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The Impact of Parental Leave Policy on Child-Rearing and Employment Behavior: The Case of Germany

Abstract

Parental leave and child care are important instruments of family policies to improve work–family balance. This paper studies the impact of the substantial change in Germany's parental leave system on maternal employment. The aim of the reform was to decrease birth-related maternal employment breaks by providing more generous parental benefits for a shorter period of time. Using the German Socio-Economic Panel data for 2002–2015, I exploited quasi-experimental variation in the benefits to estimate the impact of the reform. I incorporated the mother's decision to substitute her care time with the public child care. To control for the availability of child care, I used spatial and temporal variation in the availability of childcare slots. Overall, I did not find significant changes in maternal employment during the first three years of motherhood after the reform implementation. Only for high-income mothers, the reform produced a significant decrease in the employment participation during the first year of leave and an increase in employment probability after the benefits expired. The empirical findings suggest that the restriction in the childcare availability became an important constraint for the employment effect of the reform.

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1 Introduction

The relatively low labor participation rate of mothers with young children is a particular characteristic of female labor market. Figure 1 reports the significant differences in employment rates of females with and without children in 2012. These differences are significantly large for mothers with children aged zero to two years. Germany has one of the lowest participation rate for this category (53.8%) among the reported countries. At the same time, the German females without children report one of the highest participation rates (8.29%). The comparison of these indicators with the values reported in 2006 (Figure 2) reveals the persistence in such participation distribution.

The trade-off faced by women with small children[1] and working careers — stay at home to take care of a child or return back to work — is widely discussed in both the academic literature and social policy debates. Mothers may base their decision on different factors: e.g., preferences, social norms, income, and time constraints. In general, family policies seek to relieve economic constraints and maintain the work–family balance. The concerns surrounding such policies are numerous: decreasing fertility rates, demographic burden on the social security system, low employment participation rates of mothers, and child welfare, among others. The implementation of family policy and its effectiveness can vary significantly across countries and institutional contexts.

Parental leave is one of the principal components of government policy supporting the reconciliation of family life and careers for women. There is a vast strand of literature analyzing the impact of the parental leave system on mothers' employment behavior. The empirical

Figure 1   Employment rates of females aged 25–54 years by age of the youngest child, 2012.
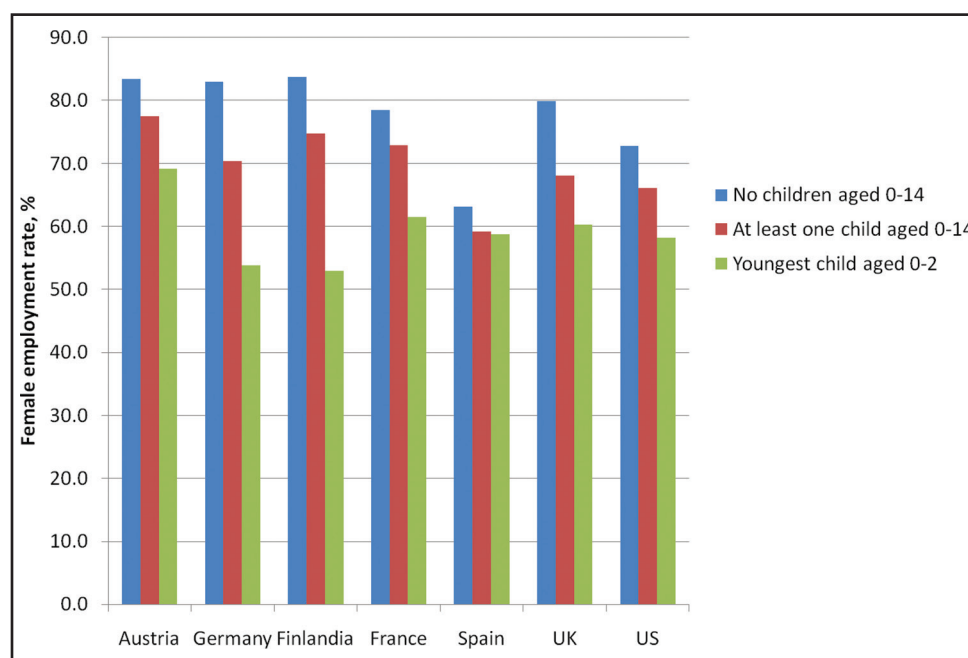
Source: Calculations based on data from the Organisation for Economic Co-operation and Development (OECD) Family Database 2012. Online at: http://www.oecd.org/els/family/database.htm.

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1   Children younger than 6 years.

Figure 2　Employment rates of females aged 25–54 years by age of the youngest child, 2006.
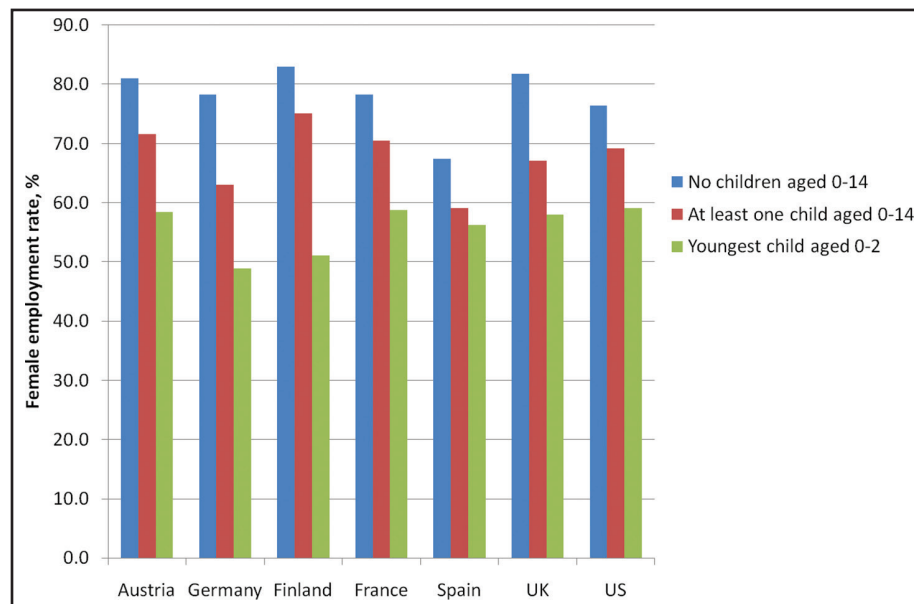
Source: Calculations based on data from the OECD Family Database 2012. Online at: http://www.oecd.org/els/family/database.htm.

evidence supports a negative relationship between parental leave benefits and maternal employment (Apps and Rees, 2004; Lalive and Zweimuller, 2009; Thevenon and Gauthier, 2011). If a woman with a young child has the option to stay at home on paid leave, she will use it. The longer the job-protected leave and the higher the parental leave payment, the longer a woman's employment break will last. As a consequence, the more difficult it will be to find employment afterward.

Another important instrument of family policy is the system of childcare provision. This type of governmental support tries to ease mothers' time constraint by subsidizing alternative child care. Childcare policies usually subsidize public childcare institutions or compensate the parents' costs related to child care. Figure 3 shows the positive association between maternal employment and children enrollment in public child care across European countries in 2012.[2] Germany is clearly noted for a low level of childcare provision (17.8%) compared to the average (37%).[3]

Overall, the literature studying childcare policies finds mixed evidence of the effect of public childcare expansion on mothers' employment behavior (Blau and Currie, 2006; Fitzpatrick, 2010; Cascio, 2009). At the same time, few studies focus on possible influence of the structure of the childcare market on the effectiveness of other family policy instruments (Geyer et al., 2015; Bick, 2016).

The aim of this paper was to address this gap by evaluating the effect of a paid parental leave reform on mothers' employment decisions, given the existing childcare system. In

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2　The childcare systems clearly differ across European countries, depending on the form of provision and funding for it. Nevertheless, formal child care, which includes daily operated childcare centers and registered childminders, remains the most important source of provision.

3　One may think that informal childcare arrangements can offset the lack of formal institutes. Similar plotting does not reflect any correlation between informal care and maternal employment. Since the informal arrangements are an important factor, I discuss them in the following sections.

Figure 3   Relationship between maternal employment and child enrollment in formal child care, 2012.
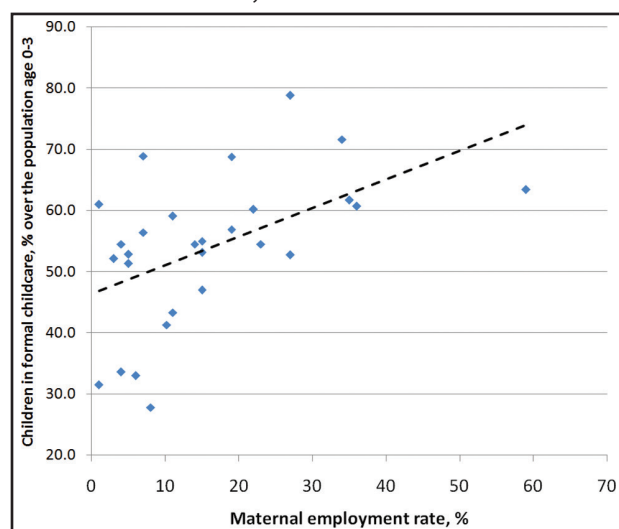
Source: Calculations based on data from European Union Statistics on Income and Living Conditions (EU-SILC) survey 2012. Online at: https://ec.europa.eu/eurostat/web/income-and-living-conditions/data/database.

particular, I analyzed the 2007 German parental leave reform that considerably changed the system of family compensation for time that mothers spent out in the labor market. Under the prereform system, a mother received a means-tested leave benefit of 300 euros per month that was paid out for two years and targeted at lower income families. The reform replaced it with the universal payment of 67% of annual prebirth net labor earnings, paid for just one year and extending the group of eligible families to the entire population. The unanticipated and quick implementation of the new regulation provided a quasi-experimental environment in which to evaluate the reform's impacts on different outcomes.[4]

The new policy was designed to meet various goals. The payment was intended to counter-act the decline in families' earnings in the first year after birth. Reducing the payment period from two years to one year was supposed to incentivize the mother's return to the labor force once the payment was terminated. To increase the father's involvement in caring for the child, the new policy provided a "father's quota" of two paid months if a family decided to share childcare responsibilities (14 months of paid leave in total). Overall, the new policy intended to make parenthood more attractive to women with careers and to make work more attractive to women who had not been in the labor force. The reform turned to increase total parental leave benefits for middle- and high-earning women and to decrease it for low-earning women.

Various studies focus on the impact of the 2007 reform on maternal employment. Kluve and Tamm (2013) found evidence of a significant decline in mothers' employment probability during the first year of motherhood and an increase of that in the second year, once the benefit expires.[5] Bergemann and Riphahn (2011) showed the positive effect of the German parental leave reform on mothers' intentions to return to work. They found a positive response in maternal labor force participation once the benefit is expired, using semi-parametric Cox

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4   Refer [18] for a detailed review.

5   The author exploits a "natural" experiment using cross-sectional survey data collected by health insurance funds in two federal states.

hazard models. Overall, these studies concluded that there is a decrease in maternal employment during the first year after childbirth and an increase in return to work in the second year associated with the reform implementation. Kluve and Schmitz (2018) showed that this positive effect persists for the medium run (three to five years after childbirth) for medium- and high-earning mothers. The important drawback of these studies is that they do not consider the availability of child care.

Geyer et al. (2015) found a decline in maternal labor supply during the first year and an increase in that in the second year. Using a structural labor supply model, they examined the role of subsidized child care. The simulated results show that significantly larger maternal employment effects might be observed once universal child care is available.

A number of studies discussed childcare provision in Germany and its role in maternal employment. Muehler (2010) compared public sector and non-public providers. She emphasized the lack of full-day slots for children under three years of age and a significant regional variation in access. Using microsimulations, Haan and Wrohlich (2011) concluded that childcare subsidies conditional on maternal employment status increase the labor supply. Bick (2016) counterfactual policy analysis showed that insufficient subsidies for childcare provision decrease labor participation by mothers with children younger than three years. Schober (2012) focused on the allocation of childcare time between parents and found that the 2007 parental leave reform increased fathers' involvement in child care.

Following the literature, I studied on the relationship between maternal employment and childcare decisions in each of first three years of motherhood. The reform sought to support families with a newborn through increased parental benefits and to decrease birth-related employment breaks through a shortened paid-leave period. Given that maternal employment is conditional on access to child care, I focused on the reform's effect on mother's employment decision in the context of restricted childcare alternatives. To identify the effect of the reform, I exploited temporal variation in parental leave benefits and temporal and spatial variations in childcare provision. Using German Socio-Economic Panel (GSOEP) data for 2002–2015, I estimated a bivariate choice model of maternal employment and childcare decisions in two specifications with and without controlling for a mother's childcare choice. Without controlling for childcare decision, the findings suggested the positive impact of the reform on the employment after childbirth. These results are in line with the previous findings of Kluve and Tamm (2013), Bergemann and Riphahn (2011), and Geyer et al. (2015). Once the estimations are corrected to the childcare factor, the policy effects turn insignificant. Only the mothers in full-time employment report the increase in participation associated with policy (6.4% points). The effect is driven by high-income mothers. Estimating the possibility of childcare arrangements and labor force participation jointly, the analysis provides new evidence on the importance of institutional constraints for policy implementation. I contribute to the literature showing that the estimation of previous studies is likely to be biased since the childcare decision is not considered. My empirical evidence confirms the importance of childcare availability for the mothers' labor market participation. The enrollment in public childcare increases significantly labor force participation. At the same time, I observed that higher availability of public childcare implies higher probability of its usage.

The paper is organized as follows. Section 2 focuses on the institutional characteristics of parental leave reform and the childcare system in Germany. Section 3 discusses the

identification strategy and presents the German data used for the analysis. Section 4 describes the main findings, and Section 5 concludes.

2 Institutional background

2.1 Family policy in Germany

For a long time, Germany has implemented a complex family policy targeted at maternal protection and child-rearing. A family with a newborn is entitled to maternity leave benefits, parental leave benefits, child benefits, a child tax allowance, and additional household benefits based on the number of children. The benefits are almost universal in Germany. The eligibility criterion is the parent's German or European citizenship and a settlement permit or a residence permit with at least three years' past employment in Germany.

The maternity leave system consists of a period of 14 paid weeks, typically divided into six weeks before childbirth and eight weeks afterward. During maternity leave, mothers are not allowed to work but are insured against dismissal. They also receive maternity benefits (Mutterschaftsgeld) – a net government transfer of up to 13 euros per day and additional coverage equal to the net income if the woman is eligible for social insurance. Employed women without government insurance receive a one-time maternity allowance of up to 210 euros[6] and supplements from the employer.

The parents receive an untaxed allowance (Kindergeld) until the child's 18th birthday. For the first and second child, this consists of 184 euros, with a slight increase to 190 euros for a third child and to 214 euros for each child thereafter. The parents can deduct part of the income necessary to maintain a child from their tax return. Low-income households[7] can further apply for an in-work tax credit (Kinderzuschlag) of up to 140 euros per month for six months. Parents may also be eligible for the accommodation allowance (Wohngeld) in the form of home-ownership subsidies for low-income families with a higher number of children.

The German paid-leave system was established in the mid-1950s when mothers have been entitled to job-protected paid leave 6 weeks before childbirth and 8 weeks after childbirth.[8] In 1979, the duration was raised to six months, but the payment remained unchanged. In 1986, the duration of the job protection and payment leave was increased to ten months. In addition, fathers became eligible for parental leave. Further reforms in the beginning of the 1990s increased the job-protected period to 36 months (1992) and the duration of leave payment to 24 months (1993). These reforms defined the structure of the parental leave system for almost 15 years, before a new set of family policies came into force.[9]

Under this original system, a parent could share job-protected parental leave of up to three years (Elternzeit). During parental leave, the parent who stayed at home (or worked fewer than 30 hours per week[10]) received the child-rearing benefit (Erziehungsgeld). It was a universal means-tested transfer with an income cap (30,000 euros for the first six months and

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6 http://ec.europa.eu/employment_social/missoc/db/public/compareTables.do?lang=en.
7 Income up to 900 euros per couple or 600 euros per single parent.
8 The following description of changes in the paid leave system is based on Schönberg and Ludsteck (2014).
9 During this period, the parental leave system saw some minor modifications. For instance, since 2001, parents with a part-time contract have been entitled to benefits.
10 It is equivalent to reduced full-time work in Germany.

16,500 euros afterward for a married couple[11]). The eligible period was up to 24 months, and the payment was 300 euros per month.[12] If the income threshold was exceeded, the benefit was withdrawn at a rate of 63%. Thus, the child-rearing benefit depended on the gross income of the household and the mother's labor participation decision. Under the old policy, the parental leave payment was targeted to low-income families, as the income threshold and the amount made the payment negligible for middle- and high-income households.[13]

Even though fathers became eligible for parental leave in 1986, the male take-up ratio of the leave was insignificant. Parental leave was effectively maternal leave, and child-rearing was considered a traditional maternal activity within the "bread-winner" household model. German mothers delayed their return to work, and the availability to take longer leave weakened their labor force attachments (Schönberg and Ludsteck, 2014; Geyer and Steiner, 2007; Ondrich et al., 2003).

2.2 The 2007 parental leave reform

Negative trends in reproduction and the low labor market participation rate of mothers with children younger than three years[14] led to further reforms to the parental leave system.

The new parental leave system was established at the end of 2006 and took effect for children born after January 1, 2007. The main changes in the reform were financial. Under the new system, the means-tested child-rearing benefit (Erziehungsgeld) has been replaced by the parental allowance (Elterngeld), which accounts for 67% of the rearing parent's net labor income per month. The benefit is calculated on the basis of the average labor earnings 12 months prior to the birth. If a parent caring for a child was economically inactive prior to the child's birth, she (he) receives a flat minimum of 300 euros per month (3,600 euros per year). This minimum is also paid to those whose parents' benefits would otherwise be less than 300 euros (part-time employees, those with a mini job, low earners). The benefit is truncated at 1,800 euros per month (21,600 euros per year), meaning that a parent with prebirth monthly net labor earnings more than 2,700 euros can get only the maximum payment. The benefit replacement rate increases to 100% if the child-rearing parent's net income is less than 1,000 euros per month.

Another important change in the parental leave legislation is the cutoff in the duration of payment. Parental leave payments are granted for 14 months if both parents share the child-rearing and for 12 months in a single-carer household. The condition to work no more than 30 hours a week remains unchanged, but the reduction in the amount and duration of benefits makes part-time employment less attractive. In 2010, approximately 2%–9% of mothers were employed part-time while receiving benefits.

The reform was designed with various goals in mind. First, it aims to provide substantial financial support to families with children younger than one year, targeting middle- and high-income households.[15] Second, it encourages mothers to return to work after childbirth.

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11 These thresholds were applied from 2004 onward, and they had previously stood at 51,130 euros per year per married couple. They were different for single parents and varied with the number of children in the household.

12 The parents could choose a payment of 450 euros per monthly for up to 12 months. This option was chosen by approximately 13% parents.

13 The income cap allowed about 77% of all parents to claim the benefits during the first six months after childbirth. Afterward, only 50% of families were entitled to the benefit.

14 For instance, 48% in Germany compared to 77% in Sweden (OECD 2006).

15 Huebener et al. (2016) provided a detailed discussion of the critics of the political shift in the distribution targets.

Third, it addresses gender equality by enhancing the father's involvement in child care. Initially, an increased birthrate among working women was not named as an official goal of the reform, but it was added later (Huebener et al., 2016).

As Spiess and Wrohlich (2008) point out, the main idea of the 2007 reforms was to move the design of the existing parental system toward the Scandinavian model, in which family policy supports the "dual-earner household." There was a belief among German politicians that the Scandinavian model, with its high supply of publicly funded daycare and its generous parental leave system, promotes higher employment rates among mothers with young children, as well as higher fertility rates due to policies that reduced family income losses after childbirth.

According to administrative statistics, the take-up ratio was about 96% of all mothers between 2007 and 2010, with the average duration of parental leave almost a full period of 12 months. The average amount of benefits was also increasing. Comparing the simulated pre- and postreform benefits, Raute (2019) showed that the financial gain in benefits was continuously increasing in the postreform period.

The administrative data also report a significant increase in the take-up ratio of parental leave by fathers. In the first year after the reform, the share jumped from 2.5% to 15%. It increased continuously and was more than 34% in 2014. However, Kluve and Tamm (2013) showed that the higher participation in parental leave did not translate into significant involvement of the father in child-rearing. Most of the fathers received the benefit during the two months that could be added to the mother's 12 months and then returned to work.

2.3 Childcare provision

The German childcare system represents a universal mixed-market provision by public institutions and different types of non-state providers, such as religious institutions, private nonprofit organizations, commercial daycare centers, nannies, childminders, and family daycare. While public centers are under municipality or local-authority control, private nonprofit providers belong to welfare organizations. Centers run by churches are part of the public market. The owners of commercial centers are entrepreneurs or companies providing childcare services for employees. According to the survey "Children and Personnel in Child-Care Centres",[16] public centers had 34% of total market share in 2009. The religious centers run by churches covered 36% of the market, while the nonprofit centers operated by nonpublic institutions represented 28% of the market share. The proportion of commercial centers was significantly low – only approximately 2%. Apart from the institutes run by public authorities, all the other categories were eligible for public finance. Therefore, the German childcare market can be defined as highly state dependent.

The German childcare market is characterized by price rationing. The local communities that finance and run the majority of public childcare institutions set their fees based on household income and the child's age.[17] Borck and Wrohlich (2011) reported the following numbers for children younger than three years: in 2005, the parents' monthly fees, on average, were

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16 The data are a part of the annual "Child and Youth Welfare Survey" collected by the German Federal Statistical Office.
17 The privately subsidized institutions use a similar scheme.

100 euros for a part-time slot and 120 euros for a full-time slot, while public expenditures were approximately 700 euros per month per child.

Since public childcare is relatively cheap, there is a high demand for slots. It is accompanied by low availability and high heterogeneity across Eastern and Western Germany, in particular for children younger than three years. Haan and Wrohlich (2011) showed that public childcare slots were available to only 8% of this age category in Western Germany in 2006 but to 40% of this age category in Eastern Germany.[18] Muehler (2010) showed that the largest part of the Western German market is served by non-profit organizations, while municipal public institutions are more typical in the eastern part of the country. Additional heterogeneity comes from the distribution of childcare providers at the regional level. Therefore, the supply of childcare might exhibit systematic differences by region or by parental preferences regarding the type of childcare provider. Muehler (2010) results confirm that non-profit and commercial centers provide a substantially higher share of full-time child care for children younger than three years than public providers offer, even when controlling for the regional factor and provider distribution.

In recent years, Germany has put substantial effort into increasing public childcare provision. The 2005 federal law regarding day-care expansion (Tagesbetreuungsausbaugesetz) established extra funding for additional childcare slots in public facilities. In particular, it focused on two groups: children younger than one year and younger than two to three years. The 2008 federal law (Kinderförderungsgesetz) continued enhancing the states' investment in childcare infrastructure. The principal goal was to achieve coverage of 35% of all children younger than three years by 2013. It also guaranteed the parents' legal right to the daycare slot for children aged one year and older from August 2013, unconditional on parents' employment status or income. All of these efforts resulted in an increase in the average attendance rate for children younger than three years, from 13.6% in 2006 to 32.7% in 2016. Table 1 reports the dynamics of childcare coverage in terms of the percentage of all children younger than three years who attend childcare at the state level. We can see that the demand for slots is higher than the supply for all states (see Table 2[19]).

2.4 Mechanism: the effect of the reform on the labor participation decision

Under the new parental leave system, mothers might respond differently to the introduced financial incentives, depending on the child's age and the income status of the household. Kluve and Tamm (2013) distinguished between two groups in the population of mothers entitled to the new benefits. The first group consisted of low-income mothers who were entitled to benefits under both the old and the new regimes. For them, the policy reduced the overall income related to the leave payments (the same payment over a 12-month shorter period). We might expect that after the termination of payments, mothers would return to work to adjust to the income loss during the next 12 months.

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18 Eastern Germany inherited the childcare system from the former German Democratic Republic, where family policy stimulated maternal employment.

19 The administrative data on childcare demand are available from 2006 onward and for childcare supply are available only from 2012.

Table 1 Public childcare enrollment rates for children younger than three years, 2006–2015

Region	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Baden-Württemberg	8.7	11.5	13.6	15.8	18.3	20.8	23.1	24.9	27.8	27.8
Bayern	8.2	10.7	13.2	15.7	18.5	20.6	23.0	24.8	27.1	27.5
Berlin	37.8	39.8	40.4	41.5	42.1	41.9	42.6	43.7	46.0	45.9
Brandenburg	40.4	43.4	44.8	48.3	51.0	51.6	53.4	53.6	57.8	56.8
Bremen	9.2	10.5	12.7	13.7	16.1	19.6	21.2	23.2	26.9	27.1
Hamburg	21.0	22.0	20.1	22.2	28.5	32.4	35.8	38.4	43.0	43.3
Hessen	9.0	12.4	14.2	16.3	19.3	21.5	23.7	25.7	28.8	29.7
Mecklenburg-Vorpommern	43.1	44.1	44.9	49.5	50.7	51.7	53.6	54.5	56.1	56.0
Niedersachsen	5.1	6.9	9.1	11.9	15.8	18.6	22.1	24.4	27.9	28.3
Nordrhein-Westfalen	6.5	6.9	9.3	11.5	14.0	15.9	18.1	19.9	23.8	25.8
Rheinland-Pfalz	9.4	12.0	15.0	17.5	20.1	24.7	27.0	28.2	30.6	30.6
Saarland	10.2	12.1	14.1	15.1	17.7	20.2	22.1	24.6	27.0	28.3
Sachsen	33.5	34.6	36.5	40.1	42.8	44.1	46.4	47.2	49.9	50.6
Sachsen-Anhalt	50.2	51.8	52.7	55.1	55.9	56.1	57.5	57.7	58.3	57.9
Schleswig-Holstein	7.5	8.2	11.6	14.3	18.1	21.6	24.2	26.3	30.3	31.4
Thüringen	37.9	37.5	38.9	42.8	45.1	46.9	49.8	51.4	52.4	52.3
Germany	13.6	15.5	17.6	20.2	23.0	25.5	27.6	29.3	32.3	32.9

Source: German Federal Statistical Office.

Table 2 Excess of demand to public childcare for children younger than three years, 2012–2015

Region	2012	2013	2014	2015
Baden-Württemberg	13.7	13.9	11.4	11.0
Bayern	8.6	11.0	8.3	9.2
Berlin	13.3	9.4	7.5	7.6
Brandenburg	4.1	7.7	4.1	4.5
Bremen	19.5	16.6	11.0	14.1
Hamburg	9.4	9.2	7.4	8.5
Hessen	14.2	16.1	10.6	10.0
Mecklenburg-Vorpommern	6.8	6.6	5.2	6.5
Niedersachsen	13.2	13.0	10.4	11.3
Nordrhein-Westfalen	15.8	15.2	9.6	13.3
Rheinland-Pfalz	13.1	14.4	12.5	11.8
Saarland	12.9	14.3	10.1	11.1
Sachsen	6.1	7.9	4.8	6.1
Sachsen-Anhalt	3.3	4.8	4.5	4.3
Schleswig-Holstein	10.6	13.0	13.5	12.2
Thüringen	3.8	4.3	4.8	4.3
Germany	11.8	12.4	9.2	10.2

Source: German Federal Statistical Office.

The second group consisted of mothers who did not receive any benefit under the old system. Now, they are entitled to a payment that partially covers the household's income loss related to maternity. We might expect a drop in mothers' employment rate during the child's

first year. Once the payments expire, the effect becomes ambiguous. On the one hand, the standard labor supply model (see Klerman and Leibowitz, 1999) predicts a positive impact of the policy on female labor force participation. An increase in the amount of benefits and a shorter payment period generate a sizable income decrease, thus creating a strong incentive to maintain the household income level by returning to work (income effect). On the other hand, before the reform, these mothers did not get anything; now, though, the payment may allow smoothing of consumption and an increasing in the reservation wage, thus postponing mothers' return to work (wealth effect). Overall, the effect of the reform might be ambiguous during the second year after childbirth.

The reform did not introduce any changes in benefit entitlements in the last year of job-protected parental leave. Thus, the possible adjustment in employment behavior that we might observe during third or fourth years is related to decisions made in the first two years after childbirth.

The mechanism discussed earlier relies on the assumption that a mother can return to work immediately after making her decision. In practice, she needs to find a substitute for her childcare time. Nonparental child care may include different options, from paid daycare centers to unpaid care by relatives, but it should be available and affordable for a family at the moment of decision-making. Following Laroque and Salanié (2014), I consider a mother who maximizes her utility function in consumption (working hours and purchasing child care) and leisure (implicitly includes the option of taking care of the child herself), subject to budget and time constraints. The availability of subsidized child care loosens up the budget constraint. Depending on her preferences and whether a substitution effect dominates an income effect, a mother might respond by having a higher demand for subsidized child care and an increase in her employment. Then, the restricted supply of public child care and the shortage of other alternatives (private market or informal childcare) could make the maternal labor supply too expensive for the household.

Another consideration is related to the hours during which child care is available. In Germany, the public childcare slots exist in the following modes: part-time (less than 25 hours per week), extended part-time (between 25 and 35 hours per week), and full-time (more than 35 hours per week). Only a half of all enrolled children in 2012 were in full-time slots; 21% were in part-time slots and 27% were in extended part-time slots (BMFSFJ, 2017). Therefore, a mother can face difficulties in adapting her work schedule to the childcare facility's hours of operation. The cultural context also matters. In a society in which child-rearing is traditionally considered a maternal activity, the financial incentives for mothers to return to work earlier do not necessarily translate into higher employment.

Summing up, the effect of the parental leave policy on maternal employment might be ambiguous for different reasons. Whether there is a positive shift in maternal employment depends not only on a mother's preferences but also on the constraints she faces in finding a substitute for her childcare time. The existence of considerable excess demand for subsidized child care is a potential constraint to the reform implementation. Since the private childcare sector is particularly expensive and cannot be regarded as an alternative to the public sector, women face an important constraint when making the decision regarding their labor participation.

3 Data and empirical strategy

3.5 Data and descriptive evidence

The empirical analysis is based on data from the GSOEP, a longitudinal household survey that collects information on demographic and socioeconomic characteristics from a representative sample of German private households.[20] The survey currently covers approximately 19,000 households, 25,000 adult respondents, and 6,000 children living in the surveyed households.

To analyze the effects of the parental leave reform on childcare and return-to-work behavior, I used the survey's detailed information on the childcare time allocation of mothers with newborns. The data allowed me to identify the usage of child care from public institutions, private institutions, and/or relatives. In addition, since 2003, the survey has been collecting detailed information on the various characteristics of newborn offspring (2002 and subsequent birth years) using the "Mother and Child" questionnaire, which covers such issues as time of pregnancy, initial motherhood evaluation, health and child care of newborns, and the support given by a partner.

I constructed the dataset using waves for 2001–2015.[21] The sample consisted of 1,748 women between the ages of 20 and 46 years who gave birth within the considered period of 2002–2011. I excluded women who gave birth during December 2006 and January 2007 since Neugart and Ohlsson (2013) found empirical evidence of birth shifting toward January 2007, when the new parental leave system came into force. The observational unit was the birth of a child.[22] The sample was balanced, 50.46% of the births happened before the policy implementation.

The objective of the analysis was to estimate whether the reform had a positive impact on labor participation during the first years of motherhood controlling for childcare decisions. I followed each mother up to 48 months after giving birth and considered her labor force participation and childcare decisions during the first three years of job-protected parental leave and the fourth year, when the parental leave right expires.

Monthly information on employment, periods of maternity leave, and a child's birth date allowed me to define when a woman returns to work. I considered only the first transition into employment. To compare the reform effects for different margins of labor supply, I considered various outcomes for each year of motherhood:

- *Employment*: emp_{it} is an overall indicator for mothers' regular labor participation at the extensive margin. It is a dummy variable where $emp_{it} = 1$, if mother i reports regular employment at year t of motherhood, and $emp_{it} = 0$ otherwise.
- *Full-time employment*: $empf_{it}$ defines the group of mothers working full-time; $empf_{it} = 1$ if mother i reports working full-time at year t of motherhood and $empf_{it} = 0$ otherwise.
- *Part-time employment*: $empp_{it}$ defines the group of mothers working part-time;[23] $empp_{it} = 1$ if mother i reports working part-time at year t of motherhood and $empp_{it} = 0$ otherwise.

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20 For more detailed information, see Wagner et al. (2007).

21 Since the ultimate reform related to family policy took place in 2000, I assumed that the only expected impact on mothers' employment decisions comes from the changes in 2007.

22 Twins are treated as a single unit.

23 The mother works no more than 35 hours per week.

To determine whether a mother is the main childcare provider, I used the GSOEP information on the type of childcare used. The questionnaire allowed me to identify whether a family uses a public childcare slot and whether the time that the child spends in a childcare institution is sufficient for a woman to work full-time or part-time. In addition, I checked whether a family uses the help of a paid childminder controlling for the number of hours. The final variable cc_{it} is a dummy variable where $cc_{it} = 1$, if the formal number of hours a child of mother i at year t spends at paid child care, provided by both public and private institutions, is sufficient for mothers' employment.

The survey also provides information about additional help from the mother's partner, parents, and other relatives or friends, but the data on how many hours people other than the mother look after the child are restricted. I created an informal childcare variable equal to 1 if a woman gets any help from her partner, grandparents, relatives, and friends.

To account for the childcare availability constraint discussed earlier, I constructed a variable that measures the provision of childcare for children younger than three years at the regional level. The childcare coverage rate ccr_{jt} is defined as the percentage of children of this age in formal child care region i in year t.[24]

I considered different time windows around the reform implementation: 2006–2007, 2005–2008, and 2002–2011. Descriptive statistics for all dependent variables and sample periods are presented in Table 3.

Table 3 reports the descriptive evidence of differences in women's labor participation and childcare decisions before and after the reform implementation for various time windows around the reform. We do not observe any differences in mothers' labor force participation for the samples 2006–2007 and 2005–2008. The share of employed women during the second year of motherhood significantly increased in the postreform period only for the sample 2002–2011, with the differences driven by the group of mothers working full-time or part-time. These changes are accompanied by an increase in use of formal child care.

The general set of individual control variables includes the mother's age, education, partnership status, employment status, and individual labor income prior to giving birth. If a partner lives in the household, I included his personal characteristics and income. An eligibility indicator d_{it} allocated mother t into the treated group if she had a child in year t after 2007.

The main summary statistics of the variables are presented in Table 4 for the various pre- and postreform samples. The employment status and labor income variables are measured at the last employment spell prior to the birth. The income variables are adjusted to the 2005 base using regional consumer price indexes.

The samples observed shortly before and after reform implementation in 2006 and 2007 do not report any significant differences in females' characteristics. The prereform mothers, who gave birth during two years prior to the reform, are less educated, are more likely to give a birth to the first child, and are more likely to be fully employed. These differences preserve for five-year time window around the reform. Table 4 shows two further important differences in the socioeconomic characteristics of females who gave birth in the period 2002–2011. The postreform mothers, on average, are less likely to be married, participate actively

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24 The calculations are based on the German administrative child care ("Statistik der Kinder- und Jugendhilfe") and population ("BevÄ¶lkerungsstand: BevÄ¶lkerungnachGeschlecht und Altersgruppen") data for 2006–2015. Information on childcare coverage before 2006 is not available. I used the 2006 values as a reference for the period 2002–2005 since the childcare provision had not passed through any reforms in these dates.

Table 3 Summary statistics: employment and childcare decision

Variable	First year of motherhood			Second year of motherhood			Third year of motherhood		
	Before 2007	After 2007	Mean test	Before 2007	After 2007	Mean test	Before 2007	After 2007	Mean test
	(1)	(2)	(2)-(1)	(3)	(4)	(4)-(3)	(5)	(6)	(6)-(5)
2006–2007					Panel A				
Employment	0.125 (0.332)	0.198 (0.401)	0.073 (0.052)	0.329 (0.473)	0.298 (0.462)	−0.031 (0.083)	0.238 (0.431)	0.147 (0.359)	−0.091 (0.092)
Employment full-time	0.0650 (0.248)	0.0833 (0.278)	0.018 (0.035)	0.0674 (0.252)	0.0617 (0.242)	−0.006 (0.038)	0.0556 (0.231)	0.0444 (0.208)	−0.011 (0.045)
Employment part-time	0.0488 (0.216)	0.111 (0.316)	0.062* (0.035)	0.202 (0.404)	0.160 (0.369)	−0.042 (0.060)	0.130 (0.339)	0.0667 (0.252)	−0.063 (0.061)
Formal childcare	0.0407 (0.198)	0.130 (0.337)	0.089** (0.036)	0.292 (0.457)	0.247 (0.434)	−0.045 (0.069)	0.500 (0.505)	0.422 (0.499)	−0.078 (0.101)
Public childcare	0.0407 (0.198)	0.0741 (0.263)	0.033 (0.030)	0.225 (0.420)	0.173 (0.380)	−0.052 (0.062)	0.444 (0.502)	0.422 (0.499)	−0.022 (0.101)
Home childcare	0.691 (0.464)	0.759 (0.430)	0.068 (0.059)	0.270 (0.446)	0.519 (0.503)	0.249*** (0.073)	0.852 (0.359)	0.844 (0.367)	−0.007 (0.073)
Nanny childcare	0.0163 (0.127)	0.0648 (0.247)	0.049* (0.025)	0.0674 (0.252)	0.0988 (0.300)	0.031 (0.042)	0.426 (0.499)	0.356 (0.484)	−0.070 (0.099)
Sample size			231			170			99
2005–2008					Panel B				
Employment	0.161 (0.368)	0.150 (0.358)	−0.010 (0.036)	0.251 (0.435)	0.345 (0.477)	0.094* (0.048)	0.225 (0.420)	0.146 (0.354)	−0.080* (0.048)
Employment full-time	0.0674 (0.251)	0.0588 (0.236)	−0.009 (0.023)	0.0429 (0.203)	0.0754 (0.264)	0.033 (0.022)	0.0455 (0.209)	0.0246 (0.155)	−0.021 (0.020)
Employment part-time	0.0816 (0.274)	0.0784 (0.270)	−0.003 (0.025)	0.162 (0.369)	0.167 (0.374)	0.005 (0.033)	0.129 (0.336)	0.0936 (0.292)	−0.035 (0.035)
Formal childcare	0.0461 (0.210)	0.123 (0.329)	0.076*** (0.024)	0.271 (0.446)	0.403 (0.491)	0.132*** (0.042)	0.439 (0.498)	0.463 (0.500)	0.024 (0.056)
Public childcare	0.0319 (0.176)	0.0637 (0.245)	0.032* (0.019)	0.214 (0.411)	0.321 (0.468)	0.107*** (0.040)	0.402 (0.492)	0.438 (0.497)	0.037 (0.055)
Home childcare	0.709 (0.455)	0.730 (0.445)	0.021 (0.041)	0.295 (0.457)	0.626 (0.485)	0.331*** (0.042)	0.833 (0.374)	0.842 (0.365)	0.009 (0.041)
Nanny childcare	0.0248 (0.156)	0.0686 (0.253)	0.044** (0.019)	0.0619 (0.242)	0.275 (0.447)	0.214*** (0.034)	0.348 (0.478)	0.433 (0.497)	0.085 (0.055)
Sample size			486			515			335
2002–2011					Panel C				
Employment	0.168 (0.374)	0.139 (0.346)	−0.029 (0.019)	0.207 (0.405)	0.371 (0.484)	0.164*** (0.026)	0.218 (0.413)	0.196 (0.398)	−0.021 (0.030)
Employment full-time	0.0624 (0.242)	0.0531 (0.224)	−0.009 (0.011)	0.0519 (0.222)	0.0886 (0.284)	0.037*** (0.013)	0.0437 (0.205)	0.0331 (0.179)	−0.011 (0.013)
Employment part-time	0.0930 (0.291)	0.0681 (0.252)	−0.025* (0.013)	0.132 (0.339)	0.182 (0.386)	0.050*** (0.019)	0.140 (0.347)	0.121 (0.327)	−0.018 (0.022)
Formal childcare	0.0635 (0.244)	0.103 (0.304)	0.039*** (0.013)	0.228 (0.420)	0.393 (0.489)	0.164*** (0.024)	0.448 (0.498)	0.472 (0.500)	0.024 (0.033)
Public childcare	0.0442 (0.206)	0.0716 (0.258)	0.027** (0.011)	0.188 (0.391)	0.312 (0.464)	0.124*** (0.022)	0.417 (0.494)	0.439 (0.497)	0.023 (0.032)
Home childcare	0.786 (0.411)	0.756 (0.430)	−0.029 (0.020)	0.355 (0.479)	0.599 (0.490)	0.244*** (0.025)	0.854 (0.353)	0.850 (0.358)	−0.004 (0.023)
Nanny childcare	0.0510 (0.220)	0.0647 (0.246)	0.014 (0.011)	0.0534 (0.225)	0.245 (0.430)	0.191*** (0.018)	0.369 (0.483)	0.437 (0.497)	0.068** (0.032)
Sample size			1,748						1,532

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 4 Summary statistics

Observational period	2006–2007			2005–2008			2002–2011		
	Before 2007	After 2007	Mean test	Before 2007	After 2007	Mean test	Before 2007	After 2007	Mean test
Personal characteristics	(1)	(2)	(2)-(1)	(3)	(4)	(4)-(3)	(5)	(6)	(6)-(5)
Age	30.34 (4.919)	31.27 (5.109)	0.932 (0.674)	30.91 (5.090)	31.27 (5.173)	0.352 (0.398)	30.93 (5.060)	31.43 (5.174)	0.503* (0.288)
Education	12.64 (2.563)	13.11 (2.256)	0.462 (0.329)	12.79 (2.646)	13.28 (2.711)	0.493*** (0.181)	12.81 (2.700)	13.27 (2.717)	0.456*** (0.132)
Married	0.715 (0.453)	0.593 (0.494)	-0.123** (0.062)	0.687 (0.464)	0.658 (0.475)	-0.029 (0.031)	0.722 (0.448)	0.648 (0.478)	-0.074*** (0.022)
Cohabiting	0.228 (0.421)	0.278 (0.450)	0.050 (0.057)	0.248 (0.433)	0.247 (0.432)	-0.002 (0.029)	0.213 (0.410)	0.252 (0.434)	0.039* (0.020)
Child gender	0.504 (0.502)	0.491 (0.502)	-0.013 (0.066)	0.481 (0.500)	0.524 (0.500)	0.043 (0.033)	0.497 (0.500)	0.509 (0.500)	0.013 (0.024)
First child	0.797 (0.404)	0.722 (0.450)	-0.075 (0.056)	0.674 (0.469)	0.831 (0.375)	0.157*** (0.028)	0.583 (0.493)	0.844 (0.363)	0.261*** (0.021)
Labor characteristics before birth									
Employment	0.776 (0.419)	0.750 (0.435)	-0.026 (0.057)	0.734 (0.442)	0.787 (0.410)	0.053 (0.034)	0.674 (0.469)	0.711 (0.454)	0.038 (0.027)
Employment part-time	0.190 (0.394)	0.148 (0.357)	-0.042 (0.050)	0.191 (0.394)	0.144 (0.352)	-0.047 (0.030)	0.180 (0.384)	0.119 (0.324)	-0.061*** (0.021)
Employment full-time	0.526 (0.501)	0.463 (0.501)	-0.063 (0.067)	0.474 (0.500)	0.555 (0.498)	0.081** (0.039)	0.420 (0.494)	0.511 (0.500)	0.091*** (0.029)
Labor income	18,667.4 (15,390.2)	19,154.3 (18,279.5)	486.862 (2,252.418)	18,928.5 (16,312.5)	21,143.3 (16,526.4)	2,214.814* (1,290.415)	17,619.3 (16,733.1)	21,148.2 (16,066.2)	3,528.880*** (964.485)
Household labor income	48,008.4 (31,253.0)	47,542.4 (35,309.4)	-466.088 (4,448.715)	53,433.7 (35,113.0)	49,731.1 (33,150.1)	-3,702.662 (2,705.036)	51,668.8 (34,682.5)	50,556.0 (33,508.7)	-1,112.802 (2,003.282)
Partner characteristics									
Age	33.94 (6.496)	34.45 (5.950)	0.510 (0.932)	34.13 (5.836)	34.75 (5.808)	0.615 (0.502)	33.96 (5.750)	34.48 (5.853)	0.519 (0.366)
Education	12.55 (2.683)	13.04 (2.661)	0.485 (0.398)	12.77 (2.860)	13.03 (2.826)	0.264 (0.211)	12.82 (2.956)	13.00 (2.849)	0.185 (0.157)
Other characteristics									
Parental leave benefits per month	421.7 (381.5)	712.6 (518.5)	290.913*** (76.575)	402.3 (397.3)	741.3 (486.5)	338.955*** (52.111)	391.7 (290.4)	768.2 (466.0)	376.446*** (24.073)
Parental leave benefits per year	2,823.1 (1,629.5)	4,984.3 (4,393.4)	2,161.185*** (491.531)	3,164.1 (2,593.8)	4,978.9 (4,161.6)	1,814.857*** (360.541)	3,293.8 (2,661.2)	4,899.0 (3,792.3)	1,605.207*** (186.716)
Childcare coverage	0.178 (0.143)	0.222 (0.145)	0.044** (0.019)	0.171 (0.146)	0.237 (0.137)	0.065*** (0.009)	0.162 (0.144)	0.250 (0.134)	0.087*** (0.007)
Sample size			486			913			1,748

Notes: Standard errors in parentheses. $*p < 0.10$, $**p < 0.05$, and $***p < 0.01$.

in the labor market in full-time jobs, and have higher labor income. At the same time, the households do not report significant differences in household incomes. Other characteristics remain similar.

Following Laroque and Salanié (2014), the identification relies on the variation in financial incentives induced by the parental leave reform, the variation in the partner's labor income, and the regional variation in access to a public childcare slot. The GSOEP provides information on the parental leave benefits received. First, an individual reports the average monthly amount of paid benefits; second, based on the observed socioeconomic characteristics of an individual and a household, the variable of the yearly paid maternal allowance is generated. According to the descriptive statistics for the estimation sample 2002–2011, the parental benefits significantly increased by, on average, 1,600 euros per year (almost 400 euros per month) after the implementation of the reform (see Table 4). Figure 4 shows the distribution of the reported benefits for the pre- and postreform periods. As expected, for all wage categories, the expected payment shifted to the right. In addition, there is a substantial variation in the introduced benefits for eligible mothers.

Descriptive statistics on childcare coverage show significant variation for the treated and control groups. These differences capture the variation in child care between states in the cross-section and over time discussed in Section 2.

3.6 **Empirical strategy**

Following Del Boca and Daniela (2007), I considered a household that derives utility from household net income Y_{it}, leisure time l_{it}, and child care CC_{it}. To avoid the problem of household bargaining, I assumed that in each time period, a woman optimally decides about her employment L_{it} and child care CC_{it} behavior, i.e., she maximizes the household utility conditioning on her partner's behavior.[25]

$$U = u(cc, l)$$

The goods are assumed to be normal.

As a result of the utility maximization problem, we observe the following maternal outcomes:

- the mother i's employment outcome emp_{it} at time t (binary variable is equal to 1 if she decides to work at a regular job) and
- the mother i's childcare outcome cc_{it} at time t (binary variable is equal to 1 if she decides to use formal child care).

The return-to-work decision is correlated with the decision about child care. On the one hand, a mother needs to substitute for her time in order to work. On the other hand, if she prefers to remain the main childcare provider, she does not return to her job. Therefore, I considered these decisions simultaneously. Summing up, at time t for a household i, the female choice set is represented by the following $emp_{it} \times cc_{it}$ combinations:

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25   Steiner and Wrohlich (2004) showed the insignificance of the cross-elasticities among the partners.

Figure 4   Maternity benefits in pre- and postreformed period.
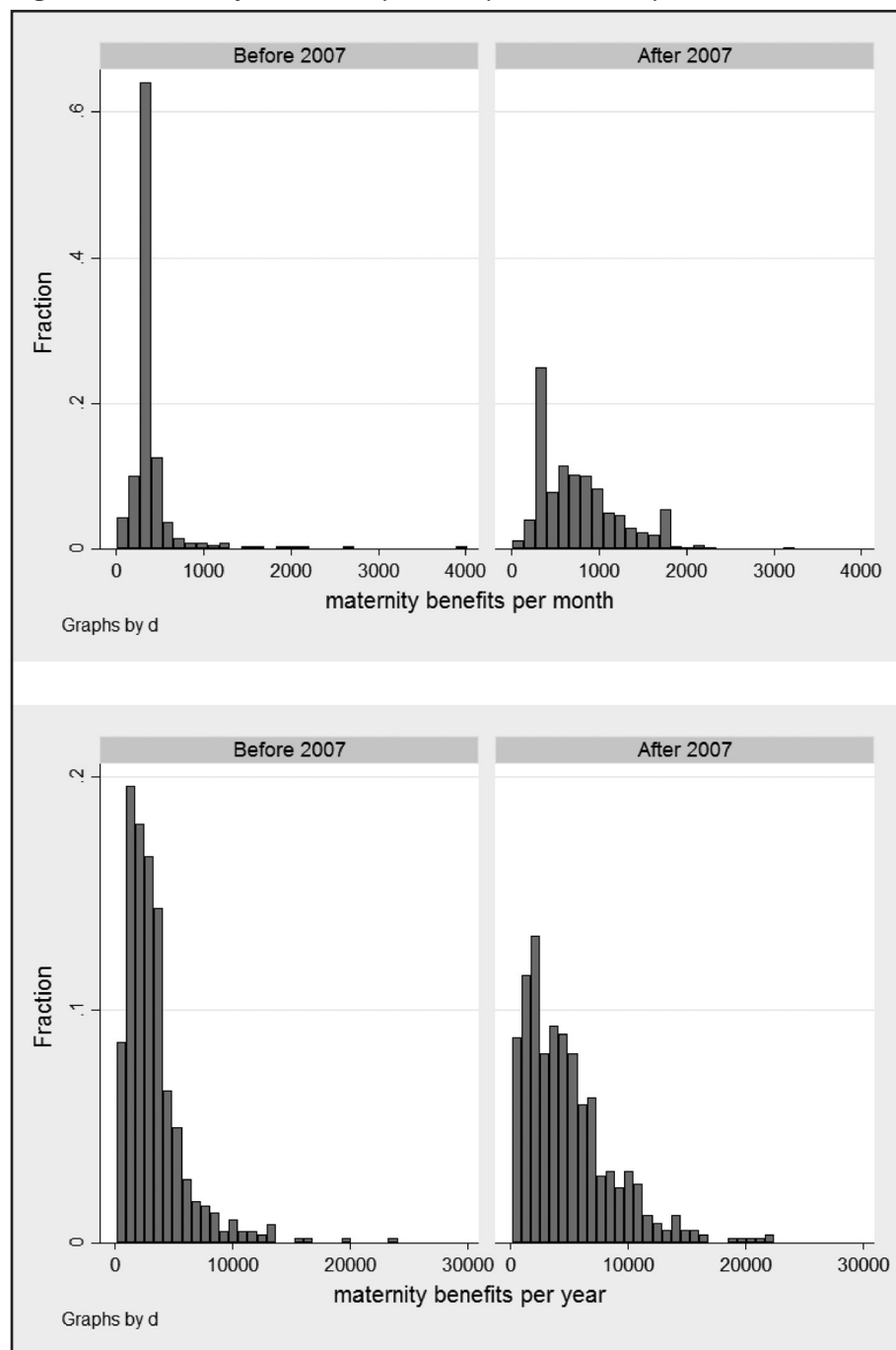
Source: Calculations based on data from GSOEP survey v34.

- (0,0): the mother does not work, staying in the household as the principal childcare provider;
- (1,1): the mother works, and she engages formal child care;
- (0,1): the mother stays at home and takes care of the child, but with additional help from formal child care; and
- (1,0): the mother combines work and child care using informal help.

Notice that the net household income varies with the set of possible outcomes.

　　To evaluate the policy effect and to account for the potential correlation between employment and childcare decisions, I estimated the bivariate model. I used the existing variation in

childcare provision at the state level to model the decision of formal childcare usage. Then, I exploited the quasi-random variation in financial benefits at the individual level to identify the effect of the reform on the employment decision given the mother's childcare decision. The empirical specification of the model is as follows:

$$P\left(emp_{ijt}\right) = \alpha_0 + \alpha_1 d_i + \alpha_2 emplbef_{ij} + \alpha_3 d_i emplbef_{ij} + \alpha_4 cc_{ijt}$$

$$+ \sum_{l=5}^{k} \alpha_l X_{1ijt} + u_{1ijt}, \tag{1}$$

$$P\left(cc_{ijt}\right) = \beta_0 + \beta_1 ccov_{jt} + \beta_2 ccinf_{ijt} + \sum_{l=3}^{k} \beta_1 X_{2ijt} + u_{2ijt}. \tag{2}$$

where $P(emp_{ijt})$ is the employment probability for the mother i at period t in the state j, d_i is a policy indicator for the postreform period starting in January 2007, and $emplbef_{ij}$ is an employment status indicator for the mother i prior to her pregnancy. The variable $P(cc_{ijt})$ represents the probability of formal child care usage for the same mother. $cccov_{jt}$ is the childcare enrollment ratio in region j in period t, $ccinf_{it}$ is an indicator variable for the actual use of informal child care, and X_{1ijt} and X_{2ijt} are vectors of various individual and household sociodemographic characteristics.

The general set of individual control variables for the mother includes age, education, marital status, her partners' characteristics, and household income. I assumed that characteristics such as public childcare availability, use of informal child care, number of children, child's gender, and whether the child is a firstborn have a direct impact on the childcare decision, but not on the labor participation decision.

Notice that the subscript $t : t = \{1,2,3\}$ refers to the years of parental leave after childbirth. For instance, $t = 1$ refers to the decisions made during the first year of child leave. Since I focus on the first transition into employment, the probability of being employed in the subsequent period is conditional on the previous nonparticipation decision.

The model (2) allows correlation between employment and childcare decisions through two channels. First, there is a direct effect of the childcare decision on the participation decision (as measured by the parameter α_4 from equation (1)). Second, the model allows correlation between individual-specific time-invariant effects, corr(u_{1ijt}, u_{2ijt}) ≠ 0. To test the significance of the childcare decision variable, I considered two specifications of equation (1) with and without cc_{ijt}. I estimated the system (1, 2) using the bivariate probit model.

The parameters of interests are as follows:

- α_1 that measures the impact of the reform on mothers' employment participation at extensive margin and
- α_3 that measures changes in labor supply of females who worked prior to a childbirth. Given the reform's design, one might expect heterogeneous response with female employment status prior to birth.

To evaluate the effect of the 2007 reform on mothers' return to labor force, I used a quasi-experimental environment generated by the unanticipated changes in the parental leave system.

The treatment group consisted of the mothers who were entitled to the benefit after the reform implementation – i.e., women with children born on or after January 1, 2007.[26] The control group consisted of mothers who gave the birth before the reform was implemented.

The estimation of the causal effect of the reform has various issues. Since the treatment is universal, every mother is eligible for benefits. Therefore, we could not observe any control group outcome after the reform implementation. Thus, the empirical strategy consists of a before–after comparison of mothers from the control group, who gave birth shortly before a reform, and mothers from the treatment group, who gave birth shortly after the reform.[27]

The key identification assumption was that, without implementation of the reform, mothers in both groups would have behaved similarly in their employment decision after childbirth. This assumption required that the reform did not influence the fertility patterns in either groups. The empirical studies based on German Microcensus data present mixed evidence on the reform's impact on the fertility patterns in the short and middle run. Cygan-Rehm (2016) found that the reform had a negative effect on the fertility decisions of low-income mothers through birth postponement. She also documented weak positive effects for other income groups. Raute (2019) pointed to a jump in fertility rates in August 2007. She also found an increase in fertility rates only for highly educated women over the five-year postreform period.

Kluve and Tamm (2013) showed that the reform was not anticipated by families. They presented a detailed analysis of the legislative process and news coverage, pointing out that the reform took place quite quickly. The government coalition agreed on the reform in May 2006, and the law was passed in the parliament four months later, in September 2006.[28] Then, one might expect that there was no self-selection in treatment for parents who conceived child before October 2006 (children born before June 2007).

Another potential threat to the validity of identification was the 2007–2009 financial crisis that could have had consequences for the employment and fertility behavior of the population. The empirical evidence suggests that the German economy, unlike the economies of other European countries, did not suffer long-term consequences of the crisis. On the contrary, Weber and Weber (2013) reported a decrease in unemployment rates during the period 2006–2011. Raute (2019) found no shift in fertility behavior due to the economic crisis.

The parental leave reform coincided with the expansion of child care – a combination of policies that could have affected maternal employment behavior. By construction, however, the two reforms seem not to be systematically related.[29] The parental leave system is regulated and financed by the federal government, while the expansion of subsidized child care is supported partially by the federal government and partially by the states. The number of available childcare slots and infrastructural investments vary significantly by the state. Table 1 reports the childcare coverage in terms of the percentage of all children younger than three years who attended child care at the state level. Overall, the average attendance rate for children younger than three years increased from 13.6% in 2006 to 32.9% in 2015. We can see in Table 5 that

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26 I focused on mothers' labor force participation decisions since that was one of the key goals of the reform (see Section (2)). In addition, the "father's quota" did not increase the fathers' involvement in child care and significantly changed fathers' employment pattern (Kluve and Tamm. 2013)

27 A similar identification strategy has been used widely in the literature. In this context, see Schönberg and Ludsteck (2014), Kluve and Tamm (2013), and Geyer et al. (2015).

28 See, also, Kluve and Schmitz (2018).

29 See the discussion of childcare reform in Section 2.

the demand for slots was higher than the supply for all states during the observation period.[30] All regions report an upward time trend in number of open slots, and no significant jump is observed around the reform implementation in 2007. This implies that the trends in childcare demand–supply over time were the same for both control and treated groups.

4 Estimation results

All estimations of this section are based on the main sample that includes mothers with children aged zero to three years born from 2002 to 2011. Table 5 presents average marginal effects for maternal employment computed using the bivariate probit model (1, 2) estimation. The estimated model controls for a set of individual and household characteristics. The specification includes the mother's age, education, marital status, prior-to-birth labor income, current household income, received amount of parental leave benefits, and partner's characteristics. I also controlled for the dwelling location: Eastern or Western Germany. In addition, I included an indicator variable for a woman who gave birth to her first child, gender of the child, and the number of children in the childcare equation. I also controlled for the available help for a newborn from a partner and relatives, including the informal childcare variable.

Table 5 is structured as follows. Estimates are reported in three groups of rows, one each for a year of motherhood. I considered three participation decisions of mothers: to work, to work full-time, and to work part-time. For each of these three groups, I reported average marginal effects of the reform with and without childcare decision control.

For the first year of motherhood, the data do not report significant changes in mothers' job participation decisions. Notice that the sign of the coefficient is negative, which supports the hypothesis that labor force participation drops during the first year of motherhood. These results confirm the same pattern identified in the previous research: once we control for covariates, the probability of return to work remains unchanged or drops insignificantly. The childcare decision does not influence the employment decision. The partial explanation might be related to the fact that the number of childcare facilities for a child younger than one year is more limited comparing to the slots for children aged one to three years. Being employed before birth increased the marginal probability of return to work by almost 10% point both for pre- and postreform mothers. It does not vary after policy implementation and remains both in full-time and part-time participation groups.

For the second year of motherhood, when the parental leave payments stop, a positive significant shift in the employment probability by 20% points is observed. However, the effect of the introduced incentives becomes insignificant after controlling for the childcare decision. It implies that the estimate of the policy impact is biased upward and captures partially the possibility of the mother to use a formal childcare. The results also suggest that the mothers who use formal child care increase their marginal probability to return to work by 40% points comparing to the mothers without access to public child care.

The policy effect remains statistically significant only for the group of mothers who work full-time. The marginal probability to get full employment is 6.4% points higher for postreform mothers compared to those from the prereform group. Interestingly, this specification reveals

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30   The administrative data for the actual enrollment are available from 2006 and onward, and the data for the slots offered are available only from 2012.

Table 5 Average marginal effects for maternal labor outcome

Variable	Participation		Full-time		Part-time	
	Panel A: first year of motherhood					
Policy	-0.058 (0.006)	-0.067 (0.049)	-0.022 (0.040)	-0.033 (0.043)	-0.041 (0.031)	-0.038 (0.037)
Employment before birth	0.108*** (0.021)	0.108*** (0.020)	0.064* (0.025)	0.066*** (0.025)	0.047*** (0.005)	0.047*** (0.018)
Policy*employment before birth	0.042 (0.047)	0.047 (0.052)	0.026 (0.043)	0.032 (0.046)	0.021 (0.038)	0.020 (0.041)
Childcare formal		0.065 (0.155)		0.113* (0.064)		-0.024 (0.123)
Rho	0.513*** (0.046)	0.378 (0.344)	0.380*** (0.068)	-0.126 (0.288)	0.348*** (0.083)	-0.432 (0.432)
Observations	1,748	1,748	1,748	1,748	1,748	1,748
	Panel B: second year of motherhood					
Policy	0.199*** (0.062)	0.080 (0.061)	0.082*** (0.026)	0.064** (0.027)	0.086 (0.068)	0.033 (0.059)
Employment before birth	0.134*** (0.015)	0.063** (0.032)	0.077*** (0.029)	0.069*** (0.025)	0.070** (0.011)	0.046 (0.007)
Policy*employment before birth	-0.041 (0.071)	-0.018 (0.055)	-0.070** (0.039)	-0.068* (0.039)	-0.0005 (0.075)	0.007 (0.070)
Childcare formal		0.409*** (0.045)		0.111*** (0.105)		0.258*** (0.069)
Rho	0.589*** (0.055)	-0.526 (0.274)	0.366*** (0.118)	-0.229 (0.440)	0.403*** (0.041)	-0.239 (0.202)
Observations	1,532	1,532	1,532	1,532	1,532	1,532
	Panel C: third year of motherhood					
Policy	-0.038 (0.010)	-0.032 (0.067)	0.004 (0.038)	-0.006 (0.044)	-0.025 (0.072)	-0.043 (0.056)
Employment before birth	0.135*** (0.034)	0.048** (0.029)	0.026 (0.023)	0.018 (0.027)	0.110*** (0.026)	0.040 (0.035)
Policy*employment before birth	0.068 (0.102)	0.068 (0.077)	-0.024 (0.041)	-0.024 (0.047)	0.054 (0.060)	0.039 (0.043)
Childcare formal		0.447*** (0.027)		0.101 (0.099)		0.414*** (0.055)
Rho	0.370*** (0.078)	-0.938* (0.124)	0.446*** (0.122)	-0.223 (0.476)	0.241*** (0.066)	-0.909** (0.118)
Observations	933	933	933	933	933	933
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, and ***$p < 0.01$.

that the effect is not driven by the mothers who were employed before the childbirth. The access to public child care remains an important factor in participation decision, but the impact value drops significantly. These results partially confirm the empirical findings of previous childcare studies for Germany. For example, Müller and Wrohlich (2018) found that an increase in childcare slots by 1% point increases mothers' participation by 0.2% points. At the same time, I did not find significant positive policy effects on the labor force participation during the second year, which is in line with Kluve and Tamm (2013), but contradicts the results of Geyer et al. (2015). Interestingly, the positive significant effect of the reform on the mothers with full-time employment is not reported before.

The last year of job-protected parental leave is unpaid for both pre- and postreform groups. The interaction of policy variables with employment status prior to birth still remains insignificant, and the overall policy indicator reports an insignificant negative impact. The impact of other variables discussed earlier remains significant. The possibility of formal child care remains an important factor on the mother's employment decision, and the employment before childbirth increases the probability to work afterward.

Table 6 reports strongly significantly very robust positive associations between childcare coverage rates and the probability to use formal child care. The decision to use formal child care depends positively on the access to public childcare institutions and negatively on the possibility of using a partner and relatives as childcare substitutes. A higher current household labor income has a positive association with the childcare decision.

Summing up the preliminary analysis of the 2007 parental leave reform shows a positive association of the policy shift with the labor force participation decision. However, after controlling for childcare decision, the effect remains only for the mothers working full-time during the second year of the motherhood. These findings suggest that if we consider labor force participation and childcare decisions jointly, controlling for a mother's possibility of finding a substitute for her child care, the 2007 reform does not seem to produce a significant impact on employment behavior during the job-protected parental leave period.

The reform design suggests that the new financial scheme of parental leave payment might give low-income females different incentives to return to work. I considered a subsample of women with below-median income (18,000 euros per year). Table 7 reports the reform effect on the marginal probability of employment for low-income mothers. There is no evidence of any significant policy effect on mothers' participation decision during the first year of parental leave. The estimation results indicate that the employment prior to birth and the availability of formal child care increase the probability of being employed during the first year of

Table 6 Average marginal effects for maternal childcare decision

Leave year	Participation		Full-time		Part-time	
First year	0.315***	0.321***	0.257***	0.269***	0.265***	0.262***
	(0.077)	(0.071)	(0.062)	(0.060)	(0.061)	(0.065)
Second year	1.066***	1.010***	1.295***	1.267***	1.233***	1.287***
	(0.244)	(0.253)	(0.244)	(0.252)	(0.233)	(0.236)
Third year	0.600	0.626*	1.125***	0.832**	0.798**	0.587
	(0.489)	(0.343)	(0.146)	(0.411)	(0.381)	(0.381)

Notes: Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, and ***$p < 0.01$.

Table 7 Average marginal effects for maternal childcare decision: low-income category

Decision	Participation		Full-time		Part-time	
Employment decision			Panel A: first year of motherhood			
Policy	0.016	0.025	0.006	0.003	0.005	0.010
	(0.035)	(0.048)	(0.022)	(0.024)	(0.032)	(0.043)
Employment before birth	0.098***	0.100***	0.040***	0.039***	0.044*	0.041
	(0.024)	(0.024)	(0.015)	(0.014)	(0.024)	(0.031)
Policy*employment before birth	0.001	-0.003	-0.002	-0.0004	0.007	0.029
	(0.055)	(0.054)	(0.020)	(0.020)	(0.050)	(0.065)
Childcare formal		-0.082		0.032		-0.195
		(0.207)		(0.068)		(0.370)
Childcare decision						
Childcare coverage	0.324***	0.314***	0.303***	0.308***	0.326***	0.196**
	(0.048)	(0.064)	(0.056)	(0.065)	(0.057)	(0.082)
Rho	0.482***	0.687	0.259*	0.043	0.406**	0.652
	(0.139)	(0.555)	(0.135)	(0.450)	(0.169)	(0.432)
Observations	909	909	909	909	909	909
Employment decision			Panel B: second year of motherhood			
Policy	0.079***	0.015	0.053***	0.038*	0.008	-0.017
	(0.072)	(0.064)	(0.026)	(0.023)	(0.060)	(0.060)
Employment before birth	0.042	-0.017	0.041*	0.024	0.011	-0.009
	(0.039)	(0.036)	(0.023)	(0.018)	(0.033)	(0.036)
Policy*employment before birth	0.054	0.062	-0.008	-0.006	0.010	0.013
	(0.092)	(0.080)	(0.032)	(0.035)	(0.077)	(0.103)
Childcare formal		0.395***		0.180		0.182*
		(0.062)		(0.124)		(0.103)
Childcare decision						
Childcare coverage	0.672***	0.513**	1.023***	0.865***	0.993***	0.985***
	(0.244)	(0.240)	(0.178)	(0.215)	(0.169)	(0.180)
Rho	0.436***	-0.830	0.353**	-0.743	0.167**	-0.405
	(0.107)	(0.246)	(0.139)	(0.467)	(0.079)	(0.231)
Observations	797	797	797	797	797	797

Notes: Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, and ***$p < 0.01$.

motherhood. The estimates presented in Panel B of Table 7 indicate that the reform had no effect on the mothers' employment for the second year. Only for full-time employment, the policy had some positive and significant effect at the 10% level.

Table 8 provides evidence that suggests different behavior patterns for high-income mothers. They report strong reductions in both part-time and full-time employment during the first year of motherhood. This sizable negative effect becomes insignificant for the mothers who were employed prior to childbirth. This finding suggests that career-oriented mothers did not change their employment behavior after the reform. Interestingly, the factor of formal childcare availability becomes insignificant for the employment decision. One possible explanation is that high-income mothers can afford the private childcare. For the second year of motherhood, the behavioral pattern changes: the probability to work increases significantly for the postreform mothers; the childcare availability increases the possibility of labor participation. The effect is driven by part-time employed mothers.

I checked whether the baseline estimation results are robust to the different income definitions, such as monthly gross and net wages of the mother before giving birth, her partner's

Table 8 Average marginal effects for maternal childcare decision: high-income category

Decision	Participation		Full-time		Part-time	
Employment decision	Panel A: first year of motherhood					
Policy	-0.340***	-0.330*	-0.802***	-0.732***	-0.191***	-0.194***
	(0.067)	(0.183)	(0.138)	(0.101)	(0.042)	(0.045)
Employment before birth	-0.017	0.028	0.041	0.055	-0.14	0.012
	(0.070)	(0.068)	(0.059)	(0.069)	(0.054)	(0.048)
Policy*employment before birth	0.280***	0.269	0.806***	0.716***	0.143	0.149***
	(0.070)	(0.180)	(0.142)	(0.106)	(0.045)	(0.049)
Childcare formal		0.503***		0.123		0.262**
		(0.191)		(0.279)		(0.134)
Childcare decision						
Childcare coverage	0.210	0.283*	0.195	0.191	0.154	0.196**
	(0.161)	(0.152)	(0.136)	(0.152)	(0.146)	(0.082)
Rho	0.597***	0.615	0.496***	0.055	0.372**	-0.479
	(0.071)	(0.751)	(0.105)	(1.079)	(0.146)	(0.417)
Observations	839	839	839	839	839	839
Employment decision	Panel B: second year of motherhood					
Policy	0.501***	0.393**	0.627***	0.030	0.258**	0.194**
	(0.139)	(0.197)	(0.216)	(0.076)	(0.112)	(0.096)
Employment before birth	0.327**	0.339**	0.614***	0.035	0.172	0.187*
	(0.142)	(0.157)	(0.215)	(0.078)	(0.114)	(0.108)
Policy*employment before birth	-0.357***	-0.322**	-0.649***	-0.074	-0.142	-0.123
	(0.120)	(0.132)	(0.219)	(0.093)	(0.103)	(0.088)
Childcare formal		0.379**		0.222***		0.261
		(0.148)		(0.39)		(0.179)
Childcare decision						
Childcare coverage	1.138***	1.447***	1.397***	1.457***	1.276***	1.420***
	(0.334)	(0.356)	(0.341)	(0.068)	(0.325)	(0.332)
Rho	0.697***	-0.013	0.382**	-0.743	0.526**	0.023
	(0.035)	(0.597)	(0.163)	(0.467)	(0.056)	(0.437)
Observations	735	735	735	735	735	735

Notes: Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, and ***$p < 0.01$.

monthly wage, and household income. I also used working hours instead of labor income. Controlling for the different categories, I found the same pattern in terms of policy effect on the probability of being employed: it remains insignificant.

I considered two age brackets: 20–30 and 30–40.[31] The results are robust to the age specification; the findings still confirm the insignificant impact of the policy on the maternal employment probability.

5 Conclusions

This paper studies the impact of the 2007 reform in the German parental leave system on maternal employment. The postreform universal system of benefits is more generous in terms of the amount of the benefit, but it pays for a shorter period of time. I estimated the short-run effects of the policy focusing on the maternal employment during the first three years of the motherhood. The mothers are protected from the job dismissal during this period. The

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31　The sample size does not allow the lower intervals.

financial incentives to work are significantly different for the pre- and postreform groups. I compared mothers who were eligible for the new benefit after childbirth with ineligible mothers. Assignment to treatment depends on the date of the child birth. All mothers who had a child on January 1, 2007, and afterward were entitled for the universal benefits. Based on data from GSOEP 2002–2014, I evaluated maternal employment responses in the first five years after the policy changed. Given the importance of childcare for a labor participation decision, I considered two specifications allowing for different channels of correlation. In the first model, I assumed that a mother takes decisions simultaneously and they are correlated through unobserved characteristics. The second specification allowed the direct impact of childcare decision on the employment.

Without controlling for a mother's selection of childcare, I found that the reform affects maternal labor outcomes in two directions. First, the higher parental leave allowance decreases the income losses of the mothers who were employed before giving birth. As a result, the probability of returning to work decreases during the first year of motherhood for high-income mothers. Second, the probability to work jumps significantly during the second year of motherhood, once the benefits terminate. These findings are in line with previous research by Kluve and Tamm (2013), Bergemann and Riphahn (2011), and Geyer et al. (2015).

However, after conditioning on the mother's particular childcare decision, the policy effects become insignificant. The result of the policy effect remains only for high-income mothers. They are more likely to decrease their working hours during the first year of motherhood and return to work more rapidly during the second year of motherhood. I interpreted these findings as evidence of the successful reform implementation only for mothers from the upper tail of labor income distribution.

My evidence suggests that the employment status before birth and the possibility of child care have strong impact on the maternal employment. The mothers from the regions where the public slots are more accessible have higher probability to use them. Therefore, they have more flexibility in working hours. As a result, the probability to return to work increases significantly.

Overall, there is no significant positive shift in probability associated with the introduction of the reform. The only group demonstrating a positive response to the introduced changes is of high-income women who worked prior to the child's birth. The results suggest that the implementation of the reform can produce ambiguous effects for the targeted group if the institutional constraints are not taken into account. Using structural estimation, Geyer et al. (2015) and Bick (2016) showed that the low availability of public child care and the absence of a private childcare market, together with low levels of informal arrangements, create a barrier for a mother to participate in the labor market. Given constraints in childcare availability and relatively low losses of future income, mothers might prefer to postpone their return to employment. To sum up, the empirical evidence does not confirm the policy's effectiveness in stimulating maternal employment once one controls for the childcare decision.

These findings highlight two important issues. First, the family policy is a set of interrelated measures. The parental leave reform has been costly to the German society, and the average annual expenditures are approximately 0.17% of GDP (Kluve and Schmitz, 2018). The effectiveness of the reform has been constrained by the German childcare institutions. Second, the reform impact is context dependent. It is questionable that the reforming parental leave

on the same scheme would lead to the same results in other European countries. However, the conclusion that the childcare system is an important factor to be considered for modeling parental leave system is applicable beyond the German context.

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