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Imprint

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Abstract

Macroeconomic downturns can have an important impact on the availability of informal and formal long-term care. This paper investigates how the market for informal care changed during and after the Great Recession in Europe. We use data from the Survey of Health, Aging and Retirement in Europe, which includes a rich set of variables covering waves before and after the Great Recession. We find evidence of an increase in the availability of informal care and a reduction in the use of formal health services (doctor visits and hospital stays) after the economic downturn when controlling for year and country fixed effects. This trend is mainly driven by changes in care provision of individuals not cohabiting with the care recipient. We also find a small negative association between old-age health and crisis severity. The results are robust to the inclusion of individual characteristics, individual-specific effects and region-specific time trends.

JEL Classifications: J1, I18

Keywords: long-term care, informal care, great recession, downturn, old age dependency

1   Introduction

Informal caregiving refers to unpaid care provided by family members, friends, and charities, to individuals in need of help with everyday tasks. Such care is still to date the most common source of long-term care (Arno et al., 1999; Karlsson et al., 2006; Grabowski et al., 2012). Slow-moving effects of aging and changes in social norms step by step modify the demand for long term care (including informal care); however, policy makers are often confronted with the question of how to influence the provision of informal care in the short term. This need raises the issue as to how the demand for and supply of informal care is determined. A sharp change in economic conditions can be useful to learn more about these determinants. In this paper, we will exploit the unemployment shock caused by the Great Recession to look at the relationship between informal care availability and macroeconomic fluctuations, and to explore potential mechanisms that can explain the demand for formal and informal LTC, such as changes in household incomes, care needs, and the opportunity cost of time of caregivers.

There is an extensive literature on the relationship between macroeconomic downturns and health outcomes and inputs. In general, the recent literature finds a counter-cyclical pattern of health – health improves when the economy deteriorates, and there is some evidence of increased use of medical care in good economic times.[1] For instance, an inverse relationship between total mortality and unemployment rates is found using data on US states (Ruhm, 2000), 16 German states (Neumayer, 2004), and 23 OECD countries (Gerdtham and Ruhm, 2006). Applying individual-level survey data from the US and using 5 different measures of health status, Ruhm (2003) finds that health tends to improve with increasing state unemployment rates. The relationship is strongest for the population of working age and for acute health conditions. In addition, Ruhm (2000, 2003) finds that health improvements occur even though the use of medical care (the number of routine check-ups, screening tests, doctor visits and hospital stays) declines in bad economic times.[2]

To our knowledge, there is little evidence on the relationship between macroeconomic fluctuations and various outcomes related to health and long-term care for older people. There are at least three reasons why this relationship is important and interesting to study. First, it is unlikely that the theoretical predictions and empirical results of the

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[1]See Ruhm (2012) for a further review of the literature. The observation that health is a counter-cyclical variable was contrary to conventional knowledge gained from early evidence using time series data, see Ruhm (2000) and references therein.

[2]The decreased use of medical care in the US might be a consequence of lower insurance coverage following a fall in economic activity. Cawley and Simon (2005) and Cawley et al. (2015) find that state unemployment rates are negatively related to insurance coverage. However, Ruhm (2003) argue that this is unlikely since the associations are just as strong for sub-samples less affected by fluctuations in insurance coverage, and the relationship is still intact after controlling for income.

previous studies apply equally to the older population. The empirical analyses focus on the working-age population and find stronger effects for acute health conditions than for chronic illnesses. The hypotheses for the observed countercyclical pattern of health include more time for health improving activities (exercise), less exposure to adverse health outcomes related to work (job-related stress, pollution, accidents), and less drinking and driving (Ruhm, 2000; Gerdtham and Ruhm, 2006). All these behavioral responses, and especially the two first, are less relevant for the older (non-working) population. There is some evidence of the relationship between macroeconomic conditions and health among older adults. Noelke and Beckfield (2014) find, using a sample of US adults aged 50 years and older, that mortality increases among those who experience a job loss. Likewise, the self-perceived health of a sample in the same age group from 9 European countries, seems to deteriorate in downturns (Bucher-Koenen and Mazzonna, 2013). Cutler et al. (2002) find that the mortality rate among older Mexicans increases in crisis years. Thus, these studies suggest that old-age health shows a pro-cyclical pattern. However, a study using Norwegian registry data (Haaland and Telle, 2015), shows that disability is pro-cyclical (i.e. an indication of health being counter-cyclical) for older adults in Norway. Long-term care is especially interesting since the market is dominated by informal (unpaid) care and public sector funds (Grabowski et al., 2012; Kotsadam, 2012; Colombo et al., 2011).

Second, the demand for and supply of long-term care (LTC) – health and social services provided to persons who, often related to age, have difficulty in maintaining daily life due to a disability – are determined by very different forces compared to those determining health care needs and utilization. In most societies, the LTC sector is dominated by informal care provided by (mostly) unpaid family members, friends, neighbors or other acquaintances. Besides, in most OECD countries, the bulk of the expenditure for formal LTC is public (Grabowski et al., 2012; Karlsson et al., 2007; Colombo et al., 2011) and the proportion of public spending is in general higher than for health care (Lipszyc et al., 2012).[3] Both public sector funds for LTC and health services, and informal care availability are expected to be affected by economic downturns. The growth of total and public expenditure for health and social services tends to slow down in recessionary periods (Keegan et al., 2013; Cylus et al., 2012).

A reduction in the growth of public spending may be particularly relevant for LTC, since an ageing population combined with falling birth rates and higher labor market participation of women (i.e. decreased supply of informal care) will increase the demand for formal LTC (Siciliani, 2013).[4] As noted in Bettio et al. (2012), recessions do not curb

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[3]Colombo et al. (2011) find in a sample of 25 OECD countries that the public share of LTC expenditure is 75 percent. Looking only at the 18 European countries in the sample, the public share is 88 percent, and disregarding Switzerland, which with a public share of 38 percent is in this respect an outlier, the share is above 90 percent. See figure 1.8, on page 46, and the corresponding data in Colombo et al. (2011).

[4]Siciliani (2013) and Colombo (2012) refer to projections by the European commission in which LTC

the ageing of the population, and therefore the demand for LTC will continue to increase. The question is then, whether informal caregiving will meet the increased demand for LTC in times when public funds are strained. The rate of unemployment is closely related to the supply of informal care, since the decision to provide informal care primarily depends on the opportunity cost of time (Grabowski et al., 2012). However, the relationship between this opportunity cost and the business cycle is far from straightforward. It might even be the case that the opportunity cost of time of the traditional caregivers increases during hard economic times. For example, caregiving responsibilities are high close to retirement (Kotsadam, 2011). A fall in household incomes caused by a recession might induce people to postpone retirement (Meschi et al., 2013), and also induce informal caregivers to seek employment outside the household due to potential employment loss of the breadwinner.[5]

The traditional way to think about recessions in economics is that they first and foremost increase leisure time (Bettio et al., 2012)[6]; however, this view is challenged by Aguiar et al. (2013) who analyze the American Time Use Survey and, after controlling for trends in leisure and household production, find that 30 percent of the time freed from reduced work hours in the recent recession are allocated to non-market production. According to Bettio et al. (2012), there is no comparable evidence of time use in recessions from Europe.

A third reason to devote particular attention to social care needs is that the LTC systems of European countries exhibit striking and interesting institutional differences, which make them a useful setting for a comparative case study. Whereas there is evidence of convergence in the European health care systems (Schmid et al., 2010), national LTC systems tend to exhibit a great degree of persistence and path-dependence (Karlsson et al., 2007, 2010). Thus, important differences persist in many of the dimensions that define a LTC system (Wittenberg et al., 2002) such as the role of the family in provision of care (Bolin et al., 2008b; Kotsadam, 2011), the balance between residential and home-based services, and the form of the public subsidy (Pommer et al., 2007). Since the last crisis appears to have had a heterogeneous impact even between countries with similar LTC institutions, a comparison between different European regions may tell us something about the robustness of their respective LTC systems to changing economic conditions. This exercise may thus be thought of as a stress test of the challenges ahead when population ageing reaches its full impact on LTC systems in a few decades' time.

The Great Recession is the worst global recession since World War II, and the impact

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expenditure will double in most European countries by 2060.

[5]This is likely to be more relevant in developing countries, see e.g. Cutler et al. (2002).

[6]The neo-classical perspective to understand The Great Depression and The Great Recession is to understand "why the marginal rate of substitution between consumption and leisure was so low relative to the marginal product of labor" (Ohanian, 2010).

of the recession was heterogeneous across European countries (EC, 2009). This resulted in significant variation in unemployment rates across European countries and over time, which allows us to estimate the relationship between recession severity and receipt and provision of informal care, while controlling for country-specific, time-specific and region-specific time trends. Our measure of recession severity is the increase in unemployment from output peak-to-trough. We use data from the Survey of Health, Aging and Retirement in Europe (SHARE), which includes a rich set of variables covering waves from before and after the Great Recession. Our main finding is that the proportion receiving and providing informal care increases when the economy deteriorates. The result is driven by increased supply of extra-residential informal care. For example, controlling for time trends, individual-specific effects and demographic characteristics, a one-percentage point increase in unemployment from peak-to-trough is associated with a 0.84 percentage point (4.6%) increase in the probability of receiving extra-residential informal care. Moreover, we find that trends in informal caregiving during the recession were very heterogeneous across LTC systems: the associations in the Northern and Southern regions correspond to an increase of about 22 and 2 percent, respectively – with the other groups of countries in between. We hypothesize that this can be because there are more intensive informal caregivers in the family-based system of elderly care of Southern Europe that take on the whole responsibility of dependent elderly, and that these are less affected by a weaker economy (i.e. changes in the opportunity cost of time).

Interestingly, we find a negative association between old-age health (measured by the number of problems with activities of daily living), formal care use (doctor visits and hospital stays), and recession severity. These effects are relatively small: an increase in unemployment by one percentage point is associated with 0.014 additional ADLs failing, or with a reduction in doctor visits by 3-4 per cent. Being aware of the bad controls problem (Angrist and Pischke, 2008), we include measures of care needs and economic well-being as control variables to assess whether the estimated associations are robust. The results are only slightly attenuated. To explore the role of opportunity cost of time, we estimate the probability of providing informal care separately for respondents who are unemployed and employed before the recession. Among the employed, who are most likely to experience a change in the opportunity cost of time, a one-percentage point increase in our crisis measure is associated with a 1.24-point increase in the probability of providing informal care, which roughly corresponds to 2.7 percent at the sample average. The corresponding association among unemployed is 0.73 percentage points (2.2%), albeit the association is not statistically significant. Therefore, it seems that the results are partly driven by changes in opportunity cost of time.

The structure of the paper is as follows. Next we discuss the underlying determinants of informal care receipt and provision. Then we discuss the empirical strategy. Section five

reports the results and a final section discusses the results and concludes.

2 Informal Care in Times of Crisis

A large-scale macroeconomic shock like the Great Recession is of course bound to have an impact also on the long-term care system in the affected countries. We will now seek to outline the various ways in which the economic crisis may have had an impact on the supply of and demand for formal and informal care. Our focus is on informal care, but since formal care is a close substitute for informal care, we also need to consider the determinants of formal care provision.

The most immediate ways in which the crisis may have an impact on **demand for informal care** is through a) physical care needs, b) the public provision of formal care, and c) household incomes. **Care needs** may be affected by the crisis either by an immediate drop in incomes – to the extent that incomes causally affect care needs – or through reductions in medical spending which may lead to a deterioration in health. It has also been postulated that the business cycle has an independent effect on health, but it is questionable if this applies to the elderly population. The **provision of formal care** is likely to be affected when public finances are squeezed, and, depending on the substitutability of formal and informal care, this will lead to an increased demand for informal care – even in the absence of an effect on physical care needs. Finally, when **household incomes** are affected by the crisis, the demand for informal (unpaid) care is likely to increase correspondingly as people turn away from formal care services.

There are also various ways in which the crisis may affect the **supply of informal care**, most importantly: a) **public support for informal carers**, and b) the **opportunity cost of care provision**. These two channels obviously operate in opposite directions: a reduced public support is likely to reduce supply, whereas the reduced opportunity cost is going to increase supply. The net effect thus remains an open issue.

Informal care can be provided by co-resident caregivers (e.g., children and spouses) or by non-co-residents (e.g., children, friends and neighbors). The latter is estimated to make 30% of the total informal care in Europe (Kalwij et al., 2014). However, **social networks** may also be affected by the crisis. This effect may be negative – for example if the stress associated with the crisis harms social networks qualitatively or quantitatively. On the other hand, the crisis might actually also further social networks, for example if there is less mobility induced by the labor market.

2.1 Demand-Side Factors

The most obvious factor determining demand for LTC is probably functional limitations and health in the older population (Altindag et al., 2012). In a series of seminal papers, Christopher Ruhm has analyzed the impact of macroeconomic conditions on health (Ruhm, 2000, 2003, 2004). A general finding in this literature is that health and survival exhibit a countercyclical behavior, which seems to be partly due to external factors (accidents etc.) and partly due to behaviors. Whether these findings also apply to long-term care remains an open issue, since they a) focus on the working-age population and b) find stronger effects for acute health conditions than for chronic illness.

A related literature considers economic conditions at the individual level and looks for credible sources of identification. There is an abundance of empirical work showing that **household incomes** and other measures of socioeconomic status – for example education or occupation – correlate with health at the individual level. These relationships are also visible for functional limitations and care needs at older ages in Europe (Majo and Van Soest, 2011) as well as North America: in the U.S., older people with two or more ADLs failing have annual incomes of more than $15,000 below those without functional limitations (Johnson et al., 2013). However, it is not generally accepted that the observed relationships are causal (Fischer et al., 2013). The few empirical studies which seek to estimate the causal effect of incomes on health suggests that the effect, if existent, is likely to be small. Using lottery wins to achieve exogenous variation in incomes, Apouey and Clark (2014) find modest positive effects on mental health and negative effects on health related behaviors. The overall effect appears to be very small. Adda et al. (2009) reach a very similar conclusion using a completely different identification strategy: the effects of a positive income shock seem to be small, but there is evidence of an increase in mortality and a slight increase in cigarette consumption. Schmitz (2011) analyses the relationship between unemployment and health and finds that the association appears to be driven by selection into unemployment and not by direct causation. Thus, it seems safe to conclude that an economic crisis is unlikely to have a large direct impact on the needs in the older population. The health of the elderly population is possibly more dependent on overall wealth, than on short-term fluctuations in income (Costa-Font, 2008).

Physical care needs may also be affected by **cuts in the public health and long-term care systems**. As mentioned above, such cuts may in fact contribute to two distinct mechanisms: even if there is no immediate impact of the cuts on physical care needs, the austerity measure may increase demand for informal care via substitution mechanisms. We now consider each of these channels in turn.

There is evidence that several governments of OECD countries cut down on health care expenditure during the crisis (Karanikolos et al., 2013). However, these cuts do not nec-

essarily have a direct impact on the quantity and quality of health care services available to citizens: in many cases, the cuts were made to salaries of health care personnel, or in the reference prices of pharmaceuticals. Both these measures are unlikely to have an immediate impact on the quality of the provision of health care. Conversely, changes to the scope of coverage of health care systems were rare. However, several countries introduced or increased user charges, which may have had an impact on utilization (Karanikolos et al., 2013).

Even in cases where austerity measures have affected the quality or the coverage of health care provision – such as in the Netherlands, where physiotherapy was removed from the benefits package (Mladovsky et al., 2012) – it remains to be established whether the cuts have had a relevant impact on long-term care needs. Again, there is an identification problem which makes it difficult to draw clear inference and there is no general agreement as to whether increases or reductions in coverage lead to discernible changes in population health (Moreno-Serra and Smith, 2012). Some American studies use the eligibility for Medicare, which leads to a sharp change in health care coverage at age 65, to estimate the effect in the older population. Card et al. (2007) reports that Medicare eligibility is associated with a significant reduction in patient mortality. The Oregon experiment, which randomly assigned health insurance coverage, has also been evaluated in various studies (Allen, 2015). Finkelstein et al. (2011) observe a positive effect on utilization and on self-reported health. The evidence for objective health measures is much more mixed: no effect was observed for detection of hypertension or indicators such as blood pressure and cholesterol, but there is some evidence that diabetes was better diagnosed and treated, and that mental health improved (Baicker et al., 2013).

Also for a given level of physical care needs, austerity measures in the formal care sector will influence demand for informal care to the extent that these are close substitutes. There is a large literature analyzing the substitutability between formal and informal care (Siciliani, 2013; Grabowski et al., 2012). Johansson et al. (2003) established that when the public provision of formal care is reduced, the provision of informal care tends to increase. However, a recent paper Karlsberg Schaffer (2015) finds that informal care increased by 6% after the introduction of a new regulation that subsidized long term care in Scotland. Instrumenting the availability of informal care, which is endogenous in the decision to utilize formal care, Bonsang (2009) finds that a 10 per cent reduction in the availability of informal care increases demand for formal care by 6.8 per cent. However, even if the substitutability between the two types of services may seem straightforward, it appears to vary strongly across context and between individuals. Bonsang (2009) finds that the two types of services are substitutes only for low levels of disability and for low-skilled but not high-skilled formal carers. Kim and Lim (2014) conclude that informal care is substituted for formal care on the intensive margin only: this finding

seems to highlight the importance of having access to an informal carer. Lee and Kim (2012) looks into substitutability for various specific chronic conditions and find strong heterogeneity, and Bolin et al. (2008a) find important differences between regions. In short, the substitution relationship is well established, but not all types of formal care can and will be substituted with informal care for all types of recipients.

The literature has focused on the effect of informal care on formal care (Van Houtven and Norton, 2004, 2008; Bolin et al., 2008a; Bonsang, 2009). In the US context (Van Houtven and Norton, 2004, 2008), persons in need of LTC are modelled to choose their use of formal care after considering the availability of informal care. To control for simultaneity bias they instrument informal care with family-level variables such as gender and number of children. The exclusion restriction is that the family-level variables only affects formal care through informal care. A similar theoretical and empirical framework has also been applied to the European context using SHARE survey data (Bolin et al., 2008a; Bonsang, 2009). It is questionable whether the US context is directly transferrable to the European context where LTC is predominately publicly funded and non-price rationed.

Finally, for a given level of need, the demand for informal care may be affected if the crisis triggers a **drop in incomes**. However, this potential channel is probably of limited importance. The pension systems of most OECD countries seem to have weathered the immediate impact of the crisis relatively well, and the economic downturn – with the associated negative investment returns – was more of a challenge to the long-term stability of the pension system. In the short term, pensioners seem not to have experienced a large setback in pension incomes. In some countries, pensioners even improved their position compared to the working-age population (DG for Employment, Social Affairs and Inclusion, 2012). Whenever there were cuts in pensions, they were typically complemented by means tested benefits designed to mitigate poverty amongst the old (OECD, 2013). In cases where older people did experience a reduction in incomes, it is likely to lead to a substitution of informal for formal care. However, the income elasticity of demand for formal care has been shown to be different in different countries (Bakx et al., 2014).

2.2   Supply-Side Factors

As mentioned above, also the supply side of informal care may be affected by a crisis. In particular, two mechanisms are important in this regard: worsening labor market prospects may reduce the opportunity costs of providing informal care, and a reduction in allowances for informal carers may reduce the incentive to provide such care. From an economic point of view, these two mechanisms have a similar interpretation as they both relate to the implicit cost of caring in some way. The decision to provide informal care is usually modelled within a simple labor-leisure model, in which the potential caregiver

takes into account the well-being of the individual in need of care either because of altruistic or bequest motives (Grabowski et al., 2012; Bolin et al., 2008b; Ettner, 1996). Informal care provision and labor supply will be determined simultaneously and depend on the opportunity cost of time (marginal value of consumption/work), the marginal utility of leisure and care supply.

A large literature has evolved which considers the connection between labor market outcomes and informal care provision (Grabowski et al., 2012; Houtven et al., 2013; Lilly et al., 2007). However, most contributions in this growing literature handle informal care provision as a 'treatment' variable which possibly has an impact on labor market outcomes, health and well-being. This perspective is quite different from one in which the economic determinants of care provision are considered. For instance, Heitmueller (2007) and Bolin et al. (2008b) use, amongst others, health of the receiver of informal care as an instrument for informal care, while controlling for the health of the caregiver. Fevang et al. (2012) question the validity of health of the receiver of care as an instrument, due to the strong intergenerational correlation in health and labor market performance. As noted by Kotsadam (2011) and Kotsadam (2012), much less is known outside the Anglo-Saxon countries and very few studies use comparable data from different European countries. The only studies we know of that look at the impact of labor market status on informal caregiving are Carmichael et al. (2010) and Stern (1995). They assume employment status prior to caring responsibilities is exogenous to the current decision to provide informal care. However, people may have fewer incentives to invest in a career if they know they are facing caring obligations in the future. Hence, past labor market outcomes might be endogenous to future care.

In a recent paper, Skira (2015) does consider the actual optimization problem faced by the potential caregiver. Using a structural model which allows for changes in parental health, human capital accumulation and job availability, the caring and labor market decisions are analyzed. The empirical analysis is based on the Health and Retirement Study and females between the ages of 42 and 70. Skira considers a range of policy experiments, such as introducing a paid leave for carers and a carer's allowance, which is independent of the labor market status of the recipient. She finds that financial incentives do matter: introducing paid leave boosts caregiving at all levels of dependence, but the caregiver's allowance have an even larger effect on informal care provision. In comparison with a scenario without financial incentives, the increase in supply ranges from 50 to 100 per cent.

2.3 Common Factors

Finally, the crisis may have an impact on the social networks of the potential care recipient – and thereby influence the demand and the supply side simultaneously. The proximity of adult children to their parents is related to the labor market in many ways. For example, it has been shown that the labor market attachment of females is positively influenced by the proximity of her mother or a mother-in-law (Compton and Pollak, 2014). Likewise, there is evidence suggesting that the adult child's choice of location is partly determined by considerations regarding future informal care: having more siblings on average increases the distance to the parents (Holmlund et al., 2013). Some economics papers thus model the proximity between parents and their children as a game of reciprocity, where the location is determined by several factors which change the incentives to involve in a reciprocity game. Johar et al. (2014) show that parental assets and their care needs are important determinants of co-residence. However, it is unclear how a changing labor market affects the incentives to live close to or far away from parents. On the one hand, the crisis could lead to an increase in co-residence for economic reasons. On the other hand, a daunting local labor market may spur migration and thereby increase the distance between parents and children. It thus remains an open issue whether the crisis changes the availability of informal carers.

2.4 Conclusion

We have considered a wide range of mechanisms over which the macroeconomic situation might influence the size of the informal care sector. Amongst the demand-side factors, we considered a direct impact of the crisis on physical care needs, and an indirect impact mediated by cuts in the health care system. Further demand-side factors include substitution away from formal LTC, due to cuts in the public support system, and a reduction in incomes. Our conclusion concerning demand-side factors is that the crisis is unlikely to have had a large direct effect on care needs, but that there might be some effects arising from reduced access to health care. However, a fairly long exposure would probably be required for this channel to have any significant importance. On the other hand, there is reason to believe that cuts in the formal LTC system may have triggered an increased demand for informal care due to substitution. The substitutability between formal and informal care is well-documented in the literature, even though the elasticity appears to vary between different groups.

As regards supply-side factors, we considered two mechanisms which both affect the opportunity cost of caring: cash transfers to informal carers, and the wage rate earned on the labor market by potential carers. Both of these may be affected in various ways

by the crisis, and they are likely to matter quite a lot for the supply of informal care.

Finally, we considered social networks as an additional factor which affects demand for and supply of informal care simultaneously. For this variable, there is quite some evidence that it is affected by the macroeconomic situation, but the sign of the effect remains unclear.

3 Data, Sample Selection and Variables

Our empirical analysis is based on the Survey of Health, Ageing and Retirement in Europe (SHARE). The SHARE database is a multi-disciplinary survey of the population aged 50 years and older in 18 European countries. It was created to inform about societal consequences of population ageing across different institutional contexts in Europe (Börsch-Supan et al., 2013). The data have been collected in three regular panel waves: wave 1 (2004/05); wave 2 (2006/07); and wave 4 (2010/11). In addition, one wave of data (wave 3; 2008/09) was designed exclusively to gather information on retrospective life histories of the respondents. We do not use wave 3 because it does not contain any information on informal care use. The target population for SHARE are all persons who are 50 years and older in the respective survey year and their partners at any age. The survey has a longitudinal dimension in that all respondents who have previously participated are eligible to be interviewed in future waves (Börsch-Supan et al., 2013).[7] The SHARE database is particularly useful in our context because it includes detailed information on health status, informal care, demographics and socioeconomic status and, in particular, samples are taken before (wave 1 and 2) and after the financial crisis (wave 4).

We estimate the availability of informal care before and after the crisis. Therefore, we are only using countries that participated in the survey before and after the financial crisis. This leaves out Estonia, Hungary, Portugal and Slovenia that joined the survey in wave 4, and Greece, Ireland and Israel that did not participate in the survey after wave 3. In addition, Switzerland is dropped from the sample because we do not have any information on our measures of crisis severity from this country. The data we use to describe the severity of the crisis is described in more detail in section 3.2. After we discard observations that have missing values in the variables of interest we are left with 88,553 observations across 11 countries[8], which we divide into the following geographic

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[7]For more in-depth information on survey design and other methodological issues see Alcser et al. (2005) and Malter and Börsch-Supan (2013).

[8]Our analyses will be conducted on complete cases, because the number of missing values varies among variables of interest the sample size across the empirical models will vary somewhat: In the informal care provision models we use 88,553 (96 percent of the total sample), in the informal care receipt regressions

regions: Sweden and Denmark (North); Germany, France, Netherlands, Austria, and Belgium (Central); Spain and Italy (South); and Poland and the Czech Republic (East).[9]

3.1 Main Outcome Variables

Receiving informal care. The respondents are asked whether they have received any informal care from someone living in the household or from a friend or family member outside the household, during the past 12 months. We call the former intra-residential informal care and the latter extra-residential informal care. In the analysis we are using an indicator for whether the respondent receives one or both types of informal care. The reason we are not analyzing the intensity is that the frequency of informal receipt is not recorded for intra-residential informal care and the number of times informal care is given is not recorded for any of the informal care variables in wave 4. Extra-residential informal care includes help with personal care, practical household help and help with paperwork. Intra-residential informal care consists only of help with personal care and the question is posed only to respondents that are reported to have a mobility limitation.[10] This is natural since practical household chores represent a shared responsibility within the household and should therefore not be regarded as informal caregiving.

It is of interest to contrast the receipt of extra and intra-residential informal care because it is likely the two are related to the financial crisis for different reasons. For example, intra-residential caregivers are often the partner of the person in need of care and therefore more likely to be older and out of the labor force than extra-residential caregivers. It is not possible to separate the types of extra-residential informal care in wave 4. To make the samples comparable we assign zero intra-residential care receipt if the respondents are not asked this question (i.e. respondents that have no mobility problems). As a robustness test, we will reestimate the informal care receipt models using only respondents who are asked the question about intra-residential informal care receipt (i.e. respondents reported to have a mobility problem).

Providing informal care. Also for the provision of informal there is a distinction between care given within and outside the household. The respondents are asked whether they provide personal care, practical household help and help with paperwork to a fam-

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we use 77,900 observations (85 percent of the total sample).

[9]This partition is very similar to the one presented by Pommer et al. (2007) and which is designed to capture the most relevant dimensions of the LTC systems. The main differences to that classification are that we include two new EU members (Poland and the Czech Republic) and that we assign the Netherlands to the Central/Continental group. It is acknowledged by Pommer et al. that the Netherlands has been moving in this direction.

[10]The respondents are asked whether they have one or more of out of 10 mobility limitations, and respondents that report to have one or more mobility problem is asked the question about intra-residential informal care.

ily member or friend living outside the household. Respondents answering yes to this question are identified as extra-residential caregivers. Intra-residential caregivers are respondents reporting that they have provided personal care over a longer period of time (i.e. not for short-term sickness spells) to a member of the household. The indicator of intra-residential care is coded zero if the respondent is reported to live alone. For the same reason as above we will use indicators for whether the respondent is a caregiver or not. Table (1) shows descriptive statistics for informal care receipt and caregiving. As is seen in the table, a substantial share of the sample – approximately 30 percent – receives informal care and a share of roughly equal size provides informal care. This is not surprising as our sample consists of older Europeans and the responsibility of and need for informal care increases with age.

Table 1: Descriptive statistics on key outcome variables

	mean	sd	count
Informal Care Receipt			
Overall (=1)	0.21	0.41	77,858
Internal (=1)	0.05	0.21	77,858
External (=1)	0.18	0.39	77,900
Informal Care Provision			
Overall (=1)	0.35	0.48	88,459
Internal (=1)	0.06	0.24	88,459
External (=1)	0.31	0.46	88,553

The table shows the means, standard deviations and number of complete observations (count) for the main outcome variables: External informal care receipt is an indicator of whether you have received informal care from someone *outside* the household, internal informal care receipt is an indicator of receiving informal care from someone *within* the household, and overall informal care receipt is whether you receive one or both types of informal care. The same division applies to informal care provision.

3.2 Measuring the Impact of the Crisis

The Great Recession which was triggered in 2007 by the US subprime mortgage crisis, was the worst global recession since World War II. It started in December 2007 in the U.S. and ended there in June 2009; however, only during 2009 the world economy was in a state of global recession in the sense that a decline in World GDP per capita was observed. The Great Recession led to a sharp decline in international trade, a rapid rise in unemployment in many countries, and slumping prices for many commodities.

To measure the impact of the Great Recession we focus on changes in unemployment. This is in line with the large literature measuring the relationship between macroeconomic fluctuations and health inputs and outcomes (Ruhm, 2000, 2003, 2004; Cawley et al., 2015; Cawley and Simon, 2005), and besides, the previous literature suggests that unemployment is a better predictor of health outcomes and inputs than other measures of macroeconomic fluctuations (Cawley et al., 2015; Stuckler et al., 2009). To measure fluctuations in unemployment directly associated with the Great Recession we follow Keegan et al. (2013) and quantify the unemployment change in the recessionary period, 2007-2009. We define a recessionary period for each country following convention of defining a period of at least two consecutive quarters of negative quarter-on-quarter growth in seasonally adjusted real GDP as a recession (Newson, 2009; EC, 2010; Keegan et al., 2013).[11] For each country, we define the start of the recession as the last quarter of positive output growth, which we call the "peak quarter", and the end of the recession as the last quarter of negative output growth, which we call the "trough quarter". Our measure of unemployment associated with the Great Recession is then the percentage point change in unemployment from output peak-to-trough.

An overview of the impact of the crisis in some European countries is provided in Table 2. All the data is from the Eurostat database (Eurostat, 2014a,b). We have sorted the countries included by the European regions they belong to. The first two columns present the situation in the last year before the crisis, and the following columns picture the duration and impact of the crisis in the different countries. Clearly, the immediate effect of the crisis was a sharp downturn in GDP in all countries but Poland. The impact from peak to trough ranges from 4.0 per cent in France to 8.0 per cent in Denmark. In general, it is not possible to rank the different regions according to the magnitude or duration of the recession. However, in terms of unemployment, it seems clear from Table 2 that the countries in the 'Central' region have done better than the three other regions. We see that the recession impact on unemployment rates ranges from -0.4 in Germany to 8.6 per cent in Spain. Germany was the only country that experienced a decrease in unemployment in this period. Overall, the crisis impact has a mean of 0.85 per cent and a standard deviation of 1.74 in our sample (Table (3)).

According to Table (2), the central European countries in our sample weathered the crisis best. This is confirmed when looking at the Euro area in total (EC, 2010). Spain, Denmark, Ireland and the Baltic countries experienced the largest increases in unemployment, while in Central European countries the unemployment increase was limited. However, looking at unemployment increases in the recessionary period conceals the different recovery paths across Europe. For instance, in Northern Europe the unemployment rates

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[11]Keegan et al. (2013) use *annual* data in defining their recessionary periods. We follow the convention and use quarterly data which give a more detailed picture of output fluctuations (Newson, 2009).

Table 2: Crisis Impact by Country.

	Pre-Crisis (2007)		Crisis Impact		
Region Country	**GDP** per capita (€)	**Unemployment** *Percent*	**Duration** *Quarters*	**GDP** *Percent*	**Unemployment** *Percent*
North					
Denmark	30,600	3.9	5	8.0	2.8
Sweden	31,200	6.4	6	7.6	1.3
Central					
Austria	30,900	4.4	6	5.1	0.9
Belgium	28,900	7.8	4	4.4	0.8
France	26,900	8.4	6	4.0	1.9
Germany	28,800	9.0	5	6.9	-0.4
Netherlands	33,000	3.9	6	4.9	0.4
South					
Italy	26,000	5.9	6	7.2	1.0
Spain	26,200	8.0	6	4.6	8.6
East					
Czech Republic	20,600	5.9	4	5.5	2.2
Poland	13,600	10.8	0	.	.

started to decrease already in 2010 while in Southern Europe the unemployment rates stabilized at high levels (EC, 2010). To account for the different impacts and recovery paths across European regions we will include region-specific time trends in the empirical analyses and do subsample analysis for specific regions.

Since Poland did not experience a recession we are not able to make a country-specific recession impact measure for Poland. Instead of discarding Poland from the analysis we calculated our recession measures for Poland using the first quarter in 2008 as the peak quarter and the second quarter of 2009 as the trough quarter, which is defined as the "official" recession period for the European Union as a whole (Newson, 2009; EC, 2010). In this period, Poland experienced a 0.4 percentage point increase in the unemployment rate.

Some previous studies include the location specific unemployment rate instead of con- structing a specific measure of recession severity (Ruhm, 2000, 2003, 2004; Cawley et al., 2015; Cawley and Simon, 2005).[12] Increases in the unemployment rate are "loosely" in- terpreted as measuring macroeconomic downturns/recessions (Ruhm, 2000, 2003). We are however specifically interested in measuring how variation in the "bite" of the Great Recession is associated with informal care supply and demand, and we therefore use a more technical definition of a downturn. However, for comparative measure we will re-estimate our models including the country-specific unemployment rate to investigate differences between the two specifications.

3.3   Control Variables

As the countries included in our analysis differ in many ways which may be related to the crisis impact, it is desirable to assess whether results are robust to the conditioning on various control variables. Thus, we consider a wide range of covariates in our empirical analyses. Our standard set of controls include gender, age and age squared, whether the respondent lives in the same household as a partner/spouse, marital status (married vs. others), household size (the number of persons living in the household), number of children, indicators of primary and secondary education, and whether the respondent is born in the country of interview.

To explore whether results are confounded by older people's health, we also consider care needs in our robustness checks. We use five variable groups to capture care needs: instrumental activities and activities of daily living, number of listed chronic conditions, mobility limitations, and self-reported health. The indicators of activities of daily living

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[12]For instance, Cawley et al. (2015) investigates the effect of the Great Recession on health insurance coverage in the US by regressing indicators for health insurance coverage on state monthly unemployment rates over the period 2004-2010

include dressing, bathing or showering, eating and cutting up food, walking across a room and getting in or out of bed. The instrumental activities of daily living are making telephone calls, taking medications, managing money, shopping for groceries, and preparing a hot meal.[13] Self-reported health is rated in five steps from 'excellent' to 'poor'. The survey lists typical chronic conditions and for each of the conditions the respondent are asked whether they have been diagnosed with them. We include the number of chronic conditions (out of 12 conditions).[14] Finally, we include indicators describing whether the respondent has problems with the following mobility limitations: walking 100 meters, walking across a room, climbing several flights of stairs and climbing one flight of stairs.

If the recession weakens the economic well-being of persons in need of care we might see a substitution effect towards unpaid care from family and friends. To explore these mechanisms we consider economic well-being in the informal care receipt regressions. To capture economic well-being we include dummies for country-specific and wave-specific household income and net-wealth quintiles and whether the respondent reports to have difficulty in making ends meet (with great difficulty; with some difficulty; fairly easily; or easily). Income and wealth are deflated using purchasing power parity adjusted exchange rates provided by the SHARE team, for details see Alcser et al. (2005) and Malter and Börsch-Supan (2013). In wave 1, income is reported in gross amounts, while in wave 2 and 4 net income is reported. Therefore, we follow Gorle and van den Bosch (2008) and use income quintiles, which Gorle and van den Bosch (2008) report will be robust to the changes in measurement. Household net worth is the sum of all real and financial assets net of liabilities (Cavasso and Weber, 2013).

Another possible important substitution effect is from formal to informal care. If the recession leads to cuts in public long-term care services persons in need of long-term care would, all else equal, be in more need of informal care. The closest substitute to informal care is probably formal home care (paid home nursing and home help services: help with household chores); however, the questions regarding formal home care are no longer asked in wave 4 of SHARE. Therefore, we focus on two of the formal care variables also considered in Bolin et al. (2008a)[15]: doctor visits and hospital stays. In addition, we consider nursing home stays, which are not included by Bolin et al. (2008b) since they only use wave 1 and the sample only includes nursing home residents if they were

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[13]The instrumental activities and activities of daily living used here are the same as those used to make the instrumental activities and activities daily living indices in easySHARE, which is a ready-made panel/repeated cross section of Share waves 1, 2, 3 and 4 (Gruber et al., 2014)

[14]The list of conditions has changed among the waves. We follow Gruber et al. (2014) and count the number of conditions that have been asked in all waves, which are (1) heart attack, (2) high blood pressure or hypertension, (3) high blood cholesterol, (4) stroke or cerebral vascular disease, (5) Diabetes or high blood sugar, (6) chronic lung disease, (7) Arthritis, including osteoarthritis, or rheumatism, (8) Cancer or malignant tumor, (9) Stomach or duodenal ulcer, peptic ulcer, (10) Parkinson disease, (11) cataracts, and (12) hip fracture or femoral fracture

[15]Bolin et al. (2008a) investigate the substitutability between informal and formal care using SHARE.

interviewed before they went to a nursing home (Bakx et al., 2014).

Finally, we take the labor market history of carers into account. The opportunity cost of time is likely to decrease in a crisis and therefore more people have time to care for a relative or friend in need of care. To investigate the importance of this mechanism we would like to investigate the role of labor market status of caregivers. Respondents who provide informal care report whether they are employed or self-employed.[16] In the informal care provision regressions we will use it to define groups for a sub-sample analysis to investigate the importance of changes in employment status for in informal care provision. It is important to remember that this is mainly the employment status of persons who are 50 years and older, and it is not clear cut how a recession will affect the employment status of employees approaching retirement. As discussed by Meschi et al. (2013), a negative income and wealth effect caused by a recession might induce people to postpone retirement. Descriptive statistics for these variables are given in Table (3).

Many of the additional control variables mentioned above may in principle also be affected by the crisis – which leads to a methodological challenge. We thus include them in our analysis in different ways: we use them as outcome variables in order to see whether they appear to be associated with the crisis, we exploit the pre-crisis realizations to conduct sub-sample analysis, and we include current values in some regressions as robustness check. In the last case, one needs of course to be aware that the estimates may be biased whenever the crisis has an impact on the covariate. Nevertheless, we believe these additional specifications are useful as robustness checks.

4   Empirical Specification

To estimate the relationship between informal care and the country-specific depth of the Great Recession we estimate the following model using OLS

$$IC_{ijt} = \alpha_j + \lambda_t + X_{itj}\beta + \gamma(E_j \times d_t) + \epsilon_{ijt}, \tag{1}$$

where IC_{ijt} is an indicator of either receipt or provision of informal care by individual i in country j at wave t, α_j and λ_t are country and wave fixed effects respectively, X_{ijt} is a row vector of individual covariates, the term $E_j \times d_t$ is our measure of the bite of the financial crisis times a dummy variable for observations after the Great recession (SHARE wave 4), and ϵ_{ijt} is the regression error. The variation we exploit is at the country-wave level; we therefore estimate robust standard errors under the assumption that observations can

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[16]Reporting of the labor market status of the carers of respondents *receiving* informal care was dropped in wave 4.

Table 3: Descriptive statistics on additional outcomes and controlvariables

	mean	sd	count
Crisis measure			
Unemployment change from output peak-to-trough	0.85	1.74	77,900
Formal care usuage			
Number of doctor visits	7.80	9.94	77,900
Hospital stay (=1)	0.16	0.37	77,900
Nursing Home Stay (=1)	0.01	0.08	77,900
Economic Wellbeing			
Household gross income (wave 1) in constant Euro (1000)	43.19	47.82	20,369
Household net income (wave 1 and 2) in constant Euro (1000)	29.89	36.85	57,531
Household net wealth in constant Euro (1000)	246.71	606.50	77,900
Some or great difficulty in making ends meet (=1)	0.36	0.48	77,900
Employment			
Employed (=1)	0.28	0.45	88,553
Unemployed (=1)	0.03	0.17	88,553
Health status			
Self-reported health (1, excellent; 5, bad)	3.16	1.06	77,900
Number of problems with adl out of 10 listed	0.39	1.30	77,900
Number of chronic diseases out of 12 listed	1.43	1.35	77,900
Number of mobility limitations out of 4 listed	0.54	0.93	77,900
Education			
Tertiary education education (=1)	0.20	0.40	88,553
Secondary education (=1)	0.51	0.50	88,553
Demographics			
Age in years	65.18	10.34	88,553
Female (=1)	0.56	0.50	88,553
Living in the same household as a partner (=1)	0.75	0.44	88,553
Number of persons living in the household	2.20	1.03	88,553
Married (=1)	0.73	0.44	88,553
Number of children	2.21	1.42	88,553
Born in the country of interview (=1)	0.93	0.26	88,553

be arbitrarily correlated within countries for a given wave, but independent across waves and countries. This assumption will allow for shocks common to observations within countries for a given wave.

The parameter of interest, γ, captures the association between the outcome IC_{ijt} a one-point increase in unemployment induced by the crisis. This parameter will thus reflect the influence of general macroeconomic conditions in a country. As discussed in Section 2, there are several channels through which a deteriorating economic climate might influence the supply and demand of informal care. To explore the different mechanisms we will split the sample according to health status and economic well-being prior to the crisis (wave 2), which can be considered to unaffected by the crisis, and we will also introduce measures of physical care needs, household income and wealth as control variables to see how they affect the relationship between informal care receipt and out crisis measure. To explore the role of employment status we will split the sample according to employment status prior to the crisis (wave 2).

The empirical specification in equation (1) follows the literature on the effect of macroeconomic conditions on health status and inputs (Ruhm, 2004).[17] It exploits within-country variation to identify the relationship between the recession indicator and availability of informal care. Controlling for country fixed effects, we cancel out differences between countries that are constant over time. For example, we know that Southern European countries were hit harder by the financial crisis, and we know from studies that filial responsibility norms are stronger in Southern European countries than elsewhere (Bolin et al., 2008b; Kotsadam, 2011). The wave specific effects will control for common time trends across locations that are correlated with informal care availability and macroeconomic conditions, such as general changes in old-age health and technological progress. The specification however will not control for confounding factors varying within countries over time. In the recessionary period, Sweden and Denmark experienced a sharper increase in unemployment than Italy, but had a faster and stronger recovery than Italy. To address such regional differences, we extend the baseline specification with region-specific linear time trends.

Another potential source of bias comes from unobserved heterogeneity at the individual level. The example used by Cawley et al. (2015) is that the recession could have hit particular hard in areas where a high share of the population are relatively poorly educated. Human capital is known to be correlated with health status and with the subsequent need for long-term care. Exploiting the longitudinal dimension of the SHARE survey, we follow

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[17]The specification is strongly advocated by Ruhm (2000, 2003, 2004), showing to evidence that time and location fixed effects are needed to control for factors having common time trends across locations (such as medical technologies), and for factors that are time invariant and location specific (such as life-style differences).

Cawley and Simon (2005) and Cawley et al. (2015) and include individual fixed effects into our specification. These models will exploit within-individual variation over time to identify the relationship between the recession indicator and availability of informal care. Cawley et al. (2015) argues that macroeconomic fluctuations are likely to be largely exogenous and therefore individual-specific factors should have limited importance. Our most restrictive/conservative model is then

$$IC_{ijt} = \alpha_i + \lambda_t + X_{itj}\beta + \gamma(E_j \times d_t) + \alpha_j t + \epsilon_{ijt}, \tag{2}$$

where α_i now represent individual-specific effects and the interaction term $\alpha_j t$ are region-specific linear time trends. This most restrictive specification would thus identify the impact of the crisis as deviations from the region-specific time trend. If it can be assumed that countries within a region would have followed a common path in the absence of the crisis, the estimated γ picks up the crisis effect.

5 Results

5.1 Informal Care Receipt

In this section we discuss the results of linear probability models of receiving informal care on the recession severity indicator. Firstly, we estimate the probability of receiving informal care from someone *outside* the household, then we estimate the probability of receiving informal care from someone *within* the household, and lastly we estimate an indicator of the two measures combined. Informal care received within the household is only asked to respondents who report to have a mobility problem. As discussed above, to make the samples comparable we code the indicator of internal informal care receipt as zero if the respondent reports to have no mobility limitations.[18] In all specifications we control for gender, age, age squared and time-specific effects. In subsequent models, we add controls that can be considered to be unrelated to our crisis measure: indicators of primary and secondary education, whether the respondent lives in the same household as a partner, whether the respondent is born in the country of interview, household size, number of children, and marital status. In the specifications with individual fixed effects, variables that do not show variation over time for a given individual are left out of the analysis. In all tables, we report the mean of the dependent variable to easily evaluate

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[18]An alternative would be to only use respondents who have a mobility problem and therefore answers both informal care receipt questions. However, as we show below, old age dependency could be an endogenous variable and could therefore bias our results. In the robustness checks below we reestimate the model using only respondents who have a mobility problem.

the size of the predicted effects.

The top panel of table (4) summarizes the results of estimating the three measures of informal care receipt on the recession severity indicator of the three baseline specifications. The third row presents the results for the linear probability model with extra-residential informal care as the dependent variable. The recession severity indicator is positively and significantly correlated with receiving extra residential informal care across all specifications. Column (1) shows results when we control for year-specific and country-specific effects. We find that a one-point change in the unemployment increase from output peak-to-trough is associated with a 0.74 percentage points increase in the probability of receiving informal care from someone outside the household. The size of the association remains largely unchanged when including individual characteristics and individual-specific effects in the second and third column respectively. It corresponds to an increase of about 4 percent at the sample average.

Row (2) in panel 1, summarizes the results for informal care provided within the household. In the two first specifications, controlling for country-specific and year-specific effects and in column (2) individual controls, the association is negative and statistically significant. A one-point increase in our crisis measure is predicted to decrease the share of internal informal care receipt by 0.1 percentage points (2.2 percent). The negative direction of the association is likely to reflect a substitution effect in response to the increased supply of extra-residential informal care. However, when we in addition control for individual-specific effects the association changes sign and when we allow time trends to vary between regions in the last column, the association is no longer statistically significant. An intuitive reasoning explaining these results is that co-residential caregivers are older and more likely to be out of the labor force than extra-residential caregivers, and are therefore less likely to be experience a lower opportunity cost of time following the crisis. When we combine the two measures of informal receipt in Row (1) of the top panel, we find a positive and statistically significant correlation across all specifications.

To further explore whether there is a substitution effect between intra-residential and extra-residential caregiving we split the sample into respondents with and without children. Children are a common source of informal care second only to spousal care (Norton, 2000). The middle panel shows the results for respondents who have children. We find that the share of respondents who have children and receive extra-residential informal care increases while the share receiving intra-residential informal care is negatively correlated with our crisis measure in three out of four specifications. For the respondents without children both types of informal caregiving is positively associated with our crisis measure, as is seen in the bottom panel of the table.

Table 4: Informal Care Receipt: DID Results

	(1)	(2)	(3)	(4)
Entire Population				
DID Overall	0.0055***	0.0057***	0.0063***	0.0064**
	(0.001)	(0.001)	(0.002)	(0.003)
ymean	0.211	0.211	0.211	0.211
r2	0.064	0.071	0.011	0.011
N	77,858	77,858	77,858	77,858
DID Internal	-0.0010**	-0.0009**	0.0017***	0.0000
	(0.000)	(0.000)	(0.000)	(0.001)
ymean	0.047	0.047	0.047	0.047
r2	0.021	0.035	0.012	0.013
N	77,858	77,858	77,858	77,858
DID External	0.0074***	0.0075***	0.0066***	0.0078**
	(0.001)	(0.001)	(0.002)	(0.003)
ymean	0.182	0.182	0.182	0.182
r2	0.052	0.064	0.009	0.010
N	77,900	77,900	77,900	77,900
Children > 0				
DID Overall	0.0059***	0.0060***	0.0055***	0.0060**
	(0.001)	(0.001)	(0.002)	(0.003)
ymean	0.209	0.209	0.209	0.209
r2	0.067	0.074	0.011	0.011
N	70,317	70,317	70,317	70,317
DID Internal	-0.0011**	-0.0010**	0.0013***	-0.0002
	(0.000)	(0.000)	(0.000)	(0.001)
ymean	0.048	0.048	0.048	0.048
r2	0.023	0.036	0.013	0.013
N	70,317	70,317	70,317	70,317
DID External	0.0079***	0.0080***	0.0063***	0.0077**
	(0.001)	(0.001)	(0.002)	(0.003)
ymean	0.180	0.180	0.180	0.180
r2	0.055	0.066	0.009	0.010
N	70,355	70,355	70,355	70,355
No children				
DID Overall	0.0013	0.0016	0.0142***	0.0088*
	(0.002)	(0.002)	(0.004)	(0.004)
ymean	0.232	0.232	0.232	0.232
r2	0.042	0.052	0.022	0.023
N	7,541	7,541	7,541	7,541
DID Internal	0.0001	0.0000	0.0066***	0.0028*
	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.040	0.040	0.040	0.040
r2	0.010	0.063	0.030	0.033
N	7,541	7,541	7,541	7,541
DID External	0.0019	0.0022	0.0103**	0.0074
	(0.003)	(0.003)	(0.004)	(0.005)
ymean	0.207	0.207	0.207	0.207
r2	0.032	0.050	0.016	0.016
N	7,545	7,545	7,545	7,545
Year FE	✓	✓	✓	✓
Country FE	✓	✓		
Individual controls		✓	✓	✓
Individual FE			✓	✓
Regional Trends				✓

The table shows regression results from a linear probability model of receiving informal care. The sample includes respondents who report to have one or more mobility problems, which are the ones that answer the questions about internal *and* external informal care receipt. All models control for age, age squared, gender and wave dummies. Individual controls include whether you live with a partner, whether you were born in the country of interview, marital status, number of children and indicators of secondary and tertiary education. The standard errors are clustered at the country-wave level. * $p < 0.10$, ** $p < 0.05$, ***$p < 0.01$

5.1.1 Regional-Level Analysis

In the following, we will concentrate on informal care received from someone *outside* the household. This is to be in line with previous literature and it seems to be consistently related to our crisis measure as is seen in the results above. Bolin et al. (2008a) and Bonsang (2009) use external informal care when investigating the relationship between the use of informal and formal care.

To see how the results vary across different institutional and cultural contexts we follow Bolin et al. (2008b) and divide the sample into European regions. Bolin et al. (2008b) find that the intensity of informal caregiving (number of hours of care per caregiver) exhibits a clear European north-south gradient. Moving from the south to the north, filial responsibility norms become weaker, expenditure and use of formal long-term care increases and the opportunity cost of time of women increases. However, the share of people receiving and giving informal care (extensive margin) is higher in Central and Northern Europe (Bolin et al., 2008b,a). An explanation for this may be that more women in Southern Europe take on the whole caregiving responsibility of dependent older people, while in Northern Europe where a larger share of women are working, the caregiving responsibility is shared among siblings and provided in addition to public formal services.

Table (5) summarizes the results for receiving extra-residential informal care by regions. There is a positive and statistically significant correlation between the recession severity and the share receiving extra-residential informal care in all regions and across all specifications. Column (3) presents the results when controlling for time varying individual characteristics, individual-specific and time-specific effects. The size of the association is strongest in the Northern region, a one-percentage point increase in recession unemployment is associated with a 4.2 percentage point increase in the probability of receiving extra-residential informal care, and weakest in the Southern region, where the predicted increase is 0.38 percentage points. These associations correspond to an increase of about 21 and 3 percent at the respective sample averages. In the Central and Eastern regions the association is of similar magnitude to that of the Northern region: 20 and 15 percent respectively.

5.1.2 The Role of Care Needs, Income and Wealth

As previously discussed, macroeconomic conditions might be associated with care needs. For instance, Ruhm (2003) finds that medical conditions and activity limitations become more common when the economy improves, while Bucher-Koenen and Mazzonna (2013), who investigate the relationship between old age health and the Great recession, find that

Table 5: Informal Care Receipt: DID Results by Region.

	(1)	(2)	(3)
North			
DID Crisis	0.0424***	0.0487***	0.0422***
	(0.009)	(0.009)	(0.010)
ymean	0.201	0.201	0.201
r2	0.002	0.034	0.006
N	14,286	14,089	14,089
Central			
DID Crisis	0.0220***	0.0227***	0.0370***
	(0.005)	(0.005)	(0.006)
ymean	0.168	0.168	0.168
r2	0.001	0.038	0.003
N	47,589	46,616	46,616
South			
DID Crisis	0.0022*	0.0020	0.0038**
	(0.001)	(0.001)	(0.002)
ymean	0.122	0.122	0.122
r2	0.000	0.042	0.007
N	17,164	16,823	16,823
Eastern			
DID Crisis	0.0177**	0.0174**	0.0342***
	(0.008)	(0.008)	(0.011)
ymean	0.236	0.236	0.236
r2	0.003	0.038	0.010
N	13,084	12,772	12,772
Year FE	✓	✓	✓
Country FE	✓	✓	
Individual controls		✓	✓
Individual FE		✓	✓

The sample includes respondents who report to have one or more mobility problems, which are the ones that answer the questions about internal *and* external informal care receipt. All models control for age, age squared, gender and wave dummies. The demographic controls include whether you live with a partner, whether you were born in the country of interview, marital status, and number of children. Education controls are indicators of secondary and tertiary education. The standard errors are clustered at the country-wave level. Northern countries are Sweden and Denmark. Central countries are Germany, France, the Netherlands, Belgium and Austria. Eastern countries are Poland and the Czech Republic. Southern countries are Italy and Spain. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

self-reported health worsens when the economy contracts. Our results support Bucher-Koenen and Mazzonna (2013), in that we find a positive, albeit weak, relationship between recession severity and the number of difficulties with activities of daily living (see Row (3) in Appendix Table (A3)): each point increase in unemployment is associated with 0.014 additional ADLs, from a baseline of 0.4. The estimates are very precise and thus rule out large correlations. Still, the estimates are strongly significant and thus raise the issue of whether changes in informal care receipt are partly driven by changing needs.

To explore this mechanism, we add controls for health status. Health status controls include number of listed chronic conditions, mobility limitations, and self-reported health. Column (5) in the top panel of table (6) presents the results when using the full sample and adding health status controls to the specification with time varying individual characteristics, individual-specific, time-specific effects and regional-specific time trends. We see that the association between recession severity and the probability of receiving extra-residential informal care is slightly attenuated by about 0.1 percentage points, which corresponds to about 40 percent of the standard error.

Another channel through which a recession might affect informal care need is through changes in household incomes. If the recession leads to a fall in incomes, persons in need of care might substitute toward unpaid care provided by family and friends.[19] To explore this mechanism, we add controls for economic well-being in column (6) of table 6. The variables describing economic well-being are country-specific and wave-specific household income and net-wealth quintiles and whether the respondent reports to have difficulty in making ends meet (with great difficulty; with some difficulty; fairly easily; or easily). The results are by and large the same indicating that possible changes in economic wellbeing do not explain the association between severity of the recession and availability of informal care.

Next, we exploit the longitudinal dimension of the panel and allow for heterogeneity in the impact of the crisis between individuals with different levels of needs before the crisis hit. Activities of daily living is the best predictor of long-term care needs (Norton, 2000). We therefore follow Adena and Myck (2013) and define someone to be in need of care if they have 3 or more limitations of daily living.[20] Rows (2) and (3) in table (A3) summarize the results for the two groups. The association between recession severity and share of respondents receiving extra-residential informal care is positive and largely statistically significant across all specifications. In our most restrictive specification (controlling for individual specific effects, year effects and region-specific time trends; column (4) in the

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[19]In Row (1) and (2) in appendix table (A3), we show that household income and wealth is negatively associated with recession severity.

[20]This is called a "bad" health state in Adena and Myck (2013), who use this indicator from SHARE to look at transitions of physical well-being among elderly.

Table 6: Informal Care Receipt: DID Results in Subgroups.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
All							
DID Crisis	0.0074***	0.0075***	0.0066***	0.0084***	0.0074**	0.0075**	0.0080**
	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
ymean	0.182	0.182	0.182	0.182	0.182	0.182	0.182
r2	0.052	0.065	0.009	0.003	0.021	0.022	0.025
N	77,900	77,900	77,900	77,900	77,900	77,900	77,900
Without limitations, Wave 2							
DID Crisis	0.0082***	0.0080***	0.0062**	0.0083***	0.0071**	0.0071**	0.0076**
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
ymean	0.166	0.166	0.166	0.166	0.166	0.166	0.166
r2	0.034	0.048	0.009	0.002	0.020	0.021	0.025
N	49,420	49,420	49,420	49,420	49,420	49,420	49,420
With limitations, Wave 2							
DID Crisis	0.0079***	0.0084***	0.0094***	0.0048	0.0070**	0.0074**	0.0081**
	(0.002)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)
ymean	0.210	0.210	0.210	0.210	0.210	0.210	0.210
r2	0.085	0.098	0.020	0.017	0.035	0.041	0.047
N	28,480	28,480	28,480	28,480	28,480	28,480	28,480
Poor in Wave 2							
DID Crisis	0.0110***	0.0104***	0.0080***	0.0081***	0.0057***	0.0057***	0.0064***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
ymean	0.199	0.199	0.199	0.199	0.199	0.199	0.199
r2	0.044	0.064	0.011	0.005	0.024	0.027	0.030
N	18,471	18,471	18,471	18,471	18,471	18,471	18,471
Non-poor in Wave 2							
DID Crisis	0.0060***	0.0063***	0.0061**	0.0089**	0.0092**	0.0092**	0.0096**
	(0.001)	(0.001)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
ymean	0.177	0.177	0.177	0.177	0.177	0.177	0.177
r2	0.054	0.065	0.009	0.003	0.021	0.022	0.025
N	59,429	59,429	59,429	59,429	59,429	59,429	59,429
Year FE	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓					
Individual controls		✓	✓	✓	✓	✓	✓
Individual FE			✓	✓	✓	✓	✓
Regional Trends				✓	✓	✓	✓
Health Controls					✓	✓	✓
Income & Wealth Controls						✓	✓
Formal Care controls							✓

All models control for age, age squared, gender and wave dummies. The demographic controls include whether you live with a partner, whether you were born in the country of interview, marital status, and number of children. Education controls are indicators of secondary and tertiary education. Health status controls include number of listed chronic conditions, mobility limitations, and self-reported health. The variables describing economic well-being are country-specific and wave-specific household income and net-wealth quintiles. Formal care controls are number of doctor visits and indicators of hospital and nursing home stay. The standard errors are clustered at the country-wave level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

table), we see that a one point increase in recession severity is associated with an increase in informal care receipt by 0.83 percentage points for those without previous limitations and 0.48 for those with previous needs. These associations correspond to an increase of 2.3 and 5 percent, respectively, at the sample average.[21] The size difference might be driven by those who become limited in wave 4, while those who are limited in activities of daily living in wave 2 are very unlikely to recover in wave 4.[22]

A related issue is whether the association between informal care availability and recession severity depends on economic wellbeing. To explore this we split the sample on whether respondents report to have difficulty in making ends meet in wave 2, which should be unrelated to recession severity – but clearly captures the individual's vulnerability to the crisis. Adena and Myck (2013) find that subjective poverty defined by respondents answering that they have "some" or "great" difficulty in making ends meet is a good predictor of quality of life. We use this variable and re-estimate our models conditioning on whether respondents report to be "poor" or "not poor" before the recession. The results are shown in Row (4) and (5) of table (6). The association with recession severity is positive and statistically significant across all specifications for both groups. In the most restrictive specification we see that the predicted increase in the share of poor recipients of extra-residential informal care is 0.81 percentage points, which corresponds to roughly 4 percent at the sample average (0.0081/0.2). The corresponding association among those who are not poor is a little over 5 percent.

5.1.3 Formal Care Utilization

To investigate whether the recession is associated with formal care use and whether such an association influences the relationship between informal care and recession severity, we regress our measure of recession severity on the available variables describing formal care use: number of doctor visits,an indicator of hospital stays, and an indicator of nursing home stays. Estimates for these formal care variables are given in appendix table (A1). We find that recession severity is negatively related to doctor visits and hospital stays. The negative association is statistically significant across all specifications. The probability of a respondent moving to a nursing home is positively related to recession severity, but the estimate is very small, insignificant, and precisely estimated.[23] Utilization of

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[21]The share of respondents who are not in need of long-term care and receives extra-residential informal care is roughly equal to 0.17, while those who are in need the share is equal to 0.21.

[22]As an interesting and endogenous side note, the predicted effect of those who become in need in wave 4 (< 3 ADLs in wave 2 and ≥ 3 ADLs in wave 4) is equal to 3.6 percentage points, corresponding to an increase of 9 percent at the sample average. This effect is significantly larger than for respondents who are not considered to be in need.

[23]Remember, this is the probability that someone already interviewed moves into a nursing home at a later stage and therefore does not represent a representative share of persons living in a nursing home.

formal care services may thus be one mechanism by which the crisis affects informal care use; however, the relatively small magnitudes of the estimates suggest this is not the main part of the story. In order to assess the empirical importance of this mechanism, we include the formal care variables as controls in the last column of table (6). The results do not alter the main results in any significant way. A reason for this could be that these formal care variables do not represent formal care services that are close substitutes to informal care. For instance, Bolin et al. (2008a) does not find any strong substitution between doctor services, hospital services and informal care.

5.2   Provision of Informal Care

Next, we consider the relationship between informal care provision and macroeconomic conditions by estimating the probability of providing extra-residential and intra-residential care on the employment change from output peak-to-trough. In the baseline specification we control for age, age-squared, gender, country-specific and year specific effects. We subsequently add individual controls, individual-specific effects and region-specific time trends. We distinguish between intra-residential and extra-residential informal care. As is shown in table (7), there is a positive correlation between our measure of recession severity and the share of external caregivers across all specifications. The correlation between recession severity and internal care provision is negative, while the overall correlation is positive – but none of the results is robust when including region-specific time trends. However, when only controlling for individual-specific effects, the predicted effect is significant at the 1 percent level and the direction of the associations after controlling for region-specific trends is consistently the same.

In our individual fixed effects specification, a one-point increase in recession severity is associated with an increase in external care provision by 0.85 percentage points (2.7 per cent; Row 3 of table (7). The association is reduced to roughly 0.3 percentage points (1 percent) when including region-specific time trends (column (4)). The association for internal care provision is small and statistically insignificant. Although the associations are small, these results confirm a tendency shown in our models explaining informal care receipt – an indication that extra-residential informal care substitutes for intra-residential informal care.

5.2.1   Informal Care Providers by Labor Market Status

In this subsection, we will investigate possible differential predicted effects of informal care provision on recession severity by subgroups according to labor market status. The apparent logic is that an increased unemployment rate reduces the opportunity cost of

Table 7: Informal Care Provision: DID Results.

	(1)	(2)	(3)	(4)	(5)	(6)
Entire Population						
DID Overall	0.0038***	0.0041***	0.0083***	0.0024	0.0023	0.0024
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
ymean	0.352	0.352	0.352	0.352	0.352	0.352
r2	0.031	0.036	0.011	0.012	0.012	0.013
N	88,459	88,459	88,459	88,459	88,459	87,524
DID Internal	-0.0016***	-0.0016***	-0.0003	-0.0005	-0.0006	-0.0002
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
ymean	0.061	0.061	0.061	0.061	0.061	0.061
r2	0.002	0.016	0.016	0.016	0.016	0.017
N	88,459	88,459	88,459	88,459	88,459	87,524
DID External	0.0050***	0.0053***	0.0085***	0.0029	0.0029	0.0029
	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)
ymean	0.311	0.311	0.311	0.311	0.311	0.311
r2	0.044	0.050	0.016	0.017	0.018	0.018
N	88,553	88,553	88,553	88,553	88,553	87,616
Working Wave 2						
DID Overall	0.0108**	0.0109**	0.0124***	0.0082*	0.0082*	0.0078*
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
ymean	0.458	0.458	0.458	0.458	0.458	0.458
r2	0.011	0.019	0.016	0.016	0.018	0.020
N	15,988	15,988	15,988	15,988	15,988	15,859
DID Internal	0.0019**	0.0020**	0.0004	0.0013	0.0013	0.0013
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.040	0.040	0.040	0.040	0.040	0.040
r2	0.001	0.008	0.004	0.004	0.005	0.005
N	15,988	15,988	15,988	15,988	15,988	15,859
DID External	0.0067	0.0067	0.0089	0.0049	0.0049	0.0050
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
ymean	0.436	0.436	0.436	0.436	0.436	0.436
r2	0.011	0.019	0.017	0.018	0.020	0.021
N	15,997	15,997	15,997	15,997	15,997	15,868
Not Working Wave 2						
DID Overall	0.0020**	0.0023**	0.0073***	0.0009	0.0009	0.0009
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
ymean	0.329	0.329	0.329	0.329	0.329	0.329
r2	0.028	0.034	0.010	0.011	0.012	0.012
N	72,471	72,471	72,471	72,471	72,471	71,665
DID Internal	-0.0023***	-0.0023***	-0.0004	-0.0010	-0.0010	-0.0006
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
ymean	0.065	0.065	0.065	0.065	0.065	0.065
r2	0.001	0.019	0.020	0.020	0.021	0.022
N	72,471	72,471	72,471	72,471	72,471	71,665
DID External	0.0042***	0.0044***	0.0084***	0.0025	0.0025	0.0024
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
ymean	0.283	0.283	0.283	0.283	0.283	0.283
r2	0.041	0.047	0.016	0.017	0.018	0.018
N	72,556	72,556	72,556	72,556	72,556	71,748
Year FE	✓	✓	✓	✓	✓	✓
Country FE	✓	✓				
Individual controls		✓	✓	✓	✓	✓
Individual FE			✓	✓	✓	✓
Regional Trends				✓	✓	✓
Health Controls					✓	✓
Income & Wealth Controls						✓

The regressions control for age, age squared, gender and wave dummies. The demographic controls include whether you live with a partner, whether you were born in the country of interview, marital status, and number of children. Education controls are indicators of secondary and tertiary education. Health status controls include number of listed chronic conditions and self-reported health. The variables describing economic well-being are country-specific and wave-specific household income and net-wealth quintiles and whether the respondent reports to have some or great difficulty in making ends meet. The standard errors are clustered at the country-wave level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

time, which in turn increases the supply of informal care – although it is not certain that our crisis measure will move one-to-one with the opportunity cost of time of our middle-aged sample.[24] If variation in our crisis measure is mainly driven by unemployment at lower ages it might have opposite impact on opportunity cost of time for our sample. For example, older individuals might postpone retirement because of uncertainty regarding the economic situation or unemployed close to retirement might cease looking for work. These examples in isolation would imply an inverse relationship between our measure of crisis severity and unemployment rate in our sample (i.e. higher opportunity cost of time).

To explore the strength of the relationship between crisis severity and unemployment we regress an indicator of unemployment and employment on our measure of recession severity. The results are shown in Appendix Table (A3). There is a positive association between recession severity and unemployment. However, the association is not statistically significant when controlling for region-specific time trends. A one-point increase in recession severity is associated with roughly 0.3 percentage point increase in the probability of being unemployed. Roughly three percent of the sample reports to be unemployed, therefore this represents an increase of about 10 percent. The association is reduced by about half when controlling for individual-specific and region-specific time trends. Row (2) of the Table, shows that there generally is a negative relationship between our measure of crisis severity and employment. Here as well, including region-specific time trends reduces the strength and renders the association insignificant. Nevertheless, the results suggest that to some extent, our crisis indicator captures the opportunity cost of time of the respondents. To look for nonlinear relationships we reestimate the models separately for those who are employed and unemployed before the recession (wave 2). Among the employed, which are most likely to experience a change in the opportunity cost of time in wave 4 compared to wave 2, a one-percentage increase in our crisis measure is associated with a 1.24 percentage point increase in the probability of providing informal care, which corresponds to roughly 2.7 percent at the sample average. Among those who are unemployed in wave 2 the corresponding predicted effects are 0.73 percentage points (2.2 %). Hence, it seems that the positive correlation between informal care provision and recession unemployment is not entirely explained by opportunity cost of time.

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[24]To recapitulate, our proxy of crisis severity is the increase in the unemployment rate for ages 15 to 74 from output peak-to-trough. This is to best describe the general economic climate, which will be most relevant to capture all channels through which adverse economic conditions might be related to informal care availability.

5.2.2 Sensitivity analyses

In Appendix Table (A2) we show results for informal care receipt when using respondents who are asked whether they receive both types of informal care (i.e. respondents reported to have a mobility limitation). As is seen in the Table, the direction and significance of the results are intact. The results seem to be somewhat stronger, which might indicate that a large share of the observed increase in informal care receipt is driven by increase in care and not for practical for more practical household chores.

To see how sensitive our results are to our choice of crisis indicator we reestimate our main models using three alternative measures of macroeconomic fluctuations: The absolute decrease in real GDP from output peak-to-trough, unemployment rate and real GDP per capita. Ruhm (2000, 2003, 2004); Cawley et al. (2015); Cawley and Simon (2005) use a specification which includes linearly the location specific unemployment rate, and Cawley and Simon (2005) also use real GDP per capita as a check of the predicted effects measured by unemployment. The results are shown in Appendix Tables (A5) and (A6) for informal care receipt and informal care provision, respectively. When we use the absolute decrease in real GDP and real GDP per capita we generally get estimates in the same direction as when we used recession unemployment increase. However, the associations seem to be weaker when it comes to statistical significance. When we linearly include real GDP per capita the results are similar and show a significant, both, substantially and statistically, negative relationship with both informal care receipt and provision i.e. a better economy reduces the availability of informal care. This is confirmed in the specification using linear unemployment rate as the independent variable.

6   Conclusion

Informal care is still the main source of long-term care in most European countries (either as a sole or combined source of care), however our knowledge of the determinants of informal caregiving is still incomplete. Recessions provide quasi-experimental evidence to examine the impact of employment shocks on the availability of informal care. We have argued that the effect of a recession on informal caregiving is mediated by several different mechanisms, the relative importance of which remain an open, and empirical issue. This paper taken advantage of the large variation in both the exposure to the great recession in Europe (Hurley et al., 2011) and models of caregiving (Costa-font et al., 2015), alongside the associated austerity measures.

Accordingly, we have shown that the Great Recession likely affected a host of different determinants on informal caregiving on the demand and supply sides, as well as factors

determining the matching between carers and recipient on this 'market'. Demand-side factors include the possibility that the recession affected physical care needs, substitution between formal and informal care, and income effects due to drops in incomes of older people. Amongst supply-side factors, in particular the opportunity cost of potential carers appears to be important, even though it is not obvious that a recession has the same impact on this group as on younger individuals. Indeed, the recession might have opened up opportunities for part-time and more flexible jobs that are more compatible with caregiving, or even to take advantage of caregiving allowance funding as an extra source of income. However, evidence of the latter seems to be questionable (Bryan, 2012).

Our analysis shows that the downturn was associated with a marked increase in informal care receipt, and that this change was almost entirely driven by informal care from outside the household. Even though we do observe a small association between the severity of the crisis and the prevalence of functional limitations among older people, the magnitude is too small to be responsible for the increase in informal care receipt. We also find some crude evidence of substitution from formal to informal care services, but also this effect appears to be too small to be one of the main explanations. Consistent with this, we do not find any evidence suggesting that poverty is an important driver of the results. Instead, it does indeed seem to be the case that the opportunity cost of potential carers is one of the main factors determining the surge in informal care receipt: only for individuals working in wave two do we observe a significant increase in informal care provision, and the association is very similar in magnitude to the coefficient estimated for informal care receipt.

As in previous studies, we find a strong North/South divide in Europe. When comparing estimates for different European regions, the impact of the crisis appears to have been stronger in the North and weaker in the South, with the countries in between being closer to Scandinavia than to Southern Europe. This might be unexpected given that the countries in the north have much more extensive provision of formal care. However, considering the labor market attachment of relatively old workers in different European regions, this North/South gradient does make perfect sense in the light of opportunity costs being an essential determinant of informal care provision.

One aspect which we have not taken into account in our analysis is that population ageing advances from different levels and at different speeds in the different countries. This is not a big obstacle to the empirical analysis, which is conducted at the individual level and conditional on the age and sex composition of the older part of the population. However, dependency ratios and the like may of course matter a lot for the availability of formal care, and for how the political process and the public sector deal with competing demands from different demographic groups. Amongst the countries included in this study, the South and the East experienced a particularly rapid increase in the 80+ population in

the aftermath of the crisis; whereas the Scandinavian countries and in particular Sweden have been essentially flat. These diverging demographic trends represent a puzzle in the sense that we would have expected the needs to grow faster in the South during the crisis – as a growing number of old people competed for the austerity-struck public resources – which in turn should have strengthened the association between the crisis and informal caregiving in those countries. The fact that we observe the opposite thus corroborate the conclusion from above that the Southern European LTC systems are largely isolated from labor market shocks. In addition, when seen in the light of these demographic trends, our results also suggest that Southern European LTC systems are much more compartmentalized between formal and informal care than their Scandinavian counterparts.

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Appendix

Table A1: Formal Care Utilisation: DID Results.

	(1)	(2)	(3)	(4)	(5)	(6)
Doctor Visits						
DID Crisis	-0.2501***	-0.2568***	-0.2178***	-0.2689***	-0.2844***	-0.2815***
	(0.055)	(0.056)	(0.048)	(0.063)	(0.059)	(0.058)
ymean	7.797	7.797	7.797	7.797	7.797	7.797
r2	0.015	0.020	0.006	0.007	0.043	0.039
N	77,900	77,900	77,900	77,900	77,900	77,900
Hospital Stays						
DID Crisis	-0.0032***	-0.0032***	-0.0037***	-0.0037***	-0.0041***	-0.0042***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.165	0.165	0.165	0.165	0.165	0.165
r2	0.013	0.015	0.006	0.006	0.028	0.027
N	77,900	77,900	77,900	77,900	77,900	77,900
Nursing Home						
DID Crisis	0.0001	0.0001	0.0002	0.0003	0.0002	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ymean	0.007	0.007	0.007	0.007	0.007	0.007
r2	0.012	0.014	0.004	0.005	0.019	0.011
N	77,900	77,900	77,900	77,900	77,900	77,900
Year FE	✓	✓	✓	✓	✓	✓
Country FE	✓	✓				
Individual controls		✓	✓	✓	✓	✓
Individual FE			✓	✓	✓	✓
Regional Trends				✓	✓	✓
Health Controls					✓	✓
Income & Wealth Controls						✓

The regressions control for age, age squared, gender and wave dummies. The demographic controls include whether you live with a partner, whether you were born in the country of interview, marital status, and number of children. Education controls are indicators of secondary and tertiary education. Health status controls include instrumental activities and activities of daily living, number of listed chronic conditions, mobility limitations, and self-reported health. The variables describing economic well-being are country-specific and wave-specific household income and net-wealth quintiles and whether the respondent reports to have some or great difficulty in making ends meet. The standard erros are clustered at the country-wave level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A2: Informal Care Receipt: DID Results

	(1)	(2)	(3)	(4)
Entire Population				
DID Overall	0.0078***	0.0083***	0.0097***	0.0060**
	(0.002)	(0.002)	(0.002)	(0.003)
ymean	0.314	0.314	0.314	0.314
r2	0.060	0.067	0.012	0.012
N	44,820	44,145	44,145	44,145
DID Internal	-0.0017	-0.0014	0.0018**	-0.0025***
	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.090	0.090	0.090	0.090
r2	0.015	0.042	0.019	0.021
N	45,013	44,323	44,323	44,323
DID External	0.0112***	0.0112***	0.0100***	0.0089***
	(0.001)	(0.001)	(0.002)	(0.003)
ymean	0.259	0.259	0.259	0.259
r2	0.052	0.070	0.011	0.011
N	44,900	44,223	44,223	44,223
Children > 0				
DID Overall	0.0079***	0.0085***	0.0085***	0.0053*
	(0.002)	(0.002)	(0.002)	(0.003)
ymean	0.312	0.312	0.312	0.312
r2	0.064	0.071	0.013	0.013
N	40,400	39,763	39,763	39,763
DID Internal	-0.0023	-0.0019	0.0008	-0.0033***
	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.092	0.092	0.092	0.092
r2	0.018	0.041	0.020	0.021
N	40,580	39,928	39,928	39,928
DID External	0.0119***	0.0118***	0.0099***	0.0090***
	(0.001)	(0.001)	(0.002)	(0.003)
ymean	0.255	0.255	0.255	0.255
r2	0.056	0.074	0.012	0.012
N	40,472	39,833	39,833	39,833
No children				
DID Overall	0.0053**	0.0049*	0.0185***	0.0112**
	(0.002)	(0.003)	(0.003)	(0.005)
ymean	0.338	0.338	0.338	0.338
r2	0.031	0.041	0.019	0.022
N	4,420	4,382	4,382	4,382
DID Internal	0.0034	0.0026	0.0117***	0.0058**
	(0.002)	(0.002)	(0.002)	(0.002)
ymean	0.076	0.076	0.076	0.076
r2	0.004	0.106	0.039	0.046
N	4,433	4,395	4,395	4,395
DID External	0.0033	0.0033	0.0082***	0.0049
	(0.002)	(0.002)	(0.002)	(0.005)
ymean	0.287	0.287	0.287	0.287
r2	0.027	0.049	0.011	0.012
N	4,428	4,390	4,390	4,390
Year FE	✓	✓	✓	✓
Country FE	✓	✓		
Individual controls		✓	✓	✓
Individual FE			✓	✓
Regional Trends				✓

The table shows regression results from a linear probability model of receiving informal care. The sample includes respondents who report to have one or more mobility problems, which are the ones that answer the questions about internal *and* external informal care receipt. All models control for age, age squared, gender and wave dummies. Individual controls include whether you live with a partner, whether you were born in the country of interview, marital status, number of children and indicators of secondary and tertiary education. The standard errors are clustered at the country-wave level. * $p < 0.10$, ** $p < 0.05$, ***$p < 0.01$

Table A3: Additional Outcomes: DID Results.

	(1)	(2)	(3)	(4)
Income				
DID Crisis	-0.9034*	-0.8430*	-0.4031	-0.0444
	(0.454)	(0.466)	(0.494)	(0.324)
ymean	29.891	29.891	29.891	29.891
r2	0.027	0.087	0.004	0.006
N	57,531	57,531	57,531	57,531
Wealth				
DID Crisis	-6.0926	-5.5602	-3.8731	-3.0190
	(5.061)	(5.121)	(5.878)	(4.931)
ymean	246.707	246.707	246.707	246.707
r2	0.010	0.030	0.016	0.019
N	77,900	77,900	77,900	77,900
ADL Limitations				
DID Crisis	0.0137***	0.0144***	0.0187***	0.0135***
	(0.004)	(0.004)	(0.004)	(0.004)
ymean	0.389	0.389	0.389	0.389
r2	0.116	0.124	0.066	0.067
N	77,900	77,900	77,900	77,900
Year FE	✓	✓	✓	✓
Country FE	✓	✓		
Individual controls		✓	✓	✓
Individual FE			✓	✓
Regional Trends				✓

The regressions control for age, age squared, gender and wave dummies. The demographic controls include whether you live with a partner, whether you were born in the country of interview, marital status, and number of children. Education controls are indicators of secondary and tertiary education. The standard errors are clustered at the country-wave level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4: Labor Market Status: DID Results.

	(1)	(2)	(3)	(4)
Unemployed				
DID Crisis	0.0033***	0.0033***	0.0014**	0.0010
	(0.000)	(0.000)	(0.001)	(0.001)
ymean	0.031	0.031	0.031	0.031
r2	0.026	0.032	0.004	0.004
N	88,553	88,553	88,553	88,553
Employed				
DID Crisis	-0.0041***	-0.0034***	0.0022	-0.0013
	(0.001)	(0.001)	(0.002)	(0.001)
ymean	0.276	0.276	0.276	0.276
r2	0.401	0.414	0.074	0.077
N	88,553	88,553	88,553	88,553
Year FE	✓	✓	✓	✓
Country FE	✓	✓		
Individual controls		✓	✓	✓
Individual FE			✓	✓
Regional Trends				✓

The regressions control for age, age squared, gender and wave dummies. The demographic controls include whether you live with a partner, whether you were born in the country of interview, marital status, and number of children. Education controls are indicators of secondary and tertiary education. The standard erros are clustered at the country-wave level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5: Informal Care Receipt: Different crisis measures

	(1)	(2)	(3)	(4)
Absolute fall in real GDP during the crisis				
DID Overall	0.003422	0.001577	0.001626	0.002244
	(0.004)	(0.003)	(0.003)	(0.003)
ymean	0.211	0.211	0.211	0.211
r2	0.064	0.010	0.010	0.011
N	77,858	77,858	77,858	77,858
DID Internal	0.001127	-0.000176	-0.000285	0.001530**
	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.047	0.047	0.047	0.047
r2	0.021	0.008	0.012	0.013
N	77,858	77,858	77,858	77,858
DID External	0.002955	0.001729	0.001868	0.001947
	(0.003)	(0.003)	(0.003)	(0.003)
ymean	0.182	0.182	0.182	0.182
r2	0.051	0.007	0.009	0.009
N	77,900	77,900	77,900	77,900
Real GDP – linear specification				
Overall	-0.000014***	-0.000013***	-0.000013***	-0.000016***
	(0.000)	(0.000)	(0.000)	(0.000)
ymean	0.211	0.211	0.211	0.211
r2	0.065	0.011	0.011	0.011
N	77,858	77,858	77,858	77,858
Internal	-0.000001	-0.000003**	-0.000003**	-0.000000
	(0.000)	(0.000)	(0.000)	(0.000)
ymean	0.047	0.047	0.047	0.047
r2	0.021	0.008	0.013	0.013
N	77,858	77,858	77,858	77,858
External	-0.000015***	-0.000013***	-0.000012***	-0.000017***
	(0.000)	(0.000)	(0.000)	(0.000)
ymean	0.182	0.182	0.182	0.182
r2	0.052	0.008	0.010	0.010
N	77,900	77,900	77,900	77,900
Unemployment rate – linear specification				
Overall	0.002970***	0.002324***	0.002244**	0.001661
	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.211	0.211	0.211	0.211
r2	0.064	0.010	0.011	0.011
N	77,858	77,858	77,858	77,858
Internal	-0.000805***	0.000459	0.000588*	-0.000792*
	(0.000)	(0.000)	(0.000)	(0.000)
ymean	0.047	0.047	0.047	0.047
r2	0.021	0.008	0.012	0.013
N	77,858	77,858	77,858	77,858
External	0.004318***	0.002814***	0.002622***	0.002920**
	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.182	0.182	0.182	0.182
r2	0.052	0.008	0.009	0.009
N	77,900	77,900	77,900	77,900
Year FE	✓	✓	✓	✓
Country FE	✓	✓		
Individual controls		✓	✓	✓
Individual FE		✓	✓	✓
Regional Trends				✓

The table shows regression results from a linear probability model of receiving informal care. All models control for age, age squared, gender and wave dummies. The demographic controls include whether you live with a partner, whether you were born in the country of interview, marital status, and number of children. Education controls are indicators of secondary and tertiary education. The standard errors are clustered at the country-wave level. * $p < 0.10$, ** $p < 0.05$, ***$p < 0.01$

Table A6: Informal Care Provision: Different crisis measures

	(1)	(2)	(3)	(4)
Absolute fall in real GDP during the crisis				
DID Overall	0.00093	-0.00284	-0.00284	-0.00206
	(0.002)	(0.003)	(0.003)	(0.003)
ymean	0.352	0.352	0.352	0.352
r2	0.030	0.010	0.010	0.012
N	88,459	88,459	88,459	88,459
DID Internal	0.00110	0.00010	0.00010	0.00235***
	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.061	0.061	0.061	0.061
r2	0.002	0.016	0.016	0.016
N	88,459	88,459	88,459	88,459
DID External	0.00065	-0.00188	-0.00188	-0.00287
	(0.003)	(0.003)	(0.003)	(0.003)
ymean	0.311	0.311	0.311	0.311
r2	0.044	0.015	0.015	0.017
N	88,553	88,553	88,553	88,553
Real GDP – linear specification				
Overall	-0.00001***	-0.00002***	-0.00002***	-0.00001**
	(0.000)	(0.000)	(0.000)	(0.000)
ymean	0.352	0.352	0.352	0.352
r2	0.031	0.011	0.011	0.012
N	88,459	88,459	88,459	88,459
Internal	-0.00000	0.00000	0.00000	0.00000
	(0.000)	(0.000)	(0.000)	(0.000)
ymean	0.061	0.061	0.061	0.061
r2	0.002	0.016	0.016	0.016
N	88,459	88,459	88,459	88,459
External	-0.00001**	-0.00002***	-0.00002***	-0.00001**
	(0.000)	(0.000)	(0.000)	(0.000)
ymean	0.311	0.311	0.311	0.311
r2	0.044	0.016	0.016	0.017
N	88,553	88,553	88,553	88,553
Unemployment rate – linear specification				
Overall	0.002970***	0.002324***	0.002244**	0.001661
	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.211	0.211	0.211	0.211
r2	0.064	0.010	0.011	0.011
N	77,858	77,858	77,858	77,858
Internal	-0.000805***	0.000459	0.000588*	-0.000792*
	(0.000)	(0.000)	(0.000)	(0.000)
ymean	0.047	0.047	0.047	0.047
r2	0.021	0.008	0.012	0.013
N	77,858	77,858	77,858	77,858
External	0.004318***	0.002814***	0.002622***	0.002920**
	(0.001)	(0.001)	(0.001)	(0.001)
ymean	0.182	0.182	0.182	0.182
r2	0.052	0.008	0.009	0.009
N	77,900	77,900	77,900	77,900
Year FE	✓	✓	✓	✓
Country FE	✓	✓		
Individual controls		✓	✓	✓
Individual FE		✓	✓	✓
Regional Trends				✓

The table shows regression results from a linear probability model of receiving extra-residential informal care. All models control for age, age squared, gender and wave dummies. The demographic controls include whether you live with a partner, whether you were born in the country of interview, marital status, and number of children. Education controls are indicators of secondary and tertiary education. The standard errors are clustered at the country-wave level. * $p < 0.10$, ** $p < 0.05$, ***$p < 0.01$

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