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Working Paper

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Working paper

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Abstract

This paper provides novel empirical evidence on the effects of the COVID-19 pandemic on the division of labour among parents of school-aged children in two-parent opposite-gender families. In line with existing evidence, we find that mothers' paid work took a larger hit than that of fathers, and that mothers spent substantially longer doing childcare and housework than their partners. We go further to show that these gender differences cannot be explained by gender differences in the industries and occupations in which parents worked prior to the lockdown. Nor can they be explained by gender differences in earnings prior to the crisis: independently of which parent earned the most before the pandemic, it is always mothers who adjusted time spent on paid and unpaid work more significantly. This is the case even in households where only one partner remained active in paid work. While we cannot fully rule out that these asymmetric responses are explained by gender differences in productivity in domestic work, our results do suggest that other factors, such as gender norms, may play an important role.

Keywords: Time Allocation, Labour Supply, Gender Inequality, Household Behaviour, Covid-19

JEL codes: J16, J22, D13

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1. Introduction

The COVID-19 lockdowns disrupted the work and domestic lives of families around the world. They shutdown entire sections of the economy and many jobs, and drastically increased demand for unpaid domestic labour with market substitutes for childcare and home services suddenly becoming unavailable. Parents were especially affected by the closure of schools and childcare providers that left to them the full responsibility of caring for and educating their children from home. It has been suggested that women -- especially mothers -- may have been disproportionately affected for two reasons. First, they are over-represented in lockdown sectors, such as hospitality and retail, where the risk of temporary or permanent job-loss was high (Alon et al. 2020; Hupkau and Petrongolo 2020). Second, the gendered ways in which families tend to divide responsibilities (Gimenez-Nadal and Sevilla 2012) could be reinforced if the huge increase in demand for domestic labour during lockdown was mainly shouldered by women at the expense of their market work.

This paper provides novel empirical evidence on the effects of the pandemic on the division of labour among parents of school-aged children. We build on the rapidly-growing literature documenting how men and women shared paid and domestic work during the Covid-19 pandemic and showing that women were more likely to stop work and take on the bulk of the additional childcare and housework.² Our contribution is twofold. We start by documenting that the paid and unpaid work of mothers was more responsive to the pandemic shock than that of fathers. These asymmetries led to an increase in gender inequalities in time-use during the lockdown relative to what existed before. We then consider the likely drivers of the emerging gender gaps in time use, separating the roles of labour market shocks

² These patterns were found in studies for UK (Sevilla and Smith 2020; Biroli et al. 2020), the USA (Biroli et al. 2020; Abi Adams-Prassl et al. 2020; Collins et al. 2020), and India (Deshpande 2020). In Germany (Abi Adams-Prassl et al. 2020) and in Australia (Craig and Churchill 2021) women were no more likely to stop work for pay but did take on a greater share of the childcare.

and decisions made by families when faced with unexpected increases in the demand for domestic work. To better understand the determinants of these intra-household decisions, we investigate how they relate to the characteristics of families and of the jobs that mothers and fathers held before the lockdown. Specifically, we examine the hypothesis that ‘who does what’ during the crisis simply reflects a choice to protect the financial wellbeing of the family, accentuating pre-existing inequalities either because fathers are more likely to be the breadwinner to start with, or because of an uneven distribution of employment shocks across gender.

We study the period of the first lockdown in England, which started at the end of March 2020 and lasted until the summer of that year. Over that period, all non-essential shops, services and schools were closed by decree,³ and the UK government implemented generous programs to protect jobs and support the financial circumstances and solvency of families and firms.

To shed light on the evolution of gender gaps in paid work and domestic responsibilities in response to the lockdown, we conducted an online survey between 29 April and 15 May 2020, in which we collected data for families living in England. The data include detailed information about the employment and earnings of parents before and during lockdown, as well as their time-use during lockdown. We measure time-use by administering a time-diary instrument. This method is more accurate than the more aggregated data collection employed in other studies of time-use during the pandemic (Gershuny et al. 2020; Cornwell et al. 2019). It also allows us to separate undisturbed time from multitasking, thus capturing both the quantity and quality of parents’ work time. We asked respondents about themselves and their partner, which allows us to document gender gaps in responses to the lockdown and to examine behaviour within couples. In this paper we use the subsample of opposite-gender two-parent households.

³ Schools remained open only for children of key-workers or those deemed most vulnerable.

We show that while participation in paid work shrunk dramatically during the lockdown for fathers, it did even more-so for mothers. We also document large gender differences in the paid work hours of parents who remained working. We show that there was an opening up of the gender gap in total and uninterrupted hours that parents devoted to paid work compared to before lockdown. At the same time, mothers shouldered more of the additional housework and childcare than fathers, whether or not they remained active in paid work.

Our results suggest that decisions made within the family are a key driver of gender gaps in time use during the lockdown. We show that gaps in work participation and hours of work are not explained by mothers' jobs being structurally more vulnerable to covid-related demand shocks or by mothers working fewer hours before the pandemic and, therefore, being more dispensable to employers. Furthermore, much of the gender gap in participation in paid work arises from instances where parents had a choice over whether to take furlough. Finally, even among observationally similar mothers and fathers, mothers reduced their working hours more sharply and spent a higher proportion of these combining work activities with other domestic duties.

These patterns are not a simple consequence of families prioritising the paid work of the partner who earned the most before lockdown. Using data on relative earnings before the crisis, we show that couples where the father had earned more before lockdown did not organise their time in the opposite way to couples where the mother earned more. In families where the mother was the main earner, she took on more of the domestic responsibilities and less of the paid work responsibilities than similar fathers in families where the father was the higher earner. We see these asymmetries even in the extreme case where one parent stops working for pay entirely during lockdown. While we cannot fully rule out that these asymmetric responses are explained by gender differences in productivity in domestic work, our results suggest that other factors such as gender norms on breadwinner and home-making roles may be important (Akerlof and Kranton 2000; Sevilla-Sanz 2010; Bertrand et al. 2016).

The remainder of this paper is organised as follows. We describe our data in Section 2. Section 3 shows how the working status and working hours of mothers and fathers were differentially affected by the lockdown. Section 4 documents the impacts of lockdown on the burden of domestic chores and childcare faced by mothers and fathers. Section 5 considers whether the observed patterns are consistent with families prioritising the paid work of the higher earning partner. Section 6 concludes.

2. Data

2.1 Survey

Our analysis draws on novel, real-time data collected during the first UK-wide coronavirus lockdown, between 29 April and 15 May 2020. We surveyed 4,925 parents living in England with at least one child aged between 4 and 15 and who was in one of eight different school years at the time of the interview.⁴ Participants were recruited through a reputable online survey company and received a small payment in compensation for their time.⁵ To improve the representativeness of our sample, we imposed sampling quotas based on gender, education and pre-lockdown employment status, and geographic region. While the resulting sample aligns well across key characteristics with a comparable subsample taken from the nationally-representative Labour Force Survey (LFS), we constructed weights to replicate the distribution of a wider set of socio-economic characteristics in that subsample, including family structure, mother's and father's education, pre-pandemic employment status, 2019

⁴ We interviewed parents with children entering Reception in September 2020 and those school-age children in Reception and Years 1, 4, 5, 8, 9 and 10.

⁵ All respondents gave informed consent for us to use the data they provided. We received ethical approval to collect and analyse this data from the UCL Institute of Education Institutional Review Board: Application 1337, "Time allocation and household routines during the COVID-19 lockdown."

pre-tax earnings, and indicators of how vulnerable their jobs were to the lockdown. Details are available in Appendix A.

2.2 Sample and key variables

This paper uses the subsample of opposite-gender two-parent households; there are 3,591 such families in our sample. We interviewed one adult per family but collected comparable data for respondents and their partners and, hence, have a balanced sample of parents.⁶

The key feature of our survey is a detailed record of how respondents and their partners spent their time on the day before the interview. This information was collected using an online time-use diary and refers to term-time weekdays in all cases.⁷ To keep the survey a manageable length, we used one-hour slots. These are longer than the 10-minute intervals used in finer time-use surveys, such as the 2014/15 UK Time Use Survey. To counterbalance the coarser intervals, we allowed respondents to select more than one activity per slot.

⁶ Main respondents are a mix of men and women, making it unlikely that gender differences are driven by reporting differences. We found no systematic differences in reported information by gender of main respondent and our analysis is robust to controlling for the identity of the respondent.

⁷ All interviews were conducted Tuesdays to Saturdays excluding school holidays and the Tuesdays after bank holidays.

Throughout, we study the total number of one-hour slots during which parents are engaged in each activity during the day. For simplicity, we refer to this measure as ‘time’ or ‘hours’ spent on each activity.⁸ Our focus is on time spent in paid work, housework and childcare.⁹

We also collected detailed socio-economic and demographic information for each family, including family composition, the respondents’ and their partners’ age, gender, education in 4 levels,¹⁰ pre-pandemic and current employment status, current furlough, normal weekly working hours and who held most responsibility for key household chores in February 2020 and annual-gross pay in 2019. Finally, we recorded industry and occupation of the jobs each partner held in February 2020 for 20 different industries and 25 different occupations, a level that is roughly equivalent but more detailed than the 2-digit classification in the official UK SIC and SOC codes.

2.3 Descriptive patterns

The average family in our sample had two children living in the household with the youngest being seven years old. 76% of mothers and 92% of fathers were working for pay in February 2020. At that point fathers were much more likely to be in full-time work and to be the higher earner in the family, while mothers did a greater share of the housework than fathers (see Online Appendix Table A2).

⁸ Although our measure is not the same as time spent on each of these activities (and might overstate it), this is inconsequential for our purpose of estimating average gender differences in time use for as long as the error in measurement affects the reported time of men and women similarly.

⁹ Our data provides a more comprehensive and disaggregated description of time use that is described in Figure A1 in the Online Appendix (Appendix B).

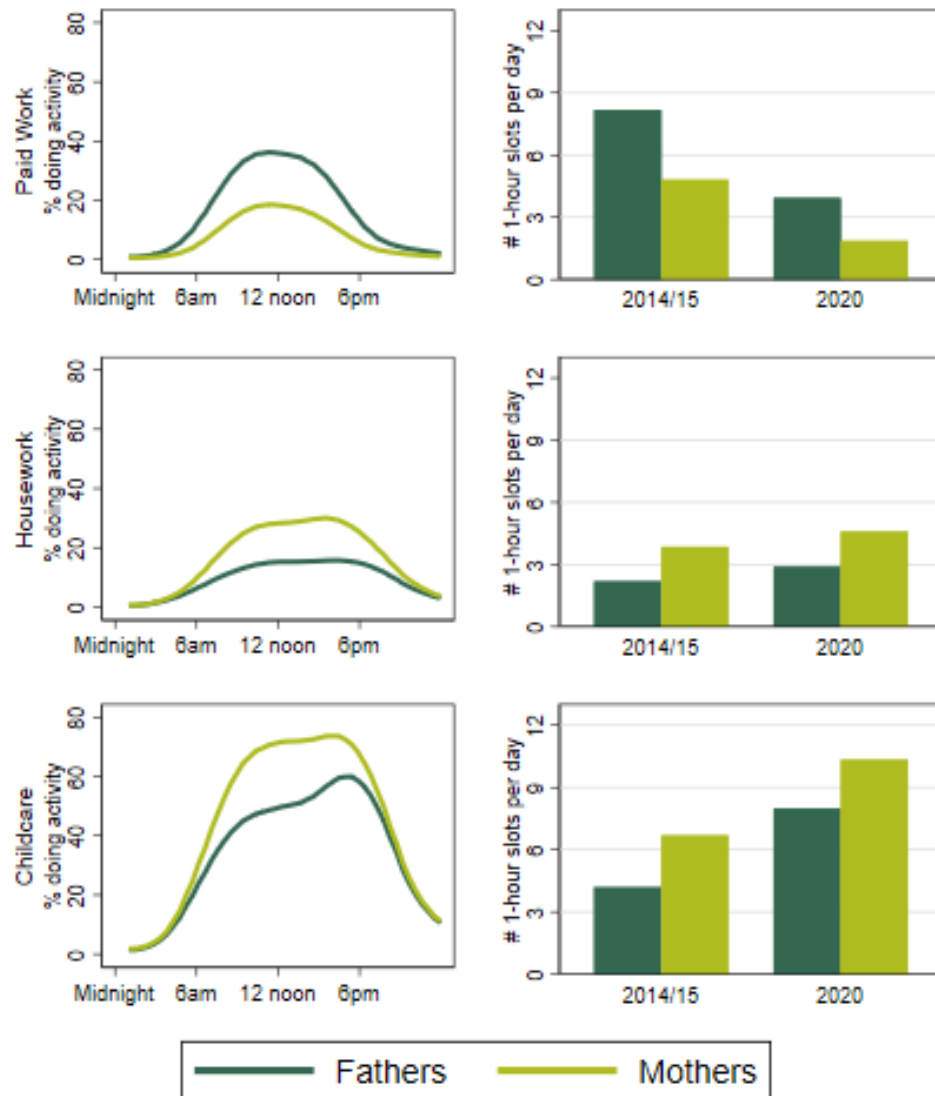
¹⁰ These correspond to leaving school without qualifications, lower secondary qualifications (obtained in the UK at age 16), high-school degree and college degree.

The left-hand panel of Figure 1 shows the distribution of domestic and paid work over a day during lockdown, separately for mothers and fathers. There are stark gender differences in time spent on paid work, housework and childcare. At all points in the day, more fathers than mothers were doing paid work. The reverse is true for housework and childcare; for example, during core working hours around 70% of mothers were doing childcare compared with 50% of fathers.

The right-hand panel of Figure 1 further shows the total amount of time spent on these activities per day and how it compares with pre-lockdown levels reported in the UK Time-Use Survey for 2014-15.¹¹ Compared to 2014/15, we observe a large reduction in working hours for both parents and a compensating increase in domestic work during lockdown. Overall, fathers spent only about a half of the amount of time that they used to spend on paid work in 2014/15 and mothers' as little as two-fifths. In the rest of the paper we study the extent to which these changes in time use are different for mothers and fathers and whether they can be explained by pre-existing differences in the jobs and family roles of each parent.

¹¹ We use comparable measures constructed from a comparable sample of parents from the 2014/15 Time Use Survey as a baseline against which to compare how parents shared responsibilities for domestic and paid work during lockdown.

Figure 1. Mothers' and fathers' time use: distribution over the day (on the left) and total daily loads in 2014/15 and 2020 (on the right)



Notes: The figures report (a) the proportion of fathers and mothers engaging in each activity in one-hour slot of the day on weekdays and (b) the total one-hour time slots spent engaging in each activity. The samples include both one and two-parent households.

Sources: (a) Authors' own calculations based on the IFS-IoE survey of time use; (b) Authors' own calculations based on the IFS-IoE survey of time use and authors' own calculations based on UKTUS 2014-15.

3. Parents' paid work under lockdown

3.1 Working status

Our data shows that only 55% of parents who had been working in February 2020 were still engaging in paid work at the time of our survey, in May 2020. We find significant gender differences in the rates of and reason for job loss among parents. Overall, mothers were 10 percentage points (pp) more likely to have stopped working for pay than fathers (Column 1, Panel A of Table 1). This gender difference is due in equal parts to mothers being more likely to have been laid off or quit, and mothers being more likely to have been furloughed (Columns 2 and 3, Panel A). These effects compound the already unequal employment rates of mothers and fathers: before the crisis mothers were in paid work at 82% of the rate of fathers, during lockdown this fell to 70%.

The opening gaps in working status could be partly due to differences in the structural vulnerability to lockdown-induced reductions in labour demand of the jobs worked by mothers and fathers before the crisis. To control for these differences, we added a full set of industry and occupation indicators for pre-pandemic jobs, as well as indicators for educational attainment in a linear regression model specification.¹²

Controlling for job characteristics almost doubles the gender difference in how likely individuals were to be in paid work during lockdown, from 9.7pp to 16.7pp (Column 1, Panel B). This suggests that mothers' jobs were *less* structurally vulnerable to the pandemic shock than those of fathers and that, therefore, the decisions made within the family about how to allocate responsibilities during this period are likely to have played an important role in driving the observed gender discrepancies.

¹² We reproduced all estimates using semi-parametric propensity score matching on the same set of covariates. Results are in all similar to those reported in this paper and are available from the authors upon request.

Table 1. Gender gaps in working status during the lockdown among parents who were active in paid work in February 2020

	Working for pay	Layoff or quit	Furloughed	Furloughed with choice	Furloughed without choice
	(1)	(2)	(3)	(4)	(5)
Panel A: Raw Differences					
Female	-0.097*** (0.015)	0.047*** (0.011)	0.050*** (0.013)	0.033*** (0.010)	0.016* (0.010)
Intercept: average for fathers	0.591*** (0.0106)	0.112*** (0.00701)	0.297*** (0.00982)	0.178*** (0.00819)	0.119*** (0.00695)
Panel B: Adding fixed effects for Occupation, Industry and Education					
Female	-0.167*** (0.015)	0.054*** (0.012)	0.113*** (0.015)	0.076*** (0.012)	0.036*** (0.011)
Panel C: Adding fixed effects for Pre-Covid daily hours of paid work					
Female	-0.121*** (0.0167)	0.002 (0.012)	0.119*** (0.016)	0.079*** (0.013)	0.038*** (0.012)
Observations	5,743				

Notes: Table shows estimates of the coefficient for the female indicator (top row of Panel A, and Panels B and C) obtained from weighted linear probability models. The weights were constructed to replicate the distribution of socio-economic and demographic characteristics of families in the 2019 UK Labour Force Survey. Regressions use varying sets of regressors, as explained in panel labels. Dependent variables labelled in column headings are indicators for working status at the time of the interview, during the first lockdown period. Column 1 shows estimates for gender differences in whether parents remain active in work. Those who stop work do so permanently ('Layoff or quit' in Column 2) or temporary ('Furloughed' in Column 3). Furloughing may happen at the request of workers who need to stop working for personal reasons ('with choice' in Column 4) or because employers reduce their economic activity ('without choice' in Column 5). Sample includes all parents in dual-parent opposite-gender families who were active in paid work in February 2020. All standard errors are clustered at the family level. Stars indicate significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

This interpretation is consistent with results in Columns 3-5, showing gender differences in furloughing rates. Early in the pandemic, the UK government released the Coronavirus Job Retention Scheme, a program designed to minimise the destruction of jobs during lockdown. The scheme subsidised up to 80% of the salaries of employees who temporarily interrupted work due to a reduction in the activity of their employers or to their personal circumstances impeding work. No similar subsidy was available for workers only partly reducing their working hours. This provided a strong incentive for specialization at home in two-earner couples, with one parent requesting a work interruption to care for their children while the other parent could remain active in paid work. Our estimates support the view that it did accentuate specialization in a gendered way. They show that almost half of the gender gap in working status, and the majority of the gap in furloughing, comes from situations in which the parent had a choice over whether to take furlough, which are likely associated with furloughing for caring reasons.

Estimates in Panel C provide further support. Here we control for pre-pandemic working hours to assess whether mothers comparatively short pre-pandemic working hours could have made them more dispensable to employers and help explain the opening gaps in working status during lockdown. The survey asked about weekly working hours in February 2020, which we used to construct a daily measure of work hours by dividing by 5, capping at 12 and discretising at the hourly level. A full set of hourly indicators was then added to the regression model. While conditioning on pre-covid working hours collapses the gender gap in layoffs to zero (Column 2), it has no impact on the gender gap in furlough rates (Columns 3-5). Overall, it only reduces the gender gap in working status mildly (Column 1).

3.2 Working hours

Next, we examine parents' hours of paid work, focusing on parents who continued to work for pay during lockdown. The first column of Table 2 compares the working hours of these mothers and fathers during lockdown. Row 1 shows that according to our data mothers were doing 2.3 fewer hours of paid work, 30% less, than fathers (who, on average, were working 7.2 hours per day). Controlling for prior job characteristics and education changes the gender difference in working hours only slightly (Column 2).

Results in Columns 3 through 6 show that only a proportion of these gaps in working hours pre-dated the lockdown. We first compare mothers and fathers working the *same* hours in similar jobs before the pandemic (Column 3); we see a new large gap emerging for them, of about 1.2 hours per day (or 70 minutes, Column 3). We then quantify the gender differences in the *change* in working hours using a difference-in-differences regression model that nets out the pre-pandemic gap (Columns 4 and 5); these estimates show that the working hours of women did not drop by more than those of men. To reconcile these results, we notice that many more mothers than fathers already worked very short hours before the pandemic. For instance, 17% of working mothers and 3% of working fathers worked fewer than 4 daily hours in February 2020. The scope for them to further reduce their hours while remaining active in work is, therefore, especially limited. We therefore limited our sample to those parents who had scope to reduce working hours - those who were working at least 4 hours per day pre-pandemic - in Column 6. For this subsample we see a widening of the gap, with mothers reducing their hours by 0.4 hours (25 minutes) more than fathers.

Not all working time is equally productive and interruptions can be particularly detrimental for productivity (Coviello et al. 2015; Coviello et al. 2014; Adams-Prassl 2020). With many parents working from home during lockdown, interruptions were especially frequent. Row 2 in Table 2 reproduces the

estimates in Row 1 for *uninterrupted* working hours, defined as the total number of 1-hour slots that were exclusively dedicated to paid work.

Table 2. Gender gap in daily hours of paid work among parents who were working for pay in February 2020 and during the lockdown

	Hours worked in levels			Change in hours worked			Average for fathers	
	(1)	(2)	(3)	(4)	(5)	(6)	Level in lockdown	Change
(1) Total paid work hours	-2.267*** (0.166)	-1.896*** (0.182)	-1.214*** (0.196)	-0.230 (0.165)	-0.191 (0.190)	-0.422** (0.187)	7.2	-1.2
(2) Uninterrupted paid work hours	-2.428*** (0.155)	-2.019*** (0.173)	-1.440*** (0.184)	-0.391** (0.161)	-0.314* (0.186)	-0.650** (0.196)	5.1	-3.3
Observations	3,095							
FEs for occupation, industry and education		✓	✓		✓			
FEs for pre-lockdown working hours			✓					
Working at least 4 hours per day pre-lockdown						✓		

Notes: Table shows estimates of the coefficient for the female indicator obtained from weighted linear regression models. The weights were constructed to replicate the distribution of socio-economic and demographic characteristics of families in the 2019 UK Labour Force Survey. In Columns 1-3, the dependent variables are the total number of one-hour slots that respondents record doing paid work (Row 1) and *only* paid work (row 2) during the day before the interview. In Columns 4-6, we use the constructed measure of the pre-pandemic daily working hours (see Section 3) to calculate the before-after change in total and uninterrupted hours. Regressions use varying sets of regressors, as indicated in the bottom two rows. Sample includes all parents in dual-parent opposite-gender families who were active in paid work in February 2020 and remained so at the time of the interview. Column 6 further restricts the sample to those working at least 4 hours per day pre-lockdown. All standard errors are clustered at the family level. Stars indicate significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

We find that parents faced significant disruptions to their working time that compounded their already reduced schedules: 2.1 and 2.3 of the hours that fathers and mothers spent working were combined with other activities (columns 1 and 7). These interruptions were especially significant for mothers, who were left with only about 2.6 hours of uninterrupted work, or about 40% of their average 6.3 pre-

lockdown total working hours. Estimates in columns 1 to 3 show that the gender gaps in uninterrupted work time are, if anything, larger than those in total work time.

By comparison, UK-TUS data for 2014/15 show that before lockdown the longer working days of fathers were also more interrupted than the working days of mothers, at 2 and 1.6 hours respectively (Andrew et al. 2020). The reversal of this gap during lockdown suggests that gender gaps opened more sharply in uninterrupted than in total work time. To investigate this hypothesis, we look at changes in uninterrupted work time in a difference-in-differences framework. Since pre-pandemic interruptions are not observed in our survey, we proxy uninterrupted with total work time in February 2020. Assuming the UK-TUS patterns remain valid in 2020, this procedure will produce upward biased estimates of the gender gap. In other words, a negative gap will be biased towards zero, underestimating the true extent to which differences opened. Estimates in Columns 4 and 5 show that mothers' uninterrupted work hours fell by around a third of an hour, or 20 minutes more than that of fathers. A larger gap opened among those working at least 4 daily hours in February 2020, at about 40 daily minutes (Column 6). As explained, these are likely lower bounds for the extent to which this gap opened.

4. Childcare, home schooling and housework during lockdown

Lockdown vastly increased demands for childcare and domestic work; estimates in Table 3, Column 1, Rows 1-2 show that mothers shouldered a larger proportion of childcare and housework during this period than fathers, spending on average 4 hours more on these activities (2.4 and 1.7 more hours on childcare and housework respectively). In Column 2 we add a full set of indicators for pre-lockdown

working hours and division of housework to control for pre-lockdown differences in time-use.¹³ This reduces the gender differences in time spent on childcare and housework during lockdown but they remain substantial at 1.4 and 1 hours respectively. These differences persist even when we restrict the sample to those in active paid work pre-lockdown (Column 3).

The gaps in domestic work could be explained by fathers being more likely to keep working during the crisis, or their jobs having different demands. However, controlling for the characteristics of jobs parents had pre-lockdown leaves the results unchanged (Column 4), as does restricting the sample to parents in work during lockdown (Column 5). Mothers who continued to work were still doing 1.5 more hours of childcare and around 0.7 more hours (40 minutes) of housework than similar fathers who continued to work.¹⁴

We cannot directly investigate how parents shared additional childcare responsibilities during lockdown because we do not observe time spent caring for children before lockdown. To get at that, we leverage the granularity of the time-use data to isolate two categories of childcare for which demand increased substantially and that can, therefore, be considered as additional load: time spent on childcare during 'school hours' (between 9am and 3pm) and on home-schooling (supporting a child doing learning activities).

¹³ Pre-lockdown division of housework was captured by asking who within the couple held most responsibility for six key household chores before the pandemic, on a scale from 1 ("mostly me") to 6 ("mostly my partner"). Respondent's share of housework is constructed by taking the ratio of the average of these six variables to their range and discretising this measure into 10 equal-sized intervals. Symmetrically, the share of housework done by the respondent's partner was set to 1 minus the value of that variable for the main respondent.

¹⁴ We see that mothers who remained active in work spent almost the same amount of time on childcare as did fathers who stopped working.

Table 3. Gender gap in daily hours of childcare and domestic work during lockdown

	(1)	(2)	(3)	(4)	(5)	Average: fathers in lockdown
(1) Housework	1.654*** (0.0745)	0.956*** (0.0896)	0.907*** (0.101)	0.877*** (0.113)	0.717*** (0.158)	2.2
(2) Childcare	2.359*** (0.107)	1.423*** (0.130)	1.464*** (0.147)	1.444*** (0.163)	1.504*** (0.239)	8.0
(3) Childcare during school hours	1.343*** (0.0614)	0.801*** (0.0680)	0.820*** (0.0761)	0.808*** (0.0811)	0.879*** (0.121)	2.9
(4) Homeschooling	0.827*** (0.0477)	0.621*** (0.0579)	0.617*** (0.0657)	0.581*** (0.0704)	0.650*** (0.107)	1.3
Observations	7,152	7,152	5,745	5,743	3,095	
FEs: pre-lockdown working hours & housework share		✓	✓	✓	✓	
FEs: occupation, industry and education				✓	✓	
Sample:						
Worked before lockdown			✓	✓	✓	
Worked during lockdown					✓	

Notes: Table shows estimates of the coefficient for the female indicator obtained from weighted linear regression models. The weights were constructed to replicate the distribution of socio-economic and demographic characteristics of families in the 2019 UK Labour Force Survey. The dependent variables are the total number of one-hour slots that respondents record doing housework (Row 1), childcare (Row 2), childcare between 9am and 3pm (Row 3) and homeschooling (Row 4) in the day before the interview. Regressions use varying sets of regressors, as indicated at the bottom 2 panels of the Table. Sample varies by column. The entire sample of parents in dual-parent opposite-gender families is used in Columns 1-2; Columns 3-4 restrict the sample to those parents who were active in paid work in February 2020; Column 5 further restricts the sample to those parents who were still active in work at the time of the interview. All standard errors are clustered at the family level. Stars indicate significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Estimates in Row 3 show that mothers did 1.3 additional hours (80 minutes) of childcare during school hours relative to fathers (Column 1). This gap remains large at 0.8 hours (50 minutes) when controlling for how partners shared housework responsibilities before the lockdown (Column 2) and is not affected by any of the other controls (Columns 3-5). Home schooling was also disproportionately covered by mothers, who did 0.8 more hours (50 minutes) per day than fathers (Row 4, Column 1).

These hours of childcare and home-schooling represent increasing inequalities in the assignment of domestic responsibilities; they are also most likely to compete with working activities.

5. Were households prioritising the paid work of the parent with the highest earning capacity?

Our findings so far suggest that faced with new challenges and constraints, adults in two-parent families intensified specialisation in the gendered way that already prevailed before the pandemic. Furthermore, we find that this is unlikely to be entirely driven by gendered patterns in changes in labour demand in response to the pandemic shock. We now consider what might be driving these family decisions. Many economic models of the household predict that couples will prioritise the paid work for the partner whose employment is the most financially valuable relative to the value of them performing domestic work. While we cannot measure productivity in domestic work and childcare, we can examine whether the gender gaps in the responses to the lockdown that we found are consistent with behaviour that would protect the financial wellbeing of the family.

First, we assess whether couples who were both working for pay before lockdown prioritised the paid work of the main earner, regardless of gender. We do this by estimating the gender gaps for main earners, comparing the time-use of male main earners with that of female main earners. Overall, the results, presented in Table 4 (Column 1), are *not* consistent with this hypothesis: couples where the father earned more did not organise their time in the opposite way to couples where the mother earned more. Controlling for the characteristics of the jobs of the main earner, we find that in families where the mother was the main earner, she took on more of the domestic responsibilities and less of the paid work responsibilities than similar fathers in families where he was the higher earner. Indeed, we find gender gaps for main earners that are similar to those reported for all parents working pre-pandemic. Estimates in Rows 7 and 8 restrict the sample to those working at least 4 hours before the pandemic. They show that mothers who were the main earner in the family reduced their hours by

more than similar fathers, with a gap that is close in magnitude but more imprecisely estimated than that found for all workers.

Not much changes if we zoom in on couples where both partners continued to work during lockdown (Column 2). The gaps in domestic work and childcare increase slightly (Rows 1-2), and while we detect no gender difference in total working hours, higher earning working mothers do almost 1 hour less of focused uninterrupted work than similar higher earning fathers (Rows 5-6). Finally, the size of the gap in uninterrupted work time net of pre-lockdown differences remains the same, though with the much smaller sample the estimate is noisier and no longer statistically significant (Row 8).

These results suggest that the choices families made were not entirely consistent with prioritising the work of the partner who earned the most. A threat to this interpretation, however, is the possibility that, in fact, both partners did more domestic work and less paid work in families where mothers were the main earner. To check for this we compare the *within family difference* in time dedicated to each activity in families where the mother was the main earner to that same difference in families where the father was the main earner. Results are displayed in Columns 3-4 of Table 4, respectively for all couples working pre-pandemic where one partner earned more than the other and for the subsample of those where both partners remain active in work during the lockdown.

We see that, if anything, the sizes of the gender gaps increase when looking at within family differences in time allocation. For instance, the difference in childcare time between higher and lower paid partners is almost 2 hours larger when the higher paid partner is the mother than when the higher paid partner is the father (Row 2, Column 3). This reveals that it is not only higher paid mothers who were doing more childcare than similar higher paid fathers - lower paid mothers were also doing more childcare than similar lower paid fathers. As before the gaps increase once we restrict the sample to couples where both partners remained active in work during lockdown (Column 4). The childcare gap increases to over 2 hours and there is a 1.5 hour gap in uninterrupted work hours – that is, the

difference in uninterrupted work hours between higher paid and lower paid partners (i.e within-couple difference) is 1.5 hours smaller when the higher paid partner is the mother than when it is the father (Row 6).

Finally, we look at families in which both parents were working prior to lockdown but one parent stopped working for pay during lockdown (due to being laid off, having quit, or having taken furlough). Here too we find asymmetries in the division of responsibilities depending on whether it was the mother or the father who stopped working for pay. Columns 5 and 6 of Table 4 show that whether or not the mother was the partner who continued to work, she always did more childcare and housework than a father in similar circumstances (Rows 1-4). Moreover, if she was the one remaining active in work, she also did almost 1 hour less paid work than a similar father in a family where only he remained active. In first differences, the gap looks more negative than prior to the pandemic, but estimates are not statistically significant.

Table 4: Heterogeneity in the gender gaps in time-use during lockdown; couples with both partners working in February 2020

	Partner who earnt the most		Within-family difference between highest and lowest paid		Partner who remained in work	Partner who stopped working
	(1)	(2)	(3)	(4)	(5)	(6)
(1) Housework	0.365* (0.198)	0.608* (0.321)	0.958*** (0.216)	0.709* (0.372)	0.377 (0.255)	1.182*** (0.294)
(2) Childcare	0.986*** (0.298)	1.386*** (0.508)	1.811*** (0.349)	2.235*** (0.698)	0.823** (0.397)	1.479*** (0.350)
(3) Childcare during school hours	0.548*** (0.141)	0.757*** (0.258)	1.008*** (0.203)	1.174*** (0.401)	0.642*** (0.197)	0.685*** (0.171)
(4) Homeschooling	0.540*** (0.130)	0.655*** (0.229)	0.780*** (0.158)	0.891*** (0.296)	0.329** (0.157)	0.500*** (0.179)
(5) Work hours	-0.577** (0.257)	-0.0474 (0.379)	-0.711** (0.358)	-0.564 (0.617)	-0.907*** (0.335)	
(6) Uninterrupted work hours	-0.653*** (0.211)	-0.939** (0.416)	-0.762** (0.302)	-1.471** (0.612)	-0.813** (0.326)	
(7) Change in work hours	-0.402 (0.282)	0.169 (0.425)			-0.169 (0.346)	
(8) Change in uninterrupted work hours	-0.455* (0.246)	-0.574 (0.441)			-0.237 (0.355)	
Observations	1921	686	1921	686	884	884
FEs: own hours, occupation, industry, education	✓	✓	✓	✓	✓	
FEs: partner's hours, occupations, industry, education			✓	✓		✓
Sample:						
Worked during lockdown		✓		✓	✓	✗
Partner worked during lockdown		✓		✓	✗	✓

Notes: Table shows estimates of the coefficient for the female indicator obtained from weighted linear regression models. The weights were constructed to replicate the distribution of socio-economic and demographic characteristics of families in the 2019 UK Labour Force Survey. The dependent variables are the total number of one-hour slots in which the respondents record doing housework (Row 1), childcare (Row 2), childcare between 9am and 3pm (Row 3), homeschooling (Row 4), paid work (Row 5), only paid work (Row 6). These are used in individual levels for regressions in columns 1-2 and 5-6, and within family differences for

regressions in columns 3-4. In rows 7-8 the dependent variable is the change in total and uninterrupted work hours using our measure of pre-pandemic daily work hours (see Section 4). The sample used to produce the estimates reported in columns 1 and 3 is that of the highest earner partner in couples where both spouses were working pre-pandemic. For estimates in Columns 2 and 4 we further restrict that sample to couples where both partners remain active in work during lockdown. The sample used to produce the estimates reported in column 5 is that of the active partner in couples where only one spouse keeps working during the lockdown; while the sample used to produce the estimates in column 6 is that of the partner who stopped working in these same families. In rows 7-8 we further restrict the sample to parents working at least 4 hours pre-pandemic; the total number of observations used in rows 7-8 drops to and 1,869, 667 and 836 in columns 1, 2 and 5, respectively. To produce estimates in columns 1, 2, 5, we control for a full set of indicators for pre-lockdown daily working hours, share of housework, occupation, industry and education on the partner who is the highest earner in the family (Columns 1-2) or who is the single partner who remains active in work (Columns 5-6). In Columns 3-4 we control for the same information for both spouses. Stars indicate significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6. Conclusion

In this paper, we show large gender gaps in how parents shared paid and domestic work during lockdown. Mothers in England were more likely than fathers to stop working but not because their jobs were structurally more vulnerable to shocks in labour demand. We document widening gaps in time spent on childcare, housework, total and uninterrupted work. The evidence we present suggests that these gender gaps are unlikely to have been driven solely by families' focusing on immediate financial considerations. We find that they look strikingly similar irrespective of whether a mother earned more or less than her partner before the pandemic, or whether or not she is the only partner who remains active in work during the lockdown.

These findings highlight that we still lack understanding of the key drivers of intra-household divisions of paid and unpaid work, and suggest that the attitudes of mothers, fathers and employers may play an important role. Recent evidence supports this view, for instance by showing that generous paternity leave policies can lead to persistent increases in fathers' involvement in childcare (Farré and González 2019; Patnaik 2019; Tamm 2019). The pandemic was a much bigger shock to how families organise their lives than any parental leave reform so far. A key question for future research is the extent to which this crisis will have transformative effects on attitudes to gender roles that promote greater gender equality.

A second key open question relates to the long term effects of the crisis on the careers of women. Past research showed that career interruptions are closely linked to large child penalties for mothers (Blundell et al. 2016, Adda et al. 2017, Costa-Dias et al. 2020). If tough labour market conditions persist for some time, the temporary work interruptions, sharp reductions in working hours and even larger drops in focused work time that were all more frequent among mothers may give way to job loss, skill depreciation and, ultimately, harm wages.

Going forward, the unequal responses that we documented could be reinforced in a new world of work where flexible work arrangements see mothers disproportionately working from home, in environments that are less conducive to productive work and the rich interactions that workplaces provide. In turn, increased work flexibility and a fundamental change in gender attitudes could counterbalance these new challenges by allowing mothers to remain actively engaged in pursuing their professional careers. The interactions between these various forces will ultimately determine how the pandemic crisis shapes progression towards gender equality (Alon et al. 2020).

Finally, we show that the time use of mothers reacts systematically more sharply than that of fathers to transitory unexpected increases in demands from home, and in ways that affect the reliability and predictability of their work time and productivity. If this finding applies to a wider set of circumstances than this pandemic, it could be an important and yet unexplored factor in explaining gender pay gaps. Specifically, the excess volatility in maternal work time in response to the demands from home will likely have adverse effects on their careers if, as expected, employers value certainty in the production process. Investigating this driver of gender inequalities is an important topic for future research.

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Online Appendix 1: Reweighting

To examine the representativeness of our data, we constructed a subsample of the nationally representative 2019 Labour Force Survey (LFS) that was comparable to our population of interest.¹⁵ Columns 1 and 2 of Table A1 in Appendix A contrasts socio-economic characteristics in the two samples. While the discrepancies are not large, we do see that our sample contains more high earners and high educated individuals, and more workers in industries that were locked down during the crisis.

To correct for sampling bias, we reweight our data to replicate the distribution of key socio-economic characteristics observed in LFS, including region, family structure, mother's and father's education, pre-pandemic employment status, 2019 pre-tax earnings, and indicators for whether the industry they worked for pre-pandemic has had more than 50% of jobs locked down and whether their pre-pandemic occupation can be worked from home.¹⁶

Weights were constructed at family the level. We did so by pooling data from LFS and our samples and regressing an indicator for LFS data on the weighting characteristics. We truncate our weights at the 10th and 90th percentiles to prevent our analysis being overly sensitive to a few observations. Column 3 of Table A1 shows that the average characteristics of the reweighted sample are very similar to those of the LFS sample.

Table A1. Means for our survey sample (weighted and unweighted) compared with nationally representative Labour Force Survey sample

	(1) Comparable LFS sample	(2) Our sample, unweighted	(3) Our sample, reweighted
<i>Characteristics reweighted on</i>			
Women's education			
GCSEs or less	0.329	0.241	0.301
A levels	0.242	0.273	0.250
University degree	0.429	0.486	0.450
Men's education			
GCSEs or less	0.416	0.305	0.372

¹⁵ Specifically, we took the subsample of parents in opposite-gender partnerships living in England with at least one child between the ages between 2 and 15. The age range of children in our LFS sample is slightly wider than that in our collected data because the LFS records the age of children in broad intervals.

¹⁶ The share of jobs in an industry subject to the lockdown and the share of jobs in each occupation that can be done from home are calculated using the methods set out in Costa-Dias et al. (2020)

	(1) Comparable LFS sample	(2) Our sample, unweighted	(3) Our sample, reweighted
A levels	0.230	0.233	0.236
University degree	0.354	0.462	0.392
Prior employment			
Women's pre-crisis employment	0.765	0.723	0.760
Men's pre-crisis employment	0.937	0.884	0.917
Women's pre-crisis earnings			
£0–£9,999	0.439	0.309	0.417
£10,000–£24,999	0.294	0.400	0.297
£25,000–£39,999	0.162	0.139	0.164
£40,000+	0.105	0.152	0.122
Men's pre-crisis earnings			
£0–£9,999	0.127	0.088	0.131
£10,000–£24,999	0.206	0.321	0.224
£25,000–£39,999	0.302	0.265	0.303
£40,000–£59,999	0.188	0.169	0.183
£60,000+	0.176	0.157	0.159
Pre-crisis industry			
<i>Proportion working in industry where 50%+ of jobs have been locked down</i>			
Women	0.218	0.311	0.243
Men	0.262	0.334	0.288
Pre-crisis occupation			
<i>Proportion working in occupation where home working is possible in 0–15% of jobs</i>			
Women	0.310	0.302	0.308
Men	0.363	0.352	0.353
<i>Proportion working in occupation where home working is possible in 15.1–75% of jobs</i>			
Women	0.221	0.198	0.200
Men	0.191	0.273	0.211
<i>Proportion working in occupation where home working is possible in 75.1–100% of jobs</i>			
Women	0.469	0.500	0.491
Men	0.446	0.375	0.436
Region			

	(1) Comparable LFS sample	(2) Our sample, unweighted	(3) Our sample, reweighted
Greater London	0.114	0.171	0.123
South East	0.255	0.158	0.223
South West	0.098	0.107	0.107
West Midlands	0.105	0.106	0.102
North West	0.129	0.147	0.139
North East	0.056	0.067	0.061
Yorkshire and the Humber	0.109	0.097	0.100
East Midlands	0.092	0.075	0.094
East of England	0.042	0.072	0.052
Characteristics not reweighted on			
Education			
Neither partner university	0.470	0.401	0.455
One partner university	0.265	0.252	0.251
Both partners university	0.265	0.348	0.294
Employment			
Neither partner employed	0.028	0.060	0.037
One partner employed	0.235	0.273	0.249
Both partners employed	0.737	0.667	0.714

Online Appendix 2: Additional Tables and Figures

Table A2. Pre-covid sample characteristics (weighted)

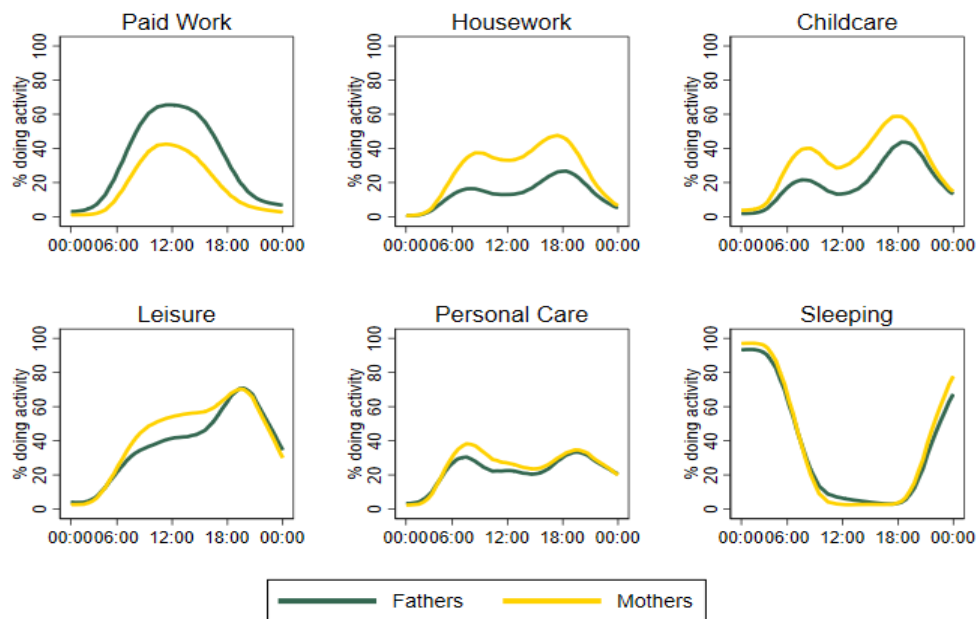
	Mothers	Fathers
Background characteristics		
Highest education: University Degree or higher	0.450 (0.498)	0.392 (0.488)
Highest education: A-levels (or equiv. age 18 qualification)	0.250 (0.433)	0.236 (0.425)
Highest education: GCSEs (A*-C) (or equiv. age 16 qualification)	0.275 (0.447)	0.326 (0.469)
Highest education: Less than GCSEs	0.025 (0.157)	0.047 (0.211)
Age of Youngest Child	7.285 (4.345)	7.285 (4.345)
Number of children in household	1.979	1.979

	(0.882)	(0.882)
Paid and domestic work before COVID-19		
Working for pay in February 2020	0.760	0.917
	(0.427)	(0.275)
Fulltime in February 2020	0.426	0.847
	(0.495)	(0.361)
Higher earner in 2019	0.160	0.718
	(0.367)	(0.450)
Share of household earnings in 2019	0.345	0.653
	(0.211)	(0.199)
Housework share before COVID-19	0.552	0.448
	(0.132)	(0.132)
Observations	3591	3591

Figure A1. Mothers' and fathers' time use over the day



a) During the lockdown (May 2020)



b) Before the lockdown (2014-15)

Note: The figures report the proportion of fathers and mothers engaging in each activity in one-hour slot of the day on weekdays. The samples include both one and two-parent households.

Sources: (a) Authors' own calculations based on the IFS-IoE survey of time use; (b) Authors' own calculations based on UKTUS 2014-15.