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Suddenly a stay-at-home dad? Short- and long-term consequences of fathers' job loss on time investment in the household

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Abstract

Commonly described as "gender care gap", there is a persistent gender difference in the division of unpaid domestic responsibilities in developed countries. We use German survey data to provide novel evidence on short- and long-run effects of an exogenous shock on paternal availability, through a job loss, on the intra-household allocation of domestic work. We find that paternal child care and housework significantly increase in the short run on weekdays, while we do not see any similar shifts on weekends. Effects are positive and persistent for fathers who remain unemployed or have a working partner, but reverse after re-employment. We also find significant changes for female partners as well as in cumulative household time investments and outsourcing of tasks. Our results are in line with theoretical predictions regarding time availability and financial constraints, while we find no strong evidence for changes in bargaining powers, gender role attitudes or emotional bonding.

JEL classification J13 · J22 · J63

Keywords Job loss · Paternal child care · Fatherhood · Domestic labor · Intra-household allocation

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1 Introduction

In most developed countries men, on average, contribute less to domestic unpaid work than women (OECD 2020). Although this so-called "gender care gap" can explain phenomena like the motherhood penalty and gender inequality in the labor market in general (Bertrand et al. 2010; Bütikofer et al. 2018), there is no clear evidence on why fathers still contribute less to child care and housework despite gender convergence in education and labor market outcomes prior to child birth (Bianchi 2000; Coltrane 2000; Hook 2010; Petrongolo and Ronchi 2020; Samtleben 2019; Sanchez and Thomson 1997).

In the past, the public debate and social science literature on labor force participation of mothers concentrated on external child care and left fathers as the more obvious in-house alternative aside. This has changed in recent years, as the benefits of paternal child care for both child development and gender equality became more established (Averett et al. 2005; Cardoso et al. 2010; Del Boca et al. 2017; Elkins and Schurer 2020; Ruhm 2004; Schober and Zoch 2019).[1]

In this paper we ask whether a forced temporary inactivity in market work is able to change existing gender patterns in affected families in order to draw conclusions about the potential of extended periods of paternal availability for domestic production. Although unemployment itself is selective with respect to paternal socioeconomic characteristics, we argue that the involuntary nature of the change in paternal availability and the involvement of fathers of older children has external validity for the explanation of paternal decision making in general.

This research is especially relevant in the context of the COVID-19 crisis, during which daycares and schools closed and which expanded working from home dramatically, shifting the daily lives of many families. The change in paternal routines "forcing" fathers to increase their domestic time investments was regularly brought up as a potential silver lining of the economic crisis (Alon et al. 2020; Del Boca et al. 2020; Hupkau and Petrongolo 2020; Mangiavacchi et al. 2020). However, first evidence on the change in housework and child care investments is mixed. Zamarro and Prados (2021) find that mothers in the United States have taken on the heavier load of child care responsibilities, which is also associated with a reduction in working hours and a higher level of psychological distress. For Germany, Kreyenfeld and Zinn (2021) find evidence for a short-run increase housework taken on by fathers, though Boll et al. (2021) show that this fades out in subsequent months. So far, it is unclear what the long-run effects on gender equality will be.

The goal of this paper is to analyze the effect of exogenous employment shocks through dismissals and firm closures on paternal involvement in child care and housework in the household. Based on the existing literature, we expect a positive effect and theoretically discuss four possible reasons: time availability and financial constraints, bargaining powers, gender role attitudes, and emotional bonding between

[1] Multiple European countries responded and introduced father quotas to their parental leave schemes to encourage fathers to consider domestic work as an outside option. While fathers in countries such as Germany and Norway responded to these "daddy months", the overall effect on paternal engagement beyond the short-term paternity leave take-up in general is inconclusive (see e.g., Bartel et al. 2018; Bünning 2015; Bünning and Pollmann-Schult 2016; Ekberg et al. 2013; Patnaik 2019; Schober 2014; Tamm 2019).

fathers and children.[2] All these mechanisms have distinctly different implications for the empirical analysis of short- and long-term effects as well as for the empirical analysis of the differences between working days and work-free days and between child care and housework involvement.

Our empirical analysis is based on extensive information available in the Socio-Economic Panel (SOEP 2019), a large representative longitudinal household panel from Germany. The SOEP not only includes detailed socio-economic information but also surveys individuals' self-reported time use in multiple domains separately for working days (annually) and work-free days (biennially) over a time period of 26 years. We embed our analysis in an event study approach with individual and year fixed effects.

Our results reveal that fathers who experience an involuntary job loss immediately increase their time allocated to child care by 1.2 h (58% relative to baseline) and to housework by 1.7 h (79% relative to baseline) on weekdays. We do not find significant or robust changes in time allocation on weekends. Heterogeneity analyses reveal that the persistence of increases in domestic work is concentrated on fathers who remain unemployed and have a spouse who is active in the labor market. In contrast, we observe that the re-employment of fathers results in, on average, lower involvement in child care and housework on weekdays and weekends as compared to pre-job loss periods, especially if the partner is not working. Employed female partners respond to the change in paternal time allocation by persistently decreasing domestic time investments, while not employed female partners even increase the time allocated to child care and housework alongside their husbands. This results in an overall increase in cumulative household time investment in couples where both partners are at home due to the employment shock, while it causes a decrease in cumulative household time investment in couples where both partners work after a re-employment of the husband. These findings correspond with a decrease in external care use and expenses, indicating a decrease in the outsourcing of domestic tasks.

Most closely related to our study, Foster and Stratton (2018) analyze the effect of unemployment and promotions on the intra-household division of housework using Australian panel data. They find that terminations and promotions of both partners affect the own time spent on housework and in case of a woman's promotion also adversely affect the partner's time spent on housework. In addition, they find that, in the case of promotions, the effects also hold when controlling for the paid work time of both partners, which is an indication of a change in the intra-household bargaining powers as opposed to time availability. Similarly, Fauser (2019) and Voßemer and Heyne (2019) both use German survey data and find significant short-run effects of individual unemployment on gender-specific tasks. While women are more likely to perform routine housework such as washing, cooking and cleaning after becoming unemployed, men are more likely to increase their activity in repairs and garden work following a job loss.

[2] It has to be noted that the focus of this paper is on quantitative rather than qualitative changes in paternal engagement. For example, Kalenkoski and Foster (2008) show that considering differences between low and high quality child care is of high importance when discussing determinants and consequences of parental involvement. Thus, potential adverse effects of unemployment on the child care quality are discussed in Section 6.

Our study makes three major contributions to the existing literature. Firstly, we consider child care as a major part of the domestic duties in households with children, while, to the best of our knowledge, all earlier studies neglect it. Secondly, we are the first to identify long-run effects of involuntary job losses on time investments as the studies mentioned above all concentrate on short-term effects. Last but not least, we are able to analyze exogenous variation in paternal availability across the entire child upbringing, while the existing parental leave literature can only provide evidence on a selective group of fathers of young children.

2 Theoretical considerations

Fitting child care into a formal economic model of intra-household time allocation is challenging due to the high levels of multitasking, female-specific tasks (e.g., breastfeeding), the amount of time investment necessary, and the emotional charge involved (Foster and Stratton 2018). Consequently, we refrain from proposing a formal framework for the underlying mechanisms, and instead draw on the simple model of time allocation of housework within households utilized by Foster and Stratton (2018). They propose a framework in which the total amount of unpaid domestic work (housework or child care in our case) (D) of both the male (D_m) and the female (D_f) partner consists of a minimum amount of total housework needed ($\overline{D}$) (i.e., for child care this would refer to the essential routine tasks) and the excess domestic work performed D_E (i.e., all additional non-routine tasks) minus the amount of time outsourced to external providers D_O (e.g., nannies and child care facilities):

$$D = D_m + D_f = \overline{D} + D_E - D_O \tag{1}$$

A father's total time available for investment into essential and excess domestic work (D_m) is determined by the total fixed time available to him ($\overline{T_m}$) minus the optimal time spend for paid work (W_m). This time can then be divided between domestic work (D_m) and other extra time use (E_m) such as leisure, sleep or personal care:

$$D_m + E_m = \overline{T_m} - W_m \tag{2}$$

How the time is divided between these components depends on different factors such as the amount of the essential child care and housework tasks which is already covered by the female partner (D_f) and external providers (D_O) and individual preferences for excess child care. The optimal contribution to essential tasks of both partners and external providers depend on the optimal labor market contribution of both partners, which generate financial resources to afford the outsourcing of tasks. The division of essential tasks is further related to the bargaining power between partners, and the preferences for the gender division of the essential tasks shaped by prevalent societal and personal gender role attitudes.

Based on this basic framework, we can now hypothesize about potential mechanisms through which an unemployment shock affects paternal child care involvement. We build upon the work of Bünning (2020) and identify four potential mechanisms: (1) time availability and financial constraints, (2) intra-household bargaining power, (3) gender role attitudes, and (4) emotional bonding between fathers and children. We, additionally, derive very distinct hypotheses from the four

Table 1 Theoretical hypotheses

	Persistent	Weekdays		Weekends		Partner spillover	
		CC	HW	CC	HW	NE	E
Time availability & Finan. Constraints	×	✓	✓	×	✓	✓(+)	✓(−)
Bargaining power	×	✓	✓	✓	✓	✓(−)	✓(−)
Gender role attitudes	✓	✓	✓	✓	✓	✓(−)	✓(−)
Emotional bonding	✓	✓	×	✓	×	×	×

Notes: CC child care, *HW* housework, *NE* not employed, *E* employed

different theoretical explanations for the empirical analysis, which allows us to make statements about which mechanisms might be more reasonable in the analyzed context. Table 1 summarizes the hypotheses derived from these channels, which are discussed in detail in the following section.

2.1 Time availability and financial constraints

The most plausible, direct mechanism behind an immediate change in paternal involvement in domestic work after a job loss is the simultaneous change in time restrictions and financial constraints of the household. The job loss imposes an exogenous shock on time spend on paid work (W_m) and thus the time a father is available for potential domestic duties (D_m) and other extra time (E_m). Additionally, it also affects the financial constraints of the household and thus potentially the optimal labor market decision of the female partner (as shown e.g., in Halla et al. 2020) as well as the financial means available for outsourcing. The increased time availability is expected to be directed to domestic duties if the father gains positive utility from performing them, e.g., enjoys spending excess time with his children or having a cleaner house (D_E), but especially if he has to cover essential tasks ($\overline{D}$) that cannot be covered by his partner or by external providers (any more).

Thus, we expect a positive effect on paternal time investment during weekdays but potentially also on work-free days if essential tasks can be flexibly postponed (especially in the case of housework). These effects are expected to be largely non-persistent and observable during unemployment only.[3] Time availability and financial constraints due to paternal unemployment are likely to also affect the female partner. An unemployed husband may induce (or force) his female partner to start working or to increase her working hours (W_f), which is likely to decrease her domestic work (D_f). On the other hand, financial constraints potentially have an adverse effect on female partners who voluntarily or involuntarily continue to be non-working. In this case, maternal domestic work potentially increases due to the decrease in outsourcing (D_O). The combined hours of domestic work by both partners ($D_m + D_f$) should thus increase, especially if the female partner is not working, but also if she is working but not able to restore the pre-job loss level of outsourcing.

[3] Based on the research by Chadi and Hetschko (2020), we may additionally be able to identify a reverse effect after re-employment if men have to invest more time and effort in a new job in order to signal or regain productivity.

2.2 Bargaining power

Drawing on the Becker (1974 1981) altruist model and the Samuelson (1956) consensus model on specialization and resource distribution within households, the theory of bargaining power is based on the underlying economic idea that the division of domestic labor is an economic bargaining process (Couprie 2007; Grossbard-Shechtman 1984; Lundberg and Pollak 1996; Manser and Brown 1980; McElroy and Horney 1981). According to this idea, higher wage income leads to higher marital power as it is associated with more control of the economic resources within the household. If we assume that the share of the essential child care and housework tasks ($\overline{D}$), which has to be performed by both partners, is determined by these relative powers and that the routine essential tasks cause disutility to the individuals who perform it, we can expect that the partners use their relative power to negotiate reduced domestic duties.

Thus, we expect positive effects of the job loss on paternal time investment during weekdays and weekends, observable for both child care and housework and accompanied by proportional decreases in maternal domestic duties. Nevertheless, this relationship might be less pronounced for child care as the share of non-routine tasks generating direct positive utility is higher (Bünning 2020; Kimmel and Connelly 2020; Raley et al. 2012; Sullivan 2013).[4] The persistence of these effects after re-employment largely depends on the length of the paternal unemployment and thus the extent of the persistent shifts in the men's workplace productivity, future earnings potentials, and comparative advantages in the household (Arulampalam et al. 2001; Eliason and Storrie 2006; Jacobson et al. 1993).

2.3 Gender role attitudes

A third channel comprises changes in the gender role attitudes within households. Multiple studies argue that women who participate in the labor force hold more egalitarian gender role attitudes while men who take up parental leave transform their attitudes toward equality due to the temporary exposure to a nontraditional division of labor (Arrighi and Maume 2000; Cunningham 2007; Davis et al. 2007; Knudsen and Wærness 2008). A change in these gender roles might alter the preferences for the gender division of the essential tasks between the male and female partner. Holding everything else constant, the relative utility from D_f would decrease and the relative utility of D_m would increase. Therefore, we would expect an effect that is persistent and observable during weekdays and weekends for both child care and housework involvement and accompanied by a proportional decrease in maternal domestic duties.[5]

[4] Studies in wellbeing research have found that the net affect generated by daily child care tasks is comparably low and not much higher than the one generated by housework (Kahneman et al. 2004; Knabe et al. 2010) which can largely be explained by very high levels of negative affect associated with child care, such as being annoyed or being stressed.

[5] As is argued, for example, in Bünning (2020), unemployment can have counteracting effects on gender role attitudes if a man attempts to restore parts of his lost "masculinity" by adopting even more traditional attitudes.

2.4 Emotional bonding

Lastly, a very prominently discussed mechanism in the public debate is the importance of emotional bonding between fathers and their children. Lower paternal involvement in the first months after birth may lead to lower emotional bounding with the child and thus lower parental engagement in later years (Doucet 2006; Vierling-Claassen 2013). If a job loss forces fathers to spend more time at home in the presence of their children, this might improve their emotional bonding and thus increase their preferences for excess time (D_E) with their children (Brady et al. 2017; Haas and Hwang 2008). We would thus expect a persistent, long-run effect on paternal child care involvement which is observable during working and work-free days. We do not expect spillovers to female partners, while effects may be heterogeneous with respect to the children's age, as emotional bonding is likely to be more volatile for young children.

3 Data and empirical approach

3.1 Data: Socio-Economic Panel

Our empirical analysis is based on data from the German Socio-Economic Panel (SOEP, see for details Goebel et al. 2019). The SOEP is a representative longitudinal household survey conducted annually since 1984. The latest available data is the 35th wave in 2018. Over 30,000 individuals in 11,000 households participate each year, reporting on inter alia household characteristics, employment histories and time use.

We focus on fathers who are cohabiting with at least one dependent child up to the age of 14 at time point t and thus drop all observations after the youngest child turns 15.[6] We do not make any restrictions on the partnership status of these fathers as changes in marital status may be important endogenous drivers of the job loss effects. We reduce the risk of falsely identifying male household members who are not the primary father figure (e.g., adult brothers, grandfathers, uncles, etc.) by restricting the analysis to men who are either the household head or partner of the household head.[7] This way, we are able to keep as many alternative household types as possible, such as single-father households, multigenerational households or patchwork families, and also allow for multiple different father figures. Furthermore, we drop fathers who are younger than 18 or older than 65 and who have missing information on the main variables. Finally, and due to our fixed effects design, we require each father to be observed for at least two periods.

[6] The cutoff at the age of 14 is based on legal restrictions on parental supervision responsibility in Germany.

[7] Of our sample, 1.6% are single fathers, 1.5% live in multigenerational households, and 4% are not the biological father of the child and hence live in a patchwork family (categories are non-exclusive). The results are not sensitive to removing these fathers from the analysis. Results are available from the authors upon request.

3.2 Job loss

The SOEP contains detailed information on employment trajectories. Information on the labor market status is collected in every wave. If an employment spell ends within a survey year, respondents are asked to choose the reason for this job loss from eight categories, including plant closure, retirement, suspension, resignation, end of non-permanent contract, and dismissal by employer. In line with the earlier literature (see e.g., Foster and Stratton 2018), we classify plant closures and dismissals by the employer as an involuntary job loss.[8] As the focus of our study is not on the job loss itself but on the unemployment spell initiated by it, a father is considered to be treated if he enters unemployment between $t-1$ and t due to an involuntary job loss. Thus, all treated fathers in our sample are unemployed at time point t, which we denote as "the time of the job loss" in the following. These fathers lost their job, on average, 4.7 months earlier. Men who report a job loss but are already re-employed in t are considered to be untreated. We will, nevertheless, discuss and analyze the potential endogeneity which is caused by this restriction in Sections 3.4. If fathers experience multiple job losses, all the job losses are treated as individual events.[9] Additionally, couples in which both partners experience an involuntary job loss within the same period are excluded from our analysis. Our estimation sample consists of both treated fathers as well as never-treated fathers (i.e., fathers who never lost their job involuntarily). Although we will use an individual fixed effects approach and untreated fathers do not directly contribute to the estimated treatment effects, they still contribute to the estimation of age-group and year fixed effects and via this means can still affect the estimated treatment effects. This results in a sample of 59,438 father-year combinations, in which 6928 fathers are observed, on average, for 8.5 years. We are able to identify 1210 job losses over the observation period. Table A.1 in the Online Appendix presents basic descriptive statistics for our treatment group of fathers, who experienced involuntary unemployment over the sample period, and, in comparison, for the control group of fathers, who did not experience any involuntary unemployment spells. It shows that the group of treated fathers is selective with respect to a number of characteristics such as income, occupation, education, and family background.

3.3 Time use

Our outcomes of interest are the number of hours fathers (and their partners) dedicate to child care and housework on working days and work-free days. SOEP respondents are shown a list of activities, which include paid work, education and training, leisure and physical activities, care (for children and other persons in need), and other

[8] In a robustness check, we only use plant closures as the most exogenous source of job loss and find that most of our results also hold for this group but we do lose estimation precision due to the low number of observed plant closures in our sample of fathers (308 plant closures compared to 902 dismissals). In particular, plant closures make it very difficult to track more long-term effects due to the small number of fathers who remain unemployed for more than one period after a plant closure.

[9] Among all fathers, 20% experience multiple job losses over the whole sampling period. In order to test the risk of biases in our estimated effect due to job losses being influenced by earlier job losses, we conduct a robustness analysis in which we only consider fathers who experience only one job loss.

unpaid domestic work such as errands, housework, and repairs and garden work. They are asked to indicate how many hours they spend on these activities on a normal day. For weekdays, this information is available for every year since 1992, while it is only collected biennially for Saturdays and Sundays.

Our main outcome variables are child care and housework, with the latter combining traditional routine housework (washing, cooking, cleaning), errands and repairs and gardening. We assume that these activities cover the majority of domestic duties in a standard household. We do not include care for persons in need in the housework measure as less than 3% of all fathers spend 1 h or more on this task. Fathers who engage in this type of work may be a selective group and not representative of fathers in general. The reported hours for Saturdays and Sundays are combined by taking the average of both as a measure for time use on a normal weekend day.[10]

Figure A.1 shows how paternal and maternal time allocated to child care and housework has evolved since 1992. It visualizes the persistent gender gap, which still amounts to over 2 h on both weekdays and weekends. In Fig. 1, we plot the distribution of paternal time allocated to child care and housework for all fathers independent of their treatment status. In addition, Fig. A.2 plots the maternal time spend on child care and housework and the first column of Fig. A.3 plots the distribution of housework separately for the three components.

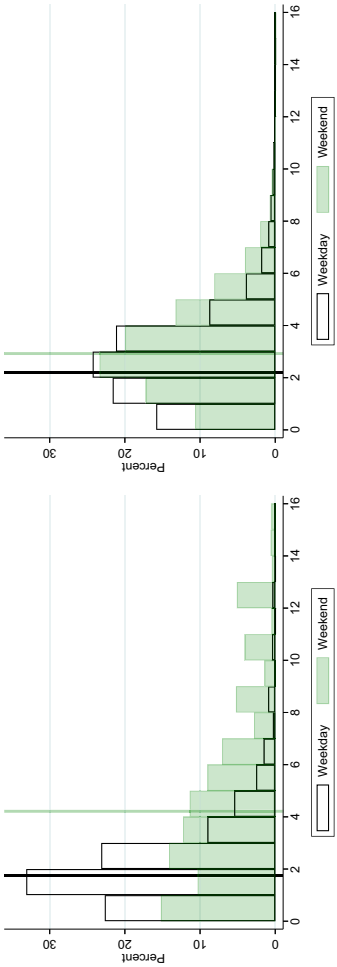
Although the variables are not continuous, we see that there is a fair amount of variation. Overall, fathers spend, on average, more time on child care than on housework but this difference is largely driven by the weekends, with the sample means of child care and housework on weekdays being very similar (approx. 2 h as compared to, on average, 4 h of child care on weekends). We also analyze the occurrence of zero reported hours, which might result in the requirement of a non-linear estimation approach. We find that 21% (13%) of fathers report zero hours of child care on weekdays (weekends) and 16% (5%) of fathers report zero hours of housework on weekdays (weekends). Additionally, we see in the data that a large proportion of the reported zero hours in child care are driven by fathers with older children. The share of zero hours for child care on weekends is only 4% for fathers with children aged 6 or younger.

Table 2 provides summary statistics of the key outcome variables and gives some first descriptive evidence on how time investments differ in the period pre- and post-job loss for the treated fathers. We can already see in this raw comparison that fathers invest more time on child care and housework post-job loss on weekdays. The average pre-job loss time spent on child care increases from 2.00 h to 3.20 h in the first post-job-loss-period (during unemployment) and from 2.14 h to 3.89 h for housework. The mean differences on weekends are less distinct and not significant.

3.4 Estimation strategy

The goal of our study is to identify the causal effect of an involuntary period of unemployment on time spent on child care and housework on weekdays and weekends. In order to achieve this goal, we address two potential identification problems:

[10] Fathers who report more than 16 h of child care or housework, which is assumed to be an unrealistic amount of time, are excluded from the analysis in order to avoid potential outliers driving the results.



Notes: The figure plots the distribution of the paternal time use variables. The vertical lines indicate the sample mean.
Source: Own calculations based on SOEP v35, weighted.

Fig. 1 Paternal time spent on child care and housework

Table 2 Descriptive statistics: pre- and post-job loss

	Pre-job loss		Post-job loss		Difference
	Sample mean	*N*	Sample mean	*N*	
Weekday					
Child care	2.00	779	3.20	1210	1.20***
Housework	2.14	779	3.89	1210	1.75***
Weekend					
Child care	4.50	399	4.62	601	0.12
Housework	2.72	399	2.97	601	0.24

Notes: The table provides descriptive statistics. Standard deviations are reported in parentheses. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Source: Own calculations based on SOEP v35

unobserved selection into unemployment and reverse causality. Firstly, although we only consider employer-initiated job losses, the job loss itself and especially the consecutive unemployment in period t may still be correlated with observed and unobserved characteristics of the individuals that also affect the outcome variables. Table A.1 shows strong differences between treated and untreated fathers in our sample with respect to observable characteristics. As expected, the monthly net household income is lower for those fathers who experience a job loss. In addition, fathers with an involuntary job loss are selected in terms of education, occupation type, partner's labor force status, the number of children in the household as well as physical and mental health. With respect to child care and housework involvement, the average hours of untreated fathers are only slightly lower for child care during workdays and for housework on weekends but otherwise indicate no severe selection compared to the pre-treatment means of treated fathers (see Table 2). Besides these observable differences, fathers who lose their job and fathers who do not might also differ with respect to unobservable characteristics, such as their preferences and priorities for work and family life, which would lead to an omitted variable bias.

In order to overcome this potential omitted variable bias with respect to unobserved characteristics, we employ an event-study approach with individual fixed effects. This allows us to compare paternal time investments for the same individual before and after job loss and thus control for any time invariant observable and unobservable characteristics, i.e., any between-individual selection into treatment. In addition, the individual fixed effects also account for differences in the reporting of time use, which are constant over time. We follow an event study methodology as described, for example, by Schmidheiny and Siegloch (2019), and estimate the following equation:

$$y_{it} = \sum_{j=\underline{j}}^{\bar{j}} \beta_j b_{it}^{j} + \alpha_i + \alpha_t + \alpha_a + \alpha_{ca} + I_{it} + \epsilon_{it} \tag{3}$$

where y_{it} is the outcome of individual i in time t, α_i and α_t are individual and year fixed effects, respectively, and α_a and α_{ca} are age group fixed effects for the fathers

and their youngest child, respectively.[11] To account for time-varying misreporting, we additionally control for interview characteristics I_{it}. The vector I_{it} includes the survey mode (self-completed, orally completed, completed by proxy or translator)[12] as well as the gender of the interviewer, which may impact the degree of misreporting due to social desirability considerations[13]. b_{it}^{j} is a treatment indicator for an event happening $j \in [\underline{j}, \bar{j}]$ periods away from t, which we define as:

$$b_{it}^{j} = \begin{cases} \mathbb{1}[t \leq e_i + j] & \text{if } j = \underline{j} \\ \mathbb{1}[t = e_i + j] & \text{if } \underline{j} < j < \bar{j} \\ \mathbb{1}[t \geq e_i + j] & \text{if } j = \bar{j} \end{cases} \tag{4}$$

The treatment indicators b_{it}^{j} are binned at the endpoints, i.e., they also include the effect of the treatment being $\underline{j}$ *or more* in the future or $\bar{j}$ *or more* periods ago. In our baseline specification, we analyze time use three years prior to the job loss and up to five years thereafter, thus covering a time frame of eight years. We choose this time-period based on the average observation length of the fathers in the SOEP of 8.5 years.[14] We follow the standard in the literature and fix the coefficient β of the pre-treatment period $t-1$ to zero (Schmidheiny and Siegloch 2019). Equation (3) is estimated using a linear parametric model and standard errors are clustered on the individual level. As the use of a non-linear estimation in the event study framework with individual fixed effects is difficult to implement, we run a robustness check using a non-linear tobit model in a setting without individual fixed effects to check the sensitivity of our results in this respect. We find that our results are robust and thus assume the applicability of a linear model for our empirical analysis.

Although individual fixed effects and the exogenous treatment indicator capture large parts of the unobserved selection, endogeneity concerns may remain with respect to within-individual selection into remaining unemployed after the job loss which is a precondition to be counted as a treated individual in our data. This within-individual selection could be caused by a number of unobserved time-variant characteristics such as motivation, ability, or mental health. We account for this by restricting the analysis to potentially less selective fathers who became unemployed up to three months prior to the interview in one robustness check in Table A.3. The results are not sensitive to this change. In order to investigate the potential of remaining within-individual selection into treatment based on time-variant omitted variables, we consider the differences between characteristics in the pre-job loss period $t-1$ and past periods for treated fathers and

[11] Due to the fixed effects design, we cannot control for exact paternal and child age directly. Instead, we construct age groups for the father (α_a) and the youngest child (α_{ca}), which are still identified as we are able to observe fathers and children multiple times within these age ranges.

[12] Bryant et al. (2004) show that errors in telephone surveys are larger than those in surveys conducted by mail.

[13] While there is some evidence that men do a comparably large share of housework and child care duties would like to preserve a traditional self-image and hence under-report, it is more likely that fathers would like to appear more supportive than they actually are.

[14] Using more years increases the risk of confounding from other events. Additionally, children age over the course of the event study, which implies that children, on average, are younger before the job loss and older after the job loss (compare Fig. A.4). A longer time frame exacerbates this problem, particularly since we only include fathers in our sample who live together with children up to age 14.

analyze whether our results are sensitive to the inclusion of these endogenous co-determined variables in Online Appendix D.

A second potential identification problem is the possibility of reverse or simultaneous causality in a situation in which an increased domestic time-investment makes a treatment more likely. This would be the case if (1) an increased pre-treatment time investment is accompanied by a decrease in workplace productivity or engagement which causes the job loss itself, or (2) if a change in time investments immediately after the job loss causes a delayed re-entry into the labor market, which leads to fathers investing more time being more likely to be captured in our treatment in t while fathers investing less time might be re-employed already and thus excluded from our treatment group. We address the first concern by considering pre-treatment trends in time investment. We also restrict our analysis to plant closures as the most exogenous form of job loss in a robustness check. We address the second concern by applying a restriction to very recent job losses, as described above, and by analyzing the potential selection into later re-employment based on changes in time investment in the treatment period. The latter results do not indicate any severe selection into re-employment in period $t+1$ or later depending on the extent of the change in paternal time investment in the household in between $t-1$ and t. A high or low change in time investment seems not to be a predictor of the re-employment rate of fathers.[15]

In addition to the main analysis, which is estimated using Eq. (3), we conduct a number of heterogeneity analysis in Section 4.2 using the following estimation equation:

$$y_{it} = \sum_{k=1}^{N} \beta_{k1} b_{0i} \times g_{ik} + \sum_{k=1}^{N} \beta_{k2} b_{12i} \times g_{ik} + \sum_{k=1}^{N} \beta_{k3} b_{34i} \times g_{ik} + \alpha_i + \alpha_t + \alpha_a + \alpha_{ca} + I_{it} + \epsilon_{it} \tag{5}$$

All heterogeneity analyses are conducted using interactions of the group indicator g_{ik} for the $k = N$ groups of interest (e.g., by employment status) with the grouped treatment indicators b_{0i} for the job-loss period ($t = 0$), b_{12i} for 1–2 periods post and b_{34i} for 3–4 periods post in order to maintain the readability of the estimation tables.

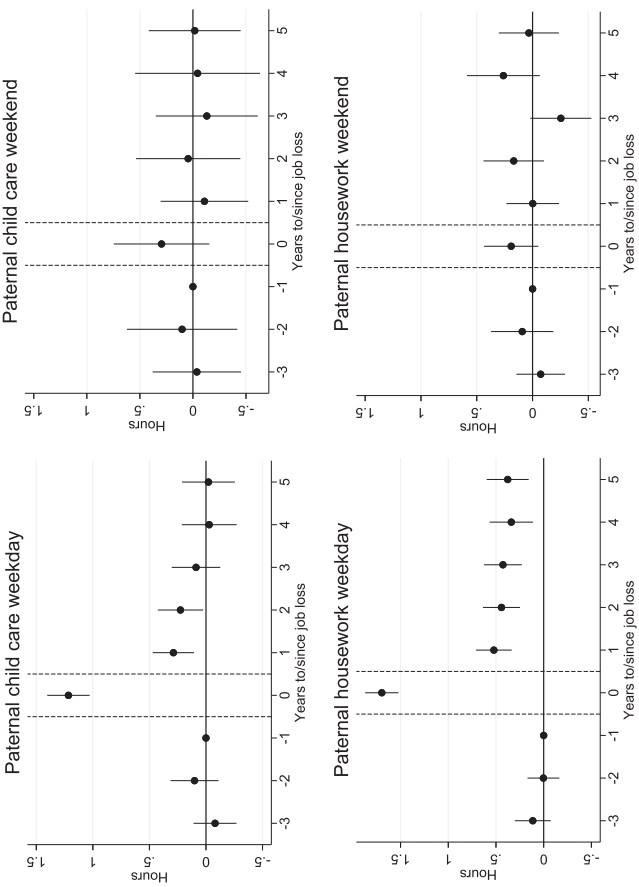
4 Results

4.1 Main results

We begin by estimating Eq. (3) for all four time allocation outcomes: child care on weekdays and weekends as well as housework on weekdays and weekends.[16] Figure 2 depicts the coefficients and 95% confidence intervals from the interaction of the involuntary job loss indicator with the time difference to the event. Corresponding regression results including standard errors are provided in Table A.2 in Online Appendix A.

[15] Results are available from the authors upon request.

[16] In addition, Online Appendix B gives an overview over how the treatment impacts employment probabilities, daily working hours, hourly wages, gross labor earnings, net household income, and the paternal income share to understand how our treatment impacts the labor market trajectories of fathers and the financial situation of households in detail.



Notes: The figure plots estimates from an interaction of the job loss with indicators on the time difference to the event. The regressions include individual and year fixed effects and interview and age-group controls. Confidence intervals are based on standard errors clustered on the individual level and refer to the 95 percentile.

Source: Own calculations based on SOEP v35.

Fig. 2 Baseline results

To begin with, we do not see any pre-treatment trends in time allocation, which is reassuring with respect to potential reverse causality issues and concerns about anticipation. Fathers do not seem to change their time allocation in the periods before the job loss. With respect to the treatment effects, we find that an involuntary job loss significantly increases paternal time allocated to child care by roughly 1.2 h in the short term, i.e., during the unemployment spell in t, which corresponds to an increase of 58% relative to the baseline of 2.06 h in the pre-treatment period. However, the effect is not persistent in the full sample: as early as in the two subsequent periods this effect falls to between 0.2 to 0.3 h and vanishes completely three to four years after the job loss.

Nevertheless, this "leveling off" in the effect is likely driven by the re-employment of most of the fathers in the sample and may thus be heterogeneous with respect to the paternal employment status. In contrast to the strong effects during weekdays, no significant effect can be observed during weekends in the short or long run.

Next, we turn to the paternal involvement in housework. Here, the immediate increase in time allocated to housework on a weekday amounts to 1.7 h, which increases the baseline amount of time spent on housework in the pre-treatment period of 2.16 h by approximately 79%. While this effect drops by two thirds to around 0.5 h in period $t + 1$, it is still significantly positive even five periods after the shock. No significant effect can be observed during weekends. As can be seen in Fig. A.3, routine housework, errands as well as repairs and gardening contribute to the overall effect in largely equal shares.

In summary, we find that a job loss leads to a large increase in paternal child care and housework on weekdays during the period of immediate unemployment. The effects seem to be more persistent for housework than for child care. In general, we see that our results for child care are less precisely estimated, which may be the result of substantial heterogeneity in responses to the employment shock. We do not see any substantial effects on weekends. Even though the confidence intervals are larger, which stems from the smaller sample size, the point estimates are not substantial either.

4.2 Heterogeneity analysis

The main findings do not allow us to draw conclusions about the channels outlined in Section 2 and are at risk of obscuring underlying heterogeneity in the responses. This is why we further investigate the mechanisms behind the raw effects by interacting the event indicators with different group indicators. Throughout the heterogeneity analysis, we do not report coefficients for each period separately, but instead pool the event indicators one to two and three to four periods after the job loss. We do so to increase the power of our estimates, to insure that the number of observations in each subgroup is sufficiently large, and to improve readability.[17]

4.3 Post-shock labor force statuses

First, we address the question of whether the identified effects are driven by a specific group of fathers (and families) depending on whether they (and their partners) are working or not working in the subsequent periods. This allows us to make statements on

[17] Results for each period are available from the authors upon request.

Table 3 Heterogeneity by paternal and maternal employment status

	Estimated treatment effect of job loss			
	Child care		Housework	
	Weekday (1)	Weekend (2)	Weekday (3)	Weekend (4)
Job loss				
Both not working	1.239*** (0.131)	0.062 (0.265)	1.361*** (0.111)	−0.040 (0.143)
Mother working	1.111*** (0.119)	0.405 (0.268)	2.088*** (0.129)	0.303* (0.151)
1–2 periods post				
Both not working	0.791*** (0.166)	0.152 (0.291)	1.025*** (0.141)	−0.158 (0.144)
Father working	−0.510*** (0.115)	−0.892** (0.307)	−0.327** (0.113)	−0.331* (0.163)
Mother working	0.806*** (0.148)	0.413 (0.286)	1.437*** (0.169)	0.116 (0.202)
Both working	−0.231* (0.103)	0.029 (0.259)	−0.048 (0.101)	0.259 (0.149)
3–4 periods post				
Both not working	0.611** (0.201)	−0.315 (0.397)	0.689*** (0.158)	−0.244 (0.198)
Father working	−0.596*** (0.123)	−0.175 (0.333)	−0.149 (0.119)	−0.235 (0.170)
Mother working	0.861*** (0.196)	0.113 (0.356)	1.459*** (0.180)	0.294 (0.211)
Both working	−0.372** (0.130)	0.005 (0.296)	−0.099 (0.118)	−0.129 (0.179)
Obs.	56,550	28,227	56,550	28,227

Notes: The table reports treatment effect estimates of an involuntary job loss on paternal time allocation based on Eq. (5). The regressions include individual and year fixed effects and interview and age-group controls. Standard errors clustered on the individual level in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Source: Own calculations based on SOEP v35

whether the observed overall long-term effect constitutes a permanent change in household dynamics, also after re-employment, or is simply driven by the remaining unemployed fathers. Nevertheless, it should be noted that post-shock employment statuses are potentially endogenous due to unobserved intra-individual selection and reverse causality between changes in time investment and re-employment probabilities. The following results, thus, have to be interpreted with care and in light of the discussion on endogeneity in the employment statuses in Section 3.4.

Results of a heterogeneity analysis with respect to paternal and maternal employment status in the post-shock periods are presented in Table 3. We only include fathers with valid information for their partners and the sample size is, thus, reduced as it excludes single fathers as well as fathers with missing information on the female partners' labor supply and time use.

In the short run and on weekdays, we find that paternal child care does not differ by taking into account the spousal employment status while the effect on housework involvement is larger for fathers with working partners. We do not find any significant short-run effects on weekends. In the long run, we find positive and persistent weekday effects for fathers who remain unemployed up to four periods after the shock. Compared to the strong effect in the initial unemployment period, the effects also seem to level off if fathers remain unemployed. This is in line with what

we find with respect to the distance to the job loss: the short-run effect is stronger for fathers who experienced the job loss more recently.[18] The heterogeneities with respect to the partner's employment status nevertheless become more pronounced in the long run and are also clearly visible for child care in the case of fathers remaining unemployed 3–4 periods after the job loss. While unemployed fathers with non-working partners seem to slowly converge back to pre-shock periods, unemployed fathers with employed partners continue to invest more. This is even more pronounced if we differentiate using maternal working hours. While unemployed men with part-time employed partners also decrease their time investment over time, the increased time investment of men with full-time employed partners stays constant 3–4 periods after the shock as well.[19] In contrast, we see a significant decrease in hours spent on child care and housework for fathers who are re-employed, especially if the partner is not working. A similar negative effect can also be seen if the partner is only part-time employed. These effects are, in contrast to all the other observed effects, also observable on weekends.

Although at risk of being biased by selection into post-shock labor force status, this heterogeneity is crucial to understand the underlying mechanisms and counteracting effects behind the overall treatment effect. This heterogeneity reveals that the identified short- and long-term effects on time investment are not caused by the job loss itself but are tied to the labor force status of the respondents.

4.4 Child age and daycare use

Next, we investigate how the effects differ by child age and daycare use. Fathers of older children have very different child care responsibilities from fathers of younger children. Given the time dimension of our event study approach, this might result in a downward bias in the long run event indicators purely driven by the fact that children get older over time. To illustrate the age distribution of children, Fig. A.4 illustrates plots the age of the youngest child in the household before and after the job loss to illustrate the age differences across event indicators by plotting the age of the youngest child in the household before and after the job loss.

Additionally, the effects for fathers with young children may be concealed since older children require substantially less care. We estimate separate effects for fathers of children up to the age of six and fathers of older children in Table 4.

Furthermore, we differentiate between younger children according to whether they attend daycare and find that the immediate effects on child care are significantly larger for younger children, especially for those who do not attend daycare as the intra-household demand for time investment is much higher.[20]

[18] Results are available from the authors upon request.

[19] Results for the heterogeneity analysis by mother's working hours are available upon request.

[20] As the literature finds that paternal time investments potentially differ by child gender (see e.g., Baker and Milligan 2016), we also split fathers according to whether they have only male or only female children, but do not find any differences. Results are available from the authors upon request.

Table 4 Heterogeneity by child age and daycare use

	Estimated treatment effect of job loss			
	Child care		Housework	
	Weekday	Weekend	Weekday	Weekend
	(1)	(2)	(3)	(4)
Job loss				
Children > 6	0.876*** (0.114)	0.397 (0.287)	1.935*** (0.128)	0.300 (0.157)
Child <= 6 not in daycare	1.854*** (0.181)	−0.141 (0.308)	1.517*** (0.138)	−0.257 (0.168)
Child <= 6 in daycare	1.062*** (0.152)	0.461 (0.325)	1.576*** (0.147)	0.127 (0.172)
1–2 periods post				
Children > 6	0.332*** (0.096)	−0.138 (0.222)	0.602*** (0.106)	0.129 (0.139)
Child <= 6 not in daycare	0.325 (0.177)	−0.110 (0.302)	0.464** (0.142)	0.004 (0.161)
Child <= 6 in daycare	0.012 (0.125)	−0.045 (0.276)	0.369** (0.126)	−0.129 (0.150)
3–4 periods post				
Children > 6	−0.032 (0.109)	−0.426 (0.243)	0.388*** (0.115)	−0.267 (0.141)
Child <= 6 not in daycare	0.396 (0.238)	−0.022 (0.479)	0.576*** (0.144)	0.088 (0.193)
Child <= 6 in daycare	−0.018 (0.154)	0.187 (0.328)	0.279* (0.138)	0.127 (0.196)
Obs.	59,438	29,782	59,438	29,782

Notes: The table reports treatment effect estimates of an involuntary job loss on paternal time allocation based on Eq. (5). The regressions include individual and year fixed effects and interview and age-group controls. Standard errors clustered on the individual level in parentheses. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

Source: Own calculations based on SOEP v35

4.5 Further heterogeneity analyses

In addition to the heterogeneity discussed above, we conduct a number of other tests for heterogeneity with respect to the educational background of the father, the fathers' pre-treatment time investment as well as the region of residence. The results of these heterogeneity analyses are reported and discussed in Online Appendix C. In summary, we find that the immediate effects on child care are larger and more persistent for highly educated fathers, as well as for fathers in the West of Germany. Fathers with low pre-treatment time investment have slightly lower short-term effects on child care but the observed changes are more persistent. As opposed to this, the effects on housework are slightly larger for fathers without a post-secondary education, fathers with low pre-treatment time investment as well as in the East of Germany.

4.6 Robustness checks

In order to support the validity of our results, we run a number of robustness checks and display the results in Table A.3. We present robustness checks for child care and housework on weekdays only as we find significant effects in our baseline specification only for these variables.[21]

[21] The estimates for time investment on weekends are also robust in all alternative specifications and are available upon request.

First, in order to increase the exogeneity of our treatment variable, we use plant closures as the sole cause of the unemployment spell in column (2). Although variation from plant closures is considered more exogenous, this reduces the sample size quite significantly and thus decreases the precision of the estimated effects. Still, we see that the baseline estimates for the job loss period still hold. Fathers significantly increase their time spent on child care and housework while being unemployed also after a plant closure. Nevertheless, the positive effects of the baseline cannot be observed for this sub-sample for the periods afterwards. This is driven by an even higher negative effect for re-employed fathers as well as a very small group of fathers who remain unemployed for more than one year after a plant closure. In period $t+1$ ($t+2$), we only observe 101 (82) fathers who lost their job due to a plant closure and are still unemployed, which is why the effect on child care investment cannot be estimated with sufficient precision.

Next, in order to tackle the potential omitted variable bias and reverse causality that could lead to selection into unemployment in period t, we restrict our sample to job losses occurring within three months prior to the interview. The estimated effects in column (3) also hold for this sub-sample of fathers, who should suffer less from selective re-employment until the interview. Thirdly, we replicate our main results using treated fathers only and thus exclude those fathers who never lost their job from the estimation. The estimated coefficients in column (4) are robust against this variation.

Then, in column (5), we change the sample restrictions to only include fathers who live with a partner in a household over the whole observation period, thus excluding single fathers as well as potentially separated couples from the analysis. While this induces endogeneity, as an involuntary job loss can impact partnership stability, we potentially avoid a downward bias of our estimates through fathers who reduce their child care engagement after a separation. Nevertheless, we find that the estimated effects hardly change by way of this adjustment.

Next, the estimations in column (6) replicate the results for fathers who lost their job only once during the whole observation period. This reduces the risk of biases in our estimated effect due to job losses being influenced by earlier job losses. Also here, the estimated effects are robust.

Furthermore, in line with the discussion in Section 3.3, we adjust our estimation model for the potential non-linearity induced by the high number of zero hours observed for fathers, especially for child care on weekdays. Column (7) includes the estimated marginal effects based on a tobit model that accounts for the censoring of the time use variable at zero. The tobit model does not allow for the inclusion of individual fixed effects but, reassuringly, the estimated coefficients are robust against this change in the estimation model also when individual fixed effects are dropped.

Lastly, we pay special attention to the weights underlying our two-way fixed effects models. Sun and Abraham (2020) show that two-way fixed effects models—and in particular pre-trends—can be biased in case the treatment timing varies across units and treatment effects are heterogenous.[22] Although the inclusion of never treated fathers in our sample reduces this risk, we follow de Chaisemartin and D'Haultfœuille (2020) and estimate the weights attached to our two-way fixed effects

[22] See Roth (2020) for a review.

regressions with their stata command `twowayfeweights`. We find that only about 14% of the weights are negative. Nevertheless, we still test the robustness of our estimates with respect to these negative weights due to the high importance of underlying effect heterogeneity identified in Section 4.2. We follow de Chaisemartin and D'Haultfœuille (2020) and apply their stata command `did_multiplegt` which is robust to treatment effect heterogeneity. Results are presented in Fig. A.5. We find that the short-term effects as well as the pre-trends are not sensitive to using the alternative estimator but most of the observed small long-term effects lose significance due to larger standard errors. Part of this is likely driven by the already identified crucial heterogeneity between different post-treatment labor force statuses which leads to counteracting effects being averaged out in the main estimator.

5 Investigating the household dynamics

In order to get a full picture of the household dynamics initiated by the paternal job loss, we devote some attention to the spillover effects on female partners, the relative shares of domestic work undertaken by fathers, and potential changes in the cumulative time investment of both partners as opposed to potential outsourcing of tasks.

The proposed channels of changes in gender norms and changes in bargaining power and comparative advantages require the analysis of within-household shifts in domestic responsibilities and division of labor. In addition to understanding how an involuntary job loss changes paternal absolute time investment, it is necessary to also examine the simultaneous changes in maternal time allocation and the share of paternal investments in total household investments. The corresponding estimates are reported in Table 5. Panel A (columns 1 to 2) reports the absolute changes in maternal hours spent on child care and housework on weekdays, whereas Panel B (columns 3 to 4) reports the changes in the share of time undertaken by the father.[23]

Analogous to the increase in hours for fathers, maternal time investments in child care and housework in the period of job loss significantly decrease during weekdays if mothers are working, and this effect also persists over time.[24] Interestingly, the long-term persistence of the reduced time investment of mothers is also observable in the case of a re-employment of the father as long as both partners are working. In contrast to this, mothers' time investment in child care and housework increase in the short and long run if she is not working, largely independent of whether her partner is re-employed or not. This indicates shifts in the cumulative time investment in the household. In line with what we observe for maternal and paternal hours in Tables 3 and 5, cumulative household time investment increases in the case of both partners not working while it decreases in the case of both partners working (see Table A.5 in Online Appendix A). In families in which only one partner is working, absolute changes are mainly driven by shifts in the shares between partners.

[23] In line with the earlier findings, the changes on weekends are small and are not discussed in detail, but can be found in Table A.4 in Online Appendix A.

[24] Additionally, the short-term involvement of working mothers in child care and housework during weekends decreases (see Table A.4).

Table 5 Cumulative household investment and domestic help

	(A) Maternal hours		(B) Paternal share		(C) Outsourcing		
	Child care Weekday	Housework Weekday	Child care Weekday	Housework Weekday	Domestic help	External care	Child care expenses
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Job loss							
Both NW	0.854*** (0.236)	0.431*** (0.109)	0.058*** (0.010)	0.084*** (0.009)	−0.004 (0.005)	−0.058** (0.021)	−12.673** (4.638)
Mother W	−1.352*** (0.204)	−0.583*** (0.098)	0.122*** (0.012)	0.177*** (0.011)	−0.008 (0.005)	−0.034 (0.023)	5.988 (5.925)
1–2 periods post							
Both NW	0.989*** (0.282)	0.213 (0.135)	0.037** (0.013)	0.064*** (0.011)	0.012 (0.010)	−0.036 (0.026)	−18.259*** (5.413)
Father W	1.031*** (0.283)	0.476** (0.153)	−0.053*** (0.012)	−0.046*** (0.011)	−0.010* (0.005)	−0.010 (0.027)	−15.333* (6.501)
Mother W	−0.954*** (0.252)	−0.816*** (0.129)	0.102*** (0.017)	0.142*** (0.016)	0.011 (0.013)	0.037 (0.034)	4.189 (8.880)
Both W	−0.478* (0.228)	−0.493*** (0.113)	−0.013 (0.011)	0.013 (0.010)	−0.002 (0.004)	0.059* (0.027)	15.467* (7.718)
3–4 periods post							
Both NW	1.245** (0.458)	0.430** (0.163)	0.016 (0.018)	0.042** (0.016)	0.011 (0.012)	−0.001 (0.035)	−8.161 (8.274)
Father W	1.020** (0.367)	0.479*** (0.144)	−0.060*** (0.014)	−0.039** (0.012)	−0.014* (0.006)	−0.045 (0.033)	−0.066 (8.783)
Mother W	−0.740** (0.287)	−0.484*** (0.147)	0.088*** (0.020)	0.130*** (0.017)	−0.007 (0.010)	0.004 (0.038)	−4.480 (13.983)
Both W	−0.658** (0.231)	−0.509*** (0.129)	−0.005 (0.014)	0.019 (0.013)	−0.005 (0.007)	0.023 (0.032)	6.067 (7.684)
Obs.	56,550	56,550	56,550	56,550	47,798	47,798	18,993

Notes: The regressions include individual and year fixed effects and interview and age-group controls. Standard errors clustered on the individual level in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Source: Own calculations based on SOEP v35

Based on these observed changes for mothers, we can now interpret the changes in paternal shares more easily. As can be seen in Panel B of Table 5, the share of paternal time investment increases as long as the father is unemployed. Nevertheless, this change in the share is much more pronounced if the mother is working. While fathers with working partners increase their share of child care (housework) time by, on average, 12.2% (18%), fathers with non-working partners increase it only by, on average, 5.9% (8.6%). This pattern also remains visible after 3–4 periods. The paternal share steadily decreases for fathers with non-working partners, while the share remains relatively stable for fathers with working partners. In contrast to this, the increase in hours for re-employed fathers and the corresponding increase in hours of their non-working partners directly translates into a decreased child care (housework) share of on average 5.0% (4.4%) during weekdays.[25]

There are two possible reasons for the changes in the cumulative household time investment observed above. First, housework and child care are performed more (less) regularly and with more (less) dedication and are less (more) likely to be postponed to weekends, or, second, the outsourcing of tasks is reduced (increased). Thus, we address whether households also respond in terms of the outsourcing of domestic tasks in Panel C of Table 5. With respect to housework, the evidence on changes in the employment of domestic help in column (5) point in the direction of the first explanation as we can only see a marginally significant reduction in the probability of employing a domestic help in the case where the mother is working in the period directly after the job loss. Expectations regarding the outsourcing of child care are less clear, especially if we assume that small children necessarily have to be cared for (i.e., someone always has to take care of them). Thus, we think the reduction in outsourcing is the much more likely scenario for child care. Nevertheless, it should be noted that regular daily care in child care facilities is a less flexible form of outsourcing in the case of Germany since pre-school and after-school care is largely covered by public daycare centers and schools at very low, or nearly no, cost. Thus, the coverage of pre-school care is very close to 100% for children over the age of three. It is still possible that newly unemployed fathers and their partners take over the care that was provided by other external persons such as grandparents or paid babysitters prior to the job loss. We provide clear evidence for this hypothesis in columns (6) and (7) of Table 5, where we analyze the effect of the changes in the use of external care as well as the monetary expenses for this external care in response to the paternal job loss. We find that if cumulative household investments increase, such as in the case of both partners not working in the period after the job loss, the probability of using external child care significantly decreases along with the corresponding expenses. In contrast to this, external child care use as well as the corresponding costs increase when both partners are employed 1–2 periods after the job loss. Variation in the outsourcing of child care is, thus, an important mechanism in the observed changes in paternal investment.

[25] A related question is how these spillovers and relative share changes would look in the case of a maternal instead of paternal job loss. Unfortunately, estimating the effects of maternal job loss is constrained by the low number of observed job losses for mothers given the large share of women out of the labor force, 30% in our sample. An analysis of the remaining group of women reveals small effects on the time investment of the mothers themselves but no obvious spillovers and no clear pattern with respect to the labor force status of both partners. Results are available from the authors upon request.

6 Discussion

What do all these empirical findings imply for the potential channels discussed in Section 2? The increase in paternal time allocated to child care and housework is concentrated on unemployed fathers, can only be observed on workdays and is accompanied by a proportional decrease in maternal time investment. This supports the time availability channel: the additional time available on workdays is partly directed into essential and excess domestic work. The channel is amplified by financial constraints, which force the father to replace expensive external providers of child care and housework or compensate for his partner's reduced availability for essential domestic work. This can be empirically observed through the increased maternal employment probability (see Online Appendix D), the heterogeneity in the spillover to the partner's time investment depending on her employment status (Table 3), and the decrease in outsourcing especially in the case of both partners not working (Table 5).[26]

Although these observed changes in time investment could also be explained by changes in bargaining powers, this mechanism would also cause changes in paternal time investments into essential tasks on weekends, which is not the case in our data. The paternal share in the households' total time investment on weekends does not change significantly, which makes it less likely that a change in bargaining powers is responsible for changes in intra-household time allocation in most households. Even if we assume that the share of essential tasks as compared to excess tasks is lower on weekends, its likely that we would see at least some change in the gender division of tasks on weekends if changes in bargaining powers explain the effects.

The identified positive effects on paternal time investment are temporary and tied to the status of being unemployed. The negative effects on time investment for re-employed fathers, thus, suggest no significant importance of changing gender role attitudes or emotional bonds for the observed changes in the time investment. Instead, the findings underline the relevance of workplace demands, which not only offset but even reverse the short-term changes in the household division of domestic labor. Even on work-free days effects are negative for re-employed fathers, though weekends should be less time constrained.

It is important to note that our results do not allow us to conclude that gender role attitudes or emotional bonds do not change. Our time-investment measure does not provide a complete picture of underlying gender roles or emotional bonds, which are difficult to measure in any case. There may still be unobserved changes in emotional bonds or gender roles, which do not affect paternal time investments, for example due to binding time constraints. An improvement of emotional bonds could, for example, also translate into an improved quality but not a higher quantity of time spend with the children. Conversely, the identified quantitative changes in paternal time allocation are silent on the underlying quality of the increased time investment (see for example Kalenkoski and Foster 2008).

[26] Additionally, our heterogeneity analysis for children's age and child care status shows that a higher demand for time spend on essential tasks, for example if very young children are present or the children are not in daycare, also amplifies the effect of time availability.

An involuntary job loss constitutes a drastic change in the paternal labor force status. The existing literature indicates that a parental job loss has a strong impact on individual wellbeing (Clark et al. 2008; Lucas et al. 2004), on mental and physical health (Noh 2009; Sullivan and Von Wachter 2009), on personality traits (Anger et al. 2017), on spousal wellbeing and mental health (Marcus 2013; Nikolova and Ayhan 2019), and on marital stability (Eliason 2012). It thus has important implications for children's outcomes (Bratberg et al. 2008; Coelli 2011; Lindo 2011, Oreopoulos et al. 2008; Peter 2016; Stevens and Schaller 2011).[27] While the adverse effects described above have the potential of negatively affecting child care quality, the findings of Knabe et al. (2010) also suggest an increase in child care quality is possible, for example if the conflict between family and work life is eased and the negative affect during child care activities is thus reduced.

7 Conclusion

Despite increases in maternal labor supply in virtually all developed countries, gender differences in care work, the so-called "gender care gap", persist. Parental leave regulations that include father quotas in leave-taking have so far been shown to reduce this gap only in the short run and also suffer from selection imposed by the voluntary nature of the treatment. As governmental efforts to increase paternal involvement, therefore, seem to be blocked by stronger unobserved forces, such as gender norms or workplace practices, we ask whether an involuntary temporary elimination of these forces is able to shift the intra-household allocation of domestic work in the long run. We do so by providing evidence on how a negative paternal employment shock, in the form of an involuntary job loss, shapes domestic time allocation within households in the short and long run.

Our findings show that a paternal job loss increases the time allocated to child care and housework by, on average, 1.2 h and 1.7 h, respectively, on regular weekdays in the short run. This corresponds to a 58% increase for child care and a 79% increase for housework relative to the baseline. Heterogeneity analyses confirm that the persistence of these effects is mainly driven by fathers who do not return to the labor market immediately and who have a spouse who is active on the labor market. Additionally, we find no evidence for changes in the time allocation on weekends during unemployment. In contrast to this, we find a strong and persistent negative effect on time investment on weekdays and weekends for fathers who are re-employed after the initial unemployment period, especially if they have non-working partners. All results are robust to changes in the estimation sample, the definition of our treatment variable, the estimation method, and the specification. Furthermore, our event study approach shows no pre-trends. We also find that employed mothers, on average, respond to the change in paternal time allocation by persistently decreasing domestic time investments, while non-working mothers actually increase the time allocated to child care and housework, thus increasing the cumulative household investment and decreasing the outsourcing of domestic tasks.

[27] Another commonly discussed topic in this respect is domestic violence and how it is potentially triggered by negative emotional cues such as unemployment (Anderberg et al. 2016; Card and Dahl 2011).

We interpret our findings as evidence for the time availability channel and the relevance of financial constraints. Based on heterogeneity analyses, differential effects on weekdays and weekends, and the persistence of these effects, we conclude that changes in intra-household bargaining power, gender norms and emotional bonding are less likely to be drivers of observed effects. The exogenous shock we analyze is likely to be accompanied by important parallel negative consequences for families, which limits the potential for generalization and application on the part of policy makers aiming to free up fathers' time for domestic duties. Although the average father increases his engagement, which may be beneficial to his children, the situation may actually get worse for many children due to the nature of the shock we are looking at. Future research could therefore attempt to disentangle the potential positive effects of quantitatively increased paternal involvement through employment shocks on children's future outcomes from the known negative effects of unemployment on the quality of child care and analyze in detail the quality of reported paternal activities, such as in time use surveys, in detail.

In conclusion, we find that paternal availability can induce changes in families through a more equal division of tasks and a reduction in outsourcing, but we also see forces reversing these constellations in the case of re-employment. We cannot identify any clear long-term changes in comparative advantages, gender role attitudes, and emotional bonds. These findings are in line with the literature showing that organizational and workplace barriers, societal expectations, and latent differences in preferences and gender identities are important and persistent determinants for the child care and housework allocation within households (see e.g., Allen and Hawkins 1999; Birkett and Forbes 2019; Brandth and Kvande 2019; Bygren and Duvander 2006; Samtleben et al. 2019; Sevilla-Sanz et al. 2010; Stratton 2012). Further, our findings indicate that in certain settings and sub-groups overcoming existing external barriers to increased paternal involvement, such as societal gender norms, workplace practices and expectations, may be more effective than short-term impulses on time availability, such as for example parental leave quotas. Additionally, the findings could be important guidelines for policymakers to learn about short- and long-term consequences of labor market shocks, such as those caused by the current COVID-19 crisis.

Availability of data and material Publicly available data.

Code availability Replication code available from authors upon request.

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Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

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