Why are the older informal carers those of better health? Solving a causality problem

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STILL PRELIMINARY, PLEASE DO NOT QUOTE OR CITE

Abstract

Informal care is a widespread and important segment of long-term care, which is carried out independently or in parallel with formal care, i.e. as a complement or replacement. That informal carers represent the backbone of long-term care is witnessed by numerous international studies and it is crucial to know to what extent informal care is currently being implemented, who are the ones that provide informal care under which conditions and for whom. In our article we focus on the relationship between health status of the respondent and decision and intensity of provided informal help to others. Interestingly, the correlation of (good) health and informal caregiving is negative, particularly for help provided within household. We explain this relationship by examining the endogenous (reverse causal) relationship between the variables, using different measures of health and instrumental variables from Wave 5 and Wave 3 of SHARE Survey, and determine the causal effects of health on informal care, provided within and/or outside household. We also model the effect of various different covariates (e.g. welfare regime, social and material deprivation, cognitive abilities) on informal caregiving. In conclusion we provide an examination of research and policy relevance of the study.

1. Introduction[1]

Causal relationship between informal caregiving and (poor) health has been established in several studies (e.g. Schulz and Sherwood, 2008; Schulz and Beach, 1999; Pinquart and

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Sörensen, 2003; Roth et al., 2009; Vitaliano, Zhang and Scanlon, 2003). Yet, what still remained under-researched is the effect of health on informal caregiving. As we will present in the article, the results of basic correlations using SHARE data often confirm the adverse sign of the relationship: particulary for caregivers within household, the ones with worse health tend to help more often. The question that was the motivation of this article therefore, was what is driving this relationship.

Long term care is considered an emerging key issue in discussing the social inclusion or exclusion of the older population in modern European society (e.g. Theobald, 2005; Motel-Klingebiel, Tesch-Roemer and von Kondratowitz, 2005). Cross-national econometric studies of the relationship between formal and informal care for older adults in western European countries have become a booming field (Suanet et al., 2012). There is a lot of literature (primary and meta-analysis) on impacts of informal caregiving on caregivers health (e.g. Roth et al., 2015; Hiel et al., 2015; Vlachantoni, 2013; Schulz and Sherwood, 2008; Pinquart and Sorensen, 2003; 2006; 2007). Interdisciplinary research has provided different research designs, sampling procedures, statistical methods of heterogenous nature. Health has been studied as psychological health and physical health (separately or simultaneously). Meta analyses and other systematic reviews typically conclude that caregivers are more likely to experience depressive symptoms and have poorer physical health outcomes when compared with various samples of noncaregivers (Pinquart and Sörensen, 2003; Schulz and Sherwood, 2008; Vitaliano, Zhang and Scanlon, 2003). Recent review (Bauer and Sousa-Poza, 2015) pointed out that caregiving tends to lower the quality of the caregiver's psyhological health, which also has a negative impact on physical health outcomes. Some studies (Schoenmakers, 2015; Bauer and Sousa Poza, 2015) noted that: a) literature reviewed is very heterogenous – minimally comparable; b) most studies are cross-sectional and thus do not / cannot account for endogeneity; c) research often omits important controls (e.g. preexisting illness).

Based on the above, in our article we will test three main hypotheses:

H1: Older people in better health tend to provide more help to others.

H2: Relationship between informal caregiving and health is of endogenous, reverse causal nature.

H3: There are significant differences in the relationship of health and informal caregiving between helpgiving within and outside household.

The main method to be used to verify the above hypotheses will be instrumental variables probit which we will complement with treatment effect models with endogenous treatment.

The article is structured in the following way. In the next section, we will present basic considerations over data and method used. In the third section, we will present the main results and robustness tests. In the final section, we will conclude with a reflection of the research findings and policy implications.

2. Data

We use dataset derived from Wave 5 of the SHARE survey. The Survey of Health, Ageing and Retirement in Europe (SHARE) is a multidisciplinary and cross-national panel database of micro data on health, socio-economic status and social and family networks of approximately 123,000 individuals (more than 293,000 interviews) from 20 European countries (+Israel) aged 50 or older. SHARE is centrally coordinated by the Munich Center for the Economics of Aging (MEA), Max Planck Institute for Social Law and Social Policy. It is harmonized with the U.S. Health and Retirement Study (HRS) and the English Longitudinal Study of Ageing (ELSA) and has become a role model for several ageing surveys worldwide. In the analysis, we also use data from Wave 3, so-called SHARELIFE, which provided data on life-histories of the respondents.

When including instruments from SHARE Wave 3, our final sample consisted of 14,564 respondents from 11 countries (Austria, Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Switzerland, Belgium, Czech Republic).

We include three main helpgiving variables:

Helpgiving_out: SP002_HelpFrom – Thinking about the last twelve months has any family member from outside the household, any friend or neighbour given you [or/or/or/or][your/your/your/your][husband/wife/partner/partner] personal care or practical household help?

Helpgiving_wtin: SP020_RecHelpPersCareInHH – And is there someone living in this household who has helped you regularly during the last twelve months with personal care, such as washing, getting out of bed, or dressing?

Helpgiving_tot: joined variable of Helpgiving_out and Helpgiving_wtin.

Figure 1 presents the distribution of the three variables over the countries and welfare regimes. We can see that the countries with the highest percentage of total helpgiving and helpgiving outside household are the Social Democratic / Scandinavian countries. They are followed by continental countries and some Eastern European ones, while, in particular, Mediterranean countries and Israel fall quite behind. Interestingly, those are the countries that, on the other hand, have the largest percentages of helpgiving within household.

Figure 1: Distribution of the helpgiving variables
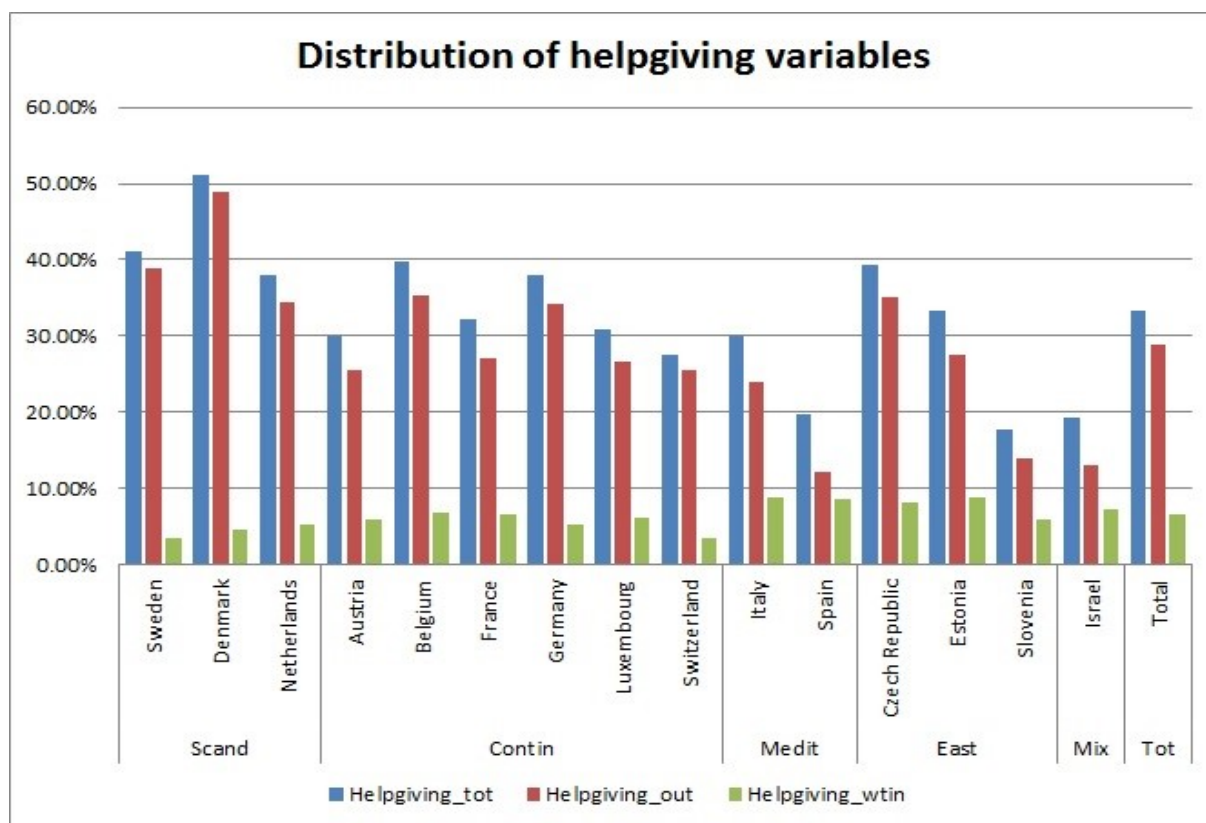
Source: Own calculations.

Table 1 provides the actual quantities of people in the population, providing help. Most of the relationships, observed in Figure 1, can be seen here as well, in particular large number of people providing help within household in Mediterranean countries.

Table 1: Estimation of total people providing helpgiving, Deville-Särndal's procedure

	country	Helpgiving_tot	Helpgiving_out	Helpgiving_wtin
Scand	Sweden	1,527,567	1,460,927	113,159
	Denmark	1,048,569	1,005,553	92,927
	Netherlands	2,376,857	2,163,370	315,709
Contin	Austria	953,164	833,773	177,566
	Belgium	1,637,570	1,426,540	331,931
	France	8,371,773	7,252,966	1,507,020
	Germany	12,648,003	11,455,470	1,745,328
	Luxembourg	52,710	45,376	10,395
	Switzerland	839,445	790,900	90,097
Medit	Italy	7,153,458	6,053,197	1,691,223
	Spain	3,572,164	2,512,323	1,268,977
East	Czech Republic	1,483,696	1,341,115	298,467
	Estonia	172,302	150,356	36,329
	Slovenia	131,627	106,774	39,095
Mix	Israel	306,143	198,250	119,050
Tot	Total	42,275,048	36,796,889	7,837,273

Source: Own calculations.

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Main health variables we use in the analysis are:

- Physical health: number of chronic diseases (dummy: 1 if a respondent has two or more chronic diseases; and 0 otherwise)
- Mental health: depression (dummy: 1 if a respondent has a score of 4 or more on the Euro-D Depression scale; and 0 otherwise);
- Subjective assesment of health: self-rated health status (dummy: 1 if less than very good; and 0 otherwise)

As control variables we use:

- Gender (0-male; 1-female);
- Age (nominal);
- Education (years);
- Income (nominal, winsorised);
- Settlement (dummy: 1 if urban; 0 if rural);
- Household size (nominal);
- Welfare regimes, 4 types: 1 – continental (Austria, Germany, Netherlands, France, Switzerland, Belgium, Luxembourg); 2 – social democratic (Sweden, Denmark); 3 – Mediterranean (Spain, Italy); 4 – eastern European (Czech Republic, Slovenia, Estonia).

We also use the following auxiliary variable:

- Receiving help: 1 if receiving informal care within household; 0 otherwise.

As instruments we use the following variables, all from Wave 3 of SHARE – SHARELIFE:

- As instrument for the number of chronic diseases: sl_hs006: „childhood health: in hospital for 1 month+";
- As instrument for mental health (depression): sl_hs009d3: „childhood illness 2: emotional, nervous, or psychiatric problem";
- As instrument for self-rated health: sl_hs003_: childhood health status.

All instruments satisfy the two instrumental variable restrictions, the second and the third are also very strong.

Instrumental variable (IV) estimation faces three perils of its own (Murray, 2006):

- IV estimation is inconsistent if the instruments are correlated with the disturbance term. This is the problem of "bad" or "invalid" instruments.
- IV estimation suffers persistent biases and size-of-test biases in even very large samples if the instruments used are only weakly correlated with explanatory variables responsible for bias in an OLS estimation. This is the problem of "weak" instruments.
- Interpreting the economic meaning of IV estimates can become problematic if the slope coefficients in one's model are heterogeneous across observations. This is the problem of "ugly" instruments.

In our case, we face the problem of "ugly" instruments (this was confirmed by the initial modellings we do not present here) and to derive the proper results we have to model helpgiving within and outside household separately to appropriately model the heterogeneity in the model.

Figure 2 provides the basic picture we want to explore. It provides the distribution of health variables for those that provide help in total, outside and within household. We can clearly see that for all three health variables, the providers of help in total and outside household face lower problems with health, while those within face even higher health problems. This is a puzzle we will solve and provide explanation in our analysis.

Figure 2: Distribution of the main variables based on helpgiving within and outside household and total helpgiving
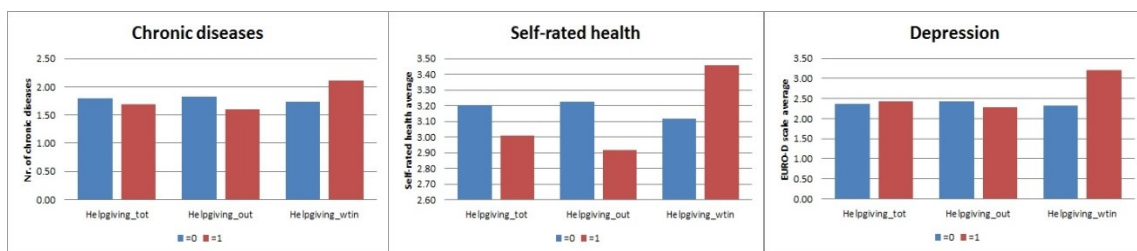
Source: Own calculations.

3. Results and robustness checks

Table 2 shows the results when using the "ordinary" econometric models with no endogeneity provided for (all models all of probit variety). Interestingly and surprisingly, it is apparent that more health problems (i.e. more chronic diseases, worse self-rated health and more depression symptoms) lead to more help provision.

Table 2: Results of the models with no endogeneity provided for

Probit: *Help_outside*	Coeff.	z	P>z	Coeff.	z	P>z	Coeff.	z	P>z
Gender	0.0095	0.84		0.0104	0.91		-0.0016	-0.14	
Age	-0.0239	-28.51	***	-0.0234	-28.12	***	-0.0233	-27.80	***
Edu_Years	0.0190	13.59	***	0.0190	13.61	***	0.0191	13.63	***
Income_Middle	0.0371	2.67	***	0.0373	2.69	***	0.0392	2.81	***
Income_Upper	0.1028	7.19	***	0.1026	7.16	***	0.1077	7.48	***
Retired vs. Employed	0.0789	4.76	***	0.0818	4.94	***	0.0789	4.75	***
Other vs. Employed	-0.0225	-1.20		-0.0162	-0.87		-0.0260	-1.38	
Hh_Size	-0.0514	-8.12	***	-0.0513	-8.11	***	-0.0510	-8.02	***
Physical_Inactivity	-0.3691	-16.73	***	-0.3638	-16.52	***	-0.3883	-17.27	***
Memory	0.0377	13.23	***	0.0369	12.91	***	0.0384	13.33	***
Continental	0.1064	7.68	***	0.1045	7.51	***	0.1037	7.43	***
Socialdemocratic	0.4534	25.15	***	0.4553	24.65	***	0.4624	25.46	***
Mediterranean	-0.1866	-9.79	***	-0.1893	-9.93	***	-0.1897	-9.90	***
Chronic diseases	0.0404	3.50	***						
Self-rated Health				0.0077	0.60				
Depression							0.1052	7.93	***
Constant	0.5855	8.89	***	0.5676	8.53	***	0.5541	8.35	***
Observations	62257			62330			61547		
LR Chi2	5073.81	***		5032.93	***		5001.36	***	
Pseudo R2	0.0673			0.0667			0.0670		
Log Likelihood	-35168.70			-35221.55			-34847.12		

Source: Own calculations.

What is driving these results? This was the main leading question of the article. An apparent possibility is consideration of the reverse causality in the model. The supposed and basic causality structure is presented in Figure 3, where health influences informal caregiving. Yet, as we noted at the start when shortly reviewing the evidence from the literature, also the informal caregiving can have (adverse) effects on health indicators.

**Figure 3: Main supposed causality structure**
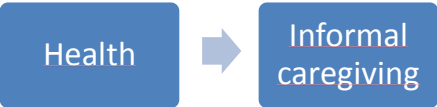
Source: Own elaboration.

To properly provide for this observation, we include instrumental variables for each of the three health variables. We instrument for number of chronic diseases by childhood health (whether the respondent was in a hospital for 1 month or more during his/her childhood); for mental health by having an emotional, nervous, or psychiatric problem in the childhood; and for self-rated health by childhood health status.

Furthermore, as is shown in the right side of Figure 4, we also need an additional intervention in the case of caregiving within household. We need to include an additional, auxiliary variable for "receiving care" within household, as we could assume that care within household would be mutual and also that health condition of the same household inhabitants would be connected between each other. The whole and final causality structures are show in Figure 4.

Figure 4: Modelling of reverse causality in the model
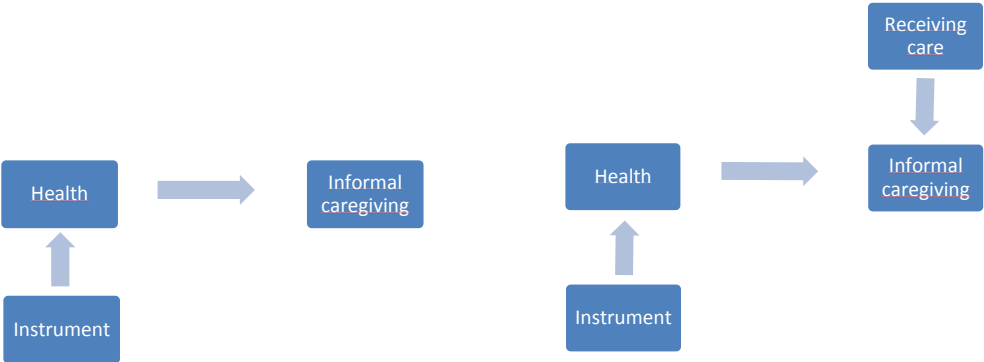
Source: Own elaboration.

As it turns out, all the models work very well when providing for endogeneity and causal problems in this manner. Firstly, in Table 3, we provide results for total helpgiving where it is apparent that with the inclusion of the instrument (the endogeneity tests confirm the presence of reverse causality in all cases) all coefficients on health variables are now of the expected, negative sign and significant.

Table 3: Results of models, endogeneity controlled for, total helpgiving

Help_total	Coeff.	z	P>z	Coeff.	z	P>z	Coeff.	z	P>z
Gender	0.0246	2.72	***	0.0183	2.11	**	0.0282	2.82	***
Age	-0.0071	-10.03	***	-0.0078	-12.34	***	-0.0079	-12.62	***
Edu_Years	0.0030	2.86	***	0.0028	2.64	***	0.0032	3.07	***
Income_Middle	0.0133	1.33		0.0108	1.09		0.0132	1.33	
Income_Upper	0.0161	1.45		0.0124	1.10		0.0174	1.57	
Retired vs. Employed	0.0258	1.69	*	0.0159	1.16		0.0068	0.52	
Other vs. Employed	0.0112	0.60		-0.0013	-0.08		-0.0088	-0.56	
Hh_Size	0.0026	0.48		0.0022	0.40		0.0021	0.37	
Physical_Inactivity	-0.0391	-2.30	**	-0.0504	-3.29	***	-0.0439	-2.62	***
Memory	0.0061	2.69	***	0.0060	2.60	***	0.0065	2.86	***
Continental	-0.0140	-0.77		-0.0042	-0.25		0.0037	0.22	
Socialdemocratic	0.0652	3.42	***	0.0512	2.40	**	0.0784	4.36	***
Mediterranean	-0.0669	-3.41	***	-0.0553	-3.00	***	-0.0471	-2.53	**
Chronic diseases	-0.1309	-2.49	**						
Self-rated Health				-0.0936	-2.46	**			
Depression							-0.0739	-1.97	**
Constant	0.7908	14.58	***	0.8617	14.07	***	0.7942	14.63	***
Observations	13232			13179			13149		
Wald Chi2	650.65	***		660.09	***		654.60	***	
Log Likelihood	-17116.06			-15074.79			-14999.20		
Test of endogeneity	7.04	***		4.87	**		8.52	***	

Source: Own calculations.

Also, in Table 4, we show results for helpgiving outside household. Here, the significance of the relationship becomes even stronger, confirming the problem of ugly instrument we have been discussing previously. All the other considerations from Table 3 are very much the same.

Table 4: Results of models, endogeneity controlled for, helpgiving outside household

Help_outside	Coeff.	z	P>z	Coeff.	z	P>z	Coeff.	z	P>z
Gender	0.0136	1.57		0.0055	0.66		0.0235	2.5	**
Age	-0.0083	-12.56	***	-0.0093	-15.51	***	-0.0095	-15.75	***
Edu_Years	0.0039	3.92	***	0.0038	3.81	***	0.0041	4.14	***
Income_Middle	0.0096	1.00		0.0070	0.74		0.0077	0.8	
Income_Upper	0.0163	1.53		0.0144	1.35		0.0165	1.55	
Retired vs. Employed	0.0333	2.34	**	0.0156	1.21		0.0086	0.68	
Other vs. Employed	0.0131	0.76		-0.0092	-0.59		-0.0103	-0.68	
Hh_Size	-0.0275	-5.19	***	-0.0277	-5.23	***	-0.0288	-5.39	***
Physical_Inactivity	-0.0488	-3.07	***	-0.0690	-4.78	***	-0.0465	-2.94	***
Memory	0.0086	3.97	***	0.0092	4.28	***	0.0082	3.77	***
Continental	-0.0139	-0.81		0.0033	0.21		0.0131	0.83	
Socialdemocratic	0.0780	4.31	***	0.0727	3.74	***	0.0965	5.6	***
Mediterranean	-0.0799	-4.30	***	-0.0624	-3.56	***	-0.0491	-2.75	***
Chronic diseases	-0.1749	-3.92	***						
Self-rated Health				-0.0839	-2.74	**			
Depression							-0.1404	-4.24	***
Constant	0.9109	17.49	***	0.9716	17.21	***	0.9227	17.71	***
Observations	13236			13183			13153		
Wald Chi2	1036.86	***		1062.89	***		1053.86	***	
Log Likelihood	-16505.67			-14463.15			-14398.63		
Test of endogeneity	14.92	***		5.08	**		18.90	***	

Source: Own calculations.

Finally, Table 5 presents the results for the modelling of helpgiving within household. Here, one would not observe the expected relationships even after the endogeneity is provided for by the instrumental variable correction. On the other hand, the final intervention, inclusion of the auxiliary variable of receiving care within household finally solves the issue and provided the (negative) sign and significance of all of the coefficients (except for depression, where the coefficient is not statistically significant) which is in accordance with the expectations.

Table 5: Results of models, endogeneity controlled for, helpgiving within household

Help_within	Coeff.	z	P>z	Coeff.	z	P>z	Coeff.	z	P>z
Gender	0.0297	2.63	***	0.0136	1.34		0.0281	2.76	***
Age	0.0018	2.36	**	0.0013	1.86	*	0.0019	2.91	***
Edu_Years	-0.0010	-0.74		-0.0014	-1.12		-0.0004	-0.33	
Income_Middle	0.0042	0.34		-0.0083	-0.73		0.0002	0.02	
Income_Upper	-0.0237	-1.65	*	-0.0407	-3.15	***	-0.0131	-1.09	
Retired vs. Employed	0.0682	3.56	***	0.0382	2.23	**	-0.0008	-0.05	
Other vs. Employed	0.0833	3.96	***	0.0509	2.70	***	0.0030	0.18	
Hh_Size	0.0182	3.01	***	0.0188	3.25	***	0.0273	4.19	***
Physical_Inactivity	0.0518	3.32	***	0.0389	2.77	***	0.0086	0.62	
Memory	-0.0055	-1.97	**	-0.0055	-2.21	**	-0.0011	-0.46	
Receiving_help	0.1061	7.36	***	0.0819	5.88	***	0.0902	5.87	***
Continental	-0.1043	-5.39	***	-0.0729	-4.20	***	-0.0532	-3.32	***
Socialdemocratic	-0.1090	-4.92	***	-0.1615	-8.06	***	-0.0792	-4.32	***
Mediterranean	-0.0548	-2.54	**	-0.0404	-2.09	**	-0.0260	-1.41	
Chronic diseases	-0.4332	-34.91	***						
Self-rated Health				-0.4326	-36.13	***			
Depression							0.0119	0.36	
Constant	0.2021	3.08	***	0.3982	6.60	***	-0.0962	-1.68	*
Observations	4656			4634			4615		
Wald Chi2	1318.33	***		1397.63	***		136.85	***	
Log Likelihood	-3592.05			-2002.05			-3583.52		
Test of endogeneity	299.29	***		525.46	***		0.38		

Source: Own calculations.

In Table 6, we also provide results of several robustness checks to verify our main findings. Firstly, we exclude the additional health variables (physical inactivity, memory) which influence the provision of helpgiving but could be related also to our three main health variables. The results do not change in any manner – indeed, the coefficient become even of stronger significance.

Secondly, we restrict the age of the respondents to 65+ (we have done also a check for the group of 80+ with no changes in results). Here, also there are no changes, furthermore, now even the coefficient on depression for the helpgiving within household becomes significant and of the expected sign.

Finally, we also include additional instrument to control for possible reverse causality between providing and receiving help within household. Although we do not provide results here, again, there were no changes in the main results.

Table 6: Results of robustness tests, top: Exclusion of additional health variables due to additional endogeneity problems; bottom: Restricting the age of the respondents: 65+

	Help_total		Help_outside		Help_within	
Chronic diseases	-0.1545	***	-0.1837	***	-0.5459	***
Self-rated Health	-0.1095	***	-0.1108	***	-0.5537	***
Depression	-0.0939	**	-0.1559	***	0.0130	

	Help_total		Help_outside		Help_within	
Chronic diseases	-0.1493	***	-0.1924	***	-0.6022	***
Self-rated Health	-0.1264	***	-0.0915	**	-0.5451	***
Depression	-0.0806	*	-0.1685	***	-0.0687	*

Source: Own calculations.

4. Conclusion

In conclusion, let's firstly summarize the findings by the set of initial three hypotheses.

H1: Older people in better health tend to provide more help to others.

The hypothesis is clearly confirmed. In all three cases we were able to confirm it and provide strong reasoning for the somewhat strange results that could be observed by basic descriptive statistics and basic econometric modellings not taking into account the specific causal relationships in the model. Indeed, the solution to this problem is the main contribution of the article and strong information for future research in this area.

H2: Relationship between informal caregiving and health is of endogenous, reverse causal nature.

We confirm the hypothesis on the basis of testing done in tables 3, 4 and 5.

H3: There are significant differences in the relationship of health and informal caregiving between helpgiving within and outside household.

We confirm the hypothesis, which was clearly demonstrated already by descriptives in Figure 2. Furthermore, we managed to provide econometric solution which was able to explain the difference and control for it when modelling for our main relationship between health and informal helpgiving.

There are some important pathways for future research. Firstly, improvements in the instrumental variable models we used could be done, using additional variables, including social and material deprivation, relationship to person receiving help, frequency of the help provided (some of this has been tried and the results are very robust).

We also confirmed that Wave 3 of SHARE is a rich and interesting source for the construction of instrumental variables, something confirmed by other existing literature in the field.

It would also be interesting to model more deeply which is the more important predictor of informal caregiving: physical, mental or self-rated health? According to our results, physical health performed the best, but this question still remains for future research.

We could also add a policy prescription: adopting measures to stimulate health of potential and actual caregivers would tend to raise the level of provided help significantly which was proven by our analysis. For future work, such measured would contribute to the welfare of caregivers and by this to a better system of (informal) long term care which is / should be the desire of all.

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