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Unequal care provision: Evidence from the SHARE-Corona Survey

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Abstract
This paper brings new evidence on the differences in informal care provision across individuals. It is based on the SHARE-Corona survey, which collected data during the pandemic, involving about 43,000 respondents aged 50 and over in 28 countries. The survey recorded detailed information on the provision of care, characteristics of the caregiver, and of the care recipient at the individual level. We link the SHARE Corona Survey data with an individual-specific "stringency index", which measures the intensity of the lockdown policies and the degree of individual's exposure to these restrictions. We propose a new methodology to measure the degree of rationing of care that older people experienced during the pandemic and implement several specifications that explain the determinants of care provision. We find that women and people in the age group 50–64, especially if low income, were more likely to supply help or care, and also document the *multi-facet* interaction with the labour market status of caregivers.

Keywords Informal care · Care provision · Caregiver · Gender · Women · COVID-19 · SHARE data

JEL Codes D1 · I14 · I18 · J14 · J16

1 Introduction

This paper explores the provision of help and the provision of personal care to older people during the Covid-19 pandemic in Europe, highlighting significant differences

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in the characteristics of caregivers at the individual level. Our work provides novel evidence on care devoted to older people by describing the mechanism through which the pandemic enhanced differences in the patterns of care provision. The basic distinction is between informal care, i.e. care provided by family members or friends, and formal care, such as paid services acquired on the market or made available by public institutions and typically offered by health-care professionals. We argue that the pandemic came as a shock, which heavily affected care provision by rationing the supply of formal care, due to the difficulties in reaching out for help during the emergency, in the presence of lockdown and social distancing policies. Many individuals in the age group 50–65 had to face a true challenge: while coping with new working arrangements or abrupt changes in working times, they also had to take care of family members, i.e. provide informal care. We show that, in general, women and individuals aged 50–65 are more likely to provide help in difficult times, the gender difference is particularly strong when we focus on the supply of personal care.

During the two waves of the pandemic, as from March 2020[1], the lives of individuals have been disrupted in several ways: from being directly affected by the virus and suffering health deterioration to losing jobs or stopping economic activities and suffering the consequences of lockdown measures such as social distancing. However, the impact and the spread of the disease has not been the same between (and even within) countries. For instance, Southern European countries, like Italy and Spain, were heavily hit by the first wave at very early stages in 2020, while Northern European countries, such as Finland and Sweden, were almost unaffected and imposed restrictions much later in the same year. Furthermore, countries characterized by an ageing population have suffered the highest toll in terms of deaths caused by Covid-19.

Governments faced an emergency scenario and responded with different policies aimed at contrasting the spread of the virus: many people experienced long periods of hard lockdown measures. As a result, working patterns and mobility were severely affected; many individuals experienced isolation and/or income uncertainty, which was often associated with changes in their health status. At the same time, significant changes occurred in public expenditure for hospitals and emergency healthcare units, so that the combination of lockdown measures and the reduction of funds normally devoted to healthcare spending and welfare policies, enhanced the negative effects of the pandemic on health and healthcare.

Several attempts have been put forward to quantify the effects of the Coronavirus on people and society in these domains. Wang et al. (2020) and Porzio et al. (2020) show that individuals with severe diseases, such as dementia or cancer, experienced difficulties in receiving care, and caregivers, in turn, experienced anxiety and developed signs of exhaustion and burnout (Wang et al. 2020). The evidence for the UK shows that 17% of the individuals, affected by limitations in their activities of daily living (ADL), reported reductions in external assistance, thus relying on informal care within the household (Evamdrou et al. 2020). Using data from the ELSA COVID-19 study, Chatzi et al. (2020) report that, during the coronavirus

[1] Although the outbreak of the pandemic has been dated by the WHO at the beginning of March 2020, scientific evidence suggests that the Coronavirus was already present in Europe from the Fall of 2019 (Apolone et al. 2020).

pandemic, 35% of caregivers stopped (or reduced) the amount of care provided while 12% of women in the sample became new caregivers for someone outside the household. Stronger evidence emerges in countries outside Europe: Chan et al. (2020) exploit a population-wide survey in Hong Kong and find that during the initial phase of the COVID-19 outbreak, approximately a quarter of the population assumed informal caregiving duties within their households.

A few early contributions drew inferences for older people in Europe from the SHARE data (Survey of Health, Ageing, and Retirement in Europe) by focusing on some relevant outcomes, such as: foregone health treatment, missing visits to the doctor, and lack of caring activities (Smolic et al., 2021). In a recent paper, Bassoli et al. (2021) show that older people in the low-income group and affected by limitations in everyday life activities were more likely to receive informal help or care, as opposed to formal care, because of the lockdown policies.

However, while this body of evidence points to an important effect of the pandemic on health and related outcomes, the challenge is to study in detail the mechanisms that explain how Covid-related restrictions affected different groups of individuals for the supply of help or care. Indeed, one main point of our investigation is that women typically take on the burden of such caring activities, and that the pandemic has changed in complex ways the supply of care, possibly enhancing such differences.

We build on previous literature that highlights the gender specialization in caring activities: it is a stylized fact that women are responsible for most of the unpaid care and domestic work even in non-emergency cases (Grundy and Henretta 2006, Di Novi et al. 2015, Bratti et al., 2018 and Fenoll, 2020). The most recent pre-pandemic data for European countries show that among individuals providing care for incapacitated relatives about 83% are in the age group 45–64; and overall, among those providing care 63% are women (Eurostat, 2018). The experience from past pandemic outbreaks in developing countries shows that women are more heavily affected than men by these shocks (Wenham et al., 2020). The role of working women in providing childcare during the first wave of the Covid-19 pandemic has already been documented by Del Boca et al. (2020), Farré et al. (2021), and Sevilla and Smith (2020).

These papers show how in general women are frontliner in various caring activities, but do not provide specific evidence on the role of older women (particularly in the age group 50–64) and their provision of care to older parents or relatives. Furthermore, these studies focus on the short-term effects of the Covid-19 emergency, while we are also interested in estimating the medium-term effects over a few years.

In general, measuring responses of the informal supply of care to changes in the demand for care is notoriously hard, because several factors determine the responses of potential caregivers. For example, their attitudes and preferences in terms of leisure or their labour market status, as well as the overall supply of care (both formal and informal) potentially available to the beneficiary. In order to overcome these shortcomings, we exploit the occurrence of the Covid-19 pandemic, which we regard as an exogenous shock creating rationing of formal caregiving. There exists evidence that lockdown policies increased the number of contacts between older people and their children (Vergauwen et al., 2022): we

want to relate this finding to the activities that were actually performed to support older people.

Our approach rests on the assumption of (partial) substitutability between formal and informal care (Bonsang, 2009, Kalwij et al. 2014), such that lockdown policies affect mostly the former, due to mobility restrictions and social distancing, thus generating a spillover effect onto the supply informal care. Another way to think about this approach is to assume the existence of a "reserve of informal care" that older people can have access to, when the public/formal welfare provisions and care provisions are rationed, but this reserve comes at a cost for specific groups of the population.

We use data drawn from the SHARE Corona Survey[2] carried out in the Summer of 2020 and 2021, which collects information on Europeans aged 50 and over. About 28 countries and 50000 individuals were interviewed and asked questions about their lives in the lockdown periods, such as their health status, help and care provision, job-market status, and financial situation. It should be stressed that SHARE is a longitudinal survey, that allows the researcher to look at the effects of lockdown policies also in the medium-term, going beyond the immediate responses to the shock.

Lockdown policies represent a true source of variation in our sample, as they varied over time and geographically, even within one country, in several dimensions, such as imposing closures of shops and workplaces, mobility restrictions, and social distancing. To measure these policies and their changes in a homogeneous way, we construct a summary variable (an index) measuring the intensity of such policies varying across time, between countries and across geographical areas within countries.

Our results suggest that the pandemic affected individuals differently according to the strictness of the lockdown policies, gender, and job market status. Harder anti-pandemic policies increase the likelihood of providing help and the caregivers who respond to the need of care are typically women and "young-old" individuals[3]. The results are even more marked when we consider the activity of providing *personal care*, suggesting a stronger substitution effect between formal and informal care. Thanks to the richness of the SHARE dataset, we can control for several dimensions of people's life at the individual level, including their labour market status. A striking result of our study is that the labour market status of caregivers becomes irrelevant when it comes to providing personal care, suggesting that informal care during the pandemic is totally dominated by the nature of the demand for care, in the presence of restrictions on the supply side.

The paper is organized as follows: Section 2 describes the data, Section 3 provides simple tabulations and a preliminary analysis of the caring activities, Section 4 introduces the empirical strategy and presents the results of the econometric estimations, while Section 5 concludes.

[2] Börsch-Supan, A. (2022a) and Börsch-Supan, A. (2022b).

[3] In the ageing studies a distinction is drawn between the young-old, i.e. individuals in the age-bracket 50–65 and the other older people, those who have age above 65. In some epidemiological studies, there is even a group of the oldest-old (i.e. people of age 90 and above or even 95 and above), but these latter are not a group of interest when considering caregiving activities of the type we analyze.

2 Data

Our empirical investigation is based on the SHARE Corona survey[4]. This survey is part of the SHARE dataset, a representative sample of individuals aged 50 and over in 28 European countries. SHARE started in 2004 and has a core longitudinal component, collecting a rich array of information on household characteristics, individual attitudes, socio-economic and health conditions through face-to-face interviews. In the Summer of 2020 and in the Summer 2021, coinciding with the two periods of the outbreak of the pandemic, telephone interviews were carried out on the same respondents of the main survey, asking questions about the health status, supply of help, and care provided, working status, demographic variables, and the general economic situation, as explained in Section 3 below. Providing help or care typically takes place between generations: care given by adults to their parents or older relatives or friends. In this sense, the SHARE survey is unique because we can look at the same time at more linked generations and different directions of help provision, having in the same survey people who give help and people who receive help[5]. About fifty-thousand individuals were interviewed in 28 countries[6].

We augmented the SHARE Corona survey to generate a unique dataset in several dimensions. First, we linked the information recorded in the Corona Survey to the information retrieved from the regular waves of the SHARE-panel. In particular, the linkage was done with wave 8, for the countries that completed the interviews of that wave in 2019–2020, while for the other countries the pre-Covid information were retrieved from the previously available waves.

The variables of interest in the SHARE-Corona survey are "help given" for necessities in everyday life, e.g. food purchases, medications, or emergency house repairs, or "personal care given". While help for necessity involves relatively simple and ordinary tasks, which might have been performed due to the recommendations given to older people to "stay home", providing personal care involves a more intense commitment, which might occur because of the limitation of ordinary care assistance due to the pandemic (Eurostat, 2018).

Second, we attached to each respondent in the survey local-level information, by introducing an index which measures the extent and timing of lockdowns and other restrictive measures, that governments implemented to limit the spread of the virus, with different intensity and length of the restrictions. These policies have been documented by the Oxford COVID-19 Government Response Tracker at country-day level. The tracker provides the so-called stringency index, which measures, on a daily basis, regulations about closures of shops and workplaces, canceling of public events, restrictions on gatherings, closure of public transports, "stay at home" requirement, restrictions on local travelling, international travel controls and public campaigns information. Every single policy has been recorded according to the "degree of severity": for example, the closure requirement of offices and public

[4] More information about the SHARE Corona survey are provided by Scherpenzeel et al. (2020).

[5] It should be noted that SHARE asks also about the help given to children (e.g. looking after grand-children), but we focus on help given by adults to the older generations. The sample selection will be explained in Section 3 below.

[6] Austria did not take part in initial SHARE Corona Survey of Summer 2020, but joined later in the fall.

places or even commercial activities ranges from full closure to partial closure or no closure. The daily index is the sum of the policy indicators, it spans from 0 to 100, with greater values being associated to higher strictness[7].

Given the information on the date of the interview of each respondent from the SHARE-Corona data, we can match each respondent to the stringency index of her country of residence on that day, but also to a measure of the cumulated exposure to stringency policies[8]. Hence, we have two measures of the lockdown policies: (i) the daily "spot" stringency index (S-Index) and (ii) a cumulative exposure index. The latter is based on the idea of Bassoli et al. (2021), and generates a cumulative measure of the stringency index by summing up, for each country, all the daily recordings of the index from the start of the pandemic until the interview date[9]. In 2021 (the second wave of the pandemic), countries were affected by restrictions with different intensity during the year, governments responded implementing measures in a heterogeneous way: some countries repeated the strong lockdown closures implemented in 2020, while others decided for milder actions. As a result, countries that implemented lockdown policies later in the year exhibit a lower index. At the same time, if two countries have the same starting date of lockdown policies, but different intensities, the country with stricter policies will have a higher S-index.

Coming to our research question, we expect the S-index to be positively correlated with the need for help: to the extent that the S-index partly captures the direct rationing in formal care, due for example to mobility restrictions, it measures the need to revert to informal care[10]. The use of the S-Index allows us to measure, with sufficient detail, the lockdown measures experienced by individuals in different geographical locations and at different times in Europe, hence getting a good grasp of the direct effects of the lockdown policies. However, we also need to control for some characteristics of the supply side of formal care, which represent alternative routes of the mechanisms of "rationing" of care or could in fact mitigate the effects of the pandemic. We focus on two dimensions that we believe to be particularly relevant, especially for the *personal care* activities: the availability of formal home care in the area (say nurses going to the residence of the recipient) and the availability of long-term care facilities in the area, before the pandemic. In both cases, the available data lacked some geographical details, which would make these measures precise, i.e. measures related to the actual experience of the care recipient and the caregiver. To overcome this lack of information we create two proxy measures as follows. As for the first variable (availability of formal home-care) we propose a novel methodology that makes use of information elicited from the recipients of care. This is an independent source of variability, as it is based on a different set of individuals also interviewed in the SHARE Corona Survey in the year 2020 and in

[7] For further information see Hale et al. (2020).

[8] For the second wave of the SHARE Corona survey we only know the month of the interview, thus we take the stringency index of the middle of the month.

[9] In fact, since the 1st of January 2020.

[10] We also experimented with other measures of the severity of the Pandemic, for example with the cumulative number of deaths per country/region, but these do not capture the actual rationing impact, as we observe that countries with the same mortality/morbidity could decide for different lockdown policies.

the year 2021. In detail, respondents who reported receiving care before the Covid-19 outbreak (say wave 7 or 8), were asked whether they experienced difficulties in getting home care during the pandemic, so that we can measure directly the "lack of professional care". Under the assumption that respondents living in the same area were assigned to the same interviewer by the survey agency, we created clusters of respondents associated to the same interviewer's code. For densely populated areas, more than one interviewer could be present, with respondents randomly allocated to each. We then assign to all individuals living in the same area (attached to the same interviewer) the average "lack of professional care" as obtained by the reported answers within the same cluster. It should be stressed that we use two separate sets of respondents: the ones who report "lack of professional care" as recipients and the ones who provide care[11].

As for the second variable, i.e. the baseline local provision of LTC, in LTC hospitals or nursing homes, we construct a proxy measured before the pandemic outbreak. The choice of timing is twofold: on the one hand, LTC facilities would partly satisfy the demand for help and personal care people normally rely on, which requires controlling for differences (at the local level) in the provision of such facilities; on the other hand, we want to abstract from the dramatic events taking place during the pandemic, such as closures of these specific facilities, because the S-index is already taking care of the dynamics of these sharp changes during the Covid-19 crisis. To construct this measure, we build an auxiliary regression that generates the number of beds in nursing and residential care facilities per hundred thousand inhabitants by NUTS2-level geographical areas (regions) in 2019 and in 2020. This procedure overcomes the problem that the information on LTC beds at the local level is available only until 2015, hence we project the number of beds for LTC at NUT2 level in 2019 and 2020, as a function of some relevant variables. The auxiliary regression makes use of the number of hospital beds and medical doctors per hundred thousand inhabitants in NUTS2-level regions of 2015, the number of individuals above the age of 85 in NUTS2-level regions of 2015, 2019 and 2020, and the number of long-term care beds and medical doctors per hundred thousand inhabitants also in 2015, 2019 and 2020, measured at NUTS0-level[12].

Finally, these two proxies (lack of formal home care in the area and number of beds for LTC) are matched with the data of the respondent on the basis of the year and geographical location.

This set of information is coupled with other dimensions of life of the respondents, also drawn from the SHARE data. A relevant one is their labour supply behaviour, as the "young old", i.e. individuals aged between 50 and 64, are likely to be engaged in labour market activities.

[11] Only 6% of the respondents belong to both groups, mostly individuals providing personal care and receiving help.

[12] The projection is based on the simple regression where the relative number of LTC beds at NUTS2 level is regressed on the population 85+, the relative number of doctors and hospital beds, and the relative number of LTC beds at NUTS0 level. These data are drawn from Eurostat (2022). Table 17 in the Appendix reports the results.

3 Descriptive analysis

Before turning the attention to the empirical analysis, we discuss the sample selection. Two waves of the SHARE-Corona Survey are available representing a (short) unbalanced panel sample, as some respondents take part to only one of the two waves. Overall, there are 49505 observations in the initial sample, once we select a balanced panel, the sample is reduced to 43626 observations. For all the individuals of the balanced panel, the pre-pandemic information can be recovered either from the regular wave of the year 2018 or from the regular wave of 2016.

We also select individuals younger than 85, mainly because attrition may take place due to non-random survival. Furthermore, the number of people aged 85 and over who provide help or care is very small, which would make it impossible to obtain a suitable cell-size when several explanatory variables are introduced in regression analysis.

The question about care provision allows us to distinguish between different beneficiaries of these activities[13]. In order to focus on the help or personal care given to older people (parents, relatives, or others), we exclude a number of answer-categories where the help provision to children may be prevalent. In particular, we exclude respondents who gave help to "children only" or to "children and parents only" etc.., which amounts to four excluded categories for a total of 1058 observations (2.42% of the sample), but we keep respondents (only a few cases, i.e. 0.76%) who provide multiple answers where "help to children" takes place along with several other helping activities, so that it is not prominent. Similarly, we drop individuals from the estimations sample who gave personal care to "children only", to "children and parents only" etc. with four excluded categories and a total of 208 dropped observations (0.47%)[14].

Following this selection, the estimation sample has 42360 observations, namely 21180 individuals. Of these 12334 (58%) are women and 8855 (42%) are men.

Table 1 reports the descriptive statistics for all countries based on the two waves of the SHARE-Corona (after selection): overall, 22.1% of the respondents gave help for necessities such as food purchases, medications, and housing repairs, while 5.6% provided personal care. As for the other sample characteristics: the bulk of the sample is younger than age 75, 30.8% of the sample has low education, while at the other extreme, 23.9% attained a college degree or more. About 67% of the respondents are retired and 21% are working.

Figures 1 and 2 show the prevalence of help for daily-life necessities or care given by gender and geographical area of residence of the caregiver[15]. There is a higher prevalence of "help given" for respondents living in Northern and Central European countries, but a higher fraction of respondents provide personal care in Southern or

[13] The answer is a "code all that apply" and different combinations are possible, for example "care provided to parents only" or "care provided to parents plus relative and friends", so the percentages do not sum to 100.

[14] The number of individuals providing help or care to all the four categories are negligible, 0.76% for help and 0.84% for personal care.

[15] For ease of presentation, we have grouped countries into four macro-areas: Nordic countries, countries of Central Europe, Southern countries and Eastern countries.

Table 1 The SHARE Corona sample

Variable	Obs	Mean	Std.Dev.
Help given	42360	0.221	0.414
Personal care given	42360	0.056	0.230
Age 50–65	42360	0.375	0.484
Age 66–75	42360	0.483	0.500
Age 76–85	42360	0.142	0.349
Female	42360	0.582	0.493
Low income	42360	0.421	0.493
Middle income	42360	0.239	0.426
High income	42360	0.339	0.473
Low education	42360	0.308	0.461
Middle education	42360	0.452	0.497
High education	42360	0.239	0.426
Retired	42360	0.669	0.471
Working	42360	0.208	0.413
Lost job because of COVID-19	42360	0.034	0.181

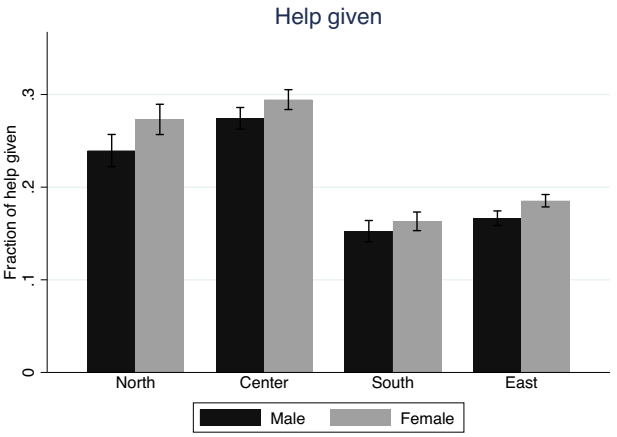

Fig. 1 Help given for necessities, by area and gender

Eastern countries than in the rest of Europe. In terms of gender: women are both more likely to provide help and care than men; women in Southern Europe exhibit the highest prevalence of care provision, followed by women in Eastern Europe (Fig. 2). These descriptive statistics are in line with the findings by Bonsang (2009) and Callegaro and Pasini (2007), who also investigate help provision in the SHARE data, with a focus on the substitutability between formal and informal care. Our study starts from the same basic representation of the observed patterns, but it emphasizes a different mechanism: while in their papers the weight of the evidence is on the characteristics of the recipient of care, we want to investigate "the reserve of care provision" which can be made available by family and friends.

Along with the individual level SHARE data, we make use of the S-index variable, defined in Section 2: this varies over time and countries and takes values

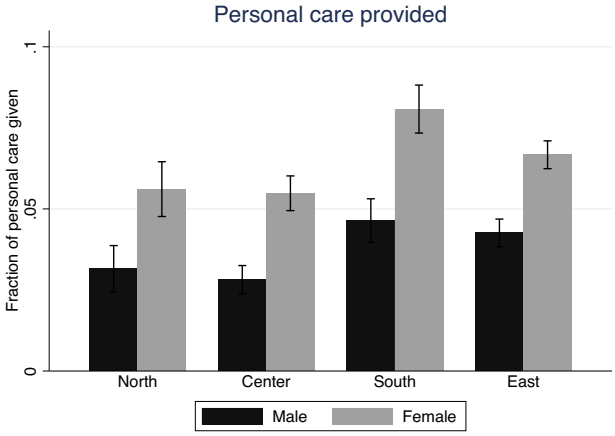

Fig. 2 Personal care provided, by area and gender

between zero (no restrictions) and one hundred (maximum restrictions). The statistics presented in Table 2 and Fig. 3, refer to the time of the first wave of the SHARE-Corona sample, linked to the exact interview date of each respondent[16]. Table 2. shows that Italy is the country exhibiting the highest mean value of the S-index in Europe, which is in line with the timing of policy responses and severity of the adopted measures, while Northern countries and Eastern countries are characterised by the lowest average values. Interestingly enough, some countries which did not implement restrictions very early in time, exhibit a much higher variability of the S-index (e.g. Sweden), which may be due to the number and timing of interventions, i.e. to the "intensity" of the lockdown measures. Figure 3 help to gain this intuition by showing the distribution of the S-index for the entire sample and for selected countries: in some countries the S-index is highly concentrated, for example, in Italy the median is 54.96, while in Finland is 36.57[17]. In other cases, such as Germany, Portugal, and Sweden we observe different median values associated with higher variability.

Since we investigate the dynamics of help and care provided, it is crucial to take account of the labour market status of the respondent before and during the pandemic, however, we want to make clear that we are not attempting a fully-fledged model of the labour market choices of individuals, but simply control for the interaction between work and caregiving as done in Grundy and Henretta (2006), Di Novi et al. (2015), Bratti et al. (2018) and Fenoll, (2020). These activities can interact through different routes in our context: a first route is triggered by the changes directly caused by the Covid-19 crisis. As we shall explain below, it is possible that some individuals could not stop working during the pandemic, even if they wanted to, while others who wanted to continue working had to stop. The other route is related to the emerging needs indirectly caused by the pandemic, for example people decided to stop working (e.g. they retired) because they had to take care of their

[16] For the second wave in 2021 we only know the month of the interview.

[17] For brevity we only report a few examples of the distribution of the S-index in selected countries.

Table 2 Mean and Standard deviation of the Stringency Index

Country identifier	Mean S-index	Sd	N obs
Italy	63.635	9.50	6919
Portugal	55.439	6.81	2115
France	52.38	2.677	3876
Germany	53.955	11.723	4632
Austria	51.173	3.757	2224
Greece	51.148	8.471	6897
Netherlands	49.416	12.468	1495
Belgium	48.371	2.442	7208
Spain	48.106	1.153	3731
Malta	47.997	2.438	618
Bulgaria	46.993	12.481	1462
Poland	46.146	3.621	5630
Cyprus	45.079	4.071	1409
Denmark	44.618	5.058	3556
Romania	43.952	3.007	2889
Switzerland	43.504	3.748	3578
Lithuania	43.204	2.203	2478
Croatia	42.539	5.497	3832
Slovakia	40.688	2.585	1821
Finland	40.567	4.436	2735
Latvia	40.54	1.152	1872
Israel	39.818	13.942	2643
Hungary	39.299	7.693	1827
Czech Republic	39.162	2.385	4702
Luxembourg	38.849	2.722	1758
Sweden	37.362	2.468	2316
Slovenia	36.093	3.398	4987
Estonia	32.021	5.196	6784

parents. In our case, for people aged 50 and over who are potentially caregivers, the latter case is likely to generate an endogeneity problem, which is why we have to resort to an instrumental variable approach that deals with the potential simultaneity of the decision to work or stop working to provide care. Notice that some labour market states, like unemployment, are not directly under the control of the respondent during the three-years span that we investigate, as they might depend on the general labour market situation, the sector of employment and the decisions of the employers. Retirement is instead a choice in most European countries, under certain eligibility conditions.

In order to build a full timeline of the labour market status of each individual, we start from the information about their occupational status before the pandemic, namely in the regular wave 8 (or the wave of 2016), we then update the information according to the respondent's answer about whether she was currently working or not working (due to Covid-19) during the first Corona Survey. We then further update

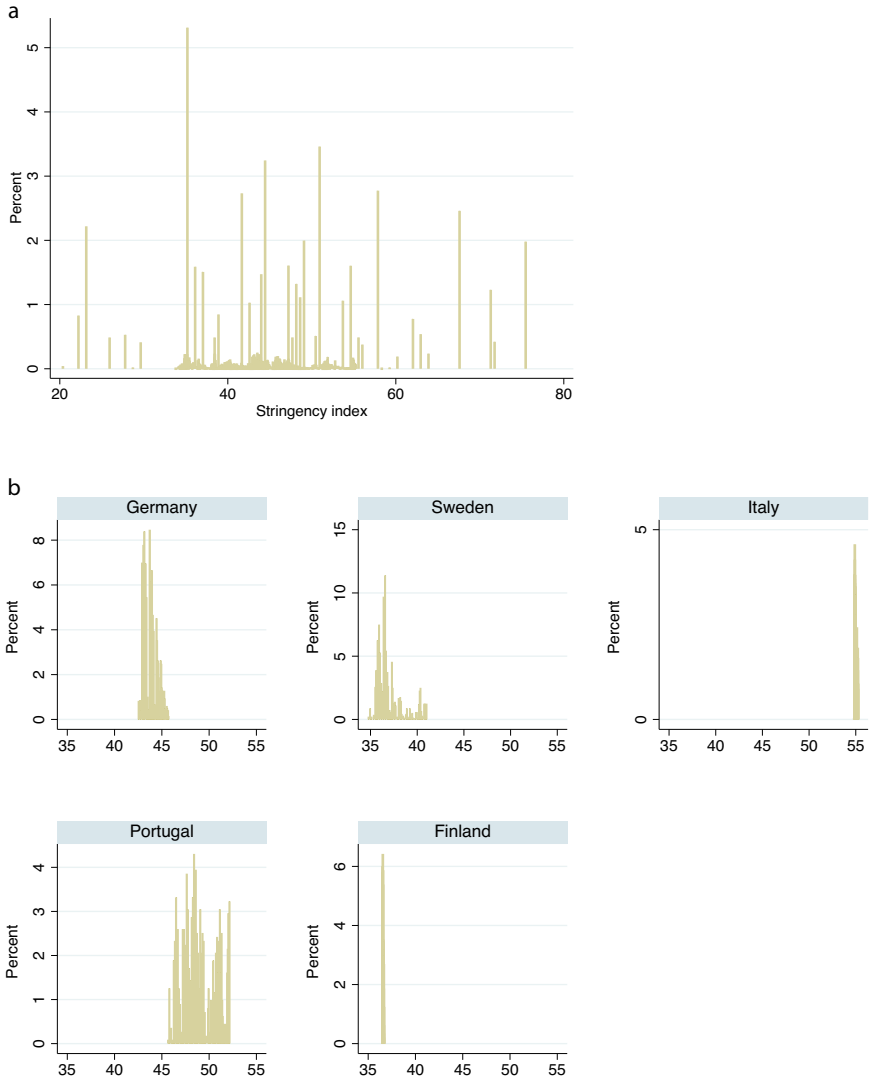

Fig. 3 Distribution of the stringency index in the full sample and in selected countries

the job status from the information provided in the second wave of the Corona Survey. The distribution of the job status is reported, by wave, in Table 3. Considering the pooled data of the year 2019 (or earlier) and of the year 2021 (third column), 20.85% of individuals are working, almost 67% are retired, a small percentage is unemployed (3.81%) and the rest is either sick or disabled (2.32%) or homemaker (6.16%).

Table 4 shows the transitions across labour markets states: apart from the respondents who worked in 2019 and remain working in the year 2021 (69%), most transitions from all states are into retirement. Particularly relevant is the transition from work to retirement (25.77%).

Table 3 Distribution of the Job status by wave

Job situation	Wave		
	Cati1(wave8)	Cati2	Total
Retired	13226	15094	28320
	46.70	53.30	100.00
	62.45	71.27	66.86
Working	4769	4065	8834
	53.98	46.02	100.00
	22.52	19.19	20.85
Unemployed	1273	340	1613
	78.92	21.08	100.00
	6.01	1.61	3.81
Sick/Disabled	521	462	983
	53.00	47.00	100.00
	2.46	2.18	2.32
Homemaker	1391	1219	2610
	53.30	46.70	100.00
	6.57	5.76	6.16
Total	21180	21180	42360
	50.00	50.00	100.00
	100.00	100.00	100.00

First row has frequencies; second row has row percentages and the third row has column percentages. Information of wave 8 have been updated with information given during the first Corona survey (1822 observations, 8.6% of information in wave 8)

Table 4 Transitions of "job status" from Corona survey 1 to Corona survey 2

Working situation	Retired	Working	Unemployed	Sick/disable	Homemaker	Total
Retired	12,954	66	8	73	125	13,226
	97.94	0.5	0.06	0.55	0.95	100
Working	1229	3292	103	79	66	4769
	25.77	69.03	2.16	1.66	1.38	100
Unemployed	328	668	184	26	67	1273
	25.77	52.47	14.45	2.04	5.26	100
Sick/Disabled	225	10	12	261	13	521
	43.19	1.92	2.3	50.1	2.5	100
Homemaker	358	29	33	23	948	1391
	25.74	2.08	2.37	1.65	68.15	100
Total	15,094	4065	340	462	1,219	21,180
	71.27	19.19	1.61	2.18	5.76	100

This table shows the transition from the initial state on the first column to the final job situation in the subsequent column. The second row shows the percentage. Not every individual who was present in the Corona Survey 1 is also present in the Corona Survey 2

Table 5 Distribution of "personal care" providers and working status (for the subsample providing help or care)

Personal care given	Working		
	No	Yes	Total
No	5329	2170	7499
	71.06	28.94	100.00
	80.67	**78.62**	**80.07**
Yes	1277	590	1867
	68.40	31.60	100.00
	19.33	**21.38**	**19.93**
Total	6606	2760	9366
	70.53	29.47	100.00
	100.00	**100.00**	**100.00**

Bold values highlight the difference between frequences and row/column percentage

First row has *frequencies*; second row has *row percentages* and third row has *column percentages*

Table 5 is based on the subsample of caregivers who provide help or care (9366 observations) and it shows the distribution of people providing services to older people along with their working status. Less than 20% of people in this subsample provide *personal care*: this result is in line with the type of task and commitment these activities involve: providing help, for example doing the grocery shopping, can involve a short amount of time and can be associated to other activities, while providing personal care involves more time and effort (Eurostat 2018, OECD 2023). No significant differences emerge in terms of working patterns: approximately 30% of the people are working regardless of the type of help they offer[18].

One main goal of our study is to explain gender differences for individuals providing help and/or care, also taking into account working activities. Table 6 shows that there is a significantly higher number of women than men providing help or care, regardless of their working status: almost 60% of individuals providing help and more than 70% providing care are women. However, 60.47% of the women helping are also working (as opposed to 39.53% of men) and 70.13% of women providing personal care are also working. In other words, women are more likely to combine work and helping activities or even work and personal caregiving[19].

These descriptive statistics highlight the interaction between working and caring activities during an emergency situation, but a richer model is needed to explain the behaviour of caregivers. We argued that the Covid pandemic could have forced people to stop working, or in fact, that it could have forced people to work even if they did not want to. It should be noted that many patterns of participation to the labour market emerged during the pandemic: for example, some people stopped working temporarily,

[18] In order to provide references for this type of activities a detailed time-use survey would be necessary. While this is not available for all European countries a discussion on this point is provided in OECD 2023.

[19] Among those individuals providing help and working (6.51%), a non-negligible percentage (27.14%) are working full time. Within this set of full-time time workers, 57% are women, suggesting the important role of women in providing help, even when working full time.

Table 6 Distribution of working status and sex (for the subsample providing help or care)

working	Sex		
	Men	Women	Total
A) if providing help			
No	2672	3934	6606
	40.45	59.55	100.00
Yes	1091	1669	2760
	39.53	60.47	100.00
Total	3763	5603	9366
	40.18	59.82	100.00
B) if providing personal care			
No	491	1188	1679
	29.24	70.76	100.00
Yes	213	500	713
	29.87	70.13	100.00
Total	704	1688	2392
	29.43	70.57	100.00

First row has *frequencies*; second row has *row percentages* and third row has *column percentages*

and then resumed their working activities, there were even cases of people who were still employed but at "zero hours", which guaranteed them a regular payment even when the firm had to shut down completely (Brugiavini et al. 2021, and Börsch Supan et al. 2023). Under these circumstances, a way to control for situations where the respondent stopped working or continued working because of an external determinant, i.e. independently of her contingent choices, is to resort to the nature of the job and the tasks performed, for example, "essential jobs" are jobs which did not experience a shutdown even in presence of lockdowns. For the definition of "essential job" we follow Brugiavini et al. (2021). These are typically jobs performed by medical doctors, nurses, but also people engaged in the provision of necessities like food. At the other extreme, non-essential jobs are those related to some leisure activities (such as people working in performing arts) or some shop-attendants. Results are reported in Table 7 and show that 2.17% of respondents in the sample had an essential job, among them 61.92% were women and the difference with men is statistically significant.

Finally, in our model, we will control for the partner's working status to see if, within the couple, some redistribution emerges in taking on responsibilities for caring activities. Table 8 reports the descriptive statistics for help given by individuals with a working partner: the prevalence of women is 30.64% in contrast to a prevalence of 25.24% for men. When looking at the provision of personal care, in a couple where the partner is working, 10.34% of women provide personal care compared to 5.66% of men (Table 9).

Hence, *prima facie* evidence suggests that women are more likely to provide help and care and that they are also more likely to undertake such activities even when working. However, our specification will have to take care of the fact that working

Table 7 Distribution by type of job and sex

Essential job	Sex		
	Men	Women	Total
No	17351	24090	41441
	98.02	97.69	97.83
	41.87	**58.13**	**100.00**
Yes	350	569	919
	1.98	2.31	2.17
	38.08	**61.92**	**100.00**
Total	17701	24659	42360
	100.00	100.00	100.00
	41.79	**58.21**	**100.00**

Bold values highlight the difference between frequences and row/column percentage

First row has *frequencies*; second row has *row percentages* and third row has *column percentages*

Table 8 Prevalence of "providing help" by sex (conditional on having the partner working)

Sex	Help given		
	No	Yes	Total
Men	2088	705	2793
	74.76	**25.24**	**100.00**
Women	1811	800	2611
	69.36	**30.64**	**100.00**
Total	3899	1505	5404
	72.15	**27.85**	**100.00**

Bold values highlight the difference between frequences and row/column percentage

First row has *frequencies*; second row has *row percentages*

Table 9 Prevalence of "providing care" by sex (conditional on having the partner working)

Sex	Personal care given		
	No	Yes	Total
Men	2635	158	2793
	94.34	**5.66**	**100.00**
Women	2341	270	2611
	89.66	**10.34**	**100.00**
Total	4976	428	5404
	92.08	**7.92**	**100.00**

Bold values highlight the difference between frequences and row/column percentage

First row has *frequencies*; second row has *row percentages*

decisions and caring decisions are not independent, requiring a more structured approach, which explicitly accounts for these interactions.

To recap: our model explains activities such as "giving help" or "providing care" as a function of a set of characteristics of the caregiver and of the environment in which help/care is provided. The S-Index measures the immediate "spot" effect of the constraints generated in terms of formal care provision by lockdown measures, which affect informal care provision, under the assumption that informal care and formal care are – to a large extent – substitutes.

4 Empirical strategy and results

We model two possible outcomes in binary form: in the first case we look at "providing help", while in the second case, we look at "providing care". Both are explained by the set of variables we have described, in particular by the severity of the policy responses (recorded at the level of the country and time period) and demographic characteristics such as: age, income level, number of individuals in the household and level of education.

$$\begin{aligned} Y_{it} = {} & \beta_1(Stringency\_index_{it}) + \mathbf{X}\,Demographics_{it} + \theta_1(Unemployed\ due\ to\ covid)_{it} \\ & + \theta_2 Log(Cumul(Covid\ deaths))_{it} + \theta_3 Log(Beds\ in\ LTC\ supply)_{it-1} \\ & + \theta_4 Lack\ of\ Care\ in\ the\ Area_{it} + \lambda_i + \delta WaveDummies_t + \varepsilon_{it} \end{aligned} \tag{1}$$

When Y_{it} represents "Providing help", it is a dummy variable taking value 1 if the respondent gave a positive answer to the question: "*Since the outbreak of Corona, did you help others outside your home to obtain necessities, e.g. food, medications or emergency household repairs?*". The second outcome "providing personal care", is described as a binary variable equal to 1 if the respondent replied yes to: *"Since the outbreak of Corona, did you provide personal care to others outside your home?"*. We restricted the sample to individuals providing "help/personal care" to parents, relatives, or friends, or to parents, relative-friends or children. Respondents who provide help/care only to children are dropped from the sample.

We argued that lockdown policies have a direct impact on caring activities because they act as a rationing mechanism for formal care: many professional caregivers were prevented from travelling and visiting other people's homes or local medical units and medical centers could not offer the type of services they could normally offer to older people. It is worth recalling that we use, in the alternative, two variables: (i) the S-index, varying at the individual level, depending on the time of the interview and location, and (ii) the degree of exposure to the lockdown and related measures, which we include in the regressions in log-scale.

Before discussing in detail the results from the measures of rationed supply we adopted, it should be mentioned that we could potentially capture both the new demand for care directly due to the pandemic (say older people catching the Covid-19 virus and needing extra care), and the demand for care that we measure due to the "spill over" from lack of formal care. In any case, we expect the demand for care not to be reduced during the pandemic (OECD, 2023). Since, as explained in Section 2,

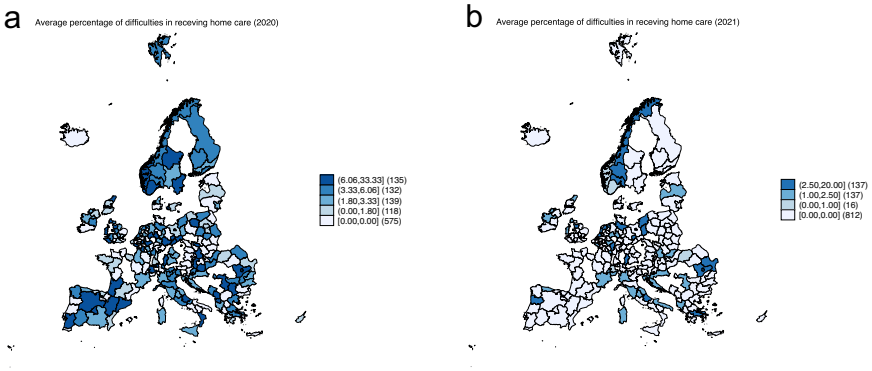

Fig. 4 Average percentage of respondents reporting difficulties in receiving home care in **a** 2020 and **b** 2021. NOTE: These maps show the percentage of individuals reporting to have experienced a lack of home care in 2020 (**a**) and 2021 (**b**). The percentage is computed as the number of individuals with difficulties in-home care over the total number of individuals receiving care, interviewed by the same interviewer and multiplied by 100. The geographical area is NUTS2

we have a proxy for the latter, i.e. the lack of care experienced by people who already received care before the pandemic, our estimates may in fact represent a lower bound to the response of the informal caregivers.

At this stage, it is worth presenting some details of the novel procedure adopted for the construction of the variable "lack of care" and the corresponding results. The variability of "lack of care" typically overlaps with the geographical administrative units at level NUTS2 (say regions), but for several countries it can be generated even at the NUTS3 geographical level, which is, to our knowledge, the most granular geographical level ever achieved in the SHARE-based studies[20].

The maps in Fig. 4a and b show the average percentage of individuals in the respective geographical area who reported a lack of home care to the interviewer. The percentage is computed starting from the ratio of the total number of individuals affected by the lack of professional care over the total number of individuals receiving care, interviewed by the same interviewer[21].

Figure 4a and b, show a decrease in the "lack of home care", which is in line with the different intensity of the pandemic: in 2020, the initial shock had caused significant disruption of health care services due to the outburst of COVID-19, and governments were under extreme pressure to manage the healthcare services. In 2021, after one year of pandemic, governments were able to limit or mitigate the diversion of personnel and services in the healthcare system. However, some areas

[20] In the Appendix, Table 14 reports the frequency of the matched observations by country and NUTS level, and Table 15 shows the percentage of interviewers working in multiple NUTS3 areas: more than 25% of the interviewers operated in several NUTS3 areas. Unfortunately, for some countries, the information can be derived at NUTS2 level only (Table 16). Figure 5 show the density of the respondents and the fraction of interviewers by NUTS2 geographical area: as expected, more populated areas have also higher number of interviewers, as 19% of interviewers acted in multiple zones.

[21] It should be noted that in generating the variable "lack of care" we never use cells where the number of observations is below 12. This is both for data protection reasons and in order to prevent any possible "reflection problem" generated by aggregating information that comes from the estimation sample.

show a high percentage of experiencing difficulties in home care service in both years, for example, North-Centre of Italy, the Netherlands, and Eastern Europe, thus, suggesting that the individuals were exposed to rationing also in the medium-term.

As for other characteristics of the respondent, we include education and a variable describing the labour market status which has three outcomes: working, retired or unemployed/out of the labour market. The former is specified through a dummy variable which takes value one for highly educated individuals (having attained a college degree or more). As for the latter we have to control for the potential endogeneity of the job status, hence, we instrument the variable "working" with two dummy variables: the eligibility for early retirement and the eligibility for statutory old-age retirement, following the institutional information about retirement ages for each country-year. The eligibility variables are therefore dummy variables that "switch on" for each individual when she/he satisfies the eligibility conditions given by the law. As we argued, the intuition is that some respondents may have decided to retire during the pandemic, precisely because they want to devote all their time to providing care. Since the eligibility conditions for retirement do not correlate with the individual's decision to provide help/care, but they have a good correlation with the "working" or "not working" decision, they represent a valid instrumental variable[22] (Angelini et al., 2009 and Banks et al., 2020). There is a third category for the labour market status "unemployed due to COVID-19/out of the labour force", which we consider as a residual category, because it is not under the control of the individual, but it is mostly due to the government's decisions and the employer's choice. We also want to be more informative about the characteristics of older individuals who work (or had to stop working) during the pandemic and we control for performing "essential" jobs. It should be stressed that the definition of "essential jobs" also embeds jobs that could be carried out remotely. Furthermore, we include also a variable indicating whether the partner was working or not, to control for the potential sharing of caring activities, or redistribution within the couple.

We propose different specifications of the two models, in particular, in order to control for unobserved heterogeneity we perform individual's Fixed-Effect (FE) estimations (as described by the term λ_i in Eq. (1)) and distinguish two separate samples for men and women respectively. Our estimations are presented through a set of tables based on the following methodologies: pooled OLS (POLS), random effect RE (GLS) along with FE-OLS specifications[23].

Table 10 shows that the effect of changes in the S-Index increases the likelihood of "providing help" in each of the estimated specifications. The effect is present both for women and for men, but in general the estimated coefficients is not statistically different between genders. A striking difference emerges instead for the variable "lack of care in the area" as women respond to changes in this variable with a significant increase in the probability of providing help of around 2%. Also, people

[22] We test the validity of the proposed instruments: the results of the test support our choice in terms of validity (F test > 10).

[23] Standard errors are clustered at the individual level. We also control for time fixed effects, represented by δ in Eq. (1). We repeat the same set of analyses via probit specification. Results are confirmed and reported in the Appendix from Table 18.

Table 10 Analysis for help provision controlling for the stringency index

Dep var: Help given	(1) POLS MEN	(2) POLS WOM	(3) RE MEN	(4) RE WOM	(5) FE MEN	(6) FE WOM
Stringency index	0.000890* (0.000538)	0.000796* (0.000457)	0.000936* (0.000522)	0.000825* (0.000439)	0.000999* (0.000550)	0.000878* (0.000462)
log(cumul deaths)	−0.000996 (0.00255)	−0.00258 (0.00217)	−0.000520 (0.00253)	−0.00255 (0.00216)	0.000316 (0.00255)	−0.00256 (0.00218)
Log(beds ltc)	0.00283 (0.00343)	−0.000176 (0.00278)	0.00350 (0.00343)	−0.000228 (0.00275)	0.00498 (0.00357)	−9.36e-06 (0.00286)
lack of care in the area	0.00451 (0.00877)	0.0200*** (0.00767)	0.00397 (0.00837)	0.0200*** (0.00715)	0.00123 (0.0110)	0.0197** (0.00904)
Age 66–75	−0.0907*** (0.0107)	−0.110*** (0.00883)	0.0816*** (0.0102)	−0.0977*** (0.00837)	0.0349* (0.0178)	0.0226 (0.0141)
Age 76–85	−0.156*** (0.0128)	−0.190*** (0.0103)	−0.142*** (0.0126)	−0.178*** (0.0101)	0.0463* (0.0254)	−0.00743 (0.0211)
Unemployed or other	−0.0156 (0.0153)	0.00495 (0.00987)	−0.00844 (0.0148)	0.0136 (0.00962)	−0.00353 (0.0241)	0.0345** (0.0168)
Working	0.0196 (0.0143)	0.0398*** (0.0145)	0.0194 (0.0141)	0.0353** (0.0142)	0.00709 (0.0237)	0.00906 (0.0239)
Essential job	0.0352 (0.0242)	0.0236 (0.0204)	0.0226 (0.0229)	0.023 (0.0191)	−0.0258 (0.0289)	0.00711 (0.0233)
Working spouse	0.000836 (0.0104)	0.0148 (0.0112)	0.00187 (0.0101)	0.0185* (0.0106)	−0.0217 (0.0191)	0.0118 (0.0180)
Low income	0.00684 (0.0118)	0.0251** (0.00980)	0.00838 (0.0118)	0.0266*** (0.00981)	−0.0129 (0.0745)	0.00905 (0.0590)
High income	−0.00359 (0.0141)	−0.00462 (0.0126)	−0.00414 (0.0141)	−0.00558 (0.0126)	−0.0773 (0.0870)	−0.0975 (0.0636)
Nhousehold	−0.00685* (0.00384)	−0.00914*** (0.00328)	−0.00579 (0.00384)	−0.00762** (0.00325)	0.00906 (0.0179)	0.00896 (0.0127)
High education	0.0290*** (0.00834)	0.0526*** (0.00794)	0.0296*** (0.00835)	0.0549*** (0.00795)		
Constant	0.248*** (0.0581)	0.303*** (0.0495)	0.222*** (0.0575)	0.288*** (0.0488)	0.151 (0.0950)	0.237*** (0.0728)
Observations	17,701	24,659	17,701	24,659	17,701	24,659
Number of individuals	8855	12,334	8855	12,334	8855	12,334

Time dummies apply. Country dummies apply in the POLS and RE analyses. Individual fixed effects are included in columns (5) and (6). The variable working is instrumented using eligibility to early and statutory retirement. We test the validity of the instruments, the F test is greater than 10, ($F = 18957.2$). Clustered standard errors are at the individual level. *P*-value: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

aged 50 to 65 are more likely to provide help, if compared to individuals aged above 65, and "highly educated" individuals are more likely to provide help.

An important dimension of the analysis is the relationship with the labour market: working individuals, are more likely to provide *help for necessities* than retirees, especially women. However, while women living with a working partner are more likely to provide help, the reverse is not true, as the helping activities of men do not depend on the working status of their partner. Similar findings are reported in a paper by Hupkau and Petrongolo (2020), which looks at childcare provision, and provides evidence of asymmetries in caring activities. Finally, no significant effect is found when the respondent is doing an essential job, which could be signaling a working arrangement of the respondent that does not allow for "working from home". Turning the attention to the role of income level, we find that having low income increases the probability of providing more help only for women. Overall, our specification suggests that a well-defined group of people takes on caring responsibilities and, even controlling for various explanatory variables, the response of women clearly emerges. By and large, these findings align with studies looking at the response of help provision during the first pandemic wave (Bergmann and Wagner, 2021) and of the supply of instrumental help (Bergmann et al., 2022), but we can be more specific about the role of lockdown policies, taking into account gender differences as well as the labour market status of the respondents.

Our initial descriptive evidence pointed to the existence of relevant gender differences in the provision of *personal care*. Indeed, the existence of an extra-burden on women has also been highlighted by the recent pandemic studies of time use, which found that women took on more caring activities (child care) and housing chores at home, if compared to men (Del Boca, 2020; Biroli et al. 2021, Farré et al. 2022) and at the same time reported a lower level of wellbeing (Giurge et al., 2021). In England, working mothers spent more time on paid and unpaid work than men (Andrews et al. 2022); in the US, working daughters reported high levels of stress due to their dual responsibilities of caring for their parents while working (Goldin, 2022).

This large body of evidence is confirmed by the SHARE data: in Table 11, we present estimates for the probability of providing *personal care*, which shows strong gender differences. Once again, the effect of the "rationing" due to the stringency index is captured in each specification (pooled-OLS, RE, and FE estimates), both for men and women. The role of "lack of care" is relevant for both men and women, but the estimated coefficient is significantly higher for women. Younger individuals in the age group 50 to 65 are more likely to provide care than individuals belonging to the other age categories, which is in line with the intensity of this caring activity, as we argued above.

In Table 11, the coefficient of the "working" variable is not statistically significant, and the same holds true for individuals who stopped working or were out of the labour force during the pandemic. Even the variable measuring the level of education does not seem to play a role. These findings suggest that, while individuals who work and are highly educated are more likely to help with necessities (like doing the shopping), the labour market status and the educational attainment become irrelevant when it comes to providing personal care, even if controlling for age[24].

[24] We repeat the same set of analyses clustering standard errors at the interviewer's level. The results are confirmed.

Table 11 Analysis for personal care provision controlling for the stringency index

	(1)	(2)	(3)	(4)	(5)	(6)
Dep var:Personal Care	POLS MEN	POLS WOM	RE MEN	RE WOM	FE MEN	FE WOM
Stringency index	0.000784** (0.000309)	0.000598* (0.000313)	0.000869*** (0.000305)	0.000637** (0.000307)	0.00125*** (0.000312)	0.000693** (0.000322)
log(cumul deaths)	0.00291** (0.00140)	0.00155 (0.00141)	0.00294** (0.00140)	0.00135 (0.00140)	0.00312** (0.00143)	0.000861 (0.00143)
Log(beds ltc)	−0.00254* (0.00138)	−0.00311* (0.00178)	−0.00296** (0.00139)	−0.00374** (0.00180)	−0.00473*** (0.00151)	−0.00480** (0.00190)
lack of care in the area	0.00906** (0.00437)	0.0197*** (0.00479)	0.00893** (0.00433)	0.0191*** (0.00458)	0.00787 (0.00615)	0.0161*** (0.00596)
Age 66–75	−0.0248*** (0.00484)	−0.0448*** (0.00537)	−0.0236*** (0.00476)	−0.0414*** (0.00516)	−0.00286 (0.00982)	0.00292 (0.00931)
Age 76–85	−0.0437*** (0.00569)	−0.0729*** (0.00618)	−0.0432*** (0.00566)	−0.0716*** (0.00607)	−0.0282** (0.0134)	−0.0306** (0.0128)
unemployed or other	−0.00357 (0.00723)	−0.00245 (0.00619)	−0.00235 (0.00723)	−0.000741 (0.00610)	0.00717 (0.0135)	0.00535 (0.0114)
Working	−0.00154 (0.00654)	0.0110 (0.00901)	−0.00122 (0.00652)	0.0101 (0.00887)	0.000369 (0.0125)	−0.00216 (0.0158)
Essential	0.00296 (0.0111)	0.0148 (0.0130)	0.00185 (0.0110)	0.00672 (0.0124)	−0.00734 (0.0170)	−0.0251 (0.0172)
working spouse	0.00569 (0.00541)	0.0104 (0.00732)	0.00574 (0.00536)	0.0129* (0.00730)	0.00338 (0.0112)	0.0275* (0.0151)
low income	0.00369 (0.00513)	0.00834 (0.00555)	0.00372 (0.00514)	0.00867 (0.00561)	−8.87e-05 (0.0376)	0.0506 (0.0467)
high income	−0.00318 (0.00586)	−0.00178 (0.00706)	−0.00332 (0.00587)	−0.00237 (0.00711)	−0.0211 (0.0398)	−0.0694 (0.0499)
Nhousehold	0.000436 (0.00187)	−0.00284 (0.00206)	0.000582 (0.00188)	−0.00251 (0.00206)	0.0127 (0.0107)	0.00963 (0.00955)
High education	−0.000459 (0.00354)	−0.00237 (0.00439)	−0.000429 (0.00355)	−0.00181 (0.00439)		
Constant	−0.000272 (0.0297)	0.0838*** (0.0315)	−0.00255 (0.0295)	0.0862*** (0.0313)	−0.0444 (0.0496)	0.0204 (0.0531)
Observations	17,701	24,659	17,701	24,659	17,701	24,659
Number of individuals	8855	12,334	8855	12,334	8855	12,334

Time dummies apply. Country dummies apply in the POLS and RE analyses. Individual fixed effects are included in columns (5) and (6). The variable working is instrumented using eligibility to early and statutory retirement. We test the validity of the instruments, the F test is greater than 10, ($F = 18957.2$). Clustered standard errors are at the individual level. *P*-value: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

Women who live with a working partner are more likely to provide personal care, according to the results of both the RE and FE specifications, while in the case of men, the working activity of the spouse does not affect the supply of care. Our interpretation is that providing personal care during the pandemic was a true "emergency situation" which prompted a marked response in terms of the supply of personal care by (younger) women[25].

5 Conclusion

This paper investigates the extent of unequal caring behavior by relying on the effect of the lockdown policies implemented during the pandemic. In fact, the Covid-19 shock provided a unique opportunity to measure the response of informal care provision for different types of individuals, when formal care was rationed, so that a spill-over effect took place across different types of caregivers.

We make use of the SHARE Corona sample, which allows us to observe several outcomes during the pandemic years (2020 and 2021 respectively), for individuals aged 50 and above in Europe. The richness of the information about health, socio-economic conditions, and provision of care is also combined with the information collected in previous waves of the SHARE data, which allows us to take into account the starting conditions for individuals going through the Corona-virus crisis.

The mechanism is as follows: the lockdown measures have generated rationing of the supply of formal care, the demand for care is not reduced, so, to the extent that formal and informal care exhibit a degree of substitutability, the demand for informal care increases. However, the responses by different individuals differ substantially, over and above the innate "preference" for providing care.

This model hinges on the measures of care provision provided in SHARE: "help for necessities", which involves relatively simple and ordinary tasks, and "providing *personal care*", which involves a more intense commitment and time use. Our approach is a first attempt to investigate the level of the "reserve of informal care" that older people can have access to, when the public/formal welfare provisions and care provisions are rationed.

The rationing mechanism is measured through three different dimensions. We construct a stringency index of the intensity and length of lockdown policies experienced by each sample respondent since the outbreak of the pandemic, varying at the individual level, in relation to the time of the interview and the geographical location. We also introduce a new variable estimated in the SHARE-Corona Survey based on the demand side, i.e. SHARE respondents normally receiving care, as to measure "lack of care" at the local level. In order to complete the set of controls we introduce a proxy for the availability of beds in

[25] Our estimates are robust to alternative specifications, we only present the results obtained when we explore alternative measures of the lockdown policies, based on a cumulative measure of the stringency index, to account for the yearly exposure of the individual to the lockdown policies. The results of this new measure (cumulative stringency indexes) are reported in Tables 12 and 13 for providing help and care, respectively: in general, results are consistent with the findings in the case of the "spot" S-Index, but often they turn out to be less significant.

Table 12 Analysis for help provision controlling for the cumulative stringency index

	(1)	(2)	(3)	(4)	(5)	(6)
Dep var: Help given	POLS MEN	POLS WOM	RE MEN	RE WOM	FE MEN	FE WOM
Log(cumul Index)	−0.0210 (0.0385)	0.00436 (0.0335)	−0.00395 (0.0375)	0.0213 (0.0324)	0.0197 (0.0429)	0.0390 (0.0368)
log(cumul deaths)	−0.00254 (0.00236)	−0.00405** (0.00200)	−0.00215 (0.00234)	−0.00406** (0.00199)	−0.00140 (0.00237)	−0.00414** (0.00201)
Log(beds ltc)	0.00464 (0.00334)	0.00103 (0.00270)	0.00531 (0.00334)	0.000931 (0.00269)	0.00674* (0.00346)	0.00113 (0.00278)
lack of care in the area	0.00510 (0.00876)	0.0207*** (0.00766)	0.00482 (0.00837)	0.0210*** (0.00714)	0.00279 (0.0110)	0.0213** (0.00902)
Age 66–75	−0.0908*** (0.0107)	−0.109*** (0.00883)	−0.0816*** (0.0102)	−0.0975*** (0.00836)	0.0348* (0.0179)	0.0224 (0.0141)
Age 76–85	−0.156*** (0.0128)	−0.190*** (0.0103)	−0.142*** (0.0126)	−0.178*** (0.0101)	0.0462* (0.0254)	−0.00812 (0.0211)
Unemployed or other	−0.0158 (0.0153)	0.00503 (0.00988)	−0.00873 (0.0148)	0.0136 (0.00962)	−0.00378 (0.0241)	0.0344** (0.0169)
Working	0.0197 (0.0143)	0.0400*** (0.0145)	0.0195 (0.0141)	0.0356** (0.0142)	0.00772 (0.0237)	0.00933 (0.0239)
Essential job	0.0347 (0.0242)	0.0228 (0.0204)	0.0218 (0.0229)	0.0218 (0.0191)	−0.0274 (0.0289)	0.00432 (0.0233)
Working spouse	0.000953 (0.0104)	0.0149 (0.0112)	0.00200 (0.0101)	0.0186* (0.0107)	−0.0212 (0.0191)	0.0124 (0.0180)
Low income	0.00674 (0.0118)	0.0251** (0.00981)	0.00825 (0.0118)	0.0264*** (0.00981)	−0.0110 (0.0749)	0.0126 (0.0586)
High income	−0.00370 (0.0141)	−0.00459 (0.0126)	−0.00422 (0.0141)	−0.00556 (0.0126)	−0.0776 (0.0865)	−0.0995 (0.0636)
Nhousehold	−0.00682* (0.00384)	−0.00916*** (0.00328)	−0.00577 (0.00384)	−0.00765** (0.00325)	0.00989 (0.0179)	0.00938 (0.0127)
High education	0.0290*** (0.00834)	0.0526*** (0.00794)	0.0295*** (0.00835)	0.0549*** (0.00795)		
Constant	0.510 (0.392)	0.305 (0.341)	0.313 (0.382)	0.120 (0.329)	0.00950 (0.443)	−0.108 (0.376)
Observations	17,701	24,659	17,701	24,659	17,701	24,659
Number of individuals	8855	12,334	8855	12,334	8855	12,334

NOTE: Time dummies apply. Country dummies apply in the POLS and RE analyses. Individual fixed effects are included in columns (5) and (6). The variable working is instrumented using eligibility to early and statutory retirement. We test the validity of the instruments, the F test is greater than 10, ($F = 18957.2$). Clustered standard errors are at the individual level. *P*-value: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

Table 13 Analysis for personal care provision controlling for the cumulative stringency index

Dep var:Personal Care	(1) POLS MEN	(2) POLS WOM	(3) RE MEN	(4) RE WOM	(5) FE MEN	(6) FE WOM
Log(cumul index)	−0.0129 (0.0175)	0.0152 (0.0200)	−0.00979 (0.0178)	0.0271 (0.0200)	0.00585 (0.0236)	0.0545** (0.0245)
log(cumul deaths)	0.00153 (0.00127)	0.000408 (0.00130)	0.00143 (0.00128)	0.000147 (0.00130)	0.00103 (0.00131)	−0.000427 (0.00132)
Log(beds ltc)	−0.00102 (0.00129)	−0.00235 (0.00171)	−0.00126 (0.00130)	−0.00301* (0.00173)	−0.00222 (0.00141)	−0.00426** (0.00183)
lack of care in the area	0.00960** (0.00436)	0.0203*** (0.00480)	0.00961** (0.00432)	0.0198*** (0.00459)	0.00972 (0.00613)	0.0176*** (0.00597)
Age 66–75	−0.0248*** (0.00484)	−0.0446*** (0.00537)	−0.0237*** (0.00476)	−0.0412*** (0.00516)	−0.00300 (0.00983)	0.00264 (0.00932)
Age 76–85	−0.0437*** (0.00568)	−0.0728*** (0.00618)	−0.0431*** (0.00566)	−0.0715*** (0.00607)	−0.0280** (0.0135)	−0.0314** (0.0128)
unemployed or other	−0.00375 (0.00724)	−0.00242 (0.00620)	−0.00258 (0.00723)	−0.000742 (0.00610)	0.00655 (0.0136)	0.00532 (0.0115)
Working	−0.00145 (0.00655)	0.0112 (0.00902)	−0.00113 (0.00654)	0.0103 (0.00888)	0.000719 (0.0126)	−0.00174 (0.0159)
Essential	0.00248 (0.0111)	0.0140 (0.0130)	0.00125 (0.0110)	0.00538 (0.0124)	−0.00883 (0.0170)	−0.0282 (0.0172)
working spouse	0.00576 (0.00540)	0.0104 (0.00732)	0.00582 (0.00536)	0.0129* (0.00730)	0.00394 (0.0112)	0.0279* (0.0151)
low income	0.00359 (0.00513)	0.00826 (0.00556)	0.00361 (0.00514)	0.00854 (0.00561)	0.00253 (0.0380)	0.0523 (0.0465)
high income	−0.00325 (0.00586)	−0.00173 (0.00707)	−0.00339 (0.00586)	−0.00232 (0.00712)	−0.0218 (0.0395)	−0.0702 (0.0496)
Nhousehold	0.000449 (0.00187)	−0.00285 (0.00206)	0.000590 (0.00188)	−0.00253 (0.00206)	0.0138 (0.0108)	0.00964 (0.00954)
high education	−0.000473 (0.00354)	−0.00243 (0.00439)	−0.000446 (0.00354)	−0.00189 (0.00439)		
Constant	0.174 (0.176)	−0.0348 (0.202)	0.145 (0.178)	−0.152 (0.201)	−0.0316 (0.239)	−0.490** (0.250)
Observations	17,701	24,659	17,701	24,659	17,701	24,659
Number of individuals	8855	12,334	8855	12,334	8855	12,334

Time dummies apply. Country dummies apply in the POLS and RE analyses. Individual fixed effects are included in columns (5) and (6). The variable working is instrumented using eligibility to early and statutory retirement. We test the validity of the instruments, the F test is greater than 10, (F = 18957.2). Clustered standard errors are at the individual level. *P*-value: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

long-term care facilities at the beginning of the pandemic, also at the local level. In dealing with caregiving related to the working status of the individuals, we control for the potential endogeneity of the decision to work and/or provide care by making use of eligibility conditions for retirement, varying across countries and over time.

We find that stricter lockdown policies are associated to a higher probability of help or care provided by the SHARE respondents. Women and younger-old people are more likely to provide help/care, so the typical caregiver is a low-income woman aged 50 to 65, with a working partner. An important difference emerges in terms of labour market conditions: while individuals providing help with necessities tend to be also workers, when it comes to providing personal care the labour market status is irrelevant, suggesting that providing informal care is totally dominated by the nature of the demand and the prevailing restrictions on the supply.

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Author contributions A.B. and E.B. conceived of the presented idea. E.B. prepared the data and performed the computations. E.B. and A.B. verified the analytical methods. E.B. and A.B. wrote the main manuscript text. All authors discussed the results and contributed to the final manuscript.

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Compliance with Ethical Standards

Conflict of interest The authors declare no competing interests.

6 Appendix

Figure 5 and Tables 14–19

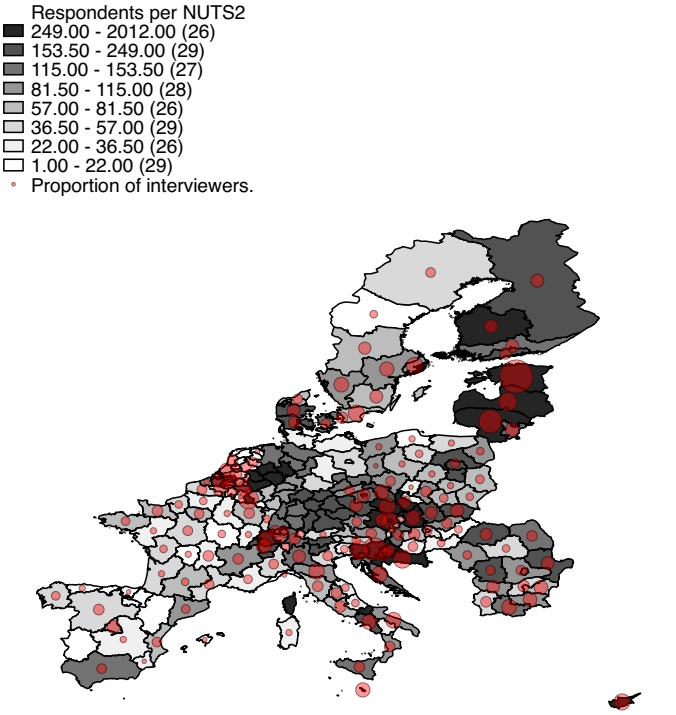

Fig. 5 Geographical representation of respondents and interviewers

Table 14 Frequency of matching sample observations to NUTS level

Country identifier	NUTS1	NUTS2	NUTS3
Austria	0.854	0.854	0.781
Germany	0.818	0	0
Sweden	0.738	0.738	0.658
Netherlands	0.598	0.493	0
Spain	0.666	0.666	0.567
Italy	0.734	0.734	0
France	0.619	0.619	0
Denmark	0.697	0.695	0.499
Greece	0.92	0.92	0
Switzerland	0.718	0.718	0
Belgium	0.781	0.723	0
Israel	0.182	0	0
Czech Republic	0.81	0.81	0.81
Poland	0.819	0.819	0.633
Luxembourg	0.884	0.795	0.795
Hungary	0.953	0.947	0.819
Portugal	0.956	0.956	0.405
Slovenia	0.934	0.934	0.934
Estonia	0.838	0.838	0.838
Croatia	0.951	0.951	0.951
Lithuania	0.886	0.886	0.886
Bulgaria	0.952	0.952	0.828
Cyprus	0.903	0.903	0.903
Finland	0.891	0.891	0.891
Latvia	0.926	0.926	0.926
Malta	0.877	0.877	0.877
Romania	0.931	0.931	0.783
Slovakia	0.969	0.969	0.969

NUTS0 are always available

Table 15 Tabulation of the number of NUTS3 visited by interviewer

NUTS3	Frequency	Percent	Cum.
1	686	73.68	73.68
2	177	19.01	92.70
3	47	5.05	97.74
4	14	1.50	99.25
5	6	0.64	99.89
6	1	0.11	100.00
Total	931	100.00	

This table shows the number of NUTS3 visited by interviewer

More than 25% of interviewers visited more than one NUTS3

Table 16 Tabulation of the number of NUTS2 visited by interviewer

NUTS2	Frequency	Percent	Cum.
1	1275	81.57	81.57
2	240	15.36	96.93
3	45	2.88	99.81
4	3	0.19	100.00
Total	100.00	100.00	

This table shows the number of NUTS2 visited by interviewer

More than 18% of interviewers visited more than one NUTS2

Table 17 Auxiliary Regression Analysis for the number of beds in nursing and residential care per hundred thousand inhabitants facilities in years 2019 and 2020

VARIABLES	(1) Beds_LTC_NUTS2
Population 85+	−0.000207*** (5.68e-05)
Beds hospital	0.0589*** (0.0218)
Doctors	0.0121 (0.0459)
Beds_LTC_NUTS0	0.515*** (0.0143)
Constant	90.26*** (10.93)
Observations	627
R-squared	0.469

The relative number of LTC beds at NUTS2 level is regressed on the population 85+, the relative number of beds in hospitals and doctors, and the relative number of LTC beds at NUTS0 level. These data are drawn from Eurostat (2022). We cluster the standard errors at NUTS2 level

P-value: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 18 Probit analysis of help given and personal care

Dependent Variable	Help Given		Personal care given	
	MEN	WOMEN		MEN
Stringency index	0.00326 (0.00209)	0.00255 (0.00175)	0.00305 (0.00327)	0.000461 (0.00233)
Log(cumul deaths)	0.00714 (0.0105)	−0.00197 (0.00877)	0.0105 (0.0176)	−0.00166 (0.0125)
Log(beds ltc)	−0.00103 (0.0121)	−0.00817 (0.0106)	−0.0244 (0.0215)	−0.0298** (0.0143)
Lack of care in the area	0.0200 (0.0320)	0.0736*** (0.0266)	0.121** (0.0520)	0.152*** (0.0365)
Age 66–75	−0.307*** (0.0339)	−0.364*** (0.0271)	−0.287*** (0.0569)	−0.341*** (0.0377)
Age 76–85	−0.581*** (0.0462)	−0.716*** (0.0383)	−0.607*** (0.0829)	−0.651*** (0.0560)
Unemployed or other	−0.0330 (0.0509)	0.0337 (0.0324)	−0.0399 (0.0820)	−0.00686 (0.0440)
working	0.0784* (0.0472)	0.137*** (0.0430)	−0.0371 (0.0798)	0.0725 (0.0587)
essential	0.151* (0.0787)	0.108* (0.0616)	0.118 (0.132)	0.168** (0.0827)
Working spouse	0.00612 (0.0319)	0.0447 (0.0314)	0.0533 (0.0501)	0.0546 (0.0415)
High education	0.100*** (0.0255)	0.174*** (0.0223)	0.000581 (0.0442)	−0.0206 (0.0322)
nhousehold	−0.0265** (0.0129)	−0.0354*** (0.0106)	0.00144 (0.0202)	−0.0252* (0.0143)
Observations	17,701	24,659	17,701	24,659

The model is estimated using a probit model, marginal effects are displayed. Time and country dummies apply. The variable working is instrumented using eligibility to early and statutory retirement. We test the validity of the instruments, the F test is greater than 10, ($F = 18957.2$). Clustered standard errors are at the individual level

P-value: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

Table 19 Probit analysis of help given and personal care

Dependent Variable	Help Given		Personal care given	
	MEN	WOMEN		MEN
Log(cumul Index)	−0.00781 (0.167)	0.0644 (0.139)	−0.0985 (0.299)	0.0992 (0.201)
Log(cumul deaths)	0.00178 (0.00993)	−0.00655 (0.00826)	0.00519 (0.0167)	−0.00250 (0.0117)
Log(beds ltc)	0.00538 (0.0118)	−0.00470 (0.0104)	−0.0174 (0.0213)	−0.0305** (0.0141)
Lack of care in the area	0.0226 (0.0319)	0.0759*** (0.0265)	0.122** (0.0520)	0.153*** (0.0365)
Age 66–75	−0.307*** (0.0338)	−0.363*** (0.0271)	−0.288*** (0.0569)	−0.340*** (0.0376)
Age 76–85	−0.580*** (0.0461)	−0.716*** (0.0383)	−0.607*** (0.0829)	−0.651*** (0.0560)
Unemployed or other	−0.0337 (0.0509)	0.0338 (0.0324)	−0.0421 (0.0820)	−0.00688 (0.0440)
working	0.0786* (0.0472)	0.138*** (0.0430)	−0.0373 (0.0798)	0.0729 (0.0587)
essential	0.149* (0.0787)	0.104* (0.0616)	0.117 (0.132)	0.165** (0.0828)
workingspouse	0.00626 (0.0319)	0.0447 (0.0314)	0.0536 (0.0501)	0.0542 (0.0415)
High education	0.100*** (0.0255)	0.174*** (0.0223)	0.000197 (0.0442)	−0.0205 (0.0322)
nhousehold	−0.0266** (0.0129)	−0.0355*** (0.0106)	0.00137 (0.0202)	−0.0252* (0.0143)
Observations	17,701	24,659	17,701	24,659

The model is estimated using a probit model, marginal effects are displayed. Time and country dummies apply. The variable working is instrumented using eligibility to early and statutory retirement. We test the validity of the instruments, the F test is greater than 10, ($F = 18957.2$). Clustered standard errors are at the individual level

P-value: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

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