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Working from home, hours worked and wages: Heterogeneity by gender and parenthood☆

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ABSTRACT

Working from home (WfH) has been widely adopted since the Covid-19 pandemic. Pre-pandemic evidence on how hybrid work arrangements relate to labour market outcomes is a scarce and valuable benchmark. We exploit the German Socio-Economic Panel between 1997 and 2014 to investigate how such a work arrangement relates to working hours, wages and job satisfaction for different demographic groups. We find that childless employees work an extra hour of unpaid overtime per week and report higher job satisfaction after taking up WfH. Among parents, gender differences in working hours and monthly earnings are lower after WfH take-up. However, hourly wage increases with WfH take-up are limited to fathers, unless mothers change employers. We discuss the role of career changes, commuting and working-time flexibility in explaining these findings.

1. Introduction

Over the past three decades, progress in information and communication technologies (ICT) has made it easier to perform tasks outside of the workplace; in part due to cheaper, more user-friendly computers and better connectivity through broadband internet. This made working from home (WfH) feasible for a wider range of tasks, and likely reduced the employer's costs of providing such arrangements (Vazquez and Winkler, 2017). Consequently, and even before the Covid-19 pandemic, there had been a major expansion of WfH in many advanced economies such as the US, Nordic and Central European countries.[1] Among certain groups of workers, such as managers, WfH had already become a mainstream practice (Bloom et al., 2015). With the need for social distancing induced by the Covid-19 pandemic, WfH has become even more widespread.[2] After the pandemic, WfH a few days a week is likely to be a widely used practice (Barrero et al., 2021).

Yet, despite its growing relevance, little is known about how this work practice relates to workers' careers and well-being. The limited empirical evidence is mixed and has not fully taken into account that outcomes likely vary across workers with different private responsibilities. In general, more flexibility in where to work is expected to benefit primarily those who face private restrictions, such as mothers. This is why flexible working arrangements may help reduce gender gaps in the labour market, especially among parents. Yet, while this may be true for labour supply responses, the theoretical expectations are far from

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[1] Evidence on high and rising shares of employees working at home at least occasionally before 2020 can be found for the U.S. (Lister and Harnish, 2011), and for Nordic and Central European countries (see Brenke, 2014; Vilhelmson and Thulin, 2016; Welz and Wolf, 2010, among others).

[2] Brynjolfsson et al. (2020) find that a third of U.S. workers switched to remote work at the start of the pandemic, in addition to 15 percent of workers already WfH before. In Germany, at the start of the pandemic, a quarter of employees were mainly working from home, which is twice the share of employees using WfH at least occasionally before the pandemic (Moehring et al., 2021).

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clear-cut when it comes to wages and other career prospects. On the one hand, WfH may improve wages and career prospects if it raises productivity due to a beneficial work environment at home, or to workers' willingness to extend their availability beyond usual office hours. On the other hand, if WfH mainly serves to reconcile work and family responsibilities, it may give rise to a wage penalty if it is costly to employers.

This paper contributes to the limited and inconclusive evidence on WfH by providing novel and comprehensive insights on how the adoption of WfH relates to a whole set of labour market and well-being outcomes. We use data for Germany from the end of the 90s until 2014, a period of massive expansion of WfH practices. In this pre-pandemic period, WfH was mostly used as a complement to on-site work, as we expect it to be after the pandemic. The paper is thus an interesting benchmark for the near future. Our findings suggest that:

(i) the incidence of WfH in Germany increased, on average, by more than 60 percent between 1997 and 2014, but it almost doubled among parents, suggesting that WfH is likely to be driven by both firms' demands as well as supply-side motives of reconciling family and work responsibilities;
(ii) among childless workers[3], WfH take-up is related to an expansion of overtime hours and higher job satisfaction, despite no compensation in terms of wages or time-off, suggesting that childless employees value the increased flexibility that WfH allows;
(iii) among parents, WfH take-up comes with reduced gender differences in contractual hours and monthly income;
(iv) saving time on daily commutes, as well as the ability to work in the evening and better share childcare responsibilities are mechanisms that enable mothers to work longer hours with WfH;
(v) for fathers, hourly wages are higher after WfH take-up, while wages remain unchanged for mothers unless they change employers. This could be due to gender differences in bargaining within established employer-employee relationships;
(vi) there is no evidence of higher job satisfaction for parents after WfH take-up despite positive labour market outcomes, indicating that related advantages may be counterbalanced by WfH-related conflicts between private and professional needs.

These results should be taken as descriptive as it is difficult in our setting to assign a causal role to WfH take-up. Indeed, other unobserved changes could take place simultaneously. However, the paper makes several contribution to the literature. Compared to experiments (Angelici and Profeta, 2020; Bloom et al., 2015), we use a sample of individuals that is representative of the whole labour market and that we can follow over a long time period to document how WfH is related to changes in contractual hours, overtime hours, hourly wages, and monthly earnings.[4] We also investigate the role of compensating wage differentials using information on job satisfaction, and take into account other schemes used to compensate overtime such as time off. In this way, we complement earlier studies that focus on responses in working hours and disregard compensations for increased working hours other than wages. Moreover, we study the case of employees working from home at least once a month or once a week, hence departing from the older literature that focuses on the less common case of home being the only workplace (Edwards and Field-Hendrey, 2002; Oettinger, 2011), and covering the type of mixed working arrangement that is likely to be the prevalent way of using WfH after the pandemic (Barrero et al., 2021).

As a second contribution, we describe how the links between WfH and labour market outcomes differ across demographic groups, i.e. by gender and parental status. The existing literature often fails to dig deeper into this heterogeneity, despite the fact that the impact of WfH is likely to vary with opportunity costs of working and labour force attachment. By carving out the differences by gender and parental status, we contribute to the debate on the role of schedule constraints as a source of gender differences in working hours and wages (Cubas et al., 2019; Goldin, 2014; Goldin and Katz, 2011) and the role of flexible work arrangements and "family friendly" workplaces as a means of reconciling work and family responsibilities (see Allen et al., 2015; Angelici and Profeta, 2020; Hotz et al., 2017, among others).

Thirdly, we are able to explore several mechanisms and confounding factors behind the link between WfH and labour outcomes by exploiting the richness of the data. We follow individuals over a long period of time and are able to use WfH take-up contrary to most previous studies that often use cross-sectional data only (Gariety and Shaffer, 2007; Leslie et al., 2012; Schroeder and Warren, 2004; Weeden, 2005). These studies likely suffer from a bias since WfH schemes are more frequently offered by high performing firms to workers who are positively selected among the firm's workforce (Bloom and Van Reenen, 2006; Kelly and Kalev, 2006; Osterman, 1995). We can partly address these concerns by accounting for time-invariant unobserved individual heterogeneity in abilities, preferences and working attitudes, and by controlling for an extensive set of time-varying demographic and job-related variables. We also control for gender-specific industry and occupation fixed-effects to account for unobserved heterogeneity in the composition of the workforce across jobs. Still, our estimates should be considered descriptive as we cannot control for all potential biases.[5] Reassuringly though, our main results are robust to including further occupational and regional characteristics as well as the partner's employment status and earnings. In order to address unobserved shocks that affect labour supply decisions as well as the decision to work from home, we also examine whether selection into paid employment due to changes in unobserved preferences or characteristics affects our results using a control function approach in a panel data setting. None of these robustness checks alter the main findings. Finally, we provide novel insights into the channels underlying the effects of WfH by providing suggestive evidence on the role of commuting, flexible schedules and changes in childcare responsibilities. We also examine to what extent the take-up of WfH is accompanied by changing firm or job position within a firm to shed light on the role of such career events in explaining part of the WfH-related labour market outcomes. If WfH take-up comes with higher wages, it is informative to understand whether this applies only to workers with simultaneous career movements or whether it also applies to workers with otherwise unchanged jobs.

The rest of the paper is organised as follows. In Section 2 we discuss the theoretical expectations regarding the effect of WfH on various outcomes and review existing findings. Section 3 describes the data and provides some facts and trends in WfH incidence and labour market outcomes across different groups of workers. We discuss the empirical strategy in Section 4. We present the results, robustness checks and discuss the mechanisms in Section 5. The last section concludes and discusses how the evolution of WfH practices during the pandemic might strengthen or alter insights from the pre-pandemic period.

2. Labour market outcomes of WfH - a review

2.1. Labour supply effects

From a theoretical perspective, there are two reasons why WfH may have positive effects on labour supply both at the extensive and

[3] We use the term childless as a short way to designate individuals without dependent children under the age of 16. Parents, mothers and fathers refer in the text to individuals with children under the age of 16.

[4] Bloom et al. (2015) study the effect of WfH on productivity, promotion and work satisfaction in a Chinese call-center firm. Angelici and Profeta (2020) analyse the effect of WfH on productivity, well-being and work-life balance in an Italian firm of the multi-utility sector.

[5] Potential exogenous determinants such as the expansion of broadband Internet or WfH feasibility at the occupational level are not strong enough to explain WfH take-up at the individual level in our sample.

intensive margin. Firstly, WfH can save on commuting time by avoiding daily commutes although the link between commuting time, WfH and labour supply appears to be weak.[6] What appears to be more important is that WfH reduces schedule constraints that stem from private commitments, such as childcare, during standard working hours. With WfH, it may be possible to meet private needs during usual office hours and to also better synchronise work and leisure time within a couple (Bryan and Sevilla, 2017). In a standard labour supply framework, these advantages attached to WfH reduce the time cost of working, raise the utility level for a given number of working hours, and may thus result in positive labour supply responses both at the extensive and intensive margin (Black et al., 2014; Cogan, 1981). In particular, this should apply to employees with family responsibilities. Therefore, WfH is expected to be one potential means of narrowing the gender gap in working hours, including overtime, that has recently been considered a main source of the gender wage gap (Cortes and Pan, 2019; Goldin, 2014).

To the best of our knowledge, there are no empirical studies explicitly focusing on the effect of WfH on the extensive margin. However, Dettling (2017) demonstrates that access to broadband internet significantly increases female labour supply by about 4 percentage points on average, and by 8 percent among high-skilled mothers. She considers telework and time saved in home production to be the channels which likely explain how internet access encourages women with strong schedule constraints to enter the labour market.

Empirical evidence on the effect of WfH on the intensive margin of the labour supply is also quite limited, but tends to suggest a moderate extension effect of WfH on overtime rather than contractual hours. Evidence by Noonan and Glass (2012) point to a positive association between WfH and longer overtime hours in the US, although the use of cross-sectional analysis may give rise to an estimation bias, as workers who telecommute tend to be positively selected with regard to hours worked and other performance measures. Controlling for individual fixed effects, Possenriede et al. (2016), however, confirms extended overtime hours in case of teleworking for both men and women in the Netherlands, and a marginally significant increase in contractual hours for women only.

2.2. Wage effects

In contrast to the expected labour supply effects, the theoretical effects of WfH on wages are ambiguous, potentially giving rise to either a wage premium or a wage penalty depending on the relative strength of a hedonic effect, a signaling effect and a productivity effect.

First, the hedonic wage effect reflects a worker's willingness to pay for being able to work from home or the need to be compensated for doing so. Workers for whom WfH raises utility due to reconciling schedule constraints or saving on commuting time might trade WfH not only for leisure, but also for wages, hence giving rise to a compensating wage differential. By the same token, workers who prefer on-site work, but use WfH in response to employer needs may need to be compensated by higher wages. The hedonic effect can thus potentially go in both directions. Evidence from an experimental study that offered random job attributes to potential job applicants suggests that, on average, both men and women attach a positive value to working from home. Yet, women's willingness to pay for WfH exceeds that of men, especially among parents with young children, suggesting that WfH might actually increase the gender wage gap (Mas and Pallais, 2017). In line with this, a recent study by Lott and Chung (2016) finds that flexible work schedules result in increased overtime for both men and women that is compensated by higher annual earnings only for men; hence reinforcing gender earnings gaps.

Secondly, WfH may also alter how workers signal their productivity or job attachment. An experimental study by Leslie et al. (2012), for instance, demonstrates that WfH may induce career premia or penalties depending on whether managers attribute the use of such arrangements to private or job-related needs. To the extent that managers consider that women use WfH for private needs but men do so for business needs, such perceptions may increase gender wage gaps. In addition, workers working remotely have fewer face-to-face interactions with their managers and face thus a higher risk of being overlooked for promotion (Bloom et al., 2015; Harrington and Emanuel, 2021).

Thirdly, WfH may increase worker productivity if it raises motivation or provides a more productive work environment, at least for certain tasks (Dutcher, 2012). On the other hand, workers may get interrupted by family members or other private responsibilities, hence giving rise to shirking which is costly to monitor at home. Empirical evidence more often suggests positive rather than negative productivity effects (Gajendran and Harrison, 2007). In an experimental setting, Bloom et al. (2015) report a 13 percent performance increase among call center employees that were allowed to work from home. Similarly, Harrington and Emanuel (2021) find that WfH raises productivity by 7.5 percent in a natural experiment with call-center workers at a large U.S. firm. Using a survey conducted in the U.S., Barrero et al. (2021) find that self-estimated productivity when WfH during the pandemic has been 7.1 percent higher than expected. Given expected usage of WfH arrangements over the week, they anticipate a 5 percent boost in productivity after the pandemic. Angelici and Profeta (2020) also find that flexibility in the time and place of work increases employees' productivity in a large Italian company of the multi-utility sector. In a competitive labour market, such productivity effects would be reflected in a worker's wage level.

Moreover, the productivity effect may to some extent depend on available technologies useful for remote working, which have improved during the pandemic. The role of ICT equipment for productivity at home is confirmed by Kitagawa et al. (2021) who find that in Japan stronger productivity declines among individuals who worked from home compared to those who worked onsite during the Covid-19 pandemic are due to poor WfH conditions, including communication difficulties. Already before the pandemic, de Graaff and Rietveld (2007) present evidence for the Netherlands that a wage penalty of 19 percent for working at home is almost reduced to zero once workers have access to the internet. Similarly, Oettinger (2011) shows that the expansion of home-based work was strongest in occupations with a greater growth in IT use and that this expansion was accompanied by a declining wage penalty for home-based work. More recently, the pandemic has been another occasion to reduce stereotypes around WfH practices and to invest in digital technologies that enhance productivity while working remotely.

However, the possibility of WfH and its potential boost in productivity are unevenly distributed among the workforce. Depending on the tasks that have to be performed, some jobs can be done from home while others require on-site presence. Using the O*Net description of tasks performed on the job, Dingel and Neiman (2020) estimate that 37 percent of jobs in the U.S. can be fully done from home. Using the same method, Boeri et al. (2020) estimate this share to be above 30 percent for the UK and Sweden, around 28 percent for Germany and France, and just below 24 percent in Italy. Using job tasks and tools used by the German workforce, Arntz et al. (2020) compute a similar index but distinguish full and partial WfH feasibility. They find that 31 percent of jobs in Germany could be almost entirely performed from home while in an additional 12 percent of jobs a share of tasks can be performed from home. They also find that women, parents and employees with a university degree are more likely to be employed in occupations with teleworkable tasks. The growing literature on WfH finds that teleworkable jobs are

[6] Black et al. (2014) show that U.S. metropolitan areas with larger increases in average commuting time between 1980 and 2000 experienced slower growth in married women's labour force participation suggesting some impact of commuting distance on the extensive margin of the labour supply. Conditional on labour force participation, though, commuting time or distance do not have much of an effect on weekly working hours (de Graaff and Rietveld, 2007; Gutiérrez-i Puigarnau and van Ommeren, 2010).

predominantly high-skill, high-wage service jobs such as management, professional and related occupations, and that younger and highly educated employees are more likely to work remotely (Adams-Prassl et al., 2022; Brynjolfsson et al., 2020; Hensvik et al., 2020, among others).

Overall, WfH arrangements may theoretically give rise to both a wage premium and a wage penalty, and its effect likely depends on job and individual characteristics. Reflecting this ambiguity, empirical studies have found mixed evidence. While some studies suggest a wage penalty for working from home (Glass, 2004), others suggest positive wage effects (Gariety and Shaffer, 2007; Leslie et al., 2012; Schroeder and Warren, 2004; Weeden, 2005). Yet, most of these studies use cross-sectional data only and may thus be upwardly biased if the positive selection of WfH practices at the level of firms and workers is not taken into account. As an exception, Glass and Noonan (2016) exploit US individual panel data to control for individual fixed effects, as well as information on firms' characteristics, and find a wage penalty for WfH during overtime but not during contractual hours. These average effects, however, may hide heterogeneous responses across groups with different private constraints.

2.3. Job satisfaction

Since WfH reduces schedule constraints and potentially lowers the fixed costs of working due to reduced commuting costs, WfH should raise job satisfaction associated with a given level of hours and wages. In line with this, Bloom et al. (2015) find positive effects of WfH on job satisfaction in an experimental setting. Related studies from the sociological or management literature support the view that an increased autonomy over when and where to work raises job satisfaction (De Menezes and Kelliher, 2017; Kröll and Nüesch, 2017; Wheatley, 2017). However, the value attached to flexible work arrangements such as WfH may differ across workers. This may be particularly pronounced among women whose willingness to pay for such arrangements has been shown to exceed men's (Mas and Pallais, 2017), or among parents whose schedule constraints are tighter (Angelici and Profeta, 2020). Since the utility gain derived from flexible arrangements may also be traded against lower wages or increased hours, simultaneous wage and hours adjustments need to be taken into account in order to assess the uncompensated value that workers attach to such work practices. If wage and hours adjustments fully compensate for the utility gains, WfH need not raise job satisfaction. Moreover, WfH need not facilitate the reconciliation of family and job needs, but may also generate new sources of conflict and stress at home, thereby potentially reducing job satisfaction (Baines and Gelder, 2003; Song and Gao, 2018; Sullivan, 2012).

3. Data and descriptive statistics

3.1. The German Socio-Economic Panel

The German Socio-Economic Panel (SOEP) is a representative household panel consisting of around 20,000 individuals living in Germany that are interviewed annually since 1984.[7] It includes detailed individual and household-level characteristics. In five waves (1997, 1999, 2002, 2009 and 2014), individuals were also asked whether they sometimes work from home and, if so, whether they do it on a daily, weekly or monthly basis. Note that this information does not capture the actual intensity of WfH, as we do not have any information on the number of hours worked at home or whether WfH takes place during normal office hours or during overtime. We construct a dummy variable equal to one if the individual works from home at least once a month and test for the robustness of the results when using weekly WfH instead. Among those working from home at least once a month, 14% do it every day, 45% do it at least once a week, and 41% do it once every two to four weeks. Hence, we focus on occasional home-based work and exclude those whose main place of work is their home. We thus focus on WfH as a complement to on-site work.[8] Moreover, we include only individuals aged 20–65 years who are not self-employed, not in education or training, nor in marginal employment (i.e. those earning less than 400–450 euros per month).

Concerning working hours, the data allows us to distinguish between contractually agreed weekly working hours and actual weekly working hours (i.e. the number of hours generally worked every week). Overtime hours are calculated as the difference between actual working hours and contractually agreed working hours. We trim overtime hours by excluding the 1st and the 99th percentile, which implies excluding observations with negative overtime hours and more than 23 overtime hours per week. The SOEP also contains information on self-reported monthly gross earnings that include earnings related to overtime hours.[9] Besides monthly earnings, we also construct a measure of hourly wages by dividing self-reported monthly gross earnings by actual monthly working hours that are the sum of contractual and overtime hours. Our hourly wage measure hence reflects the actual average wage for any hour worked irrespective of whether hours were contractually agreed or overtime. This implies that additional unpaid overtime reduces hourly wages.[10] We calculate real wages based on the CPI deflator using 2010 as the base year. In order to ensure that outliers are not driving the wage results, we also trim hourly wages excluding the 1st and the 99th percentile (individuals receiving an hourly wage lower than EUR 3.40 or higher than EUR 48 in 2010 value) and we employ the standard logarithmic form for the wage regressions. Job satisfaction is measured on an 11-point Likert scale.

Consistent with what has been reported from other advanced economies, Fig. 1 shows that the share of individuals working from home has increased in Germany over the past 20 years. Moreover, the increase in WfH has been strongest among parents.[11] This suggests that the WfH decision is likely to be driven, at least in part, by supply-side motives of reconciling family and work responsibilities and not by employers' needs alone.

In addition, the ability to use WfH arrangements is also strongly related to job characteristics. Table A.1 in the Appendix shows that the share of employees who sometimes work from home in 2014 differs greatly across industries. While 20% of employees in the services sector use WfH, very few do so in the trade sector. Table A.2 shows that the share of employees who sometimes work from home varies also greatly across occupations, tasks or work tool intensities. Teachers are different from all other employees as 70% of them report working from home in 2014, a share well above the average. After teachers, scientists, managers, consultants, accountants and IT specialists are those who work from home most often, unlike warehouse workers and cleaners who almost never work from home. This description for the period before 2020 confirms what has been documented in the group of papers on WfH during the pandemic. Moreover, we find that the likelihood of WfH

[7] In this paper, we use data from version 31.1 (DOI: 10.5684/soep.v31.1). See SOEP (2016) and Goebel et al. (2019) for details on the SOEP data set.

[8] Besides, we do not identify telecommuting or teleworking, nor a broader definition of remote work.

[9] Bonus payments are not included.

[10] In Germany, overtime may either be paid, compensated by time off or be fully uncompensated if the employer did not ask for overtime hours. For higher tier workers, monthly earnings often contain a lump-sum payment for all overtime hours. Whether there is compensatory time off will be examined in Section 5.1.

[11] Fig. 1 reports shares without using sampling weights, while Fig. A.1 shows trends in WfH using the standard weights available in SOEP data. Apart from some different developments for 1999 and 2002, the overall trends between 1997 and 2014 are fairly similar in both figures. SOEP weights may account for biases from oversampling of specific groups, but they are not based on occupations, so that it is not clear whether the results using weights should be preferred.

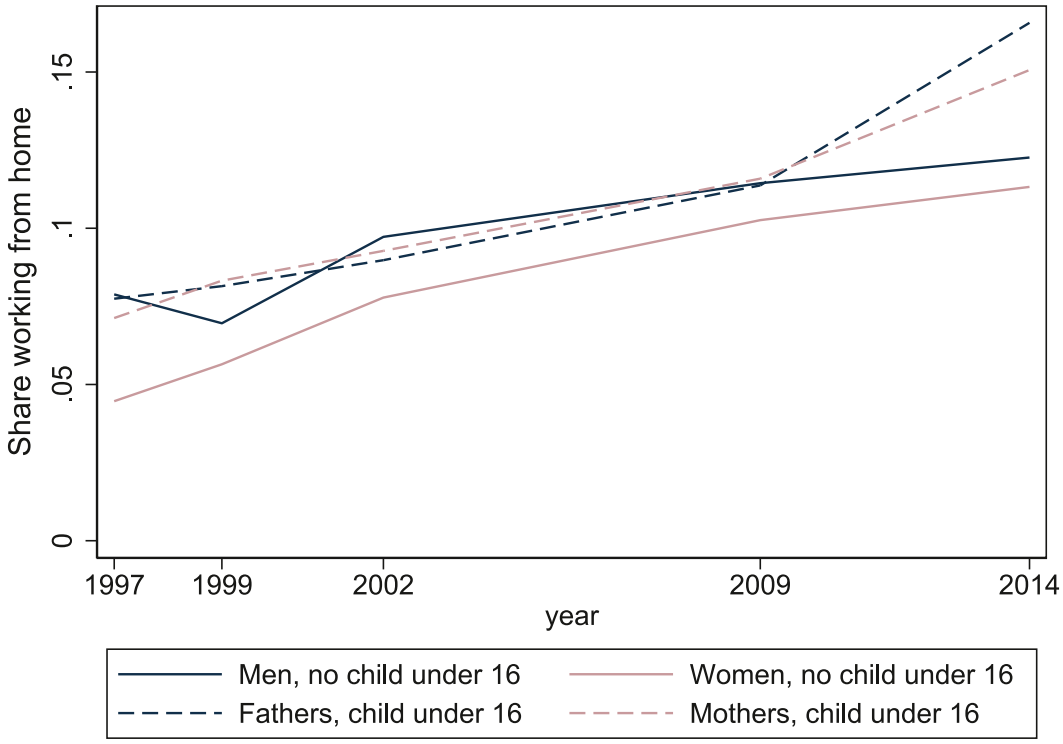

Fig. 1. Trends in working-from-home by gender and parenthood in Germany. *Notes:* The figure reports averages in working from home done at least once a month without using sampling weights. It is based on a sample of 22,521 employed workers (40,115 observations) for the five waves. In 2014, 22% and 25% of the sample are women and men with a child under 16 years old, while 28% and 25% of the sample consist of women and men without a child under 16 years old. *Source:* SOEP. 1997, 1999, 2002, 2009 and 2014 waves.

increases with the level of autonomy at work. It also increases with an occupation's share of analytical tasks. Finally, in occupations in the top quarter of personal computer use, 15% of employees work sometimes from home while only 3% of employees do it in occupations where PCs are less common. Hence, the pattern of WfH incidence seems to resemble what has been found in other countries.

3.2. Estimation sample

For all subsequent analyses, we further restrict the sample to those for whom we have information on whether or not they work from home in at least two waves. We also exclude teaching and religious occupations from the sample, since the majority of individuals in these occupations have always been working from home.[12] Moreover, we focus on the take-up of WfH, and leave out dropouts from the main sample. Results on dropping out of WfH are estimated separately because it is unlikely to be the exact mirror image of taking up WfH. For instance, due to rigidities, it is unlikely that wage gains during WfH practices are taken away after dropout at least in the short to medium run. Moreover, unobserved determinants of taking-up and dropping out of WfH are likely to differ. The take-up decision is more likely to be driven, at least in part, by factors exogenous to the firm and the individual, such as the extended availability of broadband internet, while the drop-out decision is more likely to be driven only by firm and individual-specific factors, some of which remain unobservable such as the quality of the work arrangement, or changes in childcare responsibilities.

The final sample for the main analysis is thus composed of individuals never WfH, always WfH and individuals who switch from not using WfH to using WfH later on. Hence, we estimate labour market outcomes related to WfH take-up decisions only. We end up with an unbalanced panel of 7602 individuals (21,392 observations), 46 percent of whom are women, who we observe for 2 to 5 waves over the period 1997–2014. Table A.3 gives the number of observations by WfH status and switches for different demographic groups.

Table 1 provides summary statistics by gender and WfH status. It shows that individuals working from home differ from individuals working on-site only. Employees working from home earn higher wages and work longer overtime hours than employees working onsite only. On average, employees working from home are older, are more likely to have a university degree and are less likely to have a migration background (i.e. have migrated to Germany or have parents who migrated). When it comes to the household context, they are more likely to live as a couple and to have an employed partner with relatively high earnings. Individuals working from home also tend to commute longer distances, which confirms that WfH may be used to save on commuting costs. Moreover, a higher fraction of individuals working from home have children under age 16 compared to pure on-site workers, particularly among women. This fact is consistent with the idea that WfH may be used to better combine work and family responsibilities. Turning to job characteristics, WfH is much more common in larger firms while firm tenure is not related to the WfH status. Finally, we find that WfH relates to some career events. Both men and women are 5 percentage points more likely to report a change in position within their firm (in a given period) if they work from home (at the end of that period). However, the probability of changing employer is higher but not statistically different for employees using WfH compared to other employees.

3.3. Determinants of WfH take-up

Table 2 documents how individual and family characteristics, as well as these career events, are related to the probability of working from

[12] The main results are similar in magnitude when including these occupations in the analysis, but the estimates are less precise.

Table 1
Summary statistics by working from home status and gender.

	Female				Male			
	WfH	No WfH	Difference (t-stat.)		WfH	No WfH	Difference (t-stat.)	
Panel A: Outcome variables								
Actual working hours per week	36.06	35.13	0.94*	(1.66)	46.97	42.43	4.54***	(17.06)
Contracted working hours per week	31.66	32.82	-1.15**	(-2.31)	38.99	38.76	0.23	(1.54)
Overtime hours per week	4.40	2.31	2.09***	(10.43)	7.98	3.67	4.31***	(20.15)
Gross hourly real wages	18.47	13.48	4.99***	(16.43)	21.94	16.31	5.63***	(19.47)
Panel B: Main explanatory variables								
Migration background	0.15	0.19	-0.04*	(-1.79)	0.11	0.22	-0.11***	(-5.77)
Married (or cohabitating)	0.86	0.76	0.10***	(4.04)	0.88	0.81	0.07***	(3.84)
Age	43.51	42.30	1.21**	(2.05)	44.32	42.29	2.02***	(4.41)
Youngest child aged 0–2	0.05	0.02	0.03***	(3.44)	0.08	0.09	-0.01	(-0.80)
Youngest child aged 3–5	0.12	0.05	0.07***	(5.31)	0.10	0.08	0.02	(1.54)
Youngest child aged 6–15	0.28	0.23	0.05*	(1.95)	0.28	0.24	0.04**	(2.13)
Does not have children under 16	0.56	0.70	-0.14***	(-5.36)	0.54	0.60	-0.05**	(-2.23)
Tertiary education degree	0.48	0.19	0.29***	(12.66)	0.56	0.17	0.40***	(22.72)
Vocational qualification	0.47	0.68	-0.21***	(-7.75)	0.39	0.71	-0.32***	(-15.53)
Part-time work experience (in years)	5.19	4.88	0.31	(0.79)	0.92	0.39	0.53***	(7.45)
Full-time work experience (in years)	14.02	13.84	0.19	(0.32)	19.61	20.20	-0.59	(-1.23)
Urban region	0.70	0.66	0.05*	(1.72)	0.75	0.66	0.09***	(4.02)
Civil servant	0.31	0.35	-0.04	(-1.50)	0.27	0.22	0.04**	(2.33)
Large firm (>200 empl.)	0.58	0.47	0.10***	(3.58)	0.67	0.53	0.14***	(6.21)
Small firm (<20 empl.)	0.24	0.23	0.01	(0.51)	0.10	0.17	-0.07***	(-3.84)
Firm tenure (in years)	11.37	10.72	0.66	(1.23)	12.42	12.64	-0.22	(-0.45)
New employer	0.17	0.15	0.02	(1.02)	0.17	0.16	0.02	(1.14)
New position within firm	0.08	0.02	0.05***	(6.15)	0.07	0.02	0.05***	(7.89)
Panel C: Further explanatory variables								
Partner in paid employment	0.86	0.83	0.03	(1.10)	0.67	0.61	0.06**	(2.43)
Partner's earnings	4824.89	2915.43	1909.45***	(11.89)	2057.67	1598.92	458.75***	(7.01)
Partner WfH	0.27	0.10	0.17***	(8.49)	0.18	0.05	0.13***	(11.83)
Commuting distance (in km)	23.56	12.96	10.60***	(5.82)	42.63	21.98	20.65***	(7.70)
Observations	301	9,579			492	11,020		

Source: SOEP, sample of 7602 employed workers (21,392 observations) from the 1997, 1999, 2002, 2009 and 2014 waves. Note: The table displays summary statistics on the main control variables by WfH status. The information on commuting distance is available only for a subset of 20,805 observations. The information on partner's employment, earnings and WfH status is available only for a subset of 15,946 observations.

home using a multivariate analysis based on the described sample excluding WfH dropouts.[13] The results from a linear probability model with OLS in columns (1) and (4) for women and men, respectively, confirm the findings from Table 1. When investigating the determinants of WfH take-up by adding individual fixed effects in column (2) for women and column (5) for men, most of the characteristics turn out to be insignificant and are thus not reported. Hence, WfH take-up is not systematically related to many time-varying characteristics, suggesting that exogenous drivers such as the technology-induced availability of WfH at the firm level, may be important for WfH take-up. There are some exceptions though.

First, WfH take-up is significantly more likely among women who get married, move in with their partner, and who move to a more rural area. The fact that couples tend to make their location decisions based on the male breadwinner's job could explain the latter result. Females might thus need to start working from home because they are bound to their partner's choice of location. Hence, our later analysis controls for parallel changes in partner and location status.

Secondly, having children significantly increases the likelihood of WfH among women but not among men. Exploiting individual variation in the fixed-effects estimations, we also see that becoming a mother is strongly related to WfH take-up. The negative coefficients for children older than age 6 and age 15 indicate that mother of children below age 6 are more likely to work from home. However, these coefficients are not significantly different from zero in the fixed-effects model. For women who become mothers, WfH take-up may be closely linked to the decision about when and with how many hours to return to work after birth. In particular, WfH may allow mothers with a very young child to resume work earlier but with fewer hours. Therefore, we will later look at related labour market outcomes for individuals who just became parents separately.

Thirdly, the table confirms that some career events are related to WfH take-up. In particular, men are more likely to start working from home if they change position within the firm. We will thus shed light on the impact of these parallel career shifts on the estimated effects of WfH take-up on hours and wages.

Finally, adding characteristics about the partner's job, see columns (3) and (6), does not have much of an effect apart from a higher probability among men to start WfH when the partner starts working from home as well. Similarly, controlling for commuting distances does not alter the results. We find an increase in commuting distances to be positively related to WfH take-up for men. We will later run robustness check accounting for the role of partner's job characteristics and the commuting distance.

4. Empirical strategy

Since the effect of WfH likely differs across groups of workers with different private responsibilities, we run separate estimations for women and men with children under age 16 (*parents*) and without (*childless*), disregarding transitions in and out of parenthood. In this way, we take into account that men's and women's career paths are affected differently by childbirth (Kleven et al., 2019 and references therein). Moreover, especially for mothers, decisions on when to resume paid employment, the number of hours and WfH take-up after the first birth may

[13] The main insights are unaltered when including these dropouts.

Table 2
Determinants of working from home .

	Female			Male		
	OLS	Fixed effects		OLS	Fixed effects	
	(1)	(2)	(3)	(4)	(5)	(6)
Married (or cohabitating)	0.012***	0.017**	0.028***	0.011*	-0.000	-0.000
	(0.004)	(0.007)	(0.009)	(0.006)	(0.008)	(0.010)
... × partner in paid employment			-0.009			0.004
			(0.008)			(0.008)
... × partner's earnings			-0.000			-0.000
			(0.000)			(0.000)
... × partner WfH			0.018			0.040**
			(0.012)			(0.018)
Urban region	-0.008	-0.063***	-0.052**	0.005	0.028	0.033
	(0.005)	(0.024)	(0.025)	(0.006)	(0.021)	(0.024)
Commuting distance (in 10km)			-0.000			0.001**
			(0.002)			(0.001)
Has children	0.044***	0.080***	0.067***	0.001	0.017	0.017
	(0.010)	(0.019)	(0.019)	(0.007)	(0.011)	(0.012)
Youngest child older than 6	-0.026***	0.005	0.009	0.009	0.012	0.012
	(0.010)	(0.009)	(0.009)	(0.006)	(0.008)	(0.008)
Youngest child older than 15	-0.013**	0.008	0.010	-0.013*	-0.010	-0.009
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
New employer	-0.002	0.007	0.007	-0.002	-0.004	-0.005
	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)	(0.008)
New position within firm	0.025	0.007	-0.001	0.061**	0.033	0.048**
	(0.018)	(0.017)	(0.016)	(0.024)	(0.020)	(0.024)
Occupation fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Occupational status FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9880	9880	9107	11,512	11,512	10,748
R-squared	0.101	0.680	0.701	0.119	0.714	0.724

Note: Linear probability model estimates with WfH at least once a month as the dependent variable. Column (3) and (6) are based on a smaller sample, for which we observe information on commuting distance and partner's characteristics. Partner variables are set to zero for individuals without a partner in the household. All equations include year fixed effects, further demographic controls (age, age squared, migration background), human capital controls (highest qualification and actual work experience), further job characteristics (tenure, tenure squared, public sector dummy, firm size dummies), federal state dummies, 1-digit industry dummies, occupation fixed effects (95 dummies), occupational status fixed effects (15 dummies). Standard errors are clustered at the individual level, $* p < .10, ** p < .05, *** p < .01$.

be interrelated. The subsequent analysis thus focuses on labour market outcomes of individuals who start working from home during a period of continued parenthood or during a period of continued childlessness, but briefly discusses results for WfH dropout as well as first-time parents at the end of 5.1. Table A.3 in the Appendix shows the sample sizes of all demographic sub-groups by WfH status, and the number of transitions in and out of WfH for each sub-group. All in all, our estimations are based on close to 400 take-up events for 7602 individuals, with take-up rates being slightly higher among parents than among non-parents.[14]

In general, the decision to take-up working from home is determined by the employee's and the employer's willingness to use this arrangement and the state of the technology that makes it feasible. While advances in technologies are exogenous to individual outcomes, employees' and firms' characteristics that determine WfH take-up may generate endogeneity biases. In order to reduce such biases when measuring the link between WfH take-up, hours worked and wages, we estimate the following regression separately for men and women as well as by parental status:

$$Y_{it} = \alpha + \beta_1 Wfh_{it} + X'_{it}\lambda + \theta_t + \theta_o + \theta_i + \mu_{it} \quad (1)$$

where the individual labour market outcome Y_{it} is the number of actual hours worked, the number of contractual hours and the logarithm of the wage of individual i at time t. Wfh_{it} is a dummy variable indicating whether individual i works from home at least once every month in year t. We include year fixed effects θ_t to catch up general time trends and add occupation fixed effects θ_o (using 86 groups) to ensure that we exploit changes in individual WfH status within the same occupation only, thereby reducing biases related to the endogeneity of occupational choice. Note that by running separate estimations by sub-samples, we allow year and occupation fixed effects to be both gender-specific and specific to the parental status. In addition, we further eliminate any endogeneity problem operating through the individual fixed-effects θ_i like time-invariant preferences and ability. Furthermore, we control for a rich set of time-varying observables X_{it} such as couple formation, childbirth or job-related characteristics that may confound the effect of WfH.

Identification thus stems from exploiting WfH take-up while staying in the same occupation, and further conditioning on time-varying individual events. Our estimation strategy hence addresses a number of potential threats to identification that are mostly unresolved in much of the related literature.[15] Still, there may be unobserved time-varying

[14] Note that some individuals contribute to both the sample of parents and non-parents if we observe at least two consecutive waves after a transition into or out of parenthood. The latter occurs if the youngest child turns older than 16. Estimates are very similar though when choosing a different threshold for the age of the youngest child such as 12 or 18 years, as shown in Appendix Table A.4.

[15] Most studies use cross-sectional variation only. The few panel studies that include individual fixed effects still do not take account of selection into occupation or employment and often estimate average effects for very heterogeneous sub-groups only.

Table 3
WfH, hours worked and wages: employees without children under 16.

	Actual hours ($h_a = h_c + h_o$)			Contracted hours (h_c)	Overtime hours (h_o)	Hourly wage ($w_h = w_m/h_a$)		Monthly wage (w_m)
	OLS (1)	FE (2)	FE (3)	FE (4)	FE (5)	OLS (6)	FE (7)	FE (8)
Panel A: Males								
WfH	3.928***	1.071*	0.934	0.012	0.921*	-0.007	-0.009	0.010
	(0.512)	(0.613)	(0.617)	(0.298)	(0.528)	(0.021)	(0.033)	(0.032)
Occupational status	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6828	6828	6828	6828	6828	6828	6828	6828
R-squared	0.181	0.778	0.781	0.770	0.742	0.591	0.893	0.906
Panel B: Females								
WfH	2.920***	1.081	0.931	-0.363	1.294**	0.056*	0.003	0.020
	(0.605)	(0.842)	(0.842)	(0.720)	(0.630)	(0.030)	(0.034)	(0.041)
Occupational status	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6894	6894	6894	6894	6894	6894	6894	6894
R-squared	0.459	0.869	0.870	0.887	0.711	0.523	0.883	0.917

Note: The results based on Eq. (1) refer to separate estimations for male and female employees without children under 16 years old. Control variables include year fixed effects, demographic controls (age, age squared, migration background, marital status, and for parents the age of the youngest child for three age-groups), human capital controls (highest qualification and actual work experience), job characteristics (tenure, tenure squared, public sector dummy, firm size, employer and position change), federal state and urban area dummies, 1-digit industry dummies, occupation fixed effects (95 dummies), occupational status fixed effects (15 dummies). Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

changes that affect both labour market outcomes and the decision to take up WfH. While we take care of the most prominent changes at the individual level, we have less information on firm-level events. If, for example, firms change other work practices when starting offering WfH arrangements, the unobserved firm-level changes may create a spurious correlation between WfH take-up and our outcome measures. Moreover, individuals might select into certain firms that differ in terms of WfH availability and other outcome-related measures. Hence, WfH may still be endogeneous in Eq. (1) and results should be considered as multivariate correlations that only eliminate some major sources of biases.

We confront these estimates with several robustness checks in Section 5.2. In particular, we test the robustness of the results to additional controls including occupational characteristics, such as gender-specific average hourly wages and actual working hours at the occupational level, individuals' commuting distances, and more detailed information on the household structure using partner's characteristics as there may be interaction effects between partners.[16] Moreover, we explore whether a selection bias due to unobserved shocks to individuals' decision to (re)enter paid employment affects WfH estimates using a control function approach adapted to the panel data setting.

In addition, we examine the potentially endogeneous selection into certain types of firms by later conditioning on remaining with the same employer before and after WfH take-up as a robustness check. Finally, climbing up the career ladder may simultaneously increase working hours, the demand for availability outside usual office hours, and wages. This would induce an upward bias for the effect of WfH on our outcome measures. We investigate the role of such simultaneous change in job position by comparing our baseline estimates with WfH estimates on a sample of individuals who stay with the same employer and experience no job change.

5. Results

5.1. Working from home, hours worked and wages

In this section, we present the results on how working from home is related to actual hours, contractual and overtime hours, and hourly and monthly earnings. We do so separately for childless individuals in Table 3 and for parents in Table 4 showing results for both men and women, respectively.

Childless employees. OLS results in column (1) of Table 3 show a large positive association of WfH with actual hours for childless employees. However, when using individual fixed-effects (FE) in column (2), the hours-premium associated with WfH is strongly reduced and no longer significant when further controlling for occupational status in column (3). This indicates that OLS estimates are upward biased. Individuals with WfH arrangements work longer hours in jobs and occupations that systematically differ from those without WfH arrangements. Taking account of these potential biases, we still find a significant and positive association of WfH with overtime hours for childless individuals. Childless men and women starting WfH work additional 0.9 and 1.3 overtime hours, respectively, but do not work more on a contractual basis (columns (4) and (5) in Table 3). This is consistent with other findings for the U.S. and the Netherlands (Noonan and Glass, 2012; Possenriede et al., 2016).

We may expect that longer overtime hours with WfH are also associated with higher hourly wages if overtime hours signal job commitment or reflect employer's needs for availability. However, in a compensating differential setting, an extra hour worked does not need to be compensated in monetary terms if employees value WfH. In fact, Table 3 suggests no significant hourly wage nor monthly earnings increases despite additional overtime hours (column (7) to (8)). Hence, the extra overtime done while WfH is uncompensated in monetary terms for childless employees, suggesting that neither positive nor negative productivity or signaling effects of WfH dominate for this group. Hence, both men and women seem to "pay" for the possibility to work from home occasionally by providing around one hour of additional overtime per week. This is in line with evidence that workers are willing to pay for the flexibility to choose their place of work (He et al., 2021; Mas and Pallais, 2017).

Parents. The pattern differs, however, for parents with children below age 16 (see Table 4).[17] After WfH take-up, both fathers and

[16] We do not include partner characteristics in our main analysis though as there may be additional concerns from reversed causality.

[17] We use a relatively wide age group category for children, in order to increase the sample size and the precision of the estimates. However, Appendix Table A.4 shows that the results are qualitatively similar when restricting the sample to parents with children under age 12 or to parents with children under age 18.

Table 4
WfH, hours worked and wages: employees with children under 16.

	Actual hours ($h_a = h_c + h_o$)			Contracted hours (h_c)	Overtime hours (h_o)	Hourly wage ($w_h = w_m/h_a$)		Monthly wage (w_m)
	OLS (1)	FE (2)	FE (3)	FE (4)	FE (5)	OLS (6)	FE (7)	FE (8)
Panel A: Males								
WfH	3.466***	1.232**	1.035*	0.385**	0.650	0.030	0.068***	0.091***
	(0.527)	(0.581)	(0.568)	(0.177)	(0.544)	(0.023)	(0.021)	(0.021)
Occupational status	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4684	4684	4684	4684	4684	4684	4684	4684
R-squared	0.209	0.792	0.795	0.797	0.758	0.624	0.908	0.915
Panel B: Females								
WfH	-0.358	4.418**	3.950**	3.414**	0.536	0.012	0.118***	0.283***
	(0.966)	(1.737)	(1.824)	(1.576)	(0.610)	(0.034)	(0.040)	(0.077)
Occupational status	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2986	2986	2986	2986	2986	2986	2986	2986
R-squared	0.426	0.888	0.891	0.897	0.766	0.503	0.891	0.911

Note: The results based on Eq. (1) refer to separate estimations for male and female employees with children below age 16. Control variables are equivalent to Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table 5
WfH, hours worked and wages by different WfH intensity.

	Without children under 16				With children under 16			
	Contracted hours (1)	Overtime hours (2)	Hourly wage (3)	Monthly wage (4)	Contracted hours (5)	Overtime hours (6)	Hourly wage (7)	Monthly wage (8)
Panel A: Males								
Weekly WfH	-0.271	1.275*	-0.025	-0.007	0.343	1.611**	0.040	0.082***
	(0.423)	(0.680)	(0.041)	(0.041)	(0.244)	(0.724)	(0.027)	(0.026)
WfH 2–4 weeks	0.255	0.618	0.004	0.024	0.426**	-0.270	0.094***	0.100***
	(0.304)	(0.663)	(0.039)	(0.038)	(0.198)	(0.669)	(0.025)	(0.026)
Observations	6828	6828	6828	6828	4684	4684	4684	4684
R-squared	0.770	0.742	0.893	0.906	0.797	0.759	0.908	0.915
Panel B: Females								
Weekly WfH	-0.315	1.815**	-0.047	-0.021	4.177**	0.488	0.145**	0.318***
	(1.103)	(0.834)	(0.049)	(0.063)	(2.127)	(0.765)	(0.060)	(0.110)
WfH 2–4 weeks	-0.413	0.745	0.056*	0.063*	2.491	0.594	0.086	0.240***
	(0.568)	(0.756)	(0.032)	(0.035)	(1.838)	(0.769)	(0.071)	(0.077)
Observations	6894	6894	6894	6894	2986	2986	2986	2986
R-squared	0.887	0.711	0.883	0.917	0.897	0.766	0.891	0.911

Note: Results are based on separate fixed effects estimations of Eq. (1) for female and male employees without children below age 16 (column (1) to (4)) and with children (columns (5) - (8)). Weekly WfH is a dummy variable denoting WfH done at least once a week. WfH 2–4 weeks is a dummy variable that is equal to one for individuals reporting to work from home at least once a month but not once a week. Control variables are equivalent to Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

mothers work longer. Fathers extend their actual working week by 1 h and mothers by 4 hours. This hours increase is largely driven by an increase in contractual hours. The larger response of mothers' compared to fathers' contractual hours may be due to lower average contractual hours among mothers, and thus a greater margin of adjustment. In fact, given that average working hours among mothers in Germany are around 22 hours, WfH take-up comes along with an increase of contractual hours by ~16 percent, on average. If that finding is not driven by remaining endogeneity issues, it supports the idea that WfH arrangements may help parents, and mothers in particular, to remain attached to the labour market by extending working hours. The hours response might be upwardly biased though if simultaneous, unobservable changes at the firm level such as the adoption of complementary flexible work schemes also increase working hours. In any case, the extended hours that we observe after WfH take-up pay off in terms of higher monthly earnings of 9 percent for fathers and 32 percent for mothers. This increase in monthly income is explained by both the extension of contractual working hours and a significant increase in average hourly wages. In fact, the growth in hourly wages appears to be quite large and we will later examine to what extent simultaneous job changes drive these results.

Comparing the results in Table 3 and 4 suggests that WfH take-up is related to higher earnings and/or hourly wages only if there is a simultaneous increase in contractual hours, and not if it only coincides with an increase in overtime. Glass and Noonan (2016) make a similar observation for the US.

The frequency of working from home. So far, we have looked at WfH at least once a month. Yet, with an increasing frequency of WfH, we expect hours and wage changes to actually be stronger if WfH usage drives our findings. In fact, among employees who work from home at least once a month, 60 percent of them actually do so on a weekly basis. Hence, Table 5 allows hours and wage changes to differ depending on whether someone starts working from home at least once a week or every 2–4 weeks. For childless individuals, we find longer overtime hours only for those taking up weekly WfH, although overtime is insignificantly higher also among individuals taking-up a less intense form of WfH. For mothers, starting to work from home at least once a week is

associated with 4.2 additional contractual working hours, a higher increase compared to additional, but insignificant 2.5 hours for mothers who work from home every 2–4 weeks. Irrespective of WfH intensity, however, mother's monthly earnings are significantly higher, albeit the increase is larger for weekly WfH. This is partially driven by a significantly higher hourly wage that is not significant for less intensive WfH. Hence, for most groups, a higher WfH intensity also comes with stronger hours and wage changes. Fathers, however, are an exception in this respect. For them, WfH take-up is accompanied by higher income irrespective of WfH intensity. For fathers working from home on a weekly basis, the higher monthly income comes with an extension of overtime and an insignificant increase of contractual hours. Hence, in contrast to men without children, the additional overtime is compensated for fathers, potentially suggesting that weekly WfH is considered as a positive signal among employers only for fathers. For fathers with a lower WfH intensity, the higher monthly income results from a significant increase in hourly wages and a small extension of contractual hours.

Compensatory time off. Looking at wage responses may not suffice to get the full picture if compensation for additional working hours in response to WfH take-up takes place in terms of additional leave days rather than higher wages. Such a compensation scheme might explain why additional overtime among childless individuals is not compensated by higher wages. Columns (1) and (2) in Table A.8 in the Appendix show the results of a conditional logit regression with the dependent variable equal to 1 if at least some overtime hours are converted into vacation, which is referred to as compensatory time. Columns (1) and (2) show that starting WfH is not linked to an increased likelihood to use compensatory time, irrespective of gender or presence of children. In columns (3) to (6), we replicate the hourly wage and monthly earnings regressions controlling for the use of time-off to compensate overtime. The main results remain unchanged. Compensation of overtime with days off does not explain the absence of wage increases among childless individuals while the wage increase for parents after WfH take-up remain in the same magnitude.

First-time parents. We present results for individuals having a first child in Appendix Table A.7. As discussed before, WfH take-up for this specific group may actually be a means to return to work earlier but with reduced hours. In line with this idea, we find a negative though insignificant coefficient for working hours among first-time mothers, which might reflect this simultaneity. For first-time fathers, WfH is associated with significant hourly wage and earnings increases, which might reflect that first-time fathers who start WfH are positively selected.

Dropping out of WfH. As discussed in Section 3.2, we do not expect labour market outcomes of WfH dropouts to be the mirror image of what we find for WfH take-up. This is because transitions out of WfH, perhaps even more so than WfH take-up, are likely to co-occur with other unobserved events.

Indeed, the estimates related to WfH dropout (Table A.5 in the Appendix), do not generally correspond to the reverse of the previous results for WfH take-up. While for childless women, the reduced overtime hours after WfH dropout is the exact opposite of what we find after WfH take-up, this is neither true for childless men who even experience a small increase in contracted hours and monthly earnings, nor for fathers who have higher wages after WfH dropout. These counterintuitive results may suggest that unobserved changes in the career cycle or in the firm working arrangement policy, occur simultaneously to WfH dropout. These results are only marginally significant though.

For mothers, results are even more puzzling since we find a strong and significant increase, rather than a decrease, in contractual hours along with a reduction in overtime hours after dropping out of WfH. This surprising result is driven by mothers of young children as can be seen in Panel B of Table A.6. This suggests that, for mothers, dropping out of WfH might actually be related to the extended availability of childcare in day nursery and kindergarten during these early ages. WfH may enable mothers with children below 5 to resume paid employment earlier but with fewer hours than before birth. When children get older and childcare covers a longer part of the day, they may then stop WfH and increase hours at the same time. Hence, the transition out of extensive childcare needs seems to drive these results. Note that the increase in working hours for mothers after WfH take-up, by contrast, is not driven by the age of the youngest child (see Panel A in Table A.6). During continued parenthood, WfH take-up comes with an increase in contractual hours among mothers that does not depend on the age of the youngest child.

5.2. Robustness of hours and wage results

In this section, we examine the robustness of our main findings for WfH take-up with regard to the inclusion of further covariates and the selection into paid employment.

Occupational characteristics. In our main specifications we include occupation fixed effects. However, occupations that allow to work from home may have different wage and working hours developments over the period considered due to, for instance, demand shocks. To account for this, we estimate a specification including average hourly wages and actual working hours at the occupational level. We calculate these variables from the SOEP data excluding the given individual from the occupational mean. Table A.9 shows that the main estimates are barely affected when controlling for the changes in occupation average hours and average wages over time.

Regional characteristics. Our estimates could be driven by unobserved regional trends that might reflect regional policies or labour market conditions. Yet, controlling for state-by-year fixed-effects in Table A.11 does not change the results notably. Moreover, WfH effects might be related to the regional childcare availability. Table A.12 in the Appendix focuses on the sample of parents with children under 16 and adds the number of childcare places at the federal state level for children aged 0–3 and 3–6, as well as places in after school programs for children in primary school, interacted with dummies for having children in the corresponding age group. We do so because the extension of working hours after WfH take-up might be stronger for parents who lack alternative institutional childcare. Yet, the estimated effects of WfH remain robust.

Partner characteristics. Moreover, WfH effects might be related to characteristics of the partner in terms of employment, earnings and WfH status. Hence, we include related controls in Table A.10 in the Appendix. Although partner characteristics are partly significant for labour market outcomes, the relationship between WfH take-up and these outcomes remain largely unchanged.

Addressing selection into paid employment. We also investigate whether our wage estimates suffer from selection bias due to individuals' decision to (re)enter paid employment. Note that we already address an important part of this problem by controlling for any unobserved individual characteristics and preferences that remain constant over time. However, preferences and other determinants of working status may respond to shocks that we do not observe. To address remaining concerns, we control for selection bias due to time-varying unobservable characteristics by using a control function approach adapted to the panel data setting, as in Wooldridge (1995), see Appendix B for details.

Overall, the effects of WfH on wages remain similar to the benchmark results (see Table B.2 in the Appendix). They are marginally smaller for fathers and larger for mothers when we correct for this type of selection bias, but the difference is not significant (columns (2) vs. (3) in Panels A and B of Table B.2). These results make us more confident that individual fixed-effects and the vector of time-varying individual characteristics included in Eq. (1) already control for characteristics that may simultaneously determine labour supply decisions, wages and WfH, such that the WfH estimates are unlikely to be affected by endogenous selection into paid employment.

The role of career changes. Changing firm or changing job position within the firm may lead to simultaneous changes in wages, hours and working from home status. For example, an individual may move to a more innovative and productive firm, and negotiate both a higher wage

Table 6
WfH, hours worked and wages: excluding changes in employer and job position.

	Without children under 16				With children under 16			
	Contracted hours (1)	Overtime hours (2)	Hourly wage (3)	Monthly wage (4)	Contracted hours (5)	Overtime hours (6)	Hourly wage (7)	Monthly wage (8)
Panel A1: Males, baseline results								
WfH	0.012	0.921*	-0.009	0.010	0.385**	0.650	0.068***	0.091***
	(0.298)	(0.528)	(0.033)	(0.032)	(0.177)	(0.544)	(0.021)	(0.021)
Observations	6828	6828	6828	6828	4684	4684	4684	4684
R-squared	0.770	0.742	0.893	0.906	0.797	0.758	0.908	0.915
Panel A2: Males, excluding employer changes								
WfH	0.208	1.074*	-0.014	0.017	0.383*	0.931	0.091***	0.121***
	(0.270)	(0.564)	(0.037)	(0.035)	(0.212)	(0.680)	(0.029)	(0.027)
Observations	5804	5804	5804	5804	3906	3906	3906	3906
R-squared	0.827	0.789	0.911	0.922	0.856	0.801	0.925	0.934
Panel A3: Males, excluding changes of employer and position within firm								
WfH	0.195	0.794	-0.016	0.008	0.441**	0.786	0.100***	0.128***
	(0.283)	(0.595)	(0.039)	(0.037)	(0.224)	(0.749)	(0.033)	(0.030)
Observations	5695	5695	5695	5695	3826	3826	3826	3826
R-squared	0.843	0.790	0.913	0.925	0.857	0.801	0.926	0.934
Panel B1: Females, baseline results								
WfH	-0.363	1.294**	0.003	0.020	3.414**	0.536	0.118***	0.283***
	(0.720)	(0.630)	(0.034)	(0.041)	(1.576)	(0.610)	(0.040)	(0.077)
Observations	6894	6894	6894	6894	2986	2986	2986	2986
R-squared	0.887	0.711	0.883	0.917	0.897	0.766	0.891	0.911
Panel B2: Females, excluding employer changes								
WfH	0.317	1.053*	0.020	0.052	4.796***	0.854	0.047	0.258***
	(0.604)	(0.631)	(0.026)	(0.033)	(1.638)	(0.834)	(0.044)	(0.086)
Observations	5866	5866	5866	5866	2513	2513	2513	2513
R-squared	0.914	0.754	0.902	0.935	0.931	0.802	0.916	0.936
Panel B3: Females, excluding changes of employer and position within firm								
WfH	0.291	1.104*	0.024	0.057*	4.464***	0.209	0.047	0.233***
	(0.609)	(0.628)	(0.026)	(0.032)	(1.680)	(0.768)	(0.047)	(0.090)
Observations	5742	5742	5742	5742	2451	2451	2451	2451
R-squared	0.916	0.762	0.903	0.936	0.934	0.808	0.916	0.937

Note: The table shows fixed effects estimations based on Eq. (1). Panels A1 and B1 show the baseline results. Panels A2 and B2 refer to the sub-sample of individuals not changing the employer compared to the previous observed wave. Panels A3 and B3 refer to the sub-sample of individuals not changing employer nor position within the firm. Control variables are equivalent to Table 3 and include occupational status and occupation fixed effects. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

and the possibility of WfH. Similarly, a new position within the firm might be associated with a change in tasks or responsibilities, including a higher probability of working from home and an increase in working hours and wages. Note that we already control for job change and job status in all regressions. However, this may not be sufficient to ensure that the results are not driven by such career changes. We thus explore this issue in Table 6 by replicating the analysis for employees who remain in the same firm and on those employees who remain in the same firm and the same position for men (Panels A1 and A2) and women (Panels B1 and B2).

For childless individuals, we see that the benchmark results in Section 5.1 remain unchanged when we exclude those who have changed employer. The increase in overtime hours remains significant both for childless men and women staying with the same firm when taking-up WfH. However, looking at the estimates for those who remain in the same position within the firm, the positive association with overtime hours decreases and becomes insignificant for men. This suggests that a simultaneous change in job position and WfH take-up explains part of the additional overtime hours worked among childless men. For childless women, however, we also find more overtime hours with WfH while remaining in the same job position.

Turning to parents in columns (5) to (8), we see that the large increase in contractual hours, and thus monthly earnings, is not driven by people who change employer or job position. However, the positive association between WfH and hourly wages for mothers is entirely driven by mothers who start WfH when changing employer since the WfH coefficient in column (7) turns insignificant for women in Panel B1. Fathers still have higher hourly wages with WfH when remaining in the same firm, and even in the same position (see Panels A1 and A2, column (7)). This may indicate that it is more difficult for mothers than for fathers to re-negotiate wages when remaining in the same firm. This might reflect that employers have gendered perceptions regarding the underlying motives for working from home and the implied productivity as suggested by experimental evidence in Leslie et al. (2012). In addition to gendered perceptions on WfH-related productivity, employers might perceive mothers' fallback options outside the firm to be poorer than fathers', hence reducing their bargaining power. Finally, fathers might be more likely to initiate wage negotiations with their employer. Leibbrandt and List (2015) find that when there is no explicit statement that wages are negotiable, men are more likely to negotiate for a higher wage, whereas women are more likely to signal their willingness to work for a lower wage.

5.3. Plausibility of hours extension related to WfH take-up

The findings suggest rather large increases of contractual working hours, especially among mothers. In this section, we briefly explore suggestive evidence where these additional hours actually come from and whether the estimated hours extension is backed by time saved on other activities. A first relevant channel might be time saved on commut-

ing. Under the assumption that weekly WfH involves a full day at home per week and monthly WfH involves a full day at home per month, the average commuting time saved accounts for about 15% of the increase in mothers working time.[18] For mothers with long commutes of more than 20km, the time saved by working from home may explain almost 30% of the increase in working hours.[19] We would thus expect the positive link between WfH take-up and working hours to be stronger with a higher WfH intensity and in case of longer commutes. In line with this argument, we have already seen stronger hours extensions for individuals who are more likely to save on commuting time due to taking up a higher intensity of weekly rather than monthly WfH (see Table 5). As another supportive evidence, Table A.13 in the Appendix distinguishes between employees with short commutes (less than 20km) vs. long commutes (more than 20km) and finds a much larger increase in contractual working hours of 4.7 hours per week for mothers with long commutes, compared to mothers with short commutes for whom the increase of 2.7 contractual hours is not significant.

As a second potential channel for saving time, the additional flexibility to combine private and professional needs and to work outside usual office hours may yield time gains that can be spent on working longer hours. Using information from the 2009 SOEP wave on whether individuals work in the evening or over the weekend, we find that mothers are more likely to work during the evening when using WfH than if they don't while no such effects can be found for fathers, see Table A.14 in the Appendix.[20] Childless individuals, instead, are more likely to work on Sundays. Overall, women tend to be more likely to work outside usual office hours when using WfH arrangements compared to their female colleagues who do not use WfH. This pattern is confirmed by time use data on the hours spent per day on work including commuting time, see Table A.15 in the Appendix. While childless individuals tend to work additional weekend hours, there are no significant changes for fathers[21] and additional 0.8 working hours per weekday for mothers. Moreover, this increase in hours worked is compensated by a reduction of time spent on child care (see column 5 in Table A.15). This again implies that they either work during the evening hours and/or that the partner takes care of the kids in the meantime. Indeed, we find that fathers spend 0.7 hours more on childcare when the mother starts WfH on a weekly basis.[22] Finally, we also find that mothers who start WfH take fewer days off work because of child sickness (Table A.16). In certain circumstances, it might be possible to work from home while the child stays at home.

Hence, the strong extension of working hours among mothers is well in line with time saved on commuting as well as additional time gains from the flexibility that comes with WfH.

5.4. WfH and job satisfaction

We next examine whether the increased flexibility of WfH is accompanied with higher job satisfaction, once wage and hours adjustments are taken into account. The latter is important, as such adjustments might reflect compensating differentials. Hence, we follow the literature and control for earnings, the number of hours worked and again run separate estimations by gender and parental status (see e.g. Clark and Oswald, 1996). Moreover, as before, we account for individual fixed-effects which have been shown to be particularly important when estimating the determinants of satisfaction because of unobservable personality traits (Ferrer-i Carbonell and Frijters, 2004).

Table 7
WfH and job satisfaction.

	Without children under 16		With children under 16	
	Males	Females	Males	Females
WfH 2–4 weeks	-0.047	-0.068	0.270	0.043
	(0.188)	(0.340)	(0.221)	(0.433)
Weekly WfH	0.391*	0.706*	0.048	0.616
	(0.225)	(0.396)	(0.338)	(0.430)
Log monthly earnings	0.302*	0.255	0.484**	0.301
	(0.172)	(0.165)	(0.220)	(0.238)
Contracted hours	-0.009	-0.011	-0.020	-0.026*
	(0.013)	(0.009)	(0.015)	(0.014)
Overtime hours	-0.009	-0.023*	-0.006	-0.009
	(0.009)	(0.012)	(0.010)	(0.020)
Observations	6797	6854	4667	2973
R-squared	0.073	0.059	0.092	0.126

Note: The table shows the estimates of fixed effects regressions based on Eq. (1). Columns (1) and (2) refer to the sub-sample without children under 16. Columns (3) and (4) refer to the sub-sample having children under 16. The dependent variable is job satisfaction measured on an 11-point Likert scale. Control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table 7 provides the corresponding estimates for job satisfaction, as measured on an 11-point Likert scale. Moreover, we allow estimates to differ by WfH intensity and distinguish between weekly WfH and WfH on a monthly, but not weekly basis (WfH 2–4 weeks). Given the typical noise in measures of job satisfaction, stronger links can be expected if WfH is done on a more regular basis. Indeed, we find significantly higher job satisfaction only for childless women and men working from home on a weekly basis (column (1)), while no significant estimates can be found for less intense WfH. Moreover, shifts related to weekly WfH of 0.4-0.7 on the 11-point Likert scale are quite substantial, but seem plausible when compared to findings in the literature. Using the same SOEP data and job satisfaction measure, Fahr (2011) finds that a richer job design in terms of having more varied tasks and more autonomy in how to conduct them increases job satisfaction in the range of 0.4-0.8 on the same satisfaction scale. The chance for further training and qualification has similarly positive effects on job satisfaction while conflicts with the principle reduce job satisfaction by more than 2 points on the Likert scale. As WfH also increases autonomy regarding where and when to conduct job tasks, our estimates for childless individuals appear in a plausible range.

We conclude that childless individuals gain from WfH in terms of higher job satisfaction. By contrast, point estimates for weekly WfH among parents are also positive, but insignificant (columns (3)). This might reflect that the advantages attached to the increased flexibility also have a downside in terms of, for instance, tiring evening hours for mothers (see Section 5.3) that also likely reduce women's leisure time and cause new conflicts between the job and the private sphere.

6. Concluding remarks and discussion

Given the growing importance of working from home in the last two decades and it's exceptional rise as an established work practice since the pandemic, there is remarkably little research on how WfH affects careers and on how it varies with workers' characteristics. Moreover, apart from very few experiments on specific samples, much of the literature

[18] We calculate the average time saved per week as the weighted sum of the average daily commute weighted by the weekly WfH share and the average daily commute divide by four weighted by the monthly WfH share. For mothers, the average time saved per week by avoiding commuting is: 38 minutes x 0.68 + 38 minutes /4 weeks x 0.32=29 minutes, which represents about 15% of the 4 additional hours worked when starting WfH.

[19] For these long commuters, the average commuting distance is 98km and the median daily commuting time is 1 h 30 minutes.

[20] For this, we compare individuals who work from home in 2009 with those who do not in 2009 but will do so in 2014.

[21] This is not at odds with the main results as the small increase in working hours can come from the time saved on commutes, which is included in the time use data.

[22] The estimate is from a regression based on Eq. (1) with daily hours spent by partner on childcare as dependent variable on the sample of parents living with their partner, and for whom there is information on time use. Results available upon request.

has not sufficiently explored differences between groups that are likely to respond differently to the opportunity to work from home. In order to address this research gap, this paper investigates how WfH relates to men's and women's working hours and labour earnings and looks at the related heterogeneity by parental status. For this, we control for workers' time-invariant unobserved heterogeneity, control for a set of time-varying worker and job characteristics and run several robustness checks. While this raises confidence in our findings, estimates do not have to be causal as we cannot rule out remaining biases from, for example, parallel changes in human resource practices within the firm. Still, our results shed a novel and more comprehensive light on labour market outcomes related to WfH compared to previous, non-experimental studies.

The results are consistent with much of the existing literature, but also provide important new insights. Similar to previous papers such as Noonan and Glass (2012) and Possenriede et al. (2016), we find WfH to come with increased overtime hours. However, we find longer overtime hours only among employees without children and it is not accompanied by any wage gains. At the same time, workers seem to attach a positive value to WfH, as indicated by a higher job satisfaction, which is in line with Mas and Pallais (2017) and Angelici and Profeta (2020), albeit this association is significant only for childless workers and we cannot confirm any significant gender differences. This may indicate that WfH-related conflicts between the job and the private domain may be more severe for parents, and especially mothers.

Our findings for parents with children below age 16 also offer novel insights. Among parents, WfH take-up is associated with increased contractual hours, higher monthly earnings, and higher hourly wages. Moreover, the increase in contractual hours related to WfH is much stronger among mothers than among fathers, and explains in part the larger increase in monthly earnings for mothers than for fathers. We provide suggestive evidence that saving time on commuting, the ability to work outside office hours as well as a more equal sharing of childcare responsibilities enable mothers to work longer hours with WfH.

If these gendered impacts of WfH were causal, this would imply that WfH is a means of raising mothers' labour force attachment and closing gender gaps in hours and earnings. Yet, our results also suggest that mothers, in contrast to their male counterparts, do not benefit from higher hourly wages when remaining in the same firm, but do so only if they simultaneously change employer. This might indicate that their bargaining power is weaker than men's for re-negotiating wages when adopting WfH within established employer-employee relationships. On the one hand, this might reflect that employers act on gendered preconceptions regarding the motives for WfH or that expected or actual productivity effects of WfH differ by gender. On the other hand, mothers might be more reluctant to ask for an hourly wage increase than their male counterparts when changing working arrangements, while staying with the same employer. Hence, while to some extent WfH can be a means to close gender differences in terms of working hours and monthly earnings, it does not necessarily help to close the gender difference in hourly wages. However, the higher labour force attachment that comes with WfH might still pay off for mothers in terms of career progression and wages in the long run, a possibility that needs to be examined in further research.

All in all, our paper thus highlights the notable heterogeneity of labour market outcomes related to WfH by gender and parenthood. For a post-pandemic era with higher WfH rates, our findings tentatively suggest that we may see rising working hours and earnings among mothers relative to fathers, potentially reducing what has been called the child penalty. Moreover, the pandemic did not only raise WfH rates, but likely led to higher productivity of WfH due to complementary investments in technology and raised the acceptance of WfH as a substitute for on-site work on some working days (Barrero et al., 2021). This, in turn, might weaken gendered perceptions regarding WfH. It also increased the use of online meetings as a substitute for business trips, which is especially valuable for individuals with schedule constraints, such as mothers. These changes might contribute to closing the gender gap in the wage returns to WfH.

Yet, the way parents will organise childcare seems crucial for mother's and fathers' career when opting for WfH as there is evidence that mothers working from home engaged more in childcare and experienced a larger decline in productivity during the pandemic compared to other individuals working from home (Alon et al., 2021). Moreover, presence at work is likely to remain essential for learning, visibility and networking. Higher intensity of WfH among women or parents could place them at a disadvantage at the time of competing for promotion (Barrero et al., 2021; Bloom et al., 2015). Our findings already indicate that WfH may not ensure similar hourly wage gains for mothers and fathers, hinting at the need for accompanying equal pay measures by raising, for instance, intra-firm transparency on wages. Hence, re-evaluating the effects of WfH after the Covid-19 crisis would be an interesting route for future research.

Appendix A: Additional figures and tables

Table A.1
Share of employees working from home by industries.

Industry 1-digit	Employment share	Share WfH	Male WfH	Female WfH
Services	0.466	0.2	0.25	0.17
Agriculture, Forestry	0.013	0.15	0.12	0.23
Bank, Insurance	0.04	0.14	0.18	0.1
Mining	.002	0.11	0.07	0.25
Energy, Water	0.014	00.11	0.12	0.09
Transport	0.054	0.09	0.08	0.12
Manufacturing	0.168	0.09	0.1	0.07
Construction	0.126	0.08	0.08	0.11
Trade	0.119	0.05	0.09	0.02

Notes: Data for 2014 only. Share of employees working from home (WfH) at least once a month. Industries are ranked by their share of employees working from home.

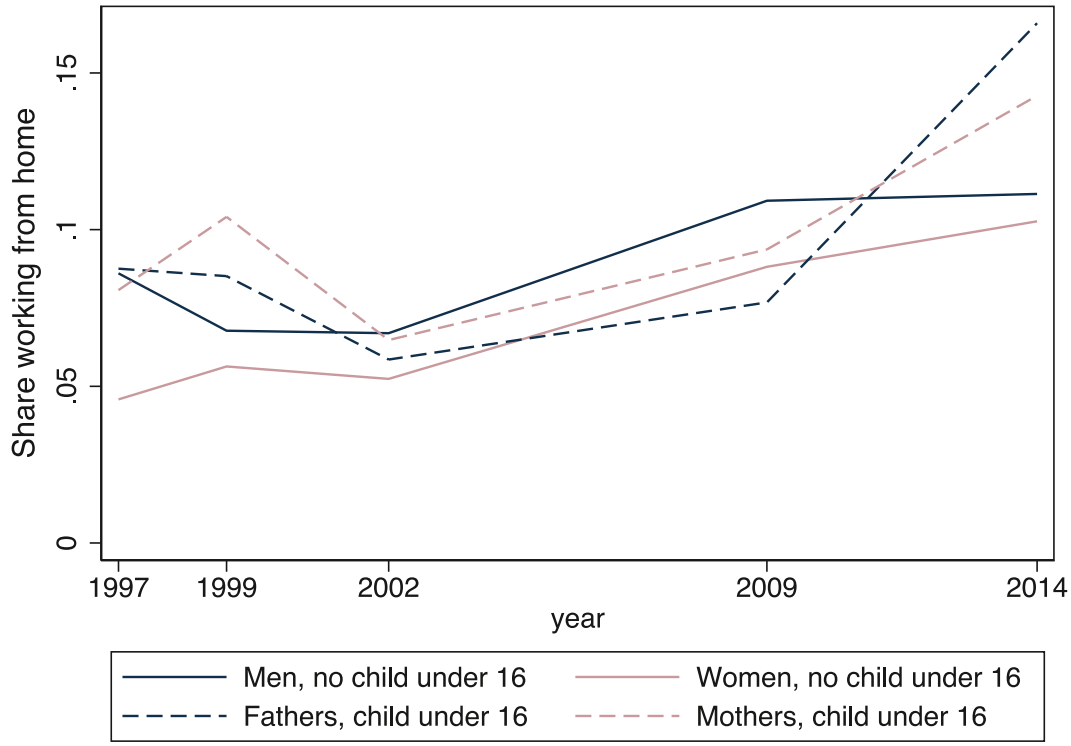

Fig. A.1. Trends in working-from-home by gender and parenthood in Germany. *Notes:* The figure reports averages in working from home done at least once a month without using sampling weights. It shows weighted averages in working from home done at least once a month using sampling weights for a sample of 22,521 employed workers (40,115 observations) for the five waves. In 2014, 22% and 25% of the sample are women and men with a child under 16 years old, while 28% and 25% of the sample consist of women and men without a child under 16 years old. *Source:* SOEP. 1997, 1999, 2002, 2009 and 2014 waves.

Table A.2
Share of employees working from home by occupations.

	Employment share	Share WfH	Male WfH	Female WfH
Occupation 2-digit KldB				
Teachers	0.06	0.7	0.73	0.69
Scientists	0.01	0.31	0.39	0.26
Managers, consultants	0.054	0.3	0.32	0.28
Accountants, IT specialists	0.053	0.25	0.34	0.11
Engineers	0.038	0.24	0.27	0.11
Senior officials	0.025	0.19	0.21	0.17
Goods examiner, despatchers	0.011	0.01	0.01	0
Locksmiths	0.012	0.01	0.01	0
Surface transport occupations	0.026	0.01	0.01	0
Sales personnel	0.034	0.01	0.02	0.01
Warehouse workers	0.022	0	0.01	0
Cleaning occupations	0.022	0	0.03	0
Autonomy level				
Highest	0.05	0.57	0.53	0.64
High	0.24	0.29	0.26	0.33
Middle	0.36	0.09	0.1	0.09
Low	0.25	0.02	0.01	0.03
Lowest	0.09	0.01	0.01	0.01
Tasks & Tools				
Analytical task above 75th perc	.26	.17	.24	.12
Analytical task below 25th perc	.25	.01	.01	.02
PC use above 75th perc	0.26	0.15	0.22	0.1
PC use below 25th perc	0.25	0.03	0.02	0.04

Notes: Data for 2014 only. Share of employees working from home at least once a month. Occupations are ranked by their share of employees working from home. The top panel displays the five occupations with the highest and the lowest share of employees working from home. Only occupations representing at least 1% of the employee population are presented here. Data on autonomy level, tasks and tools come from the 2012 wave of the BiBB/BAuA Employment survey. The third panel displays occupations by their task/tools intensity and can be read as follows. In the occupation with the use of personal computer (PC) at the 75th percentile, 83% of employees report that a PC is their main working tool. In the occupation at the 25th percentile of PC use, 9% of employees report that their main working tool is a PC.

Table A.3
WfH status and transitions by gender and parenthood.

	W/o children under 16		With children under 16		Total
	Male	Female	Male	Female	
WfH	268	168	224	133	793
... of which WfH take-up	121	98	113	66	398
No WfH	6560	6726	4460	2853	20599
... of which WfH dropout	141	71	91	44	347
Observations	6828	6894	4684	2986	21392
Individuals	3119	3067	2171	1655	7602[a]

[a] Note that the total number of individuals is smaller than the sum of the 4 sub-samples, given that 2410 individuals (1272 men and 1138 women) are part of both samples with and without children under 16. Specifically, we observe 792 individuals before and after having children, 1599 individuals before and after the youngest child turns 16, and 19 individuals before having children until the youngest child is older than 16.

Table A.4
WfH, hours worked and wages: parents with children in different age groups.

	Males				Females			
	Contracted hours (1)	Overtime hours (2)	Hourly wage (3)	Monthly wage (4)	Contracted hours (5)	Overtime hours (6)	Hourly wage (7)	Monthly wage (8)
Panel A: With children under 12								
WfH	0.389*	0.320	0.078***	0.094***	3.093*	0.121	0.103*	0.229**
	(0.207)	(0.669)	(0.024)	(0.024)	(1.802)	(0.731)	(0.054)	(0.095)
Observations	3592	3592	3592	3592	1934	1934	1934	1934
R-squared	0.837	0.778	0.912	0.921	0.922	0.819	0.916	0.927
Panel B: With children under 18								
WfH	0.484**	0.549	0.075***	0.098***	2.808**	0.777	0.101**	0.243***
	(0.191)	(0.546)	(0.022)	(0.021)	(1.340)	(0.681)	(0.050)	(0.070)
Observations	5193	5193	5193	5193	3488	3488	3488	3488
R-squared	0.789	0.745	0.904	0.911	0.883	0.745	0.886	0.903

Note: The results refer to the sub-sample of employees having children under 12 years old in panel A and employees with children under 18 years old in panel B. Control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.5
WfH dropout, hours worked and wages.

	Without children under 16				With children under 16			
	Contracted hours	Overtime hours	Hourly wage	Monthly wage	Contracted hours	Overtime hours	Hourly wage	Monthly wage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Males								
WfH dropout	0.699*	-0.565	0.033	0.042*	-0.271	-0.753	0.053*	0.032
	(0.416)	(0.594)	(0.023)	(0.023)	(0.259)	(0.596)	(0.031)	(0.031)
Observations	6820	6820	6820	6820	4604	4604	4604	4604
R-squared	0.770	0.742	0.894	0.908	0.799	0.760	0.906	0.913
Panel B: Females								
WfH dropout	0.885	-1.220*	0.041	0.046	4.338***	-1.311**	0.032	0.180**
	(0.860)	(0.712)	(0.032)	(0.037)	(1.425)	(0.608)	(0.070)	(0.079)
Observations	6792	6792	6792	6792	2931	2931	2931	2931
R-squared	0.888	0.714	0.883	0.918	0.895	0.777	0.885	0.908

Note: Columns (1) - (4) show estimates of fixed effects regressions on the sub-sample of employees without children under 16 years old, while columns (5) - (8) refer to the sub-sample of individuals having children under 16. WfH dropout is a dummy variable equal to zero for WfH done at least once a week and 1 otherwise. The sample is constructed similarly to the main sample in the paper, so that observations with a WfH take-up after a previous dropout are excluded. Control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.6
Results for parents by age of the youngest child.

	Males				Females			
	Contracted hours (1)	Overtime hours (2)	Hourly wage (3)	Monthly wage (4)	Contracted hours (5)	Overtime hours (6)	Hourly wage (7)	Monthly wage (8)
Panel A: WfH take-up								
WfH × child aged 0–5	0.048	0.284	0.076	0.082**	3.684*	0.309	0.095	0.309***
	(0.392)	(1.051)	(0.046)	(0.041)	(2.220)	(0.715)	(0.087)	(0.111)
WfH × child aged 6–15	0.483**	0.756	0.065***	0.094***	3.369**	0.574	0.122***	0.278***
	(0.206)	(0.527)	(0.023)	(0.022)	(1.601)	(0.622)	(0.040)	(0.078)
Observations	4684	4684	4684	4684	2986	2986	2986	2986
R-squared	0.797	0.758	0.908	0.915	0.897	0.766	0.891	0.911
Panel B: WfH drop-out								
WfH dropout × child aged 0–5	-0.113	-0.465	0.032	0.020	6.006***	-1.170*	0.051	0.264***
	(0.372)	(0.717)	(0.040)	(0.037)	(1.639)	(0.684)	(0.093)	(0.100)
WfH dropout × child aged 6–15	-0.437	-1.056	0.076*	0.044	2.164	-1.495**	0.008	0.071
	(0.329)	(0.720)	(0.039)	(0.038)	(1.468)	(0.645)	(0.059)	(0.059)
Observations	4604	4604	4604	4604	2931	2931	2931	2931
R-squared	0.799	0.760	0.906	0.913	0.895	0.777	0.885	0.909

Note: The results refer to the sub-sample of individuals with children under age 16. Control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.7
WfH, hours worked and wages: employees transitioning into parenthood.

	Actual hours			Contracted hours	Overtime hours	Hourly wage		Monthly wage
	OLS (1)	FE (2)	FE (3)	FE (4)	FE (5)	OLS (6)	FE (7)	FE (8)
Panel A: Males								
WfH	3.233**	1.450	0.998	0.086	0.912	0.038	0.131**	0.155***
	(1.311)	(1.066)	(1.023)	(0.610)	(0.829)	(0.044)	(0.060)	(0.058)
Occupational status	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	939	939	939	939	939	939	939	939
R-squared	0.292	0.818	0.830	0.802	0.805	0.639	0.909	0.928
Panel B: Females								
WfH	0.961	-0.745	-1.798	-2.120	0.322	-0.013	0.050	-0.044
	(1.504)	(2.250)	(2.145)	(1.789)	(0.927)	(0.057)	(0.094)	(0.136)
Occupational status	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	690	690	690	690	690	690	690	690
R-squared	0.587	0.837	0.848	0.846	0.740	0.573	0.886	0.851

Note: The results refer to the sub-sample of employees observed just before and after becoming parents for the first time. Columns (1) and (6) show estimates of OLS regressions, while the other columns show estimates of fixed effects regressions. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.8
WfH and overtime compensation.

	All employees		W/o children under 16		With children under 16	
	Compensatory time Conditional Logit		Hourly wage FE	Monthly wage FE	Hourly wage FE	Monthly wage FE
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Males						
WfH	-0.180	-0.154	-0.007	0.014	0.066***	0.090***
	(0.269)	(0.279)	(0.034)	(0.033)	(0.022)	(0.021)
WfH × child under 16	0.042	0.015				
	(0.382)	(0.392)				
Time-off			-0.030***	0.002	-0.010	0.016**
			(0.007)	(0.007)	(0.008)	(0.008)
Occupation FE	No	Yes	Yes	Yes	Yes	Yes
Occupational status	No	No	Yes	Yes	Yes	Yes
Observations	5584	5584	6728	6728	4625	4625
R-squared			0.894	0.907	0.907	0.915
Panel B: Females						
WfH	0.004	-0.042	0.001	0.019	0.122***	0.282***
	(0.299)	(0.306)	(0.034)	(0.042)	(0.040)	(0.077)
WfH × child under 16	0.114	0.095				
	(0.418)	(0.432)				
Time-off			-0.034***	0.008	-0.068***	0.002
			(0.007)	(0.008)	(0.013)	(0.016)
Occupation FE	No	Yes	Yes	Yes	Yes	Yes
Occupational status	No	No	Yes	Yes	Yes	Yes
Observations	4640	4640	6813	6813	2954	2954
R-squared			0.884	0.917	0.895	0.913

Note: Control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.9
Effect of WfH, hours worked and wages: occupation-specific controls.

	Without children under 16				With children under 16			
	Contracted hours	Overtime hours	Hourly wage	Monthly wage	Contracted hours	Overtime hours	Hourly wage	Monthly wage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Males								
WfH	0.037	0.912*	-0.020	-0.000	0.402**	0.623	0.065***	0.088***
	(0.301)	(0.528)	(0.033)	(0.032)	(0.180)	(0.545)	(0.021)	(0.021)
Average wages in occupation by gender	-0.028	0.017	0.012***	0.012***	0.006	0.035	0.003	0.003
	(0.033)	(0.051)	(0.003)	(0.002)	(0.039)	(0.064)	(0.003)	(0.003)
Average hours in occupation by gender	0.020	0.033	-0.004	-0.002	0.059	-0.007	-0.003	-0.001
	(0.043)	(0.055)	(0.003)	(0.003)	(0.047)	(0.080)	(0.004)	(0.004)
Observations	6818	6818	6818	6818	4681	4681	4681	4681
R-squared	0.770	0.742	0.894	0.907	0.797	0.758	0.908	0.915
Panel B: Females								
WfH	-0.366	1.263**	0.000	0.016	3.377**	0.513	0.118***	0.280***
	(0.718)	(0.631)	(0.034)	(0.041)	(1.598)	(0.609)	(0.040)	(0.078)
Average wages in occupation by gender	0.012	0.042	0.009**	0.010**	-0.178	-0.052	-0.005	-0.012
	(0.062)	(0.060)	(0.004)	(0.004)	(0.180)	(0.097)	(0.008)	(0.010)
Average hours in occupation by gender	0.079*	0.022	-0.001	0.002	0.086	-0.097*	0.008	0.006
	(0.044)	(0.037)	(0.002)	(0.002)	(0.139)	(0.059)	(0.005)	(0.009)
Observations	6874	6874	6874	6874	2980	2980	2980	2980
R-squared	0.887	0.712	0.884	0.917	0.897	0.765	0.891	0.912

Note: Further control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.10
WfH, hours worked and wages: adding partner's characteristics.

	Without children under 16				With children under 16			
	Contracted hours (1)	Overtime hours (2)	Hourly wage (3)	Monthly wage (4)	Contracted hours (5)	Overtime hours (6)	Hourly wage (7)	Monthly wage (8)
Panel A: Males								
WfH	-0.083	1.109**	-0.020	0.001	0.375**	0.697	0.068***	0.092***
	(0.327)	(0.563)	(0.036)	(0.035)	(0.179)	(0.546)	(0.021)	(0.021)
Married × partner in paid employment	-0.151	0.264	-0.039**	-0.038**	-0.296*	-0.132	-0.010	-0.016
	(0.192)	(0.309)	(0.016)	(0.015)	(0.179)	(0.269)	(0.014)	(0.014)
Married × partner's earnings	0.040	0.049	0.022***	0.024***	-0.073	0.031	0.009	0.005
	(0.067)	(0.113)	(0.006)	(0.007)	(0.115)	(0.157)	(0.007)	(0.008)
Married × partner WfH	0.460	-0.175	0.008	0.020	-0.119	0.094	0.025	0.021
	(0.318)	(0.389)	(0.023)	(0.024)	(0.204)	(0.402)	(0.018)	(0.018)
Observations	6557	6557	6557	6557	4534	4534	4534	4534
R-squared	0.776	0.753	0.895	0.908	0.797	0.760	0.907	0.915
Panel B: Females								
WfH	-0.487	1.428**	-0.005	0.014	3.455**	0.604	0.115***	0.290***
	(0.726)	(0.651)	(0.036)	(0.045)	(1.383)	(0.665)	(0.043)	(0.076)
Married × partner in paid employment	0.352	-0.330*	0.000	0.005	-0.729	0.188	-0.008	-0.050
	(0.274)	(0.192)	(0.013)	(0.016)	(0.868)	(0.408)	(0.030)	(0.046)
Married × partner's earnings	-0.028	0.009	-0.002	-0.003	-0.286	-0.200**	0.009	-0.008
	(0.034)	(0.025)	(0.002)	(0.002)	(0.215)	(0.087)	(0.009)	(0.012)
Married × partner WfH	-0.623*	0.094	0.000	-0.019	-0.887	0.422	0.025	0.005
	(0.371)	(0.256)	(0.019)	(0.021)	(0.715)	(0.364)	(0.035)	(0.036)
Observations	6492	6492	6492	6492	2816	2816	2816	2816
R-squared	0.891	0.721	0.885	0.919	0.903	0.774	0.892	0.914

Note: Further control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.11
WfH, hours worked and wages: adding state-by-year fixed-effects.

	Without children under 16				With children under 16			
	Contracted hours (1)	Overtime hours (2)	Hourly wage (3)	Monthly wage (4)	Contracted hours (5)	Overtime hours (6)	Hourly wage (7)	Monthly wage (8)
Panel A: Males								
WfH	0.057	0.872*	-0.012	0.007	0.378**	0.471	0.073***	0.092***
	(0.299)	(0.523)	(0.034)	(0.032)	(0.189)	(0.531)	(0.021)	(0.021)
Observations	6828	6828	6828	6828	4684	4684	4684	4684
R-squared	0.773	0.748	0.895	0.908	0.800	0.765	0.910	0.917
Panel B: Females								
WfH	-0.375	1.291**	0.005	0.021	3.835**	0.447	0.128***	0.315***
	(0.702)	(0.619)	(0.034)	(0.042)	(1.551)	(0.594)	(0.042)	(0.075)
Observations	6894	6894	6894	6894	2986	2986	2986	2986
R-squared	0.889	0.716	0.886	0.919	0.901	0.779	0.896	0.915

Note: All specifications include federal state-by-year fixed-effects. Further control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.12
WfH, hours worked and wages: adding regional childcare availability.

	Males				Females			
	Contracted hours (1)	Overtime hours (2)	Hourly wage (3)	Monthly wage (4)	Contracted hours (5)	Overtime hours (6)	Hourly wage (7)	Monthly wage (8)
WfH	0.381**	0.464	0.073***	0.093***	3.808**	0.454	0.128***	0.315***
	(0.189)	(0.527)	(0.021)	(0.021)	(1.560)	(0.590)	(0.042)	(0.076)
Child care places × children below 3 yrs'	0.012	-0.029	0.001	0.001	-0.022	0.029*	-0.000	-0.001
	(0.011)	(0.018)	(0.001)	(0.001)	(0.039)	(0.016)	(0.002)	(0.002)
Child care places × children 3 to 6 yrs'	0.002	0.015**	-0.000	0.000	-0.020	-0.013*	0.000	-0.001
	(0.004)	(0.007)	(0.000)	(0.000)	(0.021)	(0.008)	(0.001)	(0.001)
Child care places × children 6 to 10 yrs'	0.004	0.000	-0.000	-0.000	0.002	0.010**	-0.000	-0.000
	(0.003)	(0.006)	(0.000)	(0.000)	(0.008)	(0.004)	(0.000)	(0.000)
Observations	4684	4684	4684	4684	2986	2986	2986	2986
R-squared	0.800	0.766	0.910	0.917	0.901	0.780	0.896	0.915

Note: The results refer to the sub-sample of individuals with children under age 16. All specifications include federal state-by-year fixed-effects. Further control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.13
WfH results by commuting distance.

	Without children under 16				With children under 16			
	Contracted hours (1)	Overtime hours (2)	Hourly wage (3)	Monthly wage (4)	Contracted hours (5)	Overtime hours (6)	Hourly wage (7)	Monthly wage (8)
Panel A: Males								
WfH × long commute	-0.094	0.893	-0.037	-0.022	0.391	0.395	0.105***	0.124***
	(0.577)	(0.869)	(0.050)	(0.052)	(0.254)	(0.722)	(0.032)	(0.029)
WfH × short commute	-0.004	1.184*	-0.020	0.004	0.294	1.066	0.057*	0.086***
	(0.412)	(0.636)	(0.042)	(0.041)	(0.228)	(0.813)	(0.033)	(0.033)
Long commute	0.082	0.343	-0.006	0.004	0.200	0.337	0.011	0.022
	(0.183)	(0.250)	(0.013)	(0.012)	(0.258)	(0.282)	(0.015)	(0.015)
Observations	6627	6627	6627	6627	4519	4519	4519	4519
R-squared	0.781	0.751	0.897	0.911	0.803	0.764	0.911	0.920
Panel B: Females								
WfH × long commute	0.635	1.063	0.013	0.052	4.790**	-0.288	0.150	0.380**
	(0.773)	(0.855)	(0.039)	(0.040)	(2.384)	(1.173)	(0.142)	(0.174)
WfH × short commute	-0.522	1.031	0.025	0.032	2.780	0.699	0.066	0.176*
	(0.930)	(0.838)	(0.044)	(0.057)	(1.920)	(0.641)	(0.054)	(0.102)
Long commute	0.471*	0.159	0.017	0.035**	-0.525	0.267	0.001	-0.023
	(0.242)	(0.197)	(0.012)	(0.014)	(0.792)	(0.352)	(0.029)	(0.042)
Observations	6757	6757	6757	6757	2902	2902	2902	2902
R-squared	0.892	0.719	0.887	0.919	0.900	0.770	0.892	0.915

Note: Control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.14
Flexible work schedules.

	WfH (1)	No WfH yet (2)	Difference (t-stat.) (3)		WfH (4)	No WfH yet (5)	Difference (t-stat.) (6)	
	Childless women				Childless men			
Works sometimes in the evening	0.72	0.57	0.15	(1.36)	0.84	0.90	-0.06	(-0.83)
Works sometimes on Saturdays	0.80	0.61	0.20*	(1.95)	0.88	0.83	0.05	(0.70)
Works sometimes on Sundays	0.71	0.39	0.32***	(2.89)	0.69	0.50	0.19*	(1.83)
	Mothers				**Fathers**			
Works sometimes in the evening	0.76	0.53	0.24*	(1.80)	0.79	0.72	0.07	(0.71)
Works sometimes on Saturdays	0.68	0.58	0.10	(0.70)	0.78	0.79	-0.02	(-0.18)
Works sometimes on Sundays	0.35	0.39	-0.04	(-0.25)	0.60	0.46	0.13	(1.15)

Note: Data for 2009. The table displays the mean of the variables for the population of women using WfH in 2009 in column (1), women who do not use WfH in 2009 but will do so in 2014 in column (2), men using WfH in column (4), and men not yet using WfH in column (5).

Table A.15
Time use: WfH and hours spent on work and childcare.

	Without children under 16			With children under 16			
	Weekday	Weekend		Weekday		Weekend	
	Work hrs. (1)	Work hrs. (2)	Work prob. (3)	Work hrs. (4)	Childcare (5)	Work hrs. (6)	Work prob. (7)
Panel A: Males							
WfH	-0.127	0.632*	0.043	-0.036	0.204	0.313	0.040
	(0.177)	(0.340)	(0.053)	(0.149)	(0.134)	(0.334)	(0.052)
Observations	6573	6441	6441	4329	4237	4259	4259
R-squared	0.724	0.794	0.749	0.760	0.708	0.804	0.744
Panel B: Females							
WfH	-0.323	0.082	0.119*	0.861**	-0.868*	-0.302	-0.055
	(0.257)	(0.529)	(0.069)	(0.412)	(0.456)	(0.369)	(0.040)
Observations	6598	6483	6483	2415	2402	2360	2360
R-squared	0.825	0.801	0.789	0.900	0.838	0.896	0.872

Note: The table shows estimates of fixed effects regressions based on Eq. (1) with different time use variables as dependent variables. Work hours refer to the number of hours per day (during a weekday or weekend) spent on work or commute. Work probability is a dummy denoting positive hours of work on weekends. Childcare refers to the number of hours spent on childcare during a weekday. Columns (1)-(3) refer to the sub-sample without children under 16, while columns (4)-(7) refer to the sub-sample having children under 16. Individuals spending more than 18 hours per day on different activities are excluded from the sample. Control variables included are as in Table 3. Standard errors are clustered at the individual level, $* p < 0.10, ** p < 0.05, *** p < 0.01$.

Table A.16
Days off to care for children.

	WfH	No WfH	Difference (t-stat.)		WfH	No WfH	Difference (t-stat.)	
	(1)	(2)	(3)		(4)	(5)	(6)	
	Mothers				Fathers			
Cumulated number of days off	8.95	24.70	-15.75***	(-2.87)	1.78	3.29	-1.50	(-0.99)

Note: Information on days off due to child sickness exists from 2010. As we observe WfH in 2009 and 2014, we calculate the cumulated number of days off taken by parents between 2010 and 2014. Using the sample of parents who did not work from home in 2009, we compare those who reported doing so in 2014 to those who still did not use WfH arrangements in 2014. Mothers who do not use WfH arrangements accumulated 25 days off to take care of a sick child between 2010 and 2014 compared to 9 days among mothers who started using WfH in that period. There is no difference across fathers.

Appendix B. Model with correlated individual effects and correction for selection into work

Here we follow Wooldridge (1995) and present a model that accounts for correlated individual effects, as well as dealing with potential selection bias due to shocks to individuals' decision to work. We use this method to estimate the effect of WfH on wages accounting for the fact that men and women in paid employment may have different potential wages than men and women out of the labour force.

The model is composed of an outcome equation, in this case the wage equation, and a selection equation, in this case selection into paid employment.

$$y_{it} = \boldsymbol{x}_{1it}\boldsymbol{\beta}_1 + \boldsymbol{x}_{2it}\boldsymbol{\beta}_2 + \theta_t + \alpha_i + u_{it} \qquad t = 1, \dots T \tag{2}$$

$$h^*_{it} = \boldsymbol{x}_{1it}\boldsymbol{\gamma}_1 + \boldsymbol{z}_{it}\boldsymbol{\gamma}_2 + \eta_i + v_{it} \text{ and } \quad s_{it} = \mathbb{1}\left[h^*_{it} > 0\right] \tag{3}$$

where y_{it} is the outcome of individual i at time t, h^*_{it} is the hours worked by individual i in year t. Because h^*_{it} is unobserved for people who are not working in year t, we use an indicator variable s_{it} which is equal to one if individual i is working (i.e. has a strictly positive number of worked hours at time t) and zero if individual i is not working. The vector $\boldsymbol{x}_1$ includes variables that appear in both the outcome and the selection equation, while the vector $\boldsymbol{x}_2$ appears only in the outcome equation. $\boldsymbol{z}$ is the vector of excluded variables that appear only in the selection equation. θ_t is a set of time fixed effects. In both equations we account for time invariant individual unobserved characteristics, α_i in Eq. (2) and η_i in Eq. (3).

We use Chamberlain's approach to panel data models to control for individual unobservable characteristics and at the same time deal with self-selection into the work force. In this setting we make the following assumptions. First, following Chamberlain (1984), Wooldridge (1995) and Wooldridge (2010), the conditional expectation of the individual effects in the outcome equation and in the selection equation are linear functions of the mean of the observable variables:

$$\eta_i = \overline{\boldsymbol{x}}_{1i}\boldsymbol{\delta}_1 + \overline{\boldsymbol{z}}_i\boldsymbol{\delta}_2 + e_i,$$

$$E(\alpha_i|\boldsymbol{x}_i, \boldsymbol{z}_i, \varepsilon_{it}) = \overline{\boldsymbol{x}}_{1i}\tilde{\boldsymbol{\phi}}_1 + \overline{\boldsymbol{x}}_{2i}\tilde{\boldsymbol{\phi}}_2 + e_i.$$

Second, the errors in the selection Eq. (3) $\varepsilon_{it} = e_i + v_{it}$ are independent of $\boldsymbol{z}_i$.

Third, the errors in the outcome Eq. (2) u_{it} are mean independent of $(\boldsymbol{x}_i, \boldsymbol{z}_i)$ conditional on the errors in the selection Eq. (3) ε_{it} ; and the conditional expectations of u_{it} is linear in ε_{it} :

$$E(u_{it}|\boldsymbol{x}_i, \boldsymbol{z}_i, \varepsilon_{it}) = E(u_{it}|\varepsilon_{it}) = \rho_t\varepsilon_{it}.$$

As we do not observe h^*_{it} but only s_{it}, we use the selection indicator and transform the last expression into : $E(u_{it}|\boldsymbol{x}_i, \boldsymbol{z}_i, s_{it=1}) = \rho_t E(\varepsilon_{it}|\boldsymbol{x}_i, \boldsymbol{z}_i, s_{it=1})$.

Under the previous assumptions, we obtain:

$$E(\alpha_i + u_{it}) = E(c_i|\boldsymbol{x}_i, \boldsymbol{z}_i, s_{it=1}) + E(u_{it}|\boldsymbol{x}_i, \boldsymbol{z}_i, s_{it=1})$$

$$= \overline{\boldsymbol{x}}_i\psi + \rho_t E(\varepsilon_{it}|\boldsymbol{x}_i, \boldsymbol{z}_i, s_{it=1}).$$

We thus estimate the following model:

$$y_{it} = \boldsymbol{x}_{1it}\boldsymbol{\beta}_1 + \boldsymbol{x}_{2it}\boldsymbol{\beta}_2 + \overline{\boldsymbol{x}}_i\psi + \rho_t\lambda(s_{it}) + \theta_t + \mu_{it} \tag{4}$$

where $\lambda(s_{it}) = E(\varepsilon_{it}|\boldsymbol{x}_i, \boldsymbol{z}_i, s_{it=1})$. The vector $\boldsymbol{x}_1$ includes the educational degree, demographic characteristics, namely age and its square, marital status, migration background, and number of children in three age groups. Theses characteristics are interacted with a female dummy to allow for heterogenous effects across men and women. The vector $\boldsymbol{x}_2$ appears only in the outcome equation and includes the following job characteristics interacted with a female dummy: public sector, size of the firm, tenure in the firm and its square, full-time and part-time experience in years. We also control for gender-specific industry, occupation and occupational status fixed-effects.

To get estimates of $\lambda(s_{it})$ we first run the probit model (5) on a paid employment dummy s_{it} for each time period t and separately for men and for women. Second, we compute $\lambda(s_{it}) = \frac{\phi(s_{it})}{\Phi(s_{it})}$ where ϕ is the standard density function and Φ is the standard cumulative distribution function.

$$P(s_{it} = 1|\boldsymbol{x}_{1i}, \boldsymbol{z}_i, \eta_i) = \Phi(\boldsymbol{x}_{1it}\boldsymbol{\gamma}_1 + \boldsymbol{z}_{it}\boldsymbol{\gamma}_2 + \overline{\boldsymbol{x}}_{1i}\boldsymbol{\delta}_1 + \overline{\boldsymbol{z}}_i\boldsymbol{\delta}_2) \tag{5}$$

where $\boldsymbol{x}_1$ is defined as above and $\boldsymbol{z}$ is the vector of excluded variables.

The results of this first step on the pooled sample of years are reported in Table B.1.[23] We show results with the two sets of excluded variable: 1) partner's characteristics and their interaction with children 2) partner's characteristics and their interaction with the education of the mother of the surveyed individual. We assume here that changes in the partner's labour market characteristics may affect the decision to enter paid employment, due to household income motives, but do not affect wage potentials that are determined by an individual's own characteristics. Note that child-related variables are included in all regressions so that we allow them to directly affect wage potentials, for example through time availability and the choice of the type of job.

However, with the first set of exclusion restrictions, we allow the partner's labour market characteristics to influence how changes in the age of the children affect the decision to enter paid employment. Indeed, a parent might decide to remain (longer) out of the labour market for childcare reasons if the partner is in paid employment. And we assume that the interaction does not influence wages once we control for the presence and age of children. For example, the choice of a more family-friendly but less well paid job may be influenced by the presence and age of children but changes in the partner's employment status would not further influence it.

[23] Results by year are available upon request.

Table B.1
Probability to work, by gender.

	Women		Men	
Excluded variables: characteristics of	Partner & children (1)	Partner & mother (2)	Partner & children (3)	Partner & mother (4)
Children (biological) under age 3	-1.573***	-1.965***	0.149***	0.028
	(0.057)	(0.039)	(0.052)	(0.050)
Child (biological) aged between 3 and 6	-1.120***	-1.486***	-0.219*	-0.262**
	(0.096)	(0.092)	(0.131)	(0.133)
Children (biological) between 6 and 15	-0.729***	-0.971***	-0.079	-0.197***
	(0.052)	(0.045)	(0.060)	(0.056)
Has children aged 16 or older	-0.582***	-0.756***	-0.114	-0.167**
	(0.059)	(0.053)	(0.070)	(0.066)
Living with a partner/married	-0.171***	-0.179***	-0.026	-0.006
	(0.036)	(0.037)	(0.035)	(0.036)
Partner in paid employment	0.392***	0.114**	0.191***	0.092*
	(0.049)	(0.049)	(0.048)	(0.051)
... × children under 3	-0.507***		-0.476***	
	(0.057)		(0.074)	
... × children aged 3–5	-0.414***		-0.218***	
	(0.054)		(0.067)	
... × children aged 6–15	-0.334***		-0.190***	
	(0.042)		(0.050)	
... × children above 16	-0.254***		-0.059	
	(0.040)		(0.050)	
Partner has tertiary education degree	0.169***	-0.135	0.313***	0.036
	(0.064)	(0.101)	(0.075)	(0.135)
... × partner in employment	0.001	-0.024	0.014	0.046
	(0.061)	(0.064)	(0.073)	(0.077)
Partner has vocational degree	0.075*	-0.096*	0.100**	-0.097
	(0.041)	(0.056)	(0.040)	(0.060)
... × partner in employment	-0.139***	-0.160***	-0.018	-0.011
	(0.046)	(0.048)	(0.049)	(0.051)
Mother's years of education		-0.060***		0.005
		(0.011)		(0.012)
... × partner in employment		0.040		-0.033
		(0.027)		(0.032)
... × partner has tertiary education degree		0.267***		0.205***
		(0.055)		(0.071)
... × partner has vocational degree		0.179***		0.199***
		(0.034)		(0.040)
Observations	90,902	85,567	75,268	71,456

Note: Standard errors in parentheses, $* p < .10, ** p < .05, *** p < .01$. Additional control variables included are age and its square, migration background, cohort fixed effects, interactions of the children dummies with childcare availability for the corresponding age groups, regions and year fixed-effects and urban area. We also control for individual effects using Chamberlain approach and add the time average of all explanatory variables.

Column (1) and (2) in Table B.1 report the results on the female probability of being in paid employment while column (3) and (4) report the results for men. The female probability of being in paid employment decreases significantly with the number of children, especially if the children are young. The impact of children on men's probability of working is much smaller, and insignificant in many cases. The negative effect of young children on the probability of working is stronger if the partner is in paid employment for both women and men, but even more so for women.

The alternative set of exclusion restrictions uses interactions between partner's characteristics and the mother's education level when the surveyed individual was 15 years old. The intuition here is that the mother's level of education may influence attitudes in favour of labour market participation. As it is time-invariant, it is captured by the individual fixed-effects in the wage equation but we allow it to influence how changes in partner's characteristics affect the decision to enter paid employment in the selection equation. Column (2) and (4) show that having a mother with a higher level of education increases the probability of being in paid employment when having a partner with an educational degree. The effect is especially strong if the partner has a high level of education.

In a second step, we estimate Eq. 4 with a WfH dummy interacted with a gender dummy and the control function $\lambda(s_{it})$ previously estimated. The results on the different samples are reported in Table B.2. The sample size is smaller here because we drop individuals with missing information on the excluded variables used in the first step. Results on the sample of parents with children under the age of 16 are reported in Panel A and B, while results for childless employees are reported in Panels C and D. Similarly to our main specification, the regressors include demographic characteristics, job characteristics, as well as gender-specific industry, occupation and occupational status fixed-effects. It is now augmented with a control function to correct for the selection bias. We allow the effect of the control function to vary by gender and time. The correction for selection into employment does not change significantly how WfH take-up relates to hourly wages and monthly earnings.

Table B.2
WfH and wages: controlling for selection into the labour force.

	Hourly wage			Monthly wage	
	FE (1)	CRE (2)	CRE (3)	CRE (4)	CRE (5)
Panel A: With children, excluded variable partner's characteristics & interactions with children					
WfH × Male	0.071***	0.071***	0.066***	0.097***	0.091***
	(0.022)	(0.023)	(0.023)	(0.023)	(0.023)
WfH × Female	0.089**	0.089**	0.086*	0.224***	0.225***
	(0.044)	(0.045)	(0.044)	(0.074)	(0.075)
Selection correction	No	No	Yes	No	Yes
Observations	6772	6772	6772	6772	6772
Panel B: With children, excluded variable partner's & mother's characteristics					
WfH × Male	0.070***	0.070***	0.062***	0.096***	0.088***
	(0.022)	(0.023)	(0.023)	(0.023)	(0.023)
WfH × Female	0.082*	0.082*	0.079*	0.229***	0.226***
	(0.043)	(0.044)	(0.043)	(0.073)	(0.075)
Selection correction	No	No	Yes	No	Yes
Observations	6496	6496	6496	6496	6496
Panel C: Without children under 16, excluded variable partner's characteristics					
WfH × Male	-0.030	-0.030	-0.031	-0.012	-0.011
	(0.044)	(0.045)	(0.044)	(0.044)	(0.044)
WfH × Female	0.005	0.005	0.009	0.027	0.030
	(0.043)	(0.043)	(0.043)	(0.053)	(0.053)
Selection correction	No	No	Yes	No	Yes
Observations	9236	9236	9236	9236	9236
Panel D: Without children under 16, excluded variable mother's characteristics					
WfH × Male	-0.030	-0.030	-0.032	-0.017	-0.017
	(0.046)	(0.046)	(0.046)	(0.046)	(0.045)
WfH × Female	-0.017	-0.017	-0.015	0.015	0.016
	(0.042)	(0.043)	(0.042)	(0.055)	(0.055)
Selection correction	No	No	Yes	No	Yes
Observations	8775	8775	8775	8775	8775

Note: Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Control variables included are gender-specific year fixed effects, gender-specific demographic controls (age, age squared, migration background, marital status, children), gender-specific human capital controls (highest degree and actual work experience), job characteristics (tenure, tenure squared, public sector dummy, firm size), macro-regions, urban area, gender-specific occupation fixed effects (95 occupation dummies) and gender-specific occupational status fixed effects (15 occupation dummies).

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