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Telecommuting and division of domestic work: the role of gender role attitudes in Germany

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Telecommuting is often portrayed as a work-life balance measure. Though, in theory, telecommuting can provide workers with more time for leisure and family, due to the boundary blurring between work and life spheres, it can exacerbate gender inequalities by pushing women to carry out more domestic work while increasing men's time in paid work. Empirically, the evidence is mixed. We extend the debate by exploring how individuals' gender role attitudes (GRA) moderate the relationship between telecommuting and the division of domestic work. We apply hybrid models to the German Family Panel data. The data covers the timespan from 2008 to 2021, which includes the unique COVID-19 pandemic. Results show that GRA matter. When getting access to telecommuting, egalitarian men increased their contribution to childcare, while traditional men did not. Similarly, telecommuting traditional women increased their childcare contribution. The pattern remained the same during the expansion of telecommuting due to the COVID-19 pandemic: only telecommuting traditional women and telecommuting egalitarian men increased their childcare contribution. The results of this study suggest that telecommuting has the potential to serve as a 'great equaliser'. However, achieving this requires actively promoting more egalitarian views on gender roles.

Introduction

Telecommuting (i.e., working from home) is generally perceived to allow workers to better balance work and private demands by providing more time for leisure and family (Noonan and Glass, 2012). This is done through the reduction of commuting costs, through enhancing the flexibility and permeability of boundaries between work and family (Clark, 2000; Halford, 2006), and through the increase of work autonomy (Allen, Golden, and Shockley, 2015). There is some evidence that telecommuting reduces work-family conflict for parents (Erickson, Martinengo, and Hill, 2010). However, other studies show that telecommuting can increase work-family conflict, particularly for women (Yucel and Chung, 2023). This is because telecommuting reinforces the gendered division of labour (Lyttelton, Zang, and Musick, 2022; Wang and Cheng, 2024), increasing the amount of time women spend on both paid and unpaid work (Sullivan and Lewis, 2001; Hilbrecht *et al.*, 2008; Lott, 2019; Chung and Booker, 2023). In fact, scholars argue that flexible working can potentially exacerbate gender inequality for this very reason (Haddon and Silverstone, 1993).

Previous studies have shown the importance of gender role attitudes (GRA) in predicting the division of childcare and housework among different-sex couples or in explaining levels of work-life conflict (Schober, 2013; Nitsche and Grunow, 2018). More recently, studies have noted the variation in the gendered work-family outcomes of flexible working in different gender normative contexts (Lott, 2015; Kurowska, 2020; Chung and Seo, 2024). Similarly, studies have shown how GRA moderate the association between telecommuting and work-family conflict (Yucel and Chung, 2023), with an assumption that GRA shape how individuals use telecommuting to carry out more paid or unpaid labour. Less known is how GRA might moderate the association between telecommuting and the division of domestic work. A better comprehension of the role of GRA is necessary for a more fine-tuned understanding of what the wider spread of telecommuting we observe can mean for gender equality (Chung *et al.*, 2021). Telecommuting may not exacerbate gender inequality, as once expected in certain pockets of the population, where social norms do not restrict gender performance (Kurowska, 2020). What is more, if

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GRA shape flexible working outcomes, this can provide us with yet another justification for the need to tackle gender biases in social roles in today's societies and specifically pertaining to this study, to provide policy solutions to ensure that flexible working can bring about better gender equality outcomes.

Our paper also explores the role of GRA during the COVID-19 pandemic period when there was the expansion of telecommuting, alongside the rise in childcare and housework demands. Previous studies have shown that during this time, there were signs of men contributing more to domestic work (Craig and Churchill, 2021), potentially due to the widespread use of telecommuting (Lyttelton, Zang, and Musick, 2022) and, with it, a reduction in the stigmatized (negative) views against telecommuters. This may have enabled workers to use telecommuting for care and housework without fearing stigmatization against their work commitment or masculinity (see also, Rudman and Mescher, 2013). At the same time, there was evidence for the re-traditionalization of roles during the pandemic period, with women performing even more domestic work than before (Allmendinger, 2020) as couples fell back on traditional gender roles.

We explore the role of GRA in shaping the association between telecommuting and the division of domestic work, using the German Family Panel data (Hank *et al.*, 2025) from 2008 to 2021 (waves 1–13) and applying hybrid linear regression models separating the between-person effects and within individual over time changes (Allison, 2009). This article contributes to the research on the outcomes of telecommuting in the following ways. First, we explore the role of gender and GRA in shaping the relationship between the division of unpaid work and telecommuting. Enabling a more precise look at the potential heterogeneity across pockets of the population with regard to how flexibility is used at work (Clark, 2000), as well as how gender norms shape the performance of gender within the household, we enable a better understanding of what an expansion of telecommuting can mean for gender inequality patterns in the future. Secondly, given the long period covered in our data, we can estimate the effect of telecommuting before the pandemic and compare it to the COVID-19 pandemic period, when telecommuting was more common across the workforce. This allows us to disentangle the effect of GRA on the relationship between telecommuting and the division of unpaid work from their potential impact on the take-up of telecommuting.

Theory

Telecommuting and division of domestic work

Flexible working arrangements (Kelly, Moen, and Tranby, 2011) can be based on the location of work (i.e., telecommuting, working from home) and scheduling of work (i.e., schedule control, flexitime). Here, we focus on the flexibility in the location of work, the opportunity to work from home always or regularly (Noonan and Glass, 2012). While having access to telecommuting does not translate into actually using this opportunity, access to telecommuting alone can explain work-family outcomes (i.e., Chung and van der Horst, 2018). This is because such access can provide workers with psychological safety that when they need such support, they are able to make use of it (Eaton, 2003). Telecommuting is actively promoted as a resource to provide a better work-life balance, particularly for employees with children (Chung, 2022). However, empirical evidence shows that telecommuting can increase rather than decrease work-family conflict (Allen, Golden, and Shockley, 2015; Yucel and Chung, 2023). This is mainly because telecommuting can blur the boundaries between work and the private sphere, leading to an increase in housework, paid work, or both, largely depending on one's gender—and the roles attributed to them by social norms (Clark, 2000; Kurowska, 2020).

Domestic work is housework and childcare that individuals perform to maintain family and home (Coltrane, 2000). Housework activities include cooking, cleaning, buying groceries, and doing laundry, which are labelled as routine tasks and considered less enjoyable than non-routine tasks, i.e., taking care of the garden, repairs and bills (Coltrane, 2000). Research on the unequal division of housework and childcare (e.g., Petts, Carlson, and Pepin, 2021; Chung and Booker, 2023) mainly focuses on routine tasks.

How partners divide domestic work can be explained by several theories. According to the time availability perspective (Huber and Spitze, 1981), a partner with more time available will do more domestic work relative to a partner who has less time. Relative resources theory argues that the partner with more resources, especially with the potential to gain more market income, would carry out a smaller share of the domestic work (Becker, 1991). These perspectives are gender neutral, i.e., assume that regardless of gender, an individual with more time available or fewer resources will carry out more domestic work. According to the 'doing gender' approach (West and Zimmerman, 1987), constructed gender norms shape who does more housework. Thus, by performing different societal roles, individuals demonstrate their gender: as the breadwinners and as the homemakers or caregivers. In line with this perspective, societal gender norms define how domestic work is distributed. Despite the evidence of convergence in housework time (Leopold, Skopek, and Schulz, 2018), women spend more time on housework in most countries than men (Eurofound, 2022). Nonetheless, in countries with

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more egalitarian gender norms (i.e., Denmark and Norway), the gap between men and women is smaller (Kan, Sullivan, and Gershuny, 2011).

Telecommuting can shape how different-sex couples divide household responsibilities (Sullivan and Lewis, 2001). The new opportunities for flexibility model (Huws *et al.*, 1996) argues that telecommuting can allow gender roles to converge, where women can take a larger role in 'breadwinning' and men in domestic tasks. This is because telecommuting provides workers with more time and flexibility to shape work around their family and personal demands. In other words, (long hours) working in the office may have prevented men from taking a larger role in the household. With telecommuting, men are able to save commuting time and have flexibility at work to better engage in domestic work (Carlson, Petts, and Pepin, 2021). Moreover, the flexibility and permeability that telecommuting provides have been shown to improve the labour market participation of women with care responsibilities (Chung and van der Horst, 2018; Lyttelton, Zang, and Musick, 2022). Therefore, telecommuting can allow couples to break the patterns of traditional gender roles if they wish to do so, potentially supporting couples' relationship satisfaction (Petts *et al.*, 2023). On the contrary, the exploitation model (Haddon and Silverstone, 1993) sees telecommuting as a tool to better exploit women's labour by enabling women to take more part in paid employment, namely work longer hours, without disrupting the unequal division of domestic work within the household. Similarly, men may adhere to their gender role and use the blurred boundaries between work and home to do more paid work rather than engage more in unpaid domestic work (Glass and Noonan, 2016; Lott and Chung, 2016). Depending on the couple's arrangement in the division of domestic labour, telecommuting might even affect the fertility intentions and shape the family size (Kurowska, Matysiak, and Osiewalska, 2023), which can also influence how couples divide paid and unpaid labour.

Combining the theories of division of domestic work and telecommuting, we can expect that telecommuting will enhance gender equality by giving men the opportunity to engage in household chores, relieving their female partners' load. Alternatively, it might exacerbate gender inequality, where women do much more housework when telecommuting, with potential negative career consequences due to this, and where men enact the masculine role and do more paid work yet even less housework when telecommuting (Marsh and Musson, 2008; Chung and Booker, 2023). Men's masculine identities may also be threatened when working flexibly, as flexible working is seen as feminine in addition to deviating from the ideal worker norm (Rudman and Mescher, 2013; Munsch, 2016). Since telecommuting was not (and is not) common for male workers, especially before the pandemic, men may end up doing less unpaid work, even when it is possible to do more, to compensate for the deviation from the norm.

In sum, we come to the two competing hypotheses:

Hypothesis 1a: Telecommuting is associated with a higher contribution to domestic work for both men and women.

Hypothesis 1b: Telecommuting is associated with a higher contribution to domestic work for women but not for men.

The role of GRA

GRA are views individuals hold regarding the roles men and women should play in society (van der Horst, 2014). The way men and women will distribute domestic duties when telecommuting relates to their beliefs about gender roles (Kan, Sullivan, and Gershuny, 2011; Schober, 2013). Psychological research on the relationship between attitudes and behaviour also suggests that individuals' behaviour is in line with their attitudes (Cooper and Croyle, 1984) and that people act in accordance with their identity (Cast, 2003). Empirical research supports this assumption and shows that egalitarian men are more likely to contribute to housework and childcare (Greenstein, 1996; Grunow and Baur, 2014). At the same time, women who view family as their primary sphere would do more housework (Schober, 2013; Nitsche and Grunow, 2018), and women with egalitarian attitudes would participate more in paid work (Cunningham, 2008).

GRA are multidimensional in that different beliefs about men's and women's roles do not necessarily align within the traditional—egalitarian spectrum for all. Based on the existing studies (Knight and Brinton, 2017; Grunow, Begall, and Buchler, 2018; Begall, Grunow, and Buchler, 2023), we see that the beliefs around the mother's employment, the primacy of family or work for women, men's role in the family, and finally, beliefs around the couple's income generation roles can all constitute different attitudinal dimensions. Attitudinal ambivalence can be found in individuals holding egalitarian views on some dimensions and traditional views on others (Sjöberg, 2010). For instance, Grunow, Begall, and Buchler (2018) identified a class of individuals that strongly supports men's participation in household chores but, at the same time, disapproves of maternal employment. Furthermore, Grunow and Baur (2014) found that only attitudes towards male contribution to housework were a key predictor of men's housework. In this respect, it is important to distinguish between different types of

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GRA when exploring how GRA can moderate the association between telecommuting and the division of domestic work. Given the focus of our study, the most relevant GRA are the perceptions of men's roles in the household and women's roles in terms of family and work.

How couples view gender roles can especially matter when telecommuting. Border theory (Clark, 2000) argues that flexibility and permeability in the work-family boundary will result in the expansion of the sphere an individual identifies more with. This is why we expect that workers with different GRA will have different priorities with regard to how they use their additional resources of time and energy saved from not having to commute to work and flexibility of boundaries between work and family when telecommuting. Previous qualitative evidence shows that couples with more egalitarian GRA used flexibility in their work to divide domestic chores equally, whereas women with traditional GRA viewed flexibility as an opportunity to do more housework and childcare chores (Sullivan and Smithson, 2007). Similarly, Yucel and Chung (2023) demonstrate that telecommuting increased work-to-family interference among women with egalitarian GRA while it increased family-to-work interference among women with traditional GRA. GRA did not play a role in this relationship for men. This finding aligns with the expectation that women with traditional views will identify more as homemakers and expand domestic work. In contrast, women with egalitarian views will focus more on the expansion of paid work when telecommuting.

Based on these previous studies, we expect that it is mainly women who believe that their primary focus is the family and that men should not do household chores (i.e., traditional GRA) who will increase their share of domestic work when telecommuting, whereas this will not be the case for women with egalitarian GRA. On the other hand, men with egalitarian GRA will be those who will use the newly obtained flexibility in their work to try to be more involved in housework and childcare. In contrast, men with traditional GRA are unlikely to do so. Considering the multi-dimensions of GRA (see Grunow and Baur, 2014 on the predictors of men's housework contribution), we expect that for men, particularly the attitudes towards men's role in the household will matter. For women, attitudes around women's role in the work and family might be important, as they shape women's beliefs around work roles. However, attitudes towards men's role in the household will also matter since they shape women's responsibilities in the domestic sphere. We do not make assumptions about which GRA will matter more because we expect both to matter.

Therefore, we hypothesize:

Hypothesis 2a: Telecommuting is associated with a higher contribution to domestic work among women with traditional GRA compared with women with egalitarian GRA.

Hypothesis 2b: Telecommuting is associated with a lower contribution to domestic work among men with traditional GRA compared with men with egalitarian GRA.

The COVID-19 context

GRA may influence the association between telecommuting and the division of labour, not only because workers with different GRA may use telecommuting in different manners to divide household labour but also because GRA may shape the take-up of telecommuting practices. The COVID-19 pandemic provides a unique opportunity to tease out this association, as the state or organizations enforced telecommuting during this period. From March until July 2020 and from about December 2020 to May 2021, Germany, like many countries, entered a strict lockdown to contain the spread of the COVID-19 virus. Schools, daycare, restaurants, and nonessential retail were closed, and many employees were furloughed or had to work from home. The sudden expansion of telecommuting and the fact that the government has imposed it to reduce the spread of the virus meant most workers who can telecommute were or have had to telecommute during this period, which can remove the potential selection effect of GRA on telecommuting.

What is more, during the pandemic period, the stigma against telecommuters reduced (Abendroth *et al.*, 2022), potentially enabling parents, especially fathers, to use telecommuting to be more involved in housework and childcare without fearing repercussions on their careers (Chung *et al.*, 2021). Also, due to school closures, not only was there more housework and childcare to be carried out but also more of an understanding that workers, especially parents, had to address both care and work demands during the lockdown periods (Petts, Carlson, and Pepin, 2021; Zoch, Bächmann, and Vicari, 2022). The research on the consequences of COVID-19 initially proposed and found evidence for two opposing hypotheses: (i) the re-traditionalization hypothesis (Allmendinger, 2020) that the pandemic will bring back the traditional unequal division of household chores (Zoch, Bächmann, and Vicari, 2021), and (ii) the equalizing hypothesis (Craig and Churchill, 2021) that changes in the working hours, income, time and location of work will provide space for both partners to engage more equally in the domestic work. Until now, studies in Germany have shown evidence for both, depending on circumstances,

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the male partner's contribution either relatively increased or decreased (Hank and Steinbach, 2021; Hipp and Bünning, 2021; Kulic *et al.*, 2021).

We can expect two opposing outcomes with regard to telecommuting and the division of labour during the pandemic. On the one hand, we can expect an even stronger moderation of GRA during COVID-19. In such a crisis, and with the increased demand for domestic work, workers with a more traditional GRA may have reverted to their assumed gender roles with a clearer division of responsibilities, where men fully take on the breadwinning role and women the caregiving roles. Similarly, those with a more egalitarian GRA may have welcomed this new opportunity provided by the pandemic to enact their ideal division of labour (Milkie *et al.*, 2002) to divide the increased domestic work more equally. This may have especially changed the behaviours of egalitarian men, who may have previously been cautious of doing so due to stigmatized views around their flexible working (Rudman and Mescher, 2013). On the other hand, we could potentially expect that GRA do not matter as much with regard to the division of housework and childcare during the COVID-19 lockdown periods. Regardless of one's GRA, working parents were presented with unprecedented high demands of housework and childcare during the pandemic. Therefore, all telecommuting workers may have had to spend more time on housework and childcare. Between men and women, we can expect to see more changes in men in this case, as we expect that women would have already used telecommuting to be more involved in housework and childcare.

Thus, we hypothesize:

Hypothesis 3a: Telecommuting is associated with a higher contribution to domestic work for both men and women during COVID-19.

Hypothesis 3b: Telecommuting is associated with a higher contribution to domestic work among women with traditional GRA compared with women with egalitarian GRA during COVID-19.

Hypothesis 3c: Telecommuting is associated with a lower contribution to domestic work among men with traditional GRA compared with men with egalitarian GRA during COVID-19.

Data and methods

To analyse how GRA moderate the relationship between telecommuting and the distribution of domestic work, we use data from the German Family Panel (pairfam), release 14.0 (Brüderl *et al.*, 2022). Pairfam includes extensive information on GRA, working arrangements, and the relative distribution of household tasks. Pairfam data has been collected yearly since 2008. We use the pre-pandemic waves 1–12 conducted from 2008/9 to 2019/20 and the pandemic wave 13 collected between November 2020 and April 2021. Moreover, part of the wave 12 was conducted in 2020 when the first lockdown began. We included those cases and created a control variable to indicate which cases were affected by the lockdown measures and the telecommuting expansion. The analytical sample comprises different-sex couples with children under the age of 18 due to the low number of cases among same-sex couples. Detailed information on the sample and missing values is available in the Supplementary Section S18, pages 33–34. The final sample consists of 12,472 observations, with 834 men and 1,072 women participating in at least three waves during the observed period (unbalanced panel). The operationalization of the variables is presented below, with more information in Supplementary Table S1A.

Dependent variable: division of housework and childcare

The individuals relatively assess their contribution to the division of housework ('washing, cooking, cleaning' are asked simultaneously) and childcare ('who is taking care of the children'). The possible answers range from 1 '(Almost) completely my partner' to 5 '(Almost) completely me'. We normalize this variable from 0 (my partner is doing almost all the housework/childcare) to 1 (I am doing almost all the housework/childcare) and treat it as continuous.

Independent variable: telecommuting (WFH)

Telecommuting is measured by asking individuals if they (i) always work from home, (ii) have an unchanging work location with a possibility to work from home, and (iii) have an unchanging work location without the possibility to work from home. We operationalized the telecommuting variable in the following way: 0 is an unchanging work location without telecommuting, and 1 is an unchanging work location with the possibility of telecommuting and always telecommuting. Therefore, our telecommuting variable combines access and use of telecommuting. Even though it might include workers who telecommute more sporadically, previous studies show that even access to telecommuting is important in shaping employment and family outcomes (Chung and van der Horst, 2018). In the analysis section, for simplicity of terminologies, we consider those who respond having the possibility to work from home as those telecommuting, acknowledging that the category combines those who have access but may not telecommute as regularly. As a robustness check, we

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provide an analysis, excluding the group that always telecommutes. The results remain the same (see Supplementary Section S10, pages 20–21).

Moderating variable: GRA

The following statements are available to measure GRA: (i) 'Women should be more concerned about their family than about their career'; (ii) 'Men should participate in housework to the same extent as women'; (iii) 'A child under 6 will suffer from having a working mother' and (iv) 'Children often suffer because their fathers spend too much time at work'. Respondents can assess these statements on a scale from Strongly disagree (1) to Strongly agree (5). In Supplementary Figure S2A, we present the distribution of answers to how much people agree with the statements. Creating an index for all or subsamples of these statements is not possible due to the low internal consistency (Cronbach's alpha is 0.46 for all, 0.35 for the first two, 0.45 for the last two, 0.49 for the first and the third) and since we aim to explore the multidimensionality of the GRA (Knight and Brinton, 2017; Grunow, Begall, and Buchler, 2018). Statement (i) measures work-family roles ideology, statement (ii) housework division ideology, statement (iii) maternal employment ideology, while statement (iv) is less clear as it can be supported by both egalitarian and traditional individuals criticizing the long hours fathers spend at work (see Nitsche and Grunow, 2018). Therefore, given that our research question relates to the division of domestic labour and work-family roles, we use the first two statements to indicate two distinct GRA dimensions. We use the statement 'Men should participate in housework to the same extent as women' (GRA 1) to indicate attitudes around men's roles in the domestic sphere and the statement 'Women should be more concerned about their family than about their career' (GRA 2) to indicate the respondent's perception of women's roles (the correlation between the two is 0.2). We recode the scale for the statements as a binary variable (Arpino, Esping-Andersen, and Pessin, 2015; Begall, Grunow, and Buchler, 2023). For GRA 1, 0 = the individuals with egalitarian GRA (who strongly agree) and 1 = the rest to have a more balanced distribution. We separate those who strongly agree (58 per cent) from everyone else (only 18 per cent of respondents disagreed or neither agreed nor disagreed, 24 per cent agreed on the original scale), based on the median split (DeCoster, Gallucci, and Iselin, 2011) and the research on GRA that shows how strong agreement represents a more distinct view on some gender roles (Barth, 2016). For GRA 2, 0 = individuals with the egalitarian GRA (who disagreed with the statement) and 1 = the individuals with traditional GRA (who agreed with the statement and neither agreed nor disagreed), based on the median split (DeCoster, Gallucci, and Iselin, 2011). Following previous studies (Nitsche and Grunow, 2018), we treat GRA as a time-constant variable measured at the start of the observation period (wave 1) to avoid a feedback loop between acquired resources and individual attitudes. What is more, as GRA is measured in every other wave, using GRA as a time-variant variable would have constrained our sample sizes. In the Supplementary Section S5, pages 8–9, we provide the distribution of GRA across years.

Control variables

Since the division of domestic work remains gendered (Eurofound, 2022) and women are under-represented among teleworkers (Kley and Reimer, 2023), we control for the respondents' gender, and later on, in the models with GRA, we test for men and women separately. Based on the time availability perspective (Huber and Spitze, 1981) and the fact that women working part-time are less likely to be teleworking (Kley and Reimer, 2023), we control for working hours. To take into account the household demands that might be related to the division of household labour and the take-up of telecommuting, we use the age of the youngest child, the number of children and marital status (Singley and Hynes, 2005; Chung *et al.*, 2021). Following the relative resources approach (Becker, 1991) and the access to telecommuting contingent on the occupational sector (Kley and Reimer, 2023), we include education, occupation status and her share of income as controls. Finally, to account for the potential cultural variation, we control for East/West residency in Germany, migration background, and age (Yucel and Chung, 2023).

Models

We apply hybrid linear regression to explore the individual change in the telecommuting status and how it is associated with the relative division of housework and childcare (over time within-person) and variation between those who telecommute and those who do not (between-person). The hybrid model (Allison, 2009) is given by:

$$y_{it} = \beta_0 + \beta_1(x_{it} - \bar{x}_i) + \beta_2 z_i + \beta_3 \bar{x}_i + \mu_i + \epsilon_{it}$$

y_{it} is the outcome variable division of housework and childcare. First, we compute the person-specific mean to estimate the between-person differences ($\beta_3 \bar{x}_i$). Then, we calculate the deviation from the person-specific mean for the time-variant observations to estimate the within-person over time differences $\beta_1(x_{it} - \bar{x}_i)$, which are identical to the fixed-effects estimation. The advantage of the hybrid model is that it

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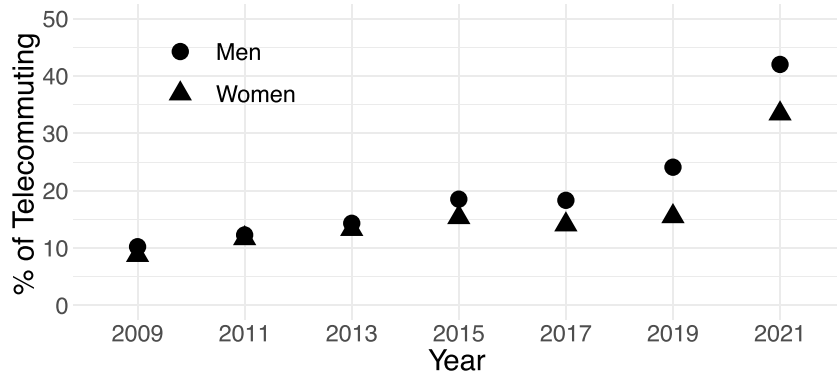

Figure 1 Share of men and women telecommuting from 2008/9 (wave 1) to 2020/21 (wave 13)

allows the inclusion of time-invariant variables $\beta_2 z_i$, which are GRA, gender, migration status, and living in East Germany. μ_i represents the person-specific variation that is stable over time and ϵ_{it} is the random variation specific to an individual at a point in time. For simplicity, we refer to the results from the within-person estimates as over time effects and the between-person differences as between-person effects. The within-person over time estimation of the hybrid models allows us to account for the self-selection of individuals with particular personality characteristics into telecommuting (Leslie *et al.*, 2012). The data was weighted with the calibrated design weight to adjust the pairfam sample to the central characteristics of the German population.

First, we assess the overall and gendered effect of telecommuting by pooling men and women in the same models. Second, to explore the role of the GRA, we build separate models for men and women using GRA as an interaction term. Finally, we estimate models including an interaction term between telecommuting and the COVID-19 period.

Results

Descriptive statistics

First, we present the descriptive findings (see Supplementary Section S6) for the distribution of domestic work, telecommuting, GRA and control variables separately for men and women. As for the outcome variable, women do a higher share of housework and childcare (0.73 and 0.67, respectively). On average, about 11 per cent of women and men got access to telecommuting. As for the statement about men doing housework to the same extent as women, most of the women strongly agree (67 per cent), while among men, about half strongly support this statement (50 per cent). About 40 per cent of both men and women (strongly) disagree that women should focus more on the family than the career. With respect to control variables, more men than women report to be in professional or managerial occupations (ISCO 1–3). The average age of the youngest child in the household is about 4 years old, and, generally, a family has one or two children. Men are, on average, 20 hours more in paid employment than women per week, reflective of the German labour market. The average age of the respondents is 35 years old. About half have a higher education certificate. Women with children provide about 30 per cent of the household income.

We further show the percentage of men and women telecommuting over the years we observe in the panel. Figure 1 shows that over the last 13 years, men had access to telecommuting more often than women, and this gap has widened during COVID-19 (2020–2021). About 10–15 per cent of women had access to telecommuting before the pandemic, and during the lockdown period, the share rose to 33 per cent. About 12–25 per cent of men had access to telecommuting before the pandemic, and in 2021, almost half of men had so. These gender differences might be attributed to occupational variations and fewer women holding jobs that could be done from home (Abendroth *et al.*, 2022).

In the Supplementary Sections S3 and S4, pages 4–7, we show the distribution of individuals working from home and their GRA. As we can see, egalitarian men and women are generally more likely to have access to telecommuting. The exception to this is where those who disagree that men should provide an equal contribution to housework are ever so slightly more likely to telecommute (51 per cent) compared with men who have egalitarian views on this (49 per cent).

Telecommuting, gender, and GRA

To test hypotheses 1a and 1b, in Table 1, we first examine how changes in the telecommuting patterns are associated with changes in the share of housework and

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Table 1 Pooled hybrid linear regression models

	Model 3-1 Housework	Model 3-2 Housework	Model 3-3 Childcare	Model 3-4 Childcare
(Intercept)	0.54***	0.53***	0.49***	0.51***
	(0.05)	(0.05)	(0.04)	(0.04)
Between-person effects				
Telecommuting (WFH)	−0.03	−0.01	0.01	−0.03 +
	(0.02)	(0.02)	(0.01)	(0.02)
Woman	0.35***	0.35***	0.22***	0.20***
	(0.01)	(0.01)	(0.01)	(0.01)
WFH × woman		−0.03		0.08**
		(0.03)		(0.02)
Over time effects				
Telecommuting (WFH)	0.00	0.01	0.01 +	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
WFH × woman		−0.01		−0.02
		(0.01)		(0.01)
Num. obs.	12,472	12,472	12,472	12,472
N waves	13	13	13	13

Note: Dependent variable: relative contribution to housework and childcare. Pairfam data, waves 1–13. Dependent variable: 1 = A respondent is doing all, 0 = a partner is doing all. Controlled for occupation, age, number of working hours, marital status, university diploma, age of youngest child, number of children, her income share, East/West residence, migration status, and COVID-19. All coefficients are in Supplementary Table S3A. $+P < 0.1$; $*P < 0.05$; $**P < 0.01$, $***P < 0.001$. Robust standard errors are in parentheses.

childcare. Looking at the total sample (model 3-1), there were no differences between telecommuting versus non-telecommuting workers in their share of washing, cleaning, and cooking (between-person effects). Similarly, workers did not change their housework contribution when they got access to telecommuting (over time effects). Moreover, there was no evidence for variation across genders regarding the association between doing housework and telecommuting (model 3-2). The situation was similar for the division of childcare for the between-person (model 3-3) and over time effects (model 3-3). However, these associations varied across genders (model 3-4). Examining between individuals, women generally carried out a larger share of childcare (model 3-4, woman coefficient 0.20, $P < 0.001$), and those telecommuting did an even larger share (model 3-4, between WFH × woman interaction term coefficient 0.08, $P < 0.01$). There were no clear differences between men who telecommuted and those who did not. However, examining changes within individuals over time, when men got access to telecommuting, they tended to increase their share of childcare slightly (model 3-4, over time effect coefficient 0.02 $P < 0.05$). This over time individual change was not found for women (model 3-4, over time WFH × woman interaction term coefficient −0.02, $P > 0.1$). Therefore, these results do not support hypothesis 1a and support hypothesis 1b, but only for the childcare division. Telecommuting is associated with a higher contribution to childcare only for women.

To test hypotheses 2a and 2b on how GRA moderate the relationship between telecommuting and the division of housework and childcare, we present the results in Table 2 for men and Table 3 for women. Overall, when distinguishing individuals based on their views around men's role in the housework (GRA 1), men with traditional GRA did a lower share of housework (model 4-1, between-person coefficient −0.06, $P < 0.001$) and childcare (model 4-3, between-person coefficient −0.03, $P < 0.01$) compared with men with egalitarian GRA. When we compared men with different attitudes towards women's roles in work and family (GRA 2) (models 4-2 and 4-4), there were no differences. Next, we examined how GRA moderate the association between men's telecommuting and their contribution to housework and childcare. No significant results were found, except for men's share in childcare. Egalitarian men contributed a higher share of childcare when they got access to telecommuting (model 4-3, over time coefficient 0.02, $P < 0.1$), whereas this was not the case for men with traditional GRA (model 4-3, over time interaction term coefficient −0.03, $P < 0.1$; see also Figure 2). Of the different GRA, men's attitude towards men's housework contribution mattered.

Table 3 demonstrates the moderating role of GRA in the association between telecommuting and the

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Table 2. Hybrid linear regression models for men

	Model 4-1 Housework men	Model 4-2 Housework men	Model 4-3 Childcare men	Model 4-4 Childcare men
(Intercept)	0.40*** (0.07)	0.39*** (0.07)	0.35*** (0.05)	0.35*** (0.06)
Between-person effects				
Telecommuting (WFH)	−0.03 (0.03)	−0.02 (0.03)	−0.04 + (0.02)	−0.03 (0.02)
Traditional GRA 1 men and housework	−0.06*** (0.01)		−0.03** (0.01)	
Traditional GRA 2 women and family		−0.01 (0.01)		−0.01 (0.01)
WFH × traditional GRA 1	0.00 (0.03)		0.04 (0.03)	
WFH × traditional GRA 2		−0.02 (0.03)		0.02 (0.03)
Over time effects				
Telecommuting (WFH)	0.01 (0.01)	−0.01 (0.01)	0.02 + (0.01)	0.01 (0.01)
WFH × traditional GRA 1	−0.01 (0.01)		−0.03 + (0.01)	
WFH × traditional GRA 2		0.01 (0.01)		−0.01 (0.01)
Num. obs.	5,608	5,608	5,608	5,608
N waves	13	13	13	13

Note: Dependent variable: relative contribution to housework and childcare. Pairfam data, waves 1–13. Dependent variable: 1 = Man is doing all, 0 = Woman is doing all. GRA 1: 'Men should participate in housework to the same extent as women'. GRA 2: 'Women should be more concerned about their family than about their career'. Controlled for occupation, age, number of working hours, marital status, university diploma, age of youngest child, number of children, her income share, East/West residence, migration status, and COVID-19. All coefficients are in Supplementary Table S4A. $+P < 0.1$; $*P < 0.05$; $**P < 0.01$, $***P < 0.001$. Robust standard errors are in parentheses.

division of housework and childcare for women. Overall, women with traditional views towards men's role in domestic work contributed more to housework (model 5-1, between-person coefficient 0.05, $P < 0.001$) and childcare (model 5-3, between-person coefficient 0.03, $P < 0.05$) compared with women who support men's involvement in housework. When examining the moderating role of GRA, we find significant results only for the attitudes around men's role in housework and the division of childcare. Women who hold traditional views regarding men's role in housework (GRA 1) contributed more to childcare when they got access to telecommuting compared with those with egalitarian GRA (model 5-3, over time interaction term coefficient 0.04, $P < 0.1$). This result is depicted in Figure 3, showing that the contribution to childcare among egalitarian women did not change when they got access to telecommuting, while traditional women did more childcare. The results show that for men and women, only the attitudes towards men's housework contribution mattered and only for the increase in childcare participation. Thus, hypotheses 2a and 2b are partially supported.

We perform several robustness checks to ensure the stability of our results. First, we present the results without including the child's age and the number of children in the household as control variables since telecommuting might be associated with fertility intentions. Supplementary Tables S24A–S26A (Section S14, pages 28–29) show that excluding these control variables does not change the results. Second, our results remain relatively the same after including the telecommuting status of a partner as a control. However, there are some changes in the significance levels due to sample size changes (Supplementary Section S13, pages 26–27, Tables S21A–S23A). We also ran analyses excluding single-earner couples (i.e., when the respondent's partner was unemployed or inactive). These do not change our results either (Supplementary Section S15, pages 30–31, Tables S27A–S29A). We also included in our analysis the distance to work (Supplementary Section S12, pages 24–25, Tables S18A–S20A), which did not

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Table 3. Hybrid linear regression models for women

	Model 5-1 Housework women	Model 5-2 Housework women	Model 5-3 Childcare women	Model 5-4 Childcare women
(Intercept)	0.84*** (0.08)	0.87*** (0.08)	0.68*** (0.07)	0.70*** (0.07)
Between-person effects				
Telecommuting (WFH)	−0.03 (0.03)	−0.04 (0.04)	0.03 (0.03)	−0.01 (0.03)
Traditional GRA 1 men and housework	0.05*** (0.01)		0.03* (0.01)	
Traditional GRA 2 women and family		−0.00 (0.01)		−0.01 (0.01)
WFH × traditional GRA 1	0.01 (0.05)		−0.02 (0.04)	
WFH × traditional GRA 2		0.01 (0.04)		0.05 (0.04)
Over time effects				
Telecommuting (WFH)	0.00 (0.02)	0.00 (0.02)	0.00 (0.01)	0.00 (0.01)
WFH × traditional GRA 1	0.02 (0.02)		0.04 + (0.02)	
WFH × traditional GRA 2		0.00 (0.02)		0.02 (0.02)
Num. obs.	6,864	6,864	6,864	6,864
N waves	13	13	13	13

Note: Dependent variable: relative contribution to housework and childcare. Pairfam data, waves 1–13. Dependent variable: 1 = Woman is doing all, 0 = Man is doing all. GRA 1: 'Men should participate in housework to the same extent as women'. GRA 2: 'Women should be more concerned about their family than about their career'. Controlled for occupation, age, number of working hours, marital status, university diploma, age of youngest child, number of children, her income share, East/West residence, migration status, and COVID-19. All coefficients are in Supplementary Table S5A. $+P < 0.1$; $*P < 0.05$; $**P < 0.01$, $***P < 0.001$. Robust standard errors are in parentheses.

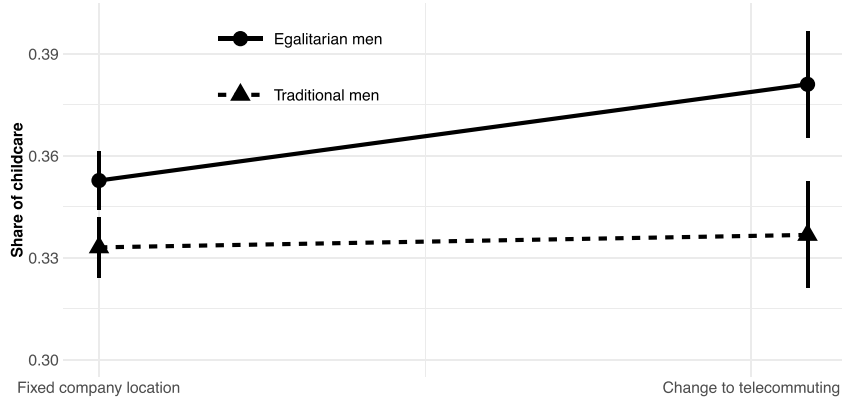

Figure 2 Telecommuting and the share of childcare (over time effects) for men. GRA 1: 'Men should participate in housework to the same extent as women'. 83 per cent confidence intervals[1]

change our results significantly. Some individuals in the sample report being on parental leave. We conduct an analysis controlling for the parental leave status of the respondent and their partners to find that the respondent's parental leave status generally increases childcare share for between-effects, and the partner's leave

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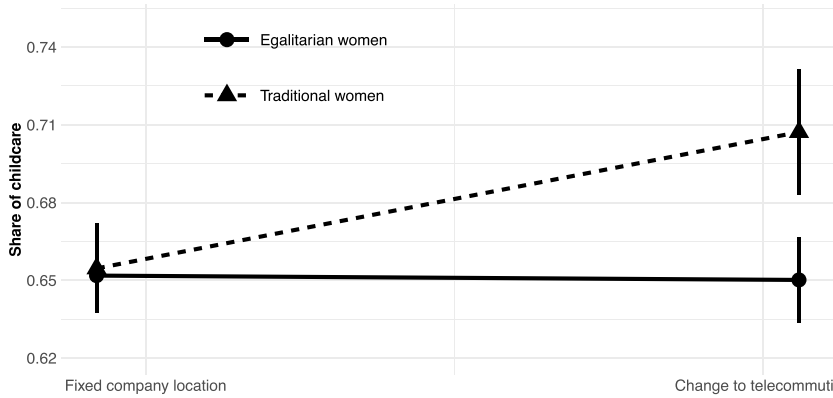

Figure 3 Telecommuting and the share of childcare (over time effects) for women. GRA 1: 'Men should participate in housework to the same extent as women'. 83 per cent confidence intervals[1]

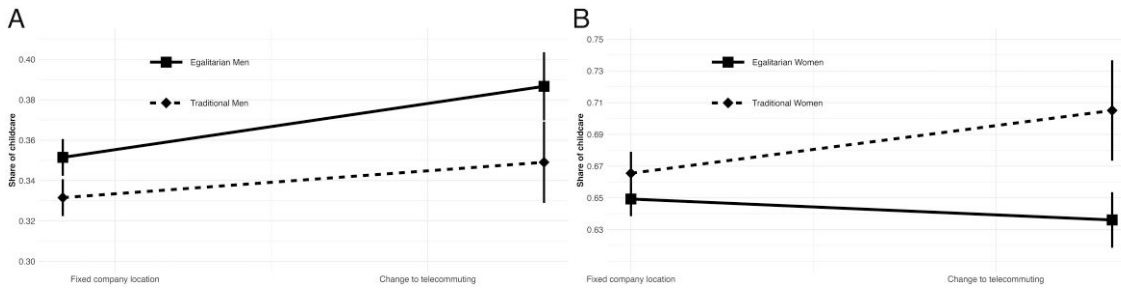

Figure 4 Change to telecommuting and the division of childcare (over time effect) for men during the COVID-19 pandemic (on the left) and for women during the COVID-19 pandemic (on the right). GRA 1: 'Men should participate in housework to the same extent as women'. 83 per cent confidence intervals[1]

reduces it. However, we see no substantial changes in the main results (see Supplementary Section S11, pages 22–23, Tables S15A–S17A).

The COVID-19 context

In Supplementary Tables S6A–S8A, we present the results for the same models examined above, but without the wave conducted during the COVID-19 pandemic (wave 13) to observe whether the increase in access to telecommuting was mainly driven by the data collected during the pandemic. As shown in Supplementary Tables S6A–S8A, the size of the main coefficients of interest remains the same, but there is a minor decrease in statistical significance. Thus, overall, our models capture a broader pattern of GRA in the relationship between telecommuting and the division of domestic work both before and during the pandemic.

To further investigate the role of COVID-19, we include interaction terms between the timing of the telecommuting, whether it happened during the pandemic period and gender, and finally, whether the GRA played a role in this relationship during the pandemic (see Supplementary Tables S9A–S11A). Partially supporting hypothesis 3a, men increased their contribution to childcare during the pandemic when they got access to telecommuting, while there was no major increase among telecommuting women. Turning to the GRA, hypothesis 3c is supported. During the pandemic, only men with egalitarian GRA increased their contribution to childcare when telecommuting, as shown in Figure 4 (left panel). While visually, there is a slightly higher contribution among both traditional and egalitarian men during COVID-19, the three-way interaction term is not statistically significant. In other words, during the increased demands for childcare and when telecommuting was more widespread, only egalitarian men made use of telecommuting practices to address increased childcare demands. It means that traditional men, even when they had an opportunity to telecommute, did not use this opportunity for childcare, likely because of their traditional beliefs surrounding gender roles.

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The results for women in Supplementary Table S11A and Figure 4 (right panel) indicate that GRA did play a role during the pandemic. As shown in Figure 4 (right panel), traditional women increased their contribution to childcare when they got access to telecommuting during the pandemic. However, egalitarian women's childcare contributions did not increase when telecommuting was more widespread. During the pandemic, telecommuting was associated with a slight decrease in egalitarian women's share of childcare. This may be because, during the pandemic, there may have been more men at home to provide some of the caregiving for children, which may have provided egalitarian women with relief from taking on the bulk of the childcare. We should be mindful that we are not looking at the absolute amount of childcare provided but merely the perceived relative division. This means that although the division may have become more equal, this does not entail the absolute amount of childcare carried out by egalitarian women reduced (see also, Chung *et al.*, 2021). Therefore, hypothesis 3b is supported. Telecommuting women with traditional GRA increased their childcare contribution during the pandemic. The pandemic neither brought up the traditionalization of the roles in the household nor contributed to more equality in the division of domestic chores within couples.

Discussion and conclusion

Telecommuting has been introduced as a policy that can enable workers to have a better work-life balance by saving their commuting costs and providing more work autonomy (Noonan and Glass, 2012; Allen, Golden, and Shockley, 2015), contributing to gender equality both at home and in the labour market (Council of the European Union, 2019). While some approaches support the idea of telecommuting benefiting workers, for instance, helping workers relieve tensions between work and family life (Huws *et al.*, 1996), others argue that it may enable the exploitation of individuals, especially women, where telecommuting enables them to carry out more of both paid and unpaid work (Haddon and Silverstone, 1993). The use of telecommuting might be gendered, with women traditionally devoting their spare time to household chores in addition to paid work, while men might be able to focus only on the latter (Kurowska, 2020), exacerbating the unequal division of labour across genders. Previous studies (Hilbrecht *et al.*, 2008; Lott, 2019; Chung and Booker, 2023) have explored this assumption and analysed whether telecommuting changes the relative distribution of housework and childcare among different-sex couples. We contribute to this debate by looking at a longer time frame and looking at both between-person and individual changes over time, including the COVID-19 pandemic, which provides a unique period where telecommuting was encouraged by the state and companies, yet childcare facilities were suspended.

What is more, we contribute to the debate by examining how the GRA of individuals may shape how workers use telecommuting to engage in domestic work across genders. Thus, we expected that women with egalitarian GRA would not necessarily increase their share of domestic work when telecommuting. In contrast, traditional women might use the flexibility to 'do gender'. Similarly, we expected egalitarian men would be the ones to use telecommuting to engage more in domestic work, whereas traditional men would not. These assumptions have been tested using data from the German Family Panel from 2008 to 2021.

At first glance, telecommuting did not make any difference to the division of housework among different-sex couples, although telecommuters contributed more to childcare. There are differences across gender and whether we examine associations between individuals or over time. Compared with women who worked on-site, telecommuting women carried out a larger share of childcare. However, women who got access to telecommuting did not increase their contribution to childcare. Potentially, these women searched for this arrangement to manage care demands better. On the other hand, when men got access to telecommuting (individual change over time), they seemed to contribute more to childcare. On an even closer inspection, as expected, GRA mattered. Men with egalitarian GRA generally contributed more to housework and childcare than men with traditional GRA, and when egalitarian men got access to telecommuting, their contribution to childcare increased even further. Telecommuting did not change traditional men's childcare contributions. Similarly, women with traditional GRA did a larger share of housework and childcare compared with egalitarian women. When women with traditional GRA got access to telecommuting, their share in childcare increased even further. This pattern was not observed for women with egalitarian GRA.

The type of GRA mattered. The perception of men's contribution to housework mattered for both men and women, whereas the attitudes towards women's role in family and career did not. This result reflects the multidimensionality of GRA established in previous studies (Grunow, Begall, and Buchler, 2018; Begall, Grunow, and Buchler, 2023). The agreement with the fact that men should contribute to domestic tasks to the same extent as women is more precise in distinguishing men's and women's roles on the egalitarianism/traditionalism dimension. Statement on women's roles in the family

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and career is more ambivalent. As earlier studies have shown (Begall, Grunow, and Buchler, 2023), a substantial number of individuals support the dual role of women as mothers and workers. Therefore, when individuals disagree with the statement that women should be more concerned about their families than their careers, it might mean two things. On the one hand, these individuals might believe that women should be more concerned with their careers than their families; on the other hand, they might believe that women should simultaneously be concerned about families and careers. Our study shows that researchers must be careful when measuring GRA using more straightforward dimensions.

Furthermore, we investigated whether GRA mattered during the COVID-19 pandemic when telecommuting was mandated or encouraged through company and government policies to reduce virus transmission. Exploring this COVID-19 period allows us to model out the potential mechanism of GRA moderating the association between telecommuting and the division of housework/childcare by impacting the take-up of telecommuting. The findings are similar to the ones observed in the more extended period for women and men. This provides us with some evidence to show that the importance of GRA does not stop at influencing the take-up of telecommuting but also moderates how workers use telecommuting to be more involved in domestic labour, confirming our assumptions. Furthermore, the COVID-19 pandemic wave shows again that in the context of increased demands for childcare and the expansion of telecommuting, telecommuting might give men—especially those with egalitarian GRA the opportunity to be better engaged in childcare activities. This provides evidence for future scenarios when telecommuting becomes more widespread in workplaces.

The study has some limitations. The division of housework and childcare is not an absolute measure but rather a perception of the individual and their share within the couple in broad terms. Future studies could utilize time-use data and other sources to have more precise measures of the division of housework and childcare carried out by couples. Examining a couple's division of mental load (Dean, Churchill, and Ruppanner, 2022) would also be essential for understanding how telecommuting shapes the division of labour. Similarly, the intensity of different telecommuting settings must be considered, as those who telecommute daily might differ in their household practices compared with those who telecommute only occasionally. The telecommuting variable used in our study measures a combination of some use and access, and previous studies have shown the importance of access in explaining work-family outcomes in addition to use (Chung and van der Horst, 2018). Regardless, future studies should distinguish between workers' access to and use of telecommuting, in addition to the frequency of telecommuting, to better understand the dynamics of home and hybrid working on the division of labour within couples. Additionally, it is important to consider the role of organizations, e.g., supervisors, in providing access to telecommuting (Hennekam, Kelland, and Dumazert, 2023) and what this may entail with regard to other support for work-family integration. Moreover, studies need to account for the changes in GRA over the life course and particularly how people adapt their values due to different critical events, such as childbirth or COVID-19 (Vandecasteele *et al.*, 2022). Finally, our study has found that telecommuting is associated with the division of domestic labour, especially childcare. Yet most of our results were from within individual changes over time rather than between individuals. Such model differences potentially show that some confounders are not included in the model. We aim to control as much as possible for some factors (e.g., working hours, type of occupation). Nonetheless, we fully understand we cannot control for an exhaustive list of items (other family and partner characteristics). We were unable to fully explain these differences in the model of cross-time and between individual changes, and more exploration of this issue is warranted.

Despite these limitations, this study has provided important contributions to the ongoing debate around whether the expansion of telecommuting practices can result in a more egalitarian division of labour within households and how this is likely to develop in the 'post-pandemic' world. Unlike the fears of previous studies (Sullivan and Lewis, 2001; Hilbrecht *et al.*, 2008; Chung, 2022; Lyttelton, Zang, and Musick, 2022), the results of this study suggest that telecommuting has the potential to contribute to a more equal division of labour in the household, supporting the view of the opportunity for flexibility model (Huws *et al.*, 1996). However, this largely depends on individuals' and, in a way, society's views on gender roles. Conservative attitudes towards the role of men and women might reproduce a more unequal distribution of labour (Haddon and Silverstone, 1993), mainly when telecommuting is not widespread (Chung *et al.*, 2021). In other words, if we want telecommuting to pave the way to gender equality, we need to provide all employees with the right to flexible working and ensure that the gender normative context in which it is introduced changes. For instance, ensuring that all individuals, regardless of their gender, are treated equally, starting from intentional interventions in early education to eliminate gender biases, would be useful. Guaranteeing that fathers take parental leave, especially for over two months, which

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is currently earmarked for fathers in Germany (Bünning, 2015) and many other European countries (Council of the European Union, 2019), independently without the mothers being at home, could also help change society and individuals' perceptions of gender roles. Thus, the expansion of telecommuting can pave the way for greater gender equality if we are able to provide the right contexts for this to happen.

Note

1. It has been shown that 83 per cent confidence intervals can effectively identify significant differences between two means with a *P*-value of 0.05 (Austin and Hux, 2002). When reporting the predictive values from the interaction effects, we use 83 per cent confidence intervals.

Author contributions

Olga Leshchenko (Conceptualization [equal], Data curation [lead], Formal analysis [lead], Investigation [lead], Methodology [equal], Visualization [lead], Writing—original draft [lead], Writing—review & editing [equal]), and Heejung Chung (Conceptualization [equal], Methodology [equal], Writing—review & editing [equal])

Supplementary data

Supplementary data are available at *ESR* online.

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Data availability

The data underlying this article are available from GESIS, Cologne, at https://doi.org/10.4232/pairfam.5678.14.1.0.

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