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DISCUSSION PAPER SERIES

IZA DP No. 14773

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ABSTRACT

Remote Working and Mental Health during the First Wave of COVID-19 Pandemic

We use longitudinal data from the SHARE survey to estimate the causal effect of remote working during the COVID-19 pandemic on mental health of senior Europeans. We face endogeneity concerns both for the probability of being employed during the pandemic and for the choice of different work arrangements conditional on employment. Our research design overcomes these issues by exploiting variation in the technical feasibility of remote working across occupations and in the legal restrictions to in-presence work across sectors. We estimate heterogeneous effects of remote working on mental health: we find negative effects for respondents with children at home and for those living in countries with low restrictions or low excess death rates due to the pandemic. On the other hand, the effect is positive for men and for respondents with no co-residing children.

JEL Classification: I10, J22, J24, J81

Keywords: mental health, remote working, COVID-19, SHARE

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1 Introduction

Mental health is a key component of subjective well-being, it is a risk factor for future health and a driver of choices, behaviours and outcomes. One of the most important challenges of the Covid-19 pandemic relates with its effects on mental health (Banks et al., 2021; Pfefferbaum and North, 2020; Holmes et al., 2020).

According to Banks et al. (2021), several aspects of the pandemic may affect mental health in the short and long run. First, anxiety stemming from the direct and indirect effect of being infected and hospitalized was particularly troublesome for senior individuals, who were more at risk of negative health consequences. Second, the pandemic induced financial problems for those households whose members were employed in sectors affected by the crisis. Third, domestic and family arrangements may also have played a role: a blurred working environment may exacerbate tensions in combining work with family chores; limited physical space or an insufficient number of PCs and devices may be a problem in a family were both parents worked remotely and children followed distance schooling; being forced to spend most (if not all) the time with other family members may be troublesome particularly if there are pre-existing tensions within the household. Fourth, workers faced an unprecedented challenge in adapting to work-from-home arrangements. For instance, the need to learn new IT skills in order to work from home may have been a source of mental distress for senior workers. Finally, the loss of otherwise fulfilling activities and social contacts is also a threat to mental health. This is especially true for the older population, who might have lower familiarity with digital means of communication (Cavapozzi and Dal Bianco, 2021).

When the pandemic hit in the spring of 2020, many private companies and public administrations had to resort to working-from-home arrangements for their employees. While remote working was rather uncommon before the pandemic (according to data from the 2018 European Labour Force Survey, roughly 10% of employees and 30% of self-employed used to work from home at least sometimes), this became the prevalent work arrangement for a large fraction of the working population: the Eurofound (2020) survey suggests that 48% of employees worked remotely at least some time in 2020. This shift did not take place homogeneously: the extent to which each firm adopted this strategy depends on the type of industry (Barbieri et al., 2020; Dingel and Neiman, 2020).

Understanding the relation between remote working and mental health is important because the share of people in remote working is likely to stay high persistently. For instance, Barrero et al. (2021) estimate that in the US roughly 20% of the total working time will be delivered from home after the pandemic will be over. Given such a potential relevance for alternative work arrangements, the public health implications will be particularly concerning. On the one hand, remote working can help especially women to cope with work and family life and reduce stress (Mas and Pallais, 2017; Angelici and Profeta, 2020), with a mechanism similar to the one in place for maternity leave (Avendano et al., 2015). On

the other hand, while remote working may increase productivity, it can still have negative effects on career prospects (Bloom et al., 2015). Moreover, it may increase isolation and family tensions, in particular if both partners work from home (Douglas et al., 2020).

Our paper contributes to the growing literature on the impact of Covid-19 restrictions on mental health (Giuntella et al., 2021; Banks et al., 2021; Barili et al., 2021; Adams-Prassl et al., 2020; Cheng et al., 2021, among others). In particular, to the best of our knowledge we are the first to estimate a causal effect of remote working on mental health of workers during the pandemic. We do so on a specific and relatively under-investigated group, senior workers. To date, the literature provided little and inconclusive evidence, particularly on our population group of interest (see Oakman et al., 2020, for a review).

In this study we will exploit longitudinal data from SHARE - the Survey of Health Ageing and Retirement in Europe - on a representative sample of Europeans aged 50+ interviewed immediately before and after the first wave of the pandemic to investigate whether working from home rather than at the usual place had a causal impact on mental health. A priori, the effect is ambiguous: safety considerations may deteriorate the mental health of those working at the usual workplace, while long permanence at home may lead to feelings of isolation, loneliness and stress.

Remote working and mental health scores are likely to correlate, but in this paper we want to go beyond associations and identify a causal effect of the former on the latter. This requires a careful research design to tackle multiple sources of endogeneity: unobserved heterogeneity (those who work remotely may differ from the others with respect to unobservable predictors of mental health), self-selection into remote working (expected mental health under different work arrangements may determine whether individuals choose to work from home or not) and, finally, sample selection: we compare individuals working from home with those that continue to work at their usual workplace, yet the probability of working during the first wave of the pandemic may depend on their mental health and their willingness/feasibility to work remotely.

We address these endogeneity concerns by exploiting two sources of variability observed during the first wave of the pandemic. The former is the variability in the probability of being employed generated by different legal restrictions to in-presence work across sectors. The latter is the variability in the probability of working remotely across teleworkable and non-teleworkable occupations. We provide evidence that the groups of workers defined according to industry sector and degree of teleworkability had comparable mental health trends before the pandemic. This result corroborates the exogeneity of these sources of variability and the validity of our identification strategy.

We find heterogeneous effects of remote working on mental health: looking at individual characteristics, men benefited from working from home during the pandemic, while women did not. Moreover, the effect on mental health was negative for respondents with children at home and positive for those without. Looking at country-level factors, remote working was detrimental in countries with low severity of the pandemic (relatively low

excess death rate between March and July 2020 compared to previous years), and with limited stringency of government policy response to the pandemic. Vice versa, respondents working remotely had on average better mental health scores than those continuing working at the usual place where restricting policies were tighter. Our findings have important implications for the ongoing debate on the future of remote work, and warn policy makers about the need to balance flexibility with threats of isolation and loneliness.

The remainder of the paper is organized as follows. In section 2 we describe the data and provide descriptive evidence on the key variables for the analysis. The econometric specification is spelled out in section 3 and results are discussed in 4. In section 5 we draw the conclusions and policy implications.

2 Data and descriptive statistics

In this paper we combine longitudinal individual survey data with aggregate information on job characteristics as well as Covid-19 pandemic severity and government response to the pandemic. The individual data come from the Survey of Health, Ageing and Retirement in Europe (SHARE). SHARE is a cross-national panel survey designed to provide comparable information on the health, employment and social conditions of a representative sample of the European population aged 50+. The survey started in 2004 and took place biannually in an increasing number of countries. Since 2018 it covers all 28 EU countries plus Israel.[1]

The fieldwork of the 8th wave of SHARE started in October 2019 and was interrupted by the outbreak of the Covid-19 pandemic. The fieldwork had to be suspended in all participating countries in March 2020 when approximately 70% of the panel respondents across Europe had been already interviewed. As a reaction, SHARE developed a specific questionnaire covering the same topics as the regular SHARE questionnaire - but considerably shortened and targeted to the living situation of people aged 50 and above during the pandemic. The SHARE Corona Survey was administered via telephone interviews (CATI methodology) to a sub-sample of panel respondents between June and July 2020. More information on the survey methodology for the SHARE Corona Survey can be found in Scherpenzeel et al. (2020). We therefore observe a sample representative of the over 50 population in Europe immediately before and after the first wave of the pandemic.

Since information on mental health was not collected in wave 7 for countries entering SHARE in this wave, our sample excludes these countries. We also exclude Portugal, that was not present in wave 8, the Netherlands, where information on occupations was not collected after wave 6, Austria, as in this country the wave 8 and SHARE Corona interviews were not administered over the same weeks as for the other countries, Israel,

[1] More details on survey methodology of regular SHARE waves can be found in Börsch-Supan et al. (2013).

for which we do not have information on the excess death rate that is comparable to the one available for the other countries (provided by EUROSTAT), Poland, that carried out a large refreshment sample at wave 7 for whom we cannot observe mental health, and Hungary, where we have limited within-country variation in the variables of interest. As a result, our sample includes the following 14 countries: Belgium, Croatia, Czech Republic, Denmark, Estonia, France, Germany, Greece, Italy, Luxembourg, Slovenia, Spain, Sweden, and Switzerland. We focus on individuals employed at the outbreak of Covid-19, aged between 50 and the country-specific statutory retirement eligibility ages (these are drawn from the MISSOC tables).

2.1 Mental health

SHARE regular waves include a large number of questions to elicit cognition and mental health of respondents. A few of them were also asked in SHARE Corona. In particular, we focus on the following three questions: first (*camh002*) "In the last month have you been sad or depressed?", possible answers Yes or No; second (*camh007*) "Have you had trouble sleeping recently?", possible answers "Trouble with sleep or recent change in pattern" or "No trouble sleeping"; third (*camh037*) "How much of the time do you feel lonely?" with three possible answers: Often, some of the time, Hardly ever or never. [2] The same questions were asked in wave 8 as well as at the most recent previous wave.[3]

In order to obtain a single mental health measure per individual at each point in time, we define a new discrete value ΔMH as follows: an individual has worse mental health if he/she was not listing mental health problems (sadness or depression, troubles sleeping, loneliness) at the baseline and lists them at the endline ($\Delta MH = -1$). The opposite holds for better mental health ($\Delta MH = 1$). Individuals who keep on having/not having any mental health problem are in the "same" category ($\Delta MH = 0$). In figure 1 we report the density plots of ΔMH between SHARE Corona and wave 8 (left panel), and between wave 7 and wave 8. The unconditional distribution of the difference in mental health suggests that it improved over the first wave of the pandemic compared to the previous period.

[2] After each question, respondents who answer positively are also asked retrospectively whether they feel sad/have troubles sleeping and feel lonely more or less than before the pandemic. However, we cannot use this information to assess the variation in mental health for the whole sample because these questions have not been posed to those who did not answer positively to the question on mental health levels.

[3] Mental health was not elicited in wave 7 for respondents that had not yet answered to the retrospective questionnaire proposed to SHARE respondents in wave 3. For these individuals, we retrieve mental health from previous waves (either wave 6 or wave 5). Eventually, we use wave 5 data for 3% of the sample, wave 6 data for 89% of the sample, and wave 7 data for 8%.

2.2 Working during the first wave of the pandemic and Remote Working

In SHARE Corona respondents are asked a series of questions to elicit labour market participation and work arrangement during the first wave of the pandemic. The first question asks the respondents whether they were employed or self-employed at the outbreak of Covid-19 (*caep805*). Conditional on a positive answer, they are asked if due to the Covid-19 crisis they became unemployed, were laid off or had to close their business (*caw002*), and again in case of a positive answer how long was in weeks the unemployment spell (*caw003*). After this set of questions, *caw010* asks "Since the outbreak of Corona, some people worked at home, some at their usual work place outside their home, some both. How would you describe your situation?", with four possible answers: "Worked at home only", "Worked at the usual work place", "Worked from home and at the usual work place", "None of these (furloughed, did not work at all)". Based on these questions, we identify three different groups of respondents among those who were working at the outbreak of the pandemic: those who continued to work at the usual place, those who worked from home at least some time and those who lost their job or did not work keeping their occupation (in many countries governments set up policies to limit or avoid job losses allowing to leave workers at home in furlough subsidized though general taxation).

2.3 Instrumental variables

The endogeneity concerns discussed in the introduction lead us to develop an instrumental variables strategy to correct for endogenous selection into employment during the pandemic as well as for the choice of working remotely.

As regards the former, we exploit the distinction of workers into "essential" and "non–essential". The mobility restrictions that induced worker to be furloughed or laid off put in place by European governments did not apply to all workers: those employed in sectors considered to be "essential" were granted the possibility to keep on working, while mobility limitations and home confinement were applied to "non–essential" workers. The first government to provide a list of essential and non-essential sectors was the Italian one: the pandemic developed first in Italy, and so did the containment policies. This list was issued with the Prime Ministerial Decree of March 22, 2020 and sectors were divided into essential and non–essential at the 2–digit Nomenclature of Economic Activities (NACE) level: workers employed in agriculture, hunting, mining, quarrying, utilities, transport and storage, public administration, education and health were classified as essential, while workers in manufacturing, construction, wholesail and retail, hotels and restaurants, financial intermediation, real estate, community workers were considered as non essential. Almost the same distinction was later adopted by most European governments (Fana et al., 2020). 2–digits NACE coding is available in wave 8 of SHARE data, therefore each respondent in the sample can be classified as essential or not essential.

An exogenous determinant of the probability of ending up working remotely can be found in Sostero et al. (2020). The authors build an index of technical teleworkability of job based on the 3-digit International Standard Classification of Occupations (ISCO) occupational codes. It measures the "technical possibility of providing labor input remotely": if a job has a significant amount of task content that requires the physical manipulation of objects or people, then it is classified as not teleworkable. The construction relies on the Italian "Indagine Campionaria delle Professioni" (ICP), collected by Istituto Nazionale per l'Analisi delle Politiche Pubbliche (INAPP), and on the "European Working Conditions Survey" (EWCS), collected by Eurofund. Starting from wave 6, respondents' occupations are retrieved in SHARE by means of a "job coder", a survey tool that allows to automatically map the self reported occupation into 4–digit ISCO codes (Brugiavini et al., 2017). This feature of the data allows us to match precisely each worker's occupation with the corresponding value of the teleworkability index by Sostero et al. (2020). Figure 2 highlights the cross country heterogeneity both in the share of essential sectors and of teleworkable workers. The details about the construction of the two instruments are in Section 3.

2.4 Covid-19 severity and containment policies

The extent to which work arrangement affects mental health is likely to depend both on the actual and on the perceived risk of contagion. In order to account for it, we build two Covid-19 severity measures: the peak in excess deaths at regional level, and a measure of household exposure to Covid-19. In order to build the peak in excess deaths, we linked Eurostat data on mortality per week by NUTS2 to SHARE respondents[4], we then computed the excess mortality rate as the percentage difference between the number of deaths in 2020 and the average number of deaths in the same week w over the years 2016-2019:

$$P - score_{r,w} = \frac{Deaths_{r,w,2020} - \frac{1}{4}\sum_{t=2016}^{2019} Deaths_{r,w,t}}{\frac{1}{4}\sum_{t=2016}^{2019} Deaths_{r,w,t}} * 100. \quad (1)$$

A P-score of 100% means the death count for that week was 100% higher than the average death count in the same week over the previous four years, that is, twice as high. Finally, we computed as proxy of the severity of the pandemic in the region where each respondent lives the highest P-score in 2020 until the week of interview (CS). Figure 3 allows to appreciate the substantial differences in terms of Covid-19 mortality Europeans from different regions had to face in the first half of 2020.

During the first wave of the pandemic, respondents residing in different European countries were exposed to a variety of containment policies: restriction to social activities,

[4]NUTS2 is not available for all respondents in SHARE. In those cases we linked mortality data by NUTS1 or NUTS0.

school closures, the closure of economic activities, and even confinement at home. Most of these are collected and organized in a comparable way across countries in the Oxford Covid-19 Government Response Tracker database (Hale et al., 2021). Our starting point is the "Stringency index": it records the strictness of policies that restrict people's behaviour based on nine ordinal containment and closure policy indicators including school closures, workplace closures, and travel bans plus an indicator recording public information campaigns. Finally, it is rescaled to a value from 0 to 100 (100 = strictest). We then look at the overall distribution of the stringency index across countries and along the period between wave 8 and SHARE Corona, and defined as days in "strict lockdown" those above the third tertile of the index, which is 59.72. Then, for each country we counted the number of days with high stringency: figure 4 highlights the degree of heterogenity across countries in this measure. In our heterogeneity analysis, we will split the sample between countries above and below the median of days with high stringency.

Table 1 reports basic descriptive statistics on all the variables described in this section, plus the other economic and demographic control variables we include in the econometric specification.

3 Econometric specification

Our outcome variable ΔMH takes on values $\{-1, 0, 1\}$ indicating that the mental health score of individual i in country c, region r interviewed in week w has respectively worsened, remained the same or improved between the interview in wave 8 and the interview in SHARE Corona. Given the discrete and ordered nature of this variable, we analyse it using an ordered probit model, which considers it as the discrete counterpart of the latent variable ΔMH^* defined as follows:

$$\Delta MH^*_{i,c,r,w} = \beta_{1;1} RW_{i,c,r} + \boldsymbol{x}'_{i,c,r}\boldsymbol{\beta}_{X;1} + \delta_{1,c;1} + \delta_{2,c;1} iw_w + \varepsilon_{i,c,r,w;1} \tag{2}$$

The key regressor of interest is a dummy $RW_{i,c,r}$ that takes value 1 if individual i in country c, region r worked at least some time during the first wave of the pandemic remotely, while it takes value 0 if individual i kept on going to work at the usual workplace. Control variables $\boldsymbol{x}_{i,c,r}$ include the log peak excess death rate by region, age, gender, a dummy for having a tertiary education degree; a dummy for living with a partner in the household; a dummy for having children; household wealth terciles (the lowest tercile is the omitted category); public employee dummy and a self employed dummy (private employee is the excluded category). All demographic characteristics in $\boldsymbol{x}_{i,c,r}$ are reported as observed during the interview in wave 8. Finally, we include a vector of country dummies, $\delta_{1,c}$, and a vector of country-specific linear trends in the week of interview in SHARE Corona, $\delta_{2,c} iw_w$. Conditional on the right-hand-side variables, the error term ε follows a standard normal distribution.

The latent outcome ΔMH^* defines its discrete observed counterpart ΔMH according to the transformation:

$$\Delta MH = \begin{cases} -1 & \text{if} \quad \beta_{1;1}RW_{i,c,r} + \boldsymbol{x}'_{i,c,r}\boldsymbol{\beta}_{X;1} + \delta_{1,c;1} + \delta_{2,c;1}iw_w + \varepsilon_{i,c,r,w;1} \leq \alpha_{-1} \\ 0 & \text{if} \quad \alpha_{-1} < \beta_{1;1}RW_{i,c,r} + \boldsymbol{x}'_{i,c,r}\boldsymbol{\beta}_{X;1} + \delta_{1,c;1} + \delta_{2,c;1}iw_w + \varepsilon_{i,c,r,w;1} \leq \alpha_1 \\ 1 & \text{if} \quad \alpha_1 < \beta_{1;1}RW_{i,c,r} + \boldsymbol{x}'_{i,c,r}\boldsymbol{\beta}_{X;1} + \delta_{1,c;1} + \delta_{2,c;1}iw_w + \varepsilon_{i,c,r,w;1} \end{cases} \tag{3}$$

As we already stated, in order to properly estimate the differential effect on mental health of working remotely versus working at the usual place, we must account for the endogenous selection of individuals who continued working during the first wave of the pandemic. We do so by adding a sample selection equation. The exclusion restriction, i.e. the variable that affects the probability of working being uncorrelated with mental health trajectories is $IV1_{i,c,r}$, a dummy that takes value 1 if individual i at the beginning of the pandemic was working in a non-essential sector and in a non-teleworkable occupation (teleworkability index equal to zero). Figure 5 provides a graphical representation of the role of $IV1$: the blue circle represent the mass of individuals who are non-essential and non-teleworkable. Their employment rate is clearly lower than the average among the teleworkable ones. It is also lower than the employment rate of the non-teleworkable but essential workers. We define the binary outcome $Demp_{i,c,r,w,s}$ as a dummy variable that is equal to 1 for individuals who keep on working during the pandemic and to 0 otherwise.

The second threat to identification of the causal effect of remote working on mental health arises due to reverse causality and omitted variable bias. A drop in mental health may increase the propensity to work from home, and unobservable factors (e.g., subjective perception of risk of contagion) may affect both mental health and the propensity to work remotely. We then instrument the binary variable RW with $IV2_{i,c,r}$, a dummy that takes value 1 if individual i works in a teleworkable sector (technical teleworkability index greater than zero) at the outbreak of the pandemic regardless of being essential or not. Again, before going to the econometric specification, we provide a graphical intuition of the role of the chosen instrument (figure 6), reporting that the probability of working remotely is substantially lower for non-teleworkable workers. We model the binary variables $Demp$ and RW using the following probit models:

$$Demp_{i,c,r,w,s} = 1(\boldsymbol{x}'_{i,c,r}\boldsymbol{\beta}_{X;2} + \beta_{2;2}IV1_{i,c,r} + \beta_{3;2}IV2_{i,c,r} + \delta_{1,c;2} + \delta_{2,c;2}iw_w + \varepsilon_{i,c,r,w;2} > 0) \tag{4}$$

$$RW_{i,c,r,t,s} = 1(\boldsymbol{x}'_{i,c,r}\boldsymbol{\beta}_{X;3} + \beta_{3,3}IV2_{i,c,r} + \delta_{1,c;3} + \delta_{2,c;3}iw_w + \varepsilon_{i,c,r,w;3} > 0) \tag{5}$$

The error terms in equations (3), (4) and (5) are standardized to have mean equal to 0 and variance equal to 1 and are allowed to be correlated. Their variance and covariance matrix is

$$\mathbf{\Sigma} = \begin{bmatrix} 1 & \rho_{\Delta MH,Demp} & \rho_{\Delta MH,RW} \\ \rho_{\Delta MH,Demp} & 1 & \rho_{Demp,RW} \\ \rho_{\Delta MH,RW} & \rho_{Demp,RW} & 1 \end{bmatrix}$$

The coefficients in equations (3), (4) and (5), the thresholds α_{-1}, α_1 and the non-diagonal elements in the variance and covariance matrix Σ are jointly estimated by maximum likelihood exploiting the triangular nature of the system (Roodman, 2011).

4 Results

Table 2 reports the baseline estimates of the model spelled out in section 3. In column (1) the estimates of equation 4: the excluded instrument $IV1$ is significant at 1% level, confirming the descriptive evidence of Figure 5. Respondents working in a non essential sector and in a non teleworkable occupation are significantly less likely to work during the first wave of the pandemic. Column (2) reports the probit estimate of equation 5: again estimation results confirm the validity of the instrument chosen: $IV2$ is significant at 1% level and positive: conditional on being at work during the first wave of the pandemic, being employed in a teleworkable occupation (regardless of being in an essential or non-essential sector) has a significant and positive effect on the probability of working remotely. Column (3) reports the ordered probit estimation of equation (3): there is no evidence of any significant effect of remote working on mental health. The coefficient and marginal effects are precisely estimated.

At this stage, an obvious concern is whether this zero result is actually a change compared to trajectories in mental health before the pandemic or not. Columns (4), (5) and (6) of table 2 report the estimates that we obtain when we substitute the dependent variable with the difference in mental health between wave 8 and wave 7 (or the latest previous available wave). We find no evidence of any significant marginal effect of remote working before the pandemic: the coefficient of interest is not significant and again precisely estimated. This placebo test leads us to conclude that there were no pre-existing systematic differences in mental health between respondents who worked remotely and those that continued to work at the usual workplace during the pandemic, once we account for the potential endogeneity of such choices. This results lends support to the validity of our identification strategy.

Our measure of mental health collects three different dimensions: sadness and depression, lack of sleep and loneliness. In table 3 we estimate the model of section 3 separately by each dimension: the dependent variable in column (1) of table 3 takes value -1 if he/she was not reporting sadness or depression in wave 8, while he does after the first wave of the pandemic in SHARE Corona. The opposite holds for improvement in sadness or depression (dependent variable equal to 1), while the dependent variable is equal to zero

for respondents who keep on having/not having sadness or depression problems. The dependent variables in columns (2) and (3) are defined accordingly. The zero result we found in table 2 is driven by lack of sleep: both for sadness or depression and for loneliness we found a significant effect of working remotely: the probability of reporting a worsening in those two dimensions is significantly higher for those working remotely compared to those who continue working at the usual workplace, while the probability of reporting an improvement in those dimensions is significant and negative.

We then study whether the zero effect we found in table 2 hides heterogeneous effects blurred by the fact that all respondents are pooled in the same regression. In table 4 we report estimates where the sample is split by some individual characteristics: columns (1) and (2) report the estimates by gender. While there is no significant effect of remote working on mental health of women, the effect is positive and significant at 10% level for males: there is a significant increase in the probability of reporting better health and a negative effect on both the probability of reporting a worsening and of reporting no change. Next, we investigate whether family composition also matters. In column (3) we estimate the model on respondents with children at home (both men and women) and in column (4) on respondents without children. The presence of children matters a lot: we find a significant at 1% and particularly large in magnitude worsening in reported mental health among respondents with children at home, while the opposite is true for respondents without children at home: they report a positive change in mental health over the first wave of the pandemic. Finally, in columns (5) and (6) we find no difference between respondents living with their partner and those without a partner at home. Angelici and Profeta (2020) finds that before the pandemic working one day per week at home improved well-being and work-life balance of women more than men. Our results in columns (1) and (2) seem to contradict this evidence, but as we showed in columns (3) and (4) having children at home posed an important burden on individuals working form home, and Zamarro and Prados (2021) finds that women have been found to carry most of the childcare burden while still working during the pandemic.

Finally, we study whether the effect of remote working differs by country-level factors related to the severity of the pandemic and to containment policies. In table 5 in columns (1) and (2) we divide the sample between countries above and below the median of peak excess death rate, and in columns (3) and (4) between countries above and below the median number of days in strict lockdown (i.e., number of days in strict lockdown above 75.5). We find that remote working has a significant and negative effect in countries below the median of peak excess death rate, but not in those above the median. Where the pandemic did not reach high numbers in terms of death rate, working remotely significantly increased the probability of reporting a mental health worsening and reduced both the probability of reporting an improvement and no changes. We find different effects for conintaiment measures: in countries that experienced a number of days in strict lockdown above the median, working remotely increased the probability to report a mental health improvement and reduced both the probability of reporting a worsening and of reporting

no changes. Vice versa, in countries below the median we estimate a negative effect of remote working on mental health of comparable magnitude. Our interpretation is that remote working has a detrimental effect on mental health when workers do not perceive substantial difference in terms of health risk between working from home and at the usual workplace. This can happen both if lockdown measures are relatively mild or when the death rate imputable to Covid-19 is not extreme. Vice versa, if working remotely is perceived as protective, it has no or even positive effects on mental health. In order to dig further into these country differences, we combined our proxies for Covid-19 severity and containment policy stringency and divided the pool of countries in four groups. In column (1) of table 6 both excess death rate and number of days in strict lock down are above the average: in these countries (Italy, France and Spain) remote working has no significant effect on mental health. Vice versa, if excess death rate or lockdown stringency (or both) are below median, then the effect is statistically significant and detrimental.

5 Conclusions

In this paper we estimate the effect of working from home on the mental health of senior workers during the first wave of the pandemic. We exploit survey data where the same workers were interviewed immediately before and immediately after the first wave of the pandemic. We exploit differences across countries and industries in Covid-19 exposure and containment policies to identify the causal effect of remote working on mental health. We found that working from home had heterogeneous effects on mental health of workers during the pandemic. Mental health improved over the first wave of Covid-19 for men and respondents without co-residing children who worked remotely, did not change in the pool of all interviewed working women, while declined for respondents who worked from home with co-residing children. Moreover, respondents who perceived remote working as health protecting, i.e. those who lived in countries exposed to a high number of deaths imputable to Covid-19 and with strict containment measures, had no or positive impact of remote working on mental health. If - as expected - remote working will remain a widespread working arrangement even after the pandemic, these findings should rise public health concerns and be considered carefully by policy makers: first, working from home is difficult to reconcile with home duties that typically still fall disproportionally on women's shoulders. Therefore the health consequences of a massive shift towards remote working may be gender biased. Second, we find evidence that those who worked remotely in countries where the pandemic was not so severe and containment measures not particularly strict - a situation comparable to a post-Covid-19 scenario- experienced a significant worsening in mental health.

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Tables and figures

Table 1: Descriptive Statistics

	Mean	Standard Deviation	Observations
Dependent variables			
Worse mental health w8covid-w8	0.092	0.289	2878
Same mental health w8covid-w8	0.651	0.477	2878
Better mental health w8covid-w8	0.257	0.437	2878
Worse mental health w8-w7	0.156	0.363	2878
Same mental health w8-w7	0.669	0.471	2878
Better mental health w8-w7	0.175	0.380	2878
Endogenous variables			
Employed during COVID	0.746	0.436	2878
Worked from home during COVID - employed only	0.409	0.492	2146
Instrumental variables			
Non-essential, Non-teleworkable job	0.177	0.382	2878
Teleworkable job	0.661	0.473	2878
Control variables			
Age	60.10	3.03	2878
Female	0.565	0.496	2878
Has a partner	0.786	0.410	2878
Tertiary education degree	0.371	0.483	2878
Has children	0.101	0.302	2878
Employed as civil servant at COVID outbreak	0.321	0.467	2878
Self-employed at COVID outbreak	0.138	0.345	2878
log(Peak excess death rate) - by region	3.31	0.81	2878
n days in strict lockdown - by country	77.33	21.11	2878

Table 2: Main results. The effect of remote work on mental health changes during the pandemic and pre-pandemic placebo tests.

	(1)	(2)	(3)	(4)	(5)	(6)
Time frame		Covid-Wave 8			Wave 8 - Wave 7	
Dependent variable	Worked	Remote work	ΔMH	Worked	Remote work	ΔMH
Coefficients						
IV1	-0.369***			-0.369***		
	(0.026)			(0.026)		
IV2	-0.087*	0.915***		-0.087*	0.915***	
	(0.053)	(0.089)		(0.053)	(0.089)	
Remote work			-0.007			-0.058
			(0.057)			(0.045)
Observations	2,878	2,146	2,146	2,878	2,146	2,146
Clusters	97	97	97	97	97	97
Marginal effects						
Pr(Worked) = 1	-0.101***			-0.101***		
for IV1	(0.007)			(0.007)		
Pr(Worked) = 1	0.024*			0.024*		
for IV2	(0.014)			(0.014)		
Pr(Remote work)= 1		0.255***			0.255***	
for IV2		(0.031)			(0.031)	
Pr(Worse MH) = 1 for			0.001			0.016
for Remote Work			(0.008)			(0.012)
Pr(Same MH) = 1			0.002			-0.003
for Remote Work			(0.013)			(0.002)
Pr(Better MH) = 1			-0.003			-0.013
for Remote Work			(0.020)			(0.011)

Notes: IV1 is a dummy for being employed in a non-essential and non-teleworkable occupation. IV2 is a dummy for being employed in a teleworkable occupation. The omitted category is being employed in an essential and non-teleworkable occupation. All models control for country dummies, country-specific linear trends in the week of interview at the SHARE Corona Survey, age, gender, having a partner, having a tertiary education degree, having children, sector of employment at the outbreak of Covid-19 (public employee, private employee, self-employed), the log peak excess death rate by region. Standard errors are clustered by cells defined on the basis of essentiality and teleworkability of the occupation. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: The effect of remote work on changes in sadness and depression, sleep troubles and loneliness during the pandemic.

	(1)	(2)	(3)
Dependent variable	ΔSadDepress	ΔSleep	ΔLonely
Coefficients			
Remote work	-0.451***	-0.047	-0.446***
	(0.060)	(0.046)	(0.055)
Observations	2,146	2,146	2,146
Clusters	97	97	97
Marginal effects			
Pr(Worse MH) = 1 for	0.074***	0.006	0.063***
for Remote Work	(0.012)	(0.006)	(0.006)
Pr(Same MH) = 1	0.055***	0.008	0.007
for Remote Work	(0.006)	(0.008)	(0.008)
Pr(Better MH) = 1	-0.129***	-0.014	-0.071***
for Remote Work	(0.016)	(0.014)	(0.014)

Notes: see Table 2

Table 4: The heterogeneous effect of remote work on changes in mental health by individual characteristics.

	(1)	(2)	(3)	(4)	(5)	(6)
Heterogeneity by	Gender		Children at home		Partner	
	Male	Female	Yes	No	Yes	No
Dependent variable	ΔMH	ΔMH	ΔMH	ΔMH	ΔMH	ΔMH
Coefficients						
Remote work	0.167*	-0.028	-0.782***	0.461***	0.027	-0.002
	(0.094)	(0.077)	(0.115)	(0.059)	(0.050)	(0.134)
Observations	928	1218	607	1454	1696	450
Clusters	92	89	79	93	93	78
Marginal effects						
Pr(Worse MH) = 1 for	-0.022*	0.004	0.127***	-0.064***	0.004	0.000
for Remote Work	(0.012)	(0.010)	(0.021)	(0.010)	(0.007)	(0.019)
Pr(Same MH) = 1	-0.037*	0.006	0.109***	-0.104***	0.006	0.000
for Remote Work	(0.022)	(0.017)	(0.019)	(0.014)	(0.011)	(0.024)
Pr(Better MH) = 1	0.059*	-0.010	-0.236***	0.168***	-0.010	-0.001
for Remote Work	(0.034)	(0.027)	(0.031)	(0.022)	(0.018)	(0.043)

Notes: see Table 2

Table 5: The heterogeneous effect of remote work on changes in mental health by country-level factors.

	(1)	(2)	(3)	(4)
Heterogeneity by	Peak excess death rate		Stringency index	
	Above median	Below median	Above median	Below median
Dependent variable	ΔMH	ΔMH	ΔMH	ΔMH
Coefficients				
Remote work	-0.176	-0.524***	0.516***	-0.521***
	(0.124)	(0.066)	(0.056)	(0.088)
Observations	742	1404	1266	880
Clusters	88	94	93	86
Marginal effects				
Pr(Worse MH) = 1 for	0.025	0.078***	-0.085***	0.083***
for Remote Work	(0.019)	(0.010)	(0.012)***	(0.017)
Pr(Same MH) = 1	0.032	0.100***	-0.103***	0.084***
for Remote Work	(0.022)	(0.014)	(0.011)	(0.012)
Pr(Better MH) = 1	-0.057	-0.178***	0.188***	-0.167***
for Remote Work	(0.040)	(0.021)	(0.019)	(0.026)

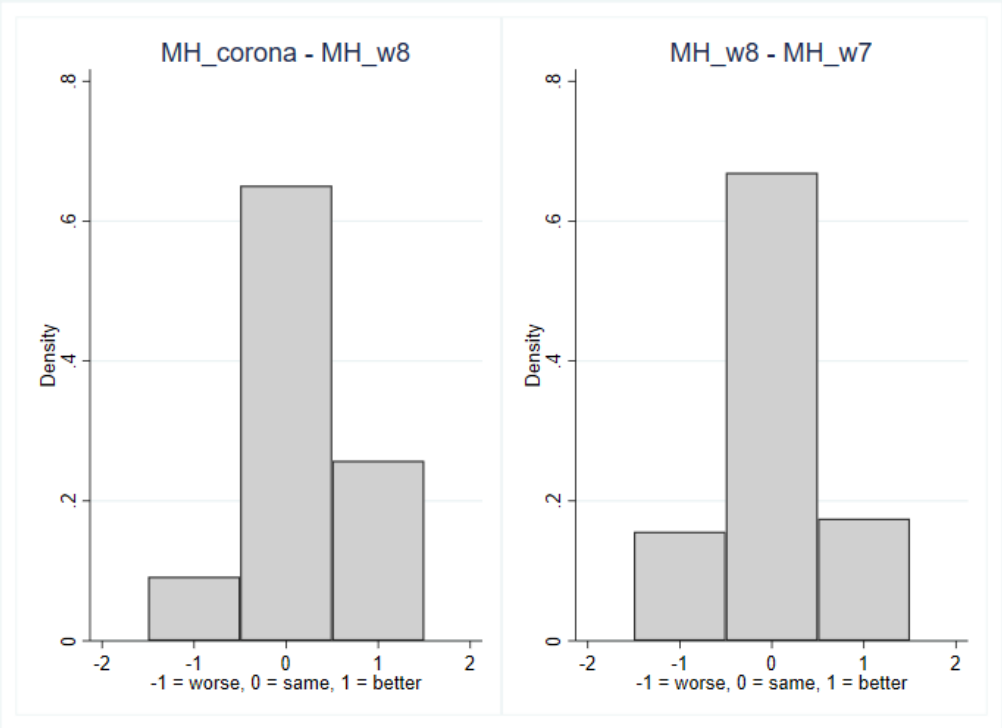
Notes: see Table 2

Table 6: The heterogeneous effect of remote work on changes in mental health by interacted country-level factors.

	(1)	(2)	(3)	(4)
Peak excess death	Above median	Below median	Above median	Below median
Stringency index	Above median	Above median	Below median	Below median
Dependent variable	ΔMH	ΔMH	ΔMH	ΔMH
Coefficients				
Remote work	0.052	-0.519***	-0.456***	-0.444***
	(0.103)	(0.096)	(0.092)	(0.111)
Observations	708	293	817	587
Clusters	81	71	87	75
Marginal effects				
Pr(Worse MH) = 1 for	-0.009	0.104***	0.068***	0.072***
for Remote Work	(0.017)	(0.038)	(0.015)	(0.022)
Pr(Same MH) = 1	-0.008	0.061***	0.080***	0.070***
for Remote Work	(0.016)	(0.020)	(0.016)	(0.015)
Pr(Better MH) = 1	0.017	-0.165***	-0.148***	-0.142***
for Remote Work	(0.017)	(0.054)	(0.028)	(0.034)

Notes: see Table 2

Figure 1: Mental health - variation across waves



Notes: an individual has worse mental health if he/she was not listing mental health problem (sadness or depression, troubles sleeping, loneliness) at the baseline and lists them at the endline. The opposite holds for better mental health. Individuals who keep on having/not having any mental health problem are in the "same" category.

Figure 2: Essential and teleworkable workers by country

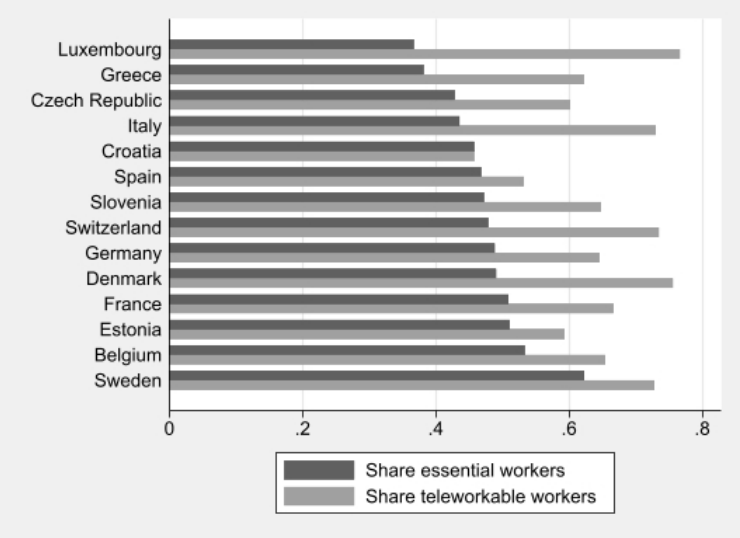


Figure 3: Highest weekly excess death rate, weeks 1 to 30, 2020

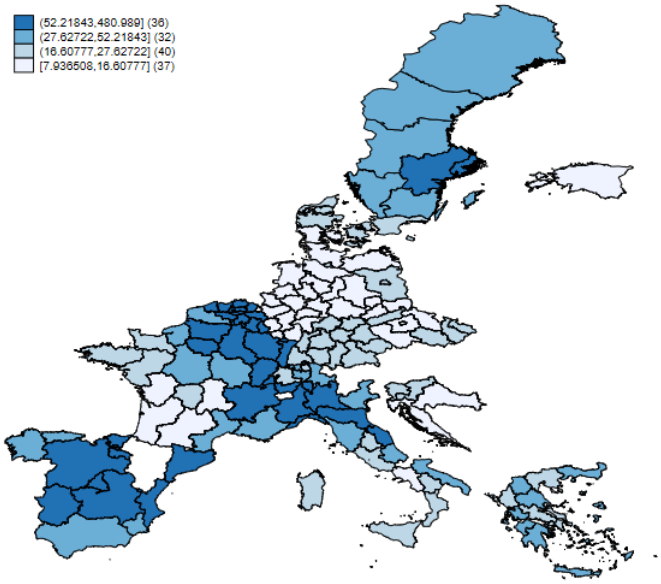


Figure 4: Countries below and above the median in number of days in strict lockdown, weeks 1 to 30, 2020

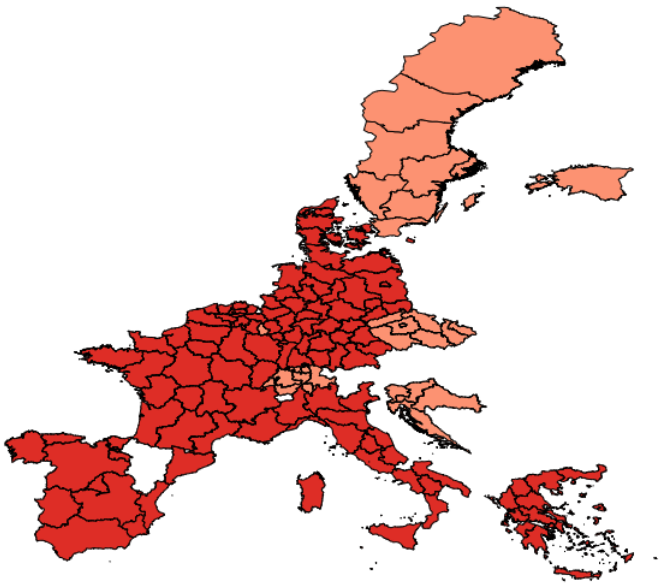


Figure 5: Teleworkability, essential workers and employment probability

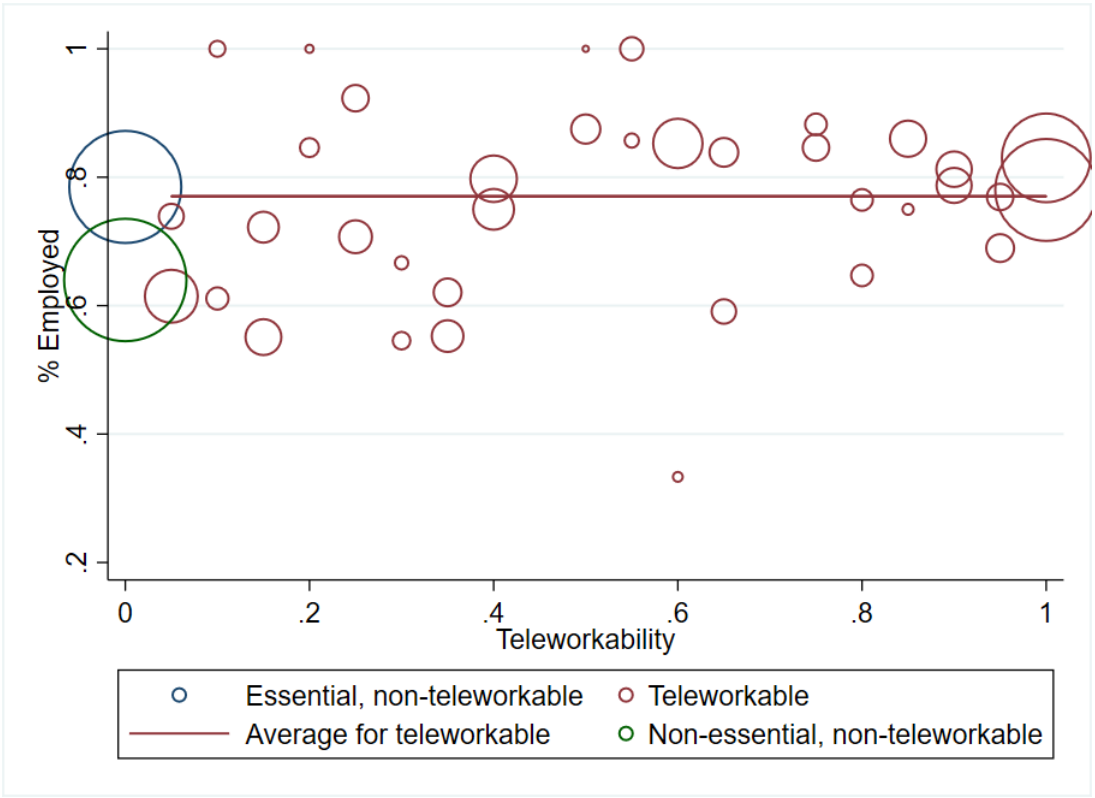


Figure 6: Teleworkability and remote working