squares the second and triangles (if applicable) the third group. Estimates are based on separate sub-sample regressions of the outcome variable on a center-based care indicator and controls (see notes to Table 2 for details). Waves 1, 2, and 3 correspond to the time-use survey waves 1991/92, 2001/02, and 2012/13 respectively. The hollow shapes and whiskers indicate conditional coefficient ($\delta = 0$) and the 90% confidence intervals. The filled shapes indicate estimates under the assumption of $\delta = 1$, i.e. equally large selection on unobservables as on observables. The filled and hollow shapes indicate the identified set. Source: German Time-Use Survey

Figure C2: Effects of center-based care on parenting activities for boys and girls

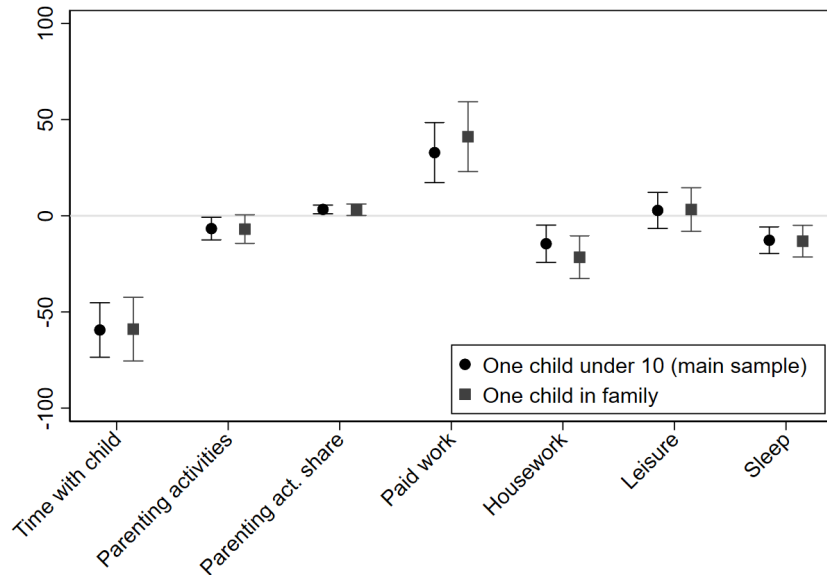


Notes: Plots show heterogeneities by gender of child in effects of center-based care on parenting activities. Circles denotes mothers and fathers pooled, squares denotes mothers and triangles fathers. Center hours are from 8am-4pm on weekdays, evening is from 4pm to 8pm on weekdays. Evening and weekend pools evening hours and weekend days (8am to 8pm). The plots show the conditional difference in outcome variables by center-based care usage. Each estimates is based on a separate regression of the outcome summed for a given time of day on an indicator for usage of center-based care and controls (see notes to Table 2 for details) using all three waves of the time-use survey (1991/02, 2001/02 and 2012/13). The hollow shapes and whiskers indicate the conditional coefficient ($\delta = 0$) and the 90% confidence intervals. The filled shapes indicate estimates under the assumption of $\delta = 1$, i.e. equally large selection on unobservables as on observables. The filled and hollow shapes indicate the identified set. Source: German Time-Use Survey

C.2 Test of sample restriction

In this section, we compare coefficients when different sample restrictions are imposed. Our main analysis sample with the time-use data is restricted to families with one child *under 10 years*. In Figure C3, we compare coefficients when we tighten the requirement and impose that only one child *of any age* is in the family (this reduces the observation number from 4,295 to 2,984). The reason for this is that although we know that the outcome *time with child* is constructed in the survey such that it only refers to children under 10, other parenting activities could still be conducted with older children (although most of them are arguably mostly performed with younger children and not with those of secondary school age). Coefficients in Figure C3 from both samples are remarkably similar and statistically indistinguishable.

Figure C3: Comparison of coefficients by sample restrictions - time-use data

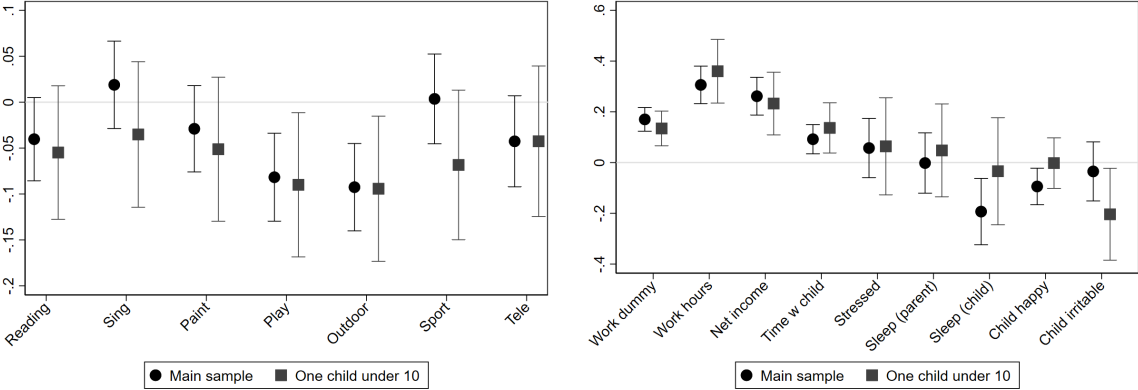


Notes: Figure shows coefficients and 95% confidence intervals for the main analysis sample (one child under 10 years) and for a tighter sample restriction of one child of all ages in families. Estimates refer to mothers and fathers pooled, and concern the whole day. Coefficients based on conditional specification with control variables as indicated in Table 2. Coefficients for *parenting activities share* are multiplied by 100 and indicated the effect in percent. Source: German Time-Use Survey

In Figure C4, we investigate to what degree the data driven sample restriction in the time-use data of one child under 10 years reduces the external validity of the findings, i.e. would the findings also hold for households with more children under 10? The household survey (pairfam) does not require the same sample restriction as the time-use data as questions are child-specific, but it contains the information needed to impose it. Thus we compare the coefficients shown in Table 3 obtained using the unrestricted sample (i.e. with potentially several children in this age group in one household) and apply the same restriction that we use in the time-use data. Figure C4 shows that, for parenting activities (left panel), coefficients are quite similar and all confidence intervals overlap. For non-

parenting activities and other outcomes (right panel) coefficients are again comparable. Overall this suggests that the sample restriction imposed don't severely threaten the generalizability of the findings.

Figure C4: Comparison of coefficients by sample restriction - pairfam



Notes: Figure shows coefficients and 95% confidence intervals for the unrestricted sample (*main sample*) and when applying the same sample restriction as in the time-use data (*one child under 10*). Estimates refer to mothers, i.e. the main sample estimates correspond to column (2) of Table 3. For presentation purposes coefficient and confidence intervals for working hours and net income are rescaled by a factor of 20 and 1000, respectively. $N = 6,005$ for the main sample and $N = 1,866$ for the under 10 sample. Source: pairfam, 2013-2019.

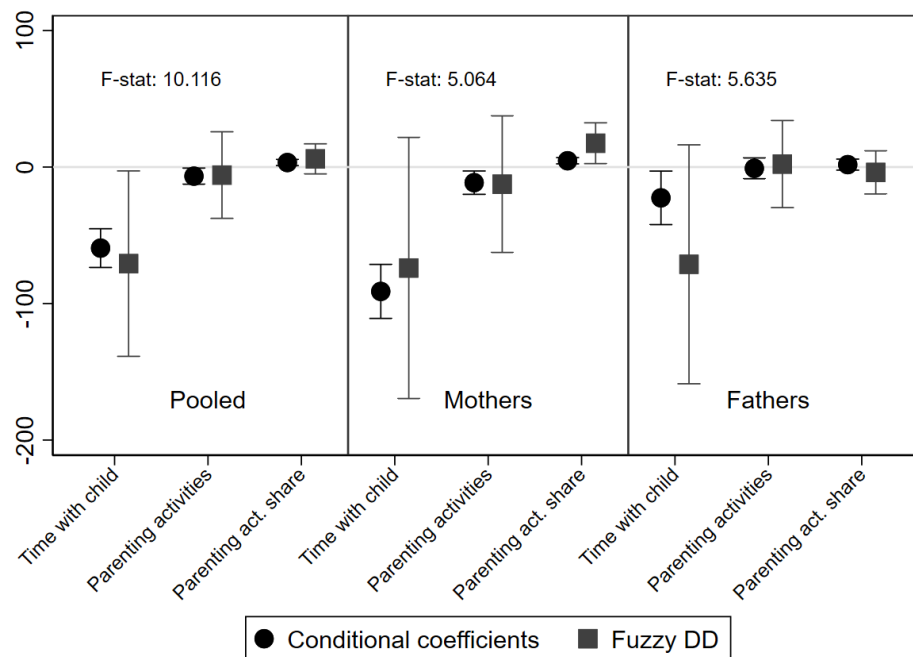
C.3 Fuzzy DD

In this section, we compare the conditional coefficients for parenting activities from the time-use data presented in the paper to estimates obtained from an instrumental variable approach. The main estimates are based on a rich set of covariates and coefficients were generally stable across unconditional and conditional models, requiring an exceptionally large role played by unobservables to be the driver of our results (Oster, 2019). As an additional validation of our estimates, we use a 2SLS approach that is a type of fuzzy difference-in-differences (de Chaisemartin and D’Haultfœuille, 2018), where we exploit differences in the timing of roll-out of center-based care by age group across regions. To do this, we instrument usage of center-based care with all interactions of wave \times region \times child-age that indicate roll-out groups, and, as seen in Figure 1 and Table 1, these provide a strong first stage. We furthermore include the full set of controls as well as wave \times region indicators in the regression to account for time and region-specific time-use patterns. This approach is comparable to Felfe and Lalive (2018), who analyze the effect of center-based care on child development.

Results are presented in Figure C5. For comparison we first plot (black circles) conditional coefficients for the full sample and separately for mothers and fathers with a specification as described in Table 2. Estimates obtained from the fuzzy DD are shown in gray squares. Point estimates are generally very close to those from the conditional coefficients (time with child of fathers as an exception), but estimates are far less precise yielding relatively large confidence intervals.³ Regardless, we see little evidence that our estimates are heavily biased due to selection on unobservables. As estimates obtained from the conditional model are far more precise, we use this as our main specification and provide bounds of the estimates throughout.

³For the pooled estimation the F-statistic suggests that the instrument just about reaches the commonly used thresholds (Stock and Yogo, 2005), separately for mothers and fathers however, the instrument is weak.

Figure C5: Comparison of coefficients by empirical model



Notes: Figure shows coefficients and 95% confidence intervals for two empirical models. Coefficients in black circles correspond to those shown in Table 2 but are pooled by household education. Fuzzy DD coefficients in gray squares are obtained by instrumenting usage of center-based care, see text in this section for details. For illustration, parenting activities share is multiplied by 100, thus showing the effect in percent. F-statistic is the Kleibergen-Paap F-statistic from the first-stage regression. Source: German Time-Use Survey

C.4 Further result tables

Table C1: Effects of center-based care on time spent on parenting activities —
 $R_{max}^2 = \min \left\{ 2.2 \times \tilde{R}^2, 1 \right\}$

	Households with lower maternal education			Households with higher maternal education		
	All parents (1)	Mothers only (2)	Fathers only (3)	All parents (4)	Mothers only (5)	Fathers only (6)
<i>Outcome: Time with child (minutes per day)</i>						
Unconditional	-83.4*** (12.7)	-134*** (15.9)	-24.8 (16.4)	-34.1** (14.8)	-70.5*** (17.5)	8.91 (20.9)
Conditional	-74.5*** (11.6)	-110*** (16.5)	-32.1** (15.4)	-35.5*** (13)	-62.9*** (17.4)	-2.43 (19)
Mean	352	434	247	376	455	277
Identified set	[-74.5, -57.3]†	[-110, -3.09]†	[-44.6, -32.1]†	[-38.3, -35.5]†	[-62.9, -29.4]†	[-25, -2.43]†
δ for 0 coefficient	2.65	1.02	-6.84	6.97	1.41	-1.38
<i>Outcome: Parenting activities (minutes per day)</i>						
Unconditional	-8.23* (4.54)	-15.9** (6.25)	1.38 (5.1)	-8.8 (6.31)	-14.5* (8.32)	-2.49 (8.05)
Conditional	-5.88 (4.35)	-12.2* (6.45)	3.25 (5.18)	-10.3* (6.23)	-13 (8.92)	-7.81 (8.42)
Mean	94.5	128	52	111	143	70.7
Identified set	[-5.88, 2.27]	[-12.2, 376]	[3.25, 8.35]†	[-16.4, -10.3]†	[-13, 1360]	[-34.4, -7.81]†
δ for 0 coefficient	.784	.213	-1.08	-15.3	.312	-5.46
<i>Outcome: Parenting activities share</i>						
Unconditional	.0605*** (.0153)	.0804*** (.0216)	.0344* (.0197)	.00293 (.0242)	.0377** (.017)	-.0406 (.0496)
Conditional	.0513*** (.0151)	.0557*** (.0197)	.0468** (.0222)	-.00642 (.0275)	.0283 (.0186)	-.049 (.0559)
Mean	0.297	0.327	0.259	0.317	0.339	0.290
Identified set	[0.011, 0.051]†	[-0.043, 0.056]	[0.047, 0.111]†	[-0.040, -0.006]†	[-0.016, 0.028]	[-0.075, -0.049]†
δ for 0 coefficient	1.16	.648	-2.03	-.299	.741	-9.17
Observations	2378	1338	1040	1917	1068	849

Notes: Table shows coefficients from OLS regressions of the outcome variables on an indicator variable for usage of center-based care. Unconditional coefficients are from a regression that includes only indicators for child age in years. The conditional coefficients are from regressions that include the child age dummies, and additionally child gender, parent age, parent age squared, parent gender, parental education indicators for secondary school track (upper, middle, or lower) and for university degree, marital status, single parent status, number of kids in household, a weekday indicator, and wave \times region indicators. Households with higher maternal education are those where the mother in the household (or single parent) was in the upper secondary school track (required to enroll in university) and those with lower educated mothers are where the mother took the lower or middle track. The identified set shows coefficients obtained using the method developed by Oster (2019), whereas $R_{max}^2 = \min \left\{ 2.2 \times \tilde{R}^2, 1 \right\}$ (in contrast to $R_{max}^2 = \min \left\{ 1.3 \times \tilde{R}^2, 1 \right\}$ in Table 2). The coefficients in the identified set are obtained under the assumption of no selection on unobservables ($\delta = 0$) and assuming that selection on unobservables is equally large to selection on observables ($\delta = 1$). † denotes that the identified set excludes zero. The last row for each outcome variable shows how large the relative selection on unobservables must be to obtain a coefficient of 0. Robust standard errors are in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Source: German Time-Use Survey

Table C2: Effects of center-based care on parents' time spent on parenting and non-parenting activities, by time of day and education

	Households with lower maternal education			Households with higher maternal education		
	Center hrs 8am-4pm (1)	Evening 4-8pm and weekend 8am-8pm (2)	Night 8pm-8am (3)	Center hrs 8am-4pm (4)	Evening 4-8pm and weekend 8am-8pm (5)	Night 8pm-8am (6)
<i>Outcome: Time with child (in minutes)</i>						
Unconditional	-56.1*** (7.85)	-11.9 (10.2)	-15.5*** (4.35)	-35.2*** (9.89)	3.32 (12)	-2.26 (4.19)
Conditional	-43*** (6.51)	-13.6* (6.97)	-17.8*** (4.32)	-31.7*** (8.15)	-2.5 (7.56)	-1.25 (4.33)
Mean	85.7	212	54.4	91.6	224	60.6
Identified set	[-43, -37.6]†	[-14.3, -13.6]†	[-18.8, -17.8]†	[-31.7, -30.3]†	[-4.65, -2.5]†	[-1.25, -7.42]†
δ for 0 coefficient	5.59	-235	-119	10.9	-1.28	2.27
<i>Outcome: Parenting activities (in minutes)</i>						
Unconditional	-8.34*** (2.35)	4.33 (3.33)	-4.22*** (1.39)	-13*** (3.6)	7.91* (4.59)	-3.71* (2.08)
Conditional	-6.12*** (2.21)	4.13 (3.15)	-3.88*** (1.44)	-12.5*** (3.28)	5.82 (4.39)	-3.62* (2.12)
Mean	22.5	50.5	21.5	25.6	60.4	25.1
Identified set	[-6.12, -5]†	[4.03, 4.13]†	[-3.88, -3.68]†	[-12.5, -12.3]†	[4.77, 5.82]†	[-3.62, -3.56]†
δ for 0 coefficient	4.3	13.1	8.66	12.6	4.35	10.3
<i>Outcome: Parenting activities share</i>						
Unconditional	.0184 (.013)	.0503*** (.0141)	.00174 (.0235)	-.0157 (.0162)	.0171 (.0182)	-.0224 (.0314)
Conditional	.021* (.0126)	.0397** (.0161)	.0163 (.0243)	-.015 (.0147)	.0133 (.019)	-.0253 (.034)
Mean	.125	.27	.365	.142	.289	.397
Identified set	[.021, .0221]†	[.0301, .0397]†	[.0163, .023]†	[-.015, -.0147]†	[.0111, .0133]†	[-.027, -.0253]†
δ for 0 coefficient	-280	3.08	-2.88	15.5	4.37	279
<i>Outcome: Paid work (in minutes)</i>						
Unconditional	42.5*** (11)	-2.64 (4.72)	14.2*** (4.96)	22.4* (12.1)	.162 (4.47)	-4.63 (3.78)
Conditional	29.3*** (8.89)	.0555 (4.89)	14.6*** (5.2)	20.5** (10.2)	.945 (4.6)	-2.98 (3.59)
Mean	147	33.5	33.2	137	30	25.8
Identified set	[24.4, 29.3]†	[.0555, 1.06]†	[14.6, 14.8]†	[19.7, 20.5]†	[.945, 1.28]†	[-2.98, -2.34]†
δ for 0 coefficient	4.86	-.0577	28.5	12.5	-3.52	3.98
<i>Outcome: Housework (in minutes)</i>						
Unconditional	-18.4*** (5.88)	2.35 (5.26)	-1.85 (1.85)	-23.7*** (5.99)	-8.78 (5.97)	-.812 (1.99)
Conditional	-11.1** (4.84)	-3.2 (4.6)	-2.27 (1.95)	-16.1*** (5.31)	-3.27 (5.12)	.0596 (2)
Mean	63.1	88.9	24.2	55.8	83.3	23.2
Identified set	[-11.1, -8.5]†	[-5.16, -3.2]†	[-2.42, -2.27]†	[-16.1, -13.3]†	[-3.27, -1.27]†	[.0596, .387]†
δ for 0 coefficient	3.72	-1.82	-40.7	4.65	1.59	-.192
<i>Outcome: Leisure (in minutes)</i>						
Unconditional	-9.04*** (3.02)	-4.45 (5.65)	-1.78 (4.21)	7.9** (3.58)	10.3 (6.26)	2.44 (4.23)
Conditional	-8.83*** (2.93)	-1.02 (4.74)	3.9 (4.36)	4.81 (3.23)	6.1 (5.49)	1.11 (4.32)
Mean	23.7	77.8	107	27.5	83.7	105
Identified set	[-8.83, -8.75]†	[-1.02, .202]	[3.9, 5.98]†	[3.64, 4.81]†	[4.59, 6.1]†	[.549, 1.11]†
δ for 0 coefficient	18.5	.841	-2.04	3.61	3.57	1.89
<i>Outcome: Sleep (in minutes)</i>						
Unconditional	.238 (2.4)	-1.4 (2.58)	-11.7** (5.47)	-3.45 (2.71)	-3.52 (2.29)	3.37 (5.35)
Conditional	.235 (2.6)	-.618 (2.28)	-16.5*** (5.62)	-3.12 (2.49)	-2.76 (2.14)	.888 (5.33)
Mean	10.486	15.749	463.957	9.442	13.931	465.605
Identified set	[0.233, 0.235]†	[-0.618, -0.336]†	[-18.303, -16.475]†	[-3.123, -2.990]†	[-2.757, -2.480]†	[-0.109, 0.888]
δ for 0 coefficient	18.8	2.09	-13.6	10.8	7.14	.896
Observations	2378	2378	2378	1917	1917	1917

Notes: Table shows coefficients from OLS regressions of the outcome variables on an indicator variable for center-based care usage. Figure 3 shows the conditional coefficients and the coefficient under the assumption of equally large selection on observables as on unobservables ($\delta = 1$). See Table 2 for other table notes and Section 4 for details on the empirical specification. Source: German Time-Use Survey

Table C3: Effects of center-based care on parents' time spent on specific parenting activities, by time of day and education

	Households with lower educated mothers			Households with higher educated mothers		
	Center hrs 8am-4pm (1)	Evening 4-8pm and weekend 8am-8pm (2)	Night 8pm-8am (3)	Center hrs 8am-4pm (4)	Evening 4-8pm and weekend 8am-8pm (5)	Night 8pm-8am (6)
<i>Outcome: Reading (in minutes)</i>						
Unconditional	.0331 (.087)	.461*** (.162)	-.131 (.151)	-.131 (.221)	-.149 (.255)	.26*** (.0935)
Conditional	.0955 (.11)	.544*** (.182)	-.137 (.161)	-.0869 (.221)	-.124 (.268)	.325*** (.122)
Mean	.0967	.442	.248	.198	.553	.308
Identified set	[.0955, .121]†	[.544, .577]†	[-.14, -.137]†	[-.0869, -.0645]†	[-.124, -.114]†	[-.325, .359]†
δ for 0 coefficient	-4.41	-62.7	36	3.29	7.89	-23.8
<i>Outcome: Playing (in minutes)</i>						
Unconditional	-1.46** (.736)	-.178 (1.4)	.292 (.194)	-2.27** (.963)	.184 (1.88)	.0223 (.495)
Conditional	-1.22* (.716)	1.25 (1.34)	.504** (.209)	-1.75* (.929)	2.82* (1.65)	.527 (.516)
Mean	1.83	5.79	.395	2.63	8.65	1.24
Identified set	[-1.22, -1.12]†	[1.25, 1.79]†	[.504, .6]†	[-1.75, -1.54]†	[2.82, 3.83]†	[-.527, .727]†
δ for 0 coefficient	7.94	-2.66	-6.27	5.96	-3.26	-3.05
<i>Outcome: Talking (in minutes)</i>						
Unconditional	-.323 (.2)	-.356** (.181)	-.0651 (.0835)	.0912* (.0496)	.0657 (.091)	-.0171 (.0777)
Conditional	-.328 (.233)	-.423** (.212)	-.184* (.109)	.316*** (.103)	.142 (.0945)	.0297 (.0856)
Mean	.181	.303	.214	.209	.323	.188
Identified set	[-.33, -.328]†	[-.45, -.423]†	[-.234, -.184]†	[.316, .412]†	[.142, .173]†	[.0297, .0501]†
δ for 0 coefficient	19.5	-53.6	-4.38	-3.47	-6.11	-1.64
<i>Outcome: Primary care (in minutes)</i>						
Unconditional	-.943 (.899)	.806 (1.34)	-1.17* (.693)	-4.56*** (1)	-2.34* (1.35)	-2.68*** (.968)
Conditional	-.344 (.957)	1.86 (1.25)	-.356 (.659)	-3.86*** (.972)	-.272 (1.18)	-1.07 (.851)
Mean	2.708	6.068	4.050	3.579	7.903	5.639
Identified set	[-0.344, -0.071]†	[1.863, 2.286]†	[-0.356, -0.043]†	[-3.858, -3.473]†	[-0.272, 0.663]	[-1.074, -0.293]†
δ for 0 coefficient	1.24	-5.71	1.13	5.97	.302	1.35
Observations	2378	2378	2378	1917	1917	1917

Notes: Table shows coefficients from OLS regressions of the outcome variables on an indicator variable for center-based care usage. See Table 2 for other table notes and Section 4 for details on the empirical specification. Source: German Time-Use Survey

Table C4: Effects of full-day vs. half-day center-based care on parenting and non-parenting activities using one wave (2012/13), by time of day and education

	Households with lower maternal education			Households with higher maternal education		
	Center hrs 8am-4pm (1)	Evening 4-8pm and weekend 8am-8pm (2)	Night 8pm-8am (3)	Center hrs 8am-4pm (4)	Evening 4-8pm and weekend 8am-8pm (5)	Night 8pm-8am (6)
<i>Outcome: Time with child (in minutes)</i>						
Unconditional	-12.7 (10.5)	35.9 (22.2)	19.3*** (6.22)	-46.9*** (10.9)	14.5 (17.2)	6.02 (5.41)
Conditional	-4.07 (10.2)	12.5 (14.5)	14.9** (6.2)	-47.4*** (9.37)	-3.07 (12.4)	10.8* (5.75)
Mean	61.5	205	49.4	74.6	214	56
Identified set	[-4.07, -.876] [†]	[3.88, 12.5] [†]	[12.2, 14.9] [†]	[-47.6, -47.4] [†]	[-9.39, -3.07] [†]	[10.8, 12.8] [†]
δ for 0 coefficient	1.26	1.43	3.73	15.4	-5.18	-5
<i>Outcome: Parenting activities (in minutes)</i>						
Unconditional	-5.63 (3.65)	.295 (6.91)	4.08 (3)	-12.9*** (3.7)	-3.93 (5.92)	-5.91** (2.52)
Conditional	-5.96* (3.51)	-.71 (7.05)	4.7 (2.98)	-10.2*** (3.17)	-7.63 (5.68)	-5.2** (2.49)
Mean	14	43.5	16.7	17.2	54.1	20.1
Identified set	[-6.09, -5.96] [†]	[-1.14, -.71] [†]	[4.7, 4.94] [†]	[-10.2, -8.85] [†]	[-9.76, -7.63] [†]	[-5.2, -4.68] [†]
δ for 0 coefficient	39.8	-1.87	-156	5.04	-4.79	5.04
<i>Outcome: Parenting activities share</i>						
Unconditional	-.017 (.0298)	-.0383 (.0343)	-.0481 (.0457)	-.00848 (.0295)	-.0143 (.0246)	-.0924** (.0386)
Conditional	-.0255 (.0325)	-.0107 (.0333)	-.0312 (.0448)	.0148 (.0334)	-.0177 (.0244)	-.102*** (.0389)
Mean	.109	.247	.33	.122	.269	.354
Identified set	[-.0288, -.0255] [†]	[-.0107, .00245] [†]	[-.0312, -.0246] [†]	[.0148, .0232] [†]	[-.0203, -.0177] [†]	[-.108, -.102] [†]
δ for 0 coefficient	-11.9	.821	4.04	-1.97	-19.7	51.7
<i>Outcome: Paid work (in minutes)</i>						
Unconditional	-4.06 (20.5)	13.2 (8.41)	-7.34 (7.59)	23.1 (16.9)	-3.1 (7.02)	2.95 (5.18)
Conditional	3.51 (15.8)	7.4 (8.33)	-5.1 (6.38)	34.9** (13.9)	1.9 (7.47)	3.36 (5.02)
Mean	169	35.1	36.8	153	33.1	27.6
Identified set	[3.51, 6.27] [†]	[4.97, 7.4] [†]	[-5.1, -3.88] [†]	[34.9, 39.2] [†]	[1.9, 4.07] [†]	[3.36, 3.51] [†]
δ for 0 coefficient	-1.39	2.7	3.47	-12.3	-9.46	15.84
<i>Outcome: Housework (in minutes)</i>						
Unconditional	-5.65 (10.1)	-7.27 (11.9)	5.06* (2.75)	-16.2** (6.96)	6.08 (8)	-8.71*** (3.33)
Conditional	3.17 (8.91)	-15.6 (10.2)	2.56 (3.03)	-13.1** (6.25)	5.52 (6.86)	-6.49** (3.12)
Mean	59.2	90.2	23.7	52.3	81.6	23.7
Identified set	[3.17, 6.44] [†]	[-18.7, -15.6] [†]	[1.22, 2.56] [†]	[-13.1, -11.9] [†]	[5.31, 5.52] [†]	[-6.49, -5.41] [†]
δ for 0 coefficient	-1.05	-6.39	1.79	7.11	12.3	3.91
<i>Outcome: Leisure (in minutes)</i>						
Unconditional	2.62 (6.34)	6.65 (11.8)	-13.9* (8.07)	-3.93 (6.37)	-.0425 (10.5)	1.47 (6.17)
Conditional	6.19 (5.31)	6.74 (9.75)	-12.5 (7.86)	-4.65 (5.63)	-1.62 (8.5)	2.01 (6.13)
Mean	20.4	76.9	109	26.9	84.4	107
Identified set	[6.19, 7.63] [†]	[6.74, 6.77] [†]	[-12.5, -11.8] [†]	[-4.93, -4.65] [†]	[-2.2, -1.62] [†]	[2.01, 2.28] [†]
δ for 0 coefficient	-5.32	27.4	8.74	-79.1	-3.32	-14.4
<i>Outcome: Sleep (in minutes)</i>						
Unconditional	-9.38** (4.38)	-.517 (5.53)	4.51 (10.5)	5.53* (2.84)	.22 (3.86)	-5.09 (7.84)
Conditional	-6.42 (3.95)	-1.19 (5.47)	4.02 (9.7)	4.8 (2.93)	-2.03 (3.31)	-10.6 (7.46)
Mean	8.716	15.233	460.872	8.624	13.418	464.117
Identified set	[-6.421, -5.109] [†]	[-1.451, -1.188] [†]	[3.734, 4.020] [†]	[4.488, 4.802] [†]	[-2.841, -2.029] [†]	[-13.463, -10.621] [†]
δ for 0 coefficient	3.79	-5.92	7.64	7.84	-2.9	-4.55
Observations	338	338	338	471	471	471

Notes: Table shows coefficients from OLS regressions of the outcome variables on an indicator variable for center-based care usage. Figure 4 shows the conditional coefficients and the coefficient under the assumption of equally large selection on observables as on unobservables ($\delta = 1$). See Table 2 for other table notes and Section 4 for details on the empirical specification. Source: German Time-Use Survey

Table C5: The effect of full-day care on parenting activities; pairfam - Oster bounds

	Households with lower maternal education			Households with higher maternal education		
	All parents (1)	Mothers (2)	Fathers (3)	All parents (4)	Mothers (5)	Fathers (6)
<i>Outcome: Reading books or telling stories (daily)</i>						
Unconditional	-0.049*** (0.019)	-0.047** (0.022)	-0.042 (0.031)	0.003 (0.015)	-0.003 (0.016)	0.001 (0.025)
Conditional	-0.0529*** (.0185)	-0.0457** (.0232)	-0.0735** (.0314)	-0.000586 (.0146)	.00389 (.0158)	-0.0124 (.0263)
Mean	.615	.718	.455	.773	.879	.645
Identified set	[-.0542, -.0529]†	[-.0457, -.0452]†	[-.085, -.0735]†	[-.00175, -.000586]†	[.00389, .00615]†	[-.0172, -.0124]†
δ for 0 coefficient	73	19.4	-8.15	-5.34	-1.89	-3.07
<i>Outcome: Musical activities (daily)</i>						
Unconditional	-0.006 (0.017)	0.018 (0.023)	-0.034 (0.021)	-0.012 (0.017)	-0.029 (0.024)	-0.002 (0.021)
Conditional	-0.00906 (.0173)	.0116 (.0244)	-.038* (.0216)	-.0176 (.0167)	-.0155 (.0246)	-.0248 (.0213)
Mean	.254	.326	.136	.32	.436	.18
Identified set	[-.0103, -.00906]†	[.00933, .0116]†	[-.0394, -.038]†	[-.0194, -.0176]†	[-.0155, -.0104]†	[-.0331, -.0248]†
δ for 0 coefficient	-10.7	4.42	61.5	-15	2.82	-3.2
<i>Outcome: Painting, building or drawing (daily)</i>						
Unconditional	-0.029* (0.017)	-0.040* (0.024)	-0.002 (0.023)	-0.043*** (0.016)	-0.107*** (0.023)	0.031 (0.021)
Conditional	-.0202 (.0171)	-.0329 (.024)	.000965 (.0232)	-.0438*** (.0162)	-.083*** (.0231)	.0037 (.0222)
Mean	.287	.367	.161	.274	.348	.184
Identified set	[-.0202, -.0172]†	[-.0329, -.0303]†	[.000965, .0021]†	[-.0442, -.0438]†	[-.083, -.0732]†	[-.0062, .0037]†
δ for 0 coefficient	5.54	8.43	-9.25	31.5	5.68	.383
<i>Outcome: Playing games together (daily)</i>						
Unconditional	-0.091*** (0.019)	-0.078*** (0.024)	-0.104*** (0.029)	-0.057*** (0.018)	-0.122*** (0.023)	0.014 (0.026)
Conditional	-.1*** (.0188)	-.0911*** (.0245)	-.12*** (.0299)	-.0578*** (.0177)	-.125*** (.0234)	.0189 (.0265)
Mean	.479	.553	.364	.516	.594	.422
Identified set	[-.104, -.1]†	[-.096, -.0911]†	[-.126, -.12]†	[-.0582, -.0578]†	[-.126, -.125]†	[.0189, .0207]†
δ for 0 coefficient	199	-60.4	-428	29.8	21.9	-18.6
<i>Outcome: Outdoor activities (daily)</i>						
Unconditional	-0.060*** (0.019)	-0.082*** (0.024)	-0.012 (0.028)	-0.022 (0.018)	-0.072*** (0.023)	0.026 (0.025)
Conditional	-0.0727*** (.0187)	-.1*** (.0244)	-.027 (.0293)	-.0562*** (.0173)	-.0903*** (.0236)	-.0138 (.0255)
Mean	.487	.606	.301	.484	.623	.316
Identified set	[-.0773, -.0727]†	[-.107, -.1]†	[-.0325, -.027]†	[-.0682, -.0562]†	[-.0974, -.0903]†	[-.0279, -.0138]†
δ for 0 coefficient	-35.2	-27.7	-6.19	-5.49	-21.2	-1.03
<i>Outcome: Gymnastics, sports (daily)</i>						
Unconditional	0.007 (0.019)	0.014 (0.024)	-0.007 (0.030)	0.005 (0.017)	0.010 (0.023)	0.001 (0.026)
Conditional	-0.0157 (.0195)	-.0034 (.025)	-.0338 (.0316)	-.00991 (.0178)	.00543 (.0239)	-.0357 (.0267)
Mean	.406	.399	.417	.386	.349	.431
Identified set	[-.0235, -.0157]†	[-.00966, -.0034]†	[-.0435, -.0338]†	[-.0151, -.00991]†	[.00377, .00543]†	[-.0486, -.0357]†
δ for 0 coefficient	-2.19	-5.73	-4.04	-2.1	3.01	-3.11
<i>Outcome: Watching television or videos (daily)</i>						
Unconditional	-0.019 (0.019)	-0.030 (0.024)	0.002 (0.031)	0.024 (0.018)	0.011 (0.024)	0.038 (0.026)
Conditional	-.0302 (.0197)	-.0442* (.0252)	-.0112 (.032)	.00941 (.0186)	-.00116 (.0254)	.0243 (.0274)
Mean	0.518	0.564	0.446	0.435	0.459	0.406
Identified set	[-0.034, -0.030]†	[-0.049, -0.044]†	[-0.016, -0.011]†	[0.004, 0.009]†	[-0.006, -0.001]†	[0.019, 0.024]†
δ for 0 coefficient	-11	-11.4	-2.75	1.75	-.28	3.98
Observations	2852	1757	1095	3114	1712	1402

Notes: Table shows coefficients from OLS regressions of the outcome variables (binary indicator that equals one if the activity is being performed daily) on an indicator variable for full-day care. Unconditional coefficients stem from a regression which only includes the full-day indicator and dummies for child age. The conditional coefficients are from regressions that additionally include wave dummies and the set of controls described in the table notes of Table 3. See Table 2 and Section 4 for other notes on the Oster-method. Source: pairfam, 2013-2019.

Table C6: The effect of full-day care on non-parenting activities and other parent- and child-related outcomes; pairfam - Oster bounds

	Households with lower maternal education			Households with higher maternal education		
	All parents (1)	Mothers (2)	Fathers (3)	All parents (4)	Mothers (5)	Fathers (6)
<i>Outcome: Working (at least 10 h/w)</i>						
Unconditional	0.113*** (0.017)	0.161*** (0.023)	0.022 (0.016)	0.105*** (0.014)	0.201*** (0.021)	-0.002 (0.012)
Conditional	.116*** (.0161)	.173*** (.0238)	.0275 (.0169)	.105*** (.0139)	.185*** (.0225)	.000318 (.0134)
Mean	.684	.571	.866	.801	.684	.943
Identified set	[.116, .118]†	[.173, .179]†	[.0275, .0294]†	[.105, .105]†	[.174, .185]†	[.000318, .00121]†
δ for 0 coefficient	30.8	32.4	-41.2	18.2	4.45	-38
<i>Outcome: Working hours (per week)</i>						
Unconditional	4.509*** (0.717)	7.053*** (0.747)	-0.617 (0.888)	4.919*** (0.634)	9.824*** (0.719)	-0.235 (0.740)
Conditional	3.83*** (.581)	6.16*** (.749)	.466 (.915)	4.38*** (.547)	8.24*** (.751)	-.251 (.787)
Mean	24.3	15.8	38	30.1	20.7	41.4
Identified set	[3.58, 3.83]†	[5.61, 6.16]†	[.466, .862]†	[4.18, 4.38]†	[6.73, 8.24]†	[-.256, -.251]†
δ for 0 coefficient	9.79	4.2	-1.27	11.1	2.53	51.4
<i>Outcome: Personal monthly net income</i>						
Unconditional	107.146** (44.057)	265.750*** (38.633)	-221.252*** (71.421)	112.236* (64.929)	462.932*** (49.950)	-271.337** (118.409)
Conditional	165*** (33.2)	261*** (37.6)	27.5 (58.2)	229*** (60)	420*** (51.1)	50.7 (126)
Mean	1124	611	1949	1807	1099	2677
Identified set	[165, 185]†	[258, 261]†	[27.5, 115]†	[229, 270]†	[397, 420]†	[50.7, 172]†
δ for 0 coefficient	-11.7	9.83	-325	-6.93	5.57	-433
<i>Outcome: Too little time with child (0/1)</i>						
Unconditional	0.076*** (0.023)	0.113*** (0.028)	0.007 (0.038)	0.092*** (0.021)	0.185*** (0.026)	-0.016 (0.032)
Conditional	.0661*** (.0239)	.0945*** (.0292)	.0255 (.0414)	.0824*** (.0217)	.187*** (.0281)	-.0495 (.0335)
Mean	.36	.276	.498	.397	.303	.51
Identified set	[.0624, .0661]†	[.0847, .0945]†	[.0255, .0325]†	[.0786, .0824]†	[.187, .188]†	[-.0613, -.0495]†
δ for 0 coefficient	8.64	4.31	-4.6	9.36	5.79	-4.55
<i>Outcome: Feeling stressed (1-5)</i>						
Unconditional	-0.022 (0.045)	0.061 (0.056)	-0.142* (0.074)	0.152*** (0.039)	0.263*** (0.050)	0.007 (0.060)
Conditional	.00643 (.0472)	.0552 (.0595)	-.0871 (.0796)	.145*** (.0407)	.265*** (.0522)	-.00481 (.0645)
Mean	3.23	3.32	3.09	3.3	3.37	3.21
Identified set	[.00643, .0163]†	[.0531, .0552]†	[-.0871, -.0658]†	[.142, .145]†	[.265, .267]†	[-.00915, -.00481]†
δ for 0 coefficient	-.685	12.7	3.38	11	7.32	-1.21
<i>Outcome: Hours of sleep (parent)</i>						
Unconditional	-0.034 (0.044)	-0.045 (0.058)	-0.014 (0.067)	-0.013 (0.034)	-0.050 (0.047)	0.025 (0.048)
Conditional	-.00699 (.0469)	-.0000499 (.0605)	-.0348 (.0751)	.00322 (.0355)	-.0454 (.0498)	.0495 (.0495)
Mean	6.77	6.81	6.71	6.84	6.86	6.81
Identified set	[-.00699, .00252]	[-.0000499, .0158]	[-.0432, -.0348]†	[.00322, .00879]†	[-.0454, -.0438]†	[.0495, .0588]†
δ for 0 coefficient	.741	.00327	-5.37	-.611	14.2	-6.86
<i>Outcome: Hours of sleep (child)</i>						
Unconditional	-0.255*** (0.048)	-0.274*** (0.062)	-0.224*** (0.074)	-0.190*** (0.038)	-0.208*** (0.049)	-0.170*** (0.059)
Conditional	-.181*** (.0506)	-.2*** (.0665)	-.138* (.0782)	-.131*** (.041)	-.154*** (.0539)	-.112* (.064)
Mean	10.3	10.3	10.3	10.5	10.5	10.4
Identified set	[-.181, -.147]†	[-.2, -.167]†	[-.138, -.1]†	[-.131, -.105]†	[-.154, -.129]†	[-.112, -.0881]†
δ for 0 coefficient	3.81	4.12	2.98	3.72	3.94	3.66

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<i>Outcome: Child is happy and content (1-5)</i>						
Unconditional	-0.064** (0.026)	-0.090*** (0.034)	-0.025 (0.041)	0.031 (0.022)	0.002 (0.029)	0.065** (0.033)
Conditional	-.0734*** (.0278)	-.0963*** (.0366)	-.0337 (.0427)	.0396* (.023)	.017 (.0312)	.0631* (.034)
Mean	4.54	4.53	4.54	4.55	4.58	4.52
Identified set	[-.0771, -.0734]†	[-.0991, -.0963]†	[-.0373, -.0337]†	[.0396, .0426]†	[.017, .0221]†	[.0623, .0631]†
δ for 0 coefficient	-74.9	31.3	-17.4	-23.5	-3.78	15.6
<i>Outcome: Child is irritable and cries often (1-5)</i>						
Unconditional	-0.053 (0.043)	-0.011 (0.057)	-0.112* (0.063)	-0.052 (0.037)	-0.006 (0.050)	-0.104* (0.054)
Conditional	-.0321 (.0444)	-.0373 (.0592)	-.0261 (.0668)	-.0335 (.0386)	-.00797 (.0524)	-.0733 (.0576)
Mean	2.295	2.326	2.247	2.226	2.147	2.318
Identified set	[-0.032, -0.025]†	[-0.047, -0.037]†	[-0.026, 0.005]	[-0.033, -0.027]†	[-0.009, -0.008]†	[-0.073, -0.061]†
δ for 0 coefficient	3.82	-4.58	.838	4.35	-15.2	4.7
Observations	2859	1763	1096	3135	1725	1410

Notes: Table shows coefficients from OLS regressions of the outcome variables on an indicator variable for full-day care. Unconditional coefficients stem from a regression which only includes the full-day indicator and dummies for child age. The conditional coefficients are from which regressions that additionally include wave dummies and the set of controls described in the table notes of Table 3. See Table 2 and Section 4 for further notes on the Oster-method. Source: pairfam, 2013-2019.

Table C7: The effect of full-day care on parenting activities - pairfam. Alternative full-day assignment

	Households with lower maternal education			Households with higher maternal education		
	All parents (1)	Mothers (2)	Fathers (3)	All parents (4)	Mothers (5)	Fathers (6)
<i>Panel A: Parenting activities</i>						
Reading books or telling stories (daily)	-0.021 (0.023)	-0.035 (0.028)	-0.018 (0.039)	-0.013 (0.016)	-0.001 (0.016)	-0.026 (0.030)
Singing or playing instruments (daily)	-0.004 (0.022)	0.000 (0.032)	0.002 (0.030)	-0.018 (0.020)	-0.025 (0.029)	-0.023 (0.026)
Painting, building or drawing (daily)	-0.019 (0.023)	-0.014 (0.033)	-0.020 (0.033)	-0.023 (0.020)	-0.058** (0.028)	0.010 (0.027)
Playing games together (daily)	-0.082*** (0.025)	-0.069** (0.032)	-0.108*** (0.041)	-0.021 (0.021)	-0.054** (0.027)	0.027 (0.032)
Outdoor activities (daily)	-0.073*** (0.024)	-0.094*** (0.031)	-0.027 (0.040)	-0.074*** (0.020)	-0.150*** (0.027)	0.019 (0.031)
Gymnastics, sports (daily)	-0.020 (0.025)	0.006 (0.032)	-0.059 (0.042)	-0.042** (0.021)	-0.050* (0.028)	-0.033 (0.032)
Watching television or videos (daily)	0.006 (0.026)	-0.016 (0.033)	0.042 (0.042)	0.038* (0.022)	-0.002 (0.030)	0.090*** (0.032)
<i>Panel B: Non-parenting activities and other outcomes</i>						
Working (at least 10 h/w)	0.142*** (0.021)	0.204*** (0.030)	0.044* (0.023)	0.136*** (0.016)	0.270*** (0.025)	-0.026* (0.015)
Working hours (per week)	6.296*** (0.747)	9.084*** (0.962)	1.993* (1.210)	5.263*** (0.620)	11.496*** (0.814)	-2.215** (0.890)
Personal monthly net income	256.669*** (42.882)	409.269*** (50.097)	23.678 (75.848)	222.188*** (66.036)	559.758*** (57.916)	-168.564 (134.647)
Too little time with child (0/1)	0.076*** (0.027)	0.081** (0.033)	0.065 (0.046)	0.120*** (0.023)	0.221*** (0.028)	-0.006 (0.035)
Feeling stressed (1-5)	0.092 (0.061)	0.058 (0.077)	0.135 (0.101)	0.170*** (0.047)	0.300*** (0.061)	0.012 (0.075)
Hours of sleep (parent)	-0.134** (0.059)	-0.106 (0.076)	-0.186* (0.097)	-0.048 (0.042)	-0.111* (0.058)	0.037 (0.060)
Hours of sleep (child)	-0.290*** (0.064)	-0.252*** (0.084)	-0.312*** (0.101)	-0.240*** (0.045)	-0.185*** (0.056)	-0.317*** (0.074)
Child is happy and content (1-5)	-0.064* (0.036)	-0.081* (0.045)	-0.067 (0.060)	-0.018 (0.026)	-0.048 (0.034)	0.019 (0.040)
Child is irritable and cries often (1-5)	0.012 (0.056)	-0.004 (0.073)	0.056 (0.091)	0.092** (0.044)	0.161*** (0.060)	0.007 (0.066)
Observations	1972	1209	763	2338	1295	1043

Notes: Table shows coefficients from OLS regressions of the outcome variables (binary indicator that equals one if the activity is being performed daily) on an indicator variable for full-day care. Additional controls; dummies for child age, number of children in family, parental sex (if applicable), age of parent, indicator for migration status, single parent indicator, education dummies (if applicable). Full-day care indicates whether the child attends center-based care 30+ vs. 15-30 hours per week. See Table 3 for other table notes. Source: parifam, 2013-2019.

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