Gender Gaps in Home Schooling Time

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Abstract

The COVID-19 pandemic has led to drastic changes to family life, including a significant increase in childcare responsibilities for parents of school-aged children. To examine the effects of the pandemic on time use in opposite-gender couples, I conduct a survey of married or cohabiting parents of school-aged children in England. The total time parents spend on childcare activities significantly increased between February and June 2020, but the gender gap in childcare responsibilities has grown significantly during the first months of the pandemic. The widening of the gender gap has been driven primarily by a more unequal division of educational activities with children. Increases in the home schooling gender gap are more (less) pronounced in couples where the mother (father) stopped working during the first UK lockdown. Perceived returns to maternal (as opposed to paternal) time investment in home schooling are positively correlated with an increase in the home schooling gender gap, even controlling for changes in the employment status of partners. The increase in the home schooling gender gap is also larger in households where the respondent holds traditional attitudes towards gender roles. I provide evidence of widespread conservative opinions about gender roles, as well as a systematic overestimation of the degree of conservatism of other survey participants.

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1 Introduction

The rapid spread of COVID-19 and the ensuing stay-at-home orders have led to drastic changes to the daily lives of individuals all over the world. For parents, the closure of schools and childcare centers has translated into a significant increase in total time spent on childcare activities during weekdays and weekends alike (for the UK, see for example Andrew et al., 2020*a*; Blundell et al., 2020; Sevilla and Smith, 2020).[1] Recent studies on time use during COVID-19 find that women are shouldering a larger share of these additional childcare duties. The growing gender gap in unpaid work has been put forward as a contributor to gender inequalities in the labor market impact of COVID-19 (Adams-Prassl et al., 2020*b*; Alon et al., 2020; Bangham, 2020). In light of these findings, understanding changes in time-use patterns within families and how parents decide to share the additional childcare responsibilities has important implications for policy.

In this paper, I document changes in the time use of parents of school-aged children during the first period of school closures in the UK, and further investigate the determinants of the growing gender gap in parental time allocated to educational activities with children. To answer my research question I proceed in three steps. First, I analyze how the home schooling gender gap reacted to changes in the employment status of parents in the couple during the first months of the COVID-19 crisis. Second, I provide novel evidence on respondents' beliefs about returns to maternal time investment in children and their attitudes towards gender roles. Third, I examine the role of these beliefs in explaining changes in the home schooling gender gap, over and beyond the effect of changes in the employment status of partners.

To shed light on the time use of parents before and during the coronavirus crisis, I administer a novel, geographically representative survey to around 1800 parents in England who are married or cohabiting and with at least one school-aged (5-16) child. In the survey, I collect information on how respondents and their partners allocate time across different activities, including home schooling. With these data, I document how the first period of school closures changed the way in which parents allocate time across paid and unpaid work.

To elicit parental beliefs about the returns and costs to mothers (or fathers) spending time on educational activities with children, I design a novel measurement tool based

[1] See also Del Boca et al. (2020); Farré et al. (2020) for the impact of COVID-19 on gender differences in paid and domestic work for Italy and Spain, respectively.

on hypothetical scenarios. The hypothetical scenarios allow to overcome the problem that a household's choice about time allocation is endogenous to the couple's socio-economic background, labor market status and preferences. I design the scenarios to purposely measure beliefs about both child and parental outcomes. More specifically, I ask respondents to imagine a hypothetical British family where both parents work full-time and have to decide how to split home schooling responsibilities for a total of four hours per working day. Survey participants are presented with two scenarios in which either (i) the mother alone takes care of home schooling the child for four hours per day, or (ii) the father alone spends four hours per day on educational childcare activities. For each scenario, I elicit respondents' expectations about a number of paternal, maternal and child outcomes.

To measure attitudes towards gender roles, I make use of vignettes to collect parents' stated preferences about time allocation in a hypothetical family. As in the case of perceived returns to maternal time investment, respondents are presented with scenarios featuring the same hypothetical family having to home school their only child during the period of school closures. However, this time respondents are asked to indicate the share of total home schooling tasks that they think the hypothetical mother should take on, separately for the case where the hypothetical mother earns less or more than her husband.

Several results emerge from this study. The first set of findings relates to changes in time use for parents in England between February and June 2020. Data on self-reported time allocation across different home-production activities show that parents' total time spent on house chores and childcare has significantly increased between February and June 2020. On the other hand, time spent on market work has decreased. While these trends hold for both mothers and fathers, the gender gap in time spent on educational activities with children has widened dramatically during the first months of the pandemic. Second, zooming in on changes in the home schooling gender gap, I find evidence of asymmetric responses to parental job loss. The gender gap widens by more than one hour per day from a baseline of 30 minutes in households where the mother stopped working between February and June 2020. Conversely, in households where the father alone stopped working the gap reduces by 19 minutes from a baseline of 36 minutes per day, but does not fully close.

I then turn to the role of beliefs about returns to maternal (*versus* paternal) time investment in educational activities with children and beliefs about gender roles in explaining the (asymmetry in) changes in time allocation to home schooling activities

during the pandemic. First, I document parents' perceptions about the benefits and costs to maternal time investment in educational activities with children. I compare answers to the scenario in which the mother alone takes care of home schooling tasks to answers for the opposite scenario where the father is the sole provider of home schooling. Looking at parental outcomes, I find that both perceived productivity at work and opportunities for career progression decrease when the hypothetical parents have to devote four hours of their day to educational childcare activities. The gradient is however more pronounced for maternal outcomes than paternal outcomes. This suggests that mothers are not thought to be intrinsically better at multi-tasking or balancing work and childcare responsibilities. Similarly, parental satisfaction with life decreases with time spent on home schooling activities, for both genders. Looking at differences in perceived returns by background characteristics, I find that women perceive both the costs for mothers and the benefits for fathers as higher than male respondents, in absolute terms. The number of children is also strongly predictive of more negative (positive) returns in terms of maternal (paternal) outcomes. Turning to child outcomes, respondents to my survey do not report differences in perceived effectiveness of maternal and paternal time investment in home schooling activities.

Looking at beliefs about gender roles, the data reveal the existence of widespread traditional gender identity norms among participants to my study. Around 50% of respondents think mothers should take care of the majority of home schooling tasks, irrespective of who is the main earner in the couple. Female respondents are found to be more conservative in their attitudes about gender roles than male respondents.

Finally, I analyze whether beliefs about returns to maternal time investment and gender roles can explain changes in the home schooling gender gap, over and beyond household characteristics and changes in the work arrangements of parents. I find that increases in the home schooling gender gap are larger in households where the respondent holds traditional views about gender roles. Gender-role attitudes are particularly strong predictors of increases in *maternal* time dedicated to educational activities with children. Returns to maternal time investment in terms of perceived life satisfaction of both parents are also found to be positively associated with increases in the gender gap.

Taken together, the results from this paper contribute to improving our understanding of the unequal impact of COVID-19 across gender, and of the way in which parents in opposite-gender couples share unpaid work. In particular, I highlight a widening gender gap in childcare responsibilities in two-parent households during the first UK lockdown. The labor market status of parents is a strong predictor of the change in time allocation

within families but, even in families where fathers stopped working, mothers continue to shoulder around half of all home schooling activities. This paper shows that beliefs about perceived returns to maternal time investment and, most importantly, gender roles appear to have a role in explaining these asymmetries.

This paper relates to three main strands of literature. First, it contributes to recent and ongoing work on gender differences in the impact of the coronavirus pandemic (Adams-Prassl et al., 2020*a*,*b*; Oreffice and Quintana-Domeque, Forthcoming; Russell and Sun, 2020). Closest to this study are papers documenting gender differences in the additional workload associated to COVID-19, with mothers bearing the brunt of additional childcare responsibilities (Andrew et al., 2020*a*,*b*; Biroli et al., 2020*a*; Del Boca et al., 2020; Heggeness, 2020; Hupkau and Petrongolo, 2020; Lee and Tipoe, 2020; Mangiavacchi et al., 2020; Sevilla and Smith, 2020). This study sheds new light on the determinants of these gender differences and the role of parental beliefs in determining time allocations within the household.

Second, this paper builds on and expands the growing literature on the importance of beliefs and preferences for parental investment decisions (Dizon-Ross and Jayachandran, 2015; Boneva and Rauh, 2018; Dizon-Ross, 2019; Attanasio, Boneva and Rauh, 2020). Differently from previous studies that have looked at how parental beliefs shape the amount of investment parents make into their children or the timing of such investment, I examine the intensive margin of choice of whom in the household should take responsibility for childcare activities.

Finally, my paper is related to the literature on the relationship between gender identity norms, female labor supply and home production (Fernandez and Sevilla Sanz, 2006; Bertrand, Kamenica and Pan, 2015; Bursztyn, Fujiwara and Pallais, 2017; Cortés and Pan, 2019; Ichino et al., 2019; Bursztyn, González and Yanagizawa-Drott, 2020; Lassen, 2020; Oh, 2020). Close to this study is Boring and Moroni (2021), who study how the pandemic has affected beliefs about gender norms in France. The authors document a shift towards more traditional beliefs about gender roles following the first lockdown, especially for the most economically vulnerable groups. I contribute to the literature on gender identity norms by examining how perceived gender roles are factored into parental decisions about time allocation to educational activities with children.

The remainder of the paper is structured as follows. Sections 2 and 3 describe the survey design and data. Section 4 presents descriptive evidence on the impact of COVID-19 on time use across families and gender gaps in time allocated to educational activities with children. Section 5 analyzes the role of parental beliefs about gender roles and

perceived returns to maternal time investment in explaining changes in the gender gap in home schooling activities during the coronavirus pandemic. Section 6 discusses the implications of the results and Section 7 concludes.

2 Survey design

The focus of this study is to examine how parents in two-parent families allocate time across different activities and to analyze parents' perceptions about the potential costs and benefits of different time allocations. To this end, I design a survey that I administer to a large, geographically representative sample of parents in two-parent households in England.[2] While I only survey one person per couple, respondents are also asked detailed information about their partner. The survey consists of several different parts, summarised in the rest of this section. The full list of questions can be found in Appendix C.

2.1 Time allocation within the household

To measure how couples in two-parent families divide the responsibility of childcare activities and house chores, I administer a time-use module where respondents have to report the number of hours that they spent on different activities on an average weekday during the week before data collection, and during a typical week in February. Similar questions are also asked about the respondent's partner.[3] The activities survey participants are asked about include educational activities with their children, other childcare activities, house chores and work. Answers to these questions allow me to document how families from different socio-economic backgrounds or with different employment situations differ in terms of how partners contribute to various aspects of home production.

[2] I decided to only survey respondents living in England to avoid heterogeneity arising from differences in both the lockdown restrictions and the schooling system across the devolved nations in the UK.

[3] Time use is measured in hours per day to keep the survey a manageable length. These questions offer a coarser measure of time use than the 10-minute intervals generally employed in time-use surveys, such as the 2015 UK Time Use Survey, and hence may yield less precise coefficient estimates for regressions where time-use measures are used as a dependent variable.

2.2 Beliefs about returns to maternal home schooling time

I develop a novel survey tool to elicit parental beliefs about the returns to maternal *versus* paternal investment in home schooling. To elicit perceived returns to maternal time investment, I make use of hypothetical scenarios. This methodology has been widely applied for the elicitation of beliefs about returns to different types of parental and other investment towards children (see, e.g., Boneva and Rauh, 2018; Attanasio, Boneva and Rauh, 2020). I extend this literature to examine beliefs about returns to the intensive margin of choice between maternal and paternal time investment. Participants to this study are presented with two scenarios depicting a hypothetical British family with one child and two working parents of opposite gender. Due to school closures, the hypothetical parents are faced with the need to spend four hours every day on home schooling activities with their only child and can decide between two time allocations: (i) the mother takes care of home schooling fully by herself for four hours per day, and (ii) the father takes care of home schooling fully by himself for four hours per day. The introductory text to the hypothetical scenarios reads as follows:

> *We will ask you to consider the situation in which, much like today, all schools in the country are closed and have moved their activities online to different degrees. In this context, we will ask you to imagine a British family, the Joneses, who have one child and have to make decisions about who will dedicate time to home schooling their only child. Both Mr and Mrs Jones work full-time. More specifically, we will show you two scenarios and ask for your opinion on certain outcomes. The scenarios will be:*
>
> - *Mrs Jones (Sarah) takes care of all of the home schooling*
> - *Mr Jones (Michael) takes care of all of the home schooling*
>
> *Please think about Michael and Sarah Jones, who both have a university degree and have one child, Emma. Emma is enrolled in Year 5 in an average school in England and has achieved the expected level in the KS1 SATS.*[4] *Sarah and Michael want to dedicate 4 hours every day to home schooling their child, and can decide whether Sarah or Michael alone will take care of all the home schooling activities. Suppose they decide by rolling a dice.*

[4]Respondents were randomised to see scenarios with a female or male child, and with different levels of educational attainment of the two hypothetical parents.

I deliberately chose to depict a hypothetical couple where both partners work full-time, in order to fix ideas about the time constraints faced by the parents. This simplifying assumption may threaten the external validity of my belief measures. However, by presenting participants with scenarios where both partners work full time, I can isolate the effect of perceived returns to maternal time investment in home schooling and avoid the confounding element of beliefs about the gendered specialisation in paid and unpaid work.

Note that in the hypothetical scenarios it is decided by chance whether the mother or the father will home school the child. Whilst this is a simplifying assumption, if this choice was presented as not random, respondents could, for example, interpret the decision of the mother to take care of home schooling as the mother caring more about her child's education than her partner, or her being more capable of helping the child with homework. Making explicit that who home schools the child is decided by a random draw helps circumvent the issue of respondents making inference about preferences or abilities of the hypothetical parents from the choice they are making.

For each scenario, I ask respondents about (the likelihood of) a range of different parental and child outcomes, summarized in Table 1. Comparing responses across the two scenarios allows me to compute a quantitative measure of respondents' beliefs about the benefits and costs of maternal time investment in home schooling.

Table 1: Overview of belief elicitation questions

Scenarios
(1) If the mother takes care of home-schooling fully by herself
(2) If the father takes care of home-schooling fully by himself
Child Outcomes
Earnings of child at age 30 (£)
Child achieves the national standard or more in KS2 (0-100%)
Parental Outcomes
Mother enjoys her life (0-100%)
Father enjoys his life (0-100%)
Mother can complete work tasks (0-100%)
Father can complete work tasks (0-100%)
Mother has full-time job one year from now (0-100%)
Father has full-time job one year from now (0-100%)

Notes: Each respondent is presented with two scenarios. For each scenario, parents are asked about child and parental outcomes as detailed above.

I use probabilistic questions to elicit respondents' perceptions about the likelihood

of different binary outcomes occurring for the two scenarios described above. More specifically, I ask respondents how likely they think it is that each parent will enjoy their life, be able to complete his / her work tasks, and retain his / her full-time job one year from now. I also ask survey participants about the probability that the hypothetical child achieves the expected standard in the KS2 assessments, and the expected earnings of the hypothetical child at age 30.[5]

2.3 Beliefs about gender roles

The division of home schooling tasks between parents may be influenced by parental beliefs about 'who is better at' or 'who should do' a certain activity, i.e., parental beliefs about gender roles. I make use of two additional hypothetical vignettes to construct a measure of traditional beliefs about gender roles. In both vignettes, participants are again asked to think about a hypothetical British family, with two working parents of opposite gender and one child who needs to be home schooled for four hours every day. Respondents are then asked what share of total parental home schooling time they think should fall upon the mother, relative to her partner. Answers are provided on a scale from 0 to 100%, where 100% (0%) corresponds to the case where the mother (father) alone takes care of home schooling. The two vignettes in this module only differ in who is the main earner in the hypothetical couple: in the first vignette, the hypothetical father earns more than the mother, whereas in the second vignette the opposite occurs. The salary difference between parents is fixed for each respondent, and randomised across respondents to be either 2%, 5%, 10% or 20%.[6] To analyze the extent to which individual perceptions deviate from the average expectations of parents in England, I also ask respondents what they think other survey participants would answer to the same questions.

[5]The National Curriculum in England is split into four 'key stages' into which children are grouped depending upon their age. This does not include the first Reception year. The second key stage (KS2) ends in Year 6, when pupils sit a test that assesses their abilities in reading, maths, spelling, punctuation and grammar. The KS2 test is a national standardised assessment that all parents should be familiar with, regardless of the age of their child.

[6]In the UK, the gender pay gap among full-time employees was 8.9% in 2019, whereas it was 17.3% among all employees (Smith, 2019).

2.4 Employment and opinion about the future

I collect information on the employment status of respondents and their partners pre- and during COVID-19. Respondents are asked to report whether they and their partner were working (either full-time or part-time) or out of work at two different points in time - February 2020 and the week before data collection. For June 2020, I further distinguish between workers who are furloughed and those who are out of work for other reasons. For workers (or partners thereof) who report being in work in the week prior to data collection, I collect information on whether they are classified as key workers. To measure the future effect of the lockdown and school closures on parental work patterns, I ask respondents whether they or their partner are considering quitting their job or substantially reducing their work hours to care for their child(ren). Finally, to measure parental perceptions about how COVID-19 will affect the division of childcare responsibilities going forward, I ask participants whether they think the division of childcare in their household will stay the same as it is now, or whether it will become more or less unequal.

3 Data description

I collect primary survey data on a large, geographically representative sample of parents in England. To participate in the survey, respondents had to be resident in England, be at least 18 years old, married or cohabiting and have at least one school-aged child (5-16). The survey was conducted anonymously and administered online through the professional survey company PureProfile. Participants were offered modest incentives to complete the survey. No personal information is collected that would allow to identify any individual respondent. The data were collected between June 15, 2020 and July 6, 2020.[7]

The original sample consists of 1805 respondents and was selected to be representative of the distribution of the population of individuals aged 18 or above across regions in England. Within each region, I used quota-based sampling to ensure an approximately equal representation of men and women. Throughout the text I interchangeably refer to the former group as men or fathers, and to the latter group as women or mothers.

[7]As COVID-19 spread in the UK, the government closed schools from 23 March 2020, except for key workers' children and vulnerable children. A gradual re-opening of schools started on 1 June 2020 for selected age groups. Parents whose children were in school in the week before data collection were asked to think about the last week in which their child was fully home schooled.

Table A.1 in the Appendix shows the distribution of respondents across regions in England and the comparison to the national distribution of the population of adults aged 18 or above. As can be seen from the table, the two distributions are very similar. Table A.2 shows the characteristics of respondents in my sample. By construction, around 50% of the sample are women. Respondents are 43 years old on average and have 1.9 children. The youngest child in the household is on average 8.7 years old. Slightly more than half of survey participants have a university degree and 67% of respondents are in work (either full-time or part-time) in the week before the data collection.[8] The share of respondents in work in June 2020 (67%) is significantly lower than the corresponding figure of 84% for February 2020. Around 37% of respondents who are still in paid work in June 2020 identify themselves as key workers. Out of those who were in paid work before the pandemic, 21% stopped working between February and June 2020. Almost the totality of respondents are in opposite-gender couples (97.6%).

For the analysis, I restrict the sample in the following ways. Given that the focus of this paper is in understanding differences in time allocation across men and women in the household, I restrict the sample to only include respondents in opposite-gender couples. I further exclude observations for respondents that gave implausible answers to the time use questions.[9] This leads to a final sample size of $N = 1,723$. Table A.3 compares the characteristics of my final sample to those of the UK Household Longitudinal Study (UKHLS), where the UKHLS sample has been restricted to respondents to the third wave of the COVID-19 special module that was run in June 2020, and limited to individuals either married or cohabiting, with a partner of opposite gender and with school-aged children.[10] Relative to UKHLS respondents, participants to my study are more likely to have obtained a university degree. Furthermore, the shares of respondents in work in February and June 2020 are slightly lower in my sample compared to the UKHLS, although the two samples are very similar in terms of the share of in-work respondents in February 2020 who stopped working by June 2020. Finally, respondents

[8]Respondents who report being on furlough in June 2020 are classified as "not working" throughout the paper. At the time of data collection, the furloughing scheme in the UK was such that furloughed employees faced the provision of doing no work at all for their employer. Hence, in principle, furloughed workers faced no constraints to their time allocation to unpaid work as arising from work commitments. In this sense, this lack of constraint is similar to that faced by individuals who are out of work altogether.

[9]I exclude respondents whose answers to the time use questions summed to more than 24 hours, either for questions about their own time or their partner's.

[10]For a description of the UKHLS data, see Institute for Social and Economic Research (2020*a*,*b*).

to my study have on average slightly less children, and their youngest child is half a year older than that of UKHLS respondents.

4 The impact of COVID-19 on time use

In this section, I document how COVID-19 has affected the time use of families with children in England. I start by documenting how parents allocate their time to home-production activities (i.e. educational activities with children, other childcare activities and house chores) and market work before and during the pandemic. I examine gender differences in time allocation and how these have evolved during the first months of the crisis. I then describe the labor market impacts of COVID-19, and discuss heterogeneities in changes to time allocations depending on the employment status of parents.

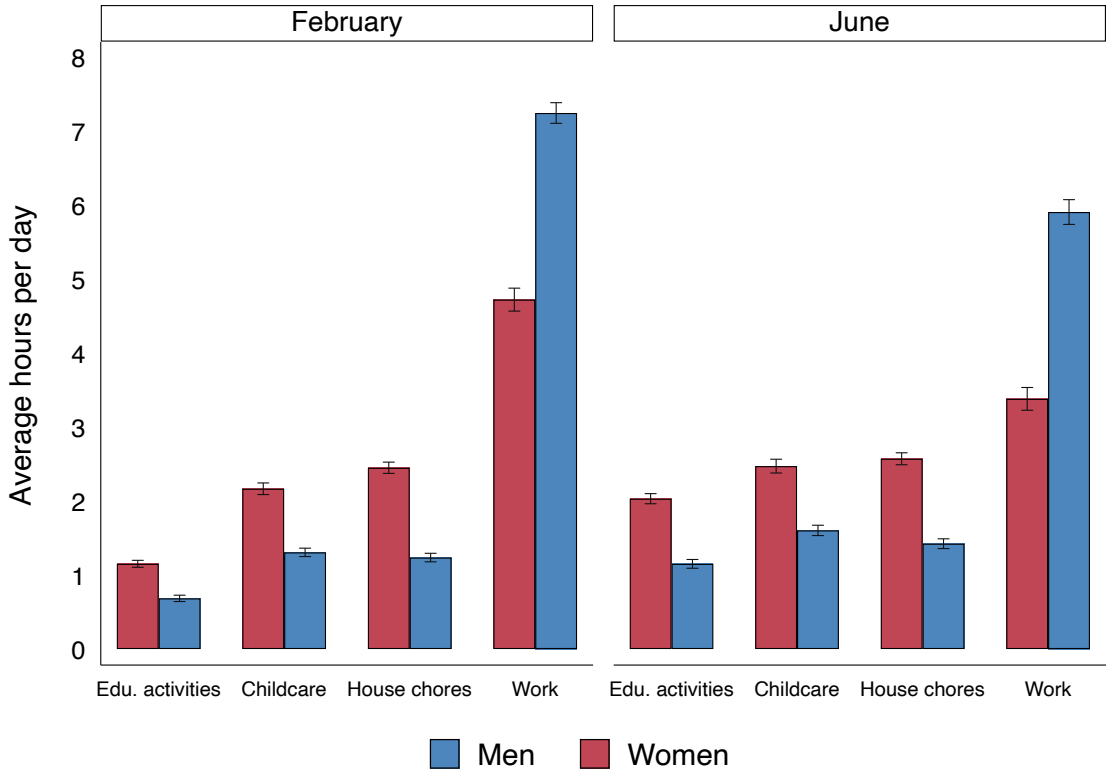
4.1 Parental time use

A distinctive feature of the coronavirus pandemic has been the introduction of stay-at-home orders and school closures, which have increased the workload of adult members of the household by limiting the possibility of outsourcing home production tasks and childcare. In what follows, I document how parental time allocation to unpaid and paid work has changed during the coronavirus pandemic, compared to the pre-crisis period. To allow inter-temporal comparisons of time use, in my survey I ask participants for the number of hours they spent on educational activities with children, other childcare activities, house chores and market work, in the week before data collection and during an average week in February 2020. To gain insights on the division of labor within the household, similar questions are asked about the time allocation of the respondent's partner. Home-production activities, including childcare and house chores, took up a significant amount of parents' time on weekdays already in normal times (see Figure B.1). Participants to this study report that the total time they and their partner spent during a typical weekday in February on educational activities with children, other childcare activities and house chores is on average 1.9, 3.6 and 3.8 hours per day, respectively.

During the pandemic, time spent on all of these activities increased significantly. This is especially true for educational activities with children, to which parents devoted 1.4 hours more on average on a weekday in June compared to February, as school closures meant that children needed substantial help from parents for their home-learning. In

contrast, the combined time respondents in two-parent families spent on market work is 9.4 hours every day on a typical workday in June, down from around 12 hours of combined market work in February.[11]

Figure 1: Parental time use before and during COVID-19 by gender



Notes: The graph shows the average number of hours respondents report they and their partner spent in total on educational activities with their child, other childcare activities, house chores and work, separately for men (blue) and women (red). The gender of the two adults in the couple is identified from answers to the question about the respondent's own gender and the gender of their partner. Separate panels show answers for a typical week in February (left) and the week before data collection (right). The black caps show 95% confidence intervals.

Looking at differences in time use within the household, Figure 1 provides details on the gender division of paid and unpaid work before (left panel) and during (right panel)

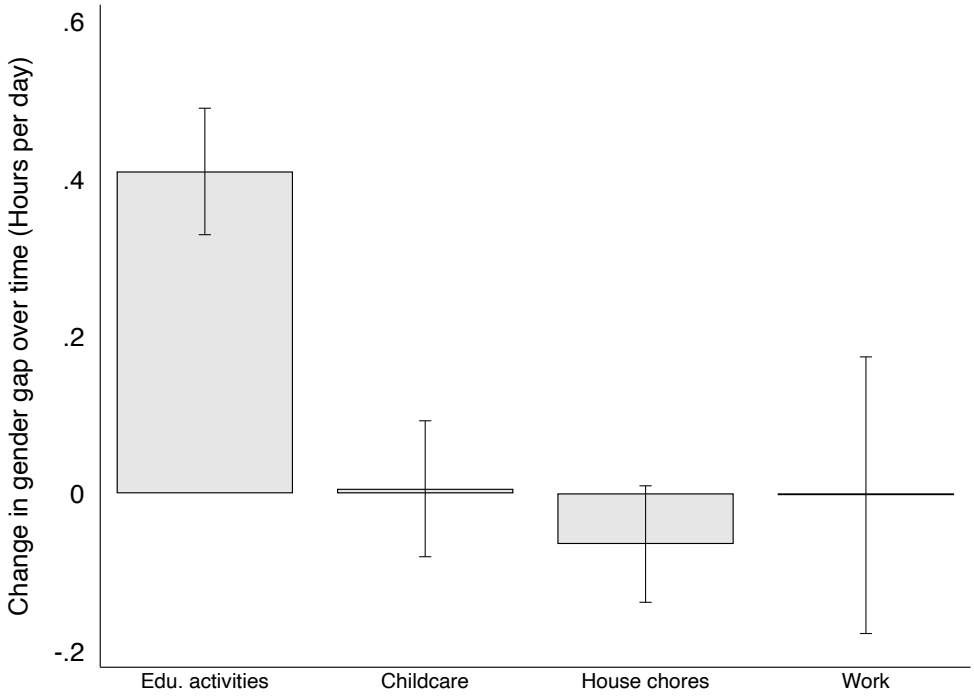
[11]Figure B.2 shows that there are differences in parental time use along the income distribution. High-income parents devote more time to home schooling activities and market work than low-income parents. Low-income parents devote less time to house chores than the rest of the sample. Further, there is a negative (positive) association between the age of the youngest child in the household and time spent on childcaring activities (market work) - see Figure B.3.

COVID-19. Before the pandemic, mothers spent significantly more time than fathers on educational activities with their children (1 hours and 12 minutes versus 43 minutes). Similarly, women spent around 2 hours of a typical workday on other childcare activities, against a corresponding figure of 1 hour and 20 minutes for men. Large gender gaps were also present before the pandemic in house chores, with mothers spending roughly double the amount of time fathers spent on these activities. Finally, consistent with differences in labor force participation across genders, men spent on average slightly more than seven hours working for pay on a typical workday in February, whereas women spent on average 4 hours and 46 minutes on market work. Table B.1 shows that the gender gaps in time use before the pandemic strongly depend on the employment status of the partners. Conditional on a broad set of individual and household characteristics, in couples where the mother was out of work in February 2020 the gender gaps in educational activities, other childcare activities and house chores are 10, 32, and 57 minutes larger, respectively, compared to families where the mother was in paid work before the pandemic. Similarly, when fathers are not in work, the difference in time allocation to childcare activities and housechores between mothers and fathers significantly decreases by 27 and 38 minutes respectively. It is however interesting to note that gender gaps in unpaid work remain positive even in families where fathers are out of work but mothers are doing some positive amount of paid work.

Figure 2 shows the evolution of these gender gaps during the first months of the pandemic. The main effect of the COVID-19 crisis has been a widening in the difference in time that mothers and fathers spend on educational activities with children. In particular, mothers, who already before the pandemic were spending significantly more time than fathers helping their children with school work, increased the time they spend on these activities by around 52 minutes per day on average. Hence, in June 2020 mothers were spending around 2 hours every day home schooling their children. These numbers stand in contrast to an increase in home schooling time of only 28 minutes for fathers. Overall, the gender difference in time dedicated to helping children with their school work inreased by around 25 minutes per day between February and June 2020. Turning to other childcare activities, both fathers and mothers in my sample increased the time dedicated to this activity by around 20 minutes, with no significant effect on the gender gap. Notably, fathers' time spent on house chores increased more than mothers' (13 and 9 minutes respectively), thus leading to a small albeit insignificant reduction in the gender gap for house work. Finally, time spent on market work was around 80 minutes lower in June than it was in February for both genders, with again no significant effect

on the gender gap.[12] In what follows, I will examine the determinants of the increase in the gender differences in time dedicated to home schooling activities with children.

Figure 2: Change in gender gaps in time allocation between pre- and during-COVID period



Notes: The graph shows the evolution of the gender gap in time dedicated to different activities between February and June 2020. The gender gap is calculated as time devoted by the mother minus time devoted by the father, both expressed in hours per day. Positive numbers correspond to an increase in the gender gap to the disadvantage of women between February and June 2020. The gender of the two adults in the couple is identified from answers to the question about the respondent's own gender and the gender of their partner. Black caps show 95% confidence intervals.

[12]In my sample, mothers are more likely than fathers to experience a reduction in work hours between February and June 2020. However, changes in work hours are overall smaller in magnitude for women than they are for men. As a consequence, among couples where only one parent lost their job or stopped working, changes in the gender gap were larger (in absolute terms) in households where the father stopped working (5.36 hours) than those where the mother did (3.47 hours), since fathers were working more hours than mothers to begin with. Similarly, in families where both parents stopped working, the gender gap in paid work time reduces due to the larger drop in work hours of men than of women.

4.2 Labor market outcomes and changes in gender gaps

Part of the increase in gender differences in time spent on educational activities with children during COVID-19 can mechanically arise from a differential effect of the pandemic on the labor market outcomes of men and women. If women were more likely than men to stop working, this would give mothers more extra time to dedicate to childcare. In the UK, the latest data show that the overall employment effects of the pandemic have been neutral across gender. However, several studies have highlighted large gender differences in the labor market impact of the pandemic *among parents*, with mothers in a couple being more likely to have stopped working or asked to be furloughed during the early phases of the crisis (Adams-Prassl et al., 2020*b*; Andrew et al., 2020*a*; Sevilla and Smith, 2020). Table A.4 offers insights on the labor market impacts of COVID-19 for two-parent families in my sample. First, comparing the share of people in work at the time of data collection across gender, we see that only 59% of mothers from households in my sample were in work (either part-time or full-time) during the week before data collection, against a corresponding figure of 79% for fathers. Further, 27% of mothers in my sample who were in work in February 2020 had stopped working by mid June, against a corresponding figure of 15% of fathers.[13]

Table 2 and Figure 3 show the evolution of the gender gap in time spent on educational activities with children across families with different transitions out of paid work across partners. I classify families depending on whether only the mother or father stopped working between February and June 2020, both parents stopped working or no change occured in the employment status of either parent. For the latter group, I further distinguish between households where the mother remained in work or out of work throughout.[14] Before the pandemic, the home schooling gender gap ranged from 21 to 40 minutes per day across family types. During the first UK lockdown, the gender gap in home schooling activities increased for all groups, with the exception of households where the father stopped working between February and June 2020. The increase is starkest, and around one hour per day, in families where the mother stopped working during the pandemic. However, also noteworthy is the increase in the gender gap in time devoted to educational activities with children for families where *no change* occured in

[13]The share of households where both parents were out of work increased from 4% in February to 12% in June 2020. Overall, 4.5% of households in my sample have seen both partners stop working during the first months of the pandemic. Of the parents still in work at the time of data collection, 44% of mothers and 36% of fathers are key workers.

[14]See Table A.5 for the distribution of households across groups.

the employment status of either partners, even in families where the mother reports being in paid work both before and during the crisis. Interestingly, we do not observe a reversal or significant reduction in the gender gap in families where the father alone stopped working in the first months of the pandemic.[15]

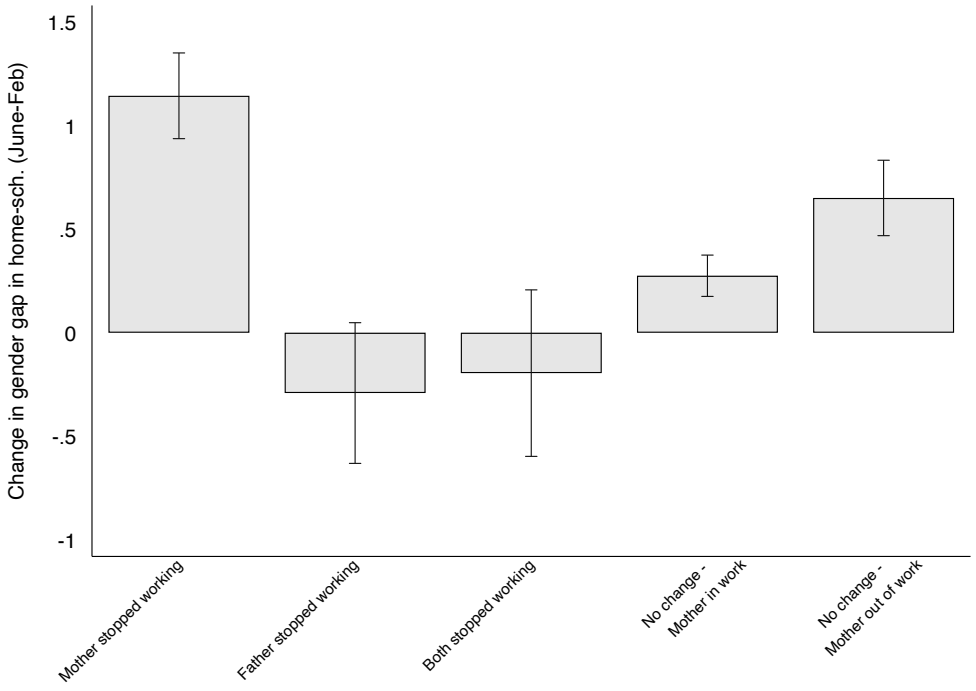
Table 2: The gender gap in home schooling time by changes in labor market outcomes

	Gender gap	
	February	June
Mother stopped working	0.50	1.66
	(0.90)	(1.81)
Father stopped working	0.60	0.31
	(1.02)	(2.45)
Both stopped working	0.47	0.27
	(1.03)	(2.03)
No change - Mother in work	0.36	0.64
	(0.97)	(1.69)
No change - Mother out of work	0.67	1.34
	(1.04)	(1.84)

Notes: Standard deviations given in parentheses. This table provides average gender gaps in educational activities with children by family type. Columns (1) and (2) refer to statistics for February and June 2020, respectively. Gender gaps are constructed as the difference between maternal and paternal time spent on educational activities with children, and are expressed in hours per day. Positive numbers indicate mothers are spending more time than fathers on educational activities with children. Family types are constructed on the basis of the labour market status of both partners in February and June 2020.

[15]Similar results hold in Table B.2 and Figure B.4 where I use a more granular definition of family types. Interestingly, in households where the father stopped working but the mother remained in work the gender gap in home schooling activities fully closes but does not significantly reverse.

Figure 3: The gender gap in home schooling time by changes in labor market outcomes



Notes: The graph shows the evolution of the gender gap in time dedicated to educational activities with children between February and June 2020. The gender gap is calculated as time devoted by the mother minus time devoted by the father, both expressed in hours per day. Positive numbers correspond to an increase in the gender gap to the disadvantage of women between February and June 2020. The gender of the two adults in the couple is identified from answers to the question about the respondent's own gender and the gender of their partner. Different bars represent households where the mother, father or both parents stopped working between February and June, or where there was no change in the labor market status of either parents. Black caps show 95% confidence intervals.

Table 3 examines the relationship between changes in the employment status of parents and the gender gap in home schooling activities in a multivariate regression framework. The first column only controls for indicators of different family types. The baseline category is the group of families where no change occured in the employment status of either partner, and the mother was in work both before and during the first UK lockdown. In this group, the home-schooling gender gap increased by 0.27 hours (or approximately 16 minutes) between February and June 2020. For families whithout changes in the employment status of either partner, but where the mother was in work throughout, the home-schooling gender gap increased by an additional 23 minutes, for a total increase of 39 minutes per day on average. In families where only mother stopped working, the gender gap increased by a total of about 70 minutes per day. Conversely, families where the father alone or both parents stopped working saw a decrease in the home-schooling gender gap of 19 and 11 minutes, respectively. Column (2) additionally controls for region fixed effects and income of both parents, as well as indicators for whether the parents are key workers in June. Not surprisingly, when mothers (fathers) are key workers, the increase in the gender gap in home schooling time is significantly smaller (larger). Finally, Column (3) additionally controls for household characteristics, including parental age and educational attainment, number of children and indicators for the presence of children aged 0-4 and 5-10 in the household. Controlling for all these characteristics does not significantly alter the relationship between family types and changes in the home schooling gender gap. The only exception is families where mothers are out of work throughout and no change occured to the employment status of the father. For this group, the increase in the home schooling gender gap is no longer significant when controlling for household characteristics.

As shown in Table 3, changes in employment status of parents, whilst important predictors of parental time allocation, cannot fully explain the changes in the home schooling gender gap that happened during the first UK lockdown. In particular, even in families where the father stopped working, mothers still continue to shoulder the majority of home schooling tasks. There could be a number of other reasons for the increasingly gendered division of educational activities with children during the COVID-19 crisis. One potential explanation could be differences in productivity across gender. If parents thought mothers were more used to, and hence better at, helping children with their school work, then both children and parents could be thought to benefit from mothers taking on the majority of home schooling tasks. Similarly, the way in which parents changed their division of childcare tasks might be driven by parental attitudes towards

gender roles, i.e., parental beliefs about who should do what in the household. In the rest of the paper, I investigate the role of beliefs about gender roles and returns to maternal time investment in explaining the asymmetric responses to changes in maternal and paternal labor market status.

Table 3: Labor market impacts of COVID-19 and changes in the gender gap in educational activities

Sample	All	All	All
Mother stopped working	0.8786***	0.7272***	0.6774***
	(0.1169)	(0.1279)	(0.1296)
Father stopped working	-0.5819***	-0.5355***	-0.6095***
	(0.1799)	(0.1830)	(0.1894)
Both stopped working	-0.4638**	-0.5593***	-0.5616***
	(0.2070)	(0.2167)	(0.2127)
No change - Mother not working	0.3879***	0.2072*	0.1735
	(0.1062)	(0.1235)	(0.1214)
Key worker - Mother		-0.2831***	-0.3202***
		(0.1054)	(0.1053)
Key worker - Father		0.1834*	0.1883**
		(0.0941)	(0.0926)
Income - Mother (£0000's)		-0.0416*	-0.0486**
		(0.0213)	(0.0211)
Income - Father (£0000's)		0.0115	0.0322*
		(0.0173)	(0.0179)
Constant	0.2690***	0.5814**	0.0531
	(0.0508)	(0.2630)	(0.4104)
Mean dep. var.	0.404	0.404	0.404
Observations	1672	1672	1672
R^2	0.061	0.073	0.098
Region F.E.	✗	✓	✓
Household characteristics	✗	✗	✓

Notes: OLS regressions. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The dependent variable is the change in gender gap in time dedicated to home-schooling activity, between February and June 2020. The gender gap for each period is calculated as the difference between maternal and paternal time devoted to educational activities with children, and expressed in number of hours per day. Positive (negative) coefficients correspond to an increase (decrease) of the gender gap. Household characteristics include age of both partners, indicators for partners having a university degree, the number of children in the household and indicators for the presence of children aged 0-4 and 5-10.

5 Beliefs about returns to maternal time investment and gender roles

In this section, I first describe how I measure beliefs about returns to maternal time investment in home schooling activities and perceived gender roles, and discuss their determinants. I then examine the role of these beliefs in explaining changes in the gender gap in time dedicated to home schooling activities, over and beyond constraints imposed by the employment status of parents.

5.1 Measuring perceived returns to maternal time investment

To elicit parental beliefs about the returns to maternal time inputs in home schooling, I make use of hypothetical scenarios featuring a British family with one child currently enrolled in Year 5 and two working parents of opposite gender.[16] The scenarios are set during the COVID-19 pandemic when schools are closed and children are at home. The hypothetical parents need to spend four hours every day on home schooling activities with their only child and can decide between two time allocations: (i) the mother takes care of home schooling fully by herself for four hours per day (t_1), and (ii) the father takes care of home schooling fully by himself for four hours per day (t_2). For each scenario, respondent are asked to report their perceived likelihood that different binary outcomes would occur on a 0-100 scale (see Manski (2004) for a review of this methodology). Let $\{b \in \{0,1\}\}_{n=1}^{N}$ denote the vector of binary outcomes. Binary outcomes include parental satisfaction with life, ability to complete their work tasks and ability to retain their full time job for at least a year. All parental outcomes are elicited separately for the mother and the father in both scenarios. Respondents are also asked about the perceived probability that the hypothetical child will score above average in their KS2 examination and the expected earnings of the child at age 30 in both scenarios. Earnings are elicited on a continuous scale using a slider.

Table 4 reports the average beliefs for all parental and child outcomes across the two scenarios where the mother or the father alone takes care of home schooling. The table shows substantial perceived costs for mothers from dedicating time to educational

[16] Year 5 is the year before the hypothetical child takes the KS2 national exam. The Department for Education had cancelled all national assessments for the 2019/2020 academic year. I therefore chose to present respondents with scenarios featuring a child in Year 5 because, with schools closed, parental investment during Year 5 would be particularly important for Year 6 examinations in the academic year 2020/2021.

activities with children. The perceived life satisfaction of mothers is 20 percentage points higher when the father takes care of home schooling relative to the scenario where the mother does. Similarly, maternal productivity at work, measured by the probability that she will be able to complete her work tasks, is 33 percentage points higher when she does not have to spend four hours every day home schooling her child. Finally, the perceived probability that the hypothetical mother will be able to retain her job in 12 months' time is around 20 percentage points lower in the scenario where she alone is responsible for home schooling. Simmetrically, maternal time spent on home schooling yields large benefits for fathers. Relative to the scenario where the hypothetical father alone home schools the child, paternal life satisfaction, ability to finish his work tasks and probability to retain his full time job are all significantly higher when the father does not have to spend time on home schooling activities. Interestingly, the perceived costs to mothers are larger in absolute terms than the perceived benefits for fathers. For work-related outcomes, this difference is driven by worse maternal outcomes in the scenario where the mother is responsible for home schooling the child compared to the symmetric outcomes for fathers. In other words, while there is no perceived difference in outcomes across gender when parents do not engage in home schooling activities, gender differences at the disadvantage of mothers arise when parents have to devote four hours every day to home schooling their child.

With regards to child outcomes, respondents believe there is a 60% chance on average that the hypothetical child would achieve the expected standard in their KS2 examination. This figure is not statistically different across the two scenarios (p-value = 0.214). Comparing parental beliefs to the actual performance of pupils in KS2 examinations in England reveals that participants to this study are somewhat pessimistic about exam performance. In 2019, 65% of pupils in England reached the expected standard in all of their KS2 reading, writing and maths examinations, while 11% of pupils reached the higher standard (Department for Education, 2019).[17] The fact that parents perceive the chance of the hypothetical child meeting the required standard as around 60%, and sinigificantly below the national average for 2019, could reflect the fact that respondents perceive home schooling and online learning as less effective than in-person teaching.[18]

[17]To reach the expected standard in all KS2 reading, writing and maths examinations, pupils must achieve a scaled score of at least 100 in their reading and maths tests and an outcome of 'reaching the expected standard' or 'working at greater depth' in the writing assessment. To reach the higher standard, a pupil must achieve a scaled score of at least 110 in their reading and maths tests, and an outcome of working at greater depth in the writing assessment.

[18]In response to the COVID-19 pandemic, the Department for Education cancelled the 2019/20

Looking at long-term child outcomes, the expected earnings of the child at age 30 are around £34,000 and again the figure does not differ across scenarios (p-value = 0.335). Beliefs about expected earnings are in line with findings from previous studies that have used a similar elicitation method to examine the role of parental beliefs about the production technology for child outcomes (see, e.g., Boneva and Rauh, 2018; Attanasio, Boneva and Rauh, 2020). Remarkably, parents are also close in their estimates to the true average: the median annual pay for full-time employees was £31,461 for the tax year ending on 5 April 2020 (Office for National Statistics, 2020).[19] Interestingly, while parents seem to be pessimistic about short-term outcomes, their answers to the earnings questions suggest that, on average, respondents do not perceive a significant earnings penalty due to COVID-19.[20]

Table 4: Mean beliefs for parental and child outcomes

	Maternal time		Paternal time		Difference
	Mean	St. Dev.	Mean	St. Dev.	P-val.
Parental outcomes					
Mother enjoys life	51.96	(21.72)	70.40	(20.26)	0.000
Father enjoys life	66.57	(20.64)	51.78	(22.41)	0.000
Mother can finish work tasks	46.41	(23.74)	79.86	(20.44)	0.000
Father can finish work tasks	76.92	(22.61)	51.35	(23.51)	0.000
Mother retains FT job	55.88	(23.68)	76.26	(21.00)	0.000
Father retains FT job	76.85	(21.68)	63.80	(23.37)	0.000
Child outcomes					
Child achieves KS2 standard	60.08	(19.96)	59.24	(19.69)	0.214
Earnings at age 30 (£)	34531.67	(14762.65)	34038.20	(15211.26)	0.335

Notes: Standard deviations given in parentheses. This table provides mean beliefs for the whole sample for all parental and chid outcomes. Columns 1-2 provide the mean and standard deviation of beliefs for the scenario where the hypothetical mother alone takes care of home-schooling activities for four hours every day. Columns 3-4 provide the corresponding figures for the scenario where the hypothetical father dedicates four hours every day to home-schooling activities and the mother dedicates zero hours. Mean beliefs are given on a 0-100 scale other than for expected earnings of the child, which are in pounds. The last column gives the p-value for a t-test of difference in means between the two scenarios.

Next, I calculate individual perceived returns to maternal time inputs for each respondent i. To obtain a measure of individual perceived returns to maternal time investment in terms of a given binary outcome b_n, I first calculate the perceived difference in prob-

national curriculum assessments. It is therefore not possible to assess how the first months of school closure have affected the performance of children in their KS2 examinations.

[19]Respondents were not given any information on actual average earnings.

[20]It is possible that the expected earnings of the child in the absence of COVID-19 would be higher than the average expected earnings elicited here. Participants to this study were not asked about their beliefs on how COVID-19 will affect the labor market prospects of children. Therefore, this question cannot be answered with the data at hand.

ability that a certain outcome would occur by comparing a parent's response in the scenario where the mother alone takes care of homeschooling to the parent's response in the corresponding scenario in which it is the father who is responsible for helping the child with school work. I then divide this difference by four to compute a measure of average perceived *hourly* return to maternal time investment:[21]

$$r_{ni} = \frac{Pr(b_{ni} = 1|t_1) - Pr(b_{ni} = 1|t_2)}{4} \tag{1}$$

Similarly, to calculate perceived hourly returns to maternal time inputs in terms of child earnings, I take the difference between respondent i's expected log earnings in the two scenarios and divide it by four:

$$r_{Yi} = \frac{log(Y_{it_1}) - log(Y_{it_2})}{4} \tag{2}$$

Panel (a) of Figure 4 shows respondents' perceived returns to maternal time investment in educational activities with their children, relative to paternal time inputs, for parental outcomes. More precisely, Panel (a) plots the perceived returns in terms of binary parental outcomes for the scenario where, in a hypothetical British family, the mother alone takes care of home schooling relative to the case where the father alone helps the child with school work. Positive (negative) numbers indicate a perceived benefit (cost) to the parent. Red and blue bars show perceived returns in terms of maternal and paternal outcomes, respectively. The figure shows substantial perceived costs for mothers to dedicating time to educational activities with children: for every hour that mothers dedicate to home schooling activities, their probability of enjoying life decreases by 4.6 percentage points (p.p.), the probability of finishing their work tasks is 8.4 p.p. lower and their likelihood of retaining their full-time job is around 5.1 p.p. lower. Conversely, the father's likelihood of enjoying life, finishing their work tasks and retaining their full-time job is 3.7, 6.4 and 3.2 p.p. higher for every hour that the mother spends home schooling the child.

Panel (b) instead plots average perceived returns to maternal time inputs in terms of child outcomes. The figure confirms that respondents do not perceive maternal time inputs as significantly more productive than paternal time inputs: every hour that the mother spends home schooling the child (instead of the father doing so) boosts child earnings by 0.01% on average, and the probability that the child will score above

[21]The difference in maternal time investment across the two scenarios is four hours per day.

average in his / her KS2 exam increases by 0.2 percentage points.[22]

Table B.3 analyzes how perceived returns to maternal time inputs vary depending on respondents' characteristics. Women perceive both the costs for mothers and the benefits for fathers as higher than male respondents, in absolute terms. Higher income individuals instead report lower perceived costs for mothers and lower perceived benefits for fathers. The number of children is also strongly predictive of more negative (positive) returns in terms of maternal (paternal) outcomes. In particular, the presence of children aged 5-10 in the household is strongly correlated with higher maternal costs in terms of being able to finish her work tasks. Child outcomes are less affected by the respondent's background characteristics, with the exception of out of work parents perceiving maternal time investment as less effective in boosting the child's KS2 score.

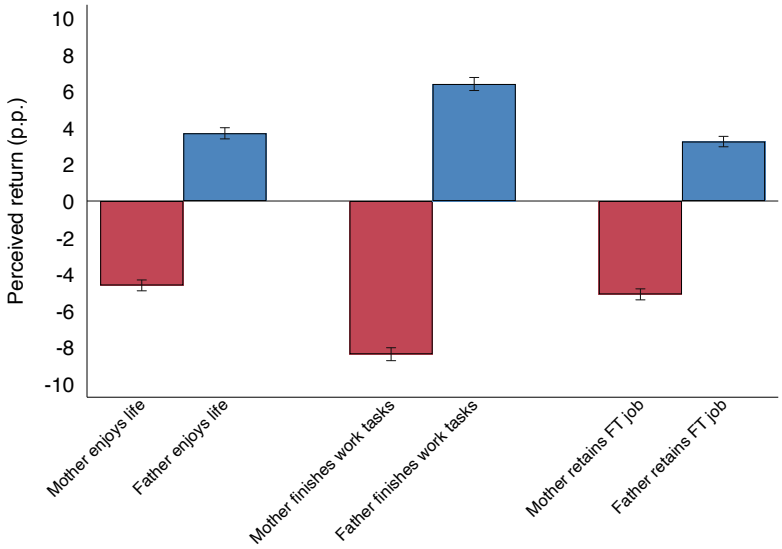
5.2 Measuring perceived gender roles

The economics literature has highlighted the importance of attitudes towards gender roles in determining how partners of opposite gender allocate their time between unpaid and paid work (see for example Bertrand, Kamenica and Pan, 2015; Ichino et al., 2019; Lassen, 2020). To gauge the extent to which respondents to my survey hold a "traditional" view of gender roles, I make use of hypothetical vignettes where participants are asked to state what share of home schooling tasks they think should fall upon the mother in a hypothetical family where both parents are working full-time. The hypothetical family in this set of vignettes is in most aspects identical to the family in the vignettes used to elicit beliefs about the returns to maternal time investment. Differently from before, however, in this set of vignettes respondents are asked to consider two cases: (i) the case where the mother's salary is higher than the father's; and (ii) the case where the father is the main earner. Salary differences between partners are randomised across respondents but kept constant within respondent. More explicitly, respondents would see the same salary difference, randomised between 2, 5, 10 and 20% first in favour of one partner and then in favour of the other. For both cases, respondents to the survey are asked what share of total parental home schooling time they think should fall upon the mother, relative to her partner. Answers are provided on a scale from 0 to 100%, where 100% (0%) corresponds to the case where the mother (father) alone takes care of home schooling.

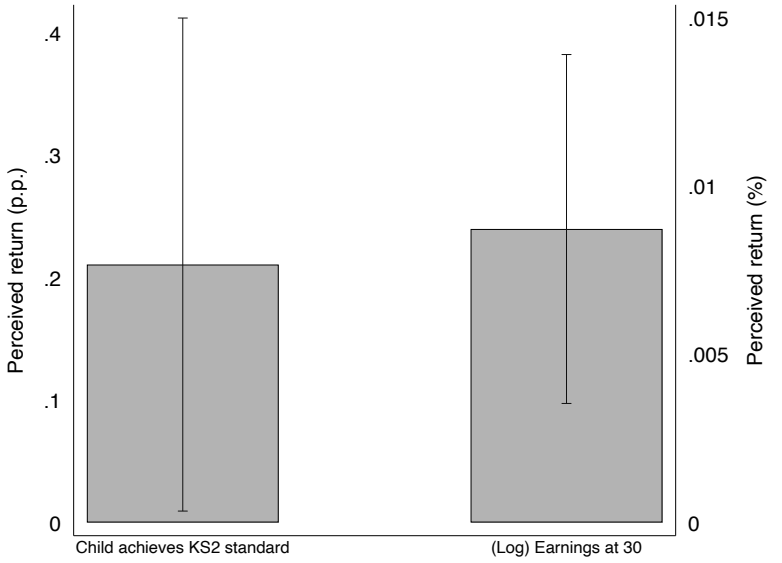
[22] Figure B.5 shows the cumulative distributions of individual perceived returns to maternal time inputs for all parental and child outcomes.

Figure 4: Perceived returns to maternal time investment

(a) Parental outcomes



(b) Child outcomes



Notes: Panel (a) shows the average perceived returns to maternal time investment relative to paternal time investment for various paternal and maternal outcomes. Panel (b) shows the average perceived returns for child outcomes. Returns are calculated as the difference between the perceived probability that a given outcome will occur under the scenario where the mother alone takes care of home schooling, and the corresponding probability under the scenario where the father alone is responsible for home schooling the child. For perceived returns in terms of child earnings, these are calculated as the difference in log earnings between the two scenarios. Black caps represent 95% confidence intervals.

Figure 5 shows respondents' opinion about the share of home schooling tasks that mothers should take care of, for different levels of earning gap between partners. Two facts emerge from this figure. First, the share of tasks respondents think mothers should do is very close to 50% on average when the hypothetical mother is the main earner in the family. Second, when the man is the breadwinner, the distribution of home schooling tasks is instead more unequal and loaded on the mother. Taking the two most extreme cases as illustrative examples, when the hypothetical mother earns 20% more than her partner, respondents believe she should take care of around 47% of home schooling activities; conversely, when the hypothetical father earns 20% more than her partner, respondents believe mothers should contribute 61% of total home schooling time.

I use respondents' answers for the two different cases where the mother or the father are the main earners in the household to construct a dummy variable indicating whether respondent i holds "traditional" beliefs about gender norms. The variable takes value 1 if the average share of tasks the respondent thinks the mother should take on across the two scenarios is higher than 50%, and 0 otherwise. 47% percent of parents in my sample are classified as "traditional" or conservative in their opinion about the allocation of time to educational activities with children within the family.[23]

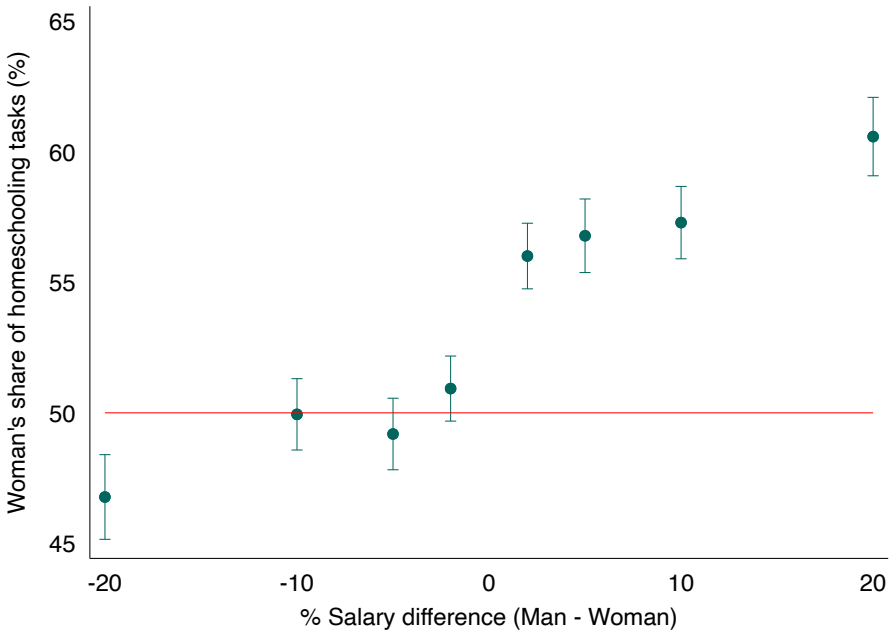
Table B.4 shows how respondents' attitudes towards gender roles varies with their background characteristics. The main finding emerging from the table is that women display higher levels of conservatism than men. Results from Column (2) show that the share of home schooling tasks that respondents think the hypothetical mother should do when she is the main earner in the couple is 3 percentage points higher for female respondents compared to male participants. Similarly, as shown in Column (3), women are 9 percentage points more likely to have traditional opinions about gender roles.

5.3 Beliefs and changes in gender gaps

Next, I turn to the question of whether parental beliefs about returns to maternal time investment and attitudes towards gender roles contribute to explaining the change in the way parents of opposite gender share home schooling activities within families during the COVID-19 pandemic. Table 5 examines the role of different sets of variables in

[23] 19% of the sample holds 'non-traditional' values (i.e., this group thinks the hypothetical father should home school more than the mother, regardless of the earnings gap). 34% of respondents can be classified as 'pragmatic', with the ideal maternal share of home schooling tasks moving symmetrically around 50% across the two scenarios.

Figure 5: Perceived gender roles



Notes: The green circles show the average share of tasks respondents think the hypothetical mother should do, relative to her husband, for different levels of salary difference between father and mother. Caps represent 95% confidence intervals.

explaining changes in the home schooling gender gap between February and June 2020. Column (1) only includes as controls region fixed effects, parental beliefs about gender roles and perceived returns to maternal time investment. Changes in the home schooling gender gap are strongly associated with beliefs about parental life satisfaction: the lower the perceived cost for mothers in terms of life satisfaction, and the higher the perceived benefit for fathers, the more the gender gap in home schooling activities increases during the pandemic. In addition, perceived returns in terms of paternal productivity at work are positively associated with increases in the home schooling gender gap. Finally, attitudes towards gender roles are strongly correlated with changes in time use during the pandemic: in households where the respondent is classified as "traditional" in their opinion about gender roles, the increase in gender gap in home schooling time was around 20 minutes larger.[24]

Column (2) additionally controls for household characteristics. The results indicate that parental income and education are important determinants of changes in time allocation within families during the pandemic. In particular, and not surprisingly, maternal income is negatively correlated with changes in the gender gap in home schooling time. Further, families with children aged 5-10 saw larger increases in the home schooling gender gap than families with children in older or younger age ranges. When controlling for household characteristics, the coefficient estimates associated with parental beliefs remain qualitatively unchanged.[25]

Finally, Column (3) further controls for indicators of family types based on the employment status of parents in February and June 2020. Controlling for changes in the employment situation of both partners in the household does not alter the magnitude or the significance of the coefficients associated to the beliefs variables. Perceived gender roles in particular remain a strong determinant of changes in the home schooling gender gap.[26] Table B.7 examines heterogeneity in the importance of beliefs in explain-

[24]Table B.5 shows equivalent regression results where beliefs about gender roles are measured with a continuous variable capturing the average share of home schooling activities respondents believe the hypothetical mother should do across the two scenarios.

[25]For the full set of coefficients of variables not displayed in Table 5, see Table B.6.

[26]Besides contraints imposed by working hours, household characteristics and differences in perceived beliefs, differences in individual preferences may also affect the way in which parents allocate their time across different activities. Figure B.6 plots answers to how much the survey participants report enjoying different activities, separately for male and female respondents. While women report enjoying childcare significantly more than men, and market work significantly less than male respondents, differences by gender in self-reported preferences for various activities (notably home schooling) are quantitatively small, even when significant, and thus unlikely to be the main driver of the gaps in time use that we observe.

ing changes in the home schooling gender gap by gender of respondent. Interestingly, gender-role attitudes of the respondent are significant determinant of changes in the home schooling gender gap only for women, but not for men. All other coefficients for perceived returns to maternal investment are similar across genders, with the exception of perceived paternal life satisfaction, which is more strongly correlated with changes in gender gaps in families of male respondents than it is for the households of female respondents.

The last two columns of Table 5 examine whether perceived returns to maternal time investment and gender-role attitudes affect changes in the time allocation of mothers and fathers differently. Column (4) regresses the change in time spent by mothers on home schooling activity between February and June 2020 on the full set of beliefs, household characteristics and indicators for family types. Column (5) presents estimates for an equivalent regression, where the dependent variable is the change in paternal time allocation to home schooling activities. Paternal time is strongly correlated with perceived returns to maternal time investment in terms of parental life satisfaction. In particular, fathers increase their home schooling time by significantly less in households where the respondent believes there are larger benefits for fathers (and lower costs for mothers) to mothers alone taking care of home schooling. Changes in maternal time allocation are instead positively associated with returns in terms of paternal ability to complete work tasks. Lastly, mothers (fathers) increase their home schooling time by significantly more (less) in households where the respondent has traditional opinions about gender roles, but maternal time reacts more strongly to gender-role attitudes than paternal time.

Taken together, these results point to the importance of the relative contribution of partners in a couple to market work as a determinant of gender inequality in the division of childcare and its evolution over the course of the pandemic. Moreover, a consistent picture emerges where gender-role attitudes are significant predictors of changes in the allocation of time to educational activities with children between partners of opposite gender. Changes in maternal time allocation are especially responsive to attitudes towards gender roles. Perceived returns to maternal time investment in terms of life satisfaction of parents are also important, whilst perceived returns in terms of child outcomes play an insignificant role.

Table 5: The importance of beliefs for changes in the home schooling gender gap

	Changes in				
	Gender gap	Gender gap	Gender gap	Mother time	Father time
Mother enjoys life	0.0210**	0.0227**	0.0212**	0.0096	-0.0116**
	(0.0096)	(0.0096)	(0.0093)	(0.0074)	(0.0057)
Father enjoys life	0.0151*	0.0162*	0.0144*	0.0039	-0.0105*
	(0.0091)	(0.0090)	(0.0088)	(0.0074)	(0.0056)
Mother can finish tasks	-0.0118	-0.0113	-0.0068	0.0010	0.0078
	(0.0086)	(0.0085)	(0.0085)	(0.0071)	(0.0052)
Father can finish tasks	0.0185*	0.0139	0.0160*	0.0241***	0.0081
	(0.0096)	(0.0096)	(0.0096)	(0.0082)	(0.0059)
Mother retains FT job	0.0066	0.0050	0.0019	0.0030	0.0011
	(0.0098)	(0.0096)	(0.0094)	(0.0076)	(0.0057)
Father retains FT job	-0.0054	-0.0042	-0.0081	-0.0140	-0.0059
	(0.0113)	(0.0110)	(0.0109)	(0.0089)	(0.0061)
Child achieves KS2 std.	-0.0017	-0.0027	0.0029	0.0075	0.0046
	(0.0112)	(0.0110)	(0.0110)	(0.0093)	(0.0066)
Child earnings at age 30	-0.5084	-0.3610	-0.3744	-0.1779	0.1965
	(0.3897)	(0.4046)	(0.4033)	(0.3231)	(0.2752)
Traditional gender roles	0.3377***	0.3142***	0.2771***	0.1865***	-0.0907*
	(0.0840)	(0.0828)	(0.0806)	(0.0673)	(0.0501)
Mean dep. var.	0.403	0.403	0.403	0.887	0.485
Observations	1647	1647	1647	1647	1647
R^2	0.029	0.060	0.117	0.082	0.084
Region F.E.	✓	✓	✓	✓	✓
Household characteristics	✗	✓	✓	✓	✓
Labour market controls	✗	✗	✓	✓	✓

Notes: OLS regressions. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The dependent variable in Columns (1) to (3) is the change in gender gap in time dedicated to home-schooling activity, between February and June 2020. The gender gap for each period is calculated as the difference between maternal and paternal time devoted to educational activities with children, and expressed in number of hours per day. Positive (negative) coefficients correspond to an increase (decrease) of the gender gap over time. The dependent variables in Columns (4) and (5) are the change in maternal and paternal time allocation to home schooling activities between February and June 2020, respectively. Labour market controls include indicators for different family types, where types are defined based on changes in labour market outcomes of both parents between June and February 2020, as well as indicators for whether the mother or father is a key worker. Household characteristics include age and income of both partners, indicators for partners having a university degree, the number of children in the household and indicators for the presence of children aged 0-4 and 5-10.

5.4 Own and others' perceived gender roles

Beyond respondents' own attitudes, recent work in economics shows that individuals' behavior might be driven by their perceptions about the opinions of others. In the context of gender norms, Bursztyn, González and Yanagizawa-Drott (2020) offer a

powerful example of how correcting men's beliefs about others' support for female labor force participation increases married men's willingness to let their wives join the labor force. Thus, evaluating the extent to which respondents' own opinion about gender roles differs from their perceptions about the attitudes of others may offer insights into possible interventions that could affect parental behavior. As detailed above, I measure respondents' gender-role attitudes by asking them what share of home schooling tasks they think a hypothetical mother in a two-parent family should do in the context of school closures. In addition, to measure how respondents perceive the opinion of others with respect to gender roles, participants to the survey are also asked to guess the average answer of other survey participants. Modest incentives were given to encourage accurate guessing.[27] By comparing respondents' opinions about gender roles to their guesses about the opinions of others, I can examine misperceptions in attitudes towards gender roles among parents in England. Figure 6 replicates Figure 5, with the addition of red dots representing respondents' guess about the share of home schooling tasks others think the mother should take care of, for different levels of earning gap between partners. The figure shows that on average individuals believe other suvery participants are more conservative than they are when it comes to gender roles within the household. An interesting question that emerges when discussing respondents' perceptions of social norms related to gender roles is how accurate individuals are in their guess about what others believe. Comparing the average share of tasks respondents think mothers should take care of to individual participants' guess about the answer of other survey respondents allows me to analyze the accuracy of parents' beliefs about gender norms. In my sample, 47% of survey respondents strictly over-estimate social norms related to gender roles. The average difference between respondents' guess about the answer of others and respondents' actual answers is 2.26 percentage points.[28] These results point to potential biases in perceptions of gender norms that could contribute to a suboptimal division of labor within couples in the case where deviating from widespread attitudes towards gender roles generates substantial disutility. Given that gender-role attitudes play a strong role in the decision-making process of couples, there could be scope for changing parental behavior through information interventions aimed at correcting individuals' misperceptions about gender norms.

[27]Respondents received an extra compensation of £5 if their guess about the opinion of others was less than 2 percentage points away from the sample average of own opinions.

[28]Figure B.7 shows the distribution of wedges in perceptions, calculated as respondents' guess about the answer of others minus the average answer of survey respondents to the questions on the share of home schooling tasks the hypothetical mother should do relative to her partner.

Figure 6: Perceived gender roles and perceived opinion of others

Notes: The green circles show the average share of tasks respondents think the hypothetical mother should do, relative to her husband, for different levels of salary difference between father and mother. The red circles represent the average respondents' guess about the opinion of other survey participants. Caps represent 95% confidence intervals.

6 Discussion

6.1 What are beliefs capturing?

This paper examines the role of beliefs about gender norms and productivity of maternal time investment in explaining the fact that, during the first UK lockdown, mothers have been at the receiving end of the additional childcare responsibilities caused by the COVID-19 pandemic. There are three potential concerns for the external validity of the belief measures presented here. First, parental perceptions elicited in June 2020 may be influenced by the current situation parents are living in, and may not generalise to normal circumstances. In particular, beliefs about child outcomes could incorporate parental perceptions on the effect of home schooling on children's educational attainment and future labor market outcomes. Indeed, as shown in section 5.1, participants to this study are relatively pessimistic about the school performance of children relative to actual exam results. Similarly, beliefs about parental outcomes may reflect respondents' opinion about the long-term consequences of the COVID-19 crisis on the labor market (and how these may differ by gender). In the absence of data on parental beliefs before the pandemic, whether or not the measures of beliefs that I present here have external validity beyond pandemic times cannot be verified. Collecting more data on parental beliefs at the end of the pandemic is an important next step.

Second, parental beliefs where elicited by asking respondents about a hypothetical family, rather than the respondents own family. This methodology has the advantage that I can abstract from differences across respondents (and their households) when varying parental inputs into home schooling across scenarios (see section **??**). However, one potential disadvantage of this approach is that respondents can make assumptions about the (unobserved) characteristics of the hypothetical family they are presented with, which may influence their answers to the questions on parental and child outcomes.[29] In the context of this study, respondents may have attributed preferences and behaviors to the hypothetical family of the scenarios based on the fact that both hypothetical parents were described as working full time. For example, if respondents assumed that a mother who works full time enjoys paid work relatively more (and unpaid work relatively less) than women with lower work hours, this could have led to an overestimation of maternal costs in terms of life satisfaction arising from her spending four hours every

[29] See also Delavande (2014) for a discussion of how the wording of hypothetical questions affects respondents' answers about their mortality expectations.

day home schooling her child. Similarly, respondents' attitudes towards gender roles might reflect their beliefs as applicable to the specific context they are presented with. To the extent that couples where the mother works full time could be perceived as less conservative in the way in which paid and unpaid work is divided among partners, elicited attitudes towards gender roles may underestimate the actual level of conservatism among survey participants. The hypothetical scenario approach used in this chapter does not allow to isolate the component of respondents' beliefs that arises from inference about the characteristics of the hypothetical family that features in the scenarios. Future work could exploit a within-subject design to explore how the elicited perceived returns and costs to maternal time investment, as well as attitudes towards gender norms, vary with the characteristics of the hypothetical family respondents are presented with. With this caveat in mind, the fact that recent literature on perceived returns to parential investment finds a strong correlation between elicited beliefs and actual investment decisions lends credibility to the hypothetical scenario approach (see for example Boneva and Rauh, 2018; Attanasio, Boneva and Rauh, 2020; Biroli et al., 2020*b*).

Finally, parental attitudes towards gender roles measured in June 2020 may have been influenced by the forced changes to both work and daily life that the pandemic brought about. Previous evidence shows that, already before the pandemic, gender norms were slowly evolving towards increased support for less traditional gendered division of paid and unpaid work (Fortin, 2005; Bertrand, 2018). The large labor market shocks induced by the COVID-19 crisis may have accelerated this evolution, especially in families were fathers have stopped working and are forced home. If that were the case, my measures of beliefs about gender roles, and potentially beliefs about perceived returns to maternal time investment, may already reflect shifts in attitudes that have been brought about by the pandemic. My estimate of the pervasiveness of traditional attitudes towards gender roles would therefore be a lower bound of the real level of conservatism in society before the advent of COVID-19. Whether the COVID-19 crisis has significantly altered the evolution of gender norms remains an important open question for future research.

6.2 Implications for gender equality

The results from this and other studies on the impact of COVID-19 on family life highlight an important gender difference in the impact of the pandemic: mothers are spending significantly more time on childcare activities than men, often at the expense

of paid work time. As a consequence, the gender gap in childcare activities has increased during the first months of the crisis. Whether or not this larger inequality will persist after the pandemic is yet to be understood. In my survey, I ask respondents whether they think the future allocation of childcare will remain the same as it is now, or whether it will become more or less unequal as a result of the pandemic. 68% of respondents believe the future allocation of childcare will remain the same as it is now, and 26% believe it will become more equal. While only 6% think the split of childcare tasks will become more unequal, women are significantly more pessimistic, with 7% of female and 4% of male respondents thinking inequality in the division of childcare will increase in the future.

The survey also includes a question aimed at investigating the future consequences of the current pandemic on the labor force participation of parents. In-work respondents are asked whether they (and / or their partner) are considering quitting their job or substantially reducing their working hours to care for their children. Around 10% of working parents in my sample report considering reducing their work hours (partially or entirely) due to childcare responsibilities. Alarmingly, women are significantly more likely to consider dropping out of the labor force or reducing their work time than men (12% vs 8%, p-value: 0.0035). This finding echoes results from Adams-Prassl et al. (2020*a*) that show that furloughed mothers have been more likely than furoughed fathers to initiate the furloughing decision, and suggests that future waves of coronavirus may exacerbate the gender gap in the labor market impact of the pandemic through an increased childcare burden placed on mothers. The provision of adequate support to working parents is therefore paramount to mitigate the already large negative consequences for women in the labor market.

7 Conclusion

In this paper, I exploit novel survey data from the UK to document the impact of the pandemic on the time use of parents of school-aged children in opposite-gender couples. I show that the gender gap in time dedicated to educational activities with children has significantly increased in the first months of the pandemic relative to February 2020. Part of this change can be explained by the differential impact of the pandemic on the labor market outcomes of men and women: female survey respondents are more likely to have stopped working between February and June 2020, and gender gaps in home schooling activities are largest (smallest) in families where only the mother (father) has stopped working at some point between February and June. However, even in families where mothers are in work and fathers have stopped working, mothers continue to spend at least as much time on educational activities with children as fathers do.

This gendered division of home schooling activities could be driven by parental beliefs about who should do what in the household, or who is better at performing certain tasks. In the second part of the paper, I present novel evidence on parental beliefs about the returns to maternal, relative to paternal, time investment in home schooling activities and parental attitudes towards gender role. The new data show that parents perceive substantial costs to spending time home schooling children for mothers, and substantial benefits to delegating this task for fathers. Looking at attitudes towards gender roles, I find that almost 50% of my sample holds traditional beliefs about the share of home schooling tasks mothers should perfom.

I then turn to examining the role of beliefs about returns to maternal (*versus* paternal) time investment and gender-role attitudes in explaining changes in the home schooling gender gap during the first UK lockdown. Whether or not respondents hold a traditional opinion about gender roles is found to be strongly and positively correlated with changes in the gender gap in home schooling activities, over and beyond the effect of changes in labor market status of the parents. Finally, I show that respondents on average over-estimate the extent to which others support a traditional split of educational childcare tasks within the household, which suggest that information interventions may have the potential of changing parental behavior through their effect of parents' own beliefs about gender roles. The evidence presented here highlights the importance for policies to take into account the heterogeneity in the impact of the COVID-19 pandemic across genders, and to provide parents with adequate support in the form of childcare.

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A Data Description

Table A.1: Distribution of respondents across regions in England (%)

Region	Sample	National
North East	4.99	4.83
North West	13.13	13.04
Yorkshire and the Humber	9.92	9.80
West Midlands	10.53	10.47
East Midlands	8.75	8.65
South West	10.31	10.22
South East	16.51	16.30
East of England	10.97	11.05
Greater London	14.90	15.64

Notes: National figures refer to the latest available estimates for the population of residents aged 18 or above and come from the Office for National Statistics. Data source: Office for National Statistics (2019).

Table A.2: Full sample characteristics

	Mean	St. Dev.	N
Female	0.495	0.500	1805
Age	42.978	8.184	1805
University degree	0.542	0.498	1805
In work - June 2020	0.666	0.472	1805
Key worker	0.370	0.483	1202
In work - Feb 2020	0.837	0.370	1805
Stopped working	0.216	0.412	1510
Number of kids	1.879	0.770	1805
Age youngest child	8.695	4.439	1784
Opposite-sex couple	0.976	0.153	1805

Notes: The variable "In work" takes value 1 for respondents who reported being in paid work (either full time or part time) in the reference period (either the week before the interview or February 2020). The variable "Key worker" takes value 1 for in-work respondents who report being employed as essential workers. "Stopped working" takes value 1 for respondents who were in work in February 2020, either full time or part time, but report being out of paid work or on furlough in the week before data collection.

Table A.3: Final sample characteristics - Comparison with UKHLS data

	UKHLS			Survey		
	Mean	St. Dev.	N	Mean	St. Dev.	N
Female	0.499	0.500	1851	0.490	0.500	1723
Age	42.473	7.170	1851	43.109	8.180	1723
University degree	0.376	0.484	1758	0.540	0.499	1723
In work - June 2020	0.705	0.456	1851	0.665	0.472	1723
Key worker	0.542	0.498	1354	0.363	0.481	1145
In work - Feb 2020	0.875	0.331	1850	0.836	0.371	1723
Stopped working	0.210	0.408	1627	0.216	0.412	1440
Number of kids	2.203	0.886	1851	1.875	0.766	1723
Age youngest child	8.186	4.056	1851	8.730	4.437	1703

Notes: The first three columns present the characteristics of respondents to the June 2020 wave of the UKHLS Covid-19 module. The sample is restricted to married or cohabiting individuals with school-aged children. Cross-sectional survey weights are used to compute the summary statistics. Columns (4) to (6) refer to the restricted sample from my survey data. The variable "In work" takes value 1 for respondents who report being in paid work (either full time or part time) and not on furlough in the reference period (either the week before the interview or February 2020). The variable "Key worker" takes value 1 for in-work respondents who report being employed as essential workers. "Stopped working" takes value 1 for respondents who were in work in February 2020, either full time or part time, but report being out of paid work or on furlough in the week before data collection.

Table A.4: Characteristics of households

	Mean	St. Dev.	N
Mother in work - Feb.	0.780	0.414	1723
Father in work - Feb.	0.921	0.270	1723
Mother in work - June	0.587	0.492	1723
Father in work - June	0.788	0.409	1723
Both partners in work - June	0.490	0.500	1723
Both partners out of work - June	0.115	0.320	1723
Mother key worker	0.439	0.496	1012
Father key worker	0.354	0.478	1357

Notes: The variable "In work" takes value 1 for respondents who reported being in paid work (either full time or part time) in the week before the interview, and 0 if the respondent reports being on furough or otherwise not working. The variable "Essential worker" takes value 1 for respondents who reported being employed as key workers in June 2020. "Stopped working" takes value 1 for respondents who were in work in February 2020, either full time or part time, but report being out of paid work or on furlough in the week before data collection.

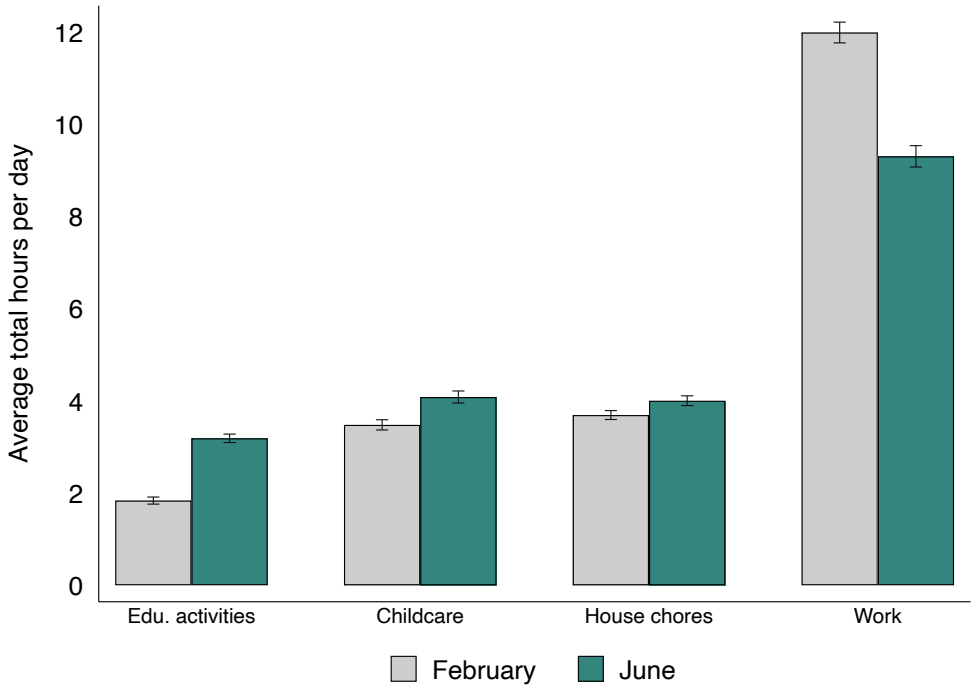
Table A.5: Distribution of households by family type

Family type	Share (%)
Mother stopped working - Father works	15.0
Mother stopped working - Father out of work	1.0
Father stopped working - Mother works	7.2
Father stopped working - Mother out of work	2.5
Both stopped working	4.5
No change - Mother in work	50.1
No change - Mother out of work	18.0
Other	1.7

Notes: Parents are classified as "In work" if they were in paid work (either full time or part time) at the relevant point in time, and 0 if they were on furough or otherwise not working. "Stopped working" takes value 1 for respondents (and their partners) who were in work in February 2020, either full time or part time, but report being out of paid work or on furlough in the week before data collection.

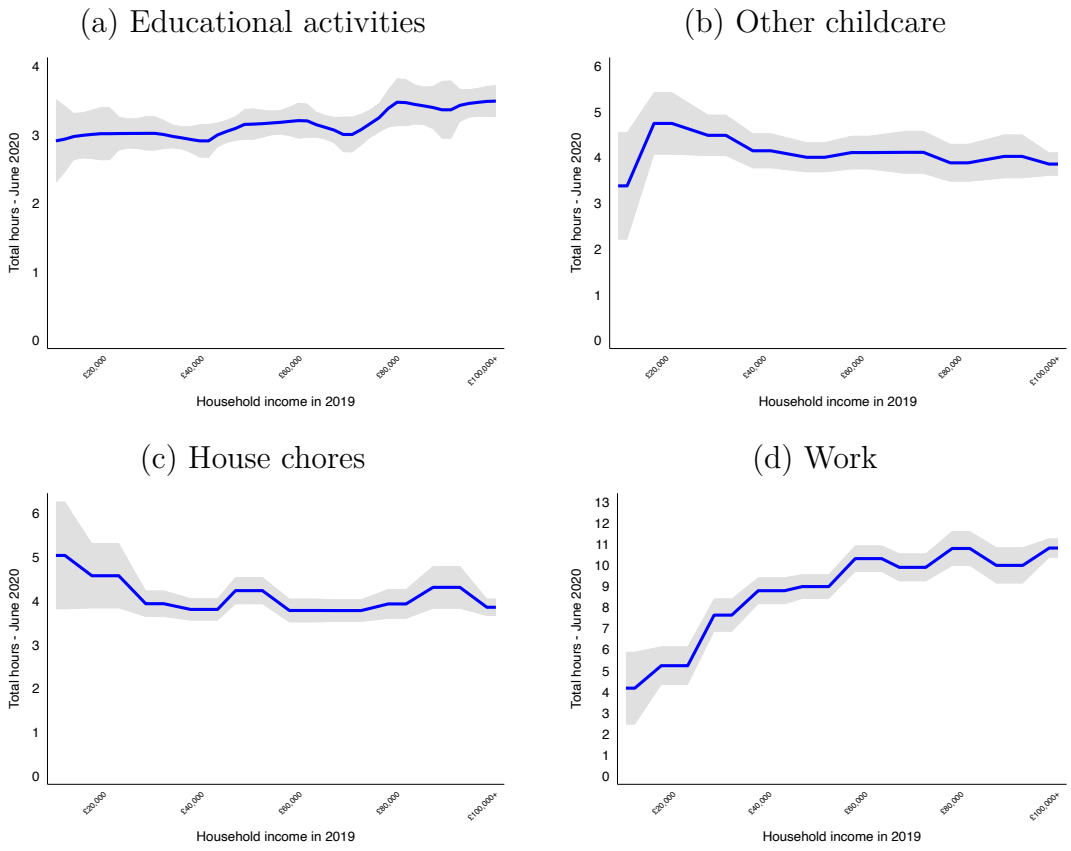
B Supplementary Analyses

Figure B.1: Parental time use before and during COVID-19



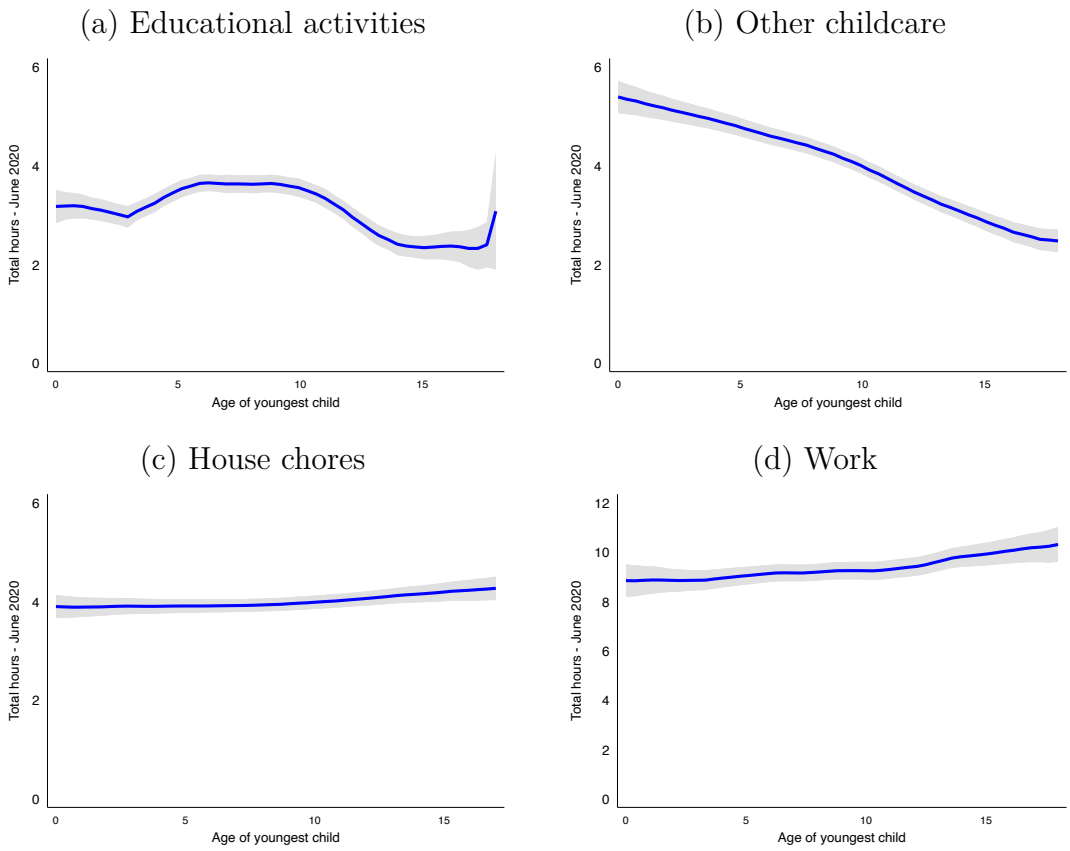
Notes: The graph shows the average number of hours respondents report they and their partner spent in total on educational activities with their child, other childcare activities, house chores and paid work. Separate bars show answers for a typical week in February (gray) and the week before data collection (green). The black caps show 95% confidence intervals.

Figure B.2: Total time use by household income



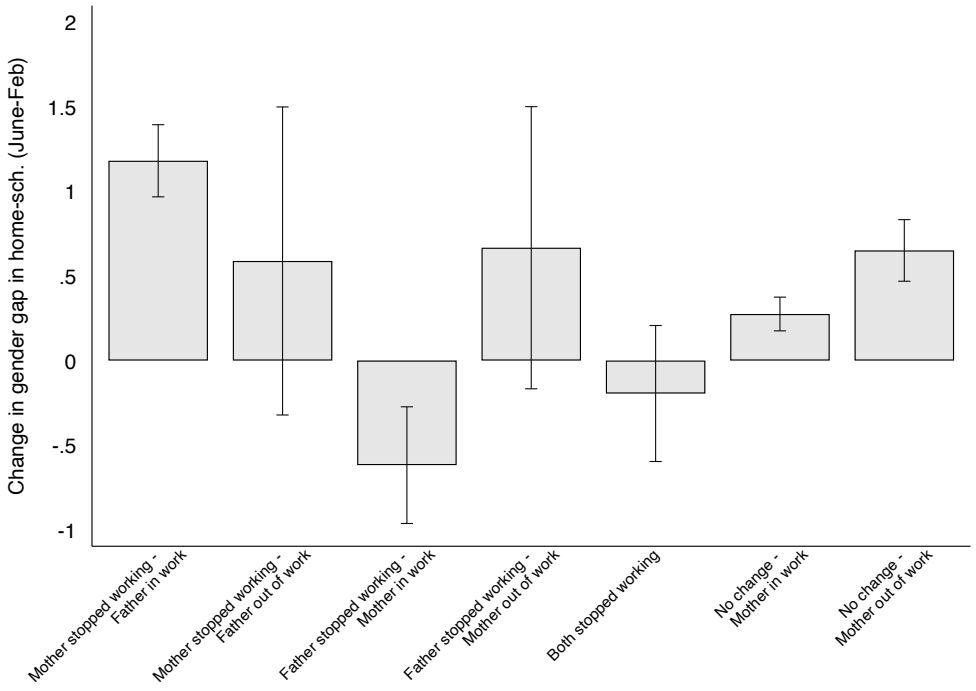
Notes: The graphs show the total number of hours respondents report they and their partner spend in total doing educational activities with their child (a), other childcare activities (b), house chores (c) and on market work (d), for different levels of household income. Household income is calculated as the sum of the respondent's income and the income of their partner in 2019. The gray area shows the 95% confidence interval.

Figure B.3: Total time use by age of youngest child



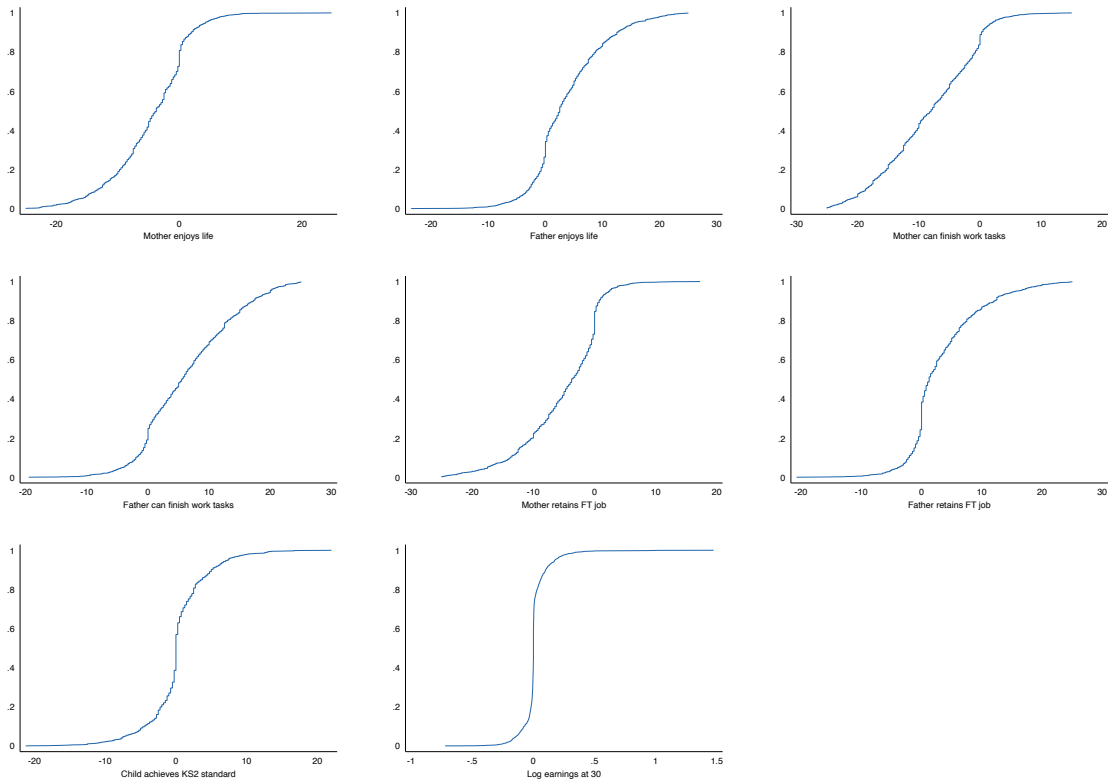
Notes: The graphs show the total number of hours respondents report they and their partner spend in total doing educational activities with their child (a), other childcare activities (b), house chores (c) and on market work (d), by age of the youngest child in the household. The gray area shows the 95% confidence interval.

Figure B.4: The gender gap in home schooling time by changes in labor market outcomes - Detailed groups



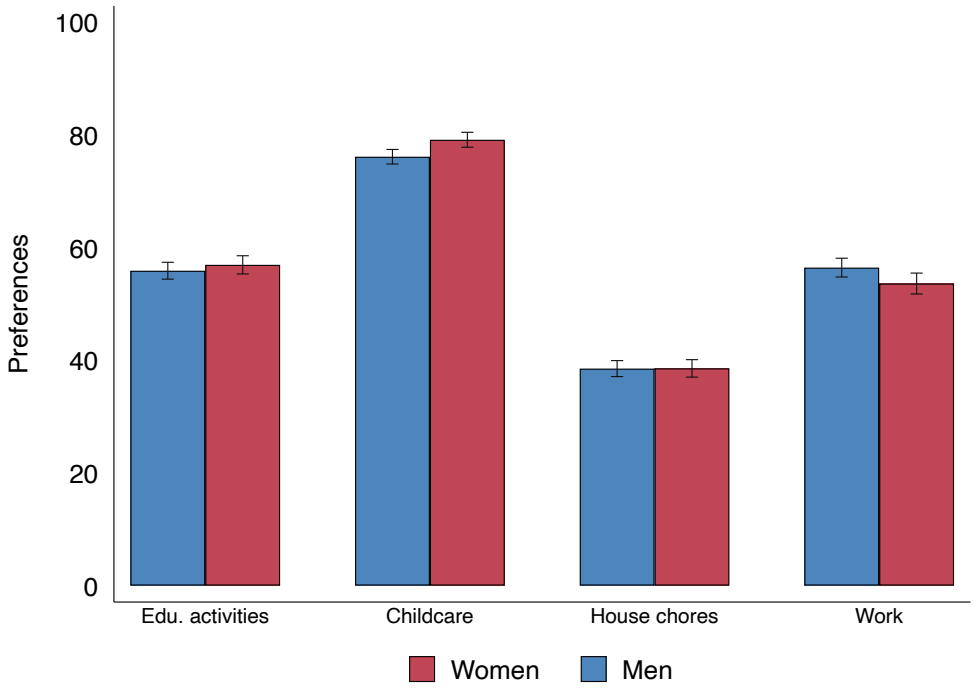
Notes: The graph shows the evolution of the gender gap in time dedicated to educational activities with children between February and June 2020. The gender gap is calculated as time devoted by the mother minus time devoted by the father, both expressed in hours per day. Positive numbers correspond to an increase in the gender gap to the disadvantage of women between February and June 2020. The gender of the two adults in the couple is identified from answers to the question about the respondent's own gender and the gender of their partner. Different bars represent households where only one parent stopped working betweek February and June 2020 (further distinguishing hoseholds depending on the employment status of the other parent) both parents stopped working, or where there was no change in the labor market status of either parent, further distinguishing between households where the mother was in work or out of work throughout. Black caps show 95% confidence intervals.

Figure B.5: Cumulative distribution of individual perceived returns to maternal time investment



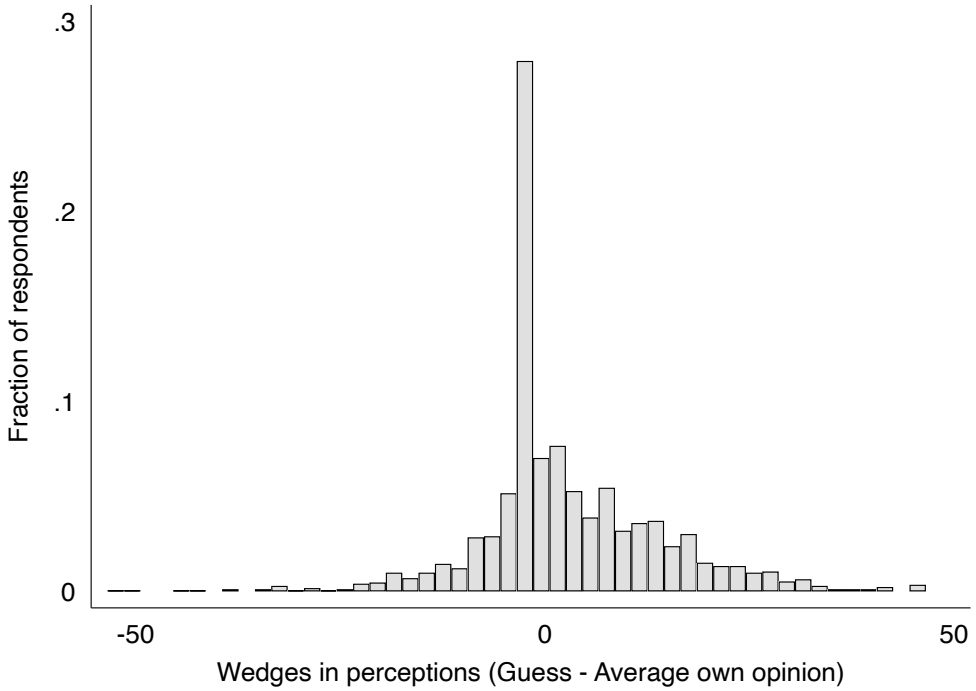
Notes: This figure shows the cumulative distribution of individual perceived returns to maternal time inputs separately for all parental and child outcomes.

Figure B.6: Preferences



Notes: The graph shows the respondents' average self-reported level of enjoyment, measured on a continuous scale from 0 to 100, of educational activities with their child, other childcare activities, house chores and work, separately for male and female respondents. The black caps show 95% confidence intervals.

Figure B.7: Wedges in perceptions of social norms about gender roles



Notes: The graph shows the distribution of the difference between respondents' guess about others' opinion about gender roles and the average opinion of survey respondents. Positive numbers indicate respondents over-estimate the extent to which others are conservative.

Table B.1: Determinants of pre-COVID gender gaps in time allocation

	Edu. activities	Childcare	House chores	Work
Has uni - Father	-0.1043*	-0.0829	-0.0806	-0.0084
	(0.0575)	(0.0998)	(0.1060)	(0.1917)
Has uni - Mother	0.0379	-0.0075	-0.1726	0.6061***
	(0.0572)	(0.0999)	(0.1117)	(0.1993)
Income - Mother	-0.0030*	-0.0136***	-0.0130***	0.0475***
	(0.0015)	(0.0021)	(0.0022)	(0.0045)
Income - Father	0.0007	0.0058***	0.0039*	-0.0365***
	(0.0012)	(0.0017)	(0.0021)	(0.0035)
Has children age 0-4	0.0576	0.5724***	0.2218	-0.2017
	(0.0782)	(0.1513)	(0.1507)	(0.2414)
Has children age 5-10	0.0486	-0.0654	0.0117	0.0469
	(0.0613)	(0.1019)	(0.1094)	(0.1869)
Out of work - Mother	0.1744***	0.5263***	0.9510***	-2.7948***
	(0.0578)	(0.0877)	(0.1097)	(0.2050)
Out of work - Father	-0.1036	-0.4545***	-0.6425***	1.9197***
	(0.0668)	(0.1103)	(0.1459)	(0.2523)
Constant	0.3861**	0.5925*	1.2637***	-1.9734***
	(0.1946)	(0.3310)	(0.3544)	(0.5804)
Mean of dep. var.	0.461	0.854	1.204	-2.473
Observations	1739	1744	1745	1745
R^2	0.029	0.105	0.118	0.303
Individual controls	✓	✓	✓	✓

Notes: OLS regressions. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The dependent variables are gender gaps in time allocation calculated as the difference between maternal and paternal time devoted to a given activity, and are expressed in number of hours per day. Positive (negative) coefficients correspond to an increase (decrease) of the gender gap. Individual controls include indicators for age groups of both partners.

Table B.2: The gender gap in home schooling time by changes in labor market outcomes - Detailed groups

	Gender gap	
	February	June
Mother stopped working - Father in work	0.55	1.74
	(0.88)	(1.78)
Mother stopped working - Father out of work	-0.18	0.41
	(0.81)	(1.87)
Father stopped working - Mother in work	0.50	-0.11
	(0.98)	(2.22)
Father stopped working - Mother out of work	0.88	1.55
	(1.10)	(2.68)
Both stopped working	0.47	0.27
	(1.03)	(2.03)
No change - Mother in work	0.36	0.64
	(0.97)	(1.69)
No change - Mother out of work	0.67	1.34
	(1.04)	(1.84)

Notes: Standard deviations given in parentheses. This table provides average gender gaps in educational activities with children by family type. Columns (1) and (2) refer to statistics for February and June 2020, respectively. Gender gaps are constructed as the difference between maternal and paternal time spent on educational activities with children, and are expressed in hours per day. Positive numbers indicate mothers are spending more time than fathers on educational activities with children. Family types are constructed on the basis of the labour market status of both partners in February and June 2020.

Table B.3: Determinants of perceived returns

	Maternal outcomes			Paternal outcomes			Child outcomes	
	Enjoys life	Finish tasks	Keep job	Enjoys life	Finish tasks	Keep job	Achieve KS2 std.	Log earnings
Female	-0.9273***	-2.2705***	-0.4376	1.6335***	2.2077***	0.3323	0.3043	0.0128*
	(0.3326)	(0.3898)	(0.3372)	(0.3426)	(0.3949)	(0.3219)	(0.2266)	(0.0068)
Age	0.0101	-0.0264	-0.0001	-0.0166	0.0201	-0.0181	0.0196	-0.0006
	(0.0225)	(0.0256)	(0.0236)	(0.0217)	(0.0238)	(0.0198)	(0.0159)	(0.0004)
Uni. degree	-0.0714	-1.1213***	-0.8495**	0.4479	1.4720***	0.5286*	0.2521	-0.0055
	(0.3263)	(0.3872)	(0.3362)	(0.3381)	(0.3980)	(0.3120)	(0.2201)	(0.0061)
Income (£'000s)	0.0182***	0.0156**	0.0135**	-0.0214***	-0.0187**	-0.0147**	-0.0084*	0.0001
	(0.0064)	(0.0073)	(0.0064)	(0.0065)	(0.0077)	(0.0062)	(0.0044)	(0.0001)
Out of work	0.0151	0.3806	-0.6388	-0.3591	-0.4327	-0.1986	-0.6158**	-0.0061
	(0.4597)	(0.5302)	(0.4704)	(0.4671)	(0.5517)	(0.4192)	(0.3133)	(0.0069)
Number of kids	-0.4258*	-0.5802**	-0.3845*	0.4012*	0.5462**	0.2210	0.0600	0.0006
	(0.2375)	(0.2513)	(0.2228)	(0.2268)	(0.2564)	(0.2118)	(0.1544)	(0.0039)
Children age 0-4	-0.0739	-0.3299	0.3651	0.2576	0.4779	0.2325	0.1944	0.0039
	(0.4389)	(0.5351)	(0.4310)	(0.4532)	(0.5420)	(0.4414)	(0.2959)	(0.0073)
Children age 5-10	-0.2991	-0.8058**	0.0439	0.0847	0.6506*	0.2498	0.1276	-0.0173***
	(0.3549)	(0.3966)	(0.3426)	(0.3486)	(0.3944)	(0.3242)	(0.2474)	(0.0060)
Constant	-3.3483**	-4.7013***	-3.0565**	3.4371**	2.5598*	2.4717**	-0.7762	0.0374*
	(1.3587)	(1.5635)	(1.4031)	(1.3470)	(1.5352)	(1.2358)	(0.9486)	(0.0211)
Mean dep. var.	-4.609	-8.381	-5.109	3.676	6.389	3.237	0.198	0.009
Observations	1713	1712	1712	1715	1712	1713	1713	1695
R^2	0.036	0.056	0.021	0.043	0.055	0.022	0.010	0.014

Notes: OLS regressions. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The dependent variables are perceived returns to maternal time investment.

Table B.4: Determinants of beliefs about gender roles

	Main earner		Trad. beliefs
	Man	Woman	
Female	0.8444	2.9972***	0.0886***
	(0.7873)	(0.8052)	(0.0266)
Age	-0.0038	-0.0116	0.0013
	(0.0543)	(0.0564)	(0.0017)
Uni. degree	-1.5516**	-0.4659	-0.0507*
	(0.7490)	(0.7487)	(0.0265)
Income (£000's)	-0.0044	0.0488***	0.0008
	(0.0150)	(0.0154)	(0.0005)
In work	-0.3999	0.3847	-0.0063
	(0.8601)	(0.8736)	(0.0279)
Number of kids	-0.0551	-0.2990	-0.0200
	(0.5221)	(0.5287)	(0.0171)
Children age 0-4	-1.4319	0.0967	-0.0476
	(1.0536)	(1.0799)	(0.0348)
Children age 5-10	0.4437	-1.0634	0.0153
	(0.8213)	(0.8282)	(0.0274)
Salary difference 5%	0.9000	-1.9974**	0.0267
	(0.9707)	(0.9430)	(0.0342)
Salary difference 10%	1.1978	-1.3433	0.0234
	(0.9612)	(0.9546)	(0.0338)
Salary difference 20%	4.6407***	-4.2886***	0.0539
	(1.0035)	(1.0450)	(0.0341)
Constant	53.3537***	50.9381***	0.3534***
	(3.3948)	(3.4433)	(0.1117)
Mean dep. var.	57.671	49.240	0.476
Observations	1716	1716	1716
R^2	0.026	0.027	0.015
Region F.E.	✓	✓	✓

Notes: OLS regressions. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The dependent variables in Columns (1) and (2) are the share of home-schooling tasks respondents think the mother should do in the scenario where the father or the mother are the main earner, respectively. The dependent variable in Column (3) is a binary indicator for whether the respondent holds traditional beliefs about gender roles.

Table B.5: The importance of beliefs for changes in the home schooling gender gap - Continuous measure of gender-role attitudes

	Changes in				
	Gender gap	Gender gap	Gender gap	Mother time	Father time
Mother enjoys life	0.0195**	0.0213**	0.0201**	0.0089	-0.0112**
	(0.0096)	(0.0096)	(0.0092)	(0.0073)	(0.0057)
Father enjoys life	0.0156*	0.0168*	0.0152*	0.0044	-0.0107*
	(0.0092)	(0.0090)	(0.0088)	(0.0074)	(0.0056)
Mother can finish tasks	-0.0106	-0.0101	-0.0057	0.0018	0.0074
	(0.0086)	(0.0085)	(0.0085)	(0.0070)	(0.0052)
Father can finish tasks	0.0172*	0.0126	0.0148	0.0233***	0.0085
	(0.0096)	(0.0096)	(0.0096)	(0.0081)	(0.0059)
Mother retains FT job	0.0056	0.0042	0.0011	0.0025	0.0013
	(0.0098)	(0.0095)	(0.0094)	(0.0076)	(0.0057)
Father retains FT job	-0.0055	-0.0042	-0.0082	-0.0141	-0.0058
	(0.0113)	(0.0110)	(0.0108)	(0.0089)	(0.0061)
Child achieves KS2 std.	-0.0001	-0.0012	0.0045	0.0086	0.0041
	(0.0111)	(0.0110)	(0.0110)	(0.0092)	(0.0066)
Child earnings at age 30	-0.4932	-0.3434	-0.3448	-0.1582	0.1866
	(0.3837)	(0.4008)	(0.3989)	(0.3203)	(0.2735)
Avg. maternal % of tasks	1.0034**	0.9374**	0.6920	0.4677	-0.2243
	(0.4462)	(0.4445)	(0.4469)	(0.3749)	(0.2481)
Mean dep. var.	0.403	0.403	0.403	0.887	0.485
Observations	1647	1647	1647	1647	1647
R^2	0.023	0.055	0.112	0.079	0.083
Region F.E.	✓	✓	✓	✓	✓
Household characteristics	✗	✓	✓	✓	✓
Labour market controls	✗	✗	✓	✓	✓

Notes: OLS regressions. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The dependent variable in Columns (1) to (3) is the change in gender gap in time dedicated to home-schooling activity, between February and June 2020. The gender gap for each period is calculated as the difference between maternal and paternal time devoted to educational activities with children, and expressed in number of hours per day. Positive (negative) coefficients correspond to an increase (decrease) of the gender gap over time. The dependent variables in Columns (4) and (5) are the change in maternal and paternal time allocation to home schooling activities between February and June 2020, respectively. Labour market controls include indicators for different family types, where types are defined based on changes in labour market outcomes of both parents between June and February 2020, as well as indicators for whether the mother or father is a key worker. Household characteristics include age and income of both partners, indicators for partners having a university degree, the number of children in the household and indicators for the presence of children aged 0-4 and 5-10.

Table B.6: The importance of beliefs for changes in the home schooling gender gap - Continued

	Changes in				
	Gender gap	Gender gap	Gender gap	Mother time	Father time
Age - Mother		0.0122	0.0143	0.0142	-0.0001
		(0.0114)	(0.0111)	(0.0086)	(0.0076)
Age - Father		-0.0043	-0.0055	0.0031	0.0087
		(0.0100)	(0.0097)	(0.0076)	(0.0065)
Has uni - Mother		0.1075	0.1846*	0.0837	-0.1009*
		(0.0980)	(0.0977)	(0.0827)	(0.0572)
Has uni - Father		-0.3980***	-0.4113***	-0.1398*	0.2715***
		(0.0977)	(0.0977)	(0.0801)	(0.0582)
Number of kids		0.0235	0.0010	0.0238	0.0228
		(0.0595)	(0.0599)	(0.0502)	(0.0372)
Children age 0-4		0.0416	0.0410	-0.0178	-0.0588
		(0.1185)	(0.1139)	(0.0947)	(0.0686)
Children age 5-10		0.4115***	0.4144***	0.5009***	0.0864
		(0.0985)	(0.0972)	(0.0786)	(0.0639)
Income - Mother (£0000s)		-0.0714***	-0.0468**	-0.0303*	0.0165
		(0.0194)	(0.0203)	(0.0174)	(0.0127)
Income - Father (£0000s)		0.0408**	0.0282	0.0196	-0.0086
		(0.0182)	(0.0178)	(0.0154)	(0.0111)
Mother stopped working			0.6714***	0.4006***	-0.2708***
			(0.1297)	(0.1085)	(0.0726)
Father stopped working			-0.5880***	-0.1583	0.4298***
			(0.1954)	(0.1533)	(0.1167)
Both stopped working			-0.5191**	-0.1211	0.3980**
			(0.2210)	(0.1648)	(0.1599)
No change - Mother not working			0.1765	-0.0099	-0.1865**
			(0.1219)	(0.1066)	(0.0742)
Key worker - Mother			-0.3068***	-0.2060**	0.1009
			(0.1062)	(0.0864)	(0.0712)
Key worker - Father			0.1989**	0.0516	-0.1474***
			(0.0933)	(0.0807)	(0.0547)
Constant	0.2231	-0.1373	-0.1396	-0.1704	-0.0308
	(0.2498)	(0.4198)	(0.4211)	(0.3297)	(0.2985)
Mean dep. var.	0.403	0.403	0.403	0.887	0.485
Observations	1647	1647	1647	1647	1647
R^2	0.029	0.060	0.117	0.082	0.084

Notes: OLS regressions. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The table displays coefficients for the variables not shown in Table 5.

Table B.7: The importance of beliefs for changes in the home schooling gender gap - Heterogeneity by gender

Sample	Men	Women
Mother enjoys life	0.0185	0.0193
	(0.0120)	(0.0138)
Father enjoys life	0.0264**	0.0047
	(0.0128)	(0.0118)
Mother can finish tasks	-0.0012	-0.0019
	(0.0128)	(0.0113)
Father can finish tasks	0.0163	0.0104
	(0.0161)	(0.0115)
Mother retains FT job	-0.0153	0.0153
	(0.0134)	(0.0131)
Father retains FT job	-0.0133	0.0026
	(0.0157)	(0.0146)
Child achieves KS2 standard	0.0130	-0.0082
	(0.0167)	(0.0146)
Child earnings at age 30	-0.2938	-0.6591
	(0.8217)	(0.4644)
Traditional gender roles	0.1272	0.3335***
	(0.1166)	(0.1112)
Mean dep. var.	0.114	0.706
Observations	844	803
R^2	0.119	0.143
Region F.E.	✓	✓
Household characteristics	✓	✓
Labour market controls	✓	✓

Notes: OLS regressions. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The dependent variable is the change in gender gap in time dedicated to home-schooling activity, between February and June 2020. The gender gap for each period is calculated as the difference between maternal and paternal time devoted to educational activities with children, and expressed in number of hours per day. Positive (negative) coefficients correspond to an increase (decrease) of the gender gap over time. Columns (1) and (2) restrict the sample to male and female respondents respectively. Labour market controls include indicators for different family types, where types are defined based on changes in labour market outcomes of both parents between June and February 2020, as well as indicators for whether the mother or father is a key worker. Household characteristics include age and income of both partners, indicators for partners having a university degree, the number of children in the household and indicators for the presence of children aged 0-4 and 5-10.

C Questionnaire

Demographics

Do you have at least one child aged between 5 and 16 living with you? Please only consider children of whom you are a parent or a guardian. [Yes, No]

Are you married or cohabiting? [Yes, No]

Which region do you live in? [Nine regions in England]

[Self and partner] *What is your age?* [Age in years, 18-99]

[Self and partner] *What is your gender?* [Male, Female, Other]

[Self and partner] *What is your highest level of education?* [No qualifications, Fewer than 5 GCSE, 5 or more GCSE, Trade/technical/vocational training, A-levels, Bachelor's degree, Master's degree, Doctoral or professional degree]

How many children aged 18 or less do you have living with you? Please count all children living in your house and of whom you are parent or guardian, including those younger than 5 and aged between 16 and 18.

[For each child] *Please specify their gender and age in years.*

[Self and partner] *Which category represents your total individual income (before taxes) in 2019? This should include money from all jobs, net income from a business or farm, and any rent, pensions, dividends, interest, social security payments or other money income you received.* [Income brackets from £10,000 to £150,000]

Hypothetical scenarios

Next, we are interested in your opinion about how important parental time is for children's future, in these unprecedented circumstances.

We will ask you to consider the situation in which, much like today, all schools in the country are closed and have moved their activities online to different degrees. In this context, we will ask you to imagine a British family, the Joneses, who have one child and have to make decisions about who will dedicate time to home schooling their only child. Both Mr and Mrs Jones work full-time.

More specifically, we will show you two scenarios and ask for your opinion on certain outcomes. The scenarios will be:

- *Mrs Jones (Sarah) takes care of all of the home schooling*
- *Mr Jones (Michael) takes care of all of the home schooling*

We know these questions are difficult. Please try to consider each scenario carefully and tell us what you believe the likely outcome to be.

Child earnings *Please think about Michael and Sarah Jones, who both have a university degree and have one child, Emma. Emma is enrolled in Year 5 in an average school in England and has achieved the expected level in the KS1 SATS.*[30]

Sarah and Michael want to dedicate 4 hours every day to home schooling their child, and can decide whether Sarah or Michael alone will take care of all the home schooling activities. Suppose they decide by rolling a dice.

Assuming that £1 today is worth £1 when the child turns 30, what do you think the child's yearly earnings at age 30 (in £, before taxes) will be, if Sarah and Michael split the home schooling responsibilities as follows? [Sliders for the scenarios described above]

Binary outcomes *Please keep thinking about Michael and Sarah Jones, who have to decide how much time each of them should spend doing educational activities with their child. How likely do you think it is that the following outcomes will occur if Sarah takes care of home schooling for 4 hours every day by herself?* [Repeat the same questions for all scenarios.]

[30]Respondents were randomised to see scenarios with a female or male child, and with different levels of educational attainment of the two hypothetical parents.

- *The child will achieve more than the expected standard in the KS2 SATs (score above 100)*
- *Sarah enjoys her life*
- *Michael enjoys his life*
- *Sarah is able to complete all her work activities*
- *Michael is able to complete all his work activities*
- *Sarah will have a full-time job one year from now*
- *Michael will have a full-time job one year from now*

Gender roles *Please keep thinking about Sarah and Michael Jones, who both work full-time and have one child. Now think about the case in which Michael earns X%*[31] *more than Sarah. With the schools closed, Sarah and Michael have to help their child with home schooling for 4 hours every day. On a scale from 0 to 100, where 0 means Michael takes care all of the home schooling by himself, and 100 means Sarah takes care of all of the home schooling by herself, please tell us:*

- *How you think Sarah and Michael should divide the home schooling responsibilities between themselves*
- *How other survey respondents think Sarah and Michael should divide the home schooling responsibilities between themselves*

We are interested in how your answers would change if now Michael earned X% less than Sarah. [Repeat two questions above with the same answer scale]

Parental time use

On an average school day last week (or the last week in which your child was home schooled), how many hours did you and your partner spend doing the following activities? Please consider only school days (Monday - Friday) and indicate a time in full hours rounding to the closest unit. [Answers in hours, separately for self and partner. A similar question was also asked in reference to a typical week in February.]

[31] 'X' randomised between 2, 5, 10 and 20%.

- *Doing educational activities with children*
- *Doing other childcare activities*
- *Doing house chores*
- *Working*

Employment

[Self and partner] *Which statement best describes your employment status in February 2020 and last week, respectively?* [Working full-time; Working part-time; Not working, furloughed; Not working, Other]

[Self and partner] *Are you a critical worker?* [Yes; No]

If schools and childcare centres remain closed until the beginning of the next academic year, are you or your partner, if applicable, considering quitting your job or significantly reducing your working hours to take care of your children? [Yes, I am; Yes, my partner is; Yes, we both are; No]

Other questions

How do you think this period of school closure will change the way in which you and your partner will divide childcare responsibilities in the future? [We will split tasks more equally than before, We will split tasks in the same way we did before the crisis, We will split tasks less equally than before]

On a scale from 0 to 100, where 0 means "Not at all" and 100 means "A great deal", how much do you enjoy doing the following activities? [Answers on a 0-100 slider]

- *Work*
- *Educational activities with child*
- *Recreational activities with child*
- *House chores*
- *Leisure time*