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Public child care and mothers' career trajectories*

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Abstract

We study the impact of public child care on mothers' career trajectories, focusing on qualitative dimensions of career choices. Using an event study approach, we find that child care helps mothers to return to the labor market more quickly and that this effect is mainly due to an increase in part-time employment. At the same time, we find no short- or long-term effects of child care on the quality of maternal careers, as measured, for example, by employment stability, employment in occupations with abstract tasks, or employment in managerial positions. Furthermore, we find no evidence of heterogeneous effects across mothers.

JEL Classification: J08, J13, J22
Keywords: Child care, maternal employment, career costs of children, women's careers

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1 Introduction

In recent decades, there has been a growing awareness of the importance of improving gender equality in all areas of society, including the labor market. However, despite significant convergence, gender gaps in career outcomes persist. Several studies have shown that these inequalities emerge after the onset of parenthood and are reflected in the fact that women with children earn significantly lower wages, are less likely to be employed in managerial positions, and have slower career progression than men or women without children (see, e.g., Bertrand et al., 2010; Blau & Kahn, 2017; Goldin, 2014; Kleven, Landais, & Sogaard, 2019; Waldfogel, 1998). This phenomenon is commonly referred to as the 'child penalty' or 'career cost of children' (Adda et al., 2017; Kleven, Landais, Posch, et al., 2019).

Many countries have increased spending on family benefits, including the provision of subsidized universal public child care, to help mothers reconcile work and family life. Although a considerable amount of literature has studied the effects of public child care on mothers' employment, measured in terms of participation rates or hours worked, there is little evidence on how child care affects the qualitative dimensions of mothers' careers, both in the short term and in the long run. Moreover, little is known about heterogeneous effects and thus about the question whether public child care affects different subgroups of mothers differently.

In this paper, we fill this gap by studying the impact of public child care on the career development of German mothers up to ten years after birth, with a particular focus on employment quality. To this end, we not only investigate the effect of public child care on maternal labor supply, but also on the likelihood of changing employer or occupation. This is important given previous research on internal labor markets showing that longer tenure contributes to career advancement within firms (Huitfeldt et al., 2023) as well as research suggesting that women adjust their careers around motherhood (Felfe, 2012; Kleven, Landais, & Sogaard, 2019). Moreover, we investigate the effects of public child care on mothers' labor market experience in jobs with abstract tasks or jobs with managerial responsibilities, which are associated with higher wage growth over time (Adda et al., 2017; Deming, 2021; Goldin, 2014) and can thus be considered as higher quality jobs. Finally, we examine whether child care has an effect on the wage position of mothers within a firm, independent of any changes in employer or occupation. To shed light on so far unexplored effect heterogeneities, we focus on mothers with different pre-birth incomes, mothers in occupations with different levels of family friendliness, and mothers in different types of firms. These three dimensions may affect the extent to which mothers benefit from child care, as they are associated with differences in the opportunity costs of staying at home (Becker, 1965; Mincer, 1963), differences in workplace flexibility and thus in the career costs of children (Adda et al., 2017; Goldin, 2014; Goldin & Katz, 2016;

Hotz et al., 2018), and differences in (non-monetary) firm amenities (Sorkin, 2022).

For our empirical analysis, we combine social security data from the Institute of Employment Research in Nuremberg (SIAB 7519) with county-level data, including child care coverage rates, and the BIBB/BAuA Employment Survey 2018. We then concentrate on first-time mothers and investigate the effects of public child care on their career development using an event study design similar to Kleven, Landais, & Sogaard (2019) and Kleven et al. (2022). Specifically, we compare the career trajectories of mothers who—prior to childbirth—lived in counties with a high level of child care expansion and mothers who lived in counties with a rather low level of expansion between five years before and ten years after the birth of their first child. We introduce exogeneity in our group definition by exploiting large temporal and spatial variations in child care coverage in West German counties after several policy initiatives starting in 2005.

Our results suggest that public child care increases maternal labor supply after childbirth. To be precise, we find that two years after the birth of the first child, mothers in high expansion counties are 5.5 percentage points more likely to work than mothers in low expansion counties. In line with previous literature, we also find that this effect is driven by an increase in part-time employment (see, e.g., Müller & Wrohlich, 2020). The effects on the likelihood of changing employer or occupation, on the likelihood of being in a job with abstract tasks or managerial responsibilities, and on mother's wage position within the firm are, however, small to insignificant in both the short and the long run. Moreover, we find no clear evidence that mothers with higher opportunity costs of staying at home, mothers with higher career costs of children, or mothers in firms with fewer (non-monetary) amenities benefit more from child care. Finally, we consider the pitfalls of standard two-way fixed effects models and confirm our results using the interaction weighted estimator of Sun & Abraham (2021). In addition, our event study estimates show that career outcomes of mothers in high and low expansion counties followed similar trends before birth and thus support the common trend assumption. Our results are also robust to a number of additional validity checks that examine (unobserved) heterogeneity between mothers in high and low expansion counties, fertility effects, selective migration, the impact of a parental leave reform in 2007, and alternative group definitions.

Our paper contributes primarily to two strands of literature. First, we contribute to the broad literature on gender inequality in the labor market (see, e.g., Bertrand (2011) and Olivetti & Petrongolo (2017) for a review) and in particular to recent work on the employment effects of parenthood. Applying an event study approach to Danish data, Kleven, Landais, & Sogaard (2019), for example, find that the birth of the first child leads to a long-term gender gap in earnings of around 20%, which results from changes in female labor force participation, reductions in working hours, and changes in wage rates. Other studies, also using an event study design, find similar results in different contexts (see, e.g., Angelov et al. (2016) for Sweden, Kuziemko et al. (2018) for the US, and

Kleven, Landais, Posch, et al. (2019) for a comparison of child penalties in six different countries).[1]

Second, we contribute to the literature on the effect of child care on maternal employment. The more recent work in this strand of the literature relies on quasi-experimental changes induced by policy reforms and finds mostly evidence in favor of child care provision helping women to reconcile work and family life (e.g., Baker et al., 2008; Bauernschuster & Schlotter, 2015; Berlinski & Galiani, 2007; Cascio, 2009; Lefebvre & Merrigan, 2008).[2] However, not all studies find significant positive effects of subsidized child care on maternal employment. Fitzpatrick (2010), for example, finds very small, statistically insignificant effects of publicly subsidized Pre-Kindergarten programs in the US. Similarly, Havnes & Mogstad (2011), who analyse the effect of the introduction of subsidized child care in Norway, find little effect. The literature explains these mixed results by differences in women's employment levels or differences in the availability of informal care.

As most of these studies focus on relatively short time horizons, our paper is most closely related to two ongoing projects by Krapf et al. (2020) and Kleven et al. (2022) who investigate the effect of child care on long-run child penalties in earnings.[3] While Krapf et al. (2020) focus on Switzerland and find that the availability of child care reduces the child penalty by increasing mothers' earnings and reducing the compensating increase in fathers' earnings, Kleven et al. (2022) conclude that the expansion of public child care (as well as the expansion of parental leave) has had no effect on gender convergence in Austria. Again, the institutional context seems to play an important role in explaining the differences in the results (Krapf et al., 2020). We contribute to this literature by providing evidence on the impact of child care not only on earnings, but also on labor market outcomes that focus on quality aspects of mothers' career trajectories. Moreover, our paper delivers novel insights into effect heterogeneities by taking into account three important dimensions for the reconciliation of family and career.

The remainder of the paper is organized as follows. Section 2 lays out the institutional setting and the data. Section 3 describes the set-up and results of our event study approach. Section 4 presents a variety of validity checks. Section 5 discusses the results and concludes.

[1] In contrast to these studies, our data do not allow us to identify fathers. Therefore, we cannot directly examine gender gaps in the labor market.

[2] Although, some of these studies suggest that some women benefit more, such as single or less educated mothers (Gelbach, 2002; Müller & Wrohlich, 2020).

[3] In a similar vein, Andresen & Nix (2022) study the effect of paternity leave and high quality child care on the child penalty in Norway. Moreover, a recent working paper by Chhaochharia et al. (2022) investigates the effect of public child care on the child penalty and the career decisions of mothers in Germany. However, compared to our study, the authors include both East and West Germany in their analysis and only consider the first five years after childbirth.

2 Institutional background and data

2.1 Institutional background

Germany has traditionally been characterized by a male breadwinner model with low fertility rates and female labor force participation. The latter holds in particular for mothers with young children: in 2005, only 46.7% of mothers with children under six were employed, a figure almost ten percentage points below the European average of 55.8% (Eurostat, 2018). Looking in more detail at mothers with children in this age group, Kreyenfeld & Geisler (2006) find that in 2002 only 19.2% of mothers with children between three and six were full-time employed. Moreover, they find that this rate varied substantially between East (50.5%) and West Germany (14.5%). Among mothers of children under the age of three, only 11.8% had a full-time job. The percentages for East and West Germany amounted to 31% and 8.9% respectively.

One reason often cited as an important cause of low female labor force participation rates in Germany is the low availability of formal child care. While the provision of public care for children between one and six years was quite high in East Germany as the result of the German Democratic Republic (GDR), West Germany lacked significantly behind. A first step towards expanding child care was taken in 1996. At that time, the German government passed a law granting three- to six-year-old children a place in a public kindergarten, which led to the availability of half-day care for this age group throughout Germany (Bauernschuster & Schlotter, 2015). However, for children under the age of three, the supply of formal care was still limited: in 2002, public child care for under-three-year-olds was available for only 2% of the children in West Germany, whereas 35% of the children had a child care slot in East Germany (Geyer et al., 2015). At the same time, there was virtually no private market for child care (Bauernschuster et al., 2016; Felfe & Lalive, 2012).

In response to the large excess demand for child care for children under the age of three in West Germany, the government consecutively enacted three major child care reforms. The first of these reforms, the Day-Care Expansion Act (*Tagesbetreuungsausbaugesetz*), was passed in 2005. This law encompassed the commitment to create 230,000 new child care slots for children aged younger than three by 2010. Moreover, the law made quality requirements more concrete to stress that early child care should also contribute to early childhood education (BMFSFJ, 2004). The second expansion stage took place in 2007. At the Day-Care Summit (*Krippengipfel*), the government decided to reach a child care coverage rate for under-three-year-olds of 35% by 2013, which was equivalent to tripling the existing slots (Tiedemann, 2014). Finally, in 2008, the Child Care Funding Act (*Kinderförderungsgesetz*) introduced a legal claim to child care for children aged one and above by August 2013. This last reform was also accompanied by a paradigm shift

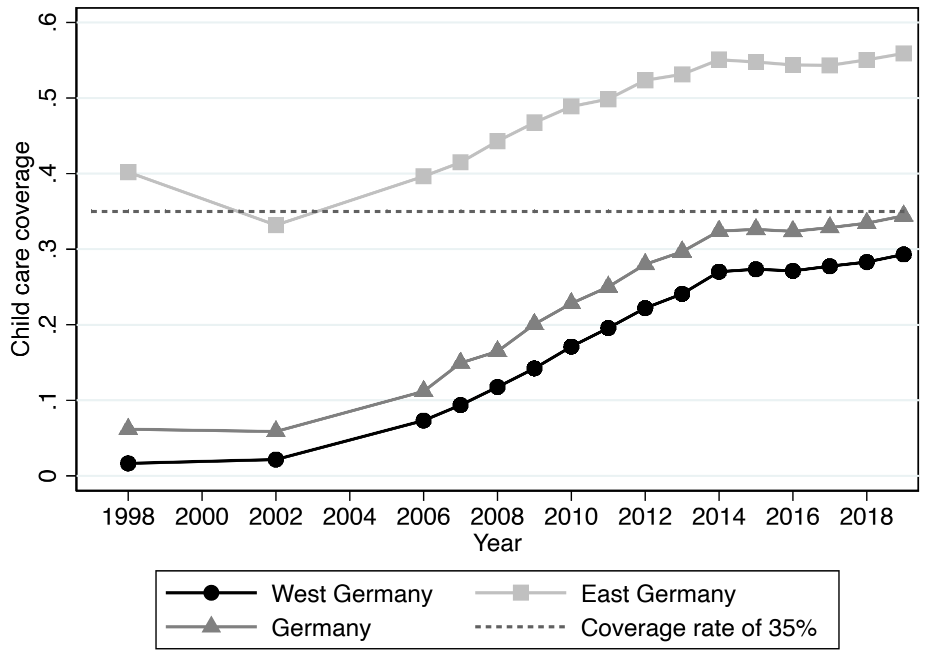


Figure 1. Child care coverage over time in East Germany, West Germany, and Germany as a whole. The dotted line indicates a coverage rate of 35%. Local child care coverage is calculated by the number of child care slots relative to the number of children aged 0 to 3 years.

concerning the financing of additional child care slots. Until 2008, local authorities had to bear all the costs of expanding public child care themselves. After 2008, the costs were shared between the three federal levels, resulting in low-cost child care for children under the age of three throughout Germany (Tiedemann, 2014).[4]

The state did not impose penalties on local authorities that did not reach the target coverage rate of 35% by 1 August 2013. Nevertheless, municipalities had an incentive to expand child care as parents could claim the additional costs for private child care or the remuneration for forgone earnings if they did not get a slot for eligible children (see, e.g., the decision of the Federal Administrative Court in September 2013 (BVerwG 5 C 35.12)). Thus, especially West German municipalities, where child care for under-three-year-olds was technically non-existent, created additional child care slots even before the entitlement to a slot was enshrined in law (Tiedemann, 2014). Figure 1 illustrates this development and highlights that the situation in East Germany is fundamentally different from that in the West. In our empirical analysis we therefore focus on mothers in West Germany.

In addition to large temporal variation, the German child care reforms also generated large spatial variation in child care coverage, as the speed of expansion varied substantially across counties. Table A1 in the Appendix shows that in 2009, for example, child care coverage ranges from 3.7% to 35.9%. We thus follow Bauernschuster et al. (2016) and

[4]The parental fees depend on family size and income and range from 0 to 600 EUR per month (Bauernschuster et al., 2016).

define a county as 'high expansion' county if it had an above-median increase in public child care coverage from 2002 to 2009. Counties with an increase in public child care provision below the median over the same period of time are considered as 'low expansion' counties. Looking at Figure 2, which depicts yearly averages (panel (a)) and emerging differences (panel (b)) in child care coverage between the two groups of counties, we find no differences in child care coverage between high and low expansion counties prior to the German child care reform. However, from 2006 onwards, the coverage rates of the two groups clearly diverge. Between 2002 and 2009, high expansion counties had an average increase in child care coverage of 15.5 percentage points, compared to an increase of 8.7 percentage points in low expansion counties.

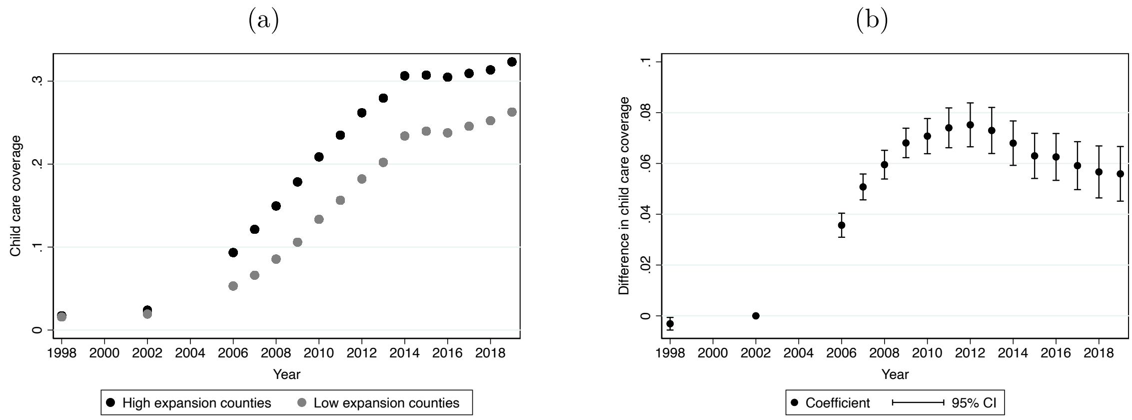


Figure 2. Child care coverage over time. Panel (a) shows the averages in child care coverage, separately for high expansion and low expansion counties. High expansion counties consist of women living in counties with an above-median increase in child care coverage rates from 2002 until 2009, whereas the low expansion counties consist of women living in counties with below-median increase in child care coverage rates from 2002 until 2009. Panel (b) depicts emerging differences in child care coverage between high and low expansion counties with the difference normalized to zero in 2002, the last year with data on child care coverage before the 2005 reform.

The regional differences are due to various causes. On the one hand, local authorities had to make projections concerning the future demand for child care slots depending on demographic and economic factors. On the other hand, the state was responsible for approving the construction of new child care centers and this approval was necessary for receiving the state subsidies (Bauernschuster et al., 2016; Felfe & Lalive, 2012). This division of responsibilities between different federal levels made the underlying administrative process complex and lengthy and, according to Hüsken (2011), also dependent on county-specific factors that local authorities could not influence such as shortages in construction ground, a lack of qualified staff, delays in approval, rejections due to non-compliance with specific regulations, or differences in the routines and rules concerning the funding system (see, e.g., Bauernschuster et al., 2016; Felfe & Lalive, 2012, 2014). Thus, the regional variation is not only due to differences in demand, which are likely to be endogenous to expected changes in maternal employment, but also due to exogenous supply-side shocks.[5]

2.2 Data

Labor market outcomes Our study relies on administrative data from the Sample of Integrated Labor Market Biographies (SIAB7519) (Frodermann et al., 2021). This dataset includes a two percent sub-sample of all individuals who were registered at least once between 1975 and 2019 due to employment, unemployment, or receipt of other public transfers (i.e., welfare benefits) through the social security system. The data contain rich information on individuals' earnings, labor supply, occupation status, education level, and many other variables related to individuals' (un)employment histories. Moreover, we use the information on benefit receipts for maternity protection and parental leave to identify births in our data set. However, as the data only cover individuals who have a record in the administrative data sources, it is almost impossible to detect the second birth if a mother does not return to employment subject to social security between two successive births. Thus, we are only able to reliably identify first births (Müller & Strauch, 2017).

We prepare the data set by splitting overlapping spells, creating biographical variables, cleaning occupational and educational information, and deflating wages. As earnings recorded in the SIAB are top-coded for about 5% of the spells for workers, we also impute top-coded wages following the procedure suggested by Dauth & Eppelsheimer (2020). We then collapse our data to one observation per individual per year and create out-of-labor force spells if an individual is not observed in a given year.[6] Finally, we restrict our data to females living in West Germany as well as to the years 1998-2019. We thus have a balanced panel of women whom we observe over a time span of 22 years.[7]

To get more detailed information on individuals' occupations, we furthermore combine our data with the BiBB/BAuA Employment Survey 2018. This survey is representative of the employed population in Germany and provides detailed information on the type of job held, the tasks performed, the skills or qualifications required, and the work environment (Rohrbach-Schmidt & Hall, 2020).

[5]Figure A1 in the Appendix proves that even after controlling for potentially important demand-side factors (such as the population's age structure, population density, male employment rates, the GDP, the conservative vote share, and indicators for females' education level), there still exists substantial regional variation that primarily results from supply-side shocks and thus is arguably exogenous to our outcomes of interest.

[6]As the SIAB does not contain information on self-employed individuals or civil servants, some women for whom we create out-of-labor force spells might indeed be self-emplyoed or in civil service in the respective year. A descriptive analysis with the German Socio-Economic Panel shows that the percentage of women switching from social security employment to self-employment or civil service around the time of the first birth is very low: up to five years after birth, only 1.35% of women have switched to civil service, only 3.8% to self-employment.

[7]Note that we start with a panel that is balanced in years. However, putting further restrictions on, e.g., the range of event times (see Section 3) will lead to an unbalanced panel for the analysis. We cannot use years prior to 1998 because the county of residence indicator is not filled in our data for earlier years.

Child care provision Our analysis also relies on information on child care provision at the county level. To this end, we use administrative data from the Federal Statistical Office of Germany, which contain the number of public child care places per county for the years 1998, 2002 and each year after 2005. To be precise, the data for the year 1998 and 2002 report the actual number of slots, the data following the year 2005 report the number of children attending child care. This, however, should not be a problem since in general child care provision is so small that one can assume that the number of children attending child care resembles the amount of the available slots (Bauernschuster et al., 2016). We combine this data with information on the counties' population-age structures and define public child care coverage as public child care slots for under three year olds divided by the population of children less than three years old.

Additional county-level data from the Federal Statistical Office of Germany and the Federal Institute for Building, Urban Affairs and Spatial Research complement our final data set. These data include the population density, GDP per capita, the male employment rate, the share of highly educated women, and the interpolated vote shares of political parties.

3 The effects of public child care on mothers' careers

3.1 Identification strategy

To identify the effects of public child care on maternal career trajectories, we restrict our sample to first-time mothers who were in regular employment in the year before the birth.[8] In addition, we focus on births after 2004 in order to include only mothers whose children could potentially be affected by the child care reforms between the ages of one and three. Table A2 in the Appendix provides descriptive statistics for our final sample.

We then adopt the event study specification proposed by Kleven, Landais, & Sogaard (2019) and compare the trajectories of labor market outcomes of mothers who—prior to childbirth—lived in high and low expansion counties between five years before and ten years after the birth of their first child.[9]

That is, for each group of mothers $g \in \{\text{high expansion, low expansion}\}$, we estimate

[8] Regular employment refers to full-time and part-time jobs that are subject to social security contributions and income tax. It does not include marginal employment, which is exempt from these, otherwise mandatory, contributions.

[9] As before, we follow Bauernschuster et al. (2016) and define a county as 'high expansion' county if it had an above-median increase in public child care coverage from 2002 to 2009. Counties with an increase in public child care provision below the median over the same period of time are considered as 'low expansion' counties. While Bauernschuster et al. (2016) use a difference-in-differences (DID) model, we apply an event study design to highlight differences in career development between mothers in high and low expansion counties after the first birth. It is, however, reassuring that we are able to replicate the findings of Bauernschuster et al. (2016) and Müller & Wrohlich (2020) using a basic DID model with our data. The results of this replication exercise are available in the Appendix in Figure A2.

the following equation:

$$Y_{ist}^{g} = \alpha_t^g D_{ist}^{Event} + \beta^g D_{ist}^{Age} + \gamma^g D_{ist}^{Year} + v_{ist}^{g} \tag{1}$$

where Y_{ist}^{g} is the outcome of interest for individual i of group g in year s and at event time t (measured relative to birth). Specifically, our outcomes include the number of days in regular employment, dummy variables for being in regular, full-time or part-time employment, and labor earnings normalized by pre-birth earnings.[10] Moreover, to shed light on the quality of maternal careers, we introduce dummy variables indicating whether an individual has changed employer or (Blossfeld) occupation since the last employment spell, a dummy for working in a job with abstract tasks, a dummy for having a job with managerial responsibilities, and a continuous variable measuring the distance of individual i's wage from the median wage of other female employees in the same firm. D_{ist}^{Event} is a vector of event time dummies with respect to the birth of the first child. D_{ist}^{Age} is a vector of age dummies controlling for life-cycle trends and D_{ist}^{Year} is a vector of year dummies controlling for any time-varying shock. We omit the event time dummy at $t = -1$, implying that the event time coefficients (α_t^g) measure the impact of children relative to the year prior to the birth of the first child. To keep the zeros in the data, we specify our continuous outcome variables in levels rather than logs. The identification relies on the assumption that maternal employment outcomes would develop smoothly in the absence of children (Kleven, Landais, & Sogaard, 2019).

To emphasize the differences in labor market outcomes between mothers in high and low expansion counties t years after birth, we additionally run an alternative model specification:

$$Y_{ist} = \alpha_t D_{ist}^{Event} + \alpha_t^{CC} D_{ist}^{Event} \times CC_i + \delta CC_i + \beta D_{ist}^{Age} + \gamma D_{ist}^{Year} + v_{ist}^{g} \tag{2}$$

where CC_i is the group indicator for woman i, which is unity for women living in high expansion counties prior to birth and zero otherwise. We cluster standards errors at the county level. The results remain virtually unchanged if we cluster standard errors at the individual level instead. This specification allows us to identify the effect of child care on maternal employment under the assumption that, in the absence of the child care reforms, the evolution of maternal employment outcomes t years after birth would have been the same in high and low expansion counties (Kleven et al., 2022). We validate our findings in Section 4.

[10] Following Dauth et al. (2021), we express annual earnings in multiples of the individual's earnings in the year prior birth to account for ex-ante earnings differences across mothers in high and low expansion counties.

3.2 Main results

We present our results in three steps. In a first step, we focus on the impact of public child care on maternal employment (rates) and earnings. We then turn to the effect on labor market outcomes which also capture the quality of maternal careers. Finally, in a detailed heterogeneity analysis, we study whether the effects of public child care on mothers' career trajectories depend on individual, occupational, and firm characteristics.

3.2.1 Average effects

Impact on employment and earnings In Figure 3, we present our results on employment and earnings. The graphs in the left column plot the event time coefficients, α_t^g, from Equation (1). Thus, they show the impact of children on labor market outcomes separately for mothers in high and low expansion counties across event times. The graphs in the right column plot the coefficients on the interactions of the event time dummies and the group indicator, α_t^{CC}, from Equation (2) and therefore highlight the differences in the labor market outcomes between the two groups.

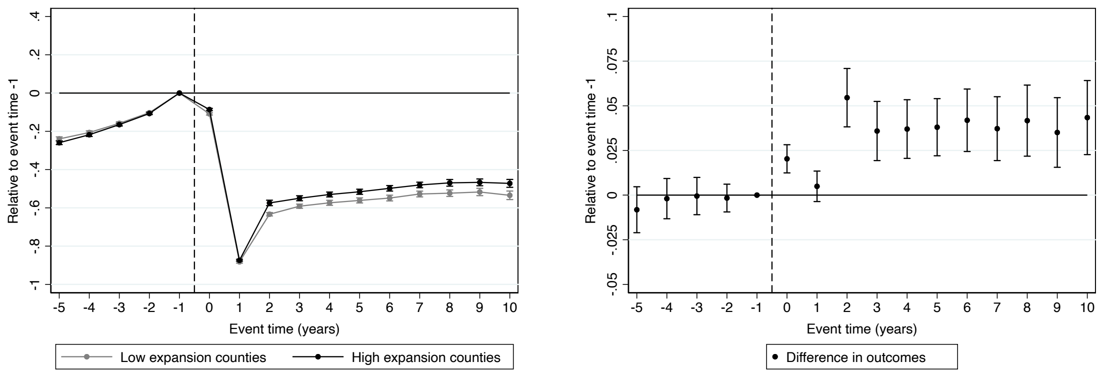
Focusing on panel (a), we find that, once we control for age and year dummies, the employment rates of mothers in high and low expansion counties follow the same trend until the onset of parenthood.[11] For both groups of mothers, we then observe a drop in employment rates of almost 90 percent between the year before the birth and the year after. However, following event time two (i.e., the year in which the entitlement to a child care slot becomes relevant), the trajectories of mothers living in high and low expansion counties diverge. In terms of magnitude, the estimates of α_t^{CC} from Equation (2) suggest that two years after the birth of the first child, mothers in high expansion counties—that is, those mothers who benefited from a 78% larger increase in child care coverage between 2002 and 2009 (see Figure 2)—are 5.5 percentage points more likely to work than mothers in low expansion counties and this effect is persistent over time. Measuring employment as the number of days a mother is regularly employed (panel (b)), we find similar results in terms of the percentage increase compared to pre-birth employment. Consistent with the expectation that early child care helps mothers to return to work sooner, this suggests that the effect of public child care on maternal labor supply happens at the extensive margin as opposed to the intensive margin (Lemieux & Milligan, 2008).

In the remaining panels of Figure 3, we examine the effect of public child care on full-time employment, part-time employment, and annual earnings. In line with previous literature, we find that the effects of child care on maternal employment are mainly driven by differences in part-time employment (panel (d)): Starting in the second year after birth, part-time employment increases for both groups compared to the year before

[11] In an alternative specification, we additionally control for education and being German at the individual level and for the set of regional characteristics mentioned in Section 2.2. The results, which are available upon request, remain qualitatively and quantitatively the same.

birth, but more so for mothers in high expansion counties. Specifically, the estimates suggest that two years after the birth of the first child, mothers in high expansion counties are 4.6 percentage points more likely to work part-time than mothers in low expansion counties. Full-time employment, however, drops by more than 70 percent in the first year after birth compared to $t = -1$ and shows no signs of recovery ten years after birth for mothers in both high and low expansion counties (left column of panel (c)). Moreover, the coefficients highlighting the differences between the two groups over time remain insignificant for all event times after birth (right column of panel (c)). Regarding the impact of children on annual earnings (panel (e)), we find that mothers in both groups experience substantial earnings losses after the birth of their first child, which persist for at least ten years after the birth. However, consistent with the employment results, we also find that child care reduces these earnings losses for mothers in high expansion counties after their child's first birthday. To be precise, two years after birth, mothers in high expansion counties are about 4.3 percentage points better off than mothers in low expansion counties, relative to their respective pre-birth earnings. Again, this difference remains persistent over all event times after birth.

(a) Employed (0/1)



(b) Employed (days)

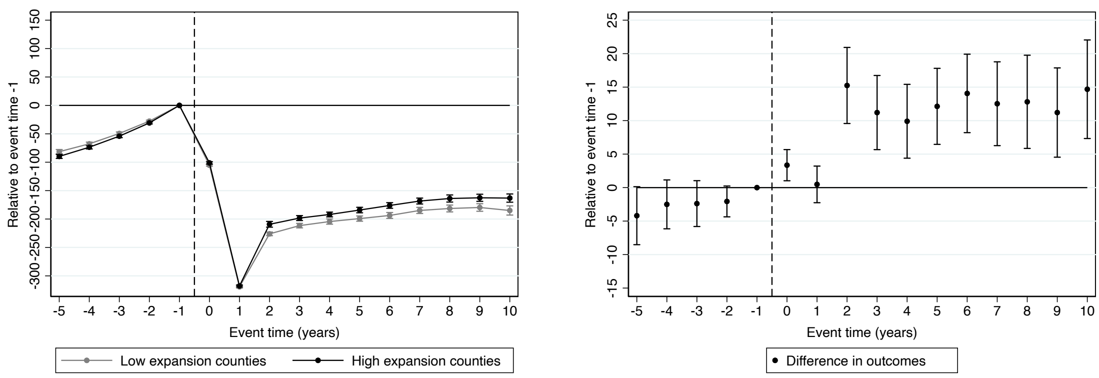
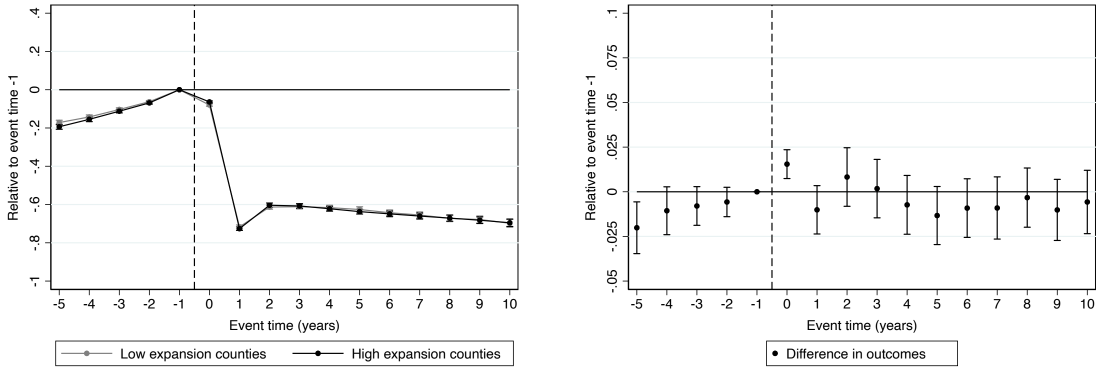
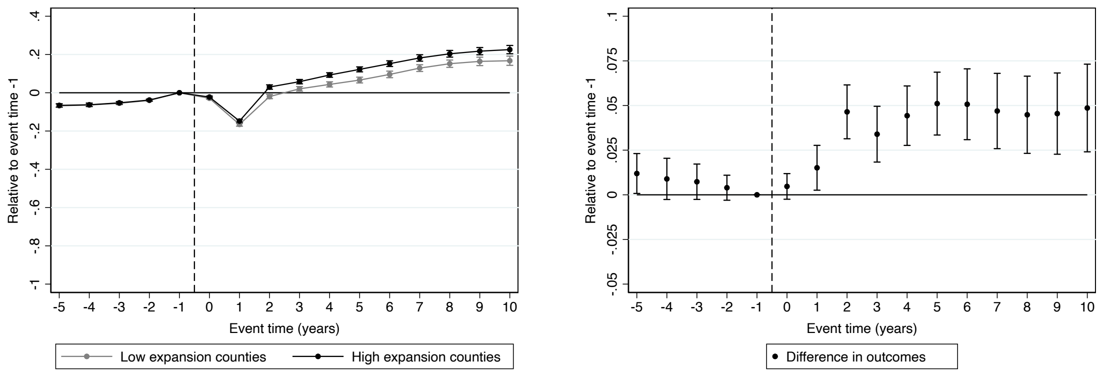


Figure 3. Continued on next page

(c) Full-time (0/1)



(d) Part-time (0/1)



(e) Annual earnings (normalized)

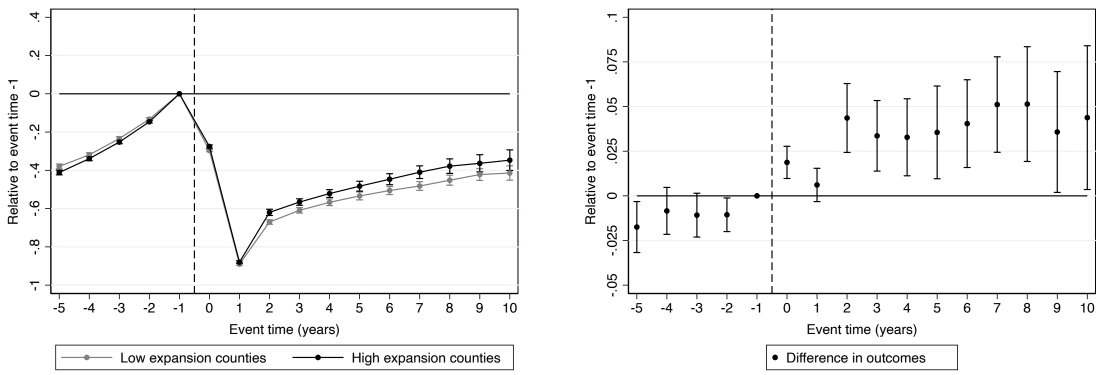


Figure 3. Child care and maternal employment outcomes: Event study estimates. The figures on the left show the event time coefficients estimated from Equation (1). The figures on the right show the coefficients on the interaction term in Equation (2). All of these statistics are estimated on a sample of mothers who have their first child between 2005–2019 and were regularly employed in the year prior to birth. All figures include 95 percent confidence intervals around the event time coefficients. These confidence intervals are based on standard errors clustered at the county level.

Impact on the quality of maternal careers The results in the previous section suggest that public child care can help mothers to return to work sooner. This quantitative effect on mothers' labor supply might also improve the quality of maternal careers. However, we showed that the labor supply effect is mainly caused by an increase in part-time employment, raising questions about whether this is sufficient to have a substantial positive effect on the quality of mothers' career trajectories. To answer this question, we estimate the same event study specifications as before, using a set of outcome variables that measure so far unexplored dimensions of maternal labor supply. The results for α_t^{CC} from Equation (2), that highlight the differences in the career trajectories between mothers living in high and low expansion counties, are shown in Figure 4. For the sake of clarity, the results for α_t^g from Equation (1), that reflect the impact of children on the qualitative labor market outcomes for both groups separately, can be found in Figure A3 in the Appendix.

We start by examining the impact of public child care on employment stability. To this end, we explore whether mothers in high and low expansion counties differ in their likelihood to change employer or occupation. These outcomes are interesting given the literature suggesting that tenure helps employees to move up the career ladder and take on more complex tasks (see the literature on internal labor markets, e.g., Doeringer & Piore, 1985; Huitfeldt et al., 2023), as well as the literature suggesting that women switch to more family-friendly occupations after having their first child (Felfe, 2012; Kleven, Landais, & Sogaard, 2019). A lower probability to change employer or occupation could thus point towards better jobs in terms of hierarchy, tasks, and wages. However, the coefficients in panel (a) and (b) of Figure 4 are close to zero and statistically insignificant, suggesting that mothers in high expansion counties are neither more nor less likely to change employer or occupation than mothers in low expansion counties.

As these two dimensions may miss quality improvements that take place within the same employer and within the same occupational group, we next focus directly on the impact of public child care on job quality. We therefore examine differences in the likelihood of being employed in jobs with abstract and thus more complex tasks and in jobs with managerial responsibilities, both of which are associated with relatively higher wage growth over time (Adda et al., 2017; Deming, 2021; Goldin, 2014). Thus, increases in employment in these types of jobs could be interpreted as an increase in the quality of careers. Moreover, we analyze whether child care helps mothers (independent of any employer, job, or task changes) to improve their wage position within a firm. To this end, we compute for each woman the difference between her current wage and the median wage of all other (full-time employed) women in the same firm. A positive value thus indicates that individual i's wage is above the median of the firm and could be interpreted as an alternative measure of job quality.[12] Looking at the remaining panels of Figure 4, however, we find no significant differences in the probability of working in jobs with abstract tasks or in positions with managerial responsibilities between mothers in high and low expansion counties.

[12]As median wages at the firm-level are only available for full-time employees, so that we can only use women who are employed full-time after the birth of their first child for this analysis, one might be concerned about selection issues. Yet, as we find no evidence of an effect of public child care on full-time employment (see Figure 3), we argue that selection issues should be modest.

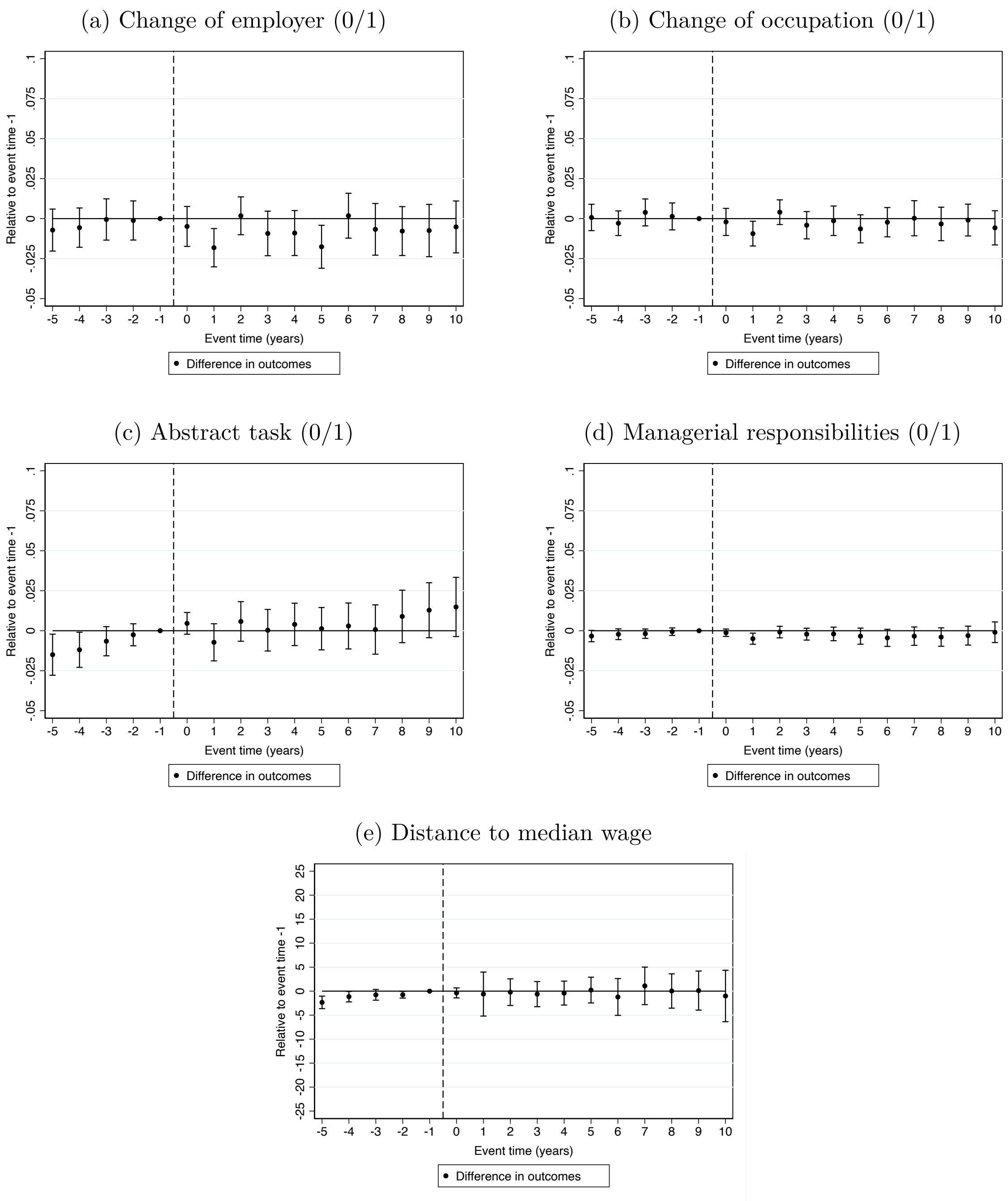


Figure 4. Child care and the quality of maternal careers: Event study estimates. The figures show the coefficients on the interaction term in Equation (2). All of these statistics are estimated on a sample of mothers who have their first child between 2005–2019 and were regularly employed in the year prior to birth. *Change of employer* and *change of occupation* are measured in comparison to the last employment spell; Jobs with *abstract tasks* are identified using the dataset provided by Dengler et al. (2014) who make use of expert knowledge about competencies and skills and apply the task-based approach developed by Autor et al. (2003) to occupations in the German labor market; Jobs with *managerial responsibilities* are defined using the last digit of the 4-digit occupational code; *Distance to median wage* measures the difference between the individual's current wage and the median wage of all other (full-time employed) women in the same firm. All figures include 95 percent confidence intervals around the event time coefficients. These confidence intervals are based on standard errors clustered at the county level.

We also find no evidence that women in high expansion counties are better off in terms of their wage position within a firm. Thus, regardless of how we measure employment stability or job quality, our results suggest that the expansion of public child care in Germany has had no effect on the quality of maternal careers.

3.2.2 Effect heterogeneity

In a next step, we analyze heterogeneities in the effects of public child care to see whether some groups of mothers benefit more than others in terms of employment. This might reveal potentially significant effects on the quality-related outcomes that are hidden in the average effects.

First, we focus on heterogeneous effects at the individual level. Specifically, we examine effect heterogeneities by income before birth. This is based on the idea that mothers with higher opportunity costs of staying at home (e.g., because of higher income or higher potential wage rates) might benefit more from better access to public child care (Becker, 1965, 1991; Mincer, 1963). We therefore create terciles based on income from regular employment in $t = -1$ and compare the effects of child care on the quantitative and qualitative dimensions of career trajectories for mothers with high versus low or medium pre-birth income. The first row of Figure 5 shows the results of this heterogeneity analysis for three selected outcomes, namely the dummy for being in regular employment, having changed employer since the last employment spell, and being employed in a job with abstract tasks. Overall, the estimates provide no evidence of large differences in the effects of public child care by pre-birth income. If anything, mothers with a low or medium income before birth, and thus mothers with lower opportunity costs of staying at home, benefit more than mothers with a high income before birth. Based on the same reasoning, we also conduct a heterogeneity analysis by mothers' pre-birth education level which delivers very similar results (see Figure A4 in the Appendix).

Second, we analyze whether the effects of public child care differ for mothers in different occupations. As previous literature highlights that the career costs of children depend on family-friendly workplace amenities such as flexibility or the degree of substitution among workers, we focus on differences in the 'family friendliness' of occupations (Adda et al., 2017; Goldin, 2014; Goldin & Katz, 2016; Hotz et al., 2018). To this end, we use the BIBB/BAuA Employment Survey of the Working Population on Qualification and Working Conditions in Germany 2018 and determine for each mother whether she worked in a more or less family friendly occupation before the birth of her first child. Specifically, we construct an index for each two-digit occupation based on information on time flexibility, the degree of regular contact with clients, decision-making processes and the transferability of skills, and define occupations in the bottom third of the index distribution as having a low degree of family friendliness. However, contrary to the expectation that public child care might help especially those mothers who work in less family-friendly occupations and thus have higher career costs of children, the results in the second row of Figure 5 suggest that it is rather those mothers who were employed in more family-friendly occupations before the birth who benefit. These results, as well as the the results on effect heterogeneities by pre-birth income, could indicate that more career-oriented mothers work regardless of the availability of public child care and substitute private or informal child care for public child care when it is sufficiently available.

Finally, we examine heterogeneities that might occur between women who were employed in different types of firms before the birth of their first child. Differences could arise if certain firm characteristics directly affect the career costs of having children (e.g., through family friendly arrangements). To depict firm-level differences, we rely on the 'AKM' pay premium (Abowd et al., 1999; Card et al., 2013) which is interpreted as a result of rent-sharing, efficiency wage, or strategic wage posting behavior and which is paid to all employees. Moreover, firms with a high 'AKM' wage premium are usually also characterized by collective bargaining agreements (Card et al., 2013), better non-monetary amenities, a higher level of job satisfaction among employees (Sorkin, 2022), and thus overall higher firm 'quality'. For our version of the SIAB, we use the firm-level information on the establishment wage premia computed by Bellmann et al. (2020) and merge this data to each mother's pre-birth employer. We then determine whether mothers worked for a firm that paid a premium in the top third of the distribution before birth. Looking at the third row of Figure 5, however, there again is no clear evidence for heterogeneous effects by firms' pay premia. If at all, it is the mothers in low or medium AKM firms who benefit slightly more from child care provision. This can be explained by the literature showing that firms with a lower wage premium on average have less favorable working conditions for minority groups such as migrants or women due to the lack of collective bargaining (Card et al., 2013; Corradini et al., 2022). Moreover, these firms tend to offer fewer non-monetary amenities related to work-life balance (e.g., Sorkin, 2022). Employees in low quality firms may therefore be more dependent on, and therefore benefit more from, public child care.

4 Validity checks

4.1 Staggered treatment design

Our event study analysis relies on variation in the timing of treatment (i.e., variation in the timing of the first birth) and thus amounts to a 'staggered treatment design'. If the treatment effects are heterogeneous across different birth cohorts or over time, the standard two-way fixed effects model leads to biased estimates. This problem arises because, in settings where the timing of treatment varies between units, the coefficient on a given lead or lag is a weighted combination of differences in trends from their own relative period, from other relative periods included in the specification, and from other

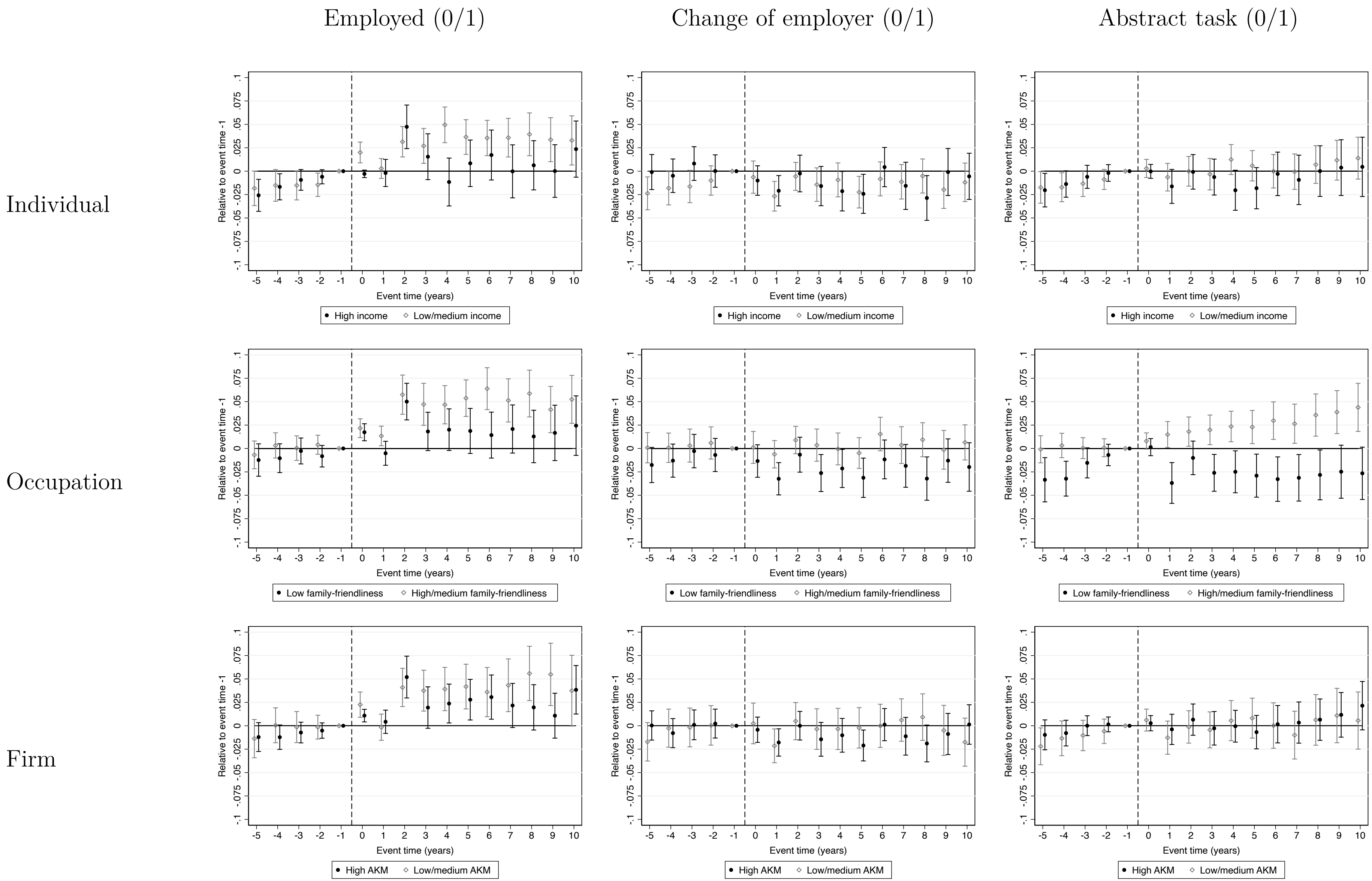


Figure 5. Heterogeneous effects of child care: Event study estimates for a dummy for being employed (1st column), a dummy for a change of employer (2nd column), and a dummy for being employed in a job with abstract tasks (3rd column). The gray dots show the coefficients of the interaction terms of event time dummies and the group dummy. The black dots depict the sum of the coefficients of the interaction between event time dummies and the group indicator and the the triple interaction with the subgroup indicator. All of these statistics are estimated on a sample of mothers who have their first child between 2005–2019 and who were regularly employed in the year prior to birth. All figures include 95 percent confidence intervals around the event time coefficients. These confidence intervals are based on standard errors clustered at the county level.

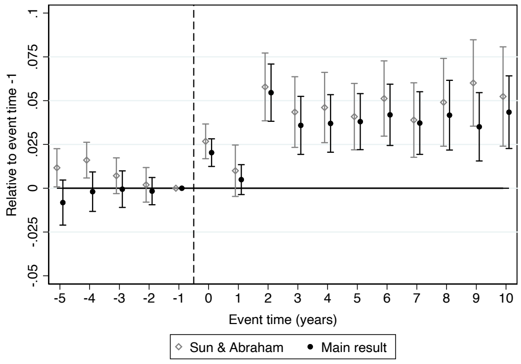
relative bins excluded from the specification (de Chaisemartin & D'Haultfoeuille, 2020; Goodman-Bacon, 2021; Sun & Abraham, 2021). As the pre-treatment coefficients may also be contaminated, this is problematic not only for identifying unbiased effects, but also for assessing the common trend assumption of the event study approach. To evaluate the extent of the problem in our setting, we follow Sun & Abraham (2021) and estimate the lead and lag specific weights underlying the linear combination of our treatment effects. The results are plotted in Figure A5 in the Appendix and suggest that although the highest weight is always on the coefficient from the own relative period, the weights on other leads and lags are not equal to zero and sometimes even negative, which makes it particularly difficult to interpret the coefficients estimated using the event study approach described above.

We therefore validate our findings from Section 3 by estimating another event study specification that applies Sun & Abraham (2021)'s interaction weighted estimator. That is, we first estimate a linear two-way fixed effects model in which we interact the relative event time indicators with the group indicator for mothers in high expansion counties and cohort indicators, where a 'cohort' is defined as the group of mothers who gets their first child in the same year.[13] Similar to our previous event study specifications, we define a woman's initial birth as the event and use the year preceding the birth as the omitted category. Since we restrict our sample to women who gave birth to their first child after 2004, we do not have to exclude cohorts that are always treated. Moreover, our sample restrictions imply that we have no cohort that is never treated. Thus, we follow the suggestions and use the last-treated cohort (i.e., women who gave birth to the first child in 2019) as the control group. We then estimate the cohort shares in each relative time period and finally obtain the interaction weighted estimator by weighting the cohort-specific estimates from the two-way fixed effects regression with these estimated shares.

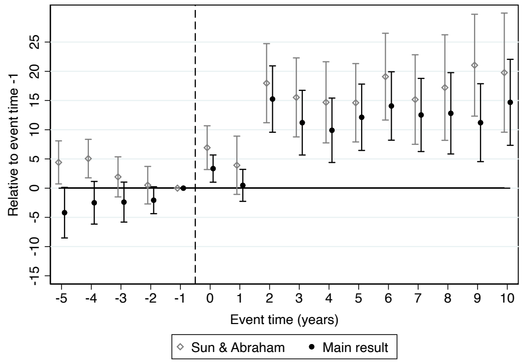
The results for all outcomes are presented in Figure 6. A direct comparison of the interaction-weighted estimator with the estimates from the previous section shows that confidence intervals of both estimates overlap in almost all cases. This is especially true for the quality-related outcomes in panels (f) to (j). Our estimates are thus robust to adjusting for potential contamination due to a staggered treatment design.

[13] Sun & Abraham (2021) do not depict differences in the treatment effects between two groups. Thus, to make the results comparable to the specification described by Equation (2), we need to include a triple interaction instead of just including an interaction between relative event time indicators and cohort indicators.

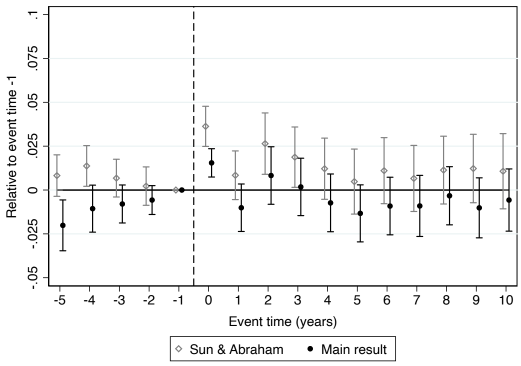
(a) Employed (0/1)



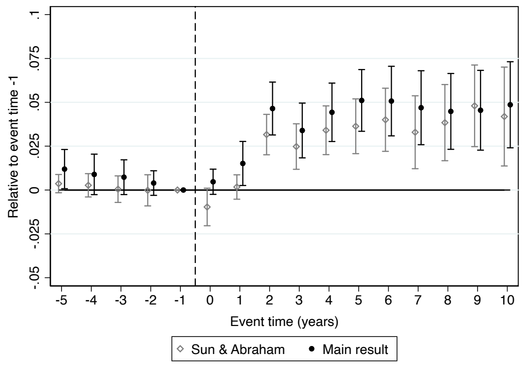
(b) Employed (days)



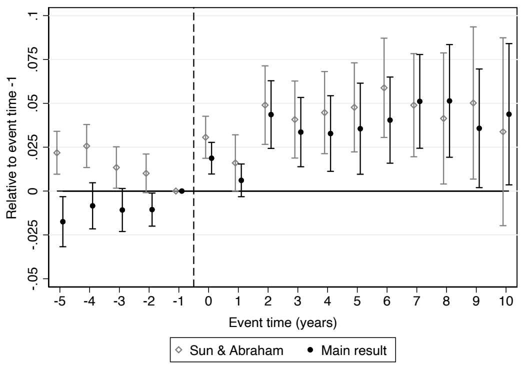
(c) Full-time (0/1)



(d) Part-time (0/1)



(e) Annual earnings (normalized)



(f) Change of employer (0/1)

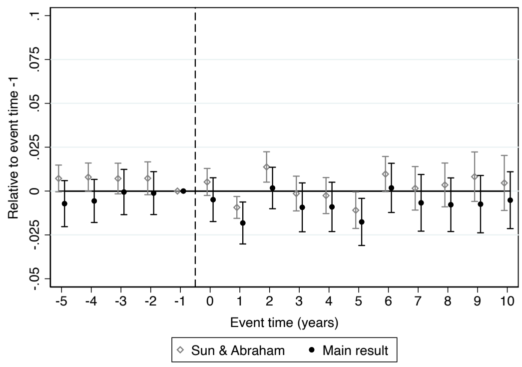


Figure 6. Continued on next page

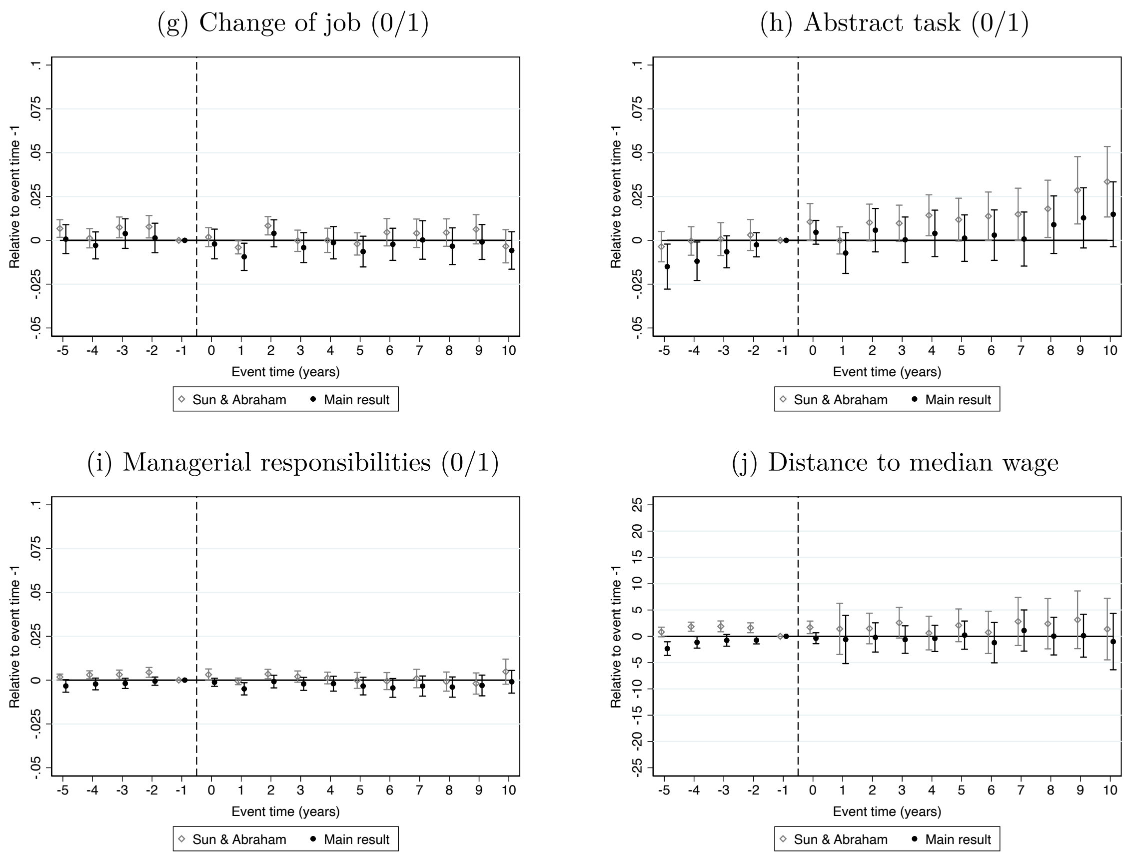


Figure 6. Child care and maternal employment outcomes: Event study estimates applying Sun & Abraham (2021)'s interaction weighted estimator are depicted in gray, the estimates from the specification described by Equation (2) are depicted in black. All of these statistics are estimated on a sample of mothers who have their first child between 2005–2019 and were regularly employed before birth. All figures include 95 percent confidence intervals around the event time coefficients. These confidence intervals are based on standard errors clustered at the county level.

4.2 Differences between mothers in high and low expansion counties

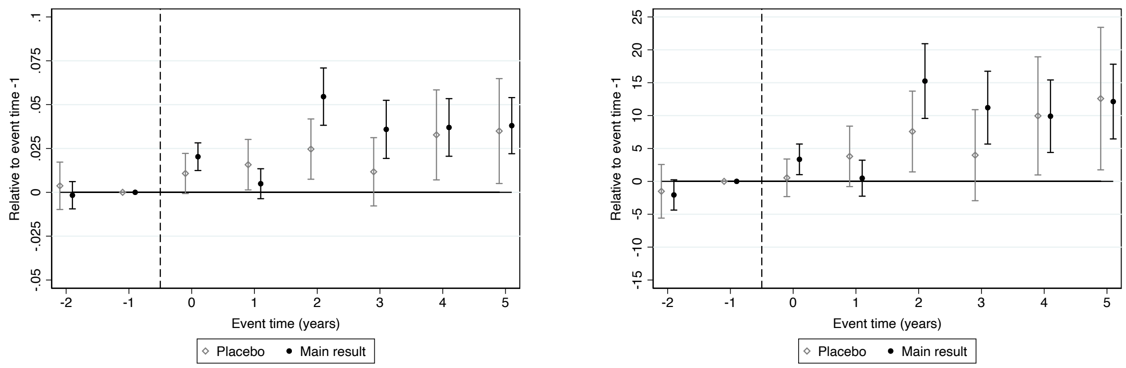
A closer look at the summary statistics reported in Table A2 shows that mothers in high expansion counties have higher education levels and earnings in $t-1$ than those in low expansion counties. This raises the question whether the results in Section 3 capture the effect of some heterogeneity between the two groups of mothers, leading to different post-birth trajectories in the absence of the treatment (first birth) and thus violating the key identifying assumption, rather than the effect of public child care on maternal employment outcomes.

To address this concern, we include an interaction of pre-birth education with a post-birth dummy to our specification in Equation (2), allowing for the possibility that highly educated mothers react differently to the birth than less educated mothers. Although this leads to a minor reduction in the point estimates, the qualitative implications remain unchanged. The same is true if we similarly control for differences in pre-birth income (see Figure A6 in the Appendix). Moreover, as we expect large cities to be special in terms of public child care and the proportion of the population that is highly educated and closely attached to the labor market, we exclude individuals living in the ten largest cities in Germany from our sample and re-estimate our event study. While this leads to an equalization of the two groups of mothers (see Table A3 in the Appendix), the results of the event study remain similar (see Figure A6 in the Appendix). Thus, the observable differences in education or earnings do not appear to be driving our results.

However, there may also be unobservable differences between mothers in high and low expansion counties that could threaten the validity of our findings. We therefore conduct a placebo-test using a sample of mothers who gave birth between 1999 and 2004, i.e. before the child care reforms, and whom we follow two years before and five years after the birth of their first child. We then estimate Equation (2) to measure the differential effects of child care in this sample, considering only the (pre-reform) years until 2005. As no child care had been introduced by this time, we should not observe any significant effects. Figure 7 presents the results. Most of the coefficients on the interactions of the event time dummies and the group indicator, α_t^{CC}, are statistically insignificant. In particular, for our quality-related outcome variables, the estimates do not suggest bias due to unobserved heterogeneity. For employment and part-time employment we observe a positive and partly significant trend (panels (a), (b), and (d)). However, a comparison of these results with those in the previous section shows that the placebo estimates are much closer to zero. Therefore, despite the possibility of overestimation due to unobserved heterogeneity in our employment effects, we still find evidence that child care affects maternal labor supply. This is especially the case for the periods when early public child care is most beneficial to mothers, i.e. in the second and third year after birth. As far as the employment effects of later years are concerned, we, however, need to be cautious because our placebo-test does not cover the full ten years after birth.

(a) Employed (0/1)

(b) Employed (days)



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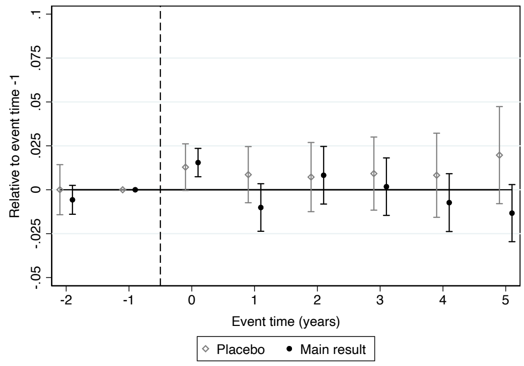
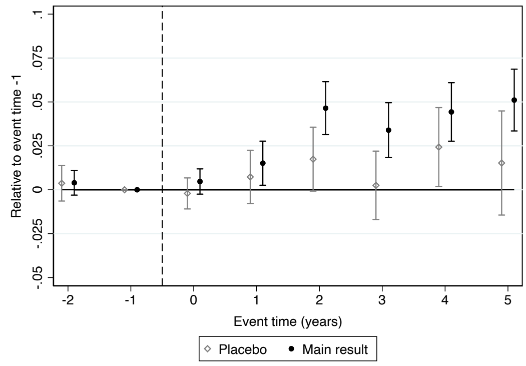
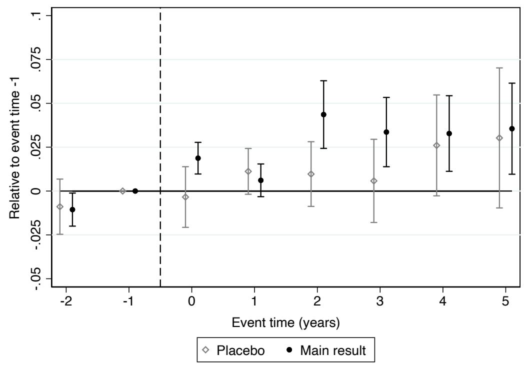
(c) Full-time (0/1)



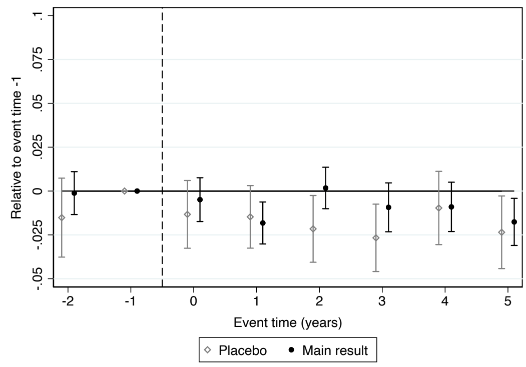
(d) Part-time (0/1)



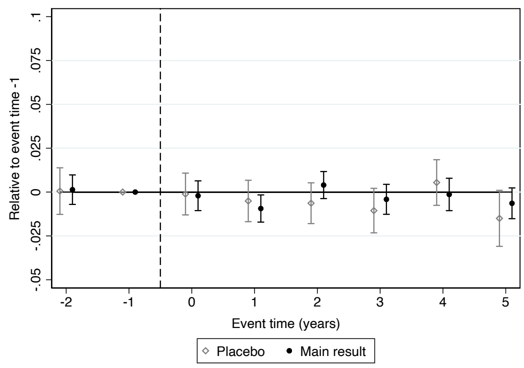
(e) Annual earnings (normalized)



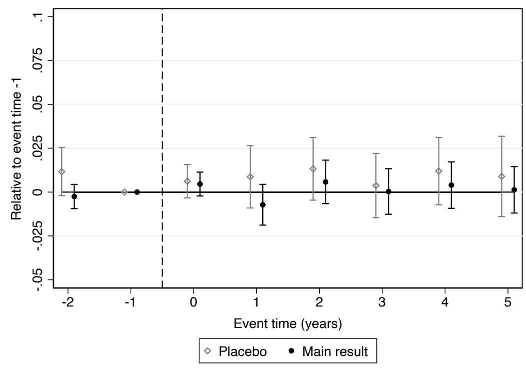
(f) Change of employer (0/1)



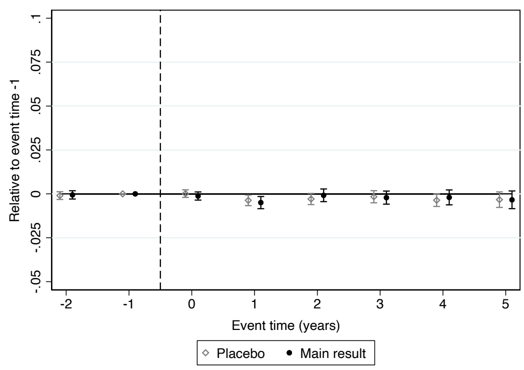
(g) Change of job (0/1)



(h) Abstract task (0/1)



(i) Managerial responsibilities (0/1)



(j) Distance to median wage

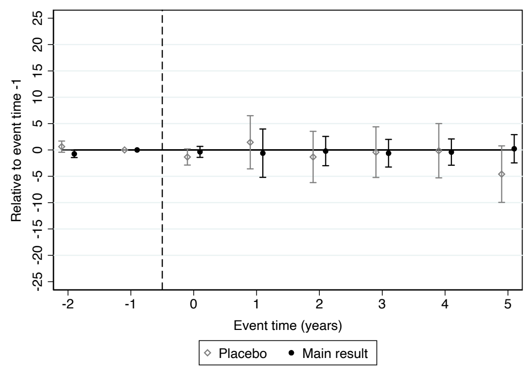


Figure 7. Placebo effect of child care. The figures show the coefficients on the interaction term in Equation (2). All of these statistics are estimated on a sample of mothers who have their first child between 1999–2004, i.e., before the child care reforms and who were regularly employed in the year prior to birth. All figures include 95 percent confidence intervals around the event time coefficients. These confidence intervals are based on standard errors clustered at the county level.

4.3 Fertility effects

Next, we have a closer look at the effect of public child care on fertility. In general, there are two ways in which the availability of public child care can affect fertility: First, it can affect the fundamental decision to have children (including the timing) and thus affect fertility at the extensive margin. If so, the estimates of the impact of child care on maternal career trajectories documented in the previous section may be biased. To check whether such selective fertility is an issue in our setting, we restrict our sample to women in fertile age (i.e., women aged 15 to 44) and estimate an event study similar to Equation (2) using the start year of the child care reforms (2005) as the event and a dummy indicating whether a woman gave birth to her first child at a given event time as the dependent variable. The results are plotted in Figure 8 and provide no evidence for changes of fertility at the extensive margin in the post-reform period.

Second, the increase in child care may affect the number of children a mother has. While our data cover primarily first-order births (see Section 2.2), making it impossible to analyze the effect on fertility at the intensive margin, Bauernschuster et al. (2016) provide evidence that the German child care expansion indeed increased the number of second and third births. We should therefore interpret our results against the backdrop that child care may have led women in high expansion counties to have more children, which is part of the effect and not a confounding factor.

4.4 Selective migration

To avoid problems due to selective migration of mothers after birth, we assign mothers to high and low expansion counties on basis of their place of residence before childbirth and thus estimate intention-to-treat effects. However, another potential problem for our identification strategy arises if women who are more attached to the labor market move from low to high expansion counties in expectation of the birth of their first child. In this case we would be overestimating the impact of child care on maternal labor market outcomes, as this could then also be due to changes in population characteristics.

In order to ensure that the latter is not the case, we follow Krapf et al. (2020) and re-estimate our event study using a sample of women who lived in the same county in both the two years before the birth and the two years after the birth. This restriction reduces our sample by about 26%. As we can see in Figure A7 in the Appendix, the estimates are qualitatively and quantitatively similar to our results in the previous section. Thus, these findings suggest that selective migration does not bias our results.

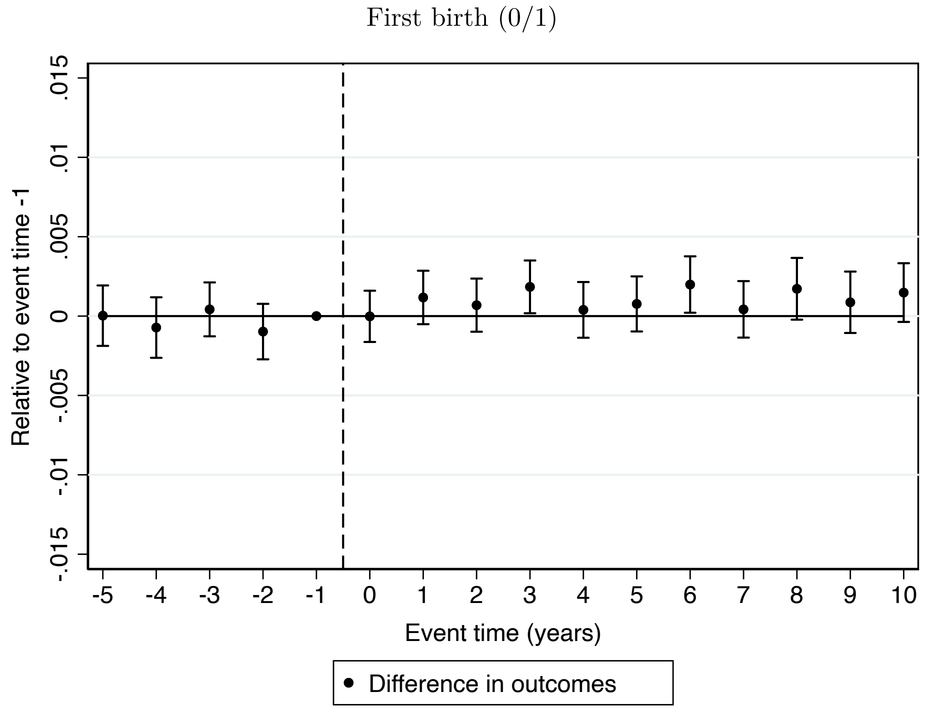


Figure 8. Child care and fertility: Event study estimates. The figures show the coefficients of the interaction term of an equation similar to Equation (2). Event times are defined relative to the start of the child care reforms in 2005, year dummies are omitted due to perfect multicollinearity with the event time dummies. The outcome is a dummy variable for having a (first) child. All of these statistics are estimated on a sample of women aged between 15 and 44. All figures include 95 percent confidence intervals around the event time coefficients. These confidence intervals are based on standard errors clustered at the county level.

4.5 Parental leave reform in 2007

One might also be concerned about the existence of another policy affecting maternal labor supply and that took place during the same observation period. A major parental leave reform passed by the German government in 2007 is an example of such a policy. Among other things, this reform replaced a means-tested parental leave benefit, targeted at lower-income families and paid for a maximum of two years, with an earnings-dependent system, which favors higher-income women by paying a certain share of the mother's pre-birth income for up to one year (e.g., Kluve & Tamm, 2013). As this reform affected all German counties equally, year fixed effects should absorb the effects of the reform on maternal labor market outcomes. However, if for some reason the impact of the reform varies systematically across counties, our results may be biased.

To explore this issue further, we make use of previous literature suggesting that it is indeed highly educated mothers who benefit most from the new parental leave regulation and adjust their labor supply accordingly (see, e.g., Huber, 2019; Kleven et al., 2022; Kluve & Tamm, 2013). We then follow Bauernschuster et al. (2016) and include an interaction term of a post-2007 dummy and educational attainment to allow for changes in the relationship between women's education and employment after the parental leave reform. As expected, Table A4 in the Appendix shows that this interaction coefficient is negative and significant for our labor supply outcomes. What is more important, however, is that our results on the effect of public child care on mothers' career trajectories still show the same pattern as before (see Figure A7 in the Appendix).

4.6 Alternatives to median split

In the event study specifications described in Section 3, we define a county as high expansion county if it had an above-median increase in public child care coverage between 2002 to 2009, and low expansion counties as those with an increase below the median. Thus, counties close to the median did not experience a particularly strong or weak expansion of child care slots, but still belong to one of the two groups. If the differences in outcomes are more pronounced for larger differences in child care availability, the median split definition could lead to an underestimation of the effect.

We therefore apply an alternative definition in which we compare more extreme cases by dividing the counties into three terciles in terms of their increase in childcare coverage between 2002 and 2009. We then compare only the bottom tercile (low expansion) and the top tercile (high expansion) and drop observations in the middle. Figure A7 shows that the results on all outcomes remain virtually unchanged. The zero effect on our quality outcomes is thus not driven by our definition of high and low expansion counties.

5 Discussion and conclusion

In this paper, we examine the impact of public child care on mothers' career trajectories, taking into account both quantitative and qualitative dimensions of employment. We investigate this question using an event study approach that compares a variety of labor market outcomes of mothers living in high and low child care expansion counties in the years surrounding the birth of their first child. Our empirical analysis draws on a combination of administrative data from the Sample of Integrated Labor Market Biographies (SIAB 7519), county-level data on child care coverage and the BIBB/BAuA Employment Survey 2018. Moreover, we take advantage of a set of German reforms leading to substantial temporal and spatial variations in child care coverage for children under three.

We find that public child care can help mothers to return to the labor market more quickly after having their first child. However, our results also suggest that the increase in employment is mainly due to an increase in part-time employment and is not associated with changes in the quality of maternal careers. In addition, our heterogeneity analysis reveals that the effects are similar for mothers with different pre-birth income or education, for mothers in different occupations in terms of family friendliness, and for mothers in firms of different quality. Our results therefore suggest that public child care has a positive impact on maternal labor supply, but that this impact does not translate into higher quality careers, at least in the specific German setting. In the following, we provide some potential explanations that may be worth exploring further.

First, despite the progress made in expanding child care provision, there are still significant gaps between supply and demand for child care slots. In 2022, for example, the coverage rate was just above 35%, while almost 50% of parents with children under the age of three reported a need for child care (BMFSFJ, 2022). Moreover, in 2019, the end of our sample period, only 14% of children under three in West Germany attended full-day child care (DESTATIS, 2022). This suggests that mothers who want to combine a career and children are dependent on (additional) informal care arrangements, which may not always be available. In addition, the large excess demand may also mean that parents are not offered a place in a public child care facility, but a place with a private childminder. Compared to staff in public child care facilities, private childminders usually do not have a professional degree (Geis-Thöne, 2020), which may lead some parents to choose to adapt their working arrangements in order to look after their child themselves.

Second, although formal child care helps mothers to spend more time at work, it may have some negative side effects that have received little attention in the literature. For example, child care centers are prone to the transmission of infectious diseases because many children from different places interact and exchange viruses and bacteria (see, e.g., Barschkett, 2022; Brady, 2005). Consequently, children who spend more time in child care centers are more likely to be sick, which may require at least one parent to take child-related sick leave. In light of recent literature on gender gaps in external demands for parental involvement suggesting that mothers are more likely to be contacted by, for example, schools or doctors' offices (Buzard et al., 2023), this suggests further challenges for mothers in combining early parenthood with full-time work or demanding jobs with children.

Third, the limited effect of public child care on maternal career trajectories may also reflect preferences or persistent gender norms, which are known to be relatively conservative in German-speaking countries. Kleven et al. (2022), for example, find that a large expansion of child care provision in Austria does not seem to have altered the strong preferences for maternal care, which seems to be an important reason why child care has had virtually no effect on female labor market outcomes. Thus, regardless of the availability of child care, mothers may still not work or only work limited hours because they simply prefer to care for their child themselves. In contrast, Boelmann et al. (2021) show that exposure to more egalitarian gender norms—both in early childhood and in the work environment—not only leads mothers to return to work more quickly, but also to work more hours.

All in all, our results therefore do not suggest that public child care is ineffective in promoting mothers' careers. Rather, it seems that the German context requires more efforts at different levels to further support gender convergence in the labor market. For example, there is still a need for further expansion of public child care in the majority of German counties, which may ultimately also help to address enrollment gaps in day care an thus other forms of inequality (see, e.g., Hermes et al., 2022; Jessen et al., 2020). In this context, future research on how child care should be organized to meet mothers' needs and the extent to which the (perceived) quality of care plays a role may be particularly fruitful. Finally, given the still prevailing gender norms, future research may further focus on factors other than government interventions to increase gender convergence.

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A Appendix

A.1 Figures

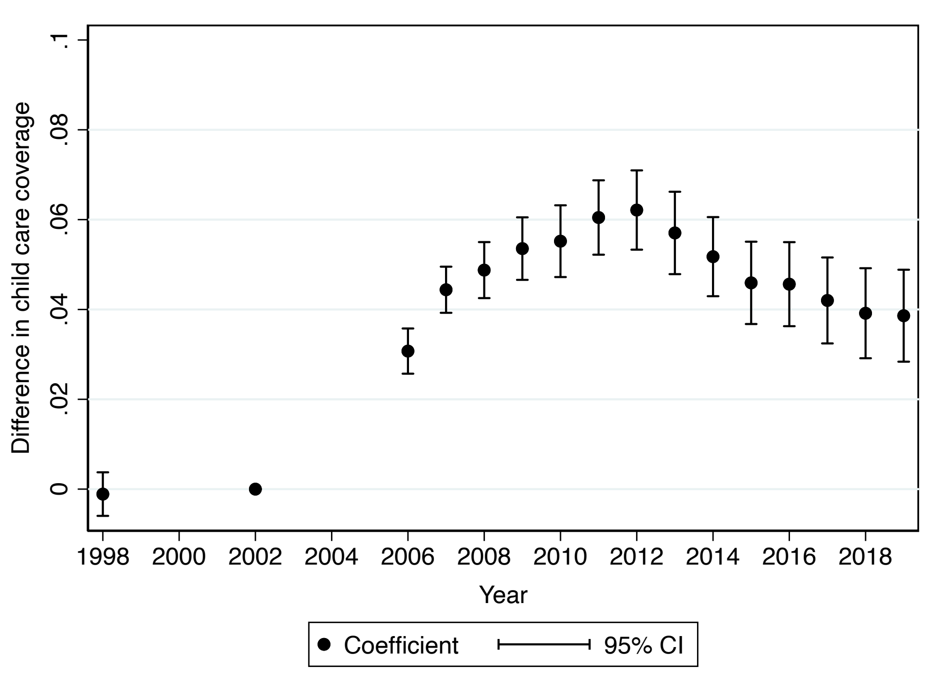


Figure A1. Child care coverage over time. Graph depicts emerging differences in child care coverage between high and low expansion counties net of differences in child care coverage rates due to demand side factors (population density, GDP per capita, male employment rate, interpolated conservative vote share, share of highly-educated females, and age structure controls).

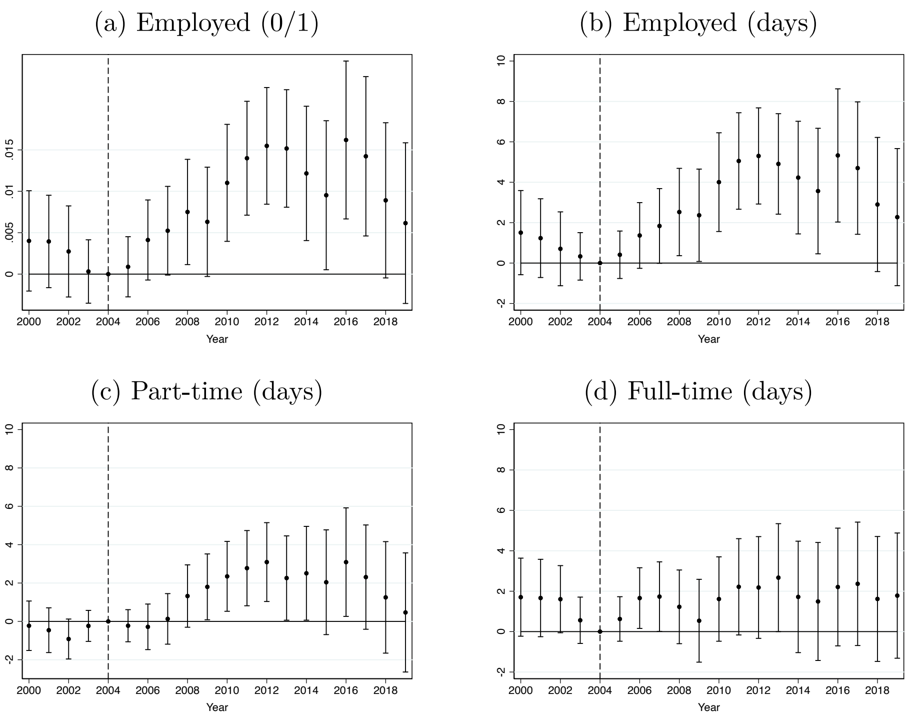


Figure A2. Replication of Bauernschuster et al. (2016): DID estimates. The figures show the effect of public child care on female employment estimated in a basic DID model that allows for effects before and during the child care expansion which started in 2005. The treatment group consists of women aged 15-44 living in counties with an above-median increase in child care coverage rates from 2002 until 2009. The control group consists of women of the same age living in counties with a below-median increase in child care coverage rates from 2002 until 2009. The model includes regional controls (i.e. population density, GDP per capita, male employment rate, interpolated conservative vote share, share of highly-educated females, and age structure controls) as well as individual-level controls (i.e. education level, age and nationality). All figures include 95 percent confidence intervals around the coefficients. These confidence intervals are based on standard errors clustered at the county level.

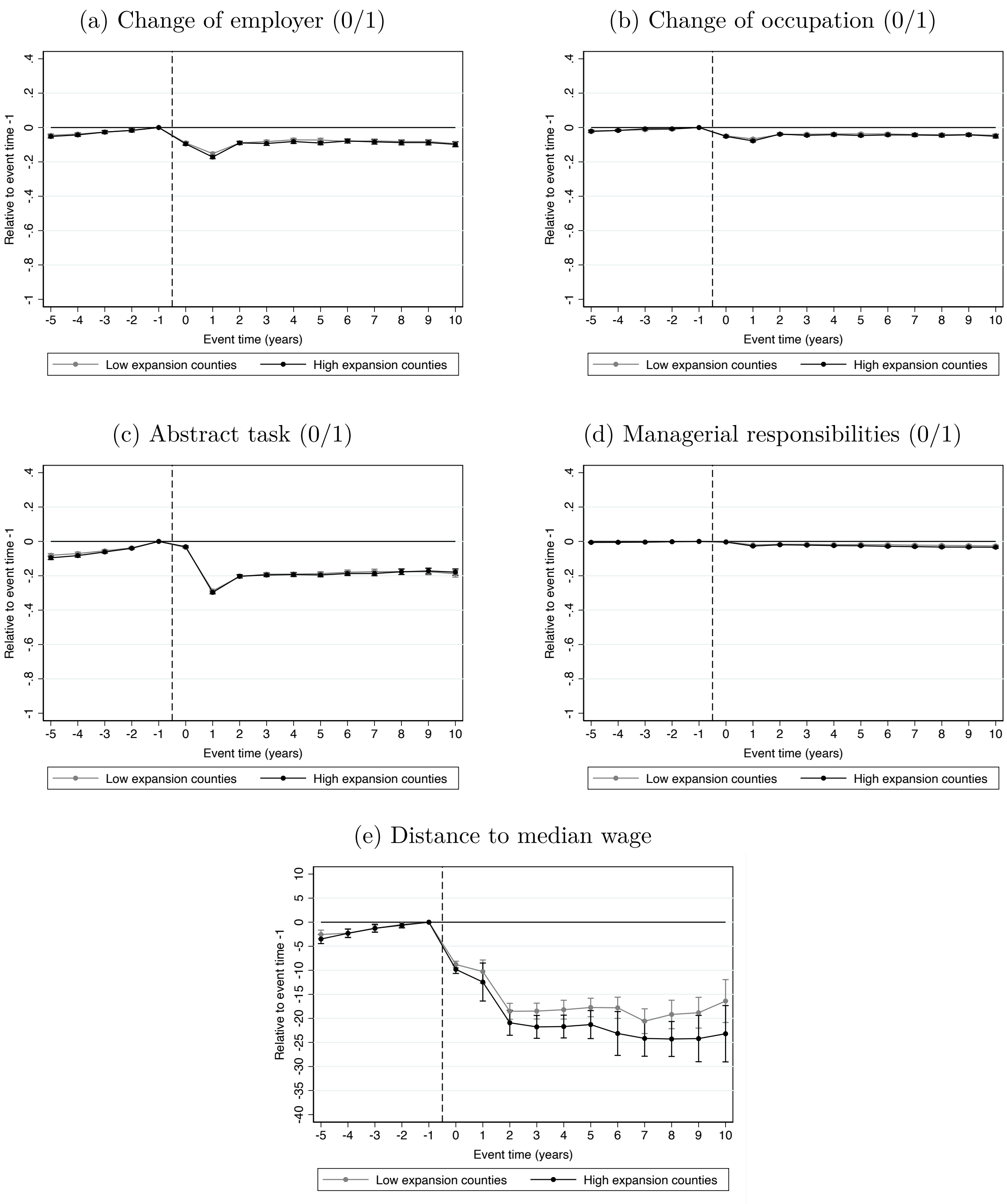
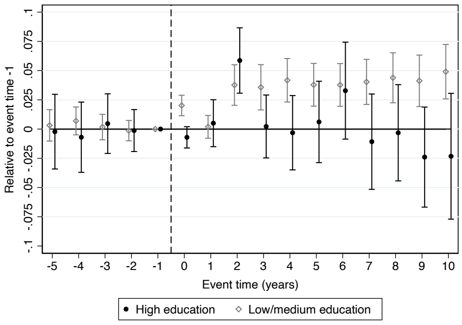
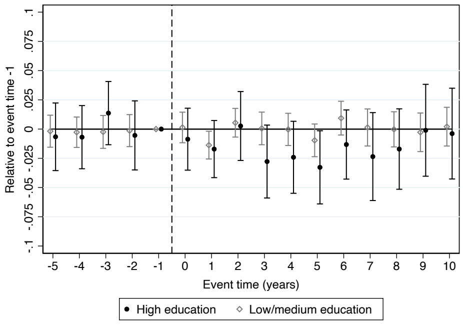


Figure A3. Child care and the quality of maternal careers: Event study estimates. The figures show the event time coefficients estimated from Equation (1). All of these statistics are estimated on a sample of mothers who have their first child between 2005–2019 and were regularly employed in the year prior to birth. All figures include 95 percent confidence intervals around the event time coefficients. These confidence intervals are based on standard errors clustered at the county level.

(a) Employed (0/1)



(b) Change of employer (0/1)



(c) Abstract task (0/1)

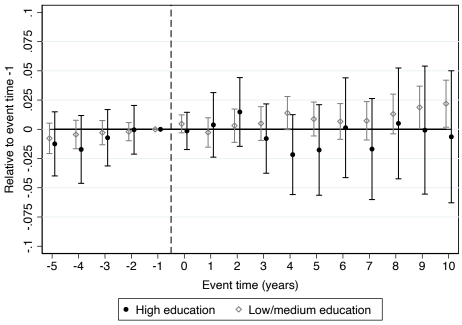


Figure A4. Heterogeneous effects of child care by pre-birth education level: Event study estimates for a dummy for being employed, a dummy for a change of employer, and a dummy for being employed in a job with abstract tasks. The gray dots show the coefficients of the interaction terms of event time dummies and the group dummy. The black dots depict the sum of the coefficients of the interaction between event time dummies and the group indicator and the the triple interaction with the subgroup indicator. All of these statistics are estimated on a sample of mothers who have their first child between 2005–2019 and who were regularly employed in the year prior to birth. All figures include 95 percent confidence intervals around the event time coefficients. These confidence intervals are based on standard errors clustered at the county level.

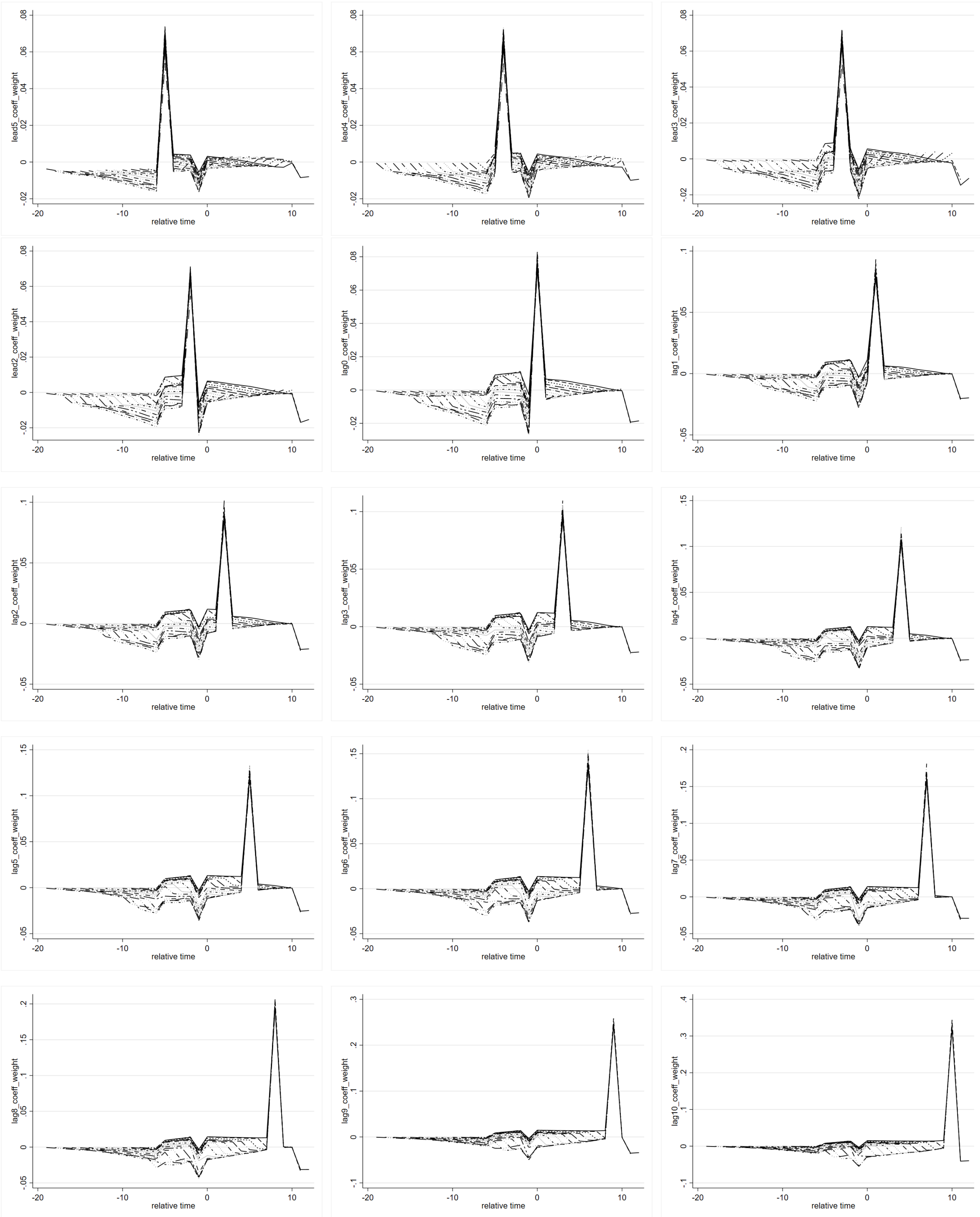
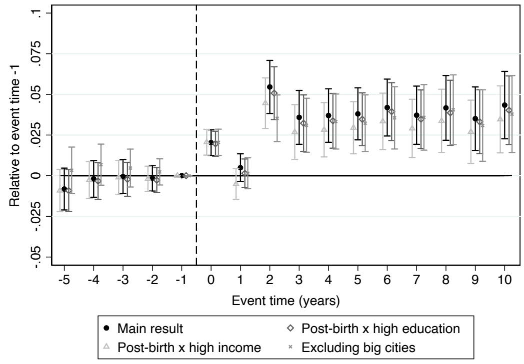
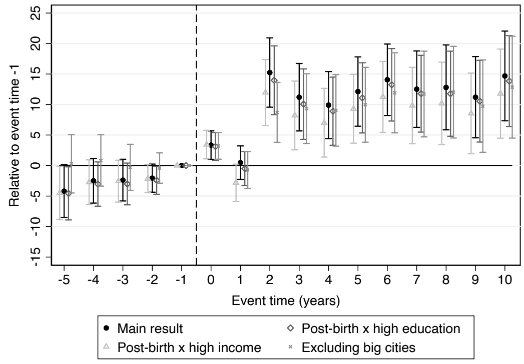


Figure A5. Lead and lag specific weights. The figure shows that in a dynamic two-way fixed effects specification, the estimated event study coefficients are combinations of their own and other period effects. We employ Sun & Abraham (2021) 's publicly available Stata package *eventstudyweights* to estimate the weights.

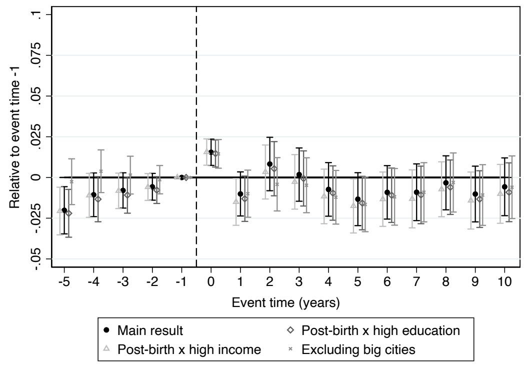
(a) Employed (0/1)



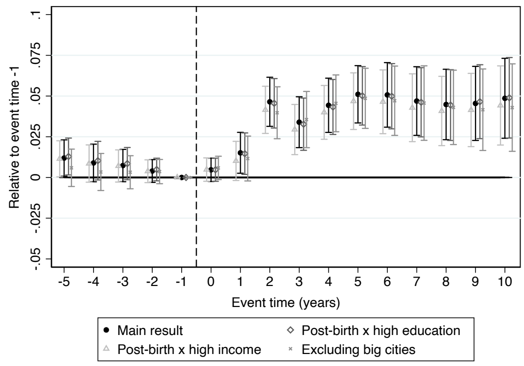
(b) Employed (days)



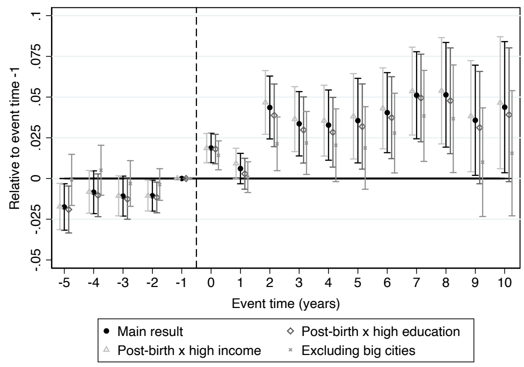
(c) Full-time (0/1)



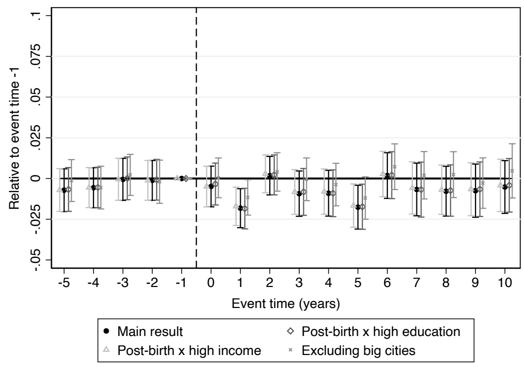
(d) Part-time (0/1)



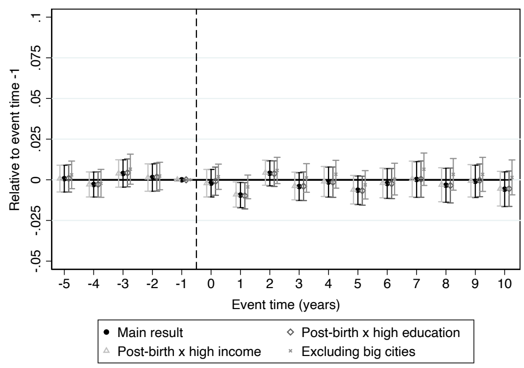
(e) Annual earnings (normalized)



(f) Change of employer (0/1)



(g) Change of occupation (0/1)



(h) Abstract task (0/1)

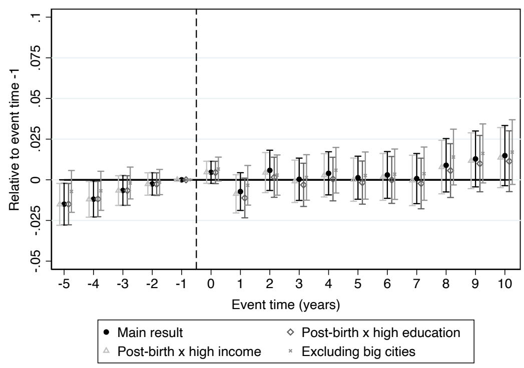


Figure A6. Continued on next page

(i) Managerial responsibilities (0/1) (j) Distance to median wage

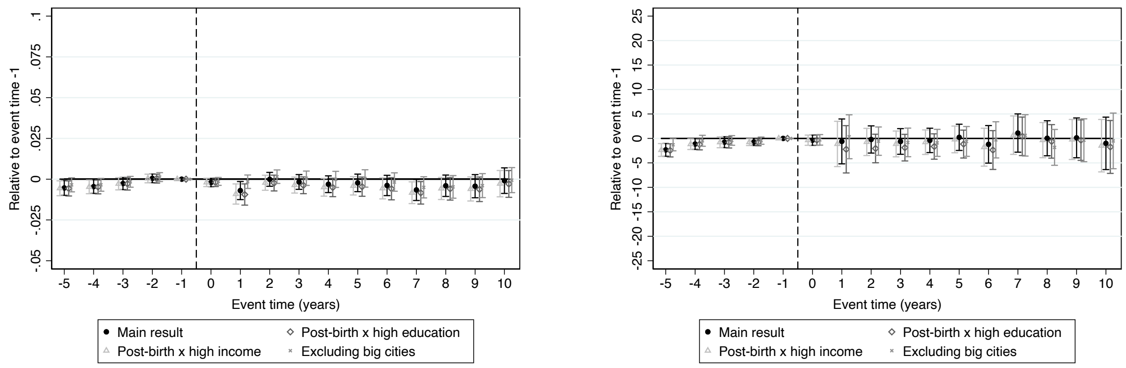
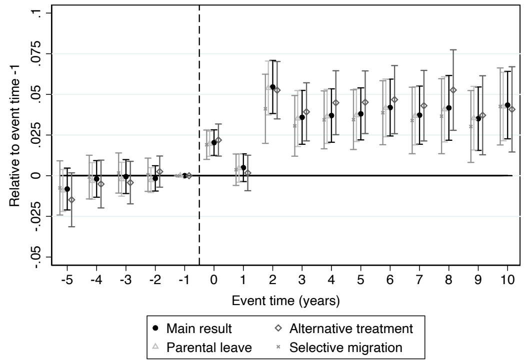
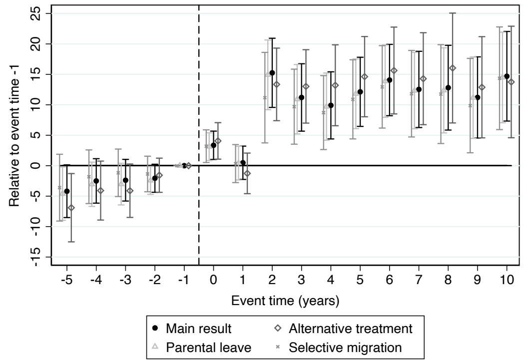


Figure A6. Differences between mothers in high and low expansion counties. The figures show the coefficients on the interaction term in Equation (2). The black dots show the main result from Figure 3 and Figure 4. The diamonds depict coefficient estimates when additionally including an interaction term between pre-birth education and a post-birth dummy. The triangles show coefficient estimates when additionally including an interaction term between an indicator for high pre-birth income and a post-birth dummy. The crosses represent estimates after excluding big cities from the sample (see section 4.2). All figures include 95 percent confidence intervals around the event time coefficients. These confidence intervals are based on standard errors clustered at the county level.

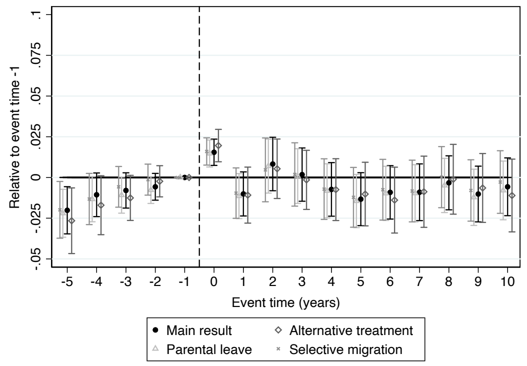
(a) Employed (0/1)



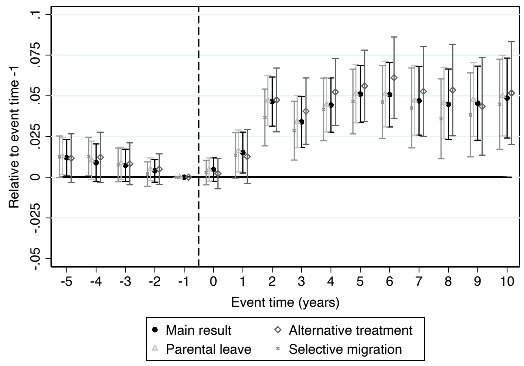
(b) Employed (days)



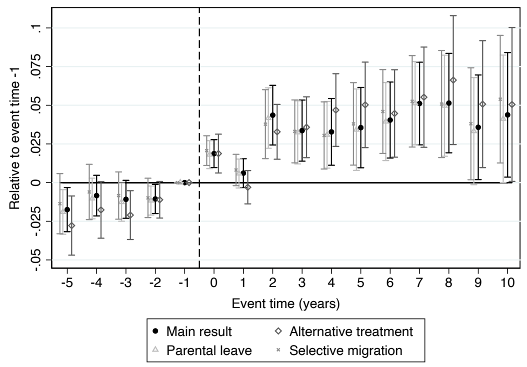
(c) Full-time (0/1)



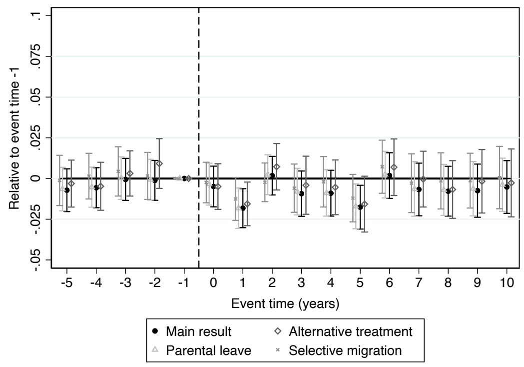
(d) Part-time (0/1)



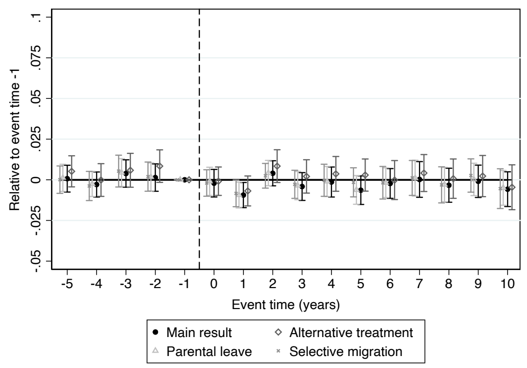
(e) Annual earnings (normalized)



(f) Change of employer (0/1)



(g) Change of occupation (0/1)



(h) Abstract task (0/1)

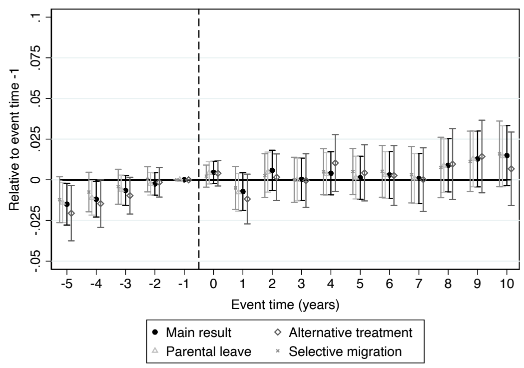
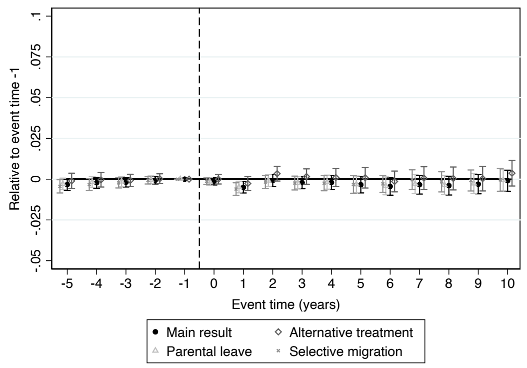


Figure A7. Continued on next page

(i) Managerial responsibilities (0/1)



(j) Distance to median wage

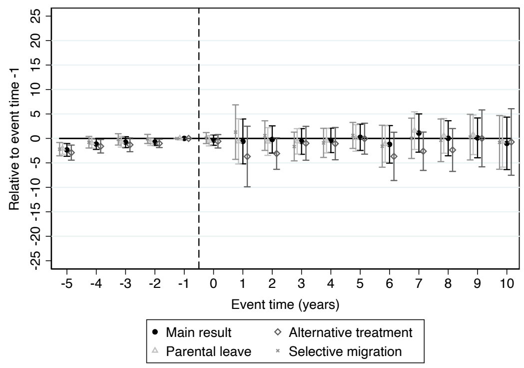


Figure A7. Summary of robustness checks. The figures show the coefficients on the interaction term in Equation (2). The black dots show the main results from Figure 3 and Figure 4. The triangles represent coefficient estimates when additionally including an interaction term of a post-2007 dummy and educational attainment (see section 4.5). The crosses depict estimates when using a sample restricted to mothers who lived in the same county two years before and after birth (see section 4.4). The diamonds show the coefficients obtained with an alternative definition of high and low expansion counties (see section 4.6). All figures include 95 percent confidence intervals around the event time coefficients. These confidence intervals are based on standard errors clustered at the county level.

A.2 Tables

Table A1. Child care coverage rates over time

Year	N	Mean	Median	SD	Min	Max
1998	324	0.017	0.009	0.020	0.000	0.117
2002	324	0.022	0.015	0.023	0.000	0.131
2007	324	0.094	0.085	0.044	0.022	0.289
2008	324	0.118	0.109	0.048	0.033	0.352
2009	324	0.142	0.135	0.050	0.037	0.359
2010	324	0.171	0.163	0.053	0.071	0.365
2011	324	0.196	0.189	0.057	0.092	0.376
2012	324	0.222	0.215	0.059	0.108	0.402
2013	324	0.241	0.236	0.060	0.113	0.442
2014	324	0.270	0.266	0.058	0.140	0.467
2015	324	0.273	0.271	0.058	0.130	0.470
2016	324	0.271	0.270	0.059	0.143	0.479
2017	324	0.277	0.278	0.058	0.137	0.454
2018	324	0.283	0.288	0.060	0.136	0.445
2019	324	0.293	0.295	0.061	0.145	0.466
Total	4,860	0.193	0.202	0.106	0.000	0.479

Notes: The table shows the number of West German counties observed, the mean, the median, the standard deviation, and the minimum/maximum values of public child care coverage for all years in which data are provided. Data source: Regional Statistics, Inkar.

Table A2. Differences between mothers in high and low expansion counties prior to first birth

	Total sample Mean	Treatment Mean	Control Mean	Difference t-stat
Dependent variables				
Employed (0/1)	1.00	1.00	1.00	-
Employed (days)	355.43	355.71	355.12	1.60
Annual earnings	31,223.05	33,107.46	29,174.63	18.96
Annual earnings normalized	1.00	1.00	1.00	-
Full-time (0/1)	0.81	0.82	0.80	3.37
Part-time (0/1)	0.19	0.18	0.20	-3.37
Abstract task (0/1)	0.32	0.33	0.32	1.82
Managerial responsibilities (0/1)	0.02	0.03	0.02	3.62
Distance to median wage	4.59	6.51	2.47	8.40
Individual level variables				
Age	28.71	28.94	28.45	9.90
German	0.90	0.89	0.91	-6.67
High education	0.20	0.23	0.16	16.67
County level variables				
Population density	569.42	553.54	585.31	-0.41
Employment rate males	0.64	0.64	0.65	-0.97
GDP per capita	33.26	34.34	32.17	1.35
Conservative vote share	0.39	0.39	0.39	-0.49
Share highly educated females	0.09	0.10	0.08	4.08
Share female students	0.02	0.03	0.02	2.74
Share females aged 15-19	0.15	0.15	0.15	-3.27
Share females aged 20-24	0.16	0.16	0.16	1.00
Share females aged 25-29	0.16	0.16	0.16	1.20
Share females aged 30-34	0.16	0.16	0.16	1.18
Share females aged 35-39	0.18	0.18	0.18	0.26
Share females aged 40-44	0.20	0.20	0.20	0.19
Share population aged 45-49	0.08	0.08	0.08	1.75
Share population aged 50-54	0.08	0.08	0.08	1.04
Share population aged 55-59	0.07	0.07	0.07	0.41
Share population aged 60-64	0.06	0.06	0.06	-0.33
Share population aged 65-69	0.06	0.06	0.06	-0.83
Share population aged 70-74	0.05	0.05	0.05	-1.09

Notes: Column 1: mean of all women who have a first birth between 2005-2019. Columns 2-3: means of respective mothers in the high an low expansion counties. Column 4: Difference in means between mothers in the high an low expansion counties. t-stat based on linear regressions of the respective variables on the group indicator. Earnings related measures are in EUR. *High education* is defined as having a university (of applied sciences) degree. *Share of female students* is measured as share of female university/college students of total female population; *Share of highly educated females* is the share of female employees with academic degree of female population aged 20-64; *Share of females* in specific age groups is the share of the respective age group in relation to all females in fertile age (up to 44 years); *Share of population* in specific age group refers to the share in the overall population of a county.

Table A3. Differences between mothers in high and low expansion counties prior to first birth (excl. ten largest German cities)

	Total sample Mean	Treatment Mean	Control Mean	Difference t-stat
Dependent variables				
Employed (0/1)	1.00	1.00	1.00	-
Employed (days)	355.67	356.12	355.30	2.09
Annual earnings	30,048.63	31,169.64	29,121.61	9.77
Annual earnings normalized	1.00	1.00	1.00	-
Full-time (0/1)	0.81	0.81	0.80	2.22
Part-time (0/1)	0.19	0.19	0.20	-2.22
Abstract task (0/1)	0.32	0.32	0.32	0.74
Managerial responsibilities (0/1)	0.02	0.02	0.02	2.03
Distance to median wage	3.22	4.15	2.44	3.55
Individual level variables				
Age	28.49	28.56	28.43	2.31
German	0.91	0.91	0.91	-1.43
High education	0.17	0.18	0.16	6.12
County level variables				
Population density	512.18	450.20	571.85	-1.82
Employment rate males	0.64	0.64	0.65	-0.66
GDP per capita	32.57	33.02	32.14	0.57
Conservative vote share	0.39	0.39	0.39	-0.09
Share highly educated females	0.09	0.10	0.08	3.32
Share female students	0.02	0.03	0.02	2.41
Share females aged 15-19	0.15	0.15	0.15	-2.48
Share females aged 20-24	0.16	0.16	0.15	1.09
Share females aged 25-29	0.16	0.16	0.16	0.46
Share females aged 30-34	0.16	0.16	0.16	-0.31
Share females aged 35-39	0.18	0.18	0.18	0.13
Share females aged 40-44	0.20	0.20	0.20	0.70
Share population aged 45-49	0.08	0.08	0.08	2.08
Share population aged 50-54	0.08	0.08	0.08	1.79
Share population aged 55-59	0.07	0.07	0.07	1.18
Share population aged 60-64	0.06	0.06	0.06	0.27
Share population aged 65-69	0.06	0.06	0.06	-0.40
Share population aged 70-74	0.05	0.05	0.05	-0.71

Notes: Column 1: mean of all women who have a first birth between 2005-2019. Columns 2-3: means of respective mothers in the high an low expansion counties. Column 4: Difference in means between mothers in the high an low expansion counties. t-stat based on linear regressions of the respective variables on the group indicator. Earnings related measures are in EUR. *High education* is defined as having a university (of applied sciences) degree. *Share of female students* is measured as share of female university/college students of total female population; *Share of highly educated females* is the share of female employees with academic degree of female population aged 20-64; *Share of females* in specific age groups is the share of the respective age group in relation to all females in fertile age (up to 44 years); *Share of population* in specific age group refers to the share in the overall population of a county. The analysis is based on a sample that excludes individuals living in one of the ten largest cities in Germany.

Table A4. Validity check - Parental leave reform: Event study estimates

	Employed (0/1)	Full-time (0/1)	Part-time (0/1)	Annual earnings (normalized)
Event -5 x Child care	-0.009	-0.022	0.013	-0.019
	(0.007)	(0.008)	(0.006)	(0.007)
Event -4 x Child care	-0.003	-0.013	0.010	-0.010
	(0.006)	(0.007)	(0.006)	(0.007)
Event -3 x Child care	-0.002	-0.011	0.009	-0.013
	(0.005)	(0.006)	(0.005)	(0.006)
Event -2 x Child care	- 0.003	-0.008	0.005	-0.012
	(0.004)	(0.004)	(0.004)	(0.005)
Event 0 x Child care	0.020	0.015	0005	0.018
	(0.004)	(0.004)	(0.004)	(0.005)
Event +1 x Child care	0.005	-0.011	0.016	0.006
	(0.004)	(0.007)	(0.007)	(0.005)
Event +2 x Child care	0.054	0.007	0.047	0.042
	(0.008)	(0.008)	(0.008)	(0.01)
Event +3 x Child care	0.035	0.001	0.034	0.032
	(0.009)	(0.009)	(0.008)	(0.01)
Event +4 x Child care	0.036	-0.008	0.045	0.031
	(0.008)	(0.008)	(0.009)	(0.011)
Event +5 x Child care	0.037	-0.014	0.051	0.034
	(0.008)	(0.008)	(0.009)	(0.013)
Event +6 x Child care	0.042	-0.010	0.051	0.039
	(0.009)	(0.008)	(0.010)	(0.013)
Event +7 x Child care	0.037	- 0.010	0.047	0.051
	()0.009)	(0.009)	(0.011)	(0.014)
Event +8 x Child care	0.041	-0.005	0.046	0.05
	(0.010)	(0.008)	(0.011)	(0.017)
Event +9 x Child care	0.035	-0.012	0.048	0.033
	(0.010)	(0.009)	(0.012)	(0.018)
Event +10 x Child care	0.043	-0.008	0.050	0.041
	(0.010)	(0.009)	(0.013)	(0.021)
Post07 x Highly educated	-0.010	-0.007	-0.004	-0.012
	(0.004)	(0.004)	(0.003)	(0.005)
Event time dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Age dummies	Yes	Yes	Yes	Yes
N	371,985	371,927	371,927	371,985

Notes: Event study estimates. The table shows the coefficients on the interaction term in Equation (2) and the interaction term of a post-2007 dummy and educational attainment. All of these statistics are estimated on a sample of mothers who have their first child between 2005–2019 and who were regularly employed in the year prior to birth. Robust standard errors are clustered at the county level and given in parentheses.