

Elderly Care Across Europe: The Role of Formal and Informal Care in Family Decision-Making*

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Abstract

This paper studies the determinants of elderly care arrangements across Europe. To understand the factors behind the observed patterns in care provision, I model the behavior of family members when making care and employment choices as a static, non-cooperative game of complete information. I estimate this model separately for Northern, Central and Southern European countries, using data from the Survey of Health, Aging and Retirement in Europe. First, I use the model to carry out a decomposition analysis of the forces behind the variety of care arrangements across countries. These differences are largely driven by preferences, followed by wages. Next, I evaluate several policies to support care recipients and caregivers. I find that informal care subsidies constitute an effective policy alternative to mitigate the gaps in care provision and labor force participation of caregivers in the continent.

Keywords: elderly care, non-cooperative game, discrete choice, SHARE.

JEL Codes: D64, J14, J22.

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I. Introduction

Population aging is one of the most concerning challenges that countries all over the world will face in the coming years. In the European Union, the ratio of people aged 65 or above to those aged 15 to 64 increased from 25% to 29.6% between 2010 and 2016, and is projected to rise up to 51.2% by 2070. During the same period, the share of people over 65 years-old who have difficulties to carry out their daily activities due to health problems, currently set at 48.7%, is set to increase by 21% (European Commission, 2018, 2019). Therefore, the demand for elderly care is high and will likely increase in the future. Elderly care can be defined as the set of activities that aim to improve the quality of life of older adults who are not fully able to look after themselves because of terminal illness or physical and cognitive decline. This includes assistance with daily activities such as dressing, bathing, getting in and out of bed, or doing housework, among others (Clancy, Fisher, Daigle, Henle, McCarthy and Fruhauf, 2019).

Elderly care arrangements have important implications for care recipients and their families. On the one hand, the use of *formal*, paid care alternatives provided by nursing homes or professional caregivers in the home of the care recipient can place a burden on household finances in the absence of public social support schemes. On the other hand, care provided *informally* by relatives, without a contractual agreement or formal payment, may impose substantial opportunity costs in terms of time and foregone labor earnings on caregivers (Skira, 2015; Korfhage, 2019), apart from being psychologically demanding (Ory, Hoffman, Yee, Tennstedt and Schulz, 1999; Cannuscio, Jones, Kawachi, Colditz, Berkman and Rimm, 2002; Pinquart and Sörensen, 2003). The children of the care recipients represent one of the main sources of this kind of help. These are usually middle-aged individuals for whom the willingness to provide care to their parents is often in conflict with the aforementioned costs, which plays a role in their labor supply decisions. In this context, understanding how families make their care arrangements and the consequences of these for their members is relevant for the evaluation of policies aimed at supporting care recipients and their relatives.

This paper asks the following questions: what factors determine care arrangements in Europe? Why do different families make different arrangements? What are the implications of these arrangements for labor supply? What policies can mitigate the lack of care provision and the cost of caregiving in some countries compared to others? The provision of elderly care is highly differentiated across Europe. In Northern European countries, 46% of the elders with help needs receive some formal care. This percentage is much lower in Southern European countries, where these

needs are often met by the relatives of care recipients in an informal way, and the share of unattended individuals is higher than in the North.

This fact can be related to two factors. First, there is a remarkable contrast with respect to the availability and generosity of public formal care services across the continent. While public spending on long-term care is around 3% of the GDP in Northern Europe, Southern European countries devote less than 1% of their GDP to it, with Central European countries falling in the middle.

Second, social norms and family structure are different across countries, which might influence care arrangements as well. Southern European countries are often categorized as *familistic* countries, contrasted with Northern and Central European countries which have a less traditional family structure reflected in lower rates of cohabitation and contact between generations (Reher, 1998; Kohli, Kunemund and Ludicke, 2005).¹ Previous studies have found evidence of the importance of culture to explain patterns in domestic production, female labor force participation (Alesina, Algan, Cahuc and Giuliano, 2015), living arrangements (Giuliano, 2007) and other economic outcomes (Guiso, Sapienza and Zingales, 2006), including take up of long-term care insurance (Costa-Font, 2010). These aspects may favor a greater potential for informal support in Southern Europe.

On top of that, the decision to give care is connected with the labor supply decisions of the children of care recipients. Previous studies offer evidence of the negative association between giving informal care to parents and labor supply (Spiess and Schneider, 2003; Viitanen, 2005; Bolin, Lindgren and Lundborg, 2008b; Crespo and Mira, 2014). Indeed, in Southern Europe, the employment rate of adult children who provide care to their parents is considerably lower than the one of children who do not give care.

In order to understand these patterns, I propose to model the behavior of family members when making care and employment choices by means of a static, non-cooperative game of complete information. In this setup, a family is composed of an old parent and her adult children. Each child makes a decision concerning labor force participation (to be employed or not) and informal care (to give care to her

¹Leitner (2003) identifies three types of welfare regimes to classify European countries according to the social functions of the family and the state. At one end, in the *optional type* of familism regime, the state offers generous services to dependent older people through cash-for-care programs, relieving families of the responsibility to care for their parents (Denmark, Finland and Sweden). At the other end, in *implicit familism* regimes, the state neither supports family care through cash payments nor provides generous public care services. Instead, support between adult children and their parents is encouraged through a strong normative system based on filial and moral obligations (Greece, Italy, Portugal and Spain). In between, the *explicit familism* regimes assign the responsibility of providing care for the elderly to the family, to which benefits are paid and support in the form of home care is given (Austria, Belgium, France and Germany).

parent or not). If a child chooses to be employed, she earns a wage that is enjoyed as consumption. Meanwhile, the parent decides whether to receive formal care. All these choices are discrete, mutually exclusive, and are made simultaneously by players to maximize their respective payoffs, which depend on observable family characteristics, the choices of the other players, and unobservables in the form of choice-specific preference shocks. The outcome is a Nash equilibrium in which the parent may receive formal care, and/or informal care from one or several children.

I fit this model to data from the Survey of Health, Ageing and Retirement in Europe (SHARE) for years 2013 and 2015 (Waves 5 and 6), where I observe the care and employment decisions and the characteristics of old parents and their children. I take advantage of the cross-country variation offered by these data, and estimate the parameters of the model separately for three country groups: Northern, Central and Southern Europe. The estimated model replicates well the choices made by families in the three regions considered.

I use the model to carry out a decomposition analysis of the forces behind care provision and labor force participation of adult children across Europe. In the first part of this exercise, I compare the decisions simulated by the model in the baseline scenario with the ones of a counterfactual where families in Central and Southern Europe have the same preferences as families in Northern Europe. In additional simulations, I shut down other sources of differences across regions, namely wage levels, and parental health and wealth. The results indicate that the variability of care arrangements across Europe is largely driven by preferences, followed by wages, while the other two factors are less relevant. If families in Southern Europe had the same preferences as families in the North, the percentage of elders who receive care would be almost 20 points higher than in the baseline scenario, closing the original gap with Northern Europe in this dimension. Employment rates of adult children would also be higher for caregivers and non-caregivers, reaching similar levels to those of the Northern countries. To further explore the relevance of social norms as part of the preferences of the agents, I run simulations in a scenario where children have preferences over the total amount of care received by their parent and do not take the number of siblings who give care into account. By doing that, I intend to shut down feelings of guilt or views of fairness with respect to the participation of siblings in caregiving, or stigma from not giving informal care to parents. The reactions of agents in this scenario with respect to the baseline situation are moderate.

Next, I assess the effects of five policy alternatives to support care recipients and caregivers. The first of these policies consists of a non-means-tested subsidy

given to parents, regardless of their decision to receive formal care. The subsidy is made conditional on this choice in the second policy experiment. In the remaining three exercises, I distribute the subsidy among the children who provide informal care. In two of these, the subsidy is conditional on employment choices, and it is unconditional in the other one. I find that this last measure is the most effective alternative in fostering care provision, giving place to a 14.3 point increase in the percentage of parents who receive some care in Southern Europe, and contributing to closing the gap in care provision with Northern Europe. Subsidies for care recipients are less effective.

This paper contributes to the literature that studies the provision of elderly care in Europe. Previous studies document the existence of differences in care arrangements across countries with respect to the use of formal and informal care (Attias-Donfut, Ogg and Wolff, 2005; Barczyk and Kredler, 2019). Studies in this group provide evidence of varying degrees of substitutability between the two forms of care (Bonsang, 2007, 2009; Bolin, Lindgren and Lundborg, 2008a) and of differentiated labor market outcomes for informal caregivers (Crespo and Mira, 2014), and highlight the role of institutions, social norms, and family cohesion to understand these patterns (Bakx, de Meijer, Schut and van Doorslaer, 2015; Dobrescu, 2015). Nevertheless, most of these papers overlook the role of the interactions among family members in the decision-making process that determines care provision. Fontaine, Gramain and Wittwer (2009) analyze the way in which siblings interact to take care of disabled parents living within the community by estimating a two-children, discrete game model on European data. Dobrescu and Iskhakov (2013) examine the saving behavior of the elderly in Europe in a dynamic discrete choice game of incomplete information between one parent and one child. Instead, my model allows multiple children to take part in the decision-making process of the family with their parent in a static, non-cooperative game of complete information.

Other studies, concerned with the role of the family in providing elderly care in the United States, also develop and estimate models that consider the interactions between parents and their relatives (Hiedemann and Stern, 1999; Pezzin and Schone, 1999; Engers and Stern, 2002; Mommaerts, 2020; Ko, 2021). These models vary along multiple dimensions. Among these studies, my paper is most closely related to Byrne, Goeree, Hiedemann and Stern (2009). These authors estimate a static, non-cooperative model that captures the interaction between parents and multiple children in the choice between informal care and formal home care, leaving nursing home care aside. However, their model predicts too low rates of formal care use, with too many families at corner solutions, and they find no effects in

the evaluation of various policy experiments that subsidize different forms of care. My model replicates well the rates of formal and informal care use across Europe, and I find stronger reactions to care subsidies than they do. Barczyk and Kredler (2018) also evaluate several long-term care policies through the lens of a dynamic, heterogeneous-agents model with imperfectly-altruistic overlapping generations, calibrated to the US economy. They also find strong effects to care subsidies, arguing that the evaluation of these policies has to take the response of the family into account. In my paper, I consider the family margin and explore its role in the context of Europe.

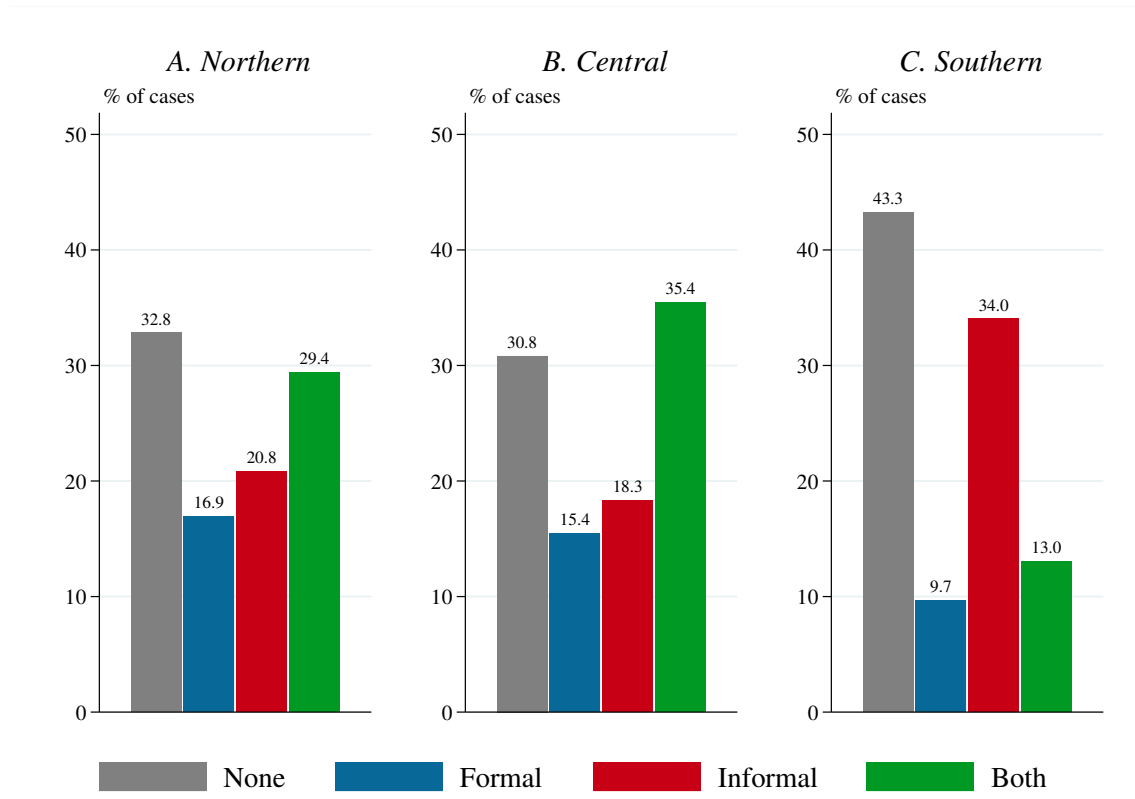
The rest of the paper is organized as follows. I present some motivating evidence on elderly care provision across Europe in Section II. I develop the model in Section III. I discuss identification and estimation in Section IV. I examine the estimates of the model and its goodness of fit in Section V. I show the results of the decomposition analysis in Section VI. Finally, I analyze the outcomes of the policy experiments before concluding in Section VIII.

II. Motivating Evidence

This section offers a general overview of the provision of elderly care across Europe, based on data from the Survey of Health, Ageing and Retirement in Europe (SHARE). My analysis focuses on eight countries that can be grouped in three regions: Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain).

Figure 1 shows the share of people aged 70 or older with difficulties to perform activities of daily living who receive only formal care, only informal care, both types of care, or no care at all in the three country groups considered. This figure represents how countries differ in the use of informal and formal care. In line with previous studies (Barczyk and Kredler, 2019), there is a North-South gradient in the use of formal care. The percentage of individuals who receive some formal care, alone or in combination with informal care, is 46.3% in Northern Europe, 50.8% in Central Europe, and 22.7% in Southern Europe. This fact can be first related to a significant degree of variety in terms of the availability and generosity of public elderly care services across the continent. As can be seen in Figure 2, governments in Northern European countries devote more resources to these services (3.2% of the GDP in Sweden, 2.5% in Denmark) than countries in the South (0.7% of the GDP in Italy and Spain), and Central European countries are in between (from 2.1% in Belgium to 1.1% in Austria). The resulting underprovision of formal care in the South may induce families in these countries to meet the needs of their

FIGURE 1: TYPE OF CARE RECEIVED BY INDIVIDUALS AGED 70 OR OLDER WITH CARE NEEDS



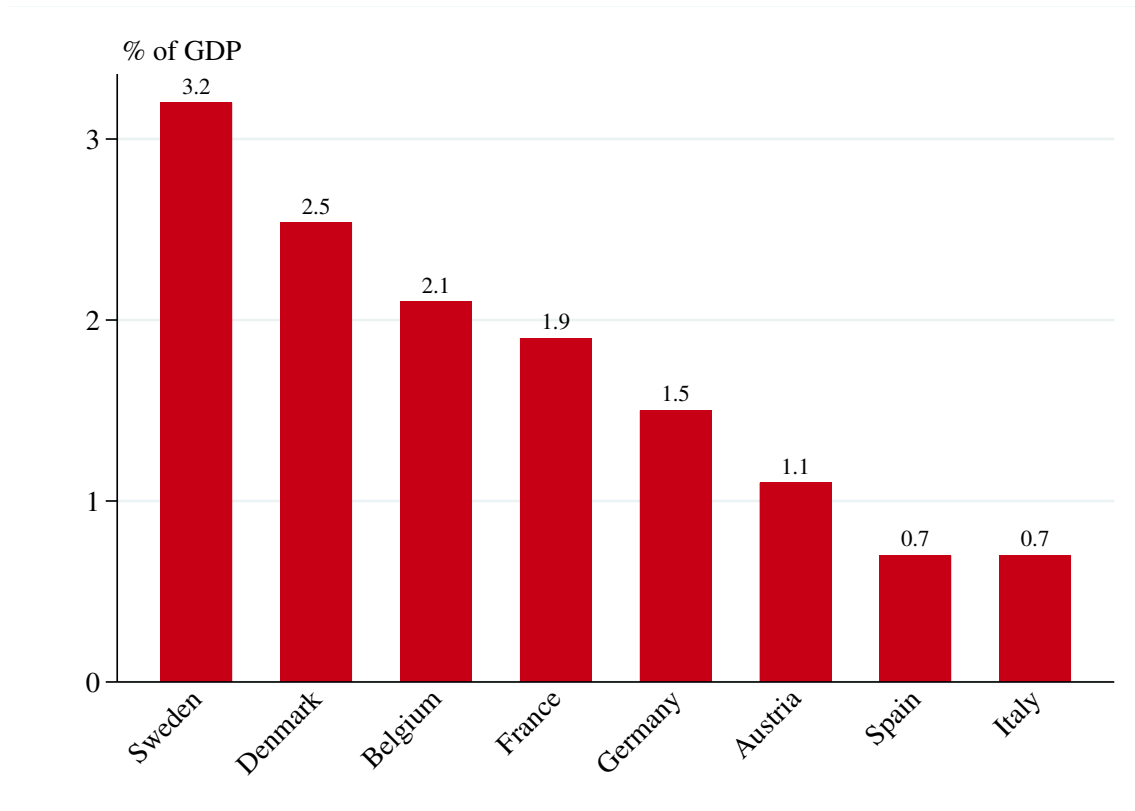
Note: The figure plots the percentage of individuals aged 70 or older with care needs and at least one child younger than 60 who receive no care, only formal care, only informal care, or both types of care in Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). *Source:* SHARE Waves 5 and 6.

parents informally, although this might be difficult for some. In the South, the use of informal care as the only means of help for the elderly is more prevalent (34% of cases) than in Northern and Central European countries (20.8% and 18.3%), where the percentage of individuals who do not receive any help is lower (32.8% and 30.8%) than in Southern countries (43.3%).

Secondly, there are differences in family structure and social norms across Europe that might also influence care arrangements. In this regard, Southern European countries are often categorized as “familistic” or “strong family” countries, contrasted with the countries in the North and the Center of Europe, with a less traditional family structure.² This gradient is noticeable with respect to rates of co-residence and frequency of contact between generations. In Southern Europe,

²Reher (1998) claims that the strength of family ties in Europe “refers to cultural patterns of family loyalties, allegiances, and authorities which are reflected in demographic patterns of coresidence with adult children and older family members”.

FIGURE 2: PUBLIC LONG-TERM CARE SPENDING AS A SHARE OF GDP (2017 OR NEAREST YEAR)

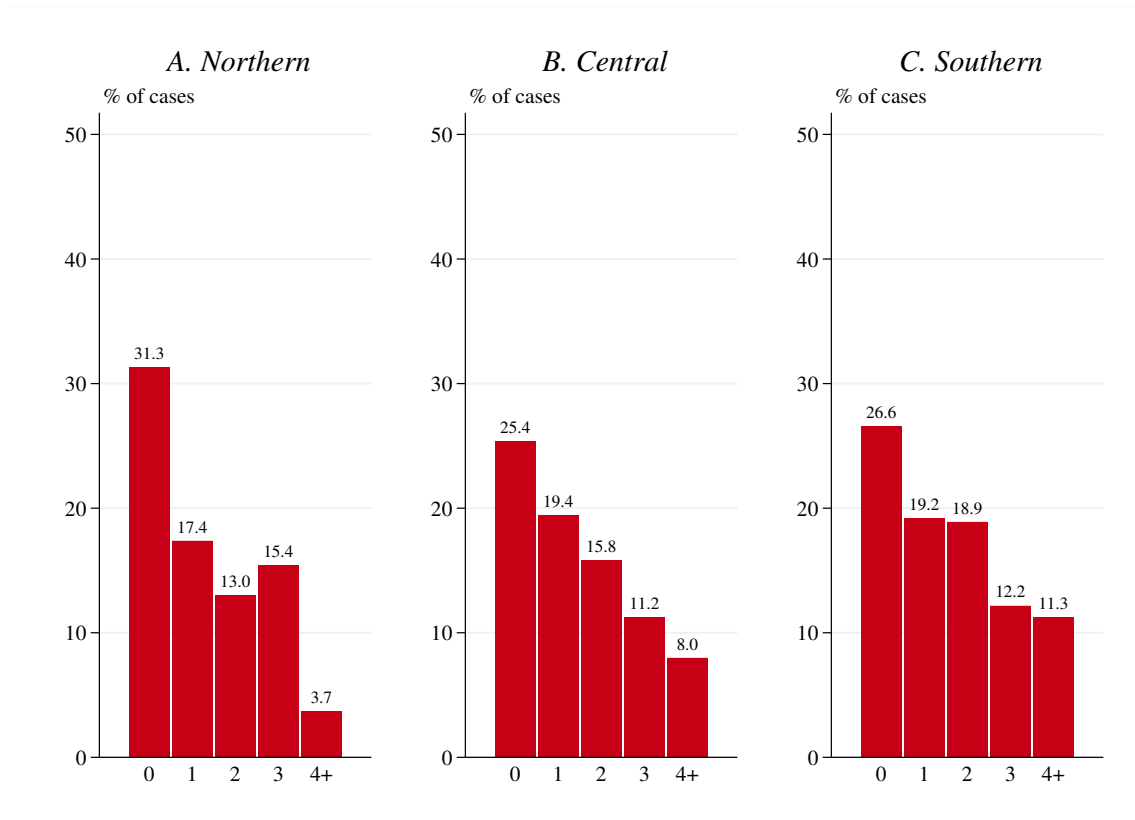


Note: Long-term care expenditure (health and social components) by government and compulsory insurance schemes. *Source:* OECD (2019).

the percentage of parents aged 60 and older who live with at least one child in the household is around 30%, while in Northern Europe this only nudges 2.5% (Kohli et al., 2005).

The aforementioned circumstances favor a greater potential for support from children to parents in the South, where the share of old parents who receive care from their children is higher than in the North and the Center (see Figure A1). Children are indeed the most common source of informal care (see Figure A3), and their role as caregivers is influenced by the structure of their families and the interactions among their members. In this sense, Figure 3 illustrates one of the aspects in which the decision to care for parents varies across families. According to this figure, the probability of engaging in care provision decreases in family size. It is highest in Northern Europe for children without siblings (31.3%) and lowest for children with four or more siblings (3.7%). This pattern of specialization is common across regions, but is somewhat less pronounced in Southern Europe, where the likelihood of giving care is 15.3 points higher for an only child than for a person

FIGURE 3: PROBABILITY OF GIVING INFORMAL CARE TO PARENTS BY NUMBER OF SIBLINGS



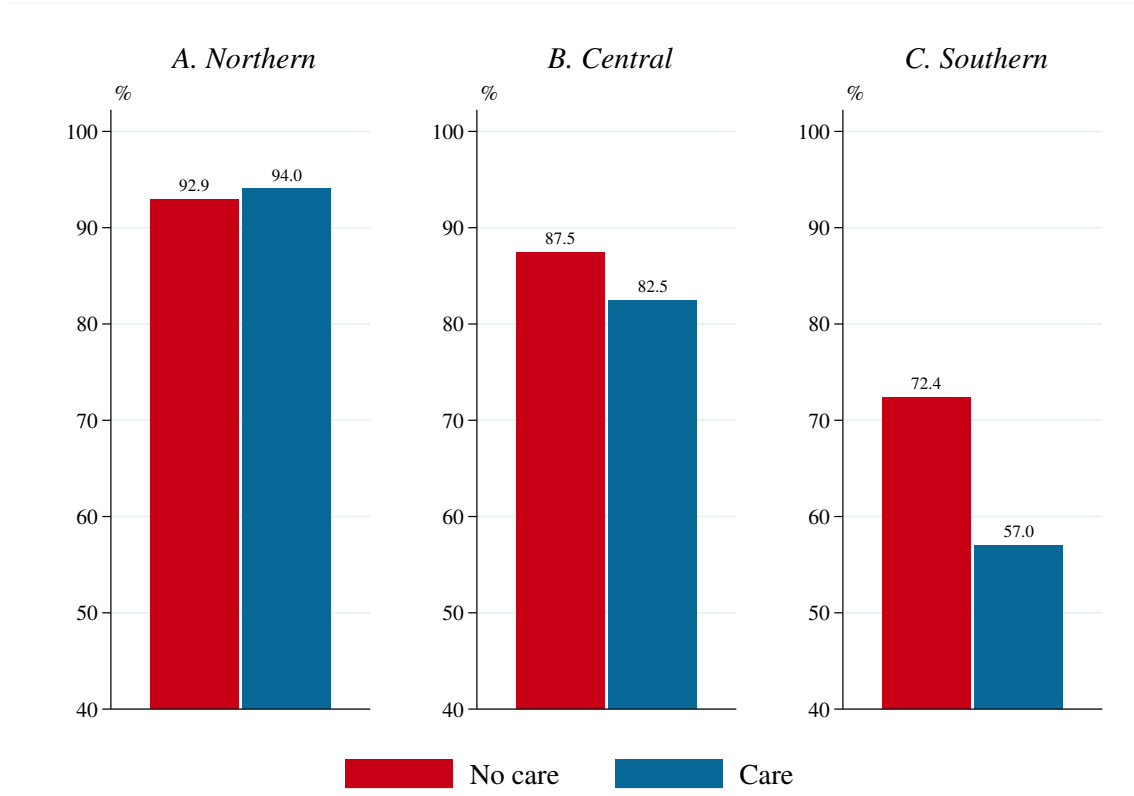
Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and give informal care to her, by number of siblings (from 0 to 4 or more). The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). *Source:* SHARE Waves 5 and 6.

with four or more siblings.

The decision to give care to parents is also connected with labor supply. Figure 4 sheds light on how this relationship differs across countries. In Central and Southern European countries, individuals who give informal care to their parents are less likely to be employed than those who do not give any help. This gap is bigger in the South, and contrast with the situation in Northern Europe, where the employment rate of caregivers even surpasses the one of non-caregivers. It is possible to find differences in the intensive margin as well, as shown in Figure A8.

Appendix A presents further evidence on the existing disparities in care arrangements across Europe, and how they manifest separately for men and women.

FIGURE 4: EMPLOYMENT STATUS OF CHILDREN AND INFORMAL CARE GIVEN TO PARENTS



Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and are employed or non-employed while giving informal care or no care at all. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). *Source:* SHARE Waves 5 and 6.

III. Model

The model is a static, non-cooperative game of complete information which features family members making simultaneous decisions. The decision makers are an old parent and her working-age children.³ Each child decides whether to be employed and whether to give informal care to her parent. If she chooses to be employed, she earns a wage that is enjoyed as consumption. Meanwhile, the parent decides whether to receive formal care. All these choices are discrete, mutually exclusive, and are made by players to maximize their respective payoffs. These payoffs depend on a set of observables representing family characteristics and the outcomes of the behavior of the other players. They also depend on unobservables in the form of choice-specific preference shocks that are known by all the players. They make

³The use of female pronouns from now on does not mean that only mothers receive care or that only daughters provide care. Instead, I use female pronouns as generic pronouns.

their decisions simultaneously, reaching a Nash equilibrium in which the parent may receive formal care, and/or informal care from one or several children.

Agents in this model face a number of trade-offs. On the one hand, the employment and informal care decision of each child maps into a number of hours worked and a number of hours of care. The number of hours worked, together with wages, determine the labor earnings of this child, which she consumes. By giving informal care, this child will not be able to work as many hours as if she does not give care, so her labor earnings will be lower. Moreover, her decision will consider the behavior of her parent and siblings with respect to caregiving. This interactions will be influenced by several factors. For instance, caregiving may be more burdensome for some children than for others, while the opportunity cost in terms of forgone labor earnings may vary across them. On the other hand, the parent can choose to receive formal care, which can be combined with the help received from children, although she may prefer to be assisted only by her children.

A. Choices

In this model, a family is composed of a parent and her children. The children, indexed by $i = 1, 2, \dots, N$, make simultaneous decisions that concern their employment status and the provision of informal care for her parent. Let a_i denote the choice or action of child i . Each child can choose among four mutually exclusive alternatives: to be non-employed and give her parent no informal care, $a_i = \text{NENC}$; to be employed and give her parent no informal care, $a_i = \text{ENC}$; to be non-employed and give informal care, $a_i = \text{NEIC}$; and to be employed and give informal care, $a_i = \text{EIC}$. Therefore, the set of choice alternatives of a child is $\mathcal{A}_i \equiv \{\text{NENC}, \text{ENC}, \text{NEIC}, \text{EIC}\}$. The actions of all the children in the family are collected by vector $\mathbf{a} \equiv (a_1, \dots, a_N)$, which is an element of $\mathcal{A} \equiv \mathcal{A}_1 \times \dots \times \mathcal{A}_N$.

At the same time, the parent makes a formal care decision. Let b denote her choice concerning formal care, which can be either to receive formal care, $b = \text{FC}$; or not, $b = \text{NFC}$. Thus, the parent's action set is $\mathcal{B} \equiv \{\text{NFC}, \text{FC}\}$. The actions of all the family members are collected by vector $\mathbf{d} \equiv (\mathbf{a}, b)$, which takes values in set $\mathcal{D} \equiv \mathcal{A} \times \mathcal{B}$.

B. Preferences

Each child draws utility from consumption and the chosen combination of employment status and informal care. I assume that child i 's utility is linear and additively separable between an observable and an unobservable component. In particular, the

utility of choosing action a is

$$U_{ia} = \alpha_a(\mathbf{x}) + \beta C_i(\mathbf{d}, \mathbf{x}) + \epsilon_{ia}, \quad (1)$$

where $\alpha_a(\mathbf{x})$ is meant to capture the preferences of the child over combinations of elderly care and employment status, given the set $\mathbf{x} \in \mathcal{X}$ of observable characteristics in the family. I model this as

$$\begin{aligned} \alpha_a(\mathbf{x}) = & \alpha_{0a} + \alpha_{1a} \sum_{\ell \neq i} I_\ell(\mathbf{d}, \mathbf{x}) + \alpha_{2a} \sum_{\ell \neq i} \mathbb{1}\{I_\ell(\mathbf{d}, \mathbf{x}) = 0\} + \alpha_{3a} F(\mathbf{d}, \mathbf{x}) + \alpha_{4a} H \\ & + \alpha_{5a} \text{widow} + \alpha_{6a} \text{near}_i + \alpha_{7a} \text{female}_i + \alpha_{8a} \text{children}_i + \alpha_{9a} \text{married}_i, \end{aligned} \quad (2)$$

a choice-specific linear index which depends on the number of hours $\sum_{\ell \neq i} I_\ell(\mathbf{d}, \mathbf{x})$ of informal care given by the siblings, the number of siblings $\sum_{\ell \neq i} \mathbb{1}\{I_\ell(\mathbf{d}, \mathbf{x}) = 0\}$ who do not give care to the parent, the number of hours $F(\mathbf{d}, \mathbf{x})$ of formal care that the parent receives, the parent's health status H , and dummies for the parent being widowed, and child i living less than 25 kilometers away from her, gender, having children, and being married. I assume that all these elements, except for the hours of care and the number of siblings who do not give care, are exogenous.⁴

$C_i(\mathbf{d}, \mathbf{x})$ denotes the consumption level of child i when the family is playing outcome \mathbf{d} . Consumption is given by

$$C_i(\mathbf{d}, \mathbf{x}) = w(\mathbf{z}_i) N_i(\mathbf{d}, \mathbf{x}), \quad (3)$$

where $w(\mathbf{z}_i)$ is the hourly wage offer for child i . This is a function of the observable, individual characteristics collected in \mathbf{z}_i , a subset of \mathbf{x}_i . $N_i(\mathbf{d}, \mathbf{x})$ is the number of hours worked by i , which is determined by her choice a_i as part of \mathbf{d} . ϵ_{ia} is a choice-specific, random preference shock that is common knowledge to all the family members, but unobserved for the econometrician. I assume that this preference shock is independent and identically distributed (i.i.d.) with probability density function g_{ϵ_i} .

The parent has linear and additively separable preferences over several sources

⁴I consider that parental health is exogenous and independent of whether or not the parents receive care. I make this assumption because, in contrast to other forms of care, elderly care is concerned with the ability to carry out basic, daily activities. Thus, children may benefit from this form of care because it enhances the well-being of their parents, rather than improving their health. Earlier research has shown that receiving care has no effect on mortality (Applebaum, Christianson, Harrigan and Schore, 1988), and it has only a small impact on health overall, suggesting that earlier investments are much more relevant for the determination of the health stock (Finkelstein and McKnight, 2008).

of care. Her choice-specific utility is

$$V_b = \delta_{0b} + \delta_{1b} \sum_{i=1}^N I_i(\mathbf{d}, \mathbf{x}) + \delta_{2b} \mathbb{1} \left\{ \sum_{i=1}^N I_i(\mathbf{d}, \mathbf{x}) > 0 \right\} + \delta_{3b} \text{spouse} + \delta_{4b} \text{others} \\ + \delta_{5b} \text{widow} \times \text{male} + \delta_{6b} \text{widow} \times \text{female} + \delta_{7b} W + \zeta_b, \quad (4)$$

where $\sum_{i=1}^N I_i(\mathbf{d}, \mathbf{x})$ is the number of hours of informal care given by the children, followed by an indicator function that takes value one if this number is larger than zero. Utility depends on other sources of informal care as well, through dummies for care given by a spouse and other sources. While the informal care given by the children depends on the decisions that these make in the model, the informal care given by partners and other potential caregivers is exogenous.

I also allow preferences over formal care to differ between married and widowed parents, with gender-specific shifters. W represents the value of wealth owned by the parent. This is to consider, in a simplified way, how the parent enjoys her wealth, and so the fact that wealthier parents may be able to obtain more formal care and leave larger bequests to their children. ζ_b is an i.i.d., choice-specific preference shock that is common knowledge to all the family members, but unobserved for the econometrician.⁵ It is jointly distributed with the shocks of the children with density $g_{\epsilon, \zeta}(\boldsymbol{\epsilon}, \zeta) = \prod_{i=1}^N g_{\epsilon_i} g_{\zeta}$.

C. Equilibrium

Let $\mathbf{U}_i = (U_i(\mathbf{d}, \mathbf{x}, \epsilon_i))_{\mathbf{d} \in \mathcal{D}}$ and $\mathbf{V} = (V(\mathbf{d}, \mathbf{x}, \zeta))_{\mathbf{d} \in \mathcal{D}}$ be vectors collecting the payoffs of child i and the parent, respectively, for each possible outcome $\mathbf{d} \in \mathcal{D}$ of the game. Matrix $\mathbf{U} = (\mathbf{U}_1, \dots, \mathbf{U}_N, \mathbf{V})$ gathers these vectors. Given their knowledge about the observable characteristics in \mathbf{x} and the preference shocks $(\boldsymbol{\epsilon}, \zeta)$, the parent and each child take a discrete action simultaneously in order to maximize their respective payoffs. Let σ_i be a strategy of child i , and π a strategy of the parent. Then, a strategy vector $(\sigma_1^*, \dots, \sigma_N^*, \pi^*) \equiv (\boldsymbol{\sigma}^*, \pi^*)$ is a Nash equilibrium if and only if each player's strategy is a best response, that is, if for every $i \in N$ and every possible

⁵An alternative formulation of the problem might consider that the parent derives utility from consumption and hours of formal care, and decides how to distribute her assets between these two by making her choice on whether to buy formal care. In this case, her choice-specific utility could be written as $V_b = \gamma C(\mathbf{d}, \mathbf{x}) + \eta F(\mathbf{d}, \mathbf{x}) + \delta_{1b} \sum_{i=1}^N I_i(\mathbf{d}, \mathbf{x}) + \delta_{2b} \mathbb{1} \left\{ \sum_{i=1}^N I_i(\mathbf{d}, \mathbf{x}) > 0 \right\} + \delta_{3b} \text{spouse} + \delta_{4b} \text{others} + \delta_{5b} \text{widow} \times \text{male} + \delta_{6b} \text{widow} \times \text{female} + \zeta_b$, and her budget constraint as $C(\mathbf{d}, \mathbf{x}) + qF(\mathbf{d}, \mathbf{x}) = W$, with $\delta_{1b}, \dots, \delta_{6b}$ normalized to zero for $b = \text{NFC}$, and $C(\mathbf{d}, \mathbf{x})$ being the consumption level enjoyed when the family plays outcome \mathbf{d} , $F(\mathbf{d}, \mathbf{x})$ the number of hours of formal care that she decides to buy, and q the price of formal care. However, wealth would not play any role in the choice to buy formal care, since $V_{\text{FC}} - V_{\text{NFC}} = (\eta - \gamma q)F(\mathbf{d}, \mathbf{x}) + \delta_1 \sum_{i=1}^N I_i(\mathbf{d}, \mathbf{x}) + \delta_2 \mathbb{1} \left\{ \sum_{i=1}^N I_i(\mathbf{d}, \mathbf{x}) > 0 \right\} + \delta_3 \text{spouse} + \delta_4 \text{others} + \delta_5 \text{widow} \times \text{male} + \delta_6 \text{widow} \times \text{female} + \zeta_{\text{FC}} - \zeta_{\text{NFC}}$.

strategy,

$$\begin{aligned} U_i(\boldsymbol{\sigma}^*, \pi^*, \mathbf{x}, \epsilon_i) &\geq U_i(\sigma_i, \boldsymbol{\sigma}_{-i}^*, \pi^*, \mathbf{x}, \epsilon_i) \\ V(\boldsymbol{\sigma}^*, \pi^*, \mathbf{x}, \zeta) &\geq V(\boldsymbol{\sigma}^*, \pi, \mathbf{x}, \zeta), \end{aligned} \quad (5)$$

where $\boldsymbol{\sigma}_{-i}^*$ collects the best response of all the children in the family except for i .

IV. Identification and Estimation

This section provides a brief description of the data and variables used in the model. It also presents the main identification arguments and estimation procedure.

A. Sample selection and variable definitions

I estimate the model using individual-level data from Waves 5 and 6 of SHARE, spanning eight countries (Austria, Belgium, Denmark, France, Germany, Italy, Spain, and Sweden) in years 2013 and 2015. I target families where at least one of the parents is retired, older than 70, has one or more limitations to perform activities of daily living, and whose children are younger than 60.⁶ I obtain this information from the sample of survey respondents who are potential care recipients and provide information about their children.

Each observation in my sample is a child-parent dyad when the survey interview was conducted. All the dyads which share the same parent constitute a family f playing a game. For each dyad, I observe the employment and care decisions made by each child and the parent, represented by a_{if} and b_f , respectively, as well as the vector of family characteristics \mathbf{x}_f that are part of the child's and the parent's utility.

I measure the health status of the parent following Ko (2021), using information available in SHARE about limitations with activities of daily living (ADL) and cognitive impairment.⁷ Survey respondents take word recall, orientation, and numeracy tests to assess their cognitive abilities. Using the scores from these tests, I categorize a respondent as cognitively impaired if she is in the bottom 10% of the cognitive score distribution of the sample. Next, I classify an individual as having light care needs if she has difficulties with three or less ADLs and is not cognitively impaired, and as having severe care needs if she has more than three ADLs or cognitive im-

⁶I exclude children who are older than 60 to lessen the concerns about simultaneous retirement and caregiving decisions.

⁷Activities of daily living include dressing, bathing/showering, eating/cutting up food, walking across a room, getting in/out of bed, and using the toilet.

pairment. Thus, H_f in the child’s utility function is a dummy that takes value 1 if the parent has severe care needs.

My measure of parental wealth W_f , also included in \mathbf{x}_{if} , comes from the value of all financial and real assets of the respondent, net of debts and liabilities, and adjusted for constant PPP exchange rates to allow for comparison across countries and over time. I divide this amount, which represents the total stock of wealth that the parent has at the moment, by the number of weeks that she is expected to live according to national life expectancy at age 65. I use these “weekly assets” in the model as a way to incorporate consumption smoothing and account for the possibility that older or wealthier parents may run down their assets at a different rate than younger or poorer ones.

In the model, the choice set concerning the child’s informal care decision contains two alternatives: to give informal care, and not to give informal care. In the data, I consider that a child gives informal care if she helped her parent with personal care (dressing, bathing or showering, eating, getting in or out of bed, using the toilet), practical household help (home repairs, gardening, transportation, shopping, household chores), or help with paperwork (filling out forms, settling financial or legal matters) in the twelve months before the interview. An analogous definition applies to the informal care supplied by the spouse of the care recipient and other informal helpers such as siblings, children-in-law or friends.

The parent in the model can choose between two alternatives: to receive formal care or not. In the data, I consider that a respondent receives formal care if she stayed in a nursing home or a residential care facility, or received professional care, help with domestic tasks or meals-on-wheels at home in the twelve months before the interview.

The decision of child i to give informal care, and the one of the parent to receive formal care, map to a number of hours $I_i(\mathbf{d}, \mathbf{x})$ of informal care given and a number of hours $F(\mathbf{d}, \mathbf{x})$ of formal care received that depend on individual and family characteristics in \mathbf{x} . Since there is no information about hours of care in Waves 5 and 6 of SHARE, I impute these using data from Waves 1 and 2, as explained in Appendix B.

B. Hours worked and wages

In terms of employment, a child in the model has two options: to be employed or to be non-employed. This choice corresponds to a number of hours worked $N_i(\mathbf{d}, \mathbf{x})$ that depends on individual characteristics in \mathbf{x} and the decision to give informal

care. In particular,

$$N_i(\mathbf{d}, \mathbf{x}) = \begin{cases} \tilde{N}_i(\mathbf{d}, \mathbf{x}) & \text{if } a_i = \text{ENC}, \\ \tilde{N}_i(\mathbf{d}, \mathbf{x}) - I_i(\mathbf{d}, \mathbf{x}) & \text{if } a_i = \text{EIC}, \\ 0 & \text{otherwise,} \end{cases} \quad (6)$$

where $\tilde{N}_i(\mathbf{d}, \mathbf{x})$ is the potential number of hours that i could work.

The data gathered by SHARE allows me to categorize the children of survey respondents as employed or non-employed, but there is no information on the number of hours worked by them. To overcome this limitation, I impute $\tilde{N}_i(\mathbf{d}, \mathbf{x})$ using data on hours worked from the European Union Statistics on Income and Living Conditions (EU-SILC). Targeting individuals aged between 30 and 60 in the countries and years studied, I regress the logarithm of hours worked on a second order polynomial of age, and dummies for gender and having college education. Table C1 shows the estimated coefficients.

I assume that wage offers w_{if} depend on a set \mathbf{z}_{if} of observable characteristics of child i in family f and are measured with error ξ_{if} , such that

$$\ln w_{if} = \mathbf{z}_{if}' \boldsymbol{\lambda} + \xi_{if}, \quad (7)$$

similar to Mincer (1974), with ξ_{if} being i.i.d. normal. Since SHARE does not report the wages of the children of survey respondents, I use EU-SILC data on employees' gross earnings from hours usually worked per week in the main job for the set of countries and years studied. Since I can only observe the wages of employed individuals in this dataset, I follow standard arguments in the literature to correct for self-selection bias (Heckman, 1974, 1979) in the estimation of $\boldsymbol{\lambda}$. In particular, \mathbf{z}_{if} consists of a quadratic in child i 's age, and dummies for gender, and college education. The marital status of the child and whether she has children act as exclusion restrictions for identification, since these aspects affect the utility associated with employment and care choices, but not wages. Table C2 displays the estimated coefficients.

C. Preferences

To estimate child i 's preferences over employment and care alternatives, I assume that the unobservables $\epsilon_i(a)$ for $i = 1, \dots, N$ and $\zeta(b)$ are independent and identically distributed as type-I extreme value. All the parameters in $\boldsymbol{\alpha}(\mathbf{d}, \mathbf{x})$, as defined in Equation 2, are choice-specific, and I normalize to zero the ones corresponding

to action $a_i = \text{NENC}$. In the parent's utility function, I also normalize to zero the parameters associated to $b = \text{NFC}$.

Let $\boldsymbol{\theta} \in \mathbb{R}^{39}$ be the vector that collects the parameters in $\boldsymbol{\alpha}(\mathbf{d}, \mathbf{x})$, together with $\beta, \delta_0, \delta_1, \delta_2, \delta_3, \delta_4, \delta_5, \delta_6$ and δ_7 . I estimate $\boldsymbol{\theta}$ by maximum simulated likelihood (MSL), using the probability distribution of the possible outcomes $\mathbf{d} \in \mathcal{D}$ of the game, conditional on the observables \mathbf{x}_f . Since these probabilities do not have a closed form, I approximate them numerically by making R independent draws of the unobservables, denoted by $(\boldsymbol{\epsilon}_f^{(r)}, \zeta_f^{(r)})$, for $r = 1, \dots, R$. With these draws, I simulate the game played by each family in the data, and obtain a Nash equilibrium in pure strategies.^{8,9} Let $\Pr(\mathbf{d}|\mathbf{x}_f; \boldsymbol{\theta}, \boldsymbol{\epsilon}_f^{(r)}, \zeta_f^{(r)})$ be the probability that family f plays outcome \mathbf{d} in equilibrium, given a value of $\boldsymbol{\theta}$, and the error draws $\boldsymbol{\epsilon}_f^{(r)}$ and $\zeta_f^{(r)}$. I obtain an estimate $\widetilde{\Pr}(\mathbf{d}|\mathbf{x}_f; \boldsymbol{\theta}, \boldsymbol{\epsilon}_f^{(r)}, \zeta_f^{(r)})$ of this probability by means of a flexibly specified logit model where the outcome of the game is assumed to depend on a polynomial of characteristics of the family.¹⁰ Averaging over draws, the simulated probability that family f plays outcome \mathbf{d} is

$$\widehat{\Pr}(\mathbf{d}|\mathbf{x}_f; \boldsymbol{\theta}) = \frac{1}{R} \sum_{r=1}^R \widetilde{\Pr}(\mathbf{d}|\mathbf{x}_f; \boldsymbol{\theta}, \boldsymbol{\epsilon}_f^{(r)}, \zeta_f^{(r)}). \quad (8)$$

Thus, the MSL estimator $\hat{\boldsymbol{\theta}}_{\text{MSL}}$ maximizes the log-likelihood

$$\widehat{\mathcal{L}}(\boldsymbol{\theta}) = \sum_{f=1}^F \hat{\ell}_f(\boldsymbol{\theta}) = \sum_{f=1}^F \sum_{\mathbf{d} \in \mathcal{D}_f} \mathbb{1}\{\mathbf{d}_f = \mathbf{d}\} \ln \widehat{\Pr}(\mathbf{d}|\mathbf{x}_f; \boldsymbol{\theta}), \quad (9)$$

where $\hat{\ell}_f(\boldsymbol{\theta})$ is the likelihood contribution of family f .¹¹

I apply the above estimation algorithm separately to the samples of families with three or fewer children in Northern, Central, and Southern Europe, which consist

⁸I simulate the game played by each family in the data by means of the Python interface of the Gambit library (McKelvey, McLennan and Turocy, 2014). This software computes the Nash equilibria of any finite, non-cooperative game using algorithms based on McKelvey and McLennan (1996).

⁹I focus on equilibria in pure strategies because mixed strategies lack empirical support in the situation described by my model. One could then be concerned about the possibility that some families may not have any equilibrium in pure strategies, but this happens in less than 1% of the games that I simulate.

¹⁰The polynomial of family characteristics contains the value of weekly assets of the parent, quadratics in the ages of the children, dummies for the parent having severe care needs, being widowed, interactions between assets and the other variables, and an intercept.

¹¹Theoretically, the game could exhibit multiple equilibria at some realizations of $\boldsymbol{\theta}, \boldsymbol{\epsilon}$ and ζ . In case of multiplicity, I assume that all the possible equilibria are equally likely. This approach could be extended by estimating the probability of playing each equilibrium as a function of covariates, as part of the overall likelihood function. Thus, this equilibrium selection mechanism can be seen as a simplified version of the one proposed by Bjorn and Vuong (1984) in the context of labor force participation in the household, further explored by Tamer (2003) and Bajari et al. (2010).

of 708, 2,349 and 2,393 families, respectively. As Table B5 shows, these families represent 88.6% of the initial sample in Northern Europe, 86.6% in Central Europe, and 83.2% in Southern Europe. I feed the optimization algorithm with the estimates of θ from a version of the model with no interactions among family members as initial guess, and use 50 draws of the unobservables in the simulations.

V. Estimation Results and Model Fit

Tables 1 and 2 report the parameter estimates of the preferences of the child and the parent. The three sets of coefficient values aim to capture the influence of different family characteristics, institutions and social norms in the provision of elderly care across Europe.

TABLE 1: CHILD'S PARAMETER ESTIMATES

β	Northern			Central			Southern		
	ENC	NEIC	EIC	ENC	NEIC	EIC	ENC	NEIC	EIC
α_0 : Constant	0.393	-4.016	-1.602	0.513	-3.588	-1.373	0.122	-3.154	-2.774
α_1 : Hours of informal care from siblings	-0.052	0.040	0.227	-0.062	0.107	0.101	-0.027	0.062	0.063
α_2 : Number of siblings who do not give care	-0.013	-0.325	-0.708	-0.014	-0.337	-0.601	-0.034	-0.445	-0.608
α_3 : Hours of formal care	-0.002	-0.007	0.000	-0.000	0.002	0.003	0.002	0.001	0.002
α_4 : Severe care needs	0.075	0.453	0.036	0.067	0.333	-0.295	-0.181	0.481	0.046
α_5 : Parent is widowed	-0.128	1.206	0.524	-0.590	0.160	0.122	-0.189	0.202	0.368
α_6 : Near dummy	0.185	1.792	1.529	0.037	2.256	1.214	-0.271	1.069	0.830
α_7 : Female dummy	-0.520	-0.033	-0.256	-0.243	0.802	0.373	-0.722	1.069	0.738
α_8 : Children dummy	1.257	2.107	1.241	0.147	-0.088	-0.132	-0.096	0.002	-0.059
α_9 : Married dummy	0.355	-1.347	-0.018	0.238	-0.038	-0.056	0.559	0.195	0.222

Note: The choice alternatives are *non-employment and no care* (NENC; base category), *employment and no care* (ENC), *non-employment and informal care* (NEIC), and *employment and informal care* (EIC). Columns 2-4 report the choice-specific parameters estimated for Northern Europe, columns 5-7 the ones for Central Europe, and columns 8-10 the ones for Southern Europe. Standard errors to be computed.

In the upper panel of Table 1, the child's marginal utility of consumption is positive, as expected, and slightly higher in Southern Europe than in Northern and Central Europe. In the lower panel, the estimates associated to the choice alternatives of the children illustrate how they respond to the needs of their parents. According to the values estimated for α_0 , remaining non-employed and becoming a caregiver is the least preferred option in the three country groups. This is an adult, unmarried male who does not have children. His parent, who is married and has light care needs, does not receive any formal care, lives more than 25 kilometers away, and there are not siblings involved in caregiving. This individual would be

better off in case he was employed, and there is a number of circumstances that can attenuate the burden of being the only caregiver in the family.

Consistent with previous studies (Ko, 2021) and reduced-form evidence in Table A4, the disutility from providing care is lower for children who live with their parents or nearby. Being married also reduces this cost in Southern Europe. Although married children might provide fewer hours of help (Sloan, Picone and Hoerger, 1997) and less effective care (Byrne, Goeree, Hiedemann and Stern, 2009) than their unmarried counterparts, the efficiency gains from household production of the former might save some time.

The disutility from providing care decreases in the presence of own children as well, except for caregivers in Central Europe and employed caregivers in this region and Southern Europe. For some families, greater contact with parents due to the grandparenting role (Kalmijn and Dykstra, 2006) and the possibility that grandchildren participate in caregiving might outweigh the “sandwich generation” effect (Železná, 2016; Albertini, Tur-Sinai, Lewin-Epstein and Silverstein, 2022), when childcare competes with elderly care.

Preferences over employment and care vary across child’s gender and parental health, too. The utility of providing care is higher for women than for men, except in Northern Europe. This is in line with Figures A7 and A9 and previous studies (Engers and Stern, 2002; Checkovich and Stern, 2002; Byrne, Goeree, Hiedemann and Stern, 2009; Ko, 2021) that show that daughters are more likely than sons to give care. Parents with worse health and more difficulties to perform daily activities demand more attention, which reflects in a higher utility for giving care, as pointed out by Table A4 and found in earlier work (Sloan, Picone and Hoerger, 1997; Checkovich and Stern, 2002; Byrne, Goeree, Hiedemann and Stern, 2009; Skira, 2015; Ko, 2021), except for employed caregivers in Central Europe.

The presence of alternative sources of care is another factor that influences the preferences of the child. The values estimated for α_1 and α_2 imply that the participation of siblings in caregiving increases the utility from providing care. The possibility of distributing the care burden over family members, or the will to stay away from guilt may work against children’s incentives to free-ride on one another and in favor of shared caregiving. Meanwhile, formal care seems to have a small impact on the utility of becoming a caregiver, being negative for non-employed caregivers in Northern Europe and positive for employed caregivers in this region and for both groups in Central and Southern Europe. Earlier literature has found that informal care is a substitute of formal care (Pezzin and Schone, 1999; Van Houtven and Norton, 2004, 2008; Bolin, Lindgren and Lundborg, 2008a), but this substitu-

tion effect tends to diminish as the needs of the elderly rise and the level of skill required to meet these demands advances (Bonsang, 2009).

TABLE 2: PARENTS' PARAMETER ESTIMATES

	Northern	Central	Southern
δ_0 : Constant	-1.094	-1.064	-1.760
δ_1 : Hours of informal care from children	0.003	0.024	0.025
δ_2 : At least one child gives some care (dummy)	0.639	0.647	-0.034
δ_3 : Informal care from the spouse (dummy)	0.719	1.166	0.530
δ_4 : Informal care from other sources (dummy)	0.556	0.512	0.596
δ_5 : Widowed male	1.070	0.688	0.697
δ_6 : Widowed female	1.241	1.243	0.327
δ_7 : Wealth	0.00005	0.00005	0.00004

Note: Standard errors to be computed.

Given that I normalize the parent's utility from receiving no formal care to zero, the negative estimate of δ_0 in Table 2 indicates that she dislikes formal care, which is consistent with findings in earlier studies (Barczyk and Kredler, 2018; Mommaerts, 2020; Ko, 2021). Informal care can mitigate this negative effect, though. Care recipients might not only prefer their children, spouses, and other relatives as caregivers, but these may also be better informed about their care needs. This is especially true for highly handicapped individuals, for whom informal care often acts as a complement rather than a substitute of formal care (Bonsang, 2009).

The choice-specific estimates of α_5 in the child's preferences and δ_5 and δ_6 in the parent's imply that there are stronger incentives to give informal care and buy formal care when the parent is widowed. Presumably, widowed parents require more attention than their married counterparts because they are generally older and in worse health. Additionally, these incentives change slightly depending on the gender of the care recipient. With the exception of Southern Europe, widowed mothers benefit more from formal care than widowed fathers do. These findings agree with reduced-form evidence in Tables A3 and A4.

The estimates of the marginal utility of wealth are positive, and slightly higher in Northern and Central Europe than in Southern Europe.

To evaluate the goodness of fit of the estimated model, Figures D1, D2 and D3 compare the elderly care arrangements and employment choices of children in the

estimation sample with those obtained in model simulations. The model is able to reproduce both the ranking of alternative sources of care and their magnitudes, as well as the probability of giving informal care to parents across family size, and employment rates across caregiving status.

VI. Decomposition Analysis

Differences in institutions, social norms and family characteristics contribute to the variety of care arrangements observed across Europe. To better understand the role of these factors, I use the estimated model to carry out a decomposition analysis based on counterfactual simulations.

The first of these exercises aims at quantifying the importance of preferences in driving care arrangements. In the model, preference parameters capture the influence of institutions and social norms, among other factors. In this exercise, I simulate the decisions made by families in Central and Southern Europe after setting their preference parameters equal to the ones estimated for Northern Europe.

Next, to further explore the relevance of social norms, I run simulations in a scenario where children assign the same value to one hour of informal care by their siblings and one hour of formal care, and do not take the number of siblings who do not give care into account. This way I intend to reproduce a scenario where children are not driven by feelings of guilt with respect to what their siblings do, views of what constitutes a normal or fair care arrangement, or stigma from not giving informal care to parents.

The model also allows me to assess the effect of other aspects in which European regions are also heterogeneous, such as wages, and levels of parental health and wealth. To remove these differences across country groups, I predict counterfactual values of these variables in Central and Southern Europe, matching individuals living in these regions with their nearest neighbors from Northern Europe.¹² This approach enables me to set the conditional distribution of each of these elements in Central and Southern Europe equal to the distribution in the North, keeping everything else the same as in the baseline scenario.

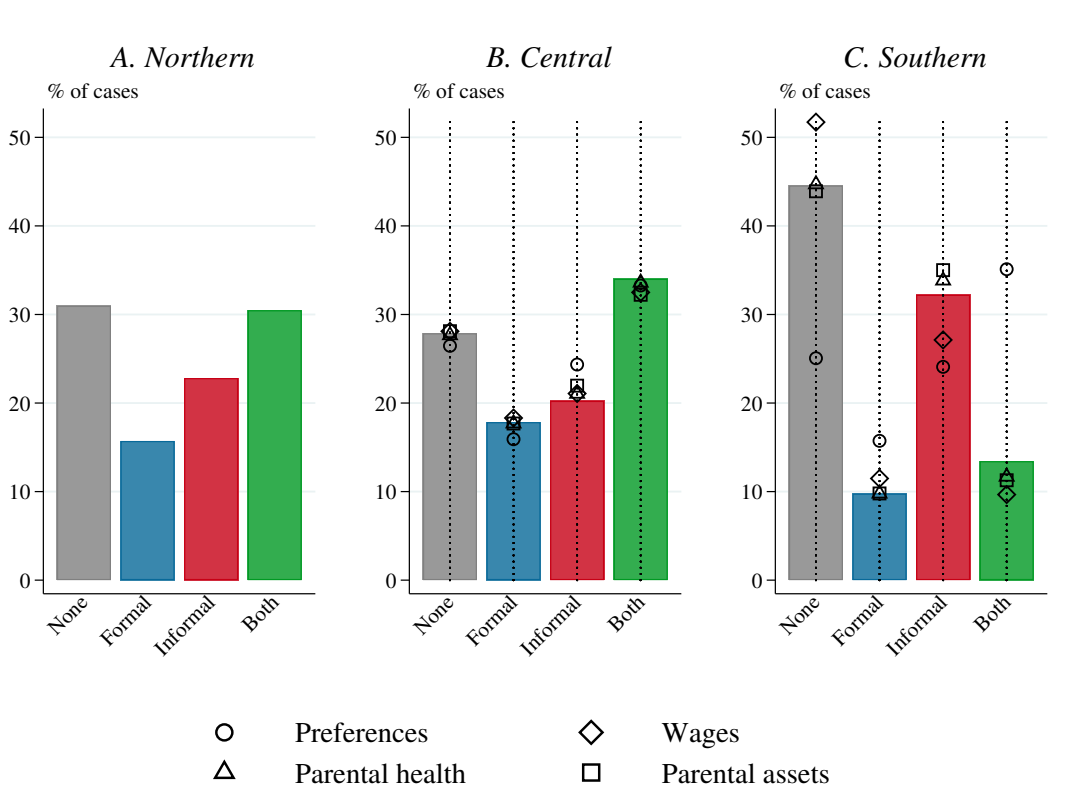
A. Preferences

Figure 5 summarizes the simulation results in terms of the type of care received by parents. Out of the factors analyzed, differences in care arrangements across

¹²I apply nearest-neighbor matching based on the Mahalanobis distance. In case an individual in Central and Southern Europe is matched with more than one Northern European individuals, I take the average of the variable of interest (wage, health or wealth) as counterfactual value.

regions seem to be mainly driven by preferences. In families in Southern Europe had the same preferences as in Northern Europe, the percentage of parents who receive both formal and informal care would rise by 21.7 points. This change, along with a modest increase in the use of formal care as the only means of help, and a reduction in the use of informal care only, would result in a 19.5 point growth in the share of individuals who receive some care.

FIGURE 5: TYPE OF CARE RECEIVED BY PARENTS – BASELINE AND COUNTERFACTUAL SIMULATIONS



Note: The figure plots the percentage of parents aged 70 or older with care needs who receive no care, only formal care, only informal care, or both types of care in baseline (bars) and counterfactual (markers) simulations. In the counterfactual scenarios, differences in preferences, wage levels, parental health and parental wealth are removed. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The percentages are also reported in Table E1.

The effect of this experiment in the differences in care arrangements across countries is illustrated in Table 3. As the second row of Panel B shows, the gap between Northern and Southern Europe in the percentage of parents who receive only one of the types of care almost disappears, and the gap in the share of those who receive both types narrows substantially. As a result, the percentage of parents receiving some care in Southern Europe goes from being 13.6 points lower than in the North

in the baseline scenario to being 5.9 points higher.

TABLE 3: TYPE OF CARE RECEIVED BY PARENTS AND EMPLOYMENT STATUS OF CHILDREN (%) – DIFFERENCE BETWEEN NORTHERN AND CENTRAL EUROPE AND NORTHERN AND SOUTHERN EUROPE IN BASELINE AND COUNTERFACTUAL SIMULATIONS

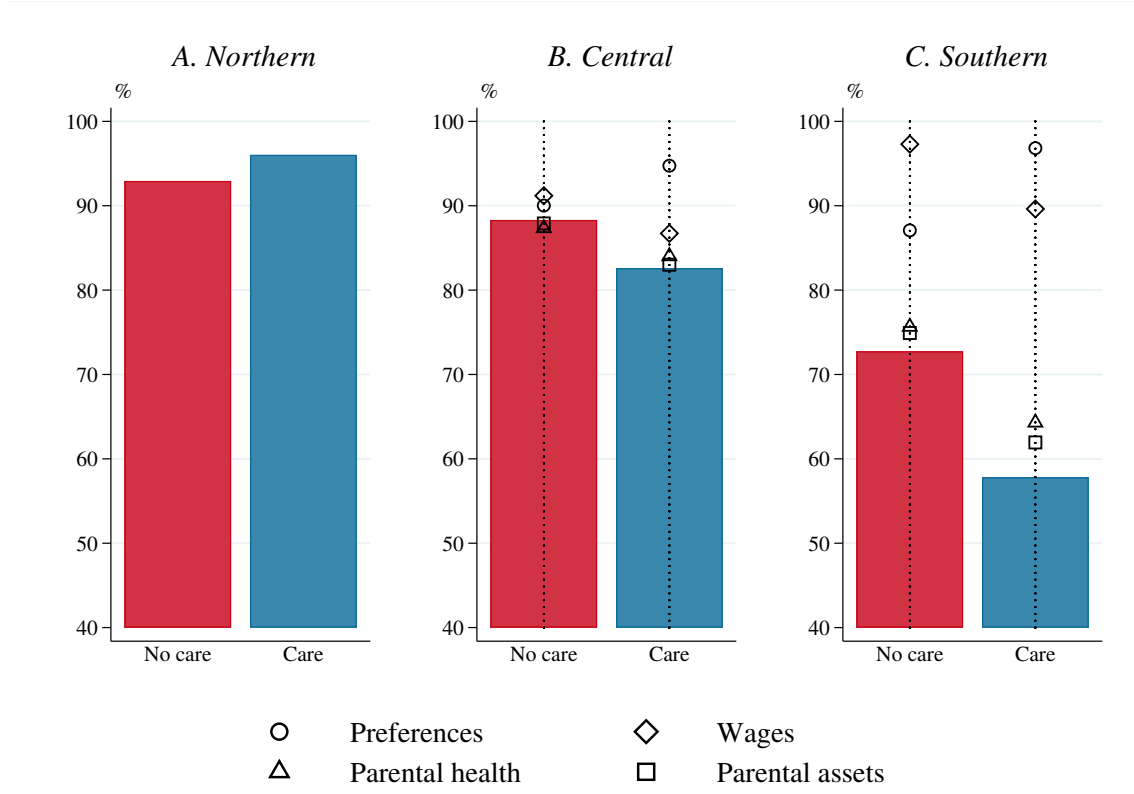
	Some care	Only formal care	Only informal care	Both types of care	Employed non-caregivers	Employed caregivers	Gap between non-caregivers and caregivers
<i>A. Northern vs Central Europe</i>							
Baseline	-3.1	-2.1	2.6	-3.5	4.6	13.4	-8.8
Preferences	-4.5	-0.2	-1.5	-2.8	2.9	1.3	1.6
Wages	-2.9	-2.6	1.7	-2.0	1.7	9.3	-7.6
Parental health	-3.3	-2.0	1.8	-3.1	5.6	12.0	-6.4
Parental wealth	-2.9	-2.0	0.9	-1.7	5.0	13.0	-8.0
PTC	-1.6	-2.4	3.7	-3.0	3.5	10.5	-7.0
Preferences + PTC	-2.2	-1.1	-0.4	-0.7	2.6	3.9	-1.3
Wages + PTC	-0.9	-2.6	2.5	-0.7	0.8	7.2	-6.4
Parental health + PTC	-1.2	-1.8	2.9	-2.3	4.0	10.7	-6.7
Parental wealth + PTC	-1.3	-1.8	1.9	-1.3	4.0	11.6	-7.5
<i>B. Northern vs Southern Europe</i>							
Baseline	13.6	5.9	-9.4	17.0	20.2	38.2	-18.0
Preferences	-5.9	-0.0	-1.3	-4.6	5.9	-0.8	6.6
Wages	20.7	4.2	-4.3	20.8	-4.4	6.4	-10.8
Parental health	13.7	5.9	-11.0	18.8	17.3	31.7	-14.5
Parental wealth	12.9	5.9	-12.2	19.2	18.0	34.1	-16.1
PTC	12.5	4.6	-11.9	19.7	17.5	33.7	-16.2
Preferences + PTC	-1.3	-2.8	1.6	-0.2	5.9	6.9	-1.0
Wages + PTC	20.8	2.7	-5.6	23.8	-4.9	4.1	-9.0
Parental health + PTC	13.3	4.4	-12.7	21.7	14.7	31.3	-16.6
Parental wealth + PTC	12.6	4.9	-13.6	21.3	15.1	33.9	-18.8

Note: The table shows the differences between Northern and Central Europe (Panel A) and Northern and Southern Europe (Panel B) in the percentage of parents who receive some care, only formal care, only informal care, or both types of care in baseline and counterfactual simulations, as well as the differences in the employment shares of children who do not give informal care and who do give informal care, and the gap between these two. In the counterfactual scenarios represented in rows 2-5 of each panel, differences in preferences, wage levels, parental health and parental assets across regions are removed. In rows 6-10, simulations are conducted under the assumption that children have preferences over the total amount of care (PTC). The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany), and Southern Europe (Italy and Spain). The percentages of each region are reported in Table E1.

The table also shows the outcomes in terms of employment. Figure 6 displays the employment rate among children who give informal care and among those who do not. Under the same preferences as Northern Europe, caregivers in the South would have a higher employment rate than non-caregivers, replicating the pattern observed in the North. This would bring the two regions closer, especially with respect to caregivers, whose employment rate would become 0.8 points higher than in Northern Europe.

In another counterfactual exercise, I try to isolate part of the influence of social

FIGURE 6: EMPLOYMENT STATUS OF CHILDREN AND INFORMAL CARE GIVEN TO PARENTS – BASELINE AND COUNTERFACTUAL SIMULATIONS



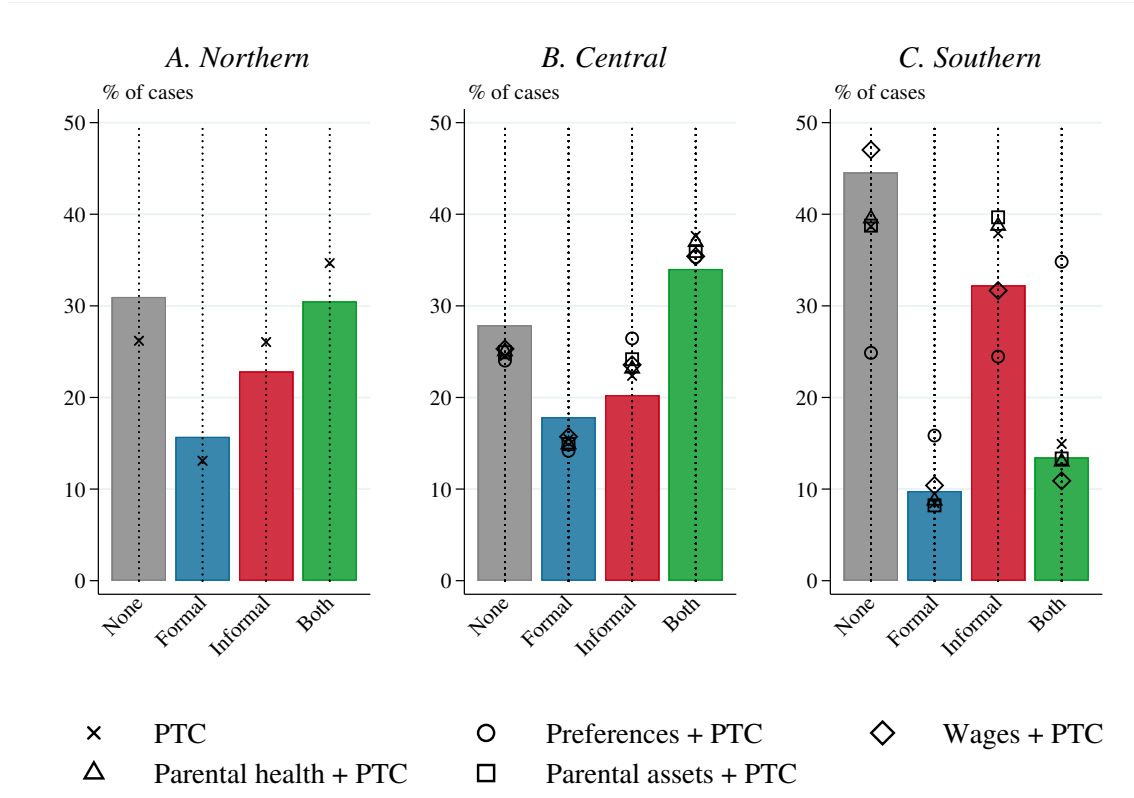
Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and are employed, or non-employed while giving informal care or no care in baseline (bars) and counterfactual (markers) simulations. In the counterfactual scenarios, differences in preferences, wage levels, parental health and parental wealth are removed. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The percentages are also reported in Table E1.

norms. I focus on the influence of siblings on the behavior of a child and the views she may have about formal and informal care. A child may have incentives to give informal care to her parents if the social norms in place encourage this type of care over formal care, especially in the countries with strong family ties. Moreover, she may have an opinion with regards to what constitute normal or fair care arrangement, and feel compelled to take part in care provision if her siblings are involved. Thus, I simulate the decisions of families in a scenario where I shut down these mechanisms by setting $\alpha_{1a} = \alpha_{3a}$ and $\alpha_{2a} = 0$ for all $a \in \mathcal{A}_i$. Under this

assumption, child i 's choice-specific utility is defined as

$$U_{ia} = \alpha_{0a} + \alpha_{1a} \left[\sum_{\ell \neq i} I_{\ell}(\mathbf{d}, \mathbf{x}) + F(\mathbf{d}, \mathbf{x}) \right] + \alpha_{4a}H + \alpha_{5a}\text{widow}_i + \alpha_{6a}\text{near}_i \\ + \alpha_{7a}\text{female}_i + \alpha_{8a}\text{children}_i + \alpha_{9a}\text{married}_i + \beta C_i(\mathbf{d}, \mathbf{x}) + \epsilon_{ia}. \quad (10)$$

FIGURE 7: TYPE OF CARE RECEIVED BY PARENTS – BASELINE AND COUNTERFACTUAL SIMULATIONS UNDER PREFERENCES FOR TOTAL CARE

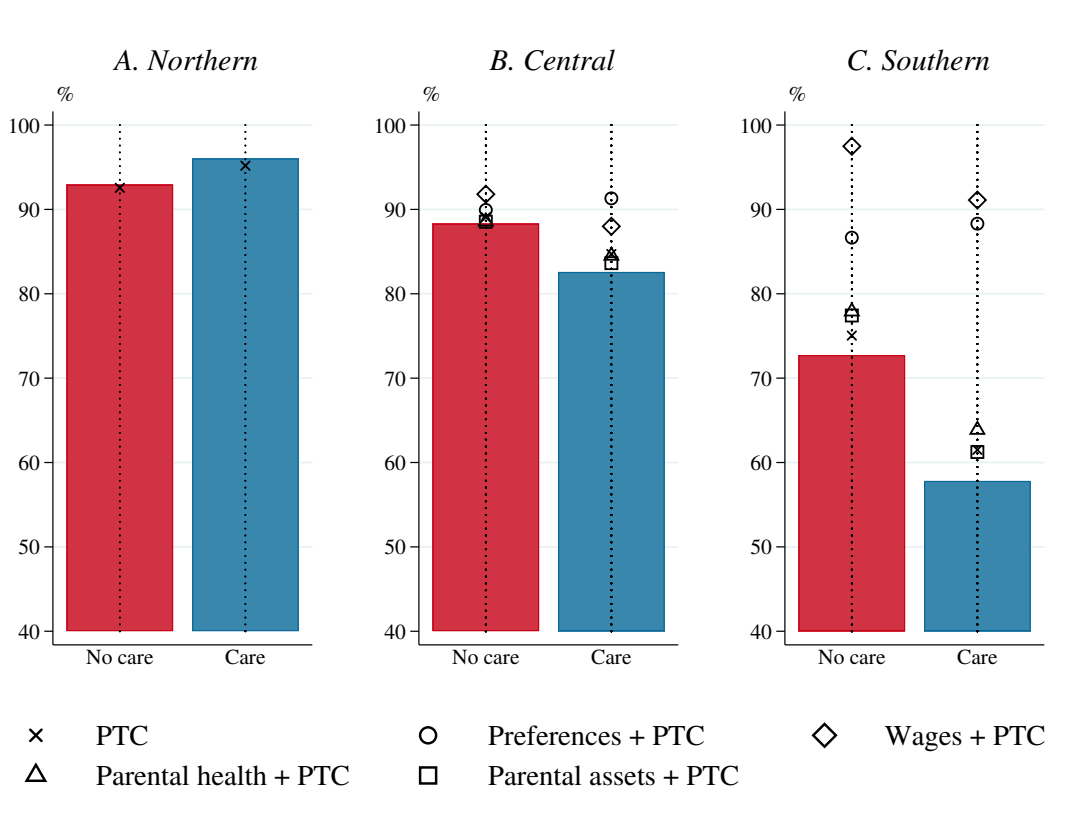


Note: The figure plots the percentage of parents aged 70 or older with care needs who receive no care, only formal care, only informal care, or both types of care in baseline (bars) and counterfactual (markers) simulations. In the counterfactual scenarios, children are assumed to have preferences over the total amount of care (PTC), and differences in preferences, wage levels, parental health and parental wealth are removed. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The percentages are also reported in Table E1.

The results of the simulations produced by these preferences for the total amount of care are also shown in Table 3 and in Figures 7 and 8. In this scenario, there is a 5.7 point increase in the use of informal care as the only means of help. This, joint with small changes in the use of formal care only and both types of care, results in a 5.9 point growth in the percentage of parents who receive some care.

The employment rates of children also vary moderately, as well as the gaps with Northern Europe.

FIGURE 8: EMPLOYMENT STATUS OF CHILDREN AND INFORMAL CARE GIVEN TO PARENTS – BASELINE AND COUNTERFACTUAL SIMULATIONS UNDER PREFERENCES FOR TOTAL CARE



Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and are employed, or non-employed while giving informal care or no care in baseline (bars) and counterfactual (markers) simulations. In the counterfactual scenarios, children are assumed to have preferences over the total amount of care (PTC), and differences in preferences, wage levels, parental health and parental wealth are removed. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The percentages are also reported in Table E1.

By contrast, when this exercise is considered in a scenario where families in the three regions have the same preferences, the effects are larger. In that setting, a 21.4 point increase in the use of both types of care, combined with smaller adjustments in the use of formal care only and informal care only, gives place to a 19.7 point increase in the share of parents who receive some care. The employment rates of children rise substantially as well (14 points for non-caregivers, 30.5 points for caregivers), closing the gap between non-caregivers and caregivers. As a consequence, the differences

in care provision and employment between Northern and Southern Europe almost vanishes.

The reactions of Central European families in these scenarios are more moderate, but point in the same direction.

B. Wages, health and wealth

Setting wage levels equal across regions has sizable effects in Southern Europe, where wages are lower than in Northern and Central Europe. If Southern European children had the same wages as their Northern European counterparts, the employment rate would grow by 24.6 and 31.8 points for non-caregiving and caregiving children, respectively, closing the gap between these two groups by 7.2 points.

The increase in labor supply to obtain higher earnings is accompanied by a reduction in the percentage of parents who receive some care, becoming 7.1 points lower than in the baseline scenario and widening the gap with Northern Europe.

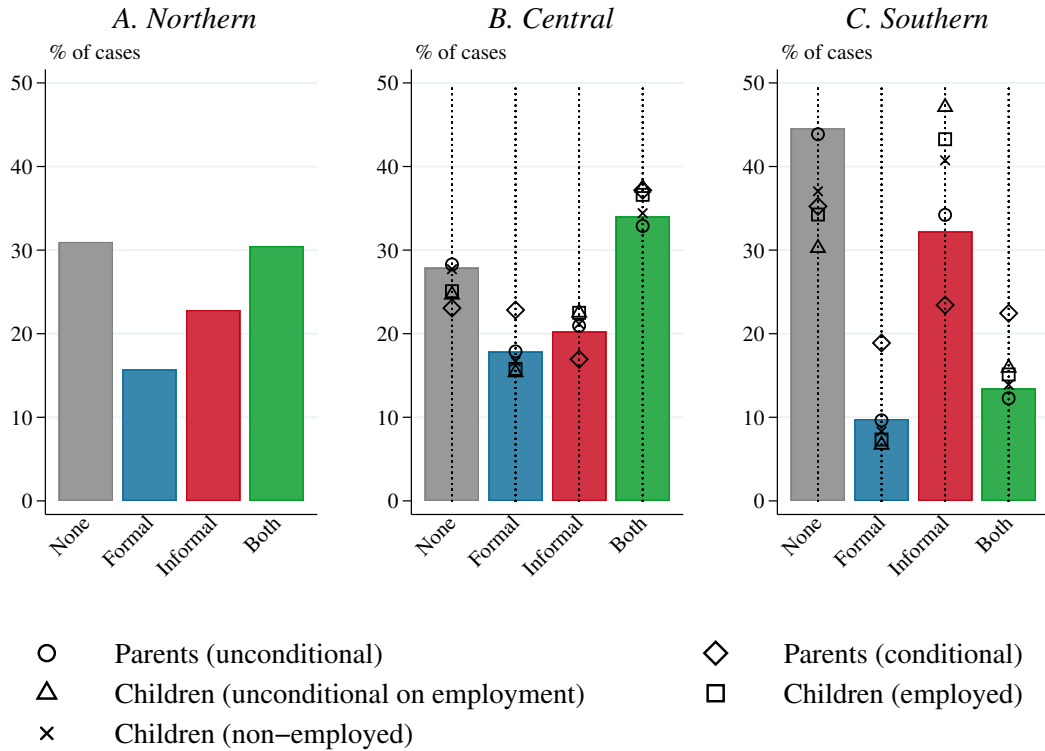
In two additional counterfactual exercises, I shut down the differences across country groups in parental health and wealth. For the first of these, I set the conditional distribution of parents with severe care needs in Central and Southern Europe equal to Northern Europe. For the second, I do the same with the value of assets owned by parents. The responses of families in both of them are small. By making Southern European parents as healthy as their Northern European counterparts, the employment rate of children increases by 3 points for non-caregivers and 6.5 points for caregivers, reducing the gap between the two groups. The percentage of parents who receive some care barely changes. By making Southern European parents as rich as those in Northern Europe, employment rates increase by 2.2 points for non-caregivers and 4.1 points for caregivers, narrowing the gap between the two, as well. The share of parents who receive some care increases by 0.7 points. The results are similar when I run these exercises under the assumption that children have preferences over the total amount of care, as discussed in Section VI.A.

The effects of these exercises in Central Europe are weaker, but similar.

VII. Policy Experiments

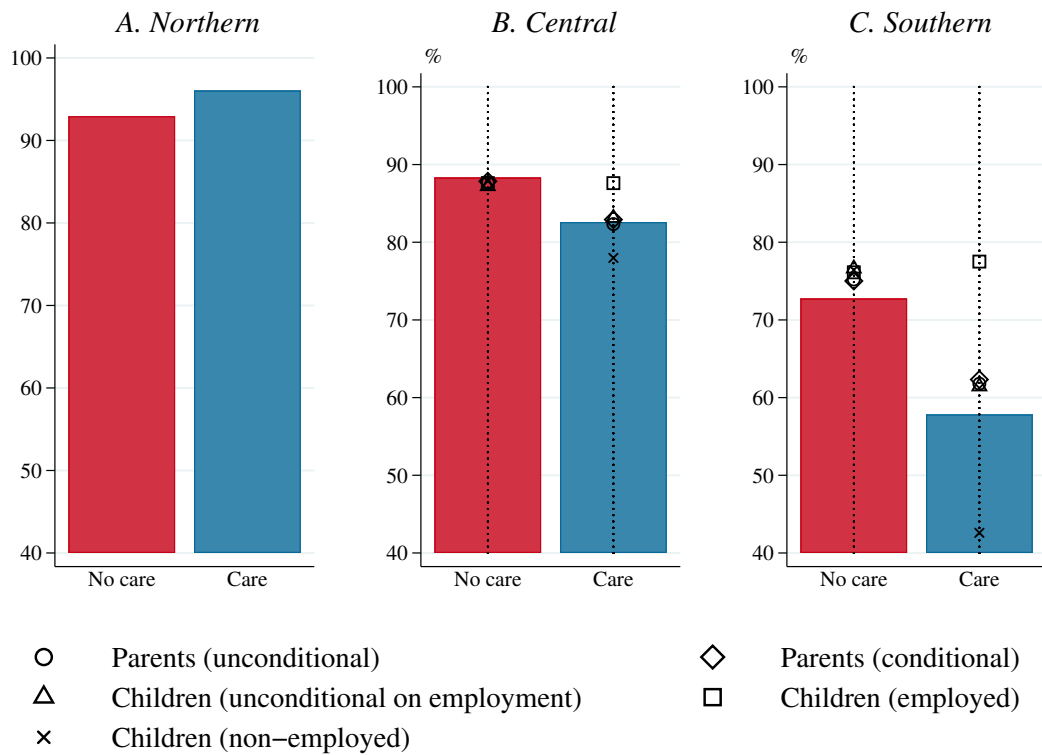
In this section, I use the estimated model to evaluate five policies with the goal of supporting care recipients and caregivers and mitigating the differences in care arrangements across regions. As discussed in previous sections, two of the most salient outcomes of care provision in Southern Europe are the high percentage of old parents who do not receive any care, and the employment gap between caregiving

FIGURE 9: TYPE OF CARE RECEIVED BY PARENTS – BASELINE AND POLICY SIMULATIONS



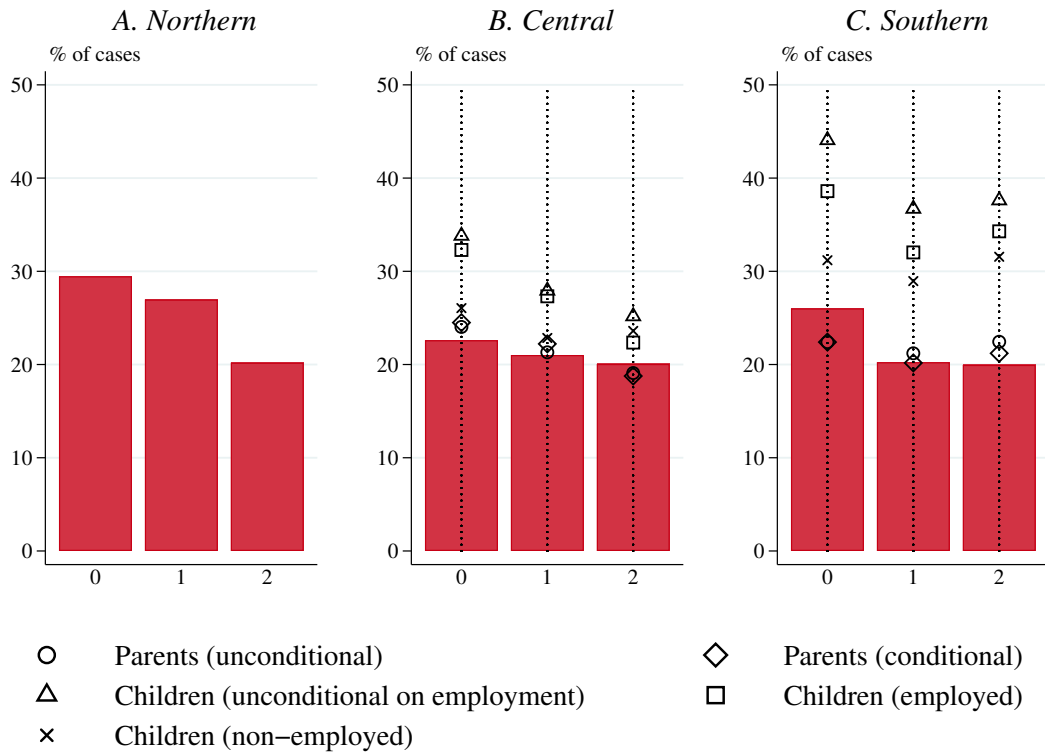
Note: The figure plots the percentage of parents aged 70 or older with care needs who receive no care, only formal care, only informal care, or both types of care in baseline (bars) and policy (markers) simulations. The evaluated policies are a subsidy for parents, unconditional on formal care; a subsidy for parents, conditional on formal care; a subsidy for caregiving children, unconditional on employment; a subsidy for caregiving children, conditional on employment; and a subsidy for caregiving children, conditional on non-employment. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The percentages are also reported in Table F2.

FIGURE 10: EMPLOYMENT STATUS OF CHILDREN AND INFORMAL CARE GIVEN TO PARENTS – BASELINE AND POLICY SIMULATIONS



Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and are employed, or non-employed while giving informal care or no care in baseline (bars) and policy (markers) simulations. The evaluated policies are a subsidy for parents, unconditional on formal care; a subsidy for parents, conditional on formal care; a subsidy for caregiving children, unconditional on employment; a subsidy for caregiving children, conditional on employment; and a subsidy for caregiving children, conditional on non-employment. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The percentages are also reported in Table F2.

FIGURE 11: PROBABILITY OF GIVING INFORMAL CARE TO PARENTS BY NUMBER OF SIBLINGS – BASELINE AND POLICY SIMULATIONS



Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and give informal care to her, by number of siblings (from zero to two) in baseline (bars) and policy (markers) simulations. The evaluated policies are a subsidy for parents, unconditional on formal care; a subsidy for parents, conditional on formal care; a subsidy for caregiving children, unconditional on employment; a subsidy for caregiving children, conditional on employment; and a subsidy for caregiving children, conditional on non-employment. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The percentages are also reported in Table F2.

TABLE 4: TYPE OF CARE RECEIVED BY PARENTS AND EMPLOYMENT STATUS OF CHILDREN (%) – DIFFERENCE BETWEEN NORTHERN AND CENTRAL EUROPE AND NORTHERN AND SOUTHERN EUROPE IN BASELINE AND POLICY SIMULATIONS

	Some care	Only formal care	Only informal care	Both types of care	Employed non-caregivers	Employed caregivers	Gap between non-caregivers and caregivers
<i>A. Northern vs Central Europe</i>							
Baseline	-3.1	-2.1	2.6	-3.5	4.6	13.4	-8.8
Parents (unconditional)	-2.7	-2.2	1.9	-2.4	5.3	13.7	-8.4
Parents (conditional)	-7.9	-7.1	5.9	-6.7	5.1	13.1	-8.0
Children (unconditional on employment)	-6.3	0.3	0.3	-6.9	5.7	12.9	-7.2
Children (employed)	-5.9	-0.1	0.3	-6.1	5.3	8.4	-3.1
Children (non-employed)	-3.3	-1.0	1.6	-3.9	5.1	18.1	-13.0
<i>B. Northern vs Southern Europe</i>							
Baseline	13.6	5.9	-9.4	17.0	20.2	38.2	-18.0
Parents (unconditional)	12.9	6.1	-11.4	18.2	17.7	34.2	-16.5
Parents (conditional)	4.3	-3.2	-0.6	8.0	17.9	33.7	-15.8
Children (unconditional on employment)	-0.7	9.0	-24.3	14.6	16.3	34.6	-18.3
Children (employed)	3.3	8.4	-20.4	15.4	16.8	18.5	-1.7
Children (non-employed)	6.1	7.4	-17.9	16.6	16.5	53.4	-36.9

Note: The table shows the differences between Northern and Central Europe (Panel A) and Northern and Southern Europe (Panel B) in the percentage of parents who receive some care, only formal care, only informal care, or both types of care in baseline and policy simulations, as well as the differences in the employment shares of children who do not give informal care and who give informal care, and the gap between these two. The evaluated policies are a subsidy for parents, unconditional on formal care; a subsidy for parents, conditional on formal care; a subsidy for caregiving children, unconditional on employment; a subsidy for caregiving children, conditional on employment; and a subsidy for caregiving children, conditional on non-employment. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany), and Southern Europe (Italy and Spain). The percentages of each region are reported in Table F2.

and non-caregiving children. In this context, the policymaker might be interested in easing access to formal care services for families, or compensating informal caregivers for the cost of providing care to their parents.

The first of these policies consists of a non-means-tested subsidy given to parents in Central and Southern Europe.¹³ This subsidy increases the value of parental wealth in the model, and is unconditional on the decision to receive formal care. The amounts of money granted, shown in Table F1, are based on the share of the long-term care costs covered by public protection systems for a representative individual in the countries studied. I compute the subsidy as the difference between actual support and counterfactual support in a situation where the share of covered costs in Central and Southern Europe equals the one of Northern Europe.

In subsequent exercises, I simulate the decisions of families in alternative scenarios where the subsidy is conditional on receiving formal care, or is split equally among the children who give informal care, increasing their consumption. In this last case, I assess three variants of the policy: one where the subsidy is unconditional on the employment choice, and two where it is.

A. Subsidies for care recipients

In the first policy experiment, I grant a subsidy to all the parents in Central and Southern Europe, regardless of their choice to receive formal care. In the second exercise, I make the the subsidy conditional on receiving formal care. Figures 9, 10 and 11 summarize the results of the policies in terms of care provision, employment rates and informal care by family size, and Table 4 compares the outcomes across regions.

Granting parents a subsidy conditional on receiving formal care turns out to be more effective than doing so unconditionally. In the former experiment, parents do not necessarily use the subsidy to obtain formal care. Indeed, in Southern Europe the percentage of parents who receive only formal care or both types of care is slightly lower than in the baseline scenario. By contrast, the other version of the policy does increase the use of formal care, crowding out informal care as the only means of help. Associated to it, children without siblings become less likely to provide informal care, while in bigger families their participation is barely affected. Overall, this policy gives place to a 9.4 point increase in the share of parents who receive some care in Southern Europe, bringing the gap with Northern Europe down to 4.3%. When it comes to employment, the two policies have a similar, moderate

¹³Cash benefits are one of the many alternatives that countries have implemented to support care recipients and their relatives (Colombo et al., 2011).

impact on non-caregivers and caregivers, narrowing the gap between the two.

B. Subsidies for caregivers

In the remaining experiments, I split the subsidy equally among children who provide informal care to their parents, distinguishing three variants of the policy: a subsidy given to all the children who give care, a subsidy given only to children who give care and are employed, and a subsidy given only to those who give care and are non-employed. Although the three versions of the subsidy have similar consequences in terms of care provision, their strength is slightly different. In this sense, the most effective policy of the three (and also the most effective of the five policies considered) is the subsidy granted to all children, regardless of their employment choice. This measure causes a 14.9 point increase in the use of informal care as the only means of help, whereas the use of formal care only and both types of care does not vary as much. The caregiving decisions of children react similarly across family size. In total, the subsidy manages to increase the percentage of parents who receive some care by 14.3 points, taking the gap with Northern Europe from 13.6% to -0.7%. This effect is comparable, although somewhat smaller, to the ones seen in Section VI.A under the same preferences across regions.

As expected, the subsidy for employed children increases the employment rate of caregivers, and the subsidy for non-employed children does the opposite. The impact of the unconditional subsidy is in the middle, very close to the effects found for the subsidies for care recipients, characterized by a mild increase in the employment rate of caregivers while the gap with non-caregivers is nearly unaffected. The impacts of the five policies on the employment rate of non-caregivers are also virtually the same.¹⁴

VIII. Conclusion

In this paper, I analyze the choices made by European families to provide care for the elderly when they require assistance to carry out their daily activities. Earlier research has documented the existence of remarkable differences in the outcomes of these decisions across Europe. The literature has studied the nature of such disparities, but it has done so without considering the implications of family interactions. To close this gap, I construct and estimate a structural model that represents old parents and their working-age children making care provision and labor supply decisions in a static, non-cooperative game of complete information. I show that the

¹⁴The effects discussed are similar and of smaller magnitude in Central Europe.

proposed model does a good job in fitting the observed patterns in care received by the elderly and employment rates of their relatives in Northern, Central and Southern Europe. Equipped with this model, I simulate families' decisions in several counterfactual scenarios to quantify the role of the factors driving the differences in care arrangements across the three country groups. Results show that preferences, capturing the influence of social norms and access to publicly provided care, are largely responsible for these disparities, followed by wage rates. Differences in parental health, geographical proximity to children, and access to informal care from spouses and other sources are less influential. Lastly, I use the model to conduct five policy experiments with the goal of supporting care recipients and caregivers. I find that informal care subsidies constitute an attractive policy alternative to mitigate the gaps in care provision and labor force participation of caregivers across Europe.

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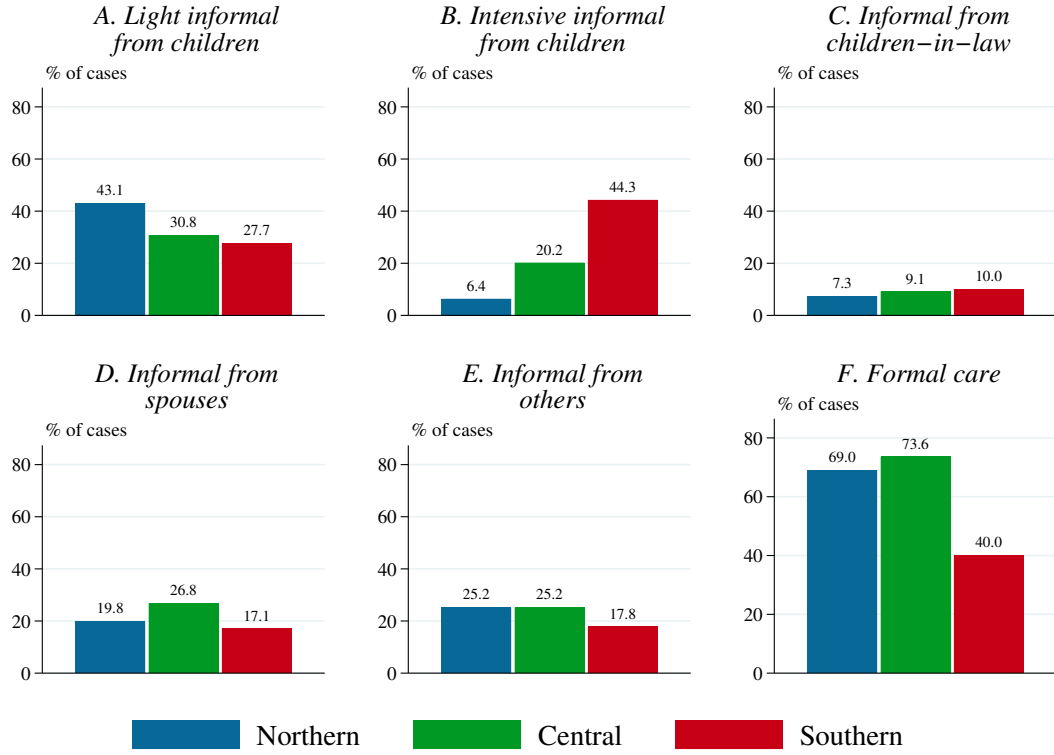
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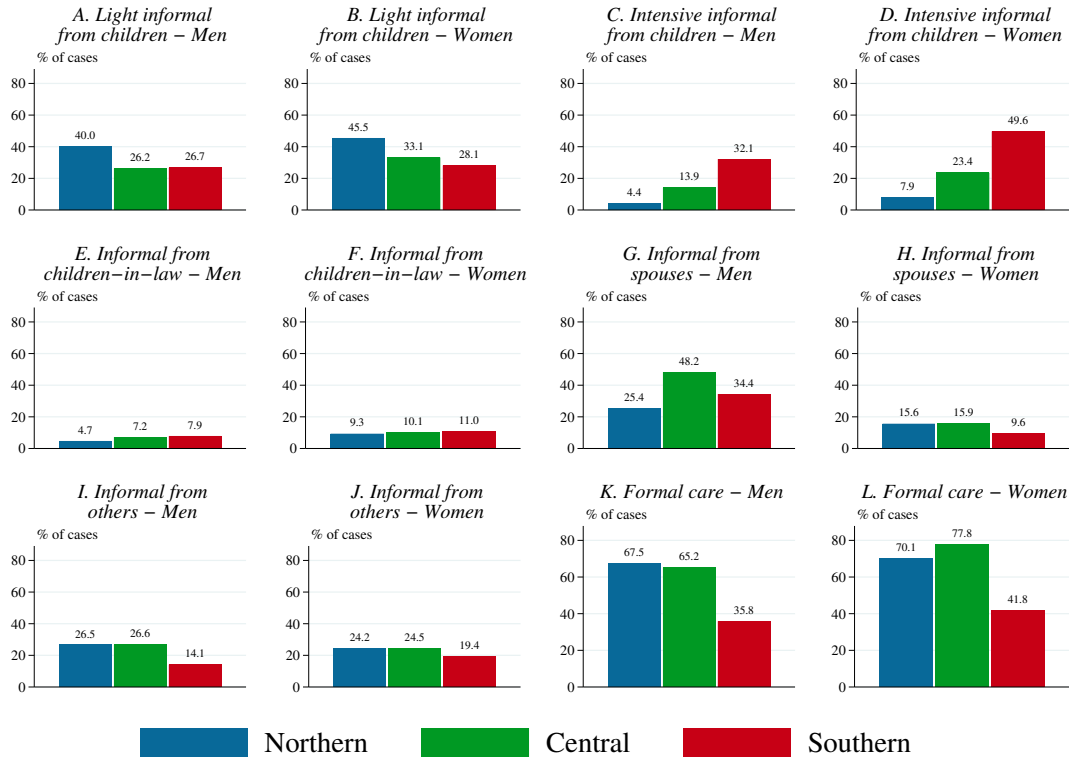
APPENDIX A: MOTIVATING EVIDENCE

FIGURE A1: TYPE OF CARE RECEIVED BY INDIVIDUALS AGED 70 OR OLDER WITH CARE NEEDS (SIX OPTIONS, CONDITIONAL ON RECEIVING CARE)



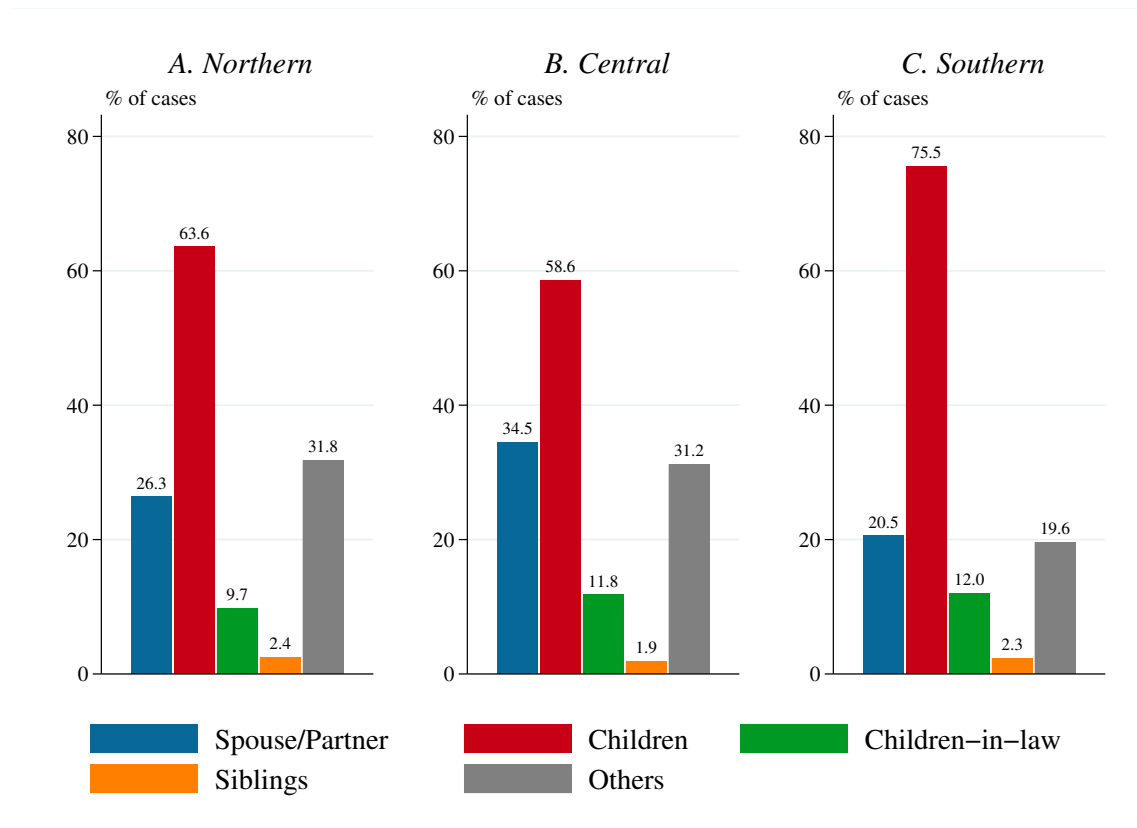
Note: The figure plots the percentages of individuals aged 70 or older with care needs and at least one child younger than 60 who receive light informal care from children, intensive informal care from children, informal care from children-in-law, informal care from a spouse, informal care from other sources, or formal care, conditional on receiving some care. Informal care is defined as *intensive* when is provided on a daily basis, and as *light* when is provided on a less than daily basis. Care alternatives are not mutually exclusive. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). *Source:* SHARE Waves 5 and 6.

FIGURE A2: TYPE OF CARE RECEIVED BY INDIVIDUALS AGED 70 OR OLDER WITH CARE NEEDS - MEN AND WOMEN (SIX OPTIONS, CONDITIONAL ON RECEIVING CARE)



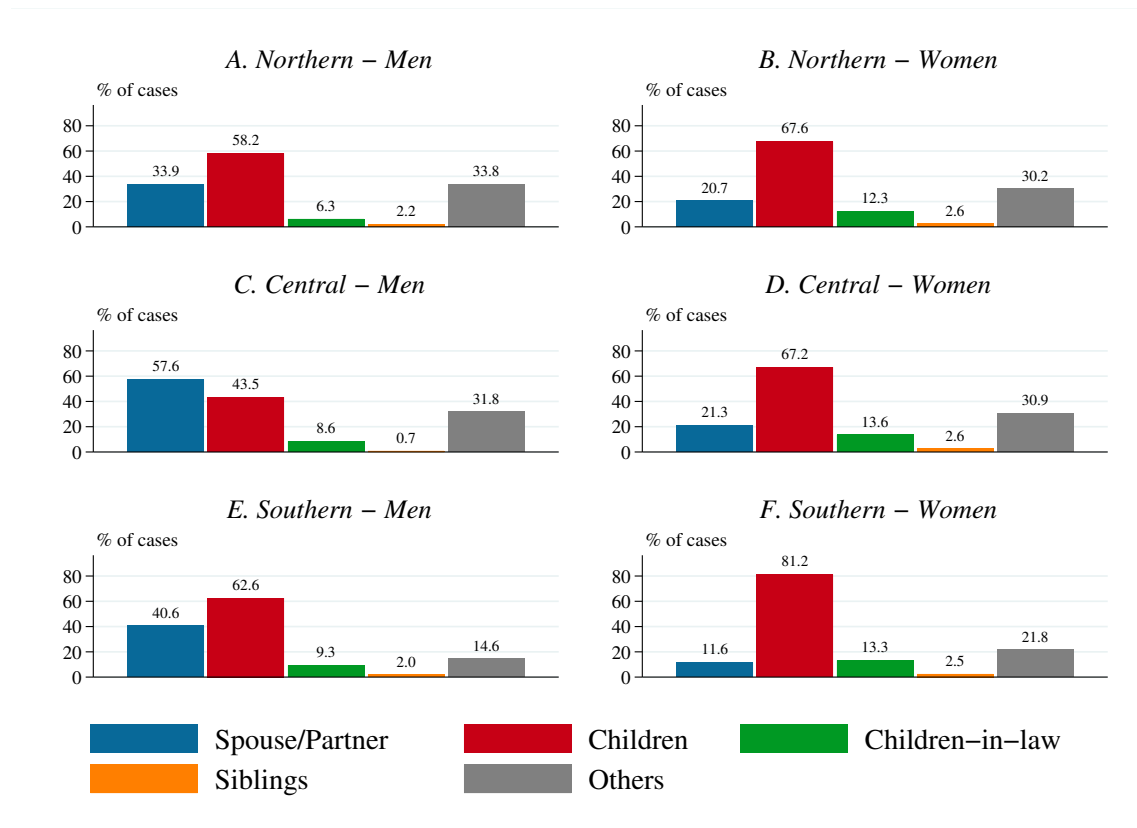
Note: The figure plots the percentages of individuals aged 70 or older with care needs who receive light informal care from children, intensive informal care from children, informal care from children-in-law, informal care from a spouse, informal care from other sources, or formal care, conditional on receiving some care. Informal care is defined as *intensive* when is provided on a daily basis, and as *light* when is provided on a less than daily basis. Care alternatives are not mutually exclusive. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). *Source:* SHARE Waves 5 and 6.

FIGURE A3: SOURCES OF INFORMAL CARE RECEIVED BY INDIVIDUALS AGED 70 OR OLDER WITH CARE NEEDS



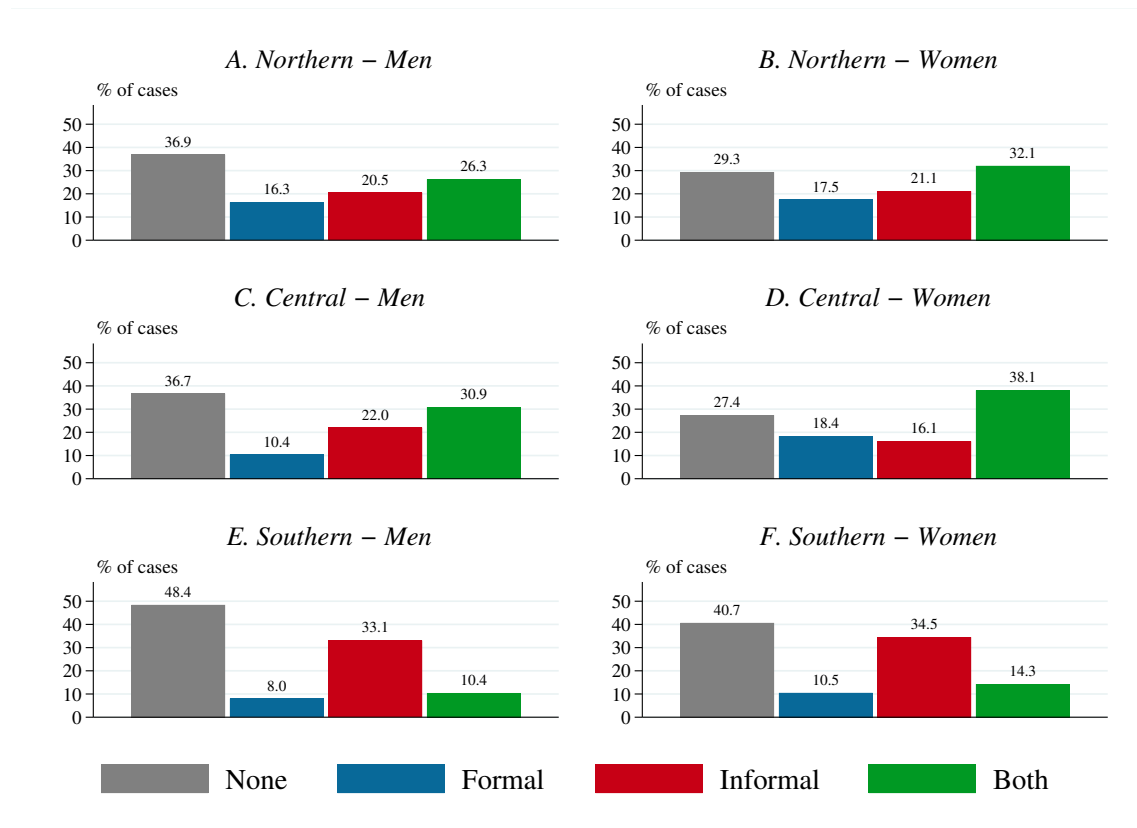
Note: The figure plots the percentage of individuals aged 70 or older with care needs and at least one child younger than 60 who receive informal care from a spouse or partner, child, child-in-law, siblings, or other sources, conditional on receiving some informal care. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The alternatives are not mutually exclusive. *Source:* SHARE Waves 5 and 6.

FIGURE A4: SOURCES OF INFORMAL CARE RECEIVED BY INDIVIDUALS AGED 70 OR OLDER WITH CARE NEEDS - MEN AND WOMEN



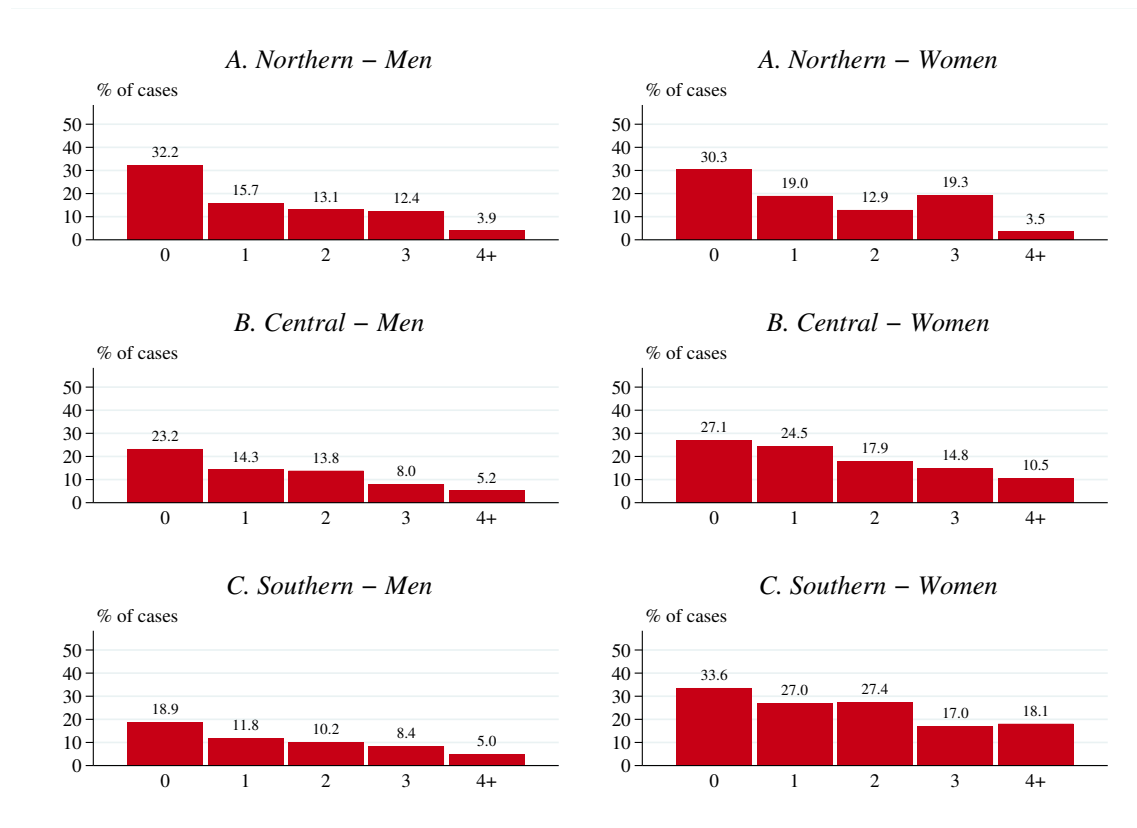
Note: The figure plots the percentage of individuals aged 70 or older with care needs who receive informal care from a spouse or partner, child, child-in-law, sibling, or other sources, conditional on receiving some informal care. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The alternatives are not mutually exclusive. *Source:* SHARE Waves 5 and 6.

FIGURE A5: TYPE OF CARE RECEIVED BY INDIVIDUALS AGED 70 OR OLDER WITH CARE NEEDS - MEN AND WOMEN



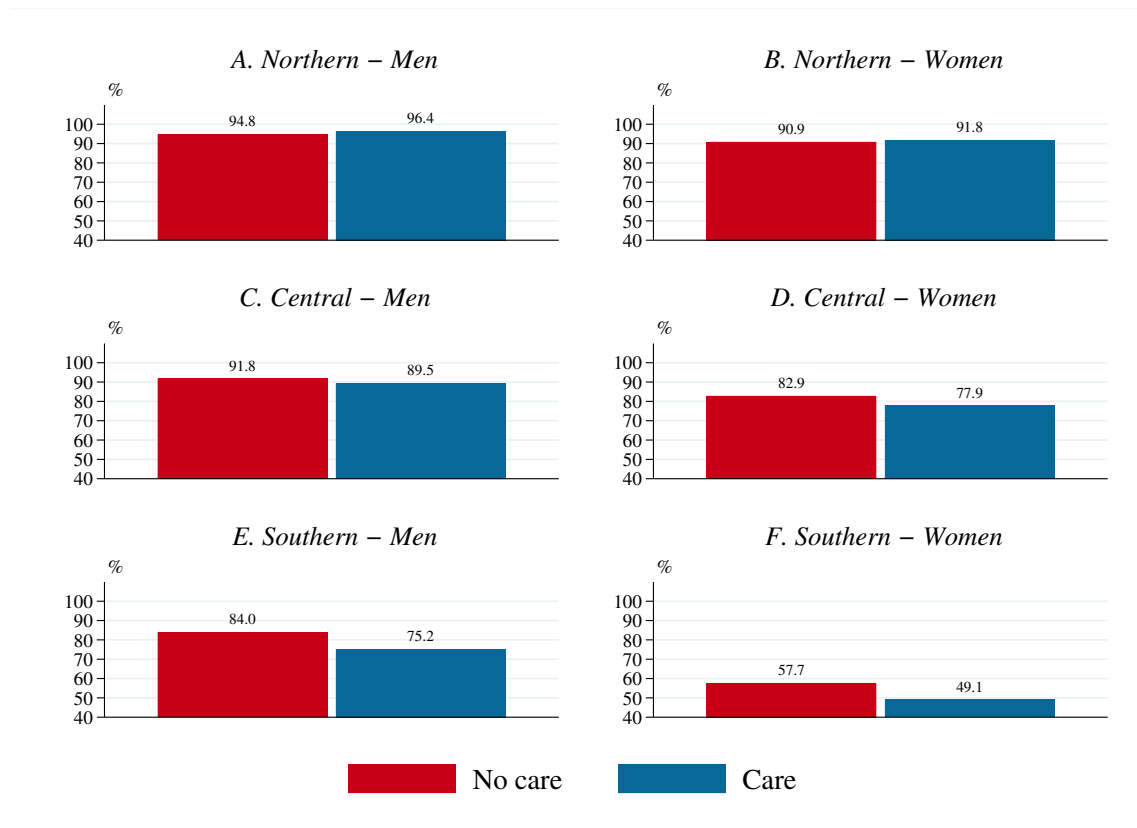
Note: The figure plots the percentage of individuals aged 70 or older with care needs who receive no care, only formal care, only informal care, or both types of care. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). *Source:* SHARE Waves 5 and 6.

FIGURE A6: PROBABILITY OF GIVING INFORMAL CARE TO PARENTS BY NUMBER OF SIBLINGS - MEN AND WOMEN



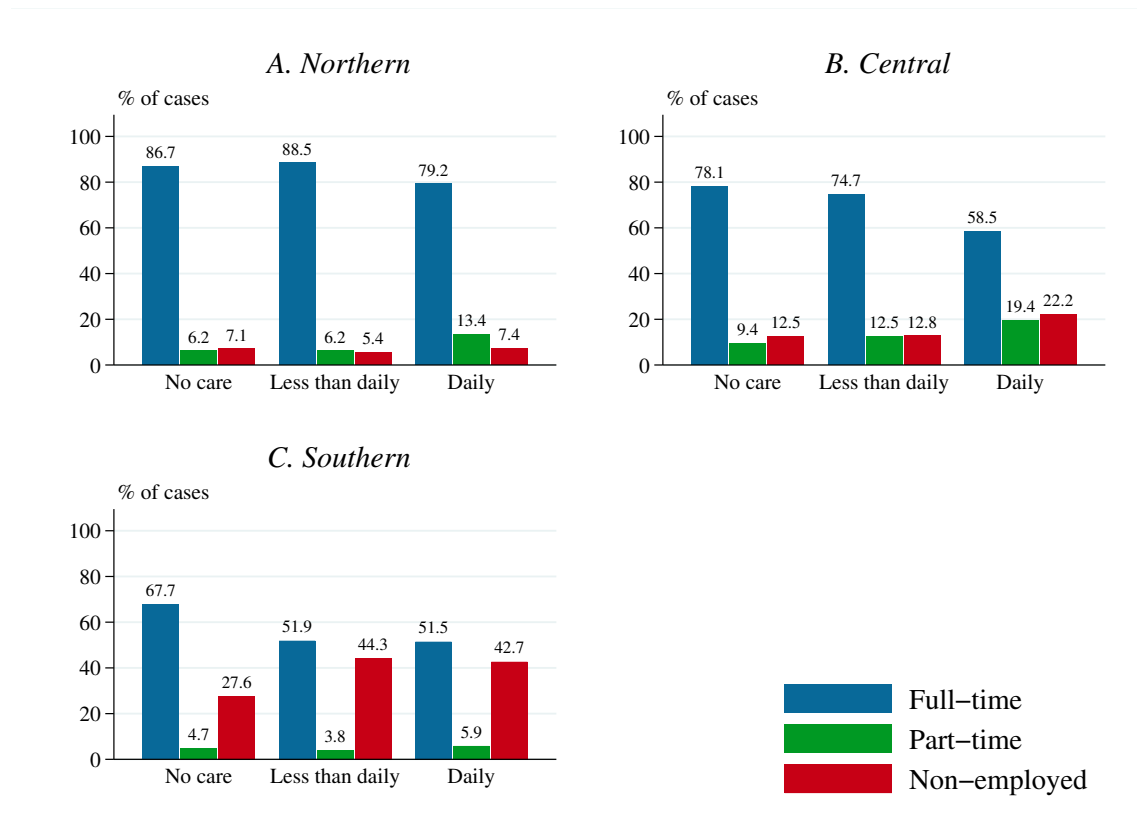
Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and give informal care to her, by number of siblings (from 0 to 4 or more). The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). *Source:* SHARE Waves 5 and 6.

FIGURE A7: EMPLOYMENT STATUS OF CHILDREN AND INFORMAL CARE GIVEN TO PARENTS - MEN AND WOMEN



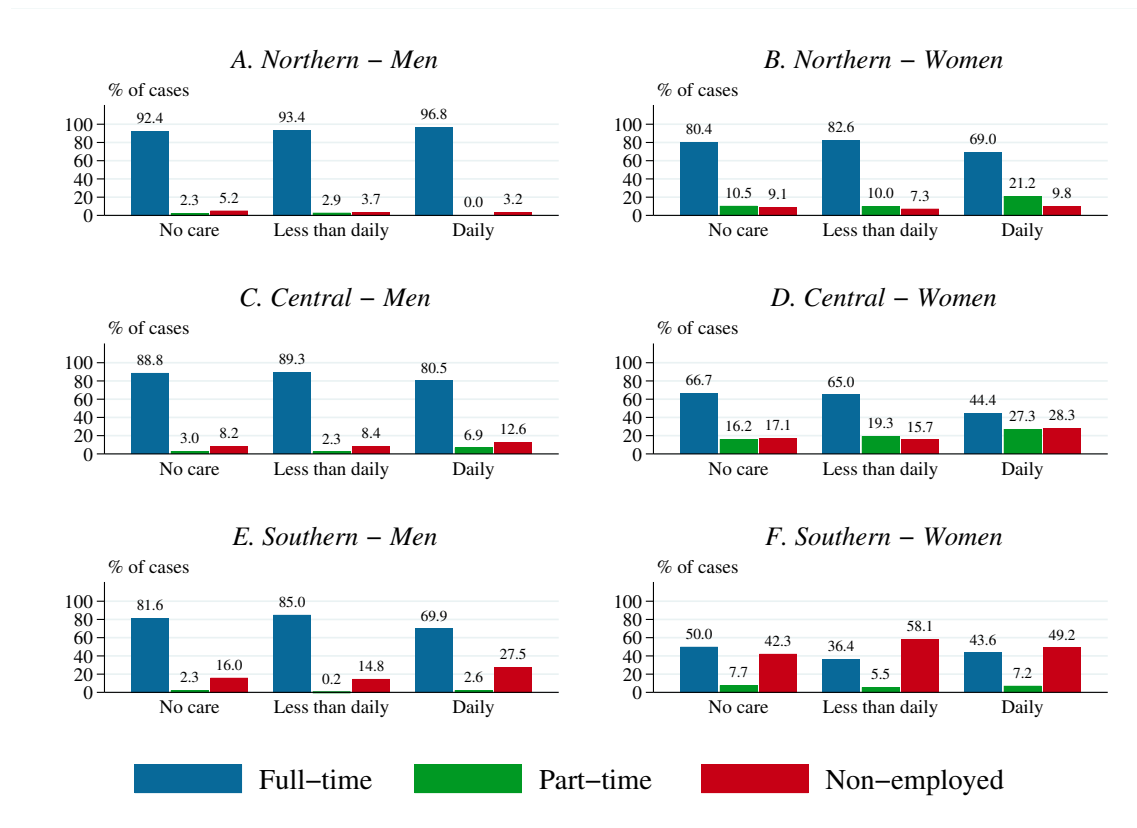
Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and are employed or non-employed while giving informal care or no care at all. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). *Source:* SHARE Waves 5 and 6.

FIGURE A8: EMPLOYMENT STATUS OF CHILDREN AND FREQUENCY OF INFORMAL CARE GIVEN TO PARENTS



Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and are full-time employed, part-time employed or non-employed while giving informal care on a daily basis, informal care less frequently or no care at all. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). *Source:* SHARE Waves 5 and 6.

FIGURE A9: EMPLOYMENT STATUS OF CHILDREN AND FREQUENCY OF INFORMAL CARE GIVEN TO PARENTS - MEN AND WOMEN



Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and are full-time employed, part-time employed or non-employed while giving informal care on a daily basis, informal care less frequently or no care at all. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). *Source:* SHARE Waves 5 and 6.

TABLE A1: HAVING CARE NEEDS - LOGIT ESTIMATES

Dependent variable	Having care needs (dummy)
Female (dummy)	1.391*** (0.064)
Age	1.004 (0.108)
Age squared	1.001 (0.001)
Widowed (dummy)	1.127** (0.059)
Log net assets	0.897*** (0.008)
Northern Europe (dummy)	0.529*** (0.029)
Southern Europe (dummy)	2.406*** (0.111)
Constant	0.009 (0.038)
Number of observations	23,756

Note: Sample of respondents aged 70 or older in SHARE Waves 5 and 6. Exponentiated coefficients (odds ratios). Standard errors in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source:* SHARE Waves 5 and 6.

TABLE A2: CARE RECEIVED BY RESPONDENTS AGED 70 OR OLDER WITH CARE NEEDS – LOGIT ESTIMATES

Dependent variable	Care received (dummy)
Female (dummy)	1.205** (0.094)
Age	0.893 (0.150)
Age squared	1.001 (0.001)
Widowed (dummy)	1.427*** (0.121)
Severe LTC needs (dummy)	0.811** (0.070)
Number of children	1.032 (0.028)
At least one child lives less than 1km away (dummy)	1.083 (0.082)
Log net assets	0.949*** (0.013)
Northern Europe (dummy)	0.977 (0.098)
Southern Europe (dummy)	0.580*** (0.049)
Constant	5.529 (36.914)
Number of observations	6,816

Note: Sample of respondents aged 70 or older with care needs in SHARE Waves 5 and 6. Exponentiated coefficients (odds ratios). Standard errors in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source:* SHARE Waves 5 and 6.

TABLE A3: TYPE OF CARE RECEIVED BY RESPONDENTS AGED 70 OR OLDER WITH CARE NEEDS – MULTINOMIAL LOGIT ESTIMATES

	Formal	Informal	Both
Female (dummy)	1.494*** (0.201)	0.991 (0.091)	1.421*** (0.153)
Age	1.054 (0.275)	1.059 (0.211)	0.777 (0.165)
Age squared	1.000 (0.002)	1.000 (0.001)	1.002* (0.001)
Widowed (dummy)	1.691*** (0.228)	1.389*** (0.138)	1.358*** (0.156)
Severe LTC needs (dummy)	0.866 (0.122)	0.728*** (0.075)	0.871 (0.098)
Number of children	0.965 (0.044)	1.067** (0.032)	1.015 (0.036)
At least one child lives less than 1km away (dummy)	0.689*** (0.087)	1.297*** (0.116)	1.041 (0.109)
Log net assets	0.914*** (0.018)	0.959** (0.016)	0.955*** (0.017)
Northern Europe (dummy)	1.029 (0.153)	1.178 (0.154)	0.827 (0.100)
Southern Europe (dummy)	0.439*** (0.060)	1.305*** (0.135)	0.232*** (0.027)
Constant	0.001 (0.007)	0.006 (0.048)	230.683 (1961.006)
Number of observations	6,816		

Note: Sample of respondents aged 70 or older with care needs in SHARE Waves 5 and 6. Exponentiated coefficients (relative-risk ratios). Standard errors in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source:* SHARE Waves 5 and 6.

TABLE A4: TYPE OF CARE RECEIVED BY RESPONDENTS AGED 70 OR OLDER WITH CARE NEEDS – LOGIT ESTIMATES

	(1)	(2)	(3)
	Light from children	Daily from children	Spouse
Female (dummy)	1.210*	1.573***	0.425***
	(0.130)	(0.194)	(0.050)
Age	1.125	0.929	1.448
	(0.230)	(0.214)	(0.354)
Age squared	0.999	1.001	0.997*
	(0.001)	(0.001)	(0.002)
Widowed (dummy)	1.349***	1.754***	
	(0.152)	(0.212)	
Severe LTC needs (dummy)	0.909	1.358**	1.132
	(0.102)	(0.179)	(0.148)
Number of children	1.133***	1.134***	0.951
	(0.037)	(0.042)	(0.039)
At least one child lives less than 1km away (dummy)	0.798**	3.312***	0.856
	(0.084)	(0.381)	(0.103)
Log net assets	1.068***	0.959**	1.075***
	(0.018)	(0.018)	(0.023)
North (dummy)	1.680***	0.368***	0.476***
	(0.202)	(0.082)	(0.069)
South (dummy)	0.802**	2.414***	0.564***
	(0.087)	(0.295)	(0.074)
Constant	0.002	0.182	0.000
	(0.016)	(1.684)	(0.000)
Number of observations	4,171	4,177	2,475

Note: Sample of respondents aged 70 or older with care needs in SHARE Waves 5 and 6. Exponentiated coefficients (odds ratios). Standard errors in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source:* SHARE Waves 5 and 6.

TABLE A5: EMPLOYMENT STATUS OF CHILDREN – MULTINOMIAL LOGIT ESTIMATES

	Part-time	Full-time
Female (dummy)	1.848*** (0.251)	0.247*** (0.016)
Age	1.183** (0.082)	1.251*** (0.057)
Age squared	0.998** (0.001)	0.998*** (0.000)
College (dummy)	1.758*** (0.247)	2.715*** (0.251)
Lives more than 25km away from parent (dummy)	0.890 (0.115)	1.259*** (0.097)
Children (dummy)	1.140 (0.164)	1.021 (0.090)
Married (dummy)	1.097 (0.139)	1.395*** (0.111)
Siblings (dummy)	0.647** (0.113)	0.860 (0.100)
Severe LTC needs (dummy)	0.787** (0.094)	0.860* (0.068)
Light informal care (dummy)	0.914 (0.207)	0.893 (0.120)
Intensive informal care (dummy)	1.051 (0.172)	0.651*** (0.066)
Northern Europe (dummy)	1.308 (0.219)	2.223*** (0.284)
Southern Europe (dummy)	0.226*** (0.028)	0.427*** (0.034)
Constant	0.020** (0.031)	0.054*** (0.057)
Number of observations	14,435	

Note: Sample of individuals who are younger than 60 years-old and have at least one parent with care needs aged 70 or older in SHARE Waves 5 and 6. Exponentiated coefficients (relative-risk ratios). Standard errors in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source:* SHARE Waves 5 and 6.

APPENDIX B: HOURS OF CARE

SHARE asks its interviewees about help they may have received from people they know, who can family members living inside or outside the household, friends or neighbors. In Wave 5, I obtain the answers to these questions from the *social support* module, where respondents can name up to three different caregivers living outside the household, among whom their children can be included. In the case of caregivers living inside the household, they can name all the people who gave them help, including a maximum of nine children. Meanwhile, in Wave 6 I use the *gvchildren* module, which is only available in Waves 6 and 7, and makes information on the children of the respondents more easily accessible by collecting answers in several parts of the questionnaire. In this case, respondents can mention up to 20 children.

TABLE B1: OVERVIEW OF DATA ON CARE RECEIVED IN SHARE

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
OIC	Hours & frequency (household)	Hours & frequency (household)	–	Frequency (household)	Frequency (household)	Frequency (individual)	Frequency (individual)
IIC	Dummy (individual)	Dummy (individual)	–	Dummy (individual)	Dummy (individual)	Dummy (individual)	Dummy (individual)
FHC	Hours (individual)	Hours (individual)	–	–	Dummy (individual)	Dummy (individual)	Hours (individual)
NHC	Dummy (individual)	Dummy (individual)	Dummy (individual)	Dummy (individual)	Dummy (individual)	Dummy (individual)	Dummy (individual)

Note: The table summarizes the information on care received that is available in each wave of SHARE. The rows correspond to the types of care distinguished in the survey: *informal care provided by individuals who live outside the household of the respondent* (OIC), *informal care provided by individuals who live with the respondent* (IIC), *formal care received at home* (FHC), and *nursing home care* (NHC). For each form of care and wave, *hours* indicates that there is information about the number of hours of care received; *frequency* denotes that the survey only reports if the respondent received care daily, weekly, monthly, or less often; and *dummy* represents that there is only information on whether the respondent received care. In parentheses, *individual* and *household* indicate if the questions refer to care received only by the respondent, or the two couple members together in case the respondent is married or living with her partner. *Source:* SHARE questionnaires and Barczyk and Kredler (2019).

I consider children, spouses or any other person to be informal caregivers if the respondent reports having received personal care, practical household help, or help with paperwork from this person in the twelve months before the interview. It should be noted, though, that the question collecting this information in Wave 5 is formulated differently when it refers to care received from people who live outside the respondent’s household. In this case, SHARE asked about care received by the

respondent and her partner together, instead of care received only by the respondent. Table B1 summarizes the way in which each wave presents the information on the various care options.

TABLE B2: ESTIMATES OF HOURS OF INFORMAL CARE GIVEN TO PARENTS

	Log hours of care
Number of siblings	0.023 (0.020)
Parental health	-0.256*** (0.028)
Widowed parent (dummy)	0.034 (0.074)
Less than 25km away from parents (dummy)	0.182*** (0.065)
Female (dummy)	0.332*** (0.061)
Having children (dummy)	-0.185* (0.103)
Northern Europe (dummy)	-0.402*** (0.046)
Southern Europe (dummy)	0.473*** (0.077)
Constant	1.938*** (0.134)
Number of observations	2,150
R ²	0.224

Note: OLS estimates of logarithmic hours of informal care given to parents weekly by survey respondents in SHARE Waves 1 and 2. Standard errors in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In Waves 5 and 6, SHARE does not provide any information about the number of hours of informal care which survey respondents receive from their children or any other caregiver. To assign each child with a number of hours of help given, I rely on data from Waves 1 and 2, where SHARE asked about hours of care given to parents living outside the household of the respondent.¹⁵ I regress the logarithm of this number on a set of characteristics of the potential caregiver, namely, the number of siblings, parental health, and dummies for the parent being widowed, living less than 25 kilometers away from the parents, gender, and living in Northern or Southern Europe. Next, I use these estimates, reported in Table B2, to impute

¹⁵SHARE stopped collecting this number after the second wave of the survey, and has never asked about hours of help given or received in the case the care recipient and the caregiver were living together.

the number of hours of care given weekly by the children of the respondents in the estimation sample.

TABLE B3: ESTIMATES OF HOURS OF FORMAL HOME CARE RECEIVED BY PARENTS

Log hours of care			
<i>ADL dummies</i>			
Dressing	-0.063 (0.085)	Cognitively impaired (dummy)	0.099 (0.118)
Walking across a room	0.480*** (0.143)	Age	27.589 (22.323)
Bathing/showering	0.038 (0.091)	Age ²	-0.502 (0.404)
Eating/Cutting up food	0.091 (0.148)	Age ³	0.004 (0.003)
Getting in/out of bed	-0.061 (0.143)	Age ⁴	-0.000 (0.000)
Using the toilet	-0.015 (0.155)	Number of children	-0.040* (0.022)
Preparing a hot meal	0.328*** (0.106)	Widowed (dummy)	0.228*** (0.067)
Shopping for groceries	0.087 (0.081)	At least one child lives less than 1km away	-0.097 (0.085)
Using the phone	-0.595*** (0.151)	Net assets	0.000 (0.000)
Taking medications	0.491*** (0.149)	North (dummy)	-0.277*** (0.067)
Working around the house	0.210*** (0.074)	South (dummy)	-0.124 (0.094)
Managing money	0.084 (0.110)	Constant	-564.548 (460.746)
Number of observations	1,830		
R ²	0.216		

Note: OLS estimates of logarithmic hours of formal home care received by parents weekly in SHARE Waves 1 and 2. Standard errors in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

I proceed similarly with the number of hours of formal care. In Waves 5 and 6, SHARE asked its interviewees if they had stayed in a nursing home or residential care facility, or received professional care, help with domestic tasks, or meals-on-wheels at home. However, it did not collect any information on the corresponding number of hours of care received. To approximate the number of hours of formal care that parents receive weekly in my sample, I use data from Waves 1 and 2, where the respondents report the number of hours of nursing care and help from

paid professionals received at home.¹⁶ I add 14.84 hours to this number in case the respondent received meals-on-wheels (Barczyk and Kredler, 2019) and regress the logarithm of it on a fourth polynomial of age, the number of children, the value of net assets, and a list of dummies for difficulties with ADLs, being cognitively impaired, being widowed, having at least one child living less than 25 kilometers away, and living in Northern or Southern Europe. With the resulting estimates, shown in Table B3, I impute the number of hours of care for those respondents in the estimation sample who received formal care at home. For those who stayed in a nursing home or residential care facility, I impute 168 hours (24 hours a day).

TABLE B4: TYPE OF CARE RECEIVED BY SURVEY RESPONDENTS AGED 70 OR OLDER

Type of care	Wave 1 (2004/05)	Wave 2 (2006/07)	Wave 4 (2010/11)	Wave 5 (2013)	Wave 6 (2015)	Wave 7 (2017)	Total
<i>A: Informal care (%)</i>							
Outside the household	88.8	88.5	84.6	86.7	91.0	91.6	88.5
Inside the household	8.9	8.1	9.9	8.6	6.5	7.1	8.1
Both	2.3	3.3	5.5	4.7	2.6	1.3	3.4
<i>B: Formal care (%)</i>							
Formal home care	88.5	88.1	68.5	88.7	87.8	86.5	86.4
Nursing home care	11.5	11.9	26.3	5.7	12.2	13.5	11.5
Both	0.0	0.0	5.2	5.6	0.0	0.0	2.1

Note: The table shows the percentages of SHARE respondents who report having received each type of care during the twelve months prior to the wave interview, conditional on having received informal care (top panel) or formal care (bottom panel).

Table B4 summarizes how the types of informal care (outside/inside the household) and formal care (home care/nursing home care) distinguished in SHARE are distributed in the survey waves.

¹⁶After Wave 2, SHARE stopped providing information about the number of hours of help received at home, and it was not collected again until Wave 7. I use first two waves of the survey and not Wave 7 to make imputations because the number of observations in the former is higher and I also use them to deal with the analogous limitation in the case of informal care.

TABLE B5: NUMBER OF CHILDREN IN THE FAMILY

Number of children	Northern			Central			Southern			Number of outcomes
	Freq.	Percent	Cumul.	Freq.	Percent	Cumul.	Freq.	Percent	Cumul.	
1	224	28.04	28.04	873	32.19	32.19	763	26.54	26.54	8
2	327	40.93	68.96	927	34.18	66.37	988	34.37	60.90	32
3	157	19.65	88.61	549	20.24	86.62	642	22.33	83.23	128
4	71	8.89	97.50	234	8.63	95.24	320	11.13	94.37	512
5	12	1.50	99.00	69	2.54	97.79	93	3.23	97.60	2,048
6	7	0.88	99.87	37	1.36	99.15	32	1.11	98.71	8,192
7	1	0.13	100.00	12	0.44	99.59	25	0.87	99.58	32,768
8	0	0.00	0.00	5	0.18	99.78	5	0.17	99.76	131,072
9	0	0.00	0.00	5	0.18	99.96	5	0.17	99.93	524,288
10	0	0.00	0.00	1	0.04	100.00	0	0.00	99.93	2,097,152
11	0	0.00	0.00	0	0.00	0.00	1	0.03	99.97	8,388,608
12	0	0.00	0.00	0	0.00	0.00	1	0.03	100.00	33,554,432

Note: The table displays the absolute (Freq.), relative (Percent), and cumulative (Cumul.) frequencies of the number of children in the families included in the estimation sample, as well as the number of possible outcomes in the game for each family size.

APPENDIX C: HOURS WORKED AND WAGES

TABLE C1: ESTIMATES OF HOURS WORKED BY REGION

	Northern	Central	Southern
Female dummy	-0.110*** (0.005)	-0.293*** (0.005)	-0.184*** (0.004)
Age	-0.131 (0.219)	0.470* (0.204)	0.681*** (0.172)
Age ²	0.004 (0.007)	-0.018* (0.007)	-0.024*** (0.006)
Age ³	-0.00005 (0.0001)	0.0003** (0.0001)	0.0004*** (0.00009)
Age ⁴	0.0000002 (0.0000006)	-0.000002** (0.0000006)	-0.000002*** (0.0000005)
College dummy	0.060*** (0.005)	0.125*** (0.005)	0.054*** (0.004)
Constant	5.155* (2.372)	-0.893 (2.195)	-3.610 (1.866)
Number of observations	17,572	47,523	35,148
R ²	0.060	0.160	0.107

Note: OLS estimates of logarithmic hours worked from the sample of employees in EU-SILC, years 2013 and 2015. Standard errors in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

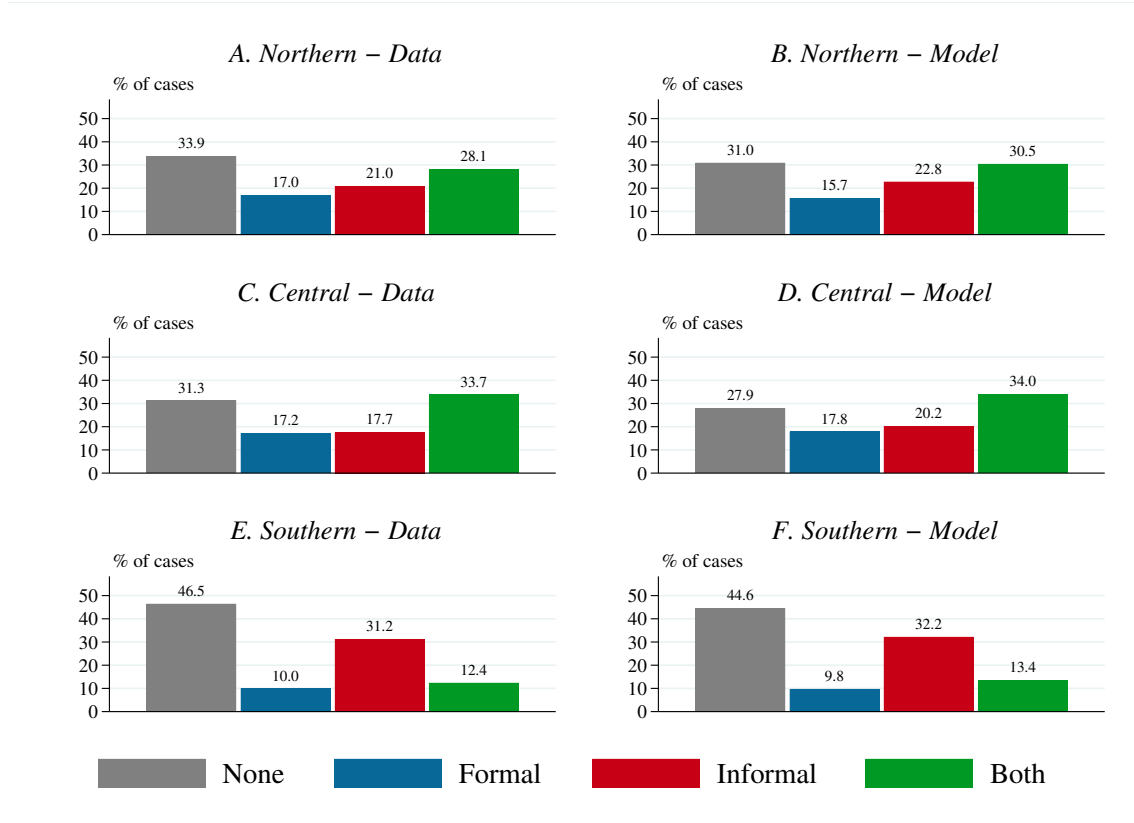
TABLE C2: WAGE PARAMETERS BY REGION

	Northern	Central	Southern
Female dummy	-0.168*** (0.009)	-0.119*** (0.008)	-0.340*** (0.023)
Age	0.058*** (0.010)	0.013** (0.005)	0.150*** (0.013)
Age ²	-0.001*** (0.000)	-0.000 (0.000)	-0.001*** (0.000)
College dummy	0.184*** (0.011)	0.285*** (0.008)	0.495*** (0.025)
Constant	1.625*** (0.232)	2.429*** (0.123)	-1.575*** (0.333)
σ_ξ	0.576	0.639	0.747
Number of observations	27,913	77,179	72,742

Note: Heckman two-step estimates of logarithmic wages using EU-SILC data for years 2013 and 2015. Standard errors in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

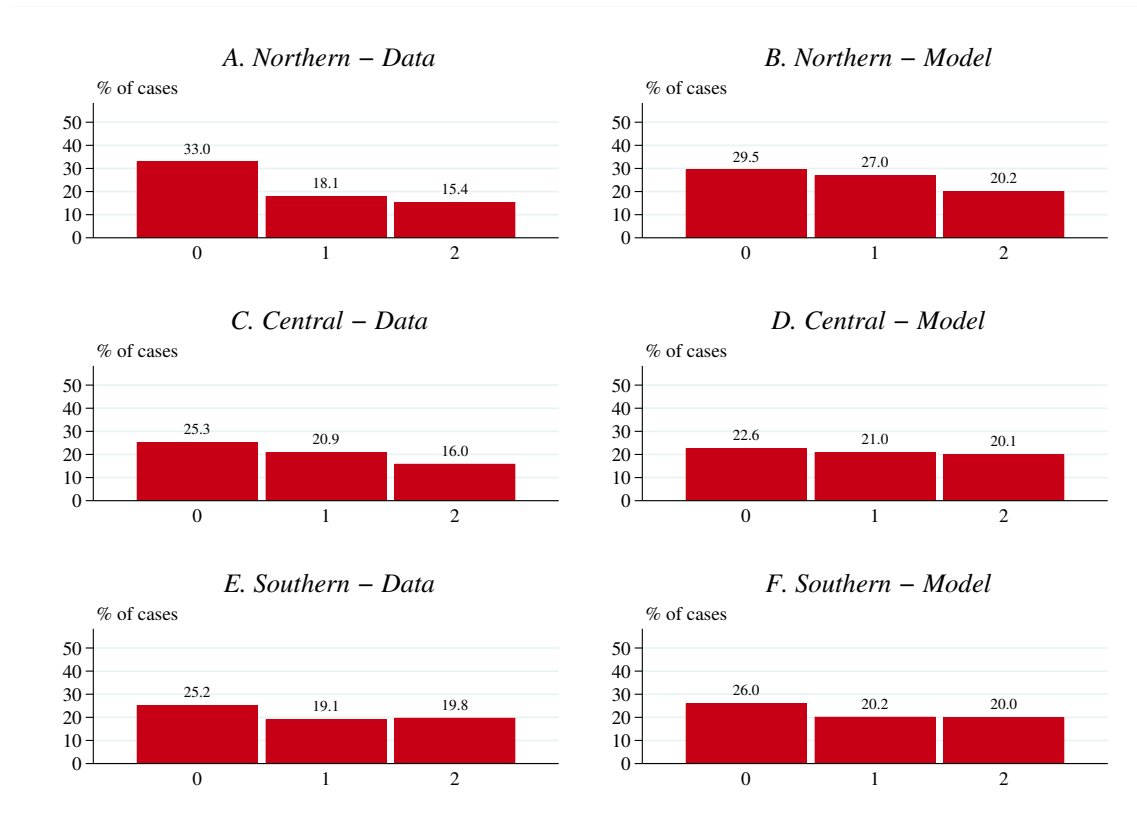
APPENDIX D: MODEL FIT

FIGURE D1: TYPE OF CARE RECEIVED BY PARENTS – MODEL FIT



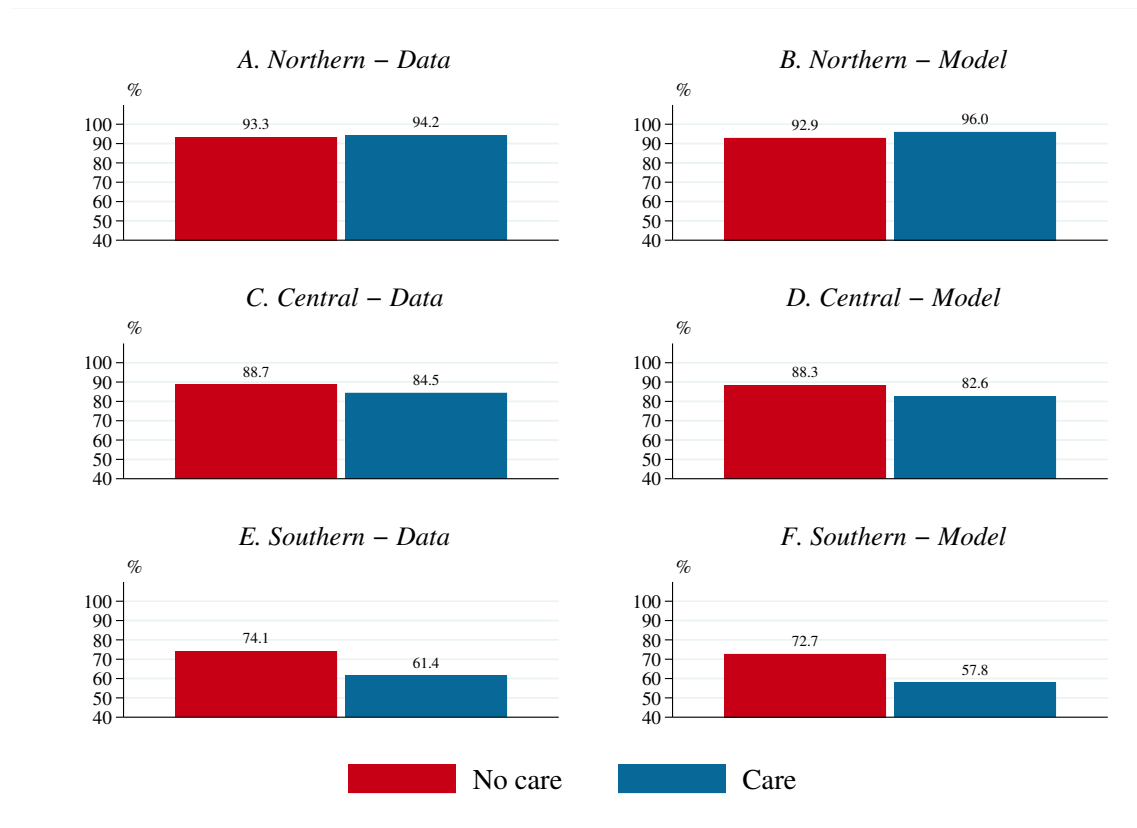
Note: The figure plots the percentage of parents aged 70 or older with care needs who receive no care, only formal care, only informal care, or both types of care in the estimation sample and model simulations. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain).

FIGURE D2: PROBABILITY OF GIVING INFORMAL CARE TO PARENTS BY NUMBER OF SIBLINGS – MODEL FIT



Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and give informal care to her, by number of siblings (from zero to two) in the estimation sample and model simulations. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain).

FIGURE D3: EMPLOYMENT STATUS OF CHILDREN AND INFORMAL CARE GIVEN TO PARENTS – MODEL FIT



Note: The figure plots the percentage of individuals who are younger than 60 years-old, have at least one parent with care needs aged 70 or older, and are employed, or non-employed while giving informal care or no care in the estimation sample and model simulations. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain).

APPENDIX E: DECOMPOSITION ANALYSIS

TABLE E1: TYPE OF CARE RECEIVED BY PARENTS AND EMPLOYMENT STATUS OF CHILDREN IN BASELINE AND COUNTERFACTUAL SIMULATIONS (%)

	Some care	Only formal care	Only informal care	Both types of care	Employed non-caregivers	Employed caregivers	Gap between non-caregivers and caregivers
<i>A. Northern Europe</i>							
Baseline	69.0	15.7	22.8	30.5	92.9	96.0	-3.1
PTC	73.8	13.1	26.1	34.7	92.6	95.2	-2.6
<i>B. Central Europe</i>							
Baseline	72.1	17.8	20.2	34.0	88.3	82.6	5.7
Preferences	73.5	15.9	24.3	33.3	90.0	94.7	-4.7
Wages	71.9	18.3	21.1	32.5	91.2	86.7	4.5
Parental health	72.3	17.7	21.0	33.6	87.3	84.0	3.3
Parental wealth	71.9	17.7	22.0	32.2	87.9	83.0	4.9
PTC	75.5	15.4	22.4	37.6	89.1	84.7	4.4
Preferences + PTC	76.0	14.2	26.4	35.3	89.9	91.3	-1.4
Wages + PTC	74.7	15.7	23.6	35.4	91.8	88.0	3.8
Parental health + PTC	75.0	14.9	23.1	37.0	88.6	84.5	4.1
Parental wealth + PTC	75.1	14.9	24.2	36.0	88.5	83.6	4.9
<i>C. Southern Europe</i>							
Baseline	55.4	9.8	32.2	13.4	72.7	57.8	14.9
Preferences	74.9	15.7	24.1	35.1	87.1	96.8	-9.7
Wages	48.3	11.5	27.1	9.7	97.3	89.6	7.7
Parental health	55.3	9.8	33.8	11.7	75.7	64.3	11.4
Parental wealth	56.1	9.8	35.0	11.3	74.9	61.9	13.0
PTC	61.3	8.5	37.9	14.9	75.1	61.5	13.5
Preferences + PTC	75.1	15.8	24.5	34.8	86.7	88.3	-1.6
Wages + PTC	53.0	10.4	31.7	10.9	97.5	91.1	6.4
Parental health + PTC	60.5	8.7	38.7	13.0	77.9	63.9	14.0
Parental wealth + PTC	61.2	8.2	39.7	13.3	77.4	61.2	16.2

Note: The table shows the share of respondents aged 70 or older with care needs who receive some care, only formal care, only informal care, or both types of care in baseline and counterfactual scenarios, as well as the share of children who are employed or non-employed while giving informal care or no care at all, and the gap between these two. In the counterfactual scenarios represented in rows 2-5 of Panels B and C, differences in preferences, wage levels, parental health and parental assets across regions are removed. In rows 6-10, simulations are conducted under the assumption that children have preferences over the total amount of care (PTC). The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany), and Southern Europe (Italy and Spain).

APPENDIX F: POLICY EXPERIMENTS

TABLE F1: ELDERLY CARE SUBSIDIES FOR POLICY SIMULATIONS (EUROS PER YEAR)

		Northern		Central		Southern	
	Care needs	Wave 5	Wave 6	Wave 5	Wave 6	Wave 5	Wave 6
Care costs	Moderate	56,267.00	55,959.18	29,901.57	30,713.12	35,735.19	36,922.45
	Severe	51,040.96	50,761.73	49,375.25	50,783.97	32,426.85	33,493.49
Baseline public support	Moderate	54,578.99	54,280.40	22,177.69	22,792.11	27,437.74	28,367.81
	Severe	48,999.32	48,731.26	36,759.83	37,830.50	20,909.70	21,627.50
Counterfactual public support	Moderate			29,004.52	29,791.72	34,663.13	35,814.77
	Severe			47,400.24	48,752.61	31,129.78	32,153.75
Subsidy	Moderate			6,826.83	6,999.61	7,225.39	7,446.96
	Severe			10,640.41	10,922.12	10,220.08	10,526.25

Note: The table shows the value of long-term care costs, financial public support to cover these costs, and subsidies given to family members in the policy simulations for each country group, survey wave, and level of care needs. Care costs are computed from data on total costs of long-term care of home care for moderate needs and institutional care for severe needs, as a share of the median disposable income of individuals over 65 years-old. Baseline public support for care is computed from the share of long-term care costs covered by public social protection systems, for care recipients earning a median income and holding no net wealth, by severity and care setting. Counterfactual public support for care is computed under the assumption that the share of costs covered by public social protection systems in all the countries is the same as in Sweden. The values of the subsidies are computed as the difference between baseline public support and counterfactual public support. *Source:* OECD analyses based on the OECD Long-Term Care Social Protection questionnaire and the OECD Income Distribution Database.

TABLE F2: TYPE OF CARE RECEIVED BY PARENTS AND EMPLOYMENT STATUS OF CHILDREN IN BASELINE AND POLICY SIMULATIONS (%)

	Some care	Only formal care	Only informal care	Both types of care	Employed non-caregivers	Employed caregivers	Gap between non-caregivers and caregivers
<i>A. Northern Europe</i>							
Baseline	69.0	15.7	22.8	30.5	92.9	96.0	-3.1
<i>B. Central Europe</i>							
Baseline	72.1	17.8	20.2	34.0	88.3	82.6	5.7
Parents (unconditional)	71.7	17.9	20.9	32.9	87.7	82.3	5.3
Parents (conditional)	76.9	22.8	16.9	37.2	87.8	82.9	4.9
Children (unconditional on employment)	75.3	15.4	22.5	37.4	87.2	83.1	4.1
Children (employed)	74.9	15.8	22.5	36.6	87.6	87.6	0.0
Children (non-employed)	72.3	16.7	21.2	34.4	87.9	78.0	9.9
<i>C. Southern Europe</i>							
Baseline	55.4	9.8	32.2	13.4	72.7	57.8	14.9
Parents (unconditional)	56.1	9.6	34.2	12.3	75.2	61.8	13.4
Parents (conditional)	64.8	18.9	23.4	22.4	75.0	62.3	12.7
Children (unconditional on employment)	69.7	6.7	47.1	15.9	76.6	61.4	15.2
Children (employed)	65.7	7.3	43.3	15.1	76.1	77.5	-1.4
Children (non-employed)	63.0	8.3	40.7	13.9	76.4	42.6	33.8

Note: The table shows the share of respondents aged 70 or older with care needs who receive some care, only formal care, only informal care, or both types of care in baseline and policy scenarios, as well as the share of children who are employed or non-employed while giving informal care or no care at all, and the gap between these two. The evaluated policies are a subsidy for parents, unconditional on formal care; a subsidy for parents, conditional on formal care; a subsidy for caregiving children, unconditional on employment; a subsidy for caregiving children, conditional on employment; and a subsidy for caregiving children, conditional on non-employment. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany), and Southern Europe (Italy and Spain).