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ABSTRACT

Caring Dads? Universal Childcare, Paternity Leave and Fathers' Involvement*

Increasing fathers' involvement in childcare is seen as an important strategy to reduce women's child penalties in the labour market. However, very little is known about the extent to which family policies can enhance fathers' engagement in domestic work. This paper examines the impact of the combined availability of universal childcare and paternity leave on fathers' involvement. We exploit quasi-experimental variation in the regional availability of childcare for children under three, resulting from the introduction of a universal childcare entitlement in Germany. We estimate generalised difference-in-differences models and confirm that children enter childcare significantly earlier. Fathers become more likely to take paternity leave with the expectation of mothers entering the labour market sooner. Yet, this leave is mainly taken for the minimum period, together with the mother, and towards the end of the first year. Fathers' subsequent roles as caregivers, as well as their labour market outcomes, remain largely unaffected. Overall, increased childcare availability primarily substitutes maternal care; significant family policy efforts could not immediately alter fathers' caregiving responsibilities within the family.

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1. Introduction

With the birth of children, women experience significant setbacks in their labour market outcomes and take on a larger share of domestic work (Cortés and Pan, 2023, Kleven et al., 2023, Huebener and Odermatt, 2024, Goldin et al., 2024). Despite some increases in fathers' involvement in domestic work over the last few decades (Bartova and Keizer, 2020), their participation in child-rearing stagnates, and mothers continue to be the primary providers of childcare (Kan et al., 2011, Altintas and Sullivan, 2016). However, in particular fathers' involvement in childcare, rather than housework, seems to hinder greater gender equality in labour market outcomes (Raley et al., 2012, Kleven et al., 2019).

While significant family policies, such as childcare provision and parental leave, aim to support mothers in balancing work and family, empirical evidence suggests their success in narrowing gender gaps remains limited (Zoch and Heyne, 2023, Kleven et al., 2024). We still know very little about the extent to which family policies affect fathers' involvement, particularly their role as caregivers. While the literature on the effects of fathers' parental leave is growing, the impact of subsidised childcare–one of the most important measures to support mothers in the labour market–on fathers' involvement has not yet been examined.

In this paper, we analyse whether the provision of universal, subsidised childcare impacts fathers' involvement in raising children. We explore this question within a framework that encourages fathers' involvement from early on through designated paternal leave. Germany undertook significant, orchestrated family policy reforms in an effort to promote maternal employment and enhance fathers' participation in caregiving. In 2007, the parental leave system was restructured to include designated parental leave periods specifically for fathers. In 2013, a legal entitlement to a subsidised childcare slot for children under the age of three was introduced, following a substantial expansion of childcare services in the years leading up to the reform. On these grounds, we study the effects of publicly subsidised childcare on fathers' involvement in childcare, starting with their early engagement through parental leave-taking, to their subsequent responsibility for childcare and labour supply decisions.

To understand how the provision of subsidised childcare may impact fathers' involvement, it is helpful to consider the theoretical mechanisms behind parents' allocation of their time between paid work and caregiving activities. The traditional division of paid and unpaid

work, often referred to as the male breadwinner model, is rooted in comparative advantage theory (Becker, 1973, 1974). If mothers take on active caregiving roles early on, they tend to specialise in childcare, while fathers, focusing on the labour market, spend less time with the child. These early disparities, often driven by differences in the costs or capabilities of providing childcare, can create lasting inequality in parenting roles.

One argument for increased paternal involvement through universal childcare relates to women's employment: with access to childcare, mothers may re-enter the labour market sooner, which can reduce their comparative advantage in childcare. The increase in maternal labour supply also reduces mothers' available time for caregiving and increases their earnings, potentially strengthening their bargaining position within the household to better distribute domestic tasks according to their preferences (e.g., Manser and Brown, 1980, Blau, 2001). This mechanism could increase fathers' involvement even before children enter childcare and mothers return to work earlier. With their anticipated earlier re-entry, couples could allocate care and market work more equally from the beginning, e.g. through increased paternal leave and a more equal division of parental leave between the partners. Fathers who engage in more caregiving from the beginning may strengthen their bonds with the child, further supporting their sustained involvement in childcare. Finally, significant changes in childcare policies and parental leave for fathers can alter prevailing norms regarding the roles of mothers and fathers as caregivers and the employment of mothers of young children (Unterhofer and Wrohlich, 2017, Zoch and Schober, 2018, Farré et al., 2023), which may then translate into increased involvement of fathers in childrearing (Bulanda, 2004).

Yet, there are also arguments as to why subsidised childcare may not significantly increase fathers' involvement. Unlike other types of unpaid work, caring for children is not widely viewed as undesirable work to be avoided or outsourced, even for parents with a stronger attachment to the labour market. Mothers may prefer to maintain their levels of childcare more than those for housework. The literature suggests that maternal employment shows only a weak association with increased paternal childcare, though it correlates more strongly with fathers' participation in housework (Raley et al., 2012). Additionally, some studies suggest that mothers may be reluctant to share childcare responsibilities with other caregivers, including fathers, a phenomenon often referred to as 'maternal gatekeeping' (Allen

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and Hawkins, 1999). Compared to housework, mothers might experience greater hesitation in relinquishing childcare duties, driven by attachment or concerns over quality. Mothers may also feel guilt about outsourcing childcare, leading them to preserve quality time with their children regardless of their employment status (Hsin and Felfe, 2014). For fathers, the traditional role of breadwinner may still dominate their approach to parenting; some fathers feel they are providing the best care by ensuring their children receive primary care from their mother through their own employment and earnings (Townsend, 2002). Further, concerns about workplace discrimination and financial security might discourage fathers from dedicating more time to childcare (Grunow and Evertsson, 2016, 2019). Given these dynamics, external childcare may primarily substitute maternal care without substantially affecting paternal involvement. Based on these considerations, the effects of subsidised childcare on fathers' involvement in childrearing remain an empirical question. To our knowledge, we are the first empirical study examining the impact of universal childcare on fathers' involvement.

Our empirical analysis builds on rich individual-level data from the DJI Childcare Study (KiBS) regarding childcare needs and arrangements during various stages of childhood. We observe between 51,000 and 81,000 children and their parents under the age of three, making the data set the largest available survey data set in Germany to analyse childcare and its consequences. Leveraging the varying pace of the childcare expansion across counties, we employ a generalised difference-in-differences approach. We argue that the county variation in childcare rates is exogenous to unobserved determinants of fathers' involvement.[1]

Our results first show in detail that a higher regional childcare availability increases actual childcare attendance after children's first birthdays. Subsidised childcare availability increases fathers' parental leave take-up, aligning with the institutional incentives for both fathers and mothers. However, for fathers' continued involvement in caregiving on weekdays for children aged 12-35 months, we find no significant effects. We find suggestive evidence

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[1]Several prior studies examine the impact of the German childcare expansion, e.g., on fertility (Bauernschuster et al., 2016), child development (Felfe and Lalive, 2018), and child maltreatment (Sandner et al., 2024 (forthcoming)). They all provide evidence on the quasi-randomness of the regional pace of the childcare expansion. We discuss the implications of recent findings on treatment effect heterogeneity and negative weights in the new difference-in-differences literature (e.g. de Chaisemartin et al., 2024, Callaway et al., 2024) when we outline our empirical strategy in section 4, and provide related robustness checks leads and lags specifications as suggested by Schmidheiny and Siegloch (2023) in section 5.5.

of very small reductions in full-time employment among fathers during these ages. Yet, the main impact of subsidised childcare is on maternal employment, with significant increases in mothers' labour market participation and working hours. Overall, our results suggest that publicly subsidised childcare mainly substitutes for maternal caregiving, with little effect on fathers' involvement in childcare beyond their parental leave.

Our paper contributes to at least two strands of the literature. First, we shed new light on how family policies impact gender equality. In most high-income countries, parental leave policies and childcare provision are central to supporting women in the labour market, yet their impact on fathers' involvement remains largely unexplored. The small previous literature has primarily focused on paternity leave, with mixed findings regarding its effects on fathers' involvement (Canaan et al., 2022). Some studies find no effects of paternity leave on fathers' involvement in childcare or changes in the allocation of labour supply between parents (e.g., Ekberg et al., 2013, Cools et al., 2015).[2] Other studies suggest that paternity leave increases fathers' engagement in household chores and childcare (e.g., Kotsadam and Finseraas, 2011, Bünning, 2015, Patnaik, 2019, Tamm, 2019, Eerola et al., 2022, González and Zoabi, 2021).[3] However, the effects are often limited to specific household tasks or certain time frames (such as support on weekends). Moreover, the effects depend on the design of the parental leave system (e.g., Duvander et al., 2019, Canaan, 2022).

Our analysis shifts the focus from paternity leave policies to universal childcare provision and its potential to impact fathers' involvement. Importantly, we consider the interaction between these policies. We demonstrate that the provision of subsidised childcare increases fathers' early involvement through higher parental leave take-up, aligning with institutional incentives. Our data allow us to examine in detail how long fathers claimed parental leave, at what age the child was, and whether the father spent this time with the child as the main caregiver, or together with the partner. Fathers' parental leave effects concentrate on two months (the minimum duration to be eligible for benefits) towards the end of the

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[2]Ekberg et al. (2013) show that one month of exclusive paternity leave in Sweden increased fathers' time off work after birth without affecting fathers' subsequent take-up of leave to care for sick children.

[3]Another set of studies examines the effects of paternity leave, or "fathers' quotas", on marital stability, producing mixed findings depending on the context (Avdic and Karimi, 2018, Olafsson and Steingrimsdottir, 2020, González and Zoabi, 2021).

first year, mainly alongside the partner. Despite increased paternal leave, the provision of subsidised childcare does not lead to greater paternal involvement in childrearing later on. In the context of the paternal leave literature, our findings show that increased paternal leave does not always correspond with effects on fathers' later involvement. Overall, the findings suggest that while subsidised childcare facilitates maternal employment, its impact on fathers' sustained involvement in childrearing is very limited.

Second, our paper contributes to a deeper understanding of the individual and societal benefits of publicly subsidised childcare, particularly regarding fathers' involvement—an aspect that has received limited attention in the literature. The literature thus far has mostly focused on the effects of childcare expansions on maternal employment (e.g., Baker et al., 2008, Bauernschuster and Schlotter, 2015, Müller and Wrohlich, 2020), their careers (e.g., Huber and Rolvering, 2023), or maternal health (e.g., Barschkett and Bosque-Mercader, 2023). Furthermore, studies also explore the effects of universal childcare on fertility (e.g., Bauernschuster et al., 2016), child development (Felfe and Lalive, 2018, Cornelissen et al., 2018, Blanden et al., 2016), child maltreatment (e.g., Sandner et al., 2024 (forthcoming)), and the integration of migrant and refugee families (e.g., Gambaro et al., 2021, 2024). Gradually, the attention of the literature has turned to fathers' labour market outcomes (Eckhoff Andresen and Havnes, 2019, Huebener et al., 2020, Brewer et al., 2022), with findings suggesting small or negligible effects on paternal employment. However, studying employment outcomes alone may overlook effects on fathers' caregiving roles if fathers' employment is only weakly correlated with their involvement in childcare, as shown for maternal employment by Hsin and Felfe (2014). Despite the highlighted role of subsidised childcare in supporting women's labour market participation and children's outcomes, very little is still known about its impact on fathers' roles in raising children. Our study addresses this gap, thereby helping to understand why substantial family policy efforts have had only limited impact in reducing gender inequality in labour market outcomes after childbirth.

The remainder of this paper is structured as follows: Section 2 outlines Germany's system of publicly subsidised childcare and parental leave regulations. Section 3 describes the data, and section 4 explains our empirical approach. Results and robustness checks are reported in section 5. Section 6 discusses our findings and concludes.

2. Institutional Background

Female employment rates, particularly for mothers, have historically been low in West Germany, despite the high level of education among women. Specifically, mothers with children under the age of six have low rates of full-time employment. East Germany has higher maternal employment rates, and women contribute more to household income compared to West Germany (Lippmann et al., 2020).[4]

Several family-oriented policies aim to support parents in balancing work and family life after childbirth and to improve the well-being of both parents and children. The main policy tools relevant to this study are publicly subsidised childcare and parental leave. The introduction of a legal entitlement to a childcare place from the age of one, along with a reform of paid parental leave entitlements during the first year after childbirth, aimed to provide the infrastructure and establish a social anchor that would encourage mothers to return to the labour market after the first year. We describe these policies in detail below.

2.1. Publicly Subsidised Childcare

Germany has a long tradition of providing publicly subsidised childcare. The provision of childcare is mainly carried out by the municipalities or non-profit organisations such as churches and welfare associations. Public subsidies cover approximately 70 % of childcare costs, with the remainder covered by income-dependent parental fees. Parental fees, which make up five to ten percent of average earnings, are lower than the OECD average and considerably lower than countries with limited public subsidies, such as the United States (OECD, 2023). The private market for childcare is very small.[5] Historically, East Germany has a higher availability of childcare slots and also offers longer hours of care, especially for very young children (Schober, 2020).

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[4]Before the German reunification in 1990, West and East Germany had different family policies and institutional settings. East Germany had more gender-equal institutions, while West Germany supported more traditional gender roles within families (Schober, 2020). Since reunification in 1989, federal laws and family policies have been applied to all of Germany, and the incentives for work-care decisions have thus been the same across the country. Maternal employment decisions have converged between East and West Germany, with part-time employment being the most common arrangement for mothers (Konietzka and Kreyenfeld, 2010).

[5]Grandparental care stands out as the predominant informal childcare arrangement. In 2019, among two-to three-year-olds whose parents reported informal care, 78 % were under the care of their grandparents, and 15 % by other relatives (Spieß et al., 2022).

In 1996, the government enacted a universal entitlement to childcare for children from the age of three until they enter school, typically at the age of six. This universal entitlement has resulted in high enrolment rates of over 90 % since the mid-2000s. However, enrolment rates for children under the age of three have remained low. To improve the accessibility of universal and publicly subsidised childcare for children under the age of three, Germany has passed major policy reforms. In 2005 and 2008, two federal laws were implemented requiring local governments to expand childcare facilities for children under the age of three. Since August 2013, every child above the age of one has been legally entitled to a place in childcare.[6] The main goal of the reforms was to improve the reconciliation of work and family life, allowing especially mothers to participate more in the labour market. The reforms also aimed to increase fertility and promote early child development. Fathers' involvement in childcare and family responsibilities is not explicitly named as a goal of the childcare expansion reforms.

Based on these reforms, Germany experiences a substantial increase in enrolment rates for children under the age of three from around 12 % in 2006 to 36 % in 2023. Despite this expansion, there are still significant childcare supply shortages (e.g., Jessen et al., 2020). Bauernschuster et al. (2016) and Felfe and Lalive (2018) provide a detailed explanation that the increased availability of childcare primarily results from the opening of new childcare centres. The process of establishing new centres involved various decisions by authorities at municipal, county, and state levels: municipal and county authorities assessed local demand for childcare, taking into account demographic factors such as cohort sizes and population movements, as well as economic factors like labour market conditions. Federal state authorities were responsible for approving proposals for new childcare centres. This administrative process faced several obstacles, including varying levels of knowledge about the complex funding system involving the federal government, the federal state, and the municipality.

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[6]The *Tagesbetreuungsausbaugesetz* (*TAG*, Deutscher Bundestag, 2004) came into effect on January 1, 2005, with the objective of accelerating the expansion of childcare (230,000 additional slots in West Germany for children under the age of three). The subsequent *Kinderförderungsgesetz* (*KiföG*, Deutscher Bundestag, 2008b) of 2008 further committed states to gradually expand childcare supply for children below the age of three and included the legal entitlement to a childcare place for all children from their first to their third birthday starting from August 1, 2013. Both federal laws represent a crucial step towards providing demand-oriented and high-quality care for children under the age of three in Germany.

Additionally, some regions suffered from shortages of construction land for new childcare centres, differing building regulations, a lack of qualified childcare workers, and delays in the approval of new centres. As a consequence, the expansion has been uneven across federal states, counties, and municipalities, leading to significant regional disparities in childcare availability. Appendix Figure A.2 illustrates considerable county-level variation in the expansion of subsidised childcare from 2006 to 2019. The coverage rates are higher in East Germany compared to West Germany, but in both regions, these rates are increasing over time, providing substantial within-region variation. These differences in administrative processes, along with idiosyncratic regional obstacles, provide the basis for our identification strategy, as they are arguably orthogonal to changes in fathers' involvement. We evaluate the orthogonality empirically in section 4.2.

2.2. Parental Leave Regulations

Around childbirth, all mothers are entitled to paid maternity leave from six weeks before until eight weeks after childbirth. After childbirth, parents can claim up to 36 months of unpaid, job-protected parental leave (*Elternzeit*), which allows them to return to their previous position.

During this job-protected parental leave period, parents can claim parental leave benefits (*Elterngeld*). For children born from 2007 onward, at the centre of our analysis, a new paid parental leave system has been implemented. It replaced the previous means-tested benefits with earnings-contingent benefits replacing approximately 67 % of the average net labour income earned in the 12 months prior to childbirth (*Elterngeld* Deutscher Bundestag, 2006). The parental leave reform focused on supporting mothers in re-entering the labour market, but also aimed to encourage greater involvement of fathers (Deutscher Bundestag, 2008a). The maximum duration of paid parental leave is a total of 14 months for both partners, with individuals able to claim a maximum of 12 months. Two additional months are granted if both partners claim parental leave benefits for at least two months (or for lone parents).[7] In 2007, the share of fathers claiming any parental leave benefits was 15 %. This share has risen to about 45 % in 2020 (Brehm et al., 2022).

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[7]The parental leave benefit had a floor of 300 euros and was capped at 1,800 euros per month.

In theory, parental leave and its benefits could be divided equally between both parents, with each partner claiming up to seven months. In practice, most couples assign 12 months of parental leave to mothers and two months to fathers (see panel A of Appendix Figure A.1). Only one in ten fathers claimed more than two months of parental leave benefits in 2020. Fathers often take parental leave immediately after childbirth and around the child's first birthday, when the 12-month benefit period for the mother expires and the legal entitlement for childcare begins (see panel B of Appendix Figure A.1).

The length of paternal leave is *correlated* with increased paternal involvement in later years. Appendix Figure A.3 shows that in 74 % of couples where fathers claimed no paternity leave, the mother reports being the main caregiver when the child is one to two years old. With paternal leave of two months, the minimum period to claim parental leave benefits, the share of mothers who are the main caregiver is only slightly lower at 69 %. When fathers claimed three to six months of paternal leave, the mother is the main caregiver in only 50 % of couples. For longer paternal leave, the share of mothers who are the main caregiver reduces to 35 %.[8]
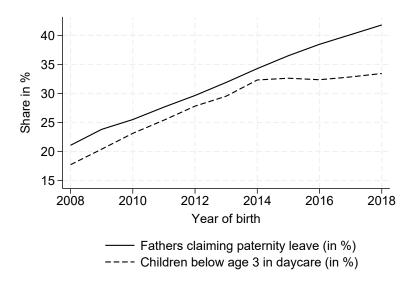
Figure 1 shows the share of fathers claiming parental leave benefits starting from 2008 alongside the substantial increase in childcare rates. Until 2014, both rates are steadily increasing. While the increase in childcare rates flattens after 2014, the share of fathers claiming parental leave benefits continues to increase. Our analysis aims to determine whether the increased availability of childcare has a causal effect on fathers' early involvement or if other factors are driving this trend.

3. Data

Our empirical analyses uses large survey data on parents and children (KiBS, Lippert et al., 2020) and administrative data on the regional availability of childcare (Child and Youth Welfare Statistics, Statistisches Bundesamt, 2023) which we explain in detail in the following.

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[8]Very similar patterns emerge in analyses of the SOEP data; see Brehm et al. (2022).

Fig. 1: Fathers claiming parental leave benefits and childcare rates for children under three over time

3.1. DJI Childcare Study (KiBS)

The Childcare Study (KiBS, Lippert et al., 2020) by the German Youth Institute (DJI) is a large survey of parents and children that has been conducted since 2012. KiBS focuses on children's care arrangements until their transition to secondary school. In households with more than one child, the survey asks about one focal child. It provides rich information on care arrangements, including childcare attendance, parental leave-taking, the division of childcare responsibilities between parents, and parental employment. Each year, it gathers information from over 33,000 parents of children in various age groups.[9]

The survey questions are answered by one family member, primarily the mother (90.3 %). This family member provides information about themselves and their partner if the responding individual indicates they are in a relationship. While the partner need not be the biological parent, supplementary information in specific waves indicates that the partner

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[9]The sampling follows a two-stage process, including families from 428 randomly selected municipalities. To achieve a sample that is representative at both the national and federal state levels, KiBS aims to survey at least 100 children across each federal state and age cohort.

is the biological parent in 98.8 % of cases.[10]

In our empirical analyses, we use information from nine waves conducted between 2012 and 2020. This includes children born between 2007 and 2019, i.e., those who were subject to considerable variation in childcare availability (see Appendix Figure A.2). Our main analysis focuses on children between 12 and 35 months, the age range for which children gained a legal entitlement to a place in childcare due to the reforms. In our analysis, we have data from between 224 and 320 different counties. Descriptive statistics are reported in Appendix Tables A.1 and A.2. For our main analysis, we observe between 51,000 and 81,000 children and their parents under the age of three.

To estimate the impact of the universal childcare expansion on fathers' involvement, we study four sets of outcomes for children aged between 0 and 6 years. First, we consider fathers' parental leave take-up after childbirth (the majority of paternal leave benefits are claimed within the first 14 months after childbirth; see Appendix Figure A.1). This indicates their early involvement in childcare, which could have effects on a more equal division of childcare later on. We use (i) an indicator of whether the father claimed parental leave for his child, and (ii) the duration of parental leave in months. This information is provided retrospectively for each child.[11]

Second, we examine the division of childcare responsibilities within the family when the child is between 0 and 6 years old. Parents assess the current distribution of childcare duties between themselves on a typical weekday, using a scale ranging from 1 (where solely the mother is responsible) to 5 (where solely the father is responsible). Evaluating this division on a typical weekday is important, as it often represents the primary time when parents must balance work requirements and childcare. This period helps to assess the challenges parents face in reconciling professional responsibilities with family obligations, which is crucial for understanding fathers' overall involvement and its subjective perception. Many policies related to family-work reconciliation are designed with weekdays in mind. The main focus

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[10]Approximately 4 % of our sample reports being single. In this group, we only have information on childcare attendance and employment, but no details on the division of care.

[11]We supplement our analysis with information on the parental leave status of both partners during the time of the survey to further characterise the age of the child when the father claimed parental leave, and whether this was taken together with the partner or by fathers alone.

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is on the division of childcare when children are 12 to 35 months old, the ages for which the childcare expansion had the most "bite". As our main outcomes, we use (i) a continuous variable ranging from 1 to 5, and (ii) an indicator that takes the value of one if the mother is the sole or main caregiver, and zero if the parents share childcare equally or if the father is primarily responsible. The distribution of the different categories over time is shown in Appendix Figure A.4. For 65 % of the sample, mothers are the main caregivers. We assess effects on other parts of the distribution in supplementary analyses using each category as the outcome. Appendix Figure A.5 shows the evolution of childcare responsibilities and paternal leave over time. While the share of fathers claiming parental leave is growing over time, mothers' role as main caregivers remains very stable over time.

Third, we examine parental employment outcomes. While the subjective assessment of the childcare division on weekdays is important in its own right, reallocations of care responsibilities can impact parents' employment outcomes and complement the analysis with more objective measures. We assess effects at both the extensive and intensive margins of labour supply. At the extensive margin, we look at (i) an indicator capturing employment. At the intensive margin, we consider (i) an indicator of full-time employment (working more than 34 hours a week), (ii) an indicator for long part-time employment (20 to 34 hours), and (iii) an indicator for short part-time employment (less than 20 hours). We examine the employment of both mothers and fathers in the second and third years after childbirth.

3.2. Regional Data

The regional availability of publicly subsidised childcare serves as our main explanatory variable. It is provided by the Federal Statistical Office (Statistisches Bundesamt, 2023). This administrative information includes the actual share of children under the age of three enrolled in childcare in a county and year. The data are available on an annual basis from 2006 to 2020. Overall, there is substantial regional variation across counties and within counties over time, as illustrated in Appendix Figure A.2. East Germany shows higher childcare rates than West Germany, but an increase in childcare rates until 2019 is evident in counties across both regions. The figure reveals various types of expansions across counties, with some starting earlier and flattening out, while others expand more steadily or later. Bauern-

schuster et al. (2016) suggest that the variation in childcare rates is primarily attributable to differences within states rather than between states.

We include additional county-level information in our analysis. These data are obtained from the regional database maintained by the German Statistical Office and the Federal Institute for Research on Building, Urban Affairs and Spatial Development of the Federal Office for Building and Regional Planning. Specifically, we include population density, gross domestic product per capita, the proportion of women aged 20 to 40, the mean population age, the share of women and men with *Abitur*, and household income (INKAR, Bundesinstitut für Bau-, Stadt- und Raumforschung, 2023).

4. Empirical Approach

4.1. Main Estimation Strategy

To identify the effects of universal childcare for children under the age of three on fathers' involvement, we estimate generalised difference-in-differences models that use the county childcare rate as a continuous treatment variable. We exploit the large variation in available childcare places across counties and within counties over time, generated by the legally mandated expansion of childcare for children below the age of three in 2008 and the corresponding universal entitlement for childcare for children from age one onward starting in 2013.

Using this exogenous variation in childcare, we estimate two-way fixed effects specifications similar to studies examining the effects of childcare expansions on parental labour supply (Bauernschuster and Schlotter, 2015, Müller and Wrohlich, 2020), child development (Felfe and Lalive, 2018, Cornelissen et al., 2018), and child maltreatment (Sandner et al., 2024 (forthcoming)).

We estimate the following generalised difference-in-differences model:

$$y_{ijb(t)} = \alpha + \delta cr_{j,b+1} + \mathbf{X}'_i\beta_1 + \mathbf{Z}'_{j,b+1}\beta_2 + \gamma_j + \theta_b + (\mu_t) + \varepsilon_{ijb(t)} \tag{1}$$

where $y_{ijb(t)}$ represents outcomes concerning children's childcare attendance, paternal involvement in childcare and parental labour supply for child i in county j born in year b.

Outcomes that vary by children's age are indexed by t, referring to children's age in months when they are observed; $cr_{j,b+1}$ denotes the childcare rate for children under the age of three in county j one year after the children's birth, which is the year in which children obtain legal entitlement to a childcare slot. Hence, δ is our coefficient of main interest. In addition, we include a vector X_i of individual control variables (mother's and father's education, their age at childbirth (also squared), child's gender, and migration background as speaking another language at least as much as German at home) and a vector $Z_{j,b+1}$ of county-level controls (population density, GDP per capita, share of women between 20 and 40 years, mean population age, share of women and men with *Abitur*, household income). γ_j and θ_b are county and birth year fixed effects. For outcomes measured at different ages of the child, we additionally include fixed effects for children's age in months to flexibly account for potential age profiles in the outcome. The i.i.d. error term is denoted by $\varepsilon_{ijb(t)}$. Standard errors are clustered at the county level.[12]

4.2. Validation of Identifying Assumptions

Our empirical model estimates the treatment effect of interest based on the standard "common trends" assumption, which requires that the treatment effect is homogeneous across different regions and over time (de Chaisemartin and D'Haultfœuille, 2020, Goodman-Bacon, 2021).[13]

For a causal interpretation of our coefficient of main interest, δ, the availability of childcare must not be associated with other time-varying regional characteristics. We are not

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[12]Our main estimations do not use weights. Unlike for descriptive statistics, their use in the estimation of causal effects is debatable (Solon et al., 2015). We report results using weights in the robustness section 5.5.

[13]Recent developments in methods related to Difference-in-Differences (DiD) with two-way fixed effects estimations highlight the issue of heterogeneous treatment effects when applied to staggered treatment (e.g. Borusyak et al., 2024, de Chaisemartin and D'Haultfœuille, 2020, Callaway and Sant'Anna, 2021, Sun and Abraham, 2021, Goodman-Bacon, 2021). The primary concerns are that treatment effects may vary across groups and over time, leading to biased results. Specifically, because the treatment effects are estimated as weighted sums of the average treatment effects in each group and period, the potential presence of negative weights may lead to a biased linear regression coefficient (de Chaisemartin and D'Haultfœuille, 2020). These issues have also been identified in settings with continuous treatment (e.g. de Chaisemartin et al., 2024, Callaway et al., 2024). While new estimators have been developed to address biased results for discrete treatment, no solutions currently exist for continuous treatment. For our main analysis, we assume homogeneous treatment effects. We perform several robustness checks in section 5.5 to demonstrate that our results are robust to various alternative model specifications. For an overview of new developments in DiD estimation, see, for example, Roth et al. (2023), Chaisemartin and D'Haultfœuille (2023).

concerned about general time trends and time-invariant differences across regions, as these are absorbed through time and county-fixed effects. However, the introduction of other regional childcare or family policies, or time-varying regional characteristics that might be associated with paternal involvement, could be problematic.

First, we acknowledge that several other studies analysing different outcomes have carefully examined the exogeneity of the German childcare expansion concerning time-varying regional characteristics (e.g. Felfe and Lalive, 2018, Bauernschuster et al., 2016, Sandner et al., 2024 (forthcoming)). Second, we highlight that several German states passed policy reforms related to childcare and parental care choices. For example, several federal states abolished or reduced parental fees for childcare (e.g. Huebener et al., 2020), extended the availability of all-day care slots (Felfe and Zierow, 2018), or provided additional family support (e.g. Collischon et al., 2022). We assess whether such region- and time-varying policies bias our results through robustness checks that include (i) state time trends and (ii) county shares of all-day childcare slots (see section 5.5).

To check the plausibility of the common trend assumption, we apply specifications of our model given by equation 1 including leads and lags of our treatment variable. Following Schmidheiny and Siegloch (2023, equation 6), we regress (binned) changes of county-level childcares rates on our main outcomes in levels to get event-study-like results for continuous treatments. In this dynamic treatment specification, we include the first difference of the treatment status and three leads and three lags in our model, binning the third lead and lag. The results of the leads and lags specification are discussed in section 5.5 and support a causal interpretation of our main findings.

A remaining concern is that other time-varying factors at the county level may be correlated with the availability of childcare. We test for associations between childcare availability and important economic and socio-demographic characteristics that may also be related to paternal involvement in child-rearing. In Appendix Table A.3, we regress the county childcare rate on economic and socio-demographic characteristics of the county that may be related to fathers' involvement. Column 1 presents the multivariate associations; in columns 2 and 3, we include county and year-fixed effects.

Gender norms are more egalitarian in more urbanised areas (e.g. Scheiner et al., 2011).

The association with childcare availability is positive and significant, but this association disappears when county and year-fixed effects are included.

More affluent and better-educated families also demonstrate a more egalitarian division of work and care responsibilities (e.g. Davis and Greenstein, 2009, Raz-Yurovich and Okun, 2024). We include counties' GDP per capita, average household income, and the share of men and women with university entrance qualifications (*Abitur*) in the regression, where the share of men with *Abitur* shows a small positive association with childcare availability in the county. We include it as a control variable in our main analysis.

Furthermore, we examine whether the age composition of the county is associated with childcare rates. Without the set of fixed effects, a higher share of women of childbearing age is associated with lower childcare availability, while a higher average age of the population is associated with a higher supply. Both associations diminish and become insignificant after including the set of fixed effects.

Finally, we include the unemployment rate in the regression and find a positive association that becomes significant when we add county and year fixed effects. Several studies document that childcare availability impacts maternal employment (e.g. Müller and Wrohlich, 2020). As more females participate in the labour force or increase their working hours, other workers could be negatively affected. Hence, the unemployment rate could itself be affected by the childcare expansion and can be considered a "bad control variable" that we omit from the set of regional control variables.
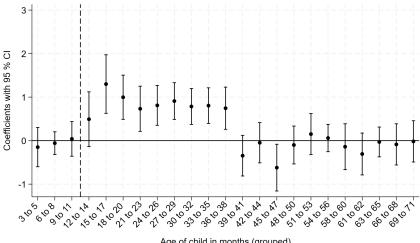
Overall, in the models with county and year-fixed effects, only two out of our eight characteristics remain significant. We include the first seven characteristics in our main specification and evaluate in the robustness section how their inclusion changes our results (not at all).

5. Results

5.1. Effects on Children's Use of Childcare

We begin by examining whether the childcare expansion affected children's actual childcare attendance. Figure 2 presents effects estimated separately by children's age. For children under the age of one, we do not find significant changes. After their first birthday,

Fig. 2: Effects of childcare expansion for children under age three on childcare attendance

Notes: Coefficient estimates with 95% CI of the childcare rate on childcare attendance from separate estimations of eq. 1 by age. All models include county and birth year fixed effects, as well as individual-level and county-level controls (for details, see notes of Table 1). Children are born between 2007 and 2019. The dashed line indicates the age at which children gain legal entitlement to a childcare slot. Paid parental leave expires after a maximum of 14 months. The childcare expansion is targeted to increase childcare slots for children between 12 and 35 months.
Source: Own illustration based on data from the KiBS, the Federal Statistical Office, and INKAR.

the childcare expansion has positive effects on children's childcare attendance until the age of three. These effect patterns align with the institutional framework that grants parents parental leave benefits for up to 14 months after childbirth. Moreover, children only gain legal entitlement to a childcare place after their first birthday. Consequently, the demand for childcare in the first year after childbirth is very low. After the third birthday, the effects on children's actual childcare attendance again vary around zero. These findings provide strong support for our identification strategy, identifying effects of universal childcare for children between the ages of one and under three.

We summarise our main findings on childcare attendance in Table 1. While the reform had no significant effect on children's childcare attendance in the first year after childbirth, thereafter, a 10 percentage point (pp) increase in the county childcare rate increases children's actual attendance by 9 pp at age one and by 8 pp at age two. This close mapping reflects the substantial excess demand for childcare services for children under the age of three.[14]

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[14]We also examine changes at the intensive margin of formal childcare in Appendix Table A.4. The childcare expansion also increased the number of hours children spend in formal childcare. The share of children attending for more than 25 hours per week (columns 2 and 3) increased, while the expansion

Table 1: Effects of childcare expansion on childcare attendance

	(1)	(2)	(3)	(4)
	Dependent variable: Childcare attendance at age ...			
	$0-11$ months	$12-23$ months	$24-35$ months	$12-35$ months
Childcare rate	0.0200	0.9103***	0.7723***	0.7697***
under 3 years	(0.1079)	(0.2270)	(0.1179)	(0.1470)
Observations	24,560	45,584	35,702	81,286
Mean of dep. var	0.0841	0.5298	0.7682	0.6345
SD of dep. var	0.2775	0.4991	0.4220	0.4816
Birth cohorts	$2011-2019$	$2010-2019$	$2009-2018$	$2009-2019$

Notes: All models include birth year and county fixed effects, as well as a set of individual level controls (each parent's education and age at birth, also squared, child's migration background and gender, child's age in months at time of interview) and a set of county level controls (population density, GDP p.c., share of women between 20 and 40 years, mean age, share of women and men with *Abitur*, household income). Children are born between 2009 and 2019. Robust standard errors clustered at county level are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Own calculations based on data from the KiBS, the Federal Statistical Office, and INKAR.

5.2. Effects on Fathers' Involvement

We now examine whether the expansion of publicly subsidised childcare for children under three years affected fathers' involvement. To do this, we consider two factors: fathers' parental leave taking as an indicator of their early involvement, and their subsequent involvement in childcare on a normal weekday.

In Table 2, we present the regression estimates from eq. 1. Column (1) shows that the expansion of childcare has a positive effect on the take-up of fathers' parental leave. An increase in publicly subsidised childcare of 10 pp increases the share of fathers taking parental leave by 3.4 pp.[15] Most of the increase accrues to fathers taking parental leave for two months, the minimum period required to claim parental leave benefits (column 2). Effects on parental leave longer than two months are small and even negative (columns 3 and 4).[16]

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reduced the share of children attending childcare for only 25 hours or less per week (column 4).

[15]As we are using the increase in regional childcare availability to estimate the effects on fathers' involvement, we estimate intention-to-treat effects rather than the effects of actual childcare attendance. However, by utilising our first-stage results from Table 1, column (1), we can consider the childcare expansion as an exogenous instrument for childcare attendance and scale our reduced form findings accordingly. Regarding the impact on fathers' parental leave take-up, we find that if the child attends childcare after age 1, the probability of fathers claiming parental leave rises by 40 pp.

[16]Supplementary analyses in Appendix Figure A.6 show that the effects on paternal leave are concentrated when the child is about 12-14 months old (panel A) and are only significant if it is taken when the mothers

Table 2: Effects of an increase in childcare coverage on fathers' involvement

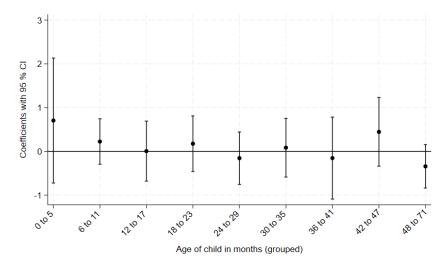|	(1)	(2)	(3)	(4)	(5)	(6)
			Dependent variables			
		Fathers' parental leave (retrospectively)			Division of childcare on a weekday at age 12-35 months	
	Take-Up	Exactly two months	More than two to six months	More than six months	Mother is main caregiver	Continuous (only mother [1]- only father [5])
Childcare coverage below 3 years	0.3459***	0.3484***	-0.0934	-0.0281	0.0454	-0.0454
	(0.1081)	(0.1167)	(0.0754)	(0.0568)	(0.1628)	(0.2127)
Observations	67,937	49,797	49,797	49,797	51,407	51,407
Mean of dep. var	0.5571	0.3841	0.0949	0.0613	0.6541	2.2889
SD of dep. var	0.4967	0.4864	0.2931	0.2398	0.4757	0.6615

Notes: All models include birth year and county fixed effects, as well as individual-level and county-level controls (see notes of table 1). For the models in columns 1 to 4, the sample includes children born between 2007 and 2019, whereas in columns 5 and 6 the sample consists of children born between 2011 and 2019. Robust standard errors clustered at the county level are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Own calculations based on data from the KiBS, the Federal Statistical Office, and INKAR.

Finding positive effects on fathers' parental leave take-up raises the question of whether this is accompanied by increased involvement of fathers in childcare later on. We noted that, descriptively, only parental leave longer than two months is associated with a higher childcare responsibility of fathers in later years. We now turn to the subsequent division of care responsibilities on a normal weekday. In Figure 3, we first look at changes in an indicator of mothers' being the sole or primary caregiver at different ages of the child. Negative coefficients would indicate a shift away from mothers towards greater involvement of fathers. In the period between 12 to 35 months, for which we found significant increases in childcare attendance, we cannot find any effects on mothers' roles as main caregivers. The results are summarised in column 5 of Table 2, where we find very small and insignificant effects. When the childcare coverage rate increases by 10 pp, mothers' role as main caregiver increases by 0.5 pp. Based on the bounds of our results, we can exclude the possibility that the share of mothers being the main caregivers decreased by more than 2.7 pp when childcare coverage increases by 10 pp. Second, we capture fathers' involvement on a continuous scale ranging from 1 (solely the mother) to 5 (solely the father) as the outcome in column 6.

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are still at home (panel C).

Fig. 3: Effects of childcare expansion for children under age three on mothers' role as main caregiver
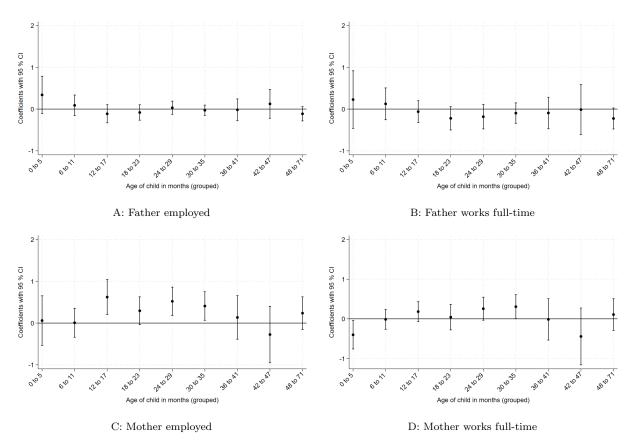

Notes: Coefficient estimates with 95% CI of the childcare rate on indicator of mothers being the main or sole caregiver on a weekday. Estimates stem from separate estimations of eq. 1 by age, children are born between 2007 and 2019. All models include county and birth year fixed effects, as well as individual-level and county-level controls (for details, see notes of Table 1). *Source:* Own illustration based on data from the KiBS, the Federal Statistical Office, and INKAR.

Positive coefficients would indicate a shift towards higher paternal involvement. Again, we do not find any effects suggesting that fathers are taking on more childcare responsibilities on a normal weekday due to a higher availability of childcare.[17]

To complete the picture, we also assess the effects of the childcare expansion on other forms of childcare provided by grandparents or other paid or unpaid care arrangements, such as nannies, au pairs, surrogate grandmas, surrogate grandpas, neighbours, friends, or siblings, in Appendix Table A.7. We cannot find any effects of the childcare expansion on care arrangements for children between the ages of 12 and 35 months, suggesting that publicly subsidised childcare is mainly substituting maternal care in Germany.

We conclude that increasing the availability of publicly subsidised childcare increases fathers' parental leave take-up, but it does not alter the subsequent assessment of who is the main childcare provider on a normal weekday.

Fig. 4: Effects of childcare expansion for children under age three on parental employment

A: Father employed

B: Father works full-time

C: Mother employed

D: Mother works full-time

Notes: Coefficient estimates with 95% CI of the childcare rate on parental employment (extensive and intensive margin). Estimates stem from separate estimations of eq. 1 by age, children are born between 2007 and 2019. All models include county and birth year fixed effects, as well as individual-level and county-level controls (for details, see notes of Table 1).
Source: Own illustration based on data from the KiBS, the Federal Statistical Office, and INKAR.

5.3. Effects on Fathers' and Mothers' Employment

Increased paternal involvement in childcare responsibilities could also be expressed in working time adjustments of fathers. With increased involvement of fathers shortly after childbirth and increased employment of mothers when children enter childcare, one could expect working hour reductions for fathers if the drop-off and pick-up of children, or afternoon care on a weekday, were divided more equally. Hence, detailed analyses of fathers' working hours could allow us to identify changes in paternal involvement that would not be associated with shifts in the subjective assessment of their main care responsibilities on a weekday.

Therefore, we study fathers' employment outcomes and report the results at different

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[17]To ensure that we do not overlook any marginal effects, we estimate the model on indicators of each of the five categories in Appendix Table A.5.

ages of the child in panels A and B of Figure 4. Neither fathers' employment (panel A) is affected, nor do we observe significant reductions in their full-time employment (panel B). This would be the margin where we would probably expect the main adjustments, as most fathers are working full-time.

Panel A of Table 3 summarises the results for when children are 12 to 35 months old, the age range during which their childcare attendance increased significantly. When childcare availability increases by 10 pp, fathers' employment decreases by 0.3 pp. This coefficient is very small and insignificant. When examining at fathers' full-time employment (column 2), we find a small and marginally significant reduction of 1.3 pp for a 10 pp increase in childcare availability, suggestively favouring long part-time work (20-34 hours, column 3). The changes in paternal employment are small and their marginal significance is sensitive to model specifications (see section 5.5).

The effects of the childcare expansion on maternal labour supply appear very different. Panels C and D of Figure 4 summarise the findings across children's ages. Maternal employment (panel C) increases when the child is between 12 and 35 months old; their full-time employment increases partially in this age range, but the effects are smaller. Panel B of Table 3 summarises the findings on maternal employment. If childcare rates increase by 10 pp, mothers' employment increases by 4.5 pp when the child is between 12 and 35 months old (column 1). Additionally, we find positive effects on maternal full-time employment (column 2), and especially long part-time employment (column 3). A 10 pp increase in the availability of childcare increases full-time and long part-time employment by 2.2 pp and 4.2 pp, respectively. The share of mothers working short part-time decreases with a higher availability of universal childcare (column 4).[18]

In summary, fathers' employment adjustments to increased childcare availability are small and barely detectable in our large data set. Mothers, on the other hand, intensify their

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[18]Our results on maternal employment align with Müller and Wrohlich (2020) who examine the effects of the same childcare expansion in Germany on maternal employment using data from the German Micro Census. The authors also find the strongest effects on mothers' employment participation and extended part-time employment; yet they do not find effects on maternal full-time employment or reductions in short part-time as we do. These differences may stem from the differing time periods considered and the use of different samples.

Table 3: Effects of childcare expansion on fathers' and mothers' employment (children aged 12 – 35 months)

	(1)	(2)	(3)	(4)
	Panel A: Fathers' Employment			
	Extensive (> 0 hours)	Full-time (> 34 hours)	Part-time (long) (20 – 34 hours)	Part-time (short) (1 – 19 hours)
Childcare coverage below 3 years	-0.0320 (0.0543)	-0.1341* (0.0762)	0.0831 (0.0562)	0.0201 (0.0252)
Observations	71,833	71,014	71,014	71,014
Mean of dep. var	0.9557	0.8726	0.0702	0.0115
SD of dep. var	0.2057	0.3334	0.2554	0.1066
	Panel B: Mothers' Employment			
	Extensive (> 0 hours)	Full-time (> 34 hours)	Part-time (long) (20 – 34 hours)	Part-time (short) (1 – 19 hours)
Childcare coverage below 3 years	0.4553*** (0.1164)	0.2220** (0.0889)	0.4152*** (0.0973)	-0.2028*** (0.0626)
Observations	80,656	80,493	80,493	80,493
Mean of dep. var	0.6486	0.2159	0.3253	0.1028
SD of dep. var	0.4774	0.4115	0.4685	0.3037

Notes: All models include birth year and county fixed effects, as well as individual-level and county-level controls (see notes of table 1). Children are born between 2009 and 2019. Robust standard errors clustered at the county level are given in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Own calculations based on data from the KiBS, the Federal Statistical Office, and INKAR.

employment in response to the increased availability of childcare, in line with other evidence on positive effects of universal childcare provision on maternal labour supply (Lefebvre and Merrigan, 2008, Bauernschuster and Schlotter, 2015, Müller and Wrohlich, 2020).[19] This corroborates the finding that expansions of publicly subsidised childcare primarily substitute maternal care, while fathers' involvement is less affected.

5.4. Heterogeneity Analysis

The effects of the childcare expansion on fathers' involvement might differ based on couples' characteristics. For example, changes in market and non-market work after childbirth differ by parental education. One reason is that higher-educated couples exhibit more egal-

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[19]Depending on the context, the provision of childcare subsidies or universal childcare can also have very small effects on maternal employment. E.g., Havnes and Mogstad (2011) find that the large-scale expansion of subsidised childcare in Norway did not increase maternal employment, but mainly crowded-out informal childcare arrangements. Givord and Marbot (2015) find that a 50 % subsidy to childcare spending introduced in France had only a marginal impact on female labour force participation.

Table 4: Heterogeneity: Effects of childcare expansion on fathers' involvement by parental education and children's sex (children aged 12 – 35 months)

	(1)	(2)	(3)	(4)	(5)
	**Dependent variables**				
	Childcare attendance at 12-35 months	Fathers' PL take-up (retrospective)	Mother cares mainly/solely	Father works fulltime	Maternal employment
	**Panel A: By Mothers' Education**				
Coverage × *Abitur*	0.5961***	0.3634***	0.0586	-0.1102	0.4267***
	(0.1526)	(0.1085)	(0.1620)	(0.0748)	(0.1194)
Coverage × no *Abitur*	1.0459***	0.3096***	0.0092	-0.2029***	0.5026***
	(0.1553)	(0.1108)	(0.1669)	(0.0760)	(0.1212)
Observations	80,415	67,783	51,266	70,363	80,100
	**Panel B: By Fathers' Education**				
Coverage × *Abitur*	0.3531*	0.3842***	0.0396	-0.2128**	0.2076
	(0.1849)	(0.1093)	(0.1627)	(0.0936)	(0.1439)
Coverage × no *Abitur*	0.7518***	0.3075***	0.0472	-0.3015***	0.3086**
	(0.1868)	(0.1114)	(0.1672)	(0.0964)	(0.1445)
Observations	63,456	67,464	50,999	62,805	63,109
	**Panel C: By Children's Gender**				
Coverage × Female child	0.7707***	0.3430***	0.0666	-0.1583**	0.4610***
	(0.1515)	(0.1080)	(0.1661)	(0.0782)	(0.1176)
Coverage × Male child	0.7688***	0.3486***	0.0258	-0.1114	0.4499***
	(0.1438)	(0.1102)	(0.1614)	(0.0755)	(0.1166)
Observations	81,286	67,937	51,407	71,014	80,656

Notes: All models include birth year and county fixed effects, as well as individual-level and county-level controls (see notes of table 1). Robust standard errors clustered at county level are given in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Own calculations based on data from the KiBS, the Federal Statistical Office, and INKAR.

itarian gender role attitudes (Davis and Greenstein, 2009, Raz-Yurovich and Okun, 2024). Moreover, more educated individuals tend to adapt earlier to new cultural values (e.g. Hook and Paek, 2020). For example, higher-educated fathers are more likely to take up parental leave or work part-time after childbirth (e.g. Bünning and Pollmann-Schult, 2015, Geisler and Kreyenfeld, 2018). The childcare expansion may therefore affect the involvement of higher and lower-educated fathers differently.

To identify potential effect heterogeneity by education, we interact the childcare coverage rate in eq. 1 with dummies indicating whether mothers or fathers have the university entrance qualification *Abitur* or not. The results are reported in Table 4, panels A and B.

In column 1, we find that the childcare expansion has a stronger effect on the childcare attendance of children of lower-educated parents. Their attendance rates have been generally

lower (Jessen et al., 2020), and place constraints are a major reason for non-attendance despite their desire to enrol the children in childcare (Huebener et al., 2023). Also, assistance in the search for a childcare place proved to have large effects on the take-up of childcare for lower-educated families (Hermes et al., 2021).

The effects on paternal leave take-up are statistically significant for both lower- and higher-educated families alike (column 2). However, as the effects on children's childcare attendance are almost twice as large for lower-educated families, early childcare attendance is more effective in increasing paternal leave for *higher*-educated families. Considering the childcare coverage rate as an instrument for children's attendance under age three, a Two-Sample Two-Stage Least Squares (TS2SLS) approach suggests that early childcare attendance increases paternal leave by 52 pp in families with higher-educated mothers and by 25 pp in families with lower-educated mothers.

Regardless of parental education, the effects on mothers being the main caregiver are small and insignificant (column 3). However, fathers are less likely to work full-time, independent of their level of education.[20] Maternal employment effects increase more strongly in lower-educated families (column 5), similar to the attendance of childcare. Overall, the childcare expansion was more effective in increasing childcare attendance for lower-educated families. In both groups, it was effective in increasing paternal leave but had no noticeable effect on fathers' increased subsequent involvement in either group.

With respect to children's characteristics, we turn to the debate about potential preferences of parents over the gender of their child. Fathers may have a preference for spending more time with boys than with girls (Hank and Kohler, 2000, Dahl and Moretti, 2008, Song and Gao, 2023). Family policies themselves might change parents preferences over the gender of their children. Policy contexts can thereby play a role. For example, the implementation of pro-family policies in the 1970s in East Germany shifted preferences from boys to girls (Brockmann, 2001). Therefore, the childcare expansion may have different effects on fathers' involvement depending on children's gender.

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[20]Differentiating the effects of fathers' full-time employment by mothers' level of education shows significant negative effects in families with lower-educated mothers and insignificant effects in families with higher-educated mothers. However, the effects are statistically not different between the groups.

Panel C reports the effects separately for boys and girls. We find no differences in the effects on childcare attendance (column 1) or on fathers' take-up of parental leave (column 2). There are no changes in the assessment that the mother is the main caregiver (column 3), and the small negative effects on fathers' full-time employment are statistically similar for both boys and girls (column 4). Finally, the effects on maternal employment are very similar regardless of whether the child is a girl or a boy (column 5).[21] In sum, we do not find any gender-based differences in the impact of the childcare expansion on fathers' involvement.

5.5. Robustness Checks

5.5.1. Sample Restrictions

To test the robustness of our findings, we conduct several robustness checks. We start with an analysis of how sensitive our results are to variations in the considered birth cohorts. Our analysis primarily focuses on samples consisting of children born between 2009 and 2019. However, we also examine different age groups, and some outcomes are only available from later waves of the KiBS data. One might be concerned that the consideration of different birth cohorts results in differential effects of children's childcare attendance. We find very robust effects of childcare availability on childcare attendance in our generalised DiD setting, irrespective of the specific birth cohorts included in our sample (see Appendix Table A.6).

The second set of robustness checks pertains to adjustments to the sample that might bias our main findings. The results are reported in Appendix Table A.9, with our main specification serving as the benchmark in column 1. First, we exclude the survey year 2020 (wave 9) from our sample, as it fell within the COVID-19 pandemic, which had a significant impact on care arrangements, the division of childcare, and parental employment during that time (e.g., Del Boca et al., 2020, Jessen et al., 2022). Second, we remove couples from the sample who do not reside in the same household, as their division of domestic work might differ substantially from that of cohabiting couples. Third, we restrict the sample to counties with at least 50 observations per birth year, to prevent results from being biased or noisy due to counties with only a few observations. Fourth, we exclude the city-states of

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[21]Heterogeneity analyses on further outcomes regarding fathers' involvement and parental labour supply are reported in Appendix Table A.8.

Hamburg and Berlin, which are each considered as one county and are exceptionally large and heterogeneous in comparison to a typical county in our analysis. Fifth, we exclude large cities with more than 500,000 inhabitants to reduce within-county heterogeneity in our sample. Lastly, we focus only on West Germany and remove East German counties from the analysis, as one might be concerned that differences between East and West Germany (e.g. in female labour force participation or gender norms) could bias our results. Across these different sample specifications, we obtain estimates close to the main results, so that we draw the same conclusions.[22]

5.5.2. Model Specifications

In a final set of sensitivity checks, we examine the robustness of our results to different model specifications, reported in Appendix Table A.10. A major concern for our identification strategy is that changes in the county childcare rate are correlated with other regional developments (such as unemployment rates or education) or with other changes in the childcare system.

To address these concerns, we conduct various checks. First, we test the sensitivity of our results to the inclusion of regional control variables. As our main analysis includes county-level controls, we omit them in column 2. Second, we incorporate state-specific time trends in the analysis, to account for any differential trends between states that could arise because childcare and other educational policies are the responsibility of the federal states. Third, we include control variables for the share of all-day childcare slots in the county (see column 5), as an increase in the availability of all-day slots was initiated during our time period (see, e.g., Felfe and Zierow, 2018). The increase in all-day care is sufficiently orthogonal to the childcare expansion we are studying, such that we draw the same conclusions when we control for the availability of all-day care in the county. Fourth, we include our main treatment indicator, the childcare coverage rate, also with a squared term in column 6 to account for potentially non-linear effects in the childcare availability. For example, expansions from a

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[22]General differences between East and West Germany are accounted for in our analysis by county-fixed effects. Although childcare coverage rates for children under the age of three are higher in East Germany compared to West Germany, these rates were also increasing over time. Additionally, there is substantial variation between counties in both regions.

lower childcare coverage level could have differential effects from settings with expansions starting from higher levels. Overall, our results are robust to these adjustments in our main empirical model.

As a final check, we estimate leads-and-lags specifications following Schmidheiny and Siegloch (2023). The results for our main outcomes are presented in Appendix Figure A.7. The specification allows us to obtain event-study type coefficients in settings with a continuous treatment. The leads include changes in future childcare rates, such that we would generally not expect effects on outcomes observed earlier. Effects on lagged changes in childcare rates would indicate persistent effects of increases in childcare availability. Almost all our coefficients on the leads are very close to zero and insignificant, supporting the assumption that there are no pre-existing trends in our outcomes. With the actual treatment, we observe generally persistent effects of fathers' parental leave take-up (panel A) and mothers' employment (panel D), while the effects on fathers' full-time employment (panel B) and the share of mothers being the main caregiver (panel C) remain insignificant throughout.

6. Conclusions

This paper examines whether the expansion of publicly subsidised childcare fosters greater involvement of fathers in childcare, thereby promoting more gender equality within families. We build on a policy environment in Germany that was redesigned to promote maternal employment and fathers' engagement through the orchestrated provision of parental leave, paternal quotas, and the subsequent entitlement to subsidised childcare. Our identification of causal effects of childcare is based on exogenous regional variation in the expansion of childcare slots for children under the age of three. We find only limited and short-term effects on fathers' engagement in childcare, mainly through an increase in their uptake of parental leave. Mothers' roles as the main caregivers on weekdays remain unaffected, despite significant increases in their labour supply. This suggests that subsidised childcare primarily serves as a substitute for maternal care rather than facilitating a redistribution of childcare responsibilities between parents.

Our findings support the notion of a "stalled gender revolution," reflected in stagnating improvements in paternal childcare engagement and persistent gender gaps in the labour

market despite substantial policy efforts to increase fathers' involvement in childrearing (Raley et al., 2012, Zoch and Heyne, 2023, Kleven et al., 2024). In light of previous, more promising findings from "daddy months" and "fathers' quotas" of parental leave on fathers' involvement (Kotsadam and Finseraas, 2011, Patnaik, 2019, Eerola et al., 2022, González and Zoabi, 2021), our probably most sobering finding is that initial increases in paternal leave take-up caused by the childcare expansion do not materialise in increased paternal involvement later on.[23] One explanation is that most previous papers find that changes in fathers' engagement relate to housework; increases in paternal childcare often occur on weekends (Tamm, 2019). We explicitly focus on fathers' involvement in *childcare* on a *weekday*, margins that are probably most relevant to understand persistent gender gaps in labour markets.

Another reason may lie in the timing and length of paternal leave in our setting. The German parental leave system allows parents to claim parental leave benefits at any time during the 14 months, also together with the partner. We find that most of the increase caused by the childcare expansion is taken together with the mother around the child's first birthday. Moreover, the effects of the childcare expansion mainly accrue over the minimum period of two months. The father-child interaction may not be intensive enough or may occur too late to have sustained effects on their role as caregivers, especially when the mother is also present.

The small effects on fathers' involvement may also be explained by the generally small associations between maternal employment and fathers' childcare. Working mothers may not wish to reduce their time with their children as much as they would with housework. They may experience feelings of guilt from outsourcing childcare to external providers, leading them to maintain quality time with their children despite their employment. If the missing reallocation of childcare work lies outside women's preferences, the provision of childcare and its effects on maternal employment can result in what is commonly referred to as a "double shift" for mothers who are simultaneously employed and primarily responsible for childcare

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[23]For Germany, Bünning and Pollmann-Schult (2015) show that fathers increased their involvement in childcare even after short leaves. However, fathers' choice of parental leave length may be correlated with their preferences for childcare or housework, which the fixed-effects approach may not fully account for without an exogenous source of variation in the length of fathers' parental leave.

and household tasks.

We note that our findings do *not* imply that universal childcare cannot be beneficial in supporting more gradual adjustments in gender role attitudes and in promoting gender equality over a longer time horizon. Zoch and Schober (2018) shows that the expansion of childcare shifts gender norms and attitudes primarily of mothers. Actual behaviour can deviate from newly prevailing norms, but one would expect that behaviour adjusts to new norms gradually over time. This would not be reflected in our estimates that focus on the immediate effects of childcare provision on fathers' involvement in childrearing.

In sum, our analyses shed new light on the interplay between different family policies and show that substantial family policy efforts do not immediately alter fathers' caregiving responsibilities and thus contribute little to enhanced gender equality in the labour market and within the household.

Declaration of Generative AI in the Writing Process

During the preparation of this work, the authors used editGPT to enhance readability and check the language. Following the use of this tool, the authors reviewed and edited the suggestions as needed. They take full responsibility for the content of the published article.

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Appendix

A.1. Tables

Table A.1: Descriptive statistics: Outcome variables

	Mean (1)	SD (2)	Min (3)	Max (4)	Obs (5)
	Panel A: Sample of parents with child $12-35$ months				
Childcare coverage (< 3)	0.2505	0.0685	0.0690	0.4670	81,970
Actual childcare attendance					
Attendance	0.6370	0.4809	0	1	81,807
Care hours	17.9386	17.7016	0	168	69,042
Part-time	0.1488	0.3559	0	1	69,042
Extended part-time	0.2086	0.4063	0	1	69,042
Full-time	0.2122	0.4089	0	1	69,042
Maternal Employment					
Employment	0.6500	0.4770	0	1	81,168
Working hours	18.4695	16.1249	0	120	81,003
Full-time	0.2185	0.4133	0	1	81,003
Part-time long	0.3247	0.4683	0	1	81,003
Part-time short	0.1021	0.3027	0	1	81,003
Paternal employment					
Employment	0.9557	0.2059	0	1	72,179
Working hours	39.3464	11.9090	0	120	71,356
Full-time	0.8729	0.3330	0	1	71,356
Part-time long	0.0698	0.2549	0	1	71,356
Part-time short	0.0114	0.1063	0	1	71,356
Parental leave taking					
Father currently on leave	0.0437	0.2043	0	1	72,179
Mother currently on leave	0.3473	0.4761	0	1	81,154
Father alone on leave	0.0229	0.1496	0	1	71,690
Together with partner	0.0200	0.1400	0	1	71,690
Division of childcare					
Continuous	2.2891	0.6614	1	5	51,110
Mother main/solely	0.6539	0.4757	0	1	51,110
Mother solely	0.0858	0.2801	0	1	51,110
Mother mainly	0.5681	0.4953	0	1	51,110
Equal division	0.3188	0.4660	0	1	51,110
Father mainly	0.0259	0.1590	0	1	51,110
Father solely	0.0014	0.0375	0	1	51,110
	Panel B: Retrospective outcomes				
Paternal leave taking					
Father took leave	0.5564	0.4968	0	1	67,551
Duration of leave	1.9589	3.5645	0	120	49,442
Exactly two months	0.3839	0.4863	0	1	49,442
>2 to 6 months	0.0948	0.2930	0	1	49,442
More than 6 months	0.0613	0.2400	0	1	49,442
Age at first formal childcare entry					
Below 12 months	0.1101	0.3130	0	1	98,312
Between $12-23$ months	0.4261	0.4945	0	1	98,312
Between $24-35$ months	0.1168	0.3212	0	1	98,312
Below 36 months	0.6530	0.4760	0	1	98,312
36 months or older	0.3470	0.4760	0	1	98,312
Age at entry	23.0207	11.7324	3	168	98,312
Dummy censored	0.2615	0.4394	0	1	98,312
Dummy imputed age	0.0209	0.1429	0	1	98,312

Source: Own calculations based on data from the KiBS and the Federal Statistical Office.

Table A.2: Descriptive statistics: Control variables (Sample with parents of child 12 – 35 months)

	Mean (1)	SD (2)	Min (3)	Max (4)	Obs (5)
	Panel A: Individual Level Controls				
Maternal education: School-leaving certificate					
Basic degree	0.0475	0.2127	0	1	81,970
Intermediate degree	0.2383	0.4260	0	1	81,970
Advanced technical college degree	0.1063	0.3082	0	1	81,970
General university entrance qualification (*Abitur*)	0.5803	0.4935	0	1	81,970
Not (yet) graduated	0.0067	0.0814	0	1	81,970
Other	0.0101	0.0999	0	1	81,970
Missing	0.0109	0.1036	0	1	81,970
Paternal education: School-leaving certificate					
Basic degree	0.0708	0.2565	0	1	81,970
Intermediate degree	0.1970	0.3977	0	1	81,970
Advanced technical college degree	0.0820	0.2744	0	1	81,970
General university entrance qualification (*Abitur*)	0.4129	0.4924	0	1	81,970
Not (yet) graduated from school	0.0059	0.0764	0	1	81,970
Other	0.0082	0.0904	0	1	81,970
Missing	0.2232	0.4164	0	1	81,970
Other language than German	0.1308	0.3371	0	1	81,970
Child female	0.4859	0.4998	0	1	81,970
Age at birth mother	32.0492	4.8167	14	60	81,970
Age at birth father	35.1461	5.0027	15	75	81,970
	Panel B: County Level Controls				
GDP p.c.	34.5179	16.2662	15.94	194.7	81,970
Population density	749.3833	835.6715	39.4	4117.84	81,970
Share of women 20 – 40	0.4891	0.0002	44.5	52.92	81,970
Mean age	43.8422	1.4524	39	48.23	81,970
Share women *Abitur*	0.3948	0.0083	0	64.25	81,970
Share men *Abitur*	0.3114	0.0068	0	55.54	81,970
Household income	1741.2877	209.1114	1223.84	2737.39	81,970

Source: Own calculations based on data from the KiBS and INKAR.

Table A.3: Correlations of County Characteristics with Childcare Coverage Rates

	Dependent variable: Childcare Rate for Children Under Three Years		
	(1)	(2)	(3)
Population density	0.0039***	-0.0023	-0.0020
	(0.0014)	(0.0036)	(0.0035)
GDP per capita	0.0248	0.0113	0.0150
	(0.0584)	(0.0249)	(0.0243)
Household income	-0.0010	0.0008	0.0010
	(0.0025)	(0.0016)	(0.0014)
Share of men	0.1602	0.0477**	0.0349**
with *Abitur*	(0.1086)	(0.0195)	(0.0169)
Share of women	0.3031***	0.0039	0.0055
with *Abitur*	(0.0935)	(0.0151)	(0.0149)
Share of women	-2.5994***	0.0000	-0.0076
20 to 40 years old	(0.4004)	(0.3136)	(0.2778)
Average age of	3.8112***	0.5660	0.3307
population	(0.3336)	(0.5083)	(0.4725)
Unemployment rate	-0.4335	0.8997***	1.0240***
	(0.2910)	(0.2477)	(0.2346)
Observations	4,798	4,798	4,398
Sample	2006 − 2020	2006 − 2020	2008 − 2020
Year FEs		✓	✓
County FEs		✓	✓

Notes: Robust standard errors clustered at county level are given in parentheses. In Germany, *Abitur* is the general university entrance qualification. *** p<0.01, ** p<0.05, * p<0.1.
Source: Own calculations based on data from the Federal Statistical Office Germany and the INKAR database.

Table A.4: Effects of childcare expansion on intensive margin of childcare attendance

	(1)	(2)	(3)	(4)
	Dependent Variable: Childcare Attendance (age 12 − 35 months)			
	Attendance (> 0 hours)	Full-time (> 35 hours)	Part-time (ext.) ($26 - 35$ hours)	Part-time ($1 - 25$ hours)
Childcare rate under 3 years	0.7697*** (0.1470)	0.4854*** (0.1251)	0.6309*** (0.1751)	-0.3867*** (0.1318)
Observations	81,286	68,707	68,707	68,707
Mean of dep. var	0.6345	0.2100	0.2078	0.1495
SD of dep. var	0.4816	0.4073	0.4057	0.3566

Notes: All models include birth year and county fixed effects, as well as individual-level and county-level controls (see notes of table 1). Children are born between 2009 and 2019. Robust standard errors clustered at county level are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Own calculations based on KiBS, the Federal Statistical Office, and INKAR.

Table A.5: Effects of an increase in childcare coverage on fathers' involvement
(age 12 − 35 months)

	Dependent variable: Fathers' Involvement				
	Mother cares solely (1)	Mother cares mainly (2)	Equal division of care (3)	Father cares mainly (4)	Father cares solely (5)
Childcare coverage below 3 years	0.0021 (0.0890)	0.0433 (0.1773)	-0.0601 (0.1637)	0.0271 (0.0634)	-0.0125 (0.0109)
Observations	51,407	51,407	51,407	51,407	51,407
Mean of dep. var	0.0858	0.5682	0.3185	0.0260	0.0014
SD of dep. var	0.2801	0.4953	0.4659	0.1592	0.0374

Notes: All models include a set of individual level controls (each parent's education and age at birth, also squared, child's migration background and gender) and a set of county level controls (population density, GDP p.c., share of women between 20 and 40 years, mean age, share of women and men with *Abitur*, and household income). Children are born between 2011 and 2019 and models include observations from 310 counties. Robust standard errors clustered at county level are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Own calculations based on data from the KiBS, the Federal Statistical Office and INKAR.

Table A.6: Sensitivity checks: Effects on childcare attendance (age 12 – 35 months) for varying birth cohorts

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variable: Childcare attendance (age 12 – 35 months)						
	Samples of different birth cohorts						
	2009-18	2011-19	2011-18	2011-17	2010-16	2009-15	2010-19
Childcare coverage	0.7583***	0.7335***	0.7183***	0.6878***	0.7274***	0.6389***	0.7690***
below 3 years	(0.1418)	(0.1830)	(0.1779)	(0.1827)	(0.1725)	(0.1862)	(0.1471)
Observations	79,430	70,152	68,296	60,480	57,226	52,253	78,707
Covariates	✓	✓	✓	✓	✓	✓	✓
Time FEs	✓	✓	✓	✓	✓	✓	✓
County FEs	✓	✓	✓	✓	✓	✓	✓

Notes: All models include birth year and county fixed effects, as well as individual-level and county-level controls (see notes of table 1). Robust standard errors clustered at county level are given in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Own calculations based on data from the KiBS, the Federal Statistical Office, and INKAR.

Table A.7: Effects of childcare expansion on other care arrangements (age 12 – 35 months)

	Dependent variable: Other care arrangements		
	Grandparents normally care (1)	Grandparental care hours (2)	Other care arrangements (3)
Childcare coverage	-0.0964	-1.3721	-0.0381
below 3 years	(0.1240)	(2.4437)	(0.0721)
Observations	79,471	47,403	81,450
Mean of dep. var	0.4640	3.2172	0.1410
SD of dep. var	0.4987	6.9829	0.3480

Notes: All models include birth year and county fixed effects, as well as individual-level and county-level controls (see notes of table 1). Children are born between 2009 and 2019. Robust standard errors clustered at county level are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Own calculations based on data from the KiBS, the Federal Statistical Office Germany and the INKAR database.

Table A.8: Heterogeneity: Effects of childcare expansion on fathers' involvement by parental education and children's sex (children aged 12 – 35 months)

	(1)	(2)	(3)	(4)	(5)
			Dependent variables		
	Father took two months of leave	Division of childcare	Paternal employment	Father works part-time (long)	Father works part-time (short)
		Panel A: By Mothers' Education			
Coverage × *Abitur* mother	0.3354***	-0.0637	-0.0236	0.0742	0.0110
	(0.1186)	(0.2120)	(0.0539)	(0.0572)	(0.0248)
Coverage × no *Abitur* mother	0.3749***	-0.0206	-0.0748	0.1087*	0.0226
	(0.1183)	(0.2162)	(0.0565)	(0.0583)	(0.0247)
Observations	49,665	51,266	71,174	70,363	70,363
		Panel B: By Fathers' Education			
Coverage × *Abitur* father	0.3483***	-0.0143	-0.0494	0.1533**	0.0131
	(0.1211)	(0.2111)	(0.0646)	(0.0661)	(0.0322)
Coverage × no *Abitur* father	0.3700***	-0.0552	-0.1140*	0.1665**	0.0267
	(0.1170)	(0.2145)	(0.0661)	(0.0687)	(0.0312)
Observations	49,434	50,999	63,380	62,805	62,805
		Panel C: By Children's Gender			
Coverage × Child is female	0.3233***	-0.0664	-0.0449	0.0942	0.0193
	(0.1177)	(0.2170)	(0.0547)	(0.0577)	(0.0252)
Coverage × Child is male	0.3725***	-0.0260	-0.0198	0.0726	0.0208
	(0.1171)	(0.2109)	(0.0545)	(0.0558)	(0.0254)
Observations	49,797	51,407	71,833	71,014	71,014

Notes: All models include birth year and county fixed effects, as well as individual-level and county-level controls (see notes of table 1). Robust standard errors clustered at county level are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Own calculations based on data from the KiBS, the Federal Statistical Office, and INKAR.
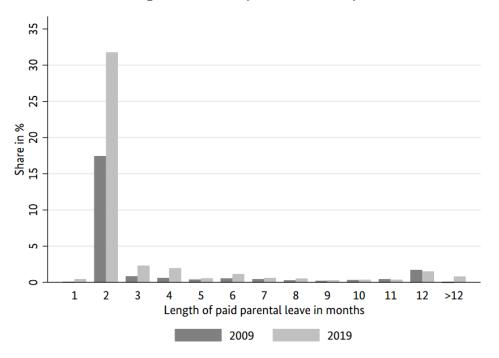
Table A.9: Robustness checks for main outcomes (age 12 – 35 months) – Sample restrictions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Sample restrictions					
Dependent variable	Main Specification	Exclude 2020	In same HH	> 49 county-year obs.	Exclude BER & HH	Cities < 500,000	West Germany
Childcare	0.7697***	0.6933***	0.7760***	0.7898***	0.5932***	0.8013***	0.5739***
Attendance	(0.1470)	(0.1689)	(0.1537)	(0.1999)	(0.1301)	(0.1597)	(0.2140)
Observations	81,286	70,851	76,309	49,579	71,080	69,542	51,702
Fathers' PL	0.3459***	0.3164**	0.3790***	0.2756*	0.2805**	0.3389***	0.5586***
uptake	(0.1081)	(0.1251)	(0.1182)	(0.1442)	(0.1151)	(0.1225)	(0.1740)
Observations	67,937	57,045	66,066	42,525	59,582	59,028	41,733
Mother is sole/	0.0454	-0.0051	0.0685	0.3541	0.0376	0.0380	-0.2589
main caregiver	(0.1628)	(0.1769)	(0.1633)	(0.2351)	(0.1809)	(0.1753)	(0.1848)
Observations	51,407	41,292	50,538	30,622	44,938	44,195	32,321
Maternal	0.4553***	0.3713***	0.4882***	0.5331***	0.3741***	0.4251***	0.2808
employment	(0.1164)	(0.1318)	(0.1226)	(0.1396)	(0.1191)	(0.1379)	(0.1755)
Observations	80,656	70,244	75,830	49,049	70,543	68,996	51,342
Paternal Full-time	-0.1341*	-0.0731	-0.1355*	0.0249	-0.1692*	-0.1725**	-0.1087
	(0.0762)	(0.0864)	(0.0776)	(0.1157)	(0.0892)	(0.0788)	(0.1031)
Observations	71,014	61,028	69,527	40,640	62,077	60,981	45,021

Notes: All models include birth year and county fixed effects, as well as individual-level and county-level controls (see notes of table 1). Robust standard errors clustered at county level are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Own calculations based on data from the KiBS, the Federal Statistical Office, and INKAR.

Table A.10: Robustness checks for main outcomes – Model specifications

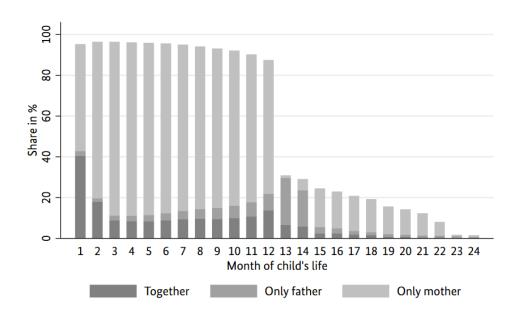|	(1)	(2)	(3)	(4)	(5)	(6)
				Model Specifications		
Dependent variable	Main specification	No regional controls	State time trends (linear)	Include weights	+ Fulltime coverage	+ Coverage squared
Childcare attendance at age 12 – 35 months						
Childcare coverage	0.7697***	0.8408***	0.7701***	0.4492***	0.7517***	0.9049***
below 3 years	(0.1470)	(0.1679)	(0.1481)	(0.1688)	(0.1763)	(0.2324)
Childcare coverage						-0.2053
squared						(0.3407)
Observations	81,286	81,286	81,280	80,681	81,280	81,286
Fathers' PL uptake						
Childcare coverage	0.3459***	0.3434***	0.3429***	0.3112*	0.3571***	0.4188*
below 3 years	(0.1081)	(0.1056)	(0.1804)	(0.1947)	(0.1248)	(0.2166)
Childcare coverage						-0.1120
squared						(0.2700)
Observations	67,937	67,937	66,374	48,536	67,381	67,937
Mother is sole/main caregiver at age 12 – 35 months						
Childcare coverage	0.0454	0.0282	0.0467	0.0814	-0.0384	0.1989
below 3 years	(0.1628)	(0.1742)	(0.1632)	(0.1864)	(0.1822)	(0.4366)
Childcare coverage						-0.2004
squared						(0.5505)
Observations	51,407	51,407	51,402	50,833	51,402	51,407
Maternal employment age 12 – 35 months						
Childcare coverage	0.4553***	0.5084***	0.4581***	0.3485**	0.3695***	0.5912**
below 3 years	(0.1164)	(0.1057)	(0.1179)	(0.1645)	(0.1406)	(0.2421)
Childcare coverage						-0.2064
squared						(0.3403)
Observations	80,656	80,656	80,650	80,047	80,650	80,656
Paternal full-time employment at age 12 – 35 months						
Childcare coverage	-0.1341*	-0.0735	-0.1315*	-0.1229	-0.1608**	0.0119
below 3 years	(0.0762)	(0.0977)	(0.0765)	(0.1005)	(0.0733)	(0.1484)
Childcare coverage						-0.2196
squared						(0.2009)
Observations	71,014	71,014	71,014	70,444	71,009	71,014

Notes: All models include birth year and county fixed effects, as well as individual-level and county-level controls (see notes of table 1). Robust standard errors clustered at county level are given in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Own calculations based on data from the KiBS, the Federal Statistical Office Germany and INKAR.
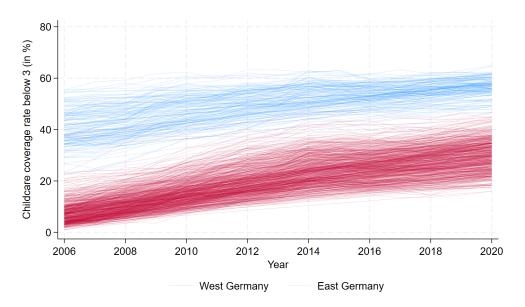
Fig. A.1: Paternity leave in Germany

A: Duration of paternity leave benefits for children born 2009 and 2019
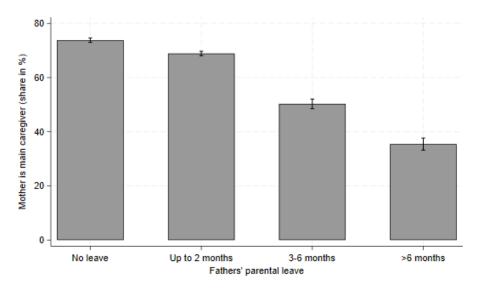

B: Allocation of parental leave by child age in 2019

Source: Customised statistics on parental leave benefit receipts from the Federal Statistical Office retrieved from Brehm et al. (2022).

Fig. A.2: Childcare rates for children under the age of three over time by county
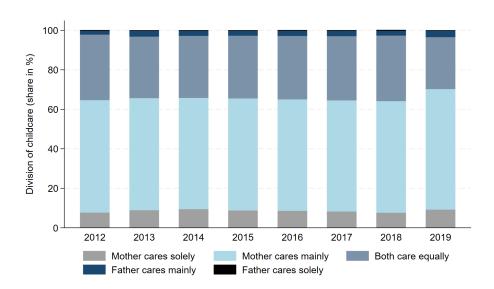
Fig. A.3: Mother's role as main caregiver by fathers' parental leave length

Fig. A.4: Division of childcare in Germany over time

Fig. A.5: Share of mother is main caregiver and fathers' parental leave take-up over birthcohorts 2012-2019

Fig. A.6: Effects of childcare expansion for children under 18 months on parental leave take-up
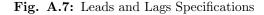

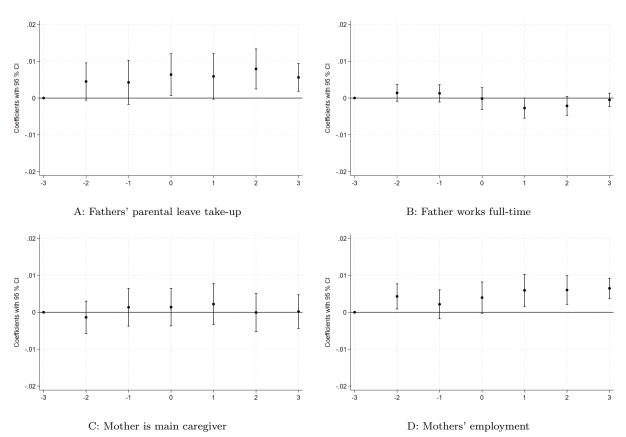A: Father currently on parental leave   B: Father takes parental leave alone   C: Father on leave with partner

Notes: Coefficient estimates with 95% CI of the childcare rate on parental leave take-up. Estimates stem from separate estimations of eq. 1 by age, children are born between 2010 and 2019. All models include county and birth year fixed effects, as well as individual-level and county-level controls (for details, see notes of Table 1).
Source: Own illustration based on data from the KiBS, the Federal Statistical Office, and INKAR.

Fig. A.7: Leads and Lags Specifications

A: Fathers' parental leave take-up

B: Father works full-time

C: Mother is main caregiver

D: Mothers' employment

Notes: The figure reports effect estimates and their 95% CI of the childcare expansion on measures of fathers' involvement. The leads-and-lags specification follows Schmidheiny and Siegloch (2023, equation 6) for event-study type estimations in settings with continuous, staggered treatment. Specifically, we regress our main outcomes in levels on three leads and three lags (third lead and lag binned) of changes in county-level childcares rates. We use the third lead as a reference because the definition of the childcare rate for children under three creates some overlap in birth cohorts for each year. Consequently, closer leads might capture some effects. All models include county and birth year fixed effects, as well as individual-level and county-level controls (for details, see notes of Table 1).

Source: Own illustration based on data from the KiBS, the Federal Statistical Office, and INKAR.