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Eassays on Elderly Care and Family Desision-Marking

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Doctoral Thesis

Essays on Elderly Care and Family Decision-Making

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Dissertation submitted to the Departament d'Economia i d'Història Econòmica in fulfillment of the requirements for the degree of Doctor of Philosophy by the International Doctorate in Economic Analysis (IDEA).

"Los abuelos son eternos, como lo es su amor incondicional y su capacidad para hacernos sentir únicos; como lo son sus abrazos y su fe en nosotros, como lo es su casa, que no es otra cosa que el hogar de toda la familia. Los abuelos son eternos, como lo son esos consejos que nos dieron y el eco de cómo nos llamaban, con esos nombres cariñosos, tan suyos, tan nuestros. Los abuelos son eternos como lo es su presencia en nuestra niñez, como lo es el espacio que dejan cuando se van y su recuerdo en nosotros. Y así, eterno, debe ser nuestro agradecimiento hacia ellos."

To Esther and Manuela, my grandmothers.

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This thesis is also based on data from Eurostat, European Union Statistics on Income and Living Conditions (EU-SILC). The responsibility for all conclusions drawn from the data lies entirely with me.

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Preface

Population aging is one of the most concerning challenges that countries all over the world will face in the coming years. Among the consequences of this trend, the demand for elderly care is very high and will likely increase in the future. In this dissertation, I study the provision of elderly care across Europe, the relative importance of formal and informal care, the factors that determine families' decisions to provide each type of help, and the relationship between caregiving and labor supply.

In Chapter 1, I lay out the facts that motivate the analysis of the next two chapters. In the first place, I analyze how European countries differ in the use of formal and informal care. Using cross-national microdata from the Survey of Health, Ageing and Retirement in Europe (SHARE), I find a North-South gradient in formal care provision. In Northern and Central European countries, the proportion of older individuals who receive formal care, alone or in combination with informal care, is more than 20 percentage points larger than in Southern European countries, and this gradient remains robust after controlling for individual characteristics. Additionally, Southern Europe exhibits a higher prevalence of informal care as the only means of help and a larger share of individuals with care needs who do not receive any help. Secondly, I discuss the role of two factors that may explain the observed disparities in care arrangements. One is the contrasting availability and generosity of public elderly care services across regions. The other is social norms, which might have an influence on how family members get involved in caregiving. Lastly, I explore the relationship between providing informal care to parents and labor supply decisions. In Southern Europe, I observe a much larger gap in terms of labor force participation between caregivers and non-caregivers than in the rest of the continent. I then present evidence to support the hypothesis that the negative association between caregiving and labor supply is stronger in Southern Europe than in the other two regions.

In order to understand these patterns, in Chapter 2, I develop a structural model that represents the interactions among older parents and adult children as a static, non-cooperative game of complete information. I estimate this model using data of Northern, Central and Southern European countries from SHARE. The model is able to replicate the choices made by families in the three regions considered well. Equipped with the estimated model, I carry out a decomposition analysis of the forces behind differences in formal and informal care use across Europe. The results of this exercise indicate that the variability in care arrangements across regions can be largely explained by model parameters that capture the influence of care prices and social norms, and by wage levels. Next, I use the estimated model to assess various types of subsidies to support care recipients and caregivers. I find that subsidies for family caregivers are more effective than subsidies for care recipients to meet elderly care needs in Southern Europe.

In Chapter 3, I analyze the effect of the provision of informal care to parents on labor supply decisions, focusing on the intensive margin. The goal of this chapter is to understand how the children of care recipients allocate hours to care and work, and how the outcomes of these decisions differ across countries in Europe. To provide a quantitative answer to these questions, I build and estimate a static, structural model featuring an agent who is altruistic towards their parent and allocates their time and budget to consumption, hours worked, and hours of formal and informal care to maximize utility. The estimated model provides valuable insights into the mechanisms driving these decisions. In particular, I concentrate on the role played by wages, prices of formal care, and family ties. Then, I use the model to simulate the reactions of agents to unconditional cash benefits and discounts on formal care prices. These simulations show that cash benefits induce agents to substitute hours worked for hours of informal care, while formal care price discounts give place to replacing hours of informal care for hours of formal care.

Chapter 1

Elderly Care Across Europe

1.1 Introduction

The rising demand for elderly care resulting from 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 experience difficulties carrying out their daily activities due to health problems, currently set at 48.7%, is expected to increase by 21% (European Commission, 2018, 2019).

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 physical or cognitive decline. This includes assistance with daily activities such as dressing, bathing, getting in and out of bed, or doing housework (Clancy, Fisher, Daigle, Henle, McCarthy and Fruhauf, 2019). Elderly care is said to be *formal* when is provided by paid, professional services in the home of the care recipient or in residential care facilities. By contrast, it is *informal* when help is given by relatives or friends without a contractual agreement in place or formal payment in exchange.

The provision of elderly care has important implications for different agents. First, for governments, which spend large amounts of resources on these services through long-term care programs. Second, for families, not only from the point of view of care recipients but also for their relatives. On the one hand, the purchase of formal care services often places a big burden on household finances, with a significant impact on consumption and savings. On the other hand, children represent one of the most important sources of informal care. These are often working-age individuals who consider the cost of giving care in terms of foregone labor earnings when making their labor supply decisions.

In this chapter, I study the provision of elderly care across Europe with the aim of quantifying the relative importance of different forms of care and their relationship with the labor supply decisions made by the children of care recipients. To do that, I use microdata from the Survey of Health, Ageing and Retirement in Europe (SHARE), a cross-national database that collects information about the living arrangements and socioeconomic characteristics of individuals aged 50 and older living in Europe. My focus is on potential care recipients from a set of eight countries that can be grouped into three regions: Northern Europe (Denmark and Sweden),

Central Europe (Austria, Belgium, France, and Germany), and Southern Europe (Italy and Spain).

In the first place, I analyze how regions differ in the use of formal and informal care. In line with earlier research, I find a North-South gradient in formal care provision. In Northern and Central European countries, the proportion of older individuals who receive formal care, alone and in combination with informal care, is more than 20 percentage points larger than in Southern European countries, and this gradient remains robust after controlling for characteristics of care recipients. Trying to compensate for this lack of formal care provision, there is a high prevalence of informal care as the only means of help in the South, as well as a higher chance of receiving informal care from children on a daily basis. At the same time, the share of individuals with care needs who do not receive any help in the South is more than 10 and 12 points larger than in the North and the Center, respectively.

Then, I discuss the role of two factors that may explain the observed disparities in care arrangements across Europe. One is the availability of public elderly care and the generosity of the programs supplying these services. In this respect, countries in Northern Europe, and to a lesser extent, those in Central Europe, spend more resources on publicly provided formal care than countries in Southern Europe. Social norms and their interplay with family structure constitute another element. Family ties have been found to be weaker in Northern and Central European countries than in Southern countries (Reher, 1998; Kohli, Kunemund and Ludicke, 2005), where contact between generations is more frequent and rates of co-residence are higher. These circumstances may favor a greater potential for informal support in the South, and have an influence on whether and how family members get involved in caregiving. Regarding this matter, I find the probability of giving informal care to parents to be decreasing in the number of siblings in the three regions considered. This slope is somewhat lower in Southern Europe, which could be related with a preference for sharing care responsibilities among siblings.

Next, I investigate the relationship between providing informal care to parents and labor supply decisions. In Southern Europe, I observe a much larger gap in terms of employment rates between individuals who give care to their parents and those who do not than in Northern and Central Europe. To analyze the link between work and caregiving in more detail, I estimate a linear regression model for each region that confirms that the association between giving informal care and being employed is negative and stronger in the South than in the Center, whereas there are no significant differences between caregivers and non-caregivers in the North. On top of that, I find that giving informal care to parents on a daily basis increases the chances of being part-time employed in Central Europe, while the effect is the opposite in Southern Europe. Thus, it may be harder for Southern Europeans to adjust the number of hours worked. In fact, workers in this region face a part-time penalty in wages that is larger than in the other two.

The work presented in this chapter lays out the facts that motivate the analysis of Chapters 2 and 3, and contributes to the literature on elderly care provision in Europe. In the first place, there is a body of literature that analyzes differences across countries. Studies in this group document the existence of a North-South divide with respect to the use of formal and informal care. Using data from the first release of SHARE, Attias-Donfut, Ogg and Wolff (2005) find a higher proportion of older people receiving family support in Northern and Central

European countries, whereas in Southern countries family members are involved in caregiving in a more intensive way. As a consequence, older individuals in Northern and Central Europe are more likely to receive support than those in the South. The authors link these differences to three main factors: the higher geographical closeness between old parents and adult children in Southern Europe, the lower labor force participation of daughters in this region, and the poorer development of public care services compared to those offered in Northern and Central European countries. The findings by Bonsang (2007), on help provided by adult children, and Bolin, Lindgren and Lundborg (2008a) and Bonsang (2009), on the substitutability between formal and informal care, rely on the same data source and point in the same direction. Proposing a broad definition of formal and informal care and a methodology to account for frequencies and hours of help, Barczyk and Kredler (2019) identify a strong North-South gradient in the utilization of informal care, conditional on receiving help, that is robust after accounting for the intensity of care. The results that I obtain in this chapter are consistent with these studies and constitute further evidence of the distinct role of formal and informal care across Europe.

In the second place, there is a strand of the literature that examines the impact of giving care to old parents on labor market outcomes. With the exception of Wolf and Soldo (1994), who find no effect of caregiving on the probability of being employed or the number of hours worked in the United States, existing studies on this and other countries argue that such effect does exist and is negative and stronger for women. Spiess and Schneider (2003), Viitanen (2005), Crespo (2008), Bolin, Lindgren and Lundborg (2008b), and Crespo and Mira (2014) provide estimates of the effect of caregiving on employment in Europe, concurring that it differs across countries. Spiess and Schneider (2003) find that Northern European women adjust their labor supply when starting care responsibilities, while Southern European women do so when increasing the number of hours of care given. Viitanen (2005) finds that elderly care responsibilities increase with age and constrain the labor force participation of middle-aged women until retirement. Crespo (2008) focuses on the provision of intensive (daily or weekly) informal care to parents, which reduces the probability of participating in the labor market for Northern and Southern European women. According to Bolin, Lindgren and Lundborg (2008b), hours of informal care have a negative effect on the probability of being employed and hours worked by men and women, and this impact is bigger in Central Europe than in Southern Europe. The results obtained by Crespo and Mira (2014) indicate that the effect of daily caregiving on women's employment is negligible in Northern and Central Europe, but not in the South, where there is a big proportion of daughters providing intensive care. In this chapter, I provide additional evidence of the link between informal caregiving and employment across Europe, considering the probability of being employed and the choice between full and part-time employment.

The rest of the chapter is structured as follows. In Section 1.2, I provide a brief description of the data. In Section 1.3, I give an overview of elderly care arrangements across Europe. In Section 1.4, I discuss the role of institutions and social norms in the provision of care. In Section 1.5, I analyze the relationship between caregiving and labor supply decisions. I conclude in Section 1.6.

1.2 Data

My analysis is based on data from the Survey of Health, Ageing and Retirement in Europe (SHARE). This is a longitudinal, cross-national micro database that collects detailed information about the living conditions of about 140,000 respondents aged 50 and older in 28 European countries. The eight biennial waves of SHARE which are available as of 2023 contain representative samples from the population in the participating countries and comprise information about demographics, physical and mental health, social support, housing, income, consumption, and labor market variables at the individual and household level.

I restrict attention to data from Wave 5 and Wave 6 (Börsch-Supan, 2018a,b), collected in 2013 and 2015, respectively, in eight countries that have been part of the survey since Wave 1. I group these countries into three regions: Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France, and Germany), and Southern Europe (Italy and Spain). The main focus of my study is on individuals who are aged 70 or older, retired, and who have at least one child aged 60 or younger.

In this sample, I can observe whether individuals have difficulties to carry out activities of daily living (ADL) and the limitations that they have. Following Ko (2021), I also use the scores obtained in world recall, orientation, and numeracy tests to categorize respondents as cognitively impaired if they are in the bottom 10% of the cognitive score distribution of the sample. Then, I classify respondents as individuals with care needs if they have difficulties with ADLs or are cognitively impaired.[1,2]

To investigate the different forms of care received by these individuals and quantify their importance, I resort to the responses collected in the *social support* and *health care* modules of the survey, complemented with a set of variables referring to the children of the survey respondents. Apart from help received from them, these variables also include information on their employment status, year of birth, level of education, marital status, number of children, and how far away they live from their parents. In these interviews, respondents are not asked to report the wages of their adult children. In order to address this issue in Section 1.5, I draw upon data of individuals aged 16 to 60 years old in the countries and years studied from the European Union Statistics on Income and Living Conditions (EU-SILC).

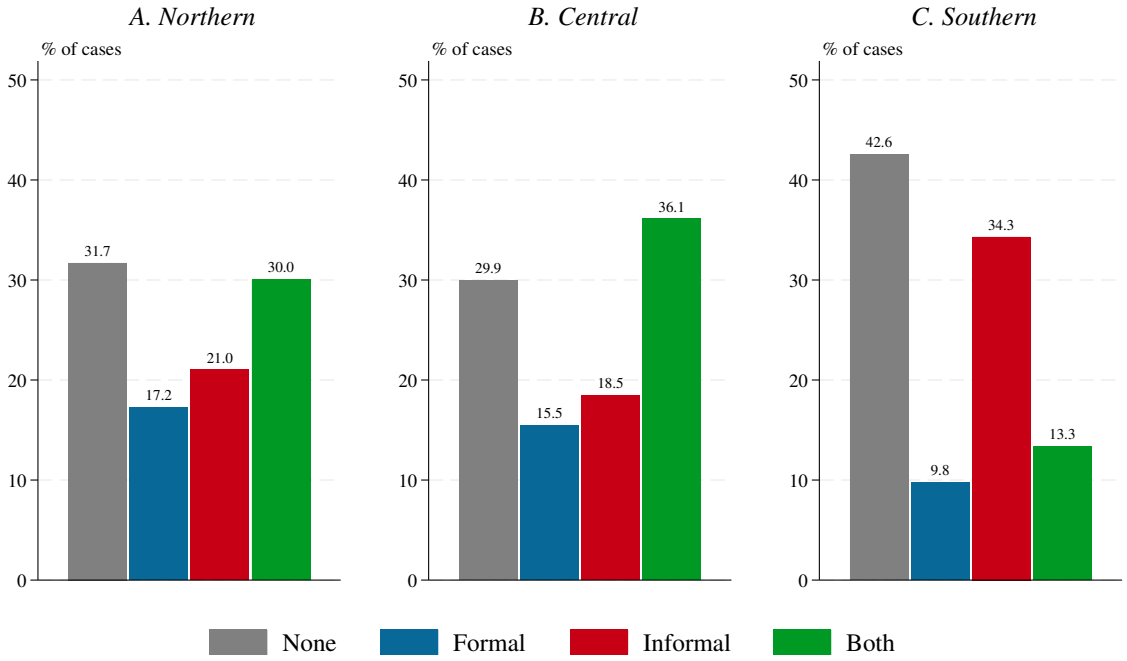
1.3 Care Arrangements Across Europe

This section aims to quantify the relative importance of the different forms of care received by the elderly across Europe. To begin with, I use raw counts of individual cases to illustrate how countries differ in the use of formal and informal care. Figure 1.1 represents the share of people aged 70 or older with care needs who receive only formal care, only informal care, both types of care, or no care at all in Northern, Central, and Southern Europe. In line with previous studies, there is a North-South gradient in the use of formal care. The percentage of

[1] If physical or cognitive limitations hinder the ability of a respondent to complete the interview independently, SHARE allows the assistance of a proxy respondent to complete the interview.

[2] I also categorize those respondents who have difficulties with three or fewer ADLs and are not cognitively impaired as individuals with *light* care needs, and those with more than three ADLs or cognitively impaired as individuals with *severe* care needs.

FIGURE 1.1: 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 aged 60 or younger 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.

individuals who receive some formal care, alone or in combination with informal care, is 47.2% in Northern Europe, 51.6% in Central Europe, and 23.1% in Southern Europe. This gradient remains robust after accounting for individual characteristics, as I show in Table A.1.1, which displays the results of a multinomial logit model for the type of care received. According to these estimates, living in Southern Europe is associated with a lower probability of receiving only formal care or both types of care.

The resulting underprovision of formal care in the South may induce families in these countries to meet the needs of their parents informally, although this might be difficult for some. As a consequence, the use of informal care as the only means of help is more prevalent in this region (34.3% of cases) than in Northern and Central Europe (21% and 18.5%), where the percentage of individuals who do not receive any help is lower (31.7% and 29.9%) than in Southern countries (42.6%). These numbers align with the logit estimates of Table 1.1, which also indicate that older parents in Southern Europe are more likely to have care needs than their Northern European counterparts.

The disparities in the combination of care types across regions suggest that there might also be differences in the burden that care represents for the children of care recipients, who are, with spouses, the most common source of informal care (see Figure A.1.1). In this respect, Table 1.2 shows the estimates of six logit models for receiving formal care and several sources of informal care: children (on a daily or less than daily basis), children-in-law, spouses, and other caregivers. Consistent with the raw case counts reported in Figure A.1.4, conditional on

Table 1.1: Having care needs and care received – Logit estimates

	Having care needs (dummy)[(a)]	Care received (dummy)[(b)]
Central Europe (dummy)	1.880***	1.050
	(0.122)	(0.116)
Southern Europe (dummy)	4.396***	0.591***
	(0.286)	(0.068)
Number of observations	23,496	6,527

Note: (a) Sample of respondents aged 70 or older; (b) sample of respondents aged 70 or older with care needs. Exponentiated coefficients (odds ratios). Controlled for gender, age, age squared, being widowed, having severe care needs (only in b), number of children (only in b), having at least one child living less than 25 km away (only in b), and log net assets (see Table A.1.2 for the full specification). Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source*: SHARE, waves 5 and 6.

receiving care, living in Southern Europe decreases the odds of receiving less-than-daily informal care from children by 60% compared to Northern Europe, while those of receiving daily help from them are nine times higher. Southern Europeans also have a higher chance of receiving informal care from children-in-law than Northern Europeans, whereas differences in spousal care are not significant. The estimates in this table are also evidence of the existence of different care arrangements in Central Europe compared to Northern Europe, especially with regard to help received from children and spouses, but there is a stark contrast between these two regions and the South, where the probability of relying on formal care is much lower.

Table 1.2: Type of care received (conditional on receiving care) – Logit estimates

	Children (light)	Children (intensive)	Children-in-law	Spouse	Others	Formal care
Central Europe (dummy)	0.588***	3.719***	1.369	1.723***	0.894	1.269*
	(0.075)	(0.876)	(0.345)	(0.266)	(0.127)	(0.172)
Southern Europe (dummy)	0.409***	9.457***	1.510*	0.907	0.648***	0.260***
	(0.057)	(2.203)	(0.375)	(0.150)	(0.102)	(0.037)
Number of observations	4,036	4,036	4,036	4,036	4,036	4,036

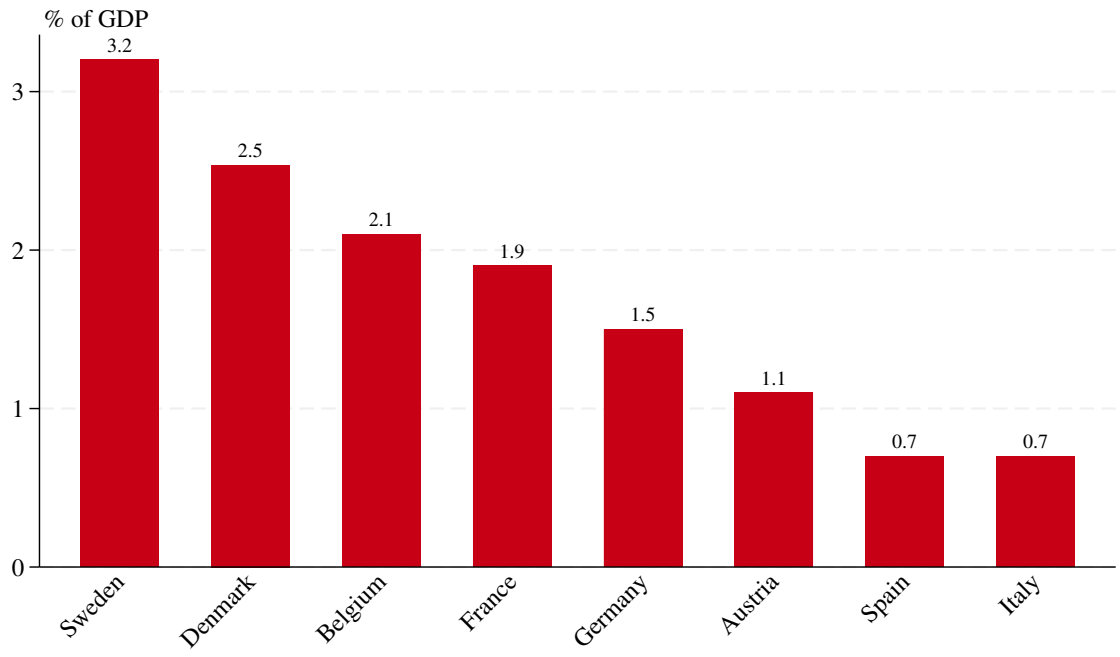
Note: Sample of respondents aged 70 or older with care needs. Exponentiated coefficients (odds ratios). Controlled for gender, age, age squared, being widowed, having severe care needs, number of children, having at least one child living less than 25 km away, and log net assets (see Table A.1.3 for the full specification). Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Care alternatives are not mutually exclusive. *Source*: SHARE, waves 5 and 6.

In addition to the differences just outlined, it is possible to find disparities between men and women. First, as pointed out by Table A.1.2, women are more likely to have care needs than men. Second, among those who have care needs, women have also have a higher probability of receiving care, as shown in the same table and Figure A.1.3. Finally, as Table A.1.3 and Figure A.1.5 suggest, conditional on receiving care, women have a higher chance of receiving informal care from children and formal care, while the probability of receiving spousal care is lower than for men. Figure A.1.2 indicates that this fact also applies conditional on receiving informal care.

1.4 Institutions and Social Norms

In this section, I discuss the role of two factors that might drive the aforementioned differences in care arrangements across Europe: institutions and social norms.

Figure 1.2: Public long-term care spending as a share of GDP (2017 or nearest year)



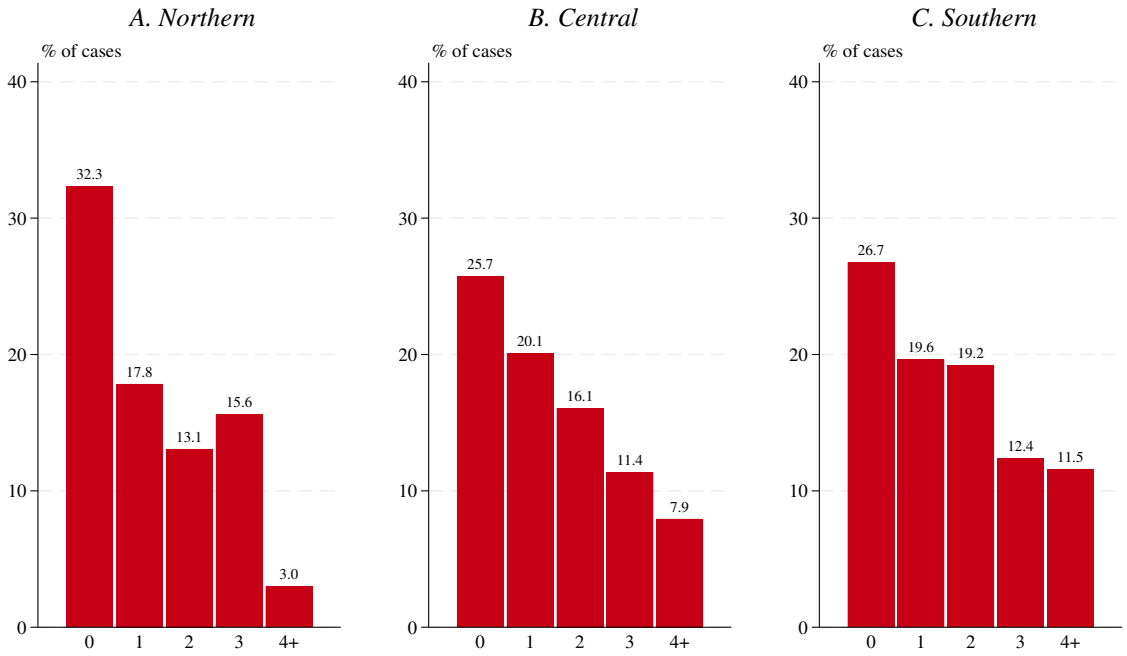
Note: Long-term care expenditure (health and social components) made by the government and compulsory insurance schemes. *Source*: OECD (2019).

In the first place, although there are publicly financed programs to support individuals with care needs in all the countries studied, there is a significant degree of variety in terms of the generosity of these programs. Figure 1.2 represents public long-term care spending as a share of GDP in the eight countries studied, in descending order. As can be seen in this figure, Northern European countries exhibit the highest shares of public spending on care services (3.2% of the GDP in Sweden, 2.5% in Denmark) and Southern European countries the lowest ones (0.7% in Italy and Spain), with Central Europe in between (from 2.1% in Belgium to 1.1% in Austria). This ordering is thus consistent with the North-South gradient in formal care and the higher share of unattended individuals with care needs in the South, presented in the previous section.

In the second place, 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. This manifests in outcomes such as rates of co-residence and frequency of contact between generations.[3] In Southern Europe, the percentage of parents aged 60 and older who live with at least one child in

[3]Reher (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 co-residence with adult children and older family members".

FIGURE 1.3: PROBABILITY OF GIVING INFORMAL CARE TO PARENTS BY NUMBER OF SIBLINGS



Note: The figure plots the percentage of individuals who are aged 60 or younger, have at least one parent with care needs aged 70 or older, and give informal care to them, by number of siblings (from zero to four 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.

the household is around 30%, while in Northern Europe this only nudges 2.5% (Kohli, Kunemund and Ludicke, 2005).

These circumstances may not only favor a greater potential for support from children to parents in the South, but they might also influence the way in which family members interact when deciding how to provide care to the elderly. Figure 1.3 illustrates one of the aspects in which elderly care provision decisions vary across families. According to this figure, the probability of engaging in care provision decreases in family size in the three regions studied. It is highest in Northern Europe for children without siblings (32.3%) and lowest for children with four or more siblings (3%). This pattern of specialization is common across regions, but is somewhat less pronounced in Southern Europe, where the likelihood of giving care is 15.2 points higher for an only child than for a person with four or more siblings.[4] This could be attributed to a greater emphasis on familial obligations and the collective responsibility of siblings in providing care to parents.

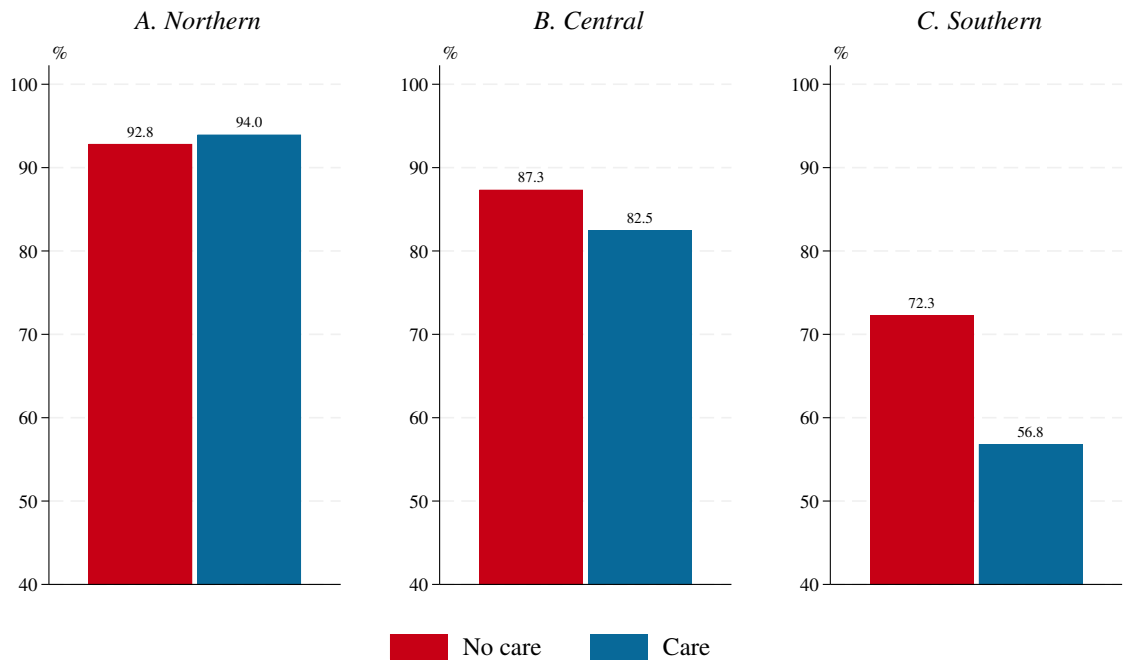
1.5 Working and Caring for the Elderly

As I stated before, the children of the care recipients represent the main source of informal care. These individuals may consider the cost of providing care to their parents in terms of

[4]In Figure A.2.1 it is possible to observe that this relationship between the likelihood of providing informal care and family size holds for both sons and daughters, although the gradient is lower for the latter.

foregone labor earnings when making care and labor supply decisions. In this section, I study the relationship between providing care to parents and labor supply decisions, and how this link differs across regions.

FIGURE 1.4: EMPLOYMENT RATE OF CHILDREN BY INFORMAL CARE GIVEN TO PARENTS



Note: The figure plots the percentage of individuals who are aged 60 or younger, 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 1.4 sheds light on these aspects. It represents the probability of being employed for working-age individuals with parents in need of care, conditional on providing or not providing help to them in Northern, Central and Southern Europe. In Northern Europe, these two fractions are similar, with the likelihood of being employed being even slightly larger for caregivers than for non-caregivers. 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. However, this gap is much bigger in the South, reaching 15.5 percentage points.

To further explore the influence of care provision decisions on labor supply, I estimate a linear regression model for the outcome of being employed as a function of giving informal care to parents, controlling for children's characteristics. Then, I compare the OLS estimates with those obtained by relaxing the assumption that informal care is exogenous to employment decisions. Since unobservables might correlate with informal care, OLS estimates might be biased. To consider this possibility, I present two-stage least squares (2SLS) estimates as well, using dummies for living less than 25 km away from parents and for having a widowed parent as instruments.[5] To preserve space, Table 1.3 only shows the coefficient of informal care for the

[5]The F-statistic of the test of joint significance of both variables in the corresponding first-stage regressions is well above the usual threshold of 10 below which instruments would be considered weak (Staiger and Stock, 1997).

Table 1.3: Regressions of being employed on giving informal care to parents (Northern, Central and Southern Europe) – OLS and 2SLS estimates

	Northern Europe			Central Europe			Southern Europe		
	All	Men	Women	All	Men	Women	All	Men	Women
OLS	0.007	0.038*	-0.011	-0.042*	-0.070*	-0.027	-0.140***	-0.146***	-0.135***
	(0.020)	(0.022)	(0.027)	(0.022)	(0.036)	(0.027)	(0.025)	(0.041)	(0.029)
2SLS[(a)]	-0.003	0.134	-0.069	-0.196**	-0.367*	-0.097	-0.341**	-0.267	-0.344*
	(0.072)	(0.124)	(0.084)	(0.079)	(0.200)	(0.088)	(0.157)	(0.258)	(0.184)
N. obs.	1,667	842	825	5,832	2,549	3,283	6,617	2,715	3,902

Note: Sample of individuals who are aged 60 or younger and have at least one parent with care needs aged 70 or older. Estimated coefficients of a dummy for giving informal care to parents. Controlled for age, age squared, and dummies for being married, having college education, and having children. Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (a) Dummies for living less than 25 km away from parents and for having a widowed parent used as instruments. *Source*: SHARE Waves 5 and 6.

whole sample of each region, and for men and women separately. The full results are available in Tables A.3.2, A.3.3, A.3.4 and A.3.5.

The OLS estimates of the effect of giving informal care to parents on being employed are much in line with the magnitudes in Figure 1.4. While in Northern Europe there are no significant differences between the employment rates of caregivers and non-caregivers, the probability of being employed is 4.2 points lower for caregivers in Central Europe, and 14 points smaller in Southern Europe. The effect is similar for men and women in this region, whereas in the North and the Center, it is slightly larger for men than for women.

The estimates obtained by 2SLS are in general larger in absolute value. In this case, being a caregiver is associated with a 19.6 point decrease in the probability of being employed in Central Europe, which seems to be mainly driven by men. In Southern Europe, the effect is stronger for women, being -0.341 in the whole sample. In the North, differences between caregivers and non-caregivers remain small and non-statistically significant.

In addition to the impact at the extensive margin just outlined, the decision to give informal care may have an influence on labor supply decisions at the intensive margin. To quantify this effect, Table 1.4 reports the estimates of a multinomial logit model for the employment status of an individual with parents in need of care, distinguishing between non-employment (base category), part-time employment, and full-time employment. Apart from the region dummies included in previous tables, I consider interactions between these and dummies that indicate whether informal care is provided on a light (less than daily) or intensive (daily) basis. The results of the full specification are reported in Table A.3.6.

The estimated relative-risk ratios reflect a lower probability of choosing full-time employment over non-employment in Central and Southern Europe compared to Northern Europe, as well as significant differences between these last two regions in terms of part-time employment that go in the same direction. Looking at the interactions with caregiving, providing intensive informal care in Central and Southern Europe is associated with a negative and significant effect on the chances of being full-time employed. At the same time, being a daily caregiver in the Center has

See Table A.3.1 for the results of the first-stage regressions.

Table 1.4: Employment status of children – Multinomial logit estimates

	Part-time	Full-time
Central Europe (dummy)	0.745	0.481***
	(0.162)	(0.091)
Southern Europe (dummy)	0.185***	0.196***
	(0.042)	(0.037)
Central Europe × Light informal care (dummy)	1.133	1.099
	(0.378)	(0.284)
Central Europe × Intensive informal care (dummy)	1.182	0.471***
	(0.346)	(0.103)
Southern Europe × Light informal care (dummy)	0.541	0.742
	(0.275)	(0.144)
Southern Europe × Intensive informal care (dummy)	0.792	0.741**
	(0.188)	(0.101)
Number of observations	13,951	

Note: Sample of individuals who are aged 60 or younger and have at least one parent with care needs aged 70 or older. Exponentiated coefficients (relative-risk ratios). Controlled for age, age squared, and dummies for having college education, living less than 25 km away from parents, having children, being married, having siblings, and having parents with severe long-term care needs. Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. 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. *Source*: SHARE Waves 5 and 6.

a positive impact on the likelihood of choosing part-time employment, while in the South this effect is negative. Although these two coefficients are not statistically significant, the results of this model overall may be interpreted as evidence of a negative effect of providing informal care to parents on hours worked. Nonetheless, for Northern and Central European caregivers, it might be easier to switch from full-time to part-time employment than for their counterparts in the South, as Figure A.3.2 would also imply.[6]

Table 1.5: Estimates of the part-time wage penalty – OLS and Heckman estimates

	Northern Europe			Central Europe			Southern Europe		
	All	Men	Women	All	Men	Women	All	Men	Women
OLS	-0.105***	-0.143***	-0.008	-0.171***	-0.147***	-0.064***	-0.203***	-0.225***	-0.118***
	(0.017)	(0.049)	(0.018)	(0.009)	(0.029)	(0.009)	(0.013)	(0.031)	(0.016)
Heckman[(a)]	-0.061***	-0.050	0.025	-0.143***	-0.103***	-0.019*	-0.203***	-0.140***	-0.120***
	(0.017)	(0.048)	(0.017)	(0.009)	(0.027)	(0.010)	(0.013)	(0.033)	(0.016)
N. obs.	27,913	13,451	14,462	76,867	36,151	40,716	72,742	33,527	39,215

Note: Sample of individuals between 16 and 60 years-old. Estimated coefficients of a dummy for being part-time employed. Dependent variable: log wages. Controlled for age, age squared divided by 100, and having college education (see Tables A.3.7, A.3.8, and A.3.9 for the full results). Standard errors clustered at the individual level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (a) Full-information maximum likelihood estimates of Heckman's selection model, using dummies for being married and having children as exclusion restrictions. *Source*: EU-SILC, years 2013 and 2015.

[6]Women may be particularly impacted by this situation, as hinted by Figure A.3.3. Daughters of individuals with care needs are less likely to be full-time employed than sons, and their employment status presents a larger variability across caregiving choices than that of men.

These difficulties to adjust the number of hours worked in Southern Europe might be the product of labor market frictions. One hypothesis could be that working part-time is more penalized in terms of wages in the South than in the rest of Europe. To test if this is the case, I run a linear regression model of log wages as a function of an indicator variable that equals one if the worker is part-time employed and zero otherwise, a quadratic polynomial of age, and education, using data from EU-SILC for the countries and years studied. To correct for self-selection bias, I re-estimate the coefficients following Heckman (1979), using marital status and having children as exclusion restrictions.

Table 1.5 displays the estimated coefficients associated to being part-time employed in each region. The results of both estimators point out that there is indeed a part-time wage penalty in the three regions considered, and that this increases from North to South. According to the results of the selection model, wages in Northern Europe are 6.1 percentage points lower for part-time workers than for full-time ones. In Central Europe, this gap goes to 14.3 points, and reaches 20.3 points in the South. In the three cases, men seem to be more penalized than women.

1.6 Conclusion

In this chapter, I study the provision of elderly care across Europe with the aim of quantifying the relative importance of different forms of care and their relationship with the labor supply decisions made by the children of care recipients. My analysis is based on micro data collected by the Survey of Health, Ageing and Retirement in Europe (SHARE) in eight countries which I group into three regions: Northern, Central, and Southern Europe.

The three regions considered exhibit remarkable differences in the provision of elderly care. First, there is a North-South gradient in terms of formal care utilization, with Northern and Central Europe having a considerably higher proportion of individuals receiving formal care compared to the South. As a response to the limited availability of formal care, there is a high prevalence of informal care as the only means of help in Southern Europe, but at the same time, the share of unattended elders is higher in this region than in the North and the Center.

One of the factors that may drive these disparities in care provision across Europe is the availability of public elderly care services. Northern European countries, and to a lesser extent, Central European countries, allocate more resources to publicly provided formal care than Southern European countries. Another aspect that may be relevant to explain the observed differences in care arrangements is the role played by social norms and family structure. Earlier research has found family ties to be weaker in Northern and Central Europe than in Southern Europe, which might influence how family members interact when deciding how to provide elderly care. To assess care reform alternatives, it would be useful to understand the quantitative relevance of these factors. I investigate this subject in Chapter 2.

Finally, and also related with informal care, there are notable differences across Europe regarding the influence of providing care to parents on labor supply decisions at the extensive and intensive margins. Specifically, I find that this impact is negative and more pronounced in Southern Europe. Therefore, another question for policy is whether supporting informal caregivers through, for example, subsidies can help mitigate the cost of caregiving in terms of

labor force participation and earnings. I analyze this matter in more detail in Chapter 2, and I delve into the intensive margin of care and labor supply decisions in Chapter 3.

Chapter 2

The Role of Formal and Informal Elderly Care in Family Decision-Making

2.1 Introduction

As I pointed out in Chapter 1, the children of the care recipients represent one of the main sources of elderly care. These are usually middle-aged individuals who consider the cost of caregiving in terms of foregone labor earnings when making care and labor supply decisions. At the same time, these decisions are influenced by the behavior of other family members. On the one hand, a child's provision of informal care for an old parent may depend on the amount of care given by their siblings. On the other, some families may prefer to resort to formal care when the informal help that their members can provide is not enough to meet the parent's needs. Understanding how families make these choices is relevant for the design of care policies.

This chapter asks the following questions: what drives families' decisions to provide formal and informal care? Why do different families make different choices? What are the implications of these for labor supply? What policies can support care recipients and caregivers? To address these questions, I model the behavior of family members when making care provision and labor force participation decisions by means of a static, non-cooperative game of complete information. In this setup, a family is composed of an old parent and their adult children. Each child makes a decision concerning labor force participation (to be employed or not) and informal care (to give care to their parent or not). If a child chooses to be employed, they earn 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 use this model to analyze the differences in the provision of elderly care across Europe that I outlined in Chapter 1. To do that, I fit the model to SHARE data, where I observe the care and

employment decisions 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 the choices made by families in the three regions considered well.

The model enables me to carry out a decomposition analysis of the factors driving the differences in 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 I set the parameter values for Central and Southern European families equal to the ones estimated for Northern Europe. These parameters capture the influence of care prices and social norms over the preferences of the agents. Then, 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 can be largely explained by the model parameters, followed by wages, while parental health and wealth are less relevant. By simulating the decisions of Southern European families under the same parameter values as Northern Europe, the percentage of elderly individuals who receive care becomes almost 20 points higher than in the baseline scenario. Besides, employment rates of adult children would be higher for caregivers and non-caregivers, reaching similar levels to those observed in Northern countries. If wage levels, instead of parameters, were equal across regions, employment rates would also increase, closing the gap between caregivers and non-caregivers by 7.2 percentage points.

Next, I assess the effects of five care subsidies aimed at reducing the high percentage of older adults who do not receive any care in Southern Europe and the big gap in terms of employment rates between the children who do not give any care to parents and those who do in this region. The first of these policies consists of a non-means-tested subsidy that is given to parents conditional on receiving formal care. The amount of money granted corresponds to the transfer that would be necessary to make the share of total elderly care costs covered by public social protection systems in Southern Europe equal to the corresponding share in Northern Europe. This subsidy gives place to a 9.9-point growth in the share of older adults who receive some care in Southern Europe. This is achieved by increasing the use of formal care by 18.3 points. The policy also seems to alleviate the pressure put on families, with an 8.5-point decline in the percentage of individuals who receive only informal care. Associated with it, the employment rate of the children who provide care becomes 3.9 points bigger than in the baseline scenario, contributing to closing the gap with those who do not give any care. By contrast, the second policy, which extends the subsidy to all parents, regardless of their formal care choices, has a small influence on families' decisions.

In the third policy experiment, I split the subsidy equally between the children who are employed and provide informal care within each family. The effect of this transfer on the share of parents who receive some care in Southern Europe is larger than that of the subsidy for formal care recipients, increasing this proportion by 11.3 points. In this case, the subsidy encourages children who would not provide any care in the baseline scenario to step in as caregivers. In terms of labor force participation, making the combination of care and employment more attractive gives place to a 19.7-point increase in the employment rate of children who choose this alternative,

closing the employment gap with respect to non-caregivers, which goes from 14.9 to -1.1 points. The fourth policy, which distributes the same amount of money between the children who do not work, has the opposite consequences on employment and a weaker effect on care provision. The fifth experiment, which offers the subsidy to all the children, regardless of their employment choice, has the strongest effects on care provision, whereas its impact on employment rates is in the middle of the other two subsidies for caregivers.

The work presented in this chapter marries two strands of the literature. In the first place, there is an applied microeconomic literature that studies the provision of elderly care by means of structural models. Most of these papers are based on the United States and analyze relatively stylized households in different settings. Some of them consider only one decision-maker (Skira, 2015; Korfhage, 2019), while others incorporate the interplay between one parent and one child (Pezzin and Schone, 1999; Dobrescu and Iskhakov, 2013; Mommaerts, 2020; Ko, 2021) or two siblings (Fontaine, Gramain and Wittwer, 2009). Some papers assume that families have a limited set of care alternatives, disregarding the possibility to combine formal and informal care, or abstracting from the labor supply decisions of children (Hiedemann and Stern, 1999; Engers and Stern, 2002; Checkovich and Stern, 2002). Byrne, Goeree, Hiedemann and Stern (2009) examine the decisions to provide elderly care in the family and evaluate various care policies in a rich environment. They develop a static, non-cooperative game where family members from two generations make care and labor supply decisions, and care is an input for parental health quality. However, they estimate a low effect of care on health quality, and as a result, they predict low rates of formal care use and null policy effects. I contribute to this group of studies by providing a different model that takes very seriously the heterogeneity in household structure in the data. In my model, multiple children and their parent make elderly care and labor supply decisions. My model allows for the combination of formal and informal care, which enter directly into the utility functions of the agents. It also incorporates strategic interactions in the family, allowing for free-riding and the possibility that the incentives for providing care differ across siblings.

In the second place, there is a literature that investigates how elderly care arrangements differ across countries in Europe. Studies in this group document the existence of different rates of use of formal and informal care (Attias-Donfut, Ogg and Wolff, 2005; Barczyk and Kredler, 2019). Some of them provide evidence of varying degrees of substitutability between the two forms of care (Bonsang, 2007, 2009; Bolin, Lindgren and Lundborg, 2008a) and of a 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). Bakx, de Meijer, Schut and van Doorslaer (2015) highlight the role of institutions, social norms, and family cohesion to understand these patterns, in line with other studies that stress 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). 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) model the interaction between two siblings who decide how to supply care to

their parent. Dobrescu and Iskhakov (2013) examine the saving behavior of older individuals in Europe through a dynamic discrete choice game of incomplete information between one parent and one child. Instead, my model features multiple children taking part in the decision-making process with their parent in a static, non-cooperative framework with complete information.

In a wider sense, this chapter also relates to the macroeconomic literature on old-age risks and long-term care insurance policies (De Nardi, French and Jones, 2010; Attanasio, Kitao and Violante, 2011; Braun, Kopecky and Koreshkova, 2017; Koreshkova and Lee, 2021). Barczyk and Kredler (2018) argue that these papers miss a key margin by neglecting the role of the family. These authors incorporate this aspect in a dynamic, heterogeneous-agents model with overlapping generations calibrated to the US economy. In this chapter, I also emphasize the importance of the family for the evaluation of elderly care policies.

The rest of the chapter is organized as follows. I develop the model in Section 2.2. I discuss the estimation of the model in Section 2.3. I discuss the results of the decomposition analysis in Section 2.4. Finally, I analyze the outcomes of the policy experiments in Section 2.5 before concluding in Section 2.6.

2.2 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 their working-age children. Each child decides whether to be employed and whether to give informal care to their parent. If they choose to be employed, they earn 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 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 they consume. By giving informal care, this child will not be able to work as many hours as if they do not give care, so their labor earnings will be lower. Moreover, their decision will consider the behavior of their parent and siblings with respect to caregiving. These 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 they may prefer to be assisted only by their children.

2.2.1 Choices

In this model, a family is composed of a parent and their children. The children, indexed by $i = 1, 2, ..., N$, make simultaneous decisions that concern their employment status and the provision of informal care for their 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 their parent no informal care, $a_i = \text{NENC}$; to be employed and give their 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 $\boldsymbol{a} \equiv (a_1, ..., a_N)$, which is an element of $\mathcal{A} \equiv \mathcal{A}_1 \times ... \times \mathcal{A}_N$.

At the same time, the parent makes a formal care decision. Let b denote their 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 $\mathcal{B} \equiv \{\text{NFC, FC}\}$. The actions of all the family members are collected by vector $\boldsymbol{d} \equiv (\boldsymbol{a}, b)$, which takes values in set $\mathcal{D} \equiv \mathcal{A} \times \mathcal{B}$.

2.2.2 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

$$U_{ia} = \boldsymbol{\alpha}_a(\boldsymbol{x}) + \beta C_i(\boldsymbol{d}, \boldsymbol{x}) + \epsilon_{ia}, \tag{2.1}$$

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

$$\begin{aligned}\boldsymbol{\alpha}_a(\boldsymbol{x}) =& \alpha_{0a} + \alpha_{1a} \sum_{\ell \neq i} I_\ell(\boldsymbol{d}, \boldsymbol{x}) + \alpha_{2a} \sum_{\ell \neq i} \mathbb{1}\{I_\ell(\boldsymbol{d}, \boldsymbol{x}) = 0\} + \alpha_{3a} F(\boldsymbol{d}, \boldsymbol{x}) + \alpha_{4a} H \\ &+ \alpha_{5a}\text{widow} + \alpha_{6a}\text{near}_i + \alpha_{7a}\text{female}_i + \alpha_{8a}\text{children}_i + \alpha_{9a}\text{married}_i,\end{aligned} \tag{2.2}$$

a choice-specific linear index that accounts for various incentives at play. First, the index is shaped by the informal care provided by the siblings of child i through the number of hours $\sum_{\ell \neq i} I_\ell(\boldsymbol{d}, \boldsymbol{x})$ of help given by them and the number of siblings $\sum_{\ell \neq i} \mathbb{1}\{I_\ell(\boldsymbol{d}, \boldsymbol{x}) = 0\}$ who do not give care to the parent. It also considers the number of hours $F(\boldsymbol{d}, \boldsymbol{x})$ of formal care received by the parent. These terms aim to capture the complementarities between different sources of care, potential specialization or free-riding among siblings, and the influence of social norms on meeting the parent's needs. Additionally, the index depends on the parent's health status, represented by the indicator H for having severe care needs, as well as other factors such as widowhood, the proximity of child i to the parent (living within 25 kilometers), and child i's gender, parenthood, and marital status. I assume that all these elements, except for the hours of formal and informal care and the number of siblings who do not give care, are exogenous.[1]

[1] I 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

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

$$C_i(\boldsymbol{d}, \boldsymbol{x}) = w(\boldsymbol{z}_i) N_i(\boldsymbol{d}, \boldsymbol{x}) + y_i, \tag{2.3}$$

where $w(\boldsymbol{z}_i)$ is the hourly wage offer for child i. This is a function of the observable, individual characteristics collected in $\boldsymbol{z}_i$, a subset of $\boldsymbol{x}_i$. $N_i(\boldsymbol{d}, \boldsymbol{x})$ is the number of hours worked by i, which is determined by their choice a_i as part of $\boldsymbol{d}$. y_i denotes other sources of income available to the child.[2] 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 of care. Their choice-specific utility is

$$\begin{aligned} V_b =& \delta_{0b} + \delta_{1b} \sum_{i=1}^{N} I_i(\boldsymbol{d}, \boldsymbol{x}) + \delta_{2b} \mathbb{1}\left\{ \sum_{i=1}^{N} I_i(\boldsymbol{d}, \boldsymbol{x}) > 0 \right\} + \delta_{3b}\text{spouse} + \delta_{4b}\text{others} \\ &+ \delta_{5b}\text{widow} \times \text{male} + \delta_{6b}\text{widow} \times \text{female} + \delta_{7b} W + \zeta_b, \end{aligned} \tag{2.4}$$

where $\sum_{i=1}^{N} I_i(\boldsymbol{d}, \boldsymbol{x})$ 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 their 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.[3] It is jointly distributed with the shocks of the children with density $g_{\boldsymbol{\epsilon},\zeta}(\boldsymbol{\epsilon}, \zeta) = \prod_{i=1}^{N} g_{\epsilon_i} g_{\zeta}$.

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).

[2] By the assumption of linear utility, non-labor income becomes irrelevant for the comparison of choice-specific utilities, since it takes the same value for all the choice alternatives.

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

2.2.3 Equilibrium

Let $\boldsymbol{U}_i = (U_i(\boldsymbol{d}, \boldsymbol{x}, \epsilon_i))_{\boldsymbol{d}\in\mathcal{D}}$ and $\boldsymbol{V} = (V(\boldsymbol{d}, \boldsymbol{x}, \zeta))_{\boldsymbol{d}\in\mathcal{D}}$ be vectors collecting the payoffs of child i and the parent, respectively, for each possible outcome $\boldsymbol{d} \in \mathcal{D}$ of the game. Matrix $\boldsymbol{U} = (\boldsymbol{U}_1, ..., \boldsymbol{U}_N, \boldsymbol{V})$ gathers these vectors. Given their knowledge about the observable characteristics in $\boldsymbol{x}$ 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 $(\sigma_1^*, ..., \sigma_N^*, \pi^*) \equiv (\boldsymbol{\sigma}^*, \pi^*)$ 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 strategy,

$$\begin{aligned} U_i(\boldsymbol{\sigma}^*, \pi^*, \boldsymbol{x}, \epsilon_i) &\geq U_i(\sigma_i, \boldsymbol{\sigma}_{-i}^*, \pi^*, \boldsymbol{x}, \epsilon_i) \\ V(\boldsymbol{\sigma}^*, \pi^*, \boldsymbol{x}, \zeta) &\geq V(\boldsymbol{\sigma}^*, \pi, \boldsymbol{x}, \zeta), \end{aligned} \tag{2.5}$$

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

2.3 Estimation

This section provides a brief description of the data and the variables used in the model and presents the estimation procedure.

2.3.1 Sample 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 in which at least one of the parents is retired and aged 70 or older, has one or more limitations to perform activities of daily living, and whose children are aged 60 or younger.[4] I obtain this information from the sample of survey respondents who are potential care recipients and report information about their children.

Each observation in my sample is a child-parent dyad. All the dyads which share the same parent constitute a family f playing a game. For each family, I observe the employment and care decisions made by each child and the parent, represented by a_{if} for $i = 1, ..., N$ and b_f, respectively, as well as the vector of family characteristics $\boldsymbol{x}_f$ 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.[5] Survey respondents also 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 they are in the bottom 10% of the cognitive score distribution of the sample. Next, I classify an individual as having light care needs if they have difficulties with three or fewer ADLs and are not cognitively impaired, and as having severe care needs if they have more than three ADLs or

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

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

cognitive impairment. 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 $\boldsymbol{x}_{if}$, 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 they are expected to live according to national life expectancy at age 65. I include this measure of weekly assets in the model 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 they helped their 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 they 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 $I_i(\boldsymbol{d}, \boldsymbol{x})$ of informal care given and a number of hours $F(\boldsymbol{d}, \boldsymbol{x})$ of formal care received that depend on individual and family characteristics in $\boldsymbol{x}$. 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.1.

2.3.2 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 $N_i(\boldsymbol{d}, \boldsymbol{x})$ that depends on individual characteristics in $\boldsymbol{x}$ and the decision to give informal care. In particular,

$$N_i(\boldsymbol{d}, \boldsymbol{x}) = \begin{cases} \tilde{N}_i(\boldsymbol{d}, \boldsymbol{x}) & \text{if } a_i = \text{ENC}, \\ \tilde{N}_i(\boldsymbol{d}, \boldsymbol{x}) - I_i(\boldsymbol{d}, \boldsymbol{x}) & \text{if } a_i = \text{EIC}, \\ 0 & \text{otherwise}, \end{cases} \tag{2.6}$$

where $\tilde{N}_i(\boldsymbol{d}, \boldsymbol{x})$ is the potential number of hours that i can 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 $\tilde{N}_i(\boldsymbol{d}, \boldsymbol{x})$ 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 fourth order polynomial of age, and dummies for gender and having college education. Table B.2.1 shows the estimated coefficients.

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

$$\ln w_{if} = \boldsymbol{z}_{if}'\boldsymbol{\lambda} + \xi_{if}, \tag{2.7}$$

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, 1979) in the estimation of $\boldsymbol{\lambda}$. In particular, $\boldsymbol{z}_{if}$ consists of a second order polynomial in child i's age, and dummies for gender, and college education. The marital status of the child and whether they have children act as exclusion restrictions for identification, since these aspects affect the utility associated with employment and care choices, but not wages. Table B.2.2 displays the estimated coefficients.

2.3.3 Preferences

To estimate the preference parameters of the parent and the children, I assume that the unobservables $\epsilon_i(a)$ for $i = 1, \ldots, N$ and $\zeta(b)$ are i.i.d. type-I extreme value. All the parameters in $\boldsymbol{\alpha}(\boldsymbol{d}, \boldsymbol{x})$, as defined in Equation 2.2, 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 $\boldsymbol{\alpha}(\boldsymbol{d}, \boldsymbol{x})$, together with β, δ_0, δ_1, δ_2, δ_3, δ_4, δ_5, δ_6 and δ_7. I estimate $\boldsymbol{\theta}$ by maximum simulated likelihood (MSL), using the probability distribution of the possible outcomes $\boldsymbol{d} \in \mathcal{D}$ of the game, conditional on the observables $\boldsymbol{x}_f$. Since these probabilities do not have a closed form, I approximate them numerically by making R independent draws of the unobservables, denoted by $\left(\boldsymbol{\epsilon}_f^{(r)}, \zeta_f^{(r)}\right)$, for $r = 1, ..., R$. With these draws, I simulate the game played by each family in the data, and obtain a Nash equilibrium in pure strategies.[6,7] Let $\Pr\left(\boldsymbol{d}|\boldsymbol{x}_f; \boldsymbol{\theta}, \boldsymbol{\epsilon}_f^{(r)}, \zeta_f^{(r)}\right)$ be the probability that family f plays outcome $\boldsymbol{d}$ in equilibrium, given a value of $\boldsymbol{\theta}$, and the error draws $\boldsymbol{\epsilon}_f^{(r)}$ and $\zeta_f^{(r)}$. I obtain an estimate $\widetilde{\Pr}\left(\boldsymbol{d}|\boldsymbol{x}_f; \boldsymbol{\theta}, \boldsymbol{\epsilon}_f^{(r)}, \zeta_f^{(r)}\right)$ 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.[8]

[6] I 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).

[7] I 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.

[8] The polynomial of family characteristics contains the value of weekly assets of the parent, fourth order polynomials in the ages of the children, dummies for the parent having severe care needs and being widowed, interactions between assets and the other variables, and an intercept.

Averaging over draws, the simulated probability that family f plays outcome $\boldsymbol{d}$ is

$$\widehat{\Pr}\left(\boldsymbol{d}|\boldsymbol{x}_f;\boldsymbol{\theta}\right) = \frac{1}{R}\sum_{r=1}^{R}\widetilde{\Pr}\left(\boldsymbol{d}|\boldsymbol{x}_f;\boldsymbol{\theta},\boldsymbol{\epsilon}_f^{(r)},\zeta_f^{(r)}\right). \tag{2.8}$$

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

$$\widehat{\mathcal{L}}\left(\boldsymbol{\theta}\right) = \sum_{f=1}^{F}\hat{\ell}_f(\boldsymbol{\theta}) = \sum_{f=1}^{F}\sum_{\forall \boldsymbol{d}\in\mathcal{D}_f}\mathbb{1}\{\boldsymbol{d}_f=\boldsymbol{d}\}\ln\widehat{\Pr}\left(\boldsymbol{d}|\boldsymbol{x}_f;\boldsymbol{\theta}\right), \tag{2.9}$$

where $\hat{\ell}_f(\boldsymbol{\theta})$ is the likelihood contribution of family f.[9]

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 of 708, 2,349 and 2,393 families, respectively. As Table B.3.1 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 $\boldsymbol{\theta}$ 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.

Tables B.4.1 and B.4.2 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. To evaluate the goodness of fit of the estimated model, Figures B.4.1 and B.4.2 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 being employed for children by caregiving status.

2.4 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 differences in the estimated utility parameters. In the model, utility parameters are influenced by 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 utility 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 given 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

[9] Theoretically, 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).

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.[10] 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. In the following subsections, I focus on discussing the results of the simulations in Southern Europe. The reactions of Central European families in these counterfactual scenarios are more moderate, but point in the same direction.

2.4.1 Model parameters

Figure 2.1 summarizes the simulation results in terms of the type of care received by the parents. Out of the factors analyzed, differences in care arrangements across regions seem to be mainly driven by the utility parameters. By simulating the decisions of Southern European families under the same parameter values 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.

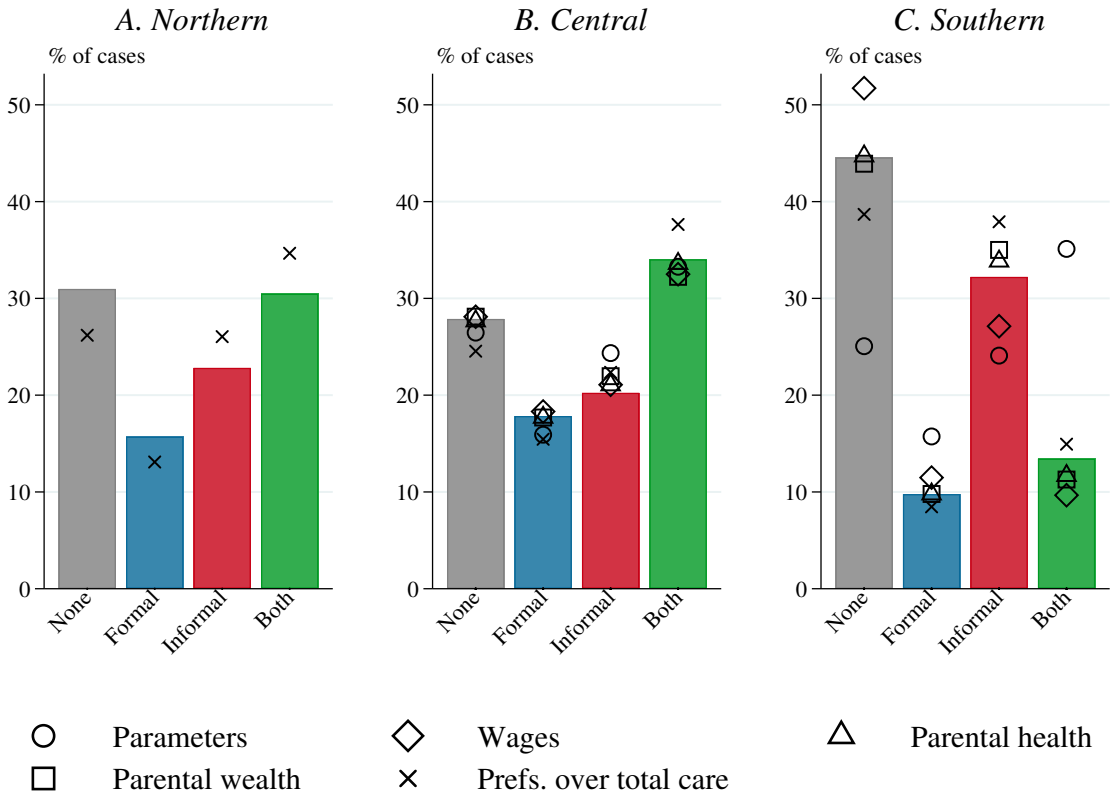
Figure 2.2 displays the employment rate among children who give informal care and among those who do not. Under the same model parameters as Northern Europe, caregivers in the South would have a higher employment rate than non-caregivers, replicating the pattern observed in the North. This would bring the two regions closer, especially with respect to caregivers, whose employment rate would become 0.8 points higher than in Northern Europe.

The effect of this experiment in the differences in care arrangements across countries is illustrated by Table B.5.2. 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.

In another counterfactual exercise, I try to isolate part of the influence of social norms in the utility parameters. I focus on the influence of siblings on the behavior of a child and the views they might have about formal and informal care. A child might have incentives to give informal care to their parents if the social norms in place encourage this type of care over formal care, especially in countries with strong family ties. Moreover, they might have an opinion with regards to what constitute a normal or fair care arrangement, and feel compelled to take part

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

FIGURE 2.1: TYPE OF CARE RECEIVED BY PARENTS – BASELINE AND COUNTERFACTUAL SIMULATIONS



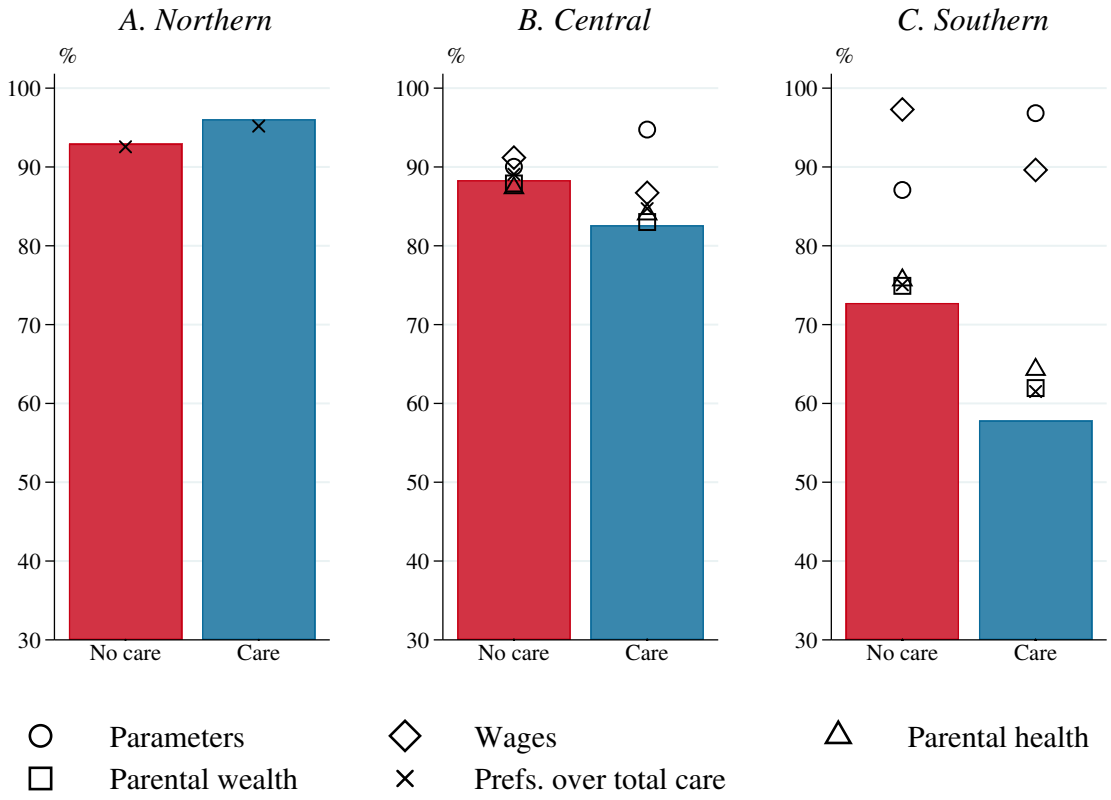
Note: The figure plots the percentage of parents aged 70 or older with care needs who receive no care, only formal care, only informal care, or both types of care in baseline (bars) and counterfactual (markers) simulations. In the counterfactual scenarios, differences in model parameters (dots), wage levels (diamonds), parental health (triangles) and parental wealth (squares) are removed. In the last counterfactual (crosses), I assume that children have preferences over the total amount of care received by their parent. 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 shares are also reported in Table B.5.1.

in care provision if their 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, the choice-specific utility for child i is defined as

$$\begin{aligned} U_{ia} =& \alpha_{0a} + \alpha_{1a}\left[\sum_{\ell \neq i} I_\ell\left(\boldsymbol{d}, \boldsymbol{x}\right) + F\left(\boldsymbol{d}, \boldsymbol{x}\right)\right] + \alpha_{4a} H + \alpha_{5a}\text{widow}_i + \alpha_{6a}\text{near}_i \\ &+ \alpha_{7a}\text{female}_i + \alpha_{8a}\text{children}_i + \alpha_{9a}\text{married}_i + \beta C_i(\boldsymbol{d}, \boldsymbol{x}) + \epsilon_{ia}. \end{aligned} \tag{2.10}$$

The results of the simulations produced in this counterfactual are also shown in Figures 2.1 and 2.2 and in Tables B.5.1 and B.5.2. In this scenario, there is a 5.7-point increase in the use of informal care as the only means of help in Southern Europe. 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

Figure 2.2: Employment rate of children by informal care given to parents – Baseline and counterfactual simulations



Note: The figure plots the percentage of individuals who are aged 60 or younger, 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 model parameters (dots), wage levels (diamonds), parental health (triangles) and parental wealth (squares) are removed. In the last counterfactual (crosses), I assume that children have preferences over the total amount of care received by their parent. 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 B.5.1.

well as the gaps with Northern Europe.

2.4.2 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 experiments 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.

2.5 Policy Experiments

As explained in Chapter 1, two of the most salient outcomes of care provision in Southern Europe are the high percentage of old parents who have care needs but do not receive any help, and the big gap in terms of employment between the children who do not give care to their parents and those who do. In this context, the policymaker might be interested in easing access to formal care services or compensating informal caregivers for the cost of providing care. In this section, I use the estimated model to evaluate five policies that serve these purposes. The first of these policies consists of a non-means-tested subsidy that is given to parents conditional on receiving formal care. Next, I assess the effects of an alternative implementation of this subsidy, where the transfer is extended to all the parents with care needs. In the remaining three policy experiments, I simulate the decisions of families when the transfer is instead split equally among the children who give informal care within the family, conditional or unconditional on their labor force participation decisions.

To gauge the impact of these policy alternatives in different regions, I carry out the policy simulations in the sample of Central Europe as well as Southern Europe. The amount of money granted to the recipients of the formal care subsidy depends on the level of care needs (moderate or severe) and is between 6,846 and 10,681 euros per year in Central Europe, and 7,208 and 10,192 euros in Southern Europe. These values correspond to the transfer that would be necessary to make the share of total elderly care costs covered by public social protection systems in Central and Southern Europe equal to the corresponding share in Northern Europe. I use the same quantities to simulate the subsidy for all the parents with care needs. In the case of the three subsidies for informal caregivers, I recalculate the amount granted to each family so the total cost of each policy equals that of the formal care subsidy.[11] In the following subsections, I will focus on Southern Europe to discuss the effects of the subsidies. In Central Europe, the effects of the policies are similar, but of smaller magnitude.

2.5.1 Subsidies for care recipients

To simulate the subsidy for parents who receive formal care, I increase the value of the estimated δ_0 in the parent's utility. In the parent's utility function, the role of wealth is captured by $\delta_{7b}W$.

[11] In the simulations for Central Europe, the cost of these policies amounts to 0.8% of the sum of Austria, Belgium, France and Germany's GDP. In Southern Europe, the cost is equal to 1.3% of the sum of Italy and Spain's GDP.

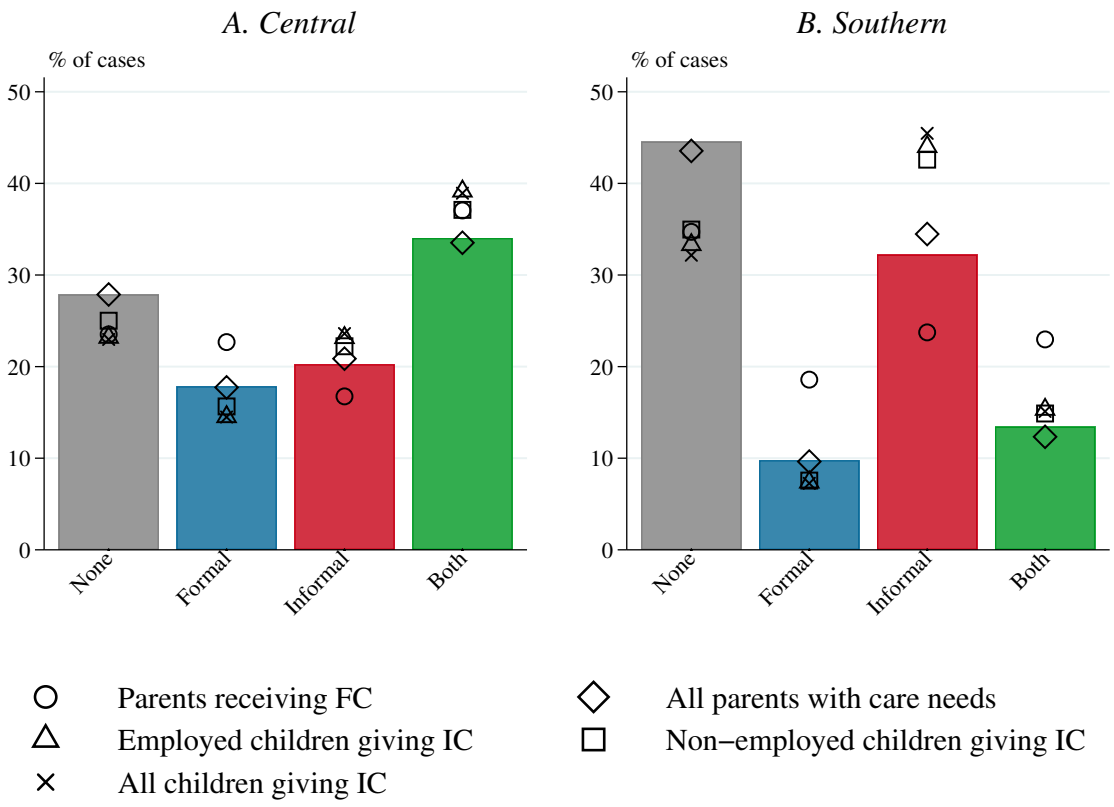
Parents may derive utility from wealth for two reasons: first, wealth could be used to pay for formal care; and second, it could be enjoyed as consumption or as bequest left to children. An alternative specification of the parent's utility would make these two roles explicit, replacing $\delta_{7b}W$ by $\gamma\widetilde{W} + \eta_b W$, with

$$\widetilde{W} = \begin{cases} W - p & \text{if } b = \text{FC}, \\ W & \text{otherwise}, \end{cases} \tag{2.11}$$

and p being the price of formal care. For $b = \text{FC}$, $\gamma\widetilde{W} + \eta_b W = (\gamma + \eta_b)W - \gamma p$, and the subsidy could be implemented by reducing the value of p. In my specification of the parent's utility, this is equivalent to increasing the value of δ_0 by $\gamma \times \textit{subsidy}$. I use the value estimated for the child's marginal utility of consumption β in each region as an approximation to γ.

Next, I implement the second version of the policy, which extends the transfer to all the parents with care needs, regardless of their formal care decision, by increasing the value of parental wealth W. Figures 2.3 and 2.4 and Tables B.6.3 and B.6.4 summarize the results of these policies in terms of care provision and employment rates.

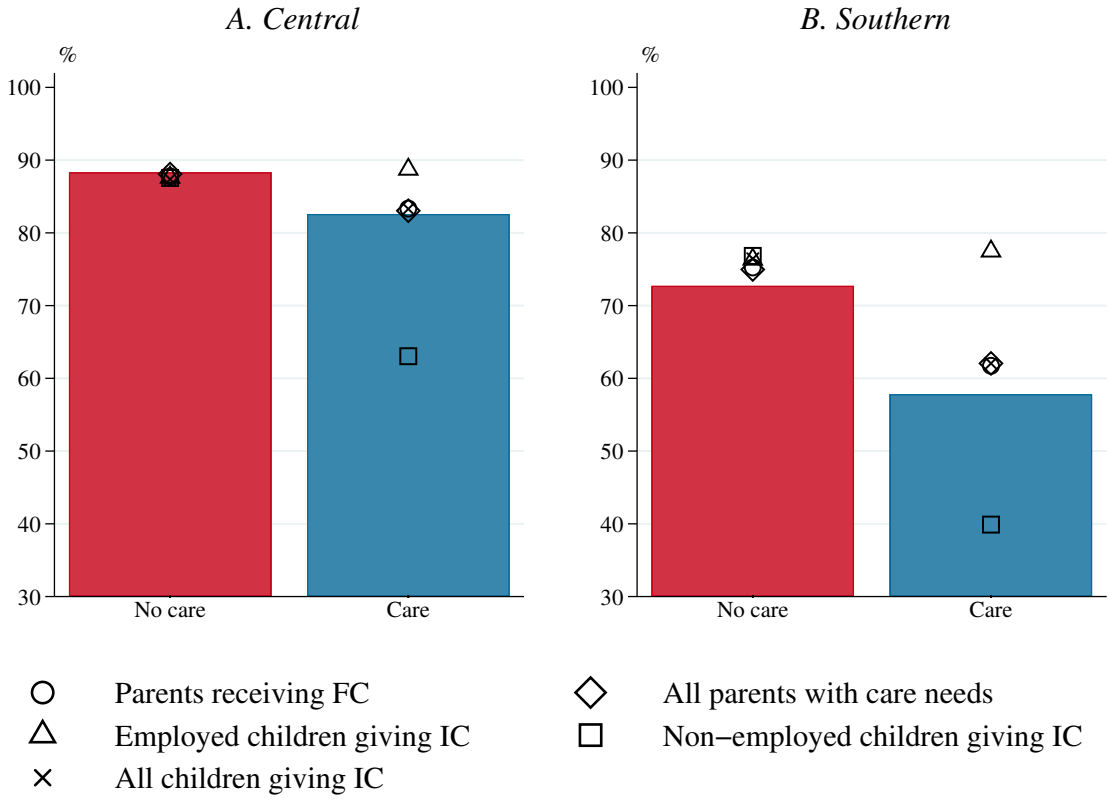
Figure 2.3: Type of care received by parents – Baseline and policy simulations



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, conditional on formal care (dots); a subsidy for parents, unconditional on formal care (diamonds); a subsidy for caregiving children, conditional on employment (triangles); a subsidy for caregiving children, conditional on non-employment (squares); and a subsidy for caregiving children, unconditional on employment (crosses). The two country groups represented are Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The shares are also reported in Tables B.6.1 and B.6.2.

Granting parents a subsidy conditional on receiving formal care gives place to a 9.9-point growth in the share of older adults who receive some care in Southern Europe. This result is achieved by increasing the use of formal care —alone or in combination with informal care— by 18.3 points, while the overall use of informal care rises by 1 point. The policy seems to alleviate the pressure put on families, with an 8.5-point decline in the percentage of individuals who receive only informal care. Associated with it, the employment rate of children becomes 2.7 points higher than in the baseline scenario, 2.5 points larger for non-caregivers, and 3.9 points bigger for caregivers, contributing to closing the gap between these two groups.

FIGURE 2.4: EMPLOYMENT RATE OF CHILDREN BY 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, conditional on formal care (dots); a subsidy for parents, unconditional on formal care (diamonds); a subsidy for caregiving children, conditional on employment (triangles); a subsidy for caregiving children, conditional on non-employment (squares); and a subsidy for caregiving children, unconditional on employment (crosses). The two country groups represented are Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). The percentages are also reported in Tables B.6.1 and B.6.2.

By contrast, extending the subsidy to all the parents, regardless of their formal care choices, has a small effect on families' decisions. This experiment makes parents richer, but this does not translate into a broader use of formal care. In fact, the rate of formal care users is 1.2 lower than in the baseline scenario, whereas the rate of informal care users becomes 1.2 points higher. As a result, there is a 1 point increase in the percentage of individuals receiving some care. The

impact of this measure on employment is comparable to the first version of the subsidy: the overall employment rate is raised by 2.5 points, 2.2 points for non-caregivers, and 4.2 points for caregivers.

2.5.2 Subsidies for caregivers

In the third policy experiment, I split the subsidy equally within each family between the children who are employed and provide informal care. The effect of this transfer on the share of parents who receive some care in Southern Europe is larger than that of the subsidy for formal care recipients, increasing this share by 11.3 points. In terms of the type of care provided, the policy makes families more likely to use informal care as the only means of help (+11.8), and less likely to choose formal care as the only source of help (-2.4), but overall, the percentage of formal care recipients does not change much: it decreases by 0.5 points, whereas the share of informal care recipients grows by 13.7 points. Thus, the subsidy encourages children who would not provide any care in the baseline scenario to step in as caregivers.

This policy also has large effects on employment. Making the combination of care and employment more attractive gives place to a 19.7-point increase in the employment rate of children who choose this alternative, closing the employment gap with respect to non-caregivers, which goes from 14.9 to -1.1 points.

The fourth policy, which distributes the same amount of money between the children who do not work, has the opposite consequences on employment and a weaker effect on care provision. This transfer reduces the employment rate of informal caregivers by 17.9 points, and increases the percentage of care recipients by 9.6 points. Finally, the fifth experiment, which offers the subsidy to all the children, regardless of their employment choice, has the strongest effects on care provision: a 14.9-point increase in the share of informal care recipients and a 0.8-point reduction in the share of formal care users, contributing to a 12.4-point growth in the percentage of parents who receive some care. The impact of this last subsidy on employment rates is in the middle of the other two subsidies for children, and close to the effects of the subsidies for care recipients.

2.6 Conclusion

In this chapter, 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 among multiple children and their parents. To close this gap, I build and estimate a structural model that represents old parents and their working-age children making care provision and labor force participation decisions in a static, non-cooperative game of complete information. I show that this model does a good job in fitting the observed patterns in care received by older adults and employment rates of their children 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 regions. Results show that differences in the estimated model parameters, capturing the influence of care prices, social norms and institutions, can largely explain the disparities found across regions, followed by wages. Differences in parental health and parental wealth are less relevant. Lastly, I use the model to conduct five policy experiments with the aim of reducing the high percentage of old parents who do not receive any care, and the big gap in terms of employment between the children who do not give care and those who do in Southern Europe. I find that subsidies for informal caregivers are more effective than subsidies for care recipients to achieve these goals.

Chapter 3

Your Job or Your Folks? Working and Caring for the Elderly in Europe

3.1 Introduction

As discussed in Chapter 1, there appears to be a negative relationship between providing informal care to parents and being employed in Southern European countries, and to a lesser extent in Central Europe. Furthermore, providing daily informal care is associated with a higher likelihood of being part-time employed in Central Europe, while the effect is the opposite in Southern Europe. This suggests that balancing work and caregiving may be more challenging for individuals in Southern Europe. At the same time, it is worth noting the higher proportion of older parents receiving exclusively informal care in this region, who also receive more care hours from their children compared to the rest of Europe.

In this context, the goal of this chapter is to examine care and labor supply decisions at the intensive margin to understand how adult children allocate their time between work and providing assistance to their parents, and whether the outcomes of these decisions differ across countries. To provide a quantitative answer to these questions, I develop and estimate a static, one-child-one-parent structural model that enables a comprehensive analysis of the factors influencing caregiving and labor supply.

The model represents a working-age individual who is altruistic towards their parent. This agent makes decisions to maximize utility, defined over consumption, leisure, and the number of hours of care received by their parent, subject to budget, time, and care requirements constraints. Therefore, the agent faces a number of trade-offs. One way to meet parental needs is to provide hours of informal care, which involves sacrificing hours of work or leisure. Choosing to reduce work hours directly impacts labor earnings, which can then be allocated to consumption. Alternatively, the agent can use their income to purchase formal care hours, which again would imply lower consumption. In addition, although one hour of informal care is assumed to be equivalent to one hour of formal care in meeting the parent's needs, the agent may place a higher value on informal care. This acknowledges the possibility that parents may prefer receiving assistance from their family members rather than relying on formal care providers.

I estimate this model by the generalized method of moments (GMM), using data of individuals

interviewed in Wave 2 of SHARE, which contains information on hours worked and hours of care given by survey respondents. I carry out estimation separately for the subsamples of Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France, and Germany), and Southern Europe (Italy and Spain), as well as for the entire sample, and men and women.

I then use the estimated parameters to understand how wages, prices of formal care and family ties drive care and labor supply decisions in the model. To do so, I define three counterfactual scenarios where I remove differences in wages, prices of formal care, and family ties across regions. Then, I compare counterfactual care and work outcomes with baseline simulations obtained with the estimated parameters. The results of this exercise enable me to quantify the influence of wages on labor supply and care decisions, and that of formal care prices and family ties on the choice between formal and informal care.

The estimated model also allows me to assess two policies in support of elderly care: an unconditional cash benefit and a discount on the price of formal care. I simulate the care and labor supply decisions of individuals in Northern, Central, and Southern Europe, and in the whole sample under these two policies. To compare their effects, I assume that both have the same total cost. I find that when agents are supported by cash benefits, they tend to reduce employment (by -2.3% in the whole sample) and hours worked (the average falls down by 12.8%). At the same time, they increase hours of informal care given to their parents (by 6.7%), while there is a decline in the formal care use rate (-4.3%) and hours of formal care (-1%). The discount on the price of formal care has a small effect on labor supply. Its impact is concentrated on care arrangements. This policy gives place to a strong decline in the share of informal care users (-70.5%) and hours of this type of help (-56.8%), whereas the number of hours of formal care becomes more than three times larger than in the baseline scenario.

The work presented in this chapter contributes to the literature that develops and estimates structural models to address questions on aging and elderly care, such as Pezzin and Schone (1999), Byrne, Goeree, Hiedemann and Stern (2009), De Nardi, French and Jones (2010), Dobrescu and Iskhakov (2013), Dobrescu (2015), Skira (2015), Barczyk and Kredler (2018), Korfhage (2019), Mommaerts (2020), Ko (2021), and Barczyk, Fahle and Kredler (2022). The models proposed by these authors vary along multiple dimensions regarding dynamics, the number of decision-makers and how these interact, and the care and employment alternatives considered. In this chapter, I opt for modeling the behavior of a single agent who makes decisions on consumption, hours worked, and hours of formal and informal care to meet the needs of their parent in a static setting, focusing on the role played by wages, prices of care, and family ties. Furthermore, most of previous studies analyze one single country, with the exception of Dobrescu and Iskhakov (2013) and Dobrescu (2015). While these two papers study the saving behavior of the elderly across Europe, I concentrate on the association between the labor supply and care provision decisions of their children.

This chapter also contributes to another group of studies that analyze the impact of giving care to old parents on labor market outcomes. Most of these attempt to estimate the causal effect of caregiving on labor supply through empirical reduced-form strategies. That is the case of Ettner (1995, 1996) and Johnson and Lo Sasso (2000) for the United States; Carmichael and Charles (1998, 2003), Madden and Walker (1999), Heitmueller and Michaud (2006), Heitmueller

(2007), and Michaud, Heitmueller and Nazarov (2010) for the United Kingdom; Casado-Marín, García-Gómez and López-Nicolás (2010) for Spain; Schmitz and Westphal (2017) for Germany; and Spiess and Schneider (2003), Viitanen (2005), Crespo (2008), and Bolin, Lindgren and Lundborg (2008b) for Europe. Also for Europe, Crespo and Mira (2014) present a model of a daughter's allocation of time to labor supply and informal care to interpret estimates from an instrumental variable-treatment effects framework. I contribute to this strand of the literature by analyzing the time allocation decisions of individuals with parents in need of care through the lens of a structural model that provides insights into the factors influencing these choices and the effects that various policies have on them.

The rest of the chapter is organized as follows. I outline the structural model in Section 3.2. I discuss the estimation of the model and goodness of fit in Section 3.3. I analyze the results of the counterfactual simulations in Section 3.4, and those of the policy experiments in Section 3.5. Finally, I conclude in Section 3.6.

3.2 Model

Building on the neoclassical labor-leisure model, I consider a working-age individual who has an older parent and maximizes a single-period utility function,

$$\max_{\{c,l,n,i,f\}} U(c,l) + \delta V(i,f), \tag{3.1}$$

where c stands for consumption, l for leisure time, n for hours worked, i for hours of informal care given by the agent to their parent, and f for hours of formal care. The agent draws utility from consumption and leisure through function $U(.)$, as well as from the amount of formal and informal care received by their parent through function $V(.)$. I assume that $U(.)$ and $V(.)$ are continuous, twice continuously differentiable, strictly increasing and strictly concave. The weight that the agent assigns to the parent's well-being from receiving care is represented by δ. This parameter takes values between 0 and 1 and can be interpreted as a measure of altruism or family ties.

The agent chooses their level of consumption, hours of formal care to buy, and how to allocate their time to work, leisure and informal care. When making these decisions, the agent is constrained by the available income,

$$c + pf \leq y + wn, \tag{3.2}$$

where p is the price of one hour of formal care, w is the wage per hour worked, and y represents non-labor income. The price of the consumption good is normalized to 1.

The agent is also constrained by time.[1] I assume that they have $\overline{h}$ hours available to distribute among work, informal care, and leisure, which comprises all activities other than work and care for parents:

$$n + i + l = \overline{h}. \tag{3.3}$$

[1] I assume that the total amount of time available to the agent is 168 hours, that is, a whole week.

Besides, the parent has a specific level of care needs represented by the number of hours $\overline{q}$, which the agent must fulfill either through providing informal care personally or by purchasing formal care hours:

$$i + f \geq \overline{q}. \tag{3.4}$$

The agent is allowed to choose a combination of the two types of care, and to provide more hours of care than needed, but not less than $\overline{q}$.

Therefore, the agent faces several trade-offs. For each hour worked in the labor market, they are paid a wage which can be used for consumption together with non-labor income. However, one additional hour worked implies one hour less of leisure or informal care. The agent may contemplate to substitute that hour of informal care for one of formal care. Nonetheless, the corresponding expenditure on formal care entails a reduction in the resources available for consumption, and so forth.

The agent maximizes utility over c, l, n, i, and f. The first-order conditions of the optimization problem are

$$\frac{\partial U}{\partial c} w = \frac{\partial U}{\partial l} \tag{3.5}$$

$$\delta \frac{\partial V}{\partial i} + \lambda = \frac{\partial U}{\partial l} \tag{3.6}$$

$$\delta \frac{\partial V}{\partial f} + \lambda = p \frac{\partial U}{\partial c}, \tag{3.7}$$

where λ is the Lagrange multiplier of the care constraint. I am interested in the case where λ is equal to 0, and so the care constraint is not binding, since in the data, the total amount of care received by parents is usually larger than the minimum required. If this is the case,

$$\delta = \frac{\partial U / \partial l}{\partial V / \partial i} \tag{3.8}$$

$$p = \delta \frac{\partial V / \partial f}{\partial U / \partial c}. \tag{3.9}$$

The agent provides informal care up to the point in which the marginal utility derived from it equals the marginal utility of leisure. Then, δ is equal to the marginal rate of substitution between informal care and leisure. Moreover, the agent buys hours of formal care up to the point in which the marginal utility derived from it equals the marginal utility of consumption. Hence, the ratio of p to δ is equal to the marginal rate of substitution between consumption and formal care.

The combination of (3.5), (3.8), and (3.9) delivers an additional result,

$$\frac{w}{p} = \frac{\partial V / \partial i}{\partial V / \partial f}, \tag{3.10}$$

according to which, the ratio of the wage to the price of formal care equals the marginal rate of substitution between the two types of care.

3.3 Estimation

3.3.1 Model specification

To estimate the model, I assume that the objective function is log-linear, and set w, p, and δ as parameters to estimate. Therefore, the model solved by agent j is

$$\begin{aligned} \max_{\{c_j,l_j,n_j,i_j,f_j\}} & \log(c_j) + \log(l_j - \bar{l}) + \delta \left[\log\left(1 + i_j + f_j - \overline{q}_j\right) + \log(1 + i_j)\right] \\ \text{s.t.:} \quad & c_j + pf_j = y_j + wn_j \\ & n_j + i_j + l_j = \overline{h} \\ & i_j + f_j > \overline{q}_j, \end{aligned} \tag{3.11}$$

where $\bar{l}$ represents the minimum amount of leisure enjoyed by the agent.[2] In this specification, the agent derives utility not only from exceeding the required level of care, but also from providing some care themselves. Thus, even though one hour of informal care meets the same needs as one hour of formal care, the agent has an additional motivation to choose the former. This could be attributed to the parent's preference for receiving assistance from their child or because the agent has a deeper understanding of their parent's needs.[3]

I estimate w, p and δ by the generalized method of moments, using a set of moment conditions derived from the solution of the model:

$$y_j + wn_j - pf_j = w(\overline{h} - n_j - i_j - \bar{l}) \tag{3.12}$$

$$\frac{y_j + wn_j - pf_j}{\overline{h} - n_j - i_j - \bar{l}} = p\left(1 + \frac{1 + i_j + f_j - \overline{q}_j}{1 + i_j}\right) \tag{3.13}$$

$$\frac{1}{\overline{h} - n_j - i_j - \bar{l}} = \delta\left(\frac{1}{1 + i_j + f_j - \overline{q}_j} + \frac{1}{1 + i_j}\right). \tag{3.14}$$

3.3.2 Sample and variable definitions

I estimate the model using data of individuals interviewed in the second wave of SHARE and living in Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France, and Germany) or Southern Europe (Italy and Spain). I target those respondents who are younger than 65, have not retired yet, and have at least one parent alive, so they can face the trade-off between giving care and working.

In my sample, I observe if respondents provide informal care to their parents. I consider that an individual provides this type of care if they helped at least one of their parents living outside the household 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

[2] I set the minimum leisure requirement to 88 hours per week.

[3] This assumption would fit in with the notion of *procedural utility*, the idea that the agent does not only derive utility from the outcome of care, i.e., that their parent is properly cared for, but also from the *process* of caring for their parent. Prior studies have found evidence in support of this point (see, for instance, Brouwer, van Exel, van den Berg, van den Bos and Koopmanschap (2005)).

matters) in the twelve months prior to the interview. I can also observe the number of hours of care which the respondent has given weekly.[4]

In the model, parents can also receive formal care. Respondents in the second wave of SHARE are asked whether they received professional or paid nursing or personal care, help for domestic tasks, or meals-on-wheels at home during the last twelve months, as well as whether they stayed in a nursing home, for how many hours a week they received these services, and how much they paid out-of-pocket for them. I use this information to impute the number of hours of formal care received by the parents of the respondents in my sample and the amount of money spent on it, which I cannot observe directly. I provide further details about the procedure followed to impute these numbers and the definitions of the rest of variables considered in the model in Appendix C.1.

3.3.3 Estimation results and model fit

Table 3.1: Estimates of the structural parameters – Full sample

	All	Men	Women	Men = Women (χ^2)
w	12.761	16.090	10.820	17.420
	(0.718)	(0.677)	(1.066)	[0.000]
p	8.110	10.524	6.246	20.422
	(0.486)	(0.686)	(0.652)	[0.000]
δ	0.014	0.017	0.011	78.644
	(0.000)	(0.001)	(0.000)	[0.000]
N. obs.	5,580	2,351	3,229	

Note: Robust standard errors in parenthesis. P-value of the test of equality of coefficients between men and women in the last column in square brackets.

Table 3.1 displays the parameter estimates for the entire sample and for men and women separately, while Table 3.2 does the same for the three country pools considered. The estimates are reasonable, ranging from 6.963 for w and 4.22 for p in the sample of women from Southern Europe, to 18.443 and 11.622 in the sample of Central European men.

The tables also report the results of the test of equality for each parameter obtained for men and women. The fact that w and p take different values for women than for men does not necessarily mean that there exists wage or price discrimination in the sample. Rather, this discrepancy may be due to the parameterization of the model. Apart from wages and prices of formal care, w and p may be capturing preference related aspects in the absence of more parameters in the utility function. Similarly, δ may be reflecting some additional information to altruism or family ties. Indeed, there are two aspects involved in the term of the objective function where this parameter is present: how much the agent values that their parent's needs are met, and how much they value to personally engage in caregiving. It is possible that individuals

[4]My analysis is restricted to the sample of individuals in Wave 2 (interviewed in 2006 or 2007) because of the lack of information about hours of care given in subsequent waves of the survey. Although survey respondents in Wave 2 were also asked whether they helped someone living in their household with personal care, SHARE did not register the number of hours spent on it.

Table 3.2: Estimates of the structural parameters for each region

	All	Men	Women	Men = Women (χ^2)
		A. Northern Europe		
w	15.901	17.853	14.150	29.644
	(0.339)	(0.548)	(0.403)	[0.000]
p	9.887	11.419	8.376	7.029
	(0.600)	(0.854)	(0.767)	[0.008]
δ	0.016	0.017	0.015	10.616
	(0.000)	(0.001)	(0.000)	[0.001]
N. obs.	1,779	834	945	
		B. Central Europe		
w	15.721	18.443	13.964	3.825
	(1.325)	(0.918)	(2.098)	[0.050]
p	9.422	11.622	7.535	7.221
	(0.789)	(0.983)	(1.161)	[0.007]
δ	0.015	0.018	0.012	31.515
	(0.001)	(0.001)	(0.001)	[0.000]
N. obs.	2,388	1,008	1,380	
		C. Southern Europe		
w	8.667	12.217	6.963	18.704
	(0.446)	(1.163)	(0.352)	[0.000]
p	5.798	8.313	4.220	12.734
	(0.509)	(1.051)	(0.461)	[0.000]
δ	0.013	0.016	0.010	47.213
	(0.000)	(0.001)	(0.000)	[0.000]
N. obs.	1,413	509	904	

Note: Robust standard errors in parenthesis. *P*-value of the test of equality of coefficients between men and women in the last column in square brackets. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain).

in the sample value the care received by their parents, but may not derive much satisfaction from being the providers of such care, or vice versa. This could potentially explain why the estimated value of δ is small.

To assess the model fit, I use the estimated model to simulate the decisions made by individuals in the sample. Table 3.3 compares the results of the simulations with the actual magnitudes in the data. Figure C.2.1 concentrates on the distribution of hours worked weekly.

In general, the model overpredicts the probability of being employed and the share of part-time work, especially in Northern Europe, where the mode of the distribution of hours worked simulated by the model is lower than 40 hours per week. The model also predicts that all individuals provide some informal care to parents, but the low estimate of δ leads them to spend fewer hours taking care of them than those observed. By contrast, the model slightly overestimates the proportion of individuals using formal care, except in Southern Europe, while the number of hours of this type of care is close to that in the data.

To gain deeper insights, Figure C.2.2 plots the predicted distribution of hours worked by men

Table 3.3: Model fit – Observed and predicted means

	Northern Europe		Central Europe		Southern Europe		Full sample	
	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
Being employed (dummy)	0.93	0.97	0.75	0.92	0.59	0.85	0.77	0.92
	(0.008)	(0.005)	(0.012)	(0.007)	(0.019)	(0.014)	(0.008)	(0.005)
Hours worked	38.20	29.04	38.13	29.46	39.87	27.66	38.44	29.00
	(0.334)	(0.292)	(0.432)	(0.340)	(0.723)	(0.685)	(0.259)	(0.219)
Being a caregiver (dummy)	0.41	1.00	0.30	1.00	0.22	1.00	0.32	1.00
	(0.016)	(0.000)	(0.013)	(0.000)	(0.016)	(0.000)	(0.009)	(0.000)
Hours of informal care	2.73	1.82	6.93	1.56	13.73	1.74	6.30	1.70
	(0.288)	(0.028)	(0.706)	(0.076)	(1.708)	(0.066)	(0.442)	(0.036)
Use of formal care (dummy)	0.78	0.86	0.79	0.92	0.76	0.61	0.78	0.83
	(0.014)	(0.012)	(0.011)	(0.008)	(0.017)	(0.020)	(0.008)	(0.007)
Hours of formal care	2.91	3.33	2.65	2.21	3.48	3.07	2.87	2.71
	(0.295)	(0.203)	(0.247)	(0.105)	(0.666)	(0.248)	(0.191)	(0.095)

Note: Standard errors in parenthesis. The standard error of the prediction does not take into account the error in the estimation of the coefficients. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France, and Germany) and Southern Europe (Italy and Spain).

and women. The model encounters difficulties in explaining the behavior of men. Compared to the actual distribution, the one produced by the model is shifted towards lower values for both genders, but in the case of men, the data show a significantly higher concentration of individuals working around 40 hours per week.

3.4 Counterfactual simulations

In this section, I use the estimated parameters to carry out a set of counterfactual simulations with the aim of understanding how wages, prices of formal care and family ties drive care and labor supply decisions in the model.

I define three counterfactual scenarios. In the first one, I simulate labor supply and care provision decisions of individuals in Central and Southern Europe after setting the estimated wage parameters in each region, represented by w, equal to the estimates obtained for Northern Europe. In the second and third scenarios, I additionally set the estimated prices of formal care p and family ties δ of Central and Southern Europe equal to those of the North. For each of these scenarios, I compare counterfactual outcomes with baseline simulations. Tables 3.4 and C.3.1 display the results of this comparison by showing rates of employment, informal caregiving and formal care use, together with mean hours worked, hours of informal care given, and hours of formal care purchased, and the percentage change between counterfactual and baseline magnitudes.

The most notable disparities between baseline and counterfactual simulations are observed in Southern Europe.[5] By making wages equal to those estimated for Northern Europe, agents react by increasing their labor supply at both the extensive and intensive margins. Compared to the baseline magnitudes, the share of employed individuals increases by 11.1% and hours worked by 24.9%. To seize the opportunity to increase their labor earnings, agents withdraw

[5]Considering the relatively closer resemblance of parameter estimates in Northern and Central Europe, the changes observed in this region are more moderate.

Table 3.4: Labor supply and elderly care decisions in Central and Southern Europe – Percentage change between counterfactual and baseline means

	Being employed (dummy)	Hours worked	Being a caregiver (dummy)	Hours of informal care	Use of formal care (dummy)	Hours of formal care
			A. Same w than Northern Europe			
Central Europe	+0.2	+0.5	+0.0	-2.6	+1.9	+0.2
Southern Europe	+11.1	+24.9	-60.8	-61.9	+64.1	+43.5
			B. Same w and p than Northern Europe			
Central Europe	+0.1	+0.2	+0.0	+7.0	-7.0	-1.2
Southern Europe	+11.0	+23.5	-0.1	-35.5	+50.0	+10.3
			C. Same w, p and δ than Northern Europe			
Central Europe	+0.1	-0.2	+0.0	+24.3	-15.2	-2.8
Southern Europe	+10.6	+22.5	+0.0	-8.2	+40.4	+7.9

Note: For each column, the table reports the percentage change between the mean obtained in the counterfactual scenario and the baseline mean. The magnitudes compared are shown in Table C.3.1. The two country groups represented are Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain).

from providing informal care to parents and reduce the number of hours of care given. The proportion of individuals who give help to their parents and hours of informal care go down by more than 60%. Nevertheless, higher earnings enable a greater number of individuals to access formal care services and buy more hours of this type of help. Thus, the rate of formal care users rises up by 64.1%, and hours of formal care by 43.5%.

Once wages are equal across regions, removing differences in prices of formal care makes little difference in terms of labor supply with respect to the first counterfactual. It does in terms of caregiving by attenuating the effect of wages alone in the previous scenario. In comparison to the baseline outcomes, the share of employed individuals and hours worked obtained under the same wages and formal care prices as in Northern Europe are 11% and 23.5% bigger, respectively, and the share of informal caregivers is 0.1% lower. The decline in hours of informal care is also weaker than that of the first counterfactual. Similarly, the simulated share of formal care users and hours of formal care are lower than those of the previous counterfactual, but still larger than baseline values.

In the third counterfactual scenario, equalizing family ties across regions has a minimal impact on the combined effect of wages and formal care prices on labor supply and the proportion of informal caregivers. In turn, it does contribute to moderating the reduction of hours of informal care and the increase in the share of formal care users and hours of formal care found in the previous counterfactuals.

3.5 Policy Experiments

In my model, care and work are two competing alternatives in the agent's time allocation problem. Once the minimum leisure and care requirements are met, one more hour of informal care for parents yields utility to the agent, but implies one hour less of paid work, and so a loss in terms of foregone wages. As a consequence, working-age individuals with parents in need of care may struggle to combine their role as caregivers with work. To help families balance work

Table 3.5: Labor supply and elderly care decisions – Percentage change between policy and baseline means

	Being employed (dummy)	Hours worked	Being a caregiver (dummy)	Hours of informal care	Use of formal care (dummy)	Hours of formal care
			A. Cash benefit			
Northern Europe	-0.6	-10.9	+0.0	+5.4	-5.7	-1.2
Central Europe	-2.3	-10.7	+0.0	+6.4	-0.6	-0.2
Southern Europe	-4.7	-20.3	+0.0	+8.9	-12.4	-2.2
Full sample	-2.3	-12.8	+0.0	+6.7	-4.3	-1.0
			B. Formal care price discount			
Northern Europe	+0.2	+1.6	-60.6	-53.1	+17.9	+177.6
Central Europe	+0.2	+1.8	-74.9	-55.5	+8.9	+263.0
Southern Europe	+1.4	+2.2	-75.5	-63.6	+64.1	+163.5
Full sample	+0.5	+1.8	-70.5	-56.8	+21.5	+209.2

Note: For each column, the table reports the percentage change between the mean obtained in the policy experiment and the baseline mean. The magnitudes compared are shown in Table C.4.1. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France, and Germany) and Southern Europe (Italy and Spain).

and care responsibilities, many countries have implemented a wide range of policies (Colombo, Llena-Nozal, Mercier and Tjadens, 2011).

In this section, I use the model estimated before to study how policies can affect labor supply and care provision decisions. In particular, I evaluate the impact of two policies with the same total cost: a cash transfer of 101.53 euros per week for individuals with parents requiring care, and an 80% discount in the price of formal care.[6]

3.5.1 Cash benefit

In the first policy experiment, I investigate how agents with parents in need of care would react if they received a cash transfer. This policy acknowledges that taking care of the elderly entails some costs for which informal caregivers should be compensated, rewarding their effort and the social role they play. Countries where these payments to caregivers have been implemented exhibit a variety of compensations schemes and eligibility conditions (Colombo, Llena-Nozal, Mercier and Tjadens, 2011). I simulate the effects of giving all individuals a transfer of 101.53 euros per week. Since all potential caregivers receive the same amount of money, there might be cases in which this is not enough to cover all the costs of care provision, and others in which, by contrast, the allowance exceeds one's needs by far. Payment is made conditional upon the presence of a parent with help needs, regardless of employment status or income.

Panel A of Tables 3.5 and C.4.1 compare the outcomes of the cash benefit with the baseline predictions of the model. With respect to these, in the full sample, the cash benefit gives place to a decrease in the employment rate and the share of formal care users. At the same time, hours worked are reduced by 12.8% and hours of informal care rise by 6.7%. Among regions, the effects are stronger in Southern Europe, where the decrease in hours worked almost doubles that of the other two regions, and the share of formal care users drops by 12.4%.

[6]Using the observations in my sample and the number of people which they represent according to sampling weights, the total cost of both policies for the entire sample would be 1.607 billion euros.

Therefore, in this exercise, when potential caregivers are supported by an external source of non-labor income, they reduce the amount of time spent at work to give some extra attention to their parents, instead of using the additional resources to buy more formal care.

3.5.2 Formal care price discount

An alternative to cash transfers paid directly to families is to subsidize the cost of formal care. Rather than providing agents with resources that they can freely allocate, this policy promotes the utilization of formal care to meet parental needs and supports individuals in maintaining their work commitments. The policy that I study in this section is an 80% discount on the price of formal care. I assume that all individuals in my sample can benefit from this discount, irrespective of their income, employment status, or level of care needs.

Panel B of Tables 3.5 and C.4.1 compare the outcomes of the discount with the predictions made in the baseline scenario. In comparison to the cash benefit, the discount has a weaker effect on employment rates and hours worked. The impact of the policy is concentrated on care arrangements. In the whole sample, there is a 70.5% reduction in the share of informal care users, and a 21.5% increase in the rate of formal care users. In the intensive margin, there is a 56.8% decrease in the number of hours of informal care, whereas the amount of formal care purchased is more than three times larger than in the baseline scenario. Southern Europe experiences a greater reduction in the share of informal caregivers and hours of informal care, along with a larger increase in the proportion of formal care users, compared to the other two regions. On the other hand, Central Europe shows the highest growth in hours of formal care.

All in all, the policy evaluation exercises conducted in this section emphasize the importance of the care mix targeted by the policymaker. If the focus is on maximizing the assistance provided by informal caregivers, it may be more effective to directly transfer resources to these individuals, helping them to substitute work hours for informal care hours. Conversely, if the goal is to achieve a better balance between work and care responsibilities, promoting the adoption of formal care may be a more suitable approach.

3.6 Conclusion

In this chapter, I study the relationship between the provision of care for older parents and labor supply decisions, focusing on the intensive margin. My goal is to understand how agents allocate hours to care and work, and whether the outcomes of these decisions differ across countries in Europe. To provide a quantitative answer to these questions, I develop a structural model featuring an agent who is altruistic towards their parent and allocates their time and budget to consumption, hours worked, and hours of formal and informal care to maximize utility.

I estimate this model using data from the second wave of SHARE, and use it to examine the mechanisms behind the time allocation decisions of the children of care recipients in Northern, Central and Southern European countries. While this model ignores the interactions among family members that I do take into account in Chapter 2, it still proves useful to further understand the drivers of these decisions. Specifically, I concentrate on the role played by wages, prices of formal care, and family ties.

Next, I use the model to evaluate the effects of two policies in support of elderly care: an unconditional cash benefit and a discount on the price of formal care. I find that agents substitute hours worked for hours of informal care given to their parents when they are supported by the first of these policies, instead of using the additional resources to buy more formal care. By contrast, the discount on the price of formal care induces a strong substitution between formal and informal care, whereas it has a small impact on labor supply.

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Appendix A: Chapter 1

A.1 Care Arrangements Across Europe

Table A.1.1: Type of care received – Multinomial logit estimates

	Only formal care	Only informal care	Both types of care
Central Europe (dummy)	0.917	0.895	1.242
	(0.145)	(0.124)	(0.167)
Southern Europe (dummy)	0.361***	1.160	0.280***
	(0.063)	(0.156)	(0.042)
Female (dummy)	1.460***	1.019	1.361***
	(0.202)	(0.096)	(0.155)
Age	0.812	0.983	0.736
	(0.223)	(0.222)	(0.181)
Age squared	1.002	1.000	1.003*
	(0.002)	(0.001)	(0.002)
Widowed (dummy)	1.641***	1.343***	1.366**
	(0.240)	(0.147)	(0.177)
Severe LTC needs (dummy)	0.938	0.791**	0.963
	(0.138)	(0.085)	(0.113)
Number of children	0.960	1.046	1.019
	(0.044)	(0.034)	(0.038)
At least one child lives less	0.788	1.023	0.907
than 25 km away from parent (dummy)	(0.141)	(0.165)	(0.147)
Log net assets	0.901***	0.962**	0.952**
	(0.020)	(0.017)	(0.019)
Constant	45.303	0.160	1835.695
	(501.649)	(1.434)	(1.8e+04)
Number of observations		6,527	

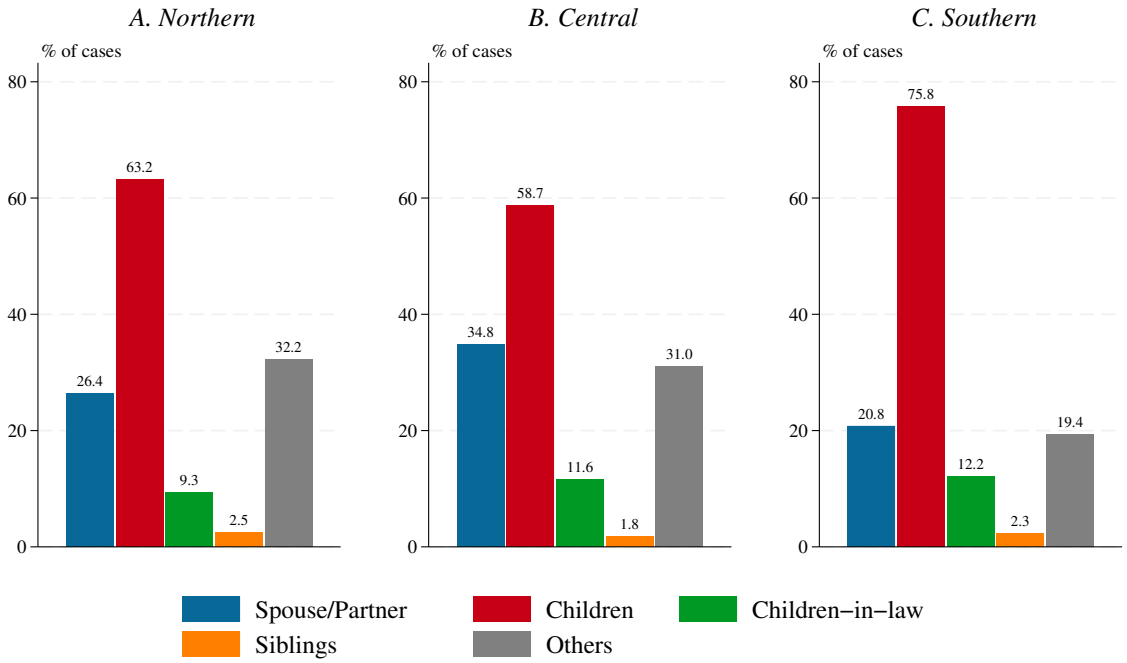
Note: *No care received* is the base category. Sample of respondents aged 70 or older with care needs. Exponentiated coefficients (relative-risk ratios). Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source*: SHARE, waves 5 and 6.

Table A.1.2: Having care needs and receiving care – Logit estimates

	Having care needs (dummy)[(a)]	Care received (dummy)[(b)]
Central Europe (dummy)	1.880***	1.050
	(0.122)	(0.116)
Southern Europe (dummy)	4.396***	0.591***
	(0.286)	(0.068)
Female (dummy)	1.411***	1.198**
	(0.071)	(0.099)
Age	1.034	0.816
	(0.122)	(0.157)
Age squared	1.001	1.002
	(0.001)	(0.001)
Widowed (dummy)	1.093	1.401***
	(0.066)	(0.134)
Severe LTC needs (dummy)		0.883
		(0.080)
Number of children		1.021
		(0.030)
At least one child lives less		0.918
than 25 km away from parent (dummy)		(0.119)
Log net assets	0.887***	0.945***
	(0.010)	(0.015)
Constant	0.002	262.504
	(0.008)	(2004.460)
Number of observations	23,496	6,527

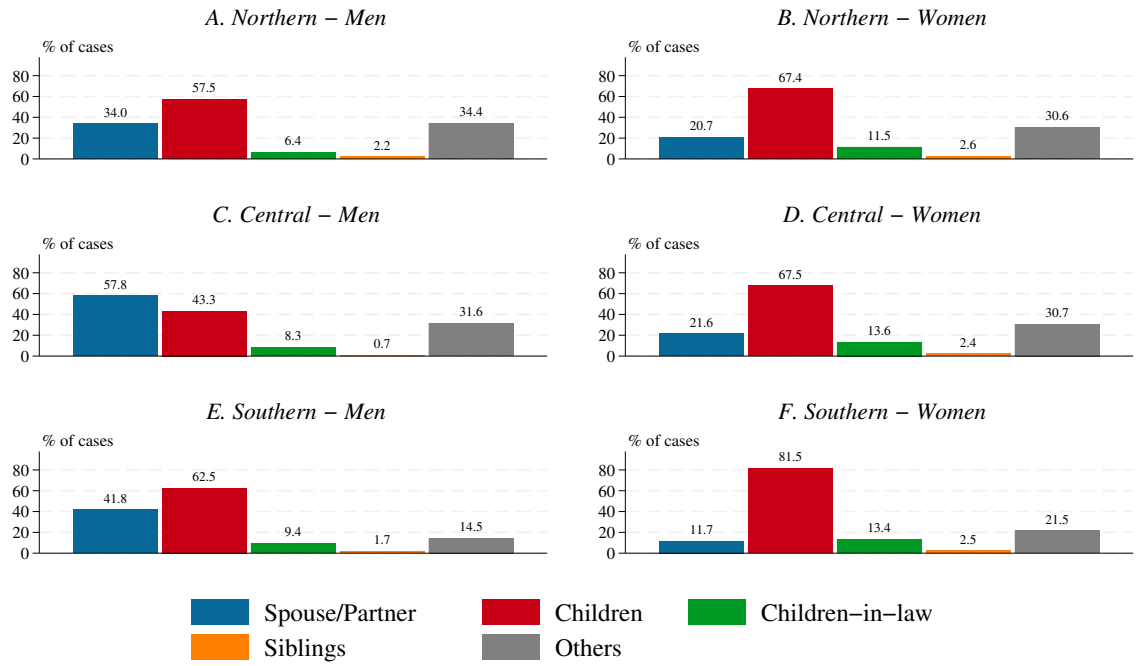
Note: (a) Sample of respondents aged 70 or older; (b) sample of respondents aged 70 or older with care needs. Exponentiated coefficients (odds ratios). Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source*: SHARE, waves 5 and 6.

FIGURE A.1.1: SOURCES OF INFORMAL CARE RECEIVED



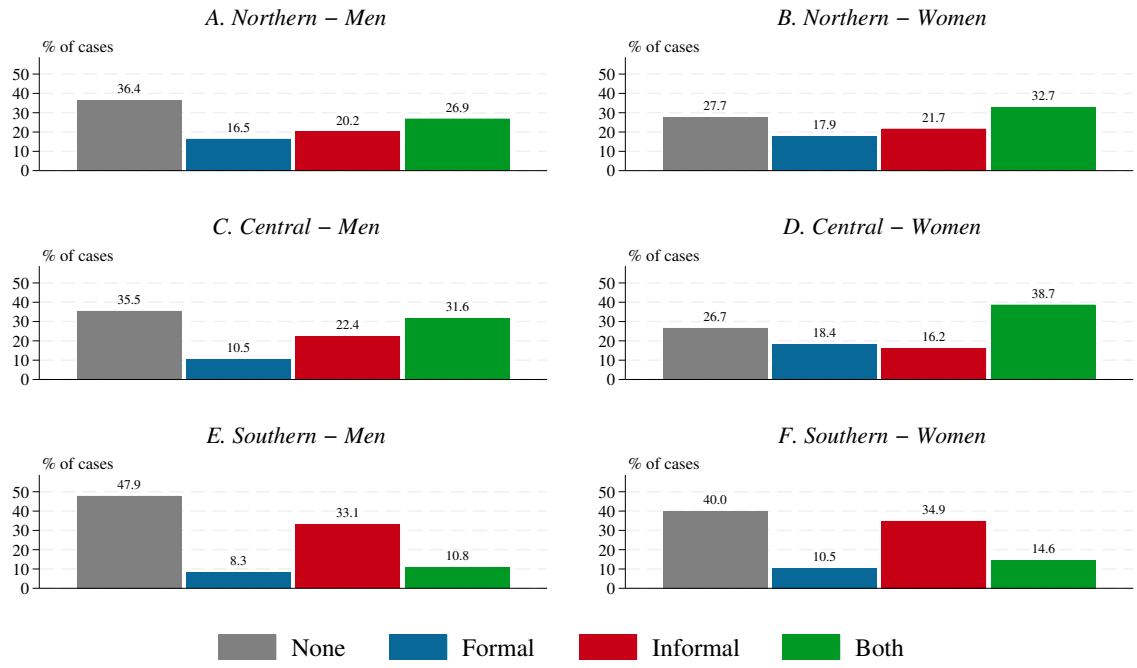
Note: The figure plots the percentage of individuals aged 70 or older with care needs and at least one child aged 60 or younger who receive informal care from a spouse or partner, child, child-in-law, siblings, or other sources, conditional on receiving some informal care. The country groups represented 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 A.1.2: SOURCES OF INFORMAL CARE RECEIVED – MEN AND WOMEN



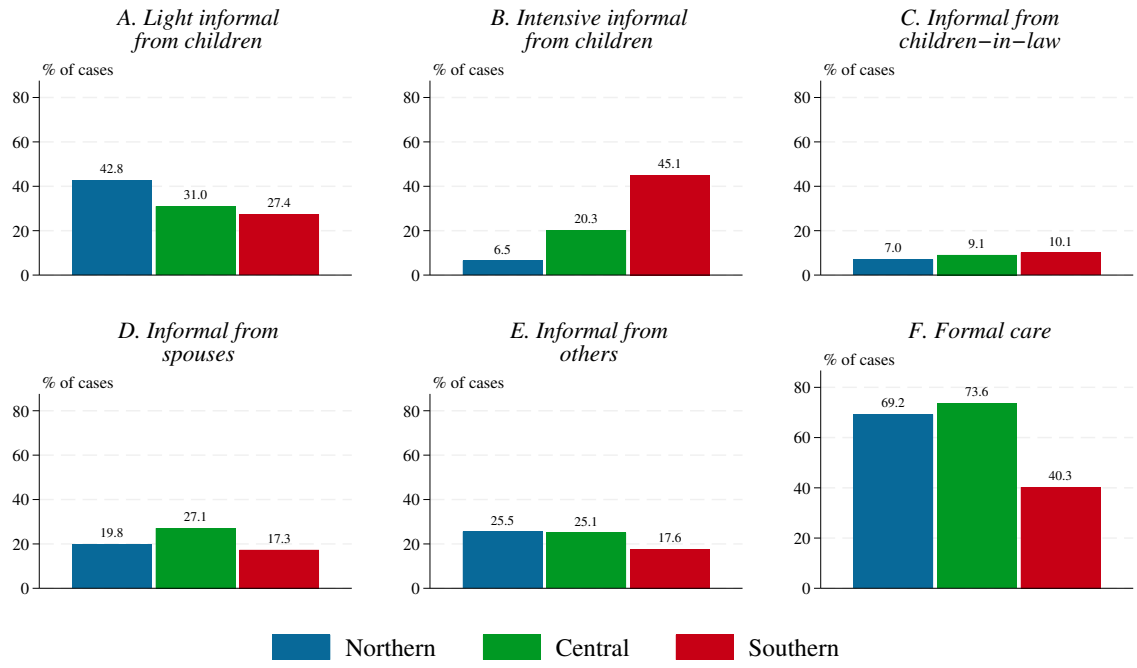
Note: The figure plots the percentage of individuals aged 70 or older with care needs who receive informal care from a spouse or partner, child, child-in-law, sibling, or other sources, conditional on receiving some informal care. The country groups represented are Northern Europe (Denmark and Sweden), 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 A.1.3: TYPE OF CARE RECEIVED – MEN AND WOMEN



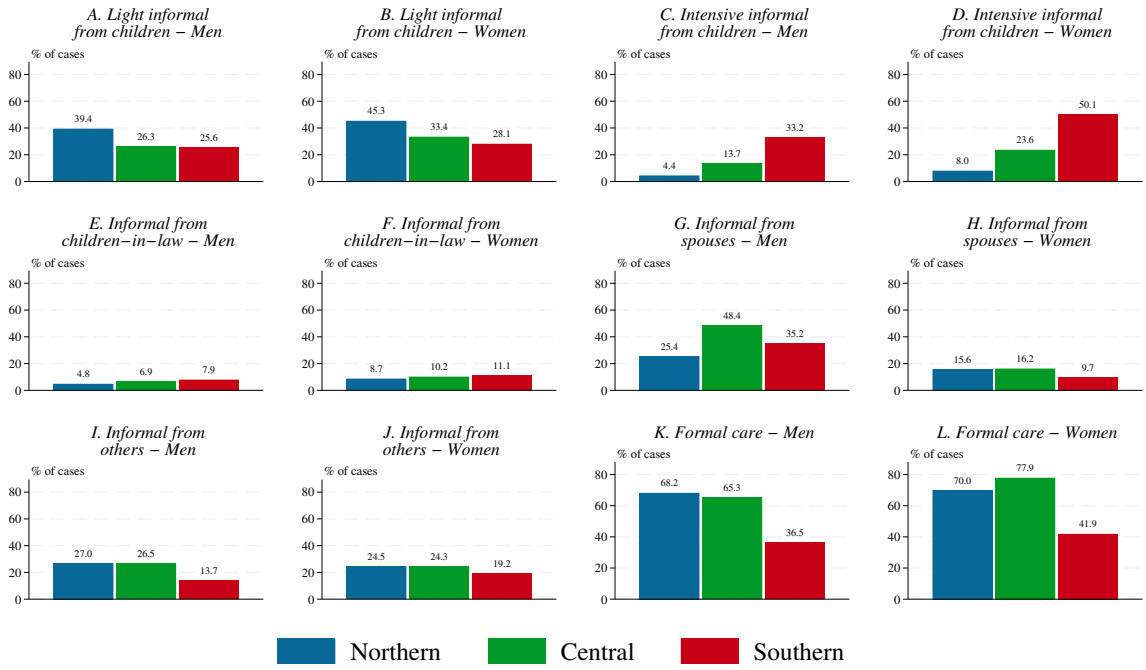
Note: The figure plots the percentage of individuals aged 70 or older with care needs who receive no care, only formal care, only informal care, or both types of care. The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern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

FIGURE A.1.4: TYPE OF CARE RECEIVED (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 aged 60 or younger 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 A.1.5: Type of care received (six options, conditional on receiving care) – Men and women



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.

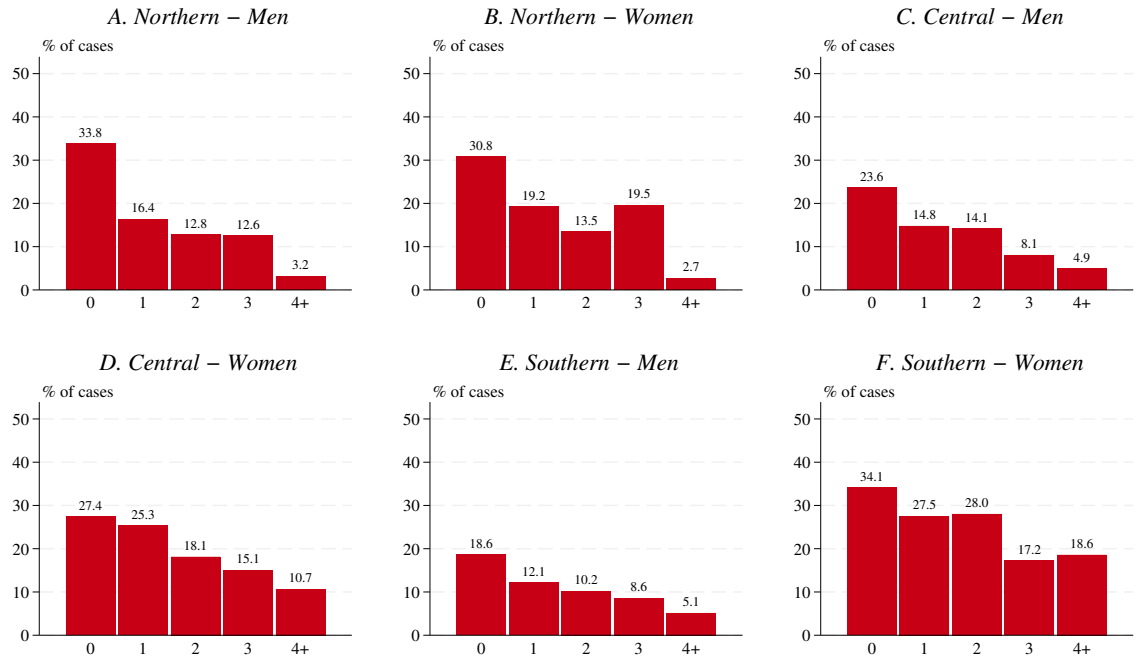
Table A.1.3: Type of care received (conditional on receiving care) – Logit estimates

	Children (light)	Children (intensive)	Children-in-law	Spouse	Others	Formal care
Central Europe (dummy)	0.588***	3.719***	1.369	1.723***	0.894	1.269*
	(0.075)	(0.876)	(0.345)	(0.266)	(0.127)	(0.172)
Southern Europe (dummy)	0.409***	9.457***	1.510*	0.907	0.648***	0.260***
	(0.057)	(2.203)	(0.375)	(0.150)	(0.102)	(0.037)
Female (dummy)	1.225**	1.549***	1.093	0.210***	0.890	1.394***
	(0.126)	(0.183)	(0.214)	(0.024)	(0.115)	(0.149)
Age	1.261	0.981	1.136	1.441	0.922	0.885
	(0.294)	(0.240)	(0.438)	(0.352)	(0.235)	(0.192)
Age squared	0.999	1.000	0.999	0.997*	1.000	1.001
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Widowed (dummy)	1.320**	1.720***	1.892***		1.811***	1.036
	(0.161)	(0.229)	(0.383)		(0.257)	(0.124)
Severe LTC needs (dummy)	0.960	1.337**	0.850	1.145	0.833	1.235*
	(0.112)	(0.180)	(0.156)	(0.141)	(0.113)	(0.150)
Number of children	1.136***	1.115***	0.878*	0.943	0.918*	0.960
	(0.039)	(0.044)	(0.064)	(0.037)	(0.045)	(0.034)
At least one child lives less	1.498**	3.141***	1.697	0.807	0.726*	0.839
than 25 km away from parent (dummy)	(0.244)	(0.732)	(0.620)	(0.130)	(0.121)	(0.138)
Log net assets	1.084***	0.960*	0.976	1.147***	1.020	0.973
	(0.019)	(0.021)	(0.026)	(0.029)	(0.021)	(0.019)
Constant	0.000	0.004	0.000	0.000	42.562	24.456
	(0.000)	(0.042)	(0.003)	(0.000)	(435.200)	(213.728)
Number of observations	4,036	4,036	4,036	4,036	4,036	4,036

Note: Sample of respondents aged 70 or older with care needs. Exponentiated coefficients (odds ratios). Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Care alternatives are not mutually exclusive. *Source*: SHARE, waves 5 and 6.

A.2 Institutions and Social Norms

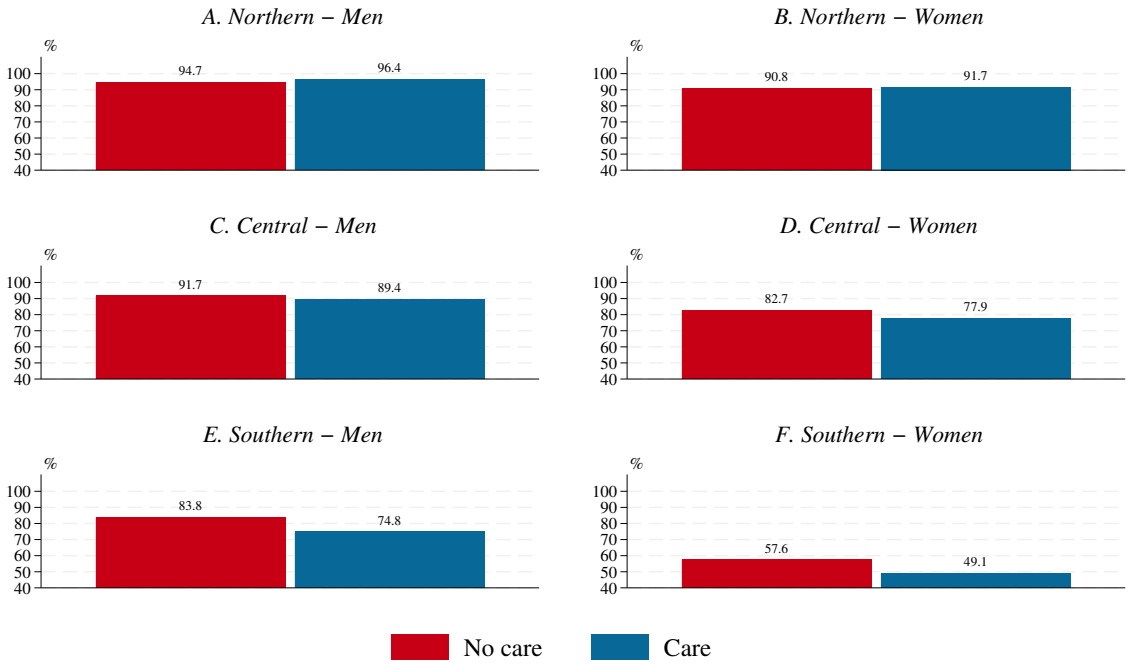
FIGURE A.2.1: PROBABILITY OF GIVING INFORMAL CARE TO PARENTS BY NUMBER OF SIBLINGS – MEN AND WOMEN



Note: The figure plots the percentage of individuals who are aged 60 or younger, have at least one parent with care needs aged 70 or older, and give informal care to them, by number of siblings (from zero to four 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.

A.3 Working and Caring for the Elderly

Figure A.3.1: Employment rate of children by informal care given to parents – Men and women



Note: The figure plots the percentage of individuals who are aged 60 or younger, 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.

Table A.3.1: 2SLS first stage regressions (all countries)

	Being a caregiver (dummy)		
	All	Men	Women
Lives less than 25 km	0.133***	0.093***	0.158***
away from parents (dummy)	(0.010)	(0.011)	(0.013)
Widowed parent (dummy)	0.107***	0.111***	0.090***
	(0.013)	(0.027)	(0.015)
Age	-0.006	0.005	-0.013
	(0.007)	(0.007)	(0.013)
Age squared	0.102	-0.034	0.191
	(0.074)	(0.077)	(0.134)
Married (dummy)	-0.011	-0.012	-0.013
	(0.012)	(0.015)	(0.017)
College education (dummy)	0.021	0.036**	0.010
	(0.013)	(0.015)	(0.018)
Having children (dummy)	-0.003	0.010	-0.010
	(0.014)	(0.017)	(0.019)
Constant	0.067	-0.122	0.233
	(0.154)	(0.152)	(0.305)
Number of observations	14,140	6,117	8,023
F-stat. excluded instruments	123.707	38.809	81.309

Note: Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source*: SHARE Waves 5 and 6.

Table A.3.2: Regressions of being employed on giving informal care to parents (all the countries) – OLS and 2SLS estimates

	OLS			2SLS[(a)]		
	All	Men	Women	All	Men	Women
Being a caregiver (dummy)	-0.093***	-0.108***	-0.082***	-0.405***	-0.535***	-0.318***
	(0.017)	(0.027)	(0.020)	(0.081)	(0.163)	(0.093)
Age	0.036***	0.027**	0.041***	0.035***	0.029**	0.038**
	(0.009)	(0.012)	(0.014)	(0.010)	(0.012)	(0.015)
Age squared	-0.363***	-0.253**	-0.417***	-0.327***	-0.261**	-0.370**
	(0.098)	(0.124)	(0.146)	(0.104)	(0.130)	(0.157)
Married (dummy)	0.011	0.034*	-0.003	0.008	0.027	-0.004
	(0.014)	(0.019)	(0.018)	(0.015)	(0.020)	(0.019)
College education (dummy)	0.145***	0.129***	0.156***	0.140***	0.134***	0.149***
	(0.012)	(0.016)	(0.015)	(0.013)	(0.017)	(0.016)
Having children (dummy)	-0.001	0.001	-0.003	-0.002	0.006	-0.005
	(0.016)	(0.021)	(0.020)	(0.016)	(0.022)	(0.021)
Constant	-0.127	0.042	-0.236	-0.076	0.025	-0.146
	(0.217)	(0.266)	(0.339)	(0.228)	(0.280)	(0.362)
Number of observations	14,116	6,106	8,010	14,116	6,106	8,010

Note: Sample of individuals who are aged 60 or younger and have at least one parent with care needs aged 70 or older. Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (a) Dummies for living less than 25 km away from parents and for having a widowed parent used as instruments. *Source*: SHARE Waves 5 and 6.

Table A.3.3: Regressions of being employed on giving informal care to parents (Northern Europe) – OLS and 2SLS estimates

	OLS			2SLS[(a)]		
	All	Men	Women	All	Men	Women
Being a caregiver (dummy)	0.007	0.038*	-0.011	-0.003	0.134	-0.069
	(0.020)	(0.022)	(0.027)	(0.072)	(0.124)	(0.084)
Age	0.001	0.013	-0.008	0.001	0.015	-0.008
	(0.017)	(0.021)	(0.024)	(0.017)	(0.022)	(0.024)
Age squared	-0.008	-0.136	0.087	-0.005	-0.164	0.092
	(0.167)	(0.219)	(0.241)	(0.171)	(0.227)	(0.242)
Married (dummy)	0.015	0.005	0.024	0.015	0.005	0.022
	(0.016)	(0.018)	(0.023)	(0.016)	(0.019)	(0.022)
College education (dummy)	0.024	0.004	0.038*	0.024	0.000	0.036
	(0.015)	(0.021)	(0.022)	(0.015)	(0.019)	(0.022)
Having children (dummy)	0.075*	0.024	0.115*	0.075*	0.024	0.120*
	(0.042)	(0.031)	(0.065)	(0.042)	(0.031)	(0.066)
Constant	0.826**	0.600	0.982*	0.830**	0.550	0.977*
	(0.387)	(0.500)	(0.569)	(0.391)	(0.515)	(0.569)
Number of observations	1,667	842	825	1,667	842	825

Note: Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (a) Dummies for living less than 25 km away from parents and for having a widowed parent used as instruments. *Source*: SHARE Waves 5 and 6.

Table A.3.4: Regressions of being employed on giving informal care to parents (Central Europe) – OLS and 2SLS estimates

	OLS			2SLS[(a)]		
	All	Men	Women	All	Men	Women
Being a caregiver (dummy)	-0.042*	-0.070*	-0.027	-0.196**	-0.367*	-0.097
	(0.022)	(0.036)	(0.027)	(0.079)	(0.200)	(0.088)
Age	0.041***	0.034**	0.051**	0.040***	0.033**	0.050**
	(0.013)	(0.015)	(0.024)	(0.013)	(0.016)	(0.025)
Age squared	-0.440***	-0.359**	-0.541**	-0.426***	-0.345**	-0.529**
	(0.132)	(0.163)	(0.245)	(0.135)	(0.168)	(0.251)
Married (dummy)	0.019	0.068***	-0.017	0.016	0.058**	-0.018
	(0.018)	(0.025)	(0.023)	(0.018)	(0.026)	(0.023)
College education (dummy)	0.081***	0.069***	0.093***	0.079***	0.076***	0.091***
	(0.015)	(0.019)	(0.020)	(0.015)	(0.020)	(0.020)
Having children (dummy)	-0.011	-0.012	-0.011	-0.016	-0.014	-0.014
	(0.020)	(0.030)	(0.025)	(0.021)	(0.030)	(0.026)
Constant	-0.091	0.049	-0.325	-0.058	0.100	-0.291
	(0.293)	(0.348)	(0.593)	(0.300)	(0.365)	(0.609)
Number of observations	5,832	2,549	3,283	5,832	2,549	3,283

Note: Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (a) Dummies for living less than 25 km away from parents and for having a widowed parent used as instruments. *Source*: SHARE Waves 5 and 6.

Table A.3.5: Regressions of being employed on giving informal care to parents (Southern Europe) – OLS and 2SLS estimates

	OLS			2SLS[(a)]		
	All	Men	Women	All	Men	Women
Being a caregiver (dummy)	-0.140***	-0.146***	-0.135***	-0.341**	-0.267	-0.344*
	(0.025)	(0.041)	(0.029)	(0.157)	(0.258)	(0.184)
Age	0.036***	0.034**	0.028	0.035***	0.036**	0.024
	(0.013)	(0.017)	(0.018)	(0.013)	(0.017)	(0.019)
Age squared	-0.366***	-0.322*	-0.295	-0.336**	-0.336*	-0.233
	(0.140)	(0.184)	(0.189)	(0.146)	(0.180)	(0.207)
Married (dummy)	0.066***	0.066**	0.068**	0.066***	0.067**	0.067**
	(0.023)	(0.030)	(0.028)	(0.023)	(0.031)	(0.028)
College education (dummy)	0.148***	0.130***	0.159***	0.144***	0.130***	0.152***
	(0.022)	(0.030)	(0.025)	(0.022)	(0.029)	(0.027)
Having children (dummy)	-0.033	-0.031	-0.035	-0.030	-0.028	-0.032
	(0.024)	(0.031)	(0.030)	(0.024)	(0.032)	(0.030)
Constant	-0.194	-0.200	0.020	-0.164	-0.240	0.127
	(0.303)	(0.379)	(0.423)	(0.309)	(0.373)	(0.450)
Number of observations	6,617	2,715	3,902	6,617	2,715	3,902

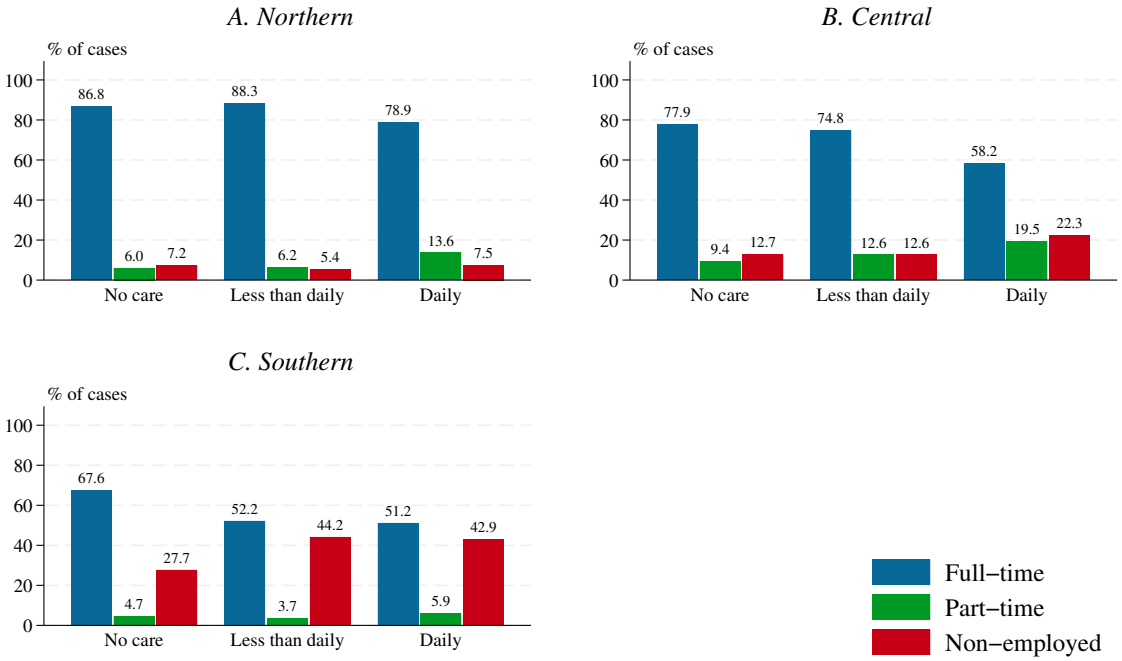
Note: Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (a) Dummies for living less than 25 km away from parents and for having a widowed parent used as instruments. *Source*: SHARE Waves 5 and 6.

Table A.3.6: Employment status of children – Multinomial logit estimates

	Part-time	Full-time
Central Europe (dummy)	0.745	0.481***
	(0.162)	(0.091)
Southern Europe (dummy)	0.185***	0.196***
	(0.042)	(0.037)
Central Europe × Light informal care (dummy)	1.133	1.099
	(0.378)	(0.284)
Central Europe × Intensive informal care (dummy)	1.182	0.471***
	(0.346)	(0.103)
Southern Europe × Light informal care (dummy)	0.541	0.742
	(0.275)	(0.144)
Southern Europe × Intensive informal care (dummy)	0.792	0.741**
	(0.188)	(0.101)
Female (dummy)	1.901***	0.246***
	(0.309)	(0.021)
Age	1.154*	1.247***
	(0.086)	(0.068)
Age squared	0.998**	0.998***
	(0.001)	(0.001)
College (dummy)	1.669***	2.633***
	(0.275)	(0.306)
Lives less than 25 km away from parent (dummy)	1.106	0.782***
	(0.166)	(0.072)
Having children (dummy)	1.134	1.025
	(0.181)	(0.109)
Married (dummy)	1.047	1.341***
	(0.149)	(0.126)
Having siblings (dummy)	0.919	0.809
	(0.250)	(0.132)
Severe LTC needs (dummy)	0.765**	0.869
	(0.103)	(0.078)
Constant	0.029**	0.169
	(0.049)	(0.215)
Number of observations	13,951	

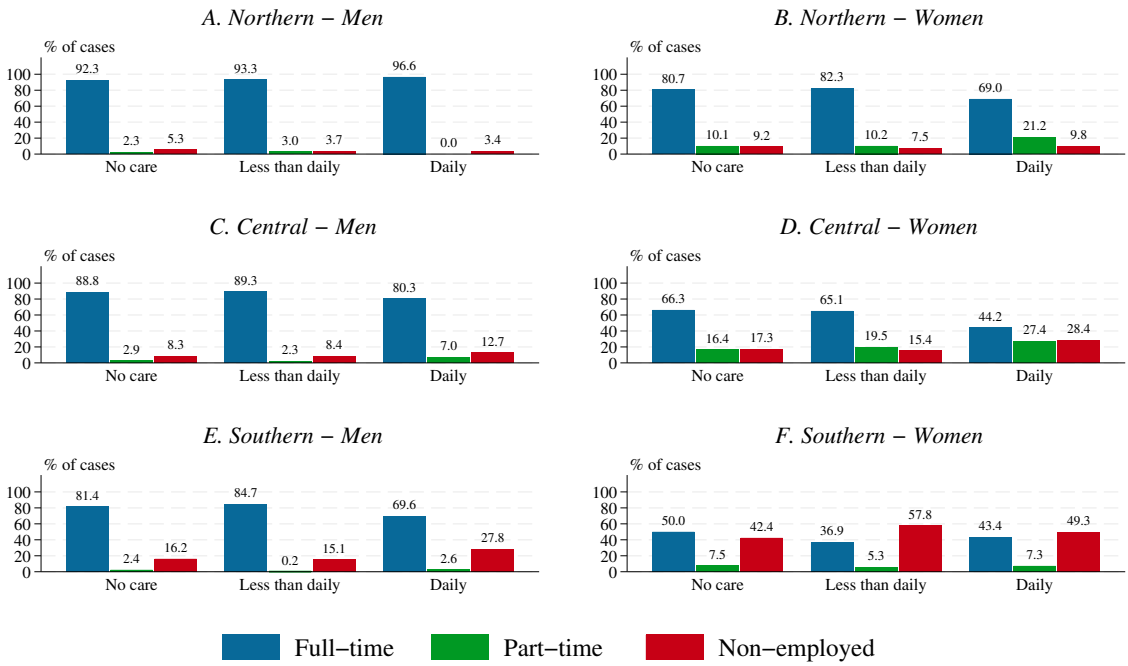
Note: Sample of individuals who are aged 60 or younger and have at least one parent with care needs aged 70 or older. Exponentiated coefficients (relative-risk ratios). Standard errors clustered at the household level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Informal care is defined as *intensive* when is provided on a daily basis, and as *light* when is provided on a less than daily basis. *Source*: SHARE Waves 5 and 6.

FIGURE A.3.2: EMPLOYMENT STATUS OF CHILDREN BY FREQUENCY OF INFORMAL CARE GIVEN TO PARENTS



Note: The figure plots the percentage of individuals who are aged 60 or younger, 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 A.3.3: Employment status of children by frequency of informal care given to parents – Men and women



Note: The figure plots the percentage of individuals who are aged 60 or younger, 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 A.3.7: Wage estimates – Northern Europe

	OLS			Heckman[(a)]		
	All	Men	Women	All	Men	Women
Part-time employed (dummy)	-0.105***	-0.143***	-0.008	-0.061***	-0.050	0.025
	(0.017)	(0.049)	(0.018)	(0.017)	(0.048)	(0.017)
Age	0.091***	0.097***	0.082***	0.002	0.012	-0.009
	(0.005)	(0.006)	(0.007)	(0.007)	(0.010)	(0.008)
Age squared/100	-0.090***	-0.096***	-0.079***	0.005	-0.004	0.016
	(0.005)	(0.007)	(0.008)	(0.008)	(0.012)	(0.010)
College education (dummy)	0.171***	0.213***	0.187***	0.107***	0.182***	0.081***
	(0.012)	(0.019)	(0.016)	(0.014)	(0.022)	(0.018)
Constant	-1.654***	-1.718***	-1.590***	0.565***	0.342	0.751***
	(0.092)	(0.125)	(0.140)	(0.140)	(0.215)	(0.184)
Number of observations	19,785	9,574	10,211	27,913	13,451	14,462

Note: Sample of individuals between 16 and 60 years-old. Dependent variable: log wages. Standard errors clustered at the individual level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (a) Full-information maximum likelihood estimates of Heckman's selection model, using marital status and having children dummies as exclusion restrictions. *Source*: EU-SILC, years 2013 and 2015.

Table A.3.8: Wage estimates – Central Europe

	OLS			Heckman[(a)]		
	All	Men	Women	All	Men	Women
Part-time employed (dummy)	-0.171***	-0.147***	-0.064***	-0.143***	-0.103***	-0.019*
	(0.009)	(0.029)	(0.009)	(0.009)	(0.027)	(0.010)
Age	0.098***	0.108***	0.078***	0.038***	0.058***	0.014***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.006)	(0.005)
Age squared/100	-0.099***	-0.108***	-0.079***	-0.033***	-0.052***	-0.009
	(0.003)	(0.004)	(0.005)	(0.004)	(0.007)	(0.006)
College education (dummy)	0.361***	0.377***	0.354***	0.286***	0.326***	0.263***
	(0.007)	(0.010)	(0.009)	(0.008)	(0.012)	(0.011)
Constant	0.285***	0.072	0.639***	1.747***	1.263***	2.262***
	(0.052)	(0.069)	(0.081)	(0.076)	(0.121)	(0.107)
Number of observations	54,158	27,140	27,018	76,867	36,151	40,716

Note: Sample of individuals between 16 and 60 years-old. Dependent variable: log wages. Standard errors clustered at the individual level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (a) Full-information maximum likelihood estimates of Heckman's selection model, using marital status and having children dummies as exclusion restrictions. *Source*: EU-SILC, years 2013 and 2015.

Table A.3.9: Wage estimates – Southern Europe

	OLS			Heckman[(a)]		
	All	Men	Women	All	Men	Women
Part-time employed (dummy)	-0.203***	-0.225***	-0.118***	-0.203***	-0.140***	-0.120***
	(0.013)	(0.031)	(0.016)	(0.013)	(0.033)	(0.016)
Age	0.046***	0.045***	0.047***	0.054***	-0.069***	0.060***
	(0.004)	(0.005)	(0.006)	(0.004)	(0.007)	(0.006)
Age squared/100	-0.035***	-0.032***	-0.037***	-0.044***	0.092***	-0.051***
	(0.004)	(0.006)	(0.007)	(0.004)	(0.008)	(0.007)
College education (dummy)	0.310***	0.336***	0.330***	0.325***	0.222***	0.364***
	(0.009)	(0.014)	(0.014)	(0.009)	(0.016)	(0.013)
Constant	1.030***	1.089***	0.935***	0.827***	3.888***	0.578***
	(0.079)	(0.108)	(0.116)	(0.078)	(0.146)	(0.119)
Number of observations	37,897	19,838	18,059	72,742	33,527	39,215

Note: Sample of individuals between 16 and 60 years-old. Dependent variable: log wages. Standard errors clustered at the individual level in parentheses. P-values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. (a) Full-information maximum likelihood estimates of Heckman's selection model, using marital status and having children dummies as exclusion restrictions. *Source*: EU-SILC, years 2013 and 2015.

Appendix B: Chapter 2

B.1 Hours of Care

SHARE asks its interviewees about help they may have received from people they know, who can be 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 from several parts of the questionnaire. In this case, respondents can mention up to 20 children.

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 their partner together, instead of care received only by the respondent. Table B.1.1 summarizes the way in which each wave presents information on various care forms.

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.[1] 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, having children, and region. Next, I use these estimates, reported in Table B.1.2, to impute the number of hours of care given weekly by the children of the respondents in the estimation sample.

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

[1] SHARE 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 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.[2] 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 order polynomial of age, the number of children, the value of net assets, and a list of dummies for difficulties with activities of daily living, 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 B.1.3, I impute the number of hours of formal 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 B.1.1: 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 reports if the respondent received care daily, weekly, monthly, or less often; and *dummy* represents that there is 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 their partner. *Source*: SHARE questionnaires and Barczyk and Kredler (2019).

[2] After 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 the 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 these to deal with the analogous limitation in the case of informal care.

Table B.1.2: Estimates of hours of informal care given to parents

	Log hours of informal care
Number of siblings	0.023
	(0.020)
Parental health	-0.256***
	(0.028)
Widowed parent (dummy)	0.034
	(0.074)
Lives less than 25km	0.182***
away from parents (dummy)	(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

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: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.1.3: Estimates of hours of formal home care received by parents

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

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: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B.2 Hours Worked and Wages

Table B.2.1: Estimates of hours worked by region

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

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 B.2.2: Wage estimates by region

	Northern	Central	Southern
Female dummy	-0.168***	-0.119***	-0.340***
	(0.009)	(0.008)	(0.023)
Age	0.058***	0.013**	0.150***
	(0.010)	(0.005)	(0.013)
Age^2	-0.001***	-0.000	-0.001***
	(0.000)	(0.000)	(0.000)
College dummy	0.184***	0.285***	0.495***
	(0.011)	(0.008)	(0.025)
Constant	1.625***	2.429***	-1.575***
	(0.232)	(0.123)	(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: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B.3 Estimation Sample

Table B.3.1: 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.) frecuencies 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.

B.4 Estimation Results and Model Fit

Table B.4.1: Parameter estimates of the child's utility

	Northern			Central			Southern		
β	0.002			0.002			0.005		
	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

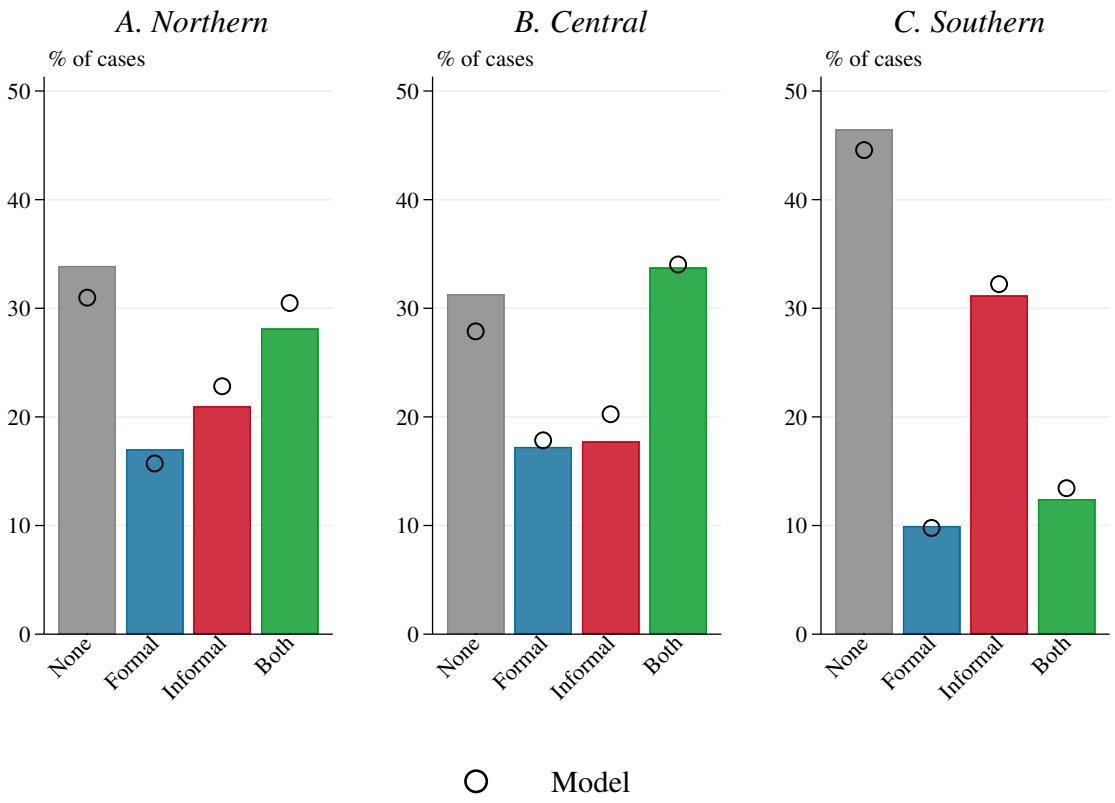
Note: The choice alternatives are *non-employment and no care* (NENC; base category), *employment and no care* (ENC), *non-employment and informal care* (NEIC), and *employment and informal care* (EIC). Columns 2-4 report the choice-specific parameters estimated for Northern Europe, columns 5-7 the ones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

Table B.4.2: Parameter estimates of the parent's utility

	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

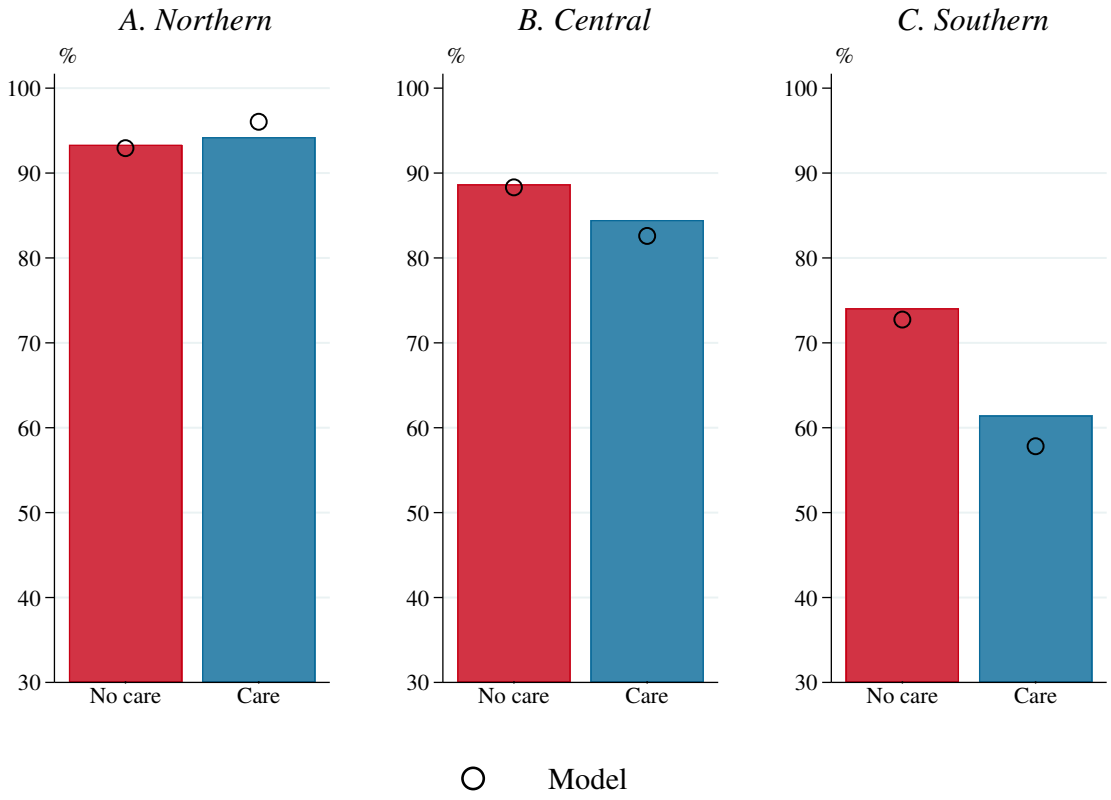
Note: Standard errors to be computed.

Figure B.4.1: 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 (bars) and the model simulations (dots). The country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain).

Figure B.4.2: Employment rate of children by informal care given to parents – Model fit



Note: The figure plots the percentage of individuals who are aged 60 or younger, 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 (bars) and the model simulations (dots). The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain).

B.5 Decomposition Analysis

Table B.5.1: Type of care received by parents and employment rate of children in baseline and counterfactual simulations (%)

	Some care	Only formal care	Only informal care	Both types of care	Employed (overall)	Employed non-caregivers	Employed caregivers	Gap between non-caregivers and caregivers
	A. Northern Europe							
Baseline	69.0	15.7	22.8	30.5	93.7	92.9	96.0	-3.1
Prefs. over total care	73.8	13.1	26.1	34.7	93.3	92.6	95.2	-2.6
	B. Central Europe							
Baseline	72.1	17.8	20.2	34.0	87.1	88.3	82.6	5.7
Parameters	73.5	15.9	24.3	33.3	91.5	90.0	94.7	-4.7
Wages	71.9	18.3	21.1	32.5	90.3	91.2	86.7	4.5
Parental health	72.3	17.7	21.0	33.6	86.6	87.3	84.0	3.3
Parental wealth	71.9	17.7	22.0	32.2	86.9	87.9	83.0	4.9
Prefs. over total care	75.5	15.4	22.4	37.6	88.1	89.1	84.7	4.4
	C. Southern Europe							
Baseline	55.4	9.8	32.2	13.4	69.6	72.7	57.8	14.9
Parameters	74.9	15.7	24.1	35.1	91.7	87.1	96.8	-9.7
Wages	48.3	11.5	27.1	9.7	96.5	97.3	89.6	7.7
Parental health	55.3	9.8	33.8	11.7	73.4	75.7	64.3	11.4
Parental wealth	56.1	9.8	35.0	11.3	72.1	74.9	61.9	13.0
Prefs. over total care	61.3	8.5	37.9	14.9	72.0	75.1	61.5	13.5

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 overall share of employed children, the share of children who are 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 model parameters, wage levels, parental health and parental wealth across regions are removed. In row 6 of the same panels, simulations are conducted under the assumption that children have preferences over the total amount of care. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany), and Southern Europe (Italy and Spain).

Table B.5.2: Type of care received by parents and employment rate 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 (overall)	Employed non-caregivers	Employed caregivers	Gap between non-caregivers and caregivers
	A. Northern vs Central Europe							
Baseline	-3.1	-2.1	2.6	-3.5	6.6	4.6	13.4	-8.8
Parameters	-4.5	-0.2	-1.5	-2.8	2.2	2.9	1.3	1.6
Wages	-2.9	-2.6	1.7	-2.0	3.5	1.7	9.3	-7.6
Parental health	-3.3	-2.0	1.8	-3.1	7.1	5.6	12.0	-6.4
Parental wealth	-2.9	-2.0	0.9	-1.7	6.9	5.0	13.0	-8.0
Prefs. over total care	-1.6	-2.4	3.7	-3.0	5.1	3.5	10.5	-7.0
	B. Northern vs Southern Europe							
Baseline	13.6	5.9	-9.4	17.0	24.1	20.2	38.2	-18.0
Parameters	-5.9	-0.0	-1.3	-4.6	2.0	5.9	-0.8	6.6
Wages	20.7	4.2	-4.3	20.8	-2.8	-4.4	6.4	-10.8
Parental health	13.7	5.9	-11.0	18.8	20.4	17.3	31.7	-14.5
Parental wealth	12.9	5.9	-12.2	19.2	21.7	18.0	34.1	-16.1
Prefs. over total care	12.5	4.6	-11.9	19.7	21.3	17.5	33.7	-16.2

Note: The table shows the differences in percentage points 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 overall, the children who do not give informal care, those who do give informal care, and the gap between the last two. In the counterfactual scenarios represented in rows 2-5 of each panel, differences in model parameters, wage levels, parental health and parental wealth across regions are removed. In row 6, simulations are conducted under the assumption that children have preferences over the total amount of care. 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 shares of each region are reported in Table B.5.1.

B.6 Policy Experiments

Table B.6.1: Type of care received by parents in baseline and policy simulations (%)

	Some care	Only formal care	Only informal care	Both types of care
	A. Northern Europe			
Baseline	69.0	15.7	22.8	30.5
	B. Central Europe			
Baseline	72.1	17.8	20.2	34.0
Parents receiving FC	76.5	22.7	16.8	37.0
All parents with care needs	72.1	17.7	20.9	33.5
Employed children giving IC	76.8	14.5	23.1	39.1
Non-employed children giving IC	75.0	15.7	22.2	37.1
All children giving IC	77.0	14.5	23.6	38.9
	C. Southern Europe			
Baseline	55.4	9.8	32.2	13.4
Parents receiving FC	65.3	18.6	23.7	23.0
All parents with care needs	56.4	9.6	34.5	12.3
Employed children giving IC	66.7	7.4	44.0	15.3
Non-employed children giving IC	65.0	7.6	42.6	14.9
All children giving IC	67.8	7.3	45.5	15.1

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. The evaluated policies are a subsidy for parents, conditional on formal care; a subsidy for parents, unconditional on formal care; a subsidy for caregiving children, conditional on employment; a subsidy for caregiving children, conditional on non-employment; and a subsidy for caregiving children, unconditional on 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).

Table B.6.2: Employment rate of children in baseline and policy simulations (%)

	Employed (overall)	Employed non-caregivers	Employed caregivers	Gap between non-caregivers and caregivers
	A. Northern Europe			
Baseline	93.7	92.9	96.0	-3.1
	B. Central Europe			
Baseline	87.1	88.3	82.6	5.7
Parents receiving FC	86.8	87.8	83.3	4.4
All parents with care needs	87.0	88.1	83.0	5.0
Employed children giving IC	88.0	87.6	88.7	-1.1
Non-employed children giving IC	80.6	87.5	63.0	24.5
All children giving IC	86.1	87.4	83.3	4.1
	C. Southern Europe			
Baseline	69.6	72.7	57.8	14.9
Parents receiving FC	72.2	75.2	61.7	13.5
All parents with care needs	72.1	75.0	62.1	12.9
Employed children giving IC	76.8	76.4	77.5	-1.1
Non-employed children giving IC	64.6	76.8	39.9	36.9
All children giving IC	71.3	76.4	62.1	14.4

Note: The table shows the share of employed children overall, the share of children who are employed while giving informal care or no care at all, and the gap between the last two in baseline and policy scenarios. The evaluated policies are a subsidy for parents, conditional on formal care; a subsidy for parents, unconditional on formal care; a subsidy for caregiving children, conditional on employment; a subsidy for caregiving children, conditional on non-employment; and a subsidy for caregiving children, unconditional on 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).

Table B.6.3: Results of the policy experiments – Central Europe

Outcome	Parents receiving FC	All parents with care needs	Employed children giving IC	Non-employed children giving IC	All children giving IC
Rate of only FC users	+4.8	-0.1	-3.3	-2.2	-3.3
Rate of only IC users	-3.5	+0.6	+2.9	+2.0	+3.4
Rate of users of both types of care	+3.0	-0.5	+5.1	+3.1	+4.9
Rate of users of FC	+7.9	-0.6	+1.8	+0.9	+1.6
Rate of users of IC	-0.5	+0.1	+8.0	+5.1	+8.3
Rate of care users	+4.4	+0.0	+4.7	+2.9	+4.9
Employment rate	-0.3	-0.1	+0.9	-6.5	-1.0
Employment rate of non-caregivers	-0.5	-0.2	-0.7	-0.8	-0.9
Employment rate of caregivers	+0.7	+0.5	+6.1	-19.6	+0.7
Employment rate gap non-caregivers/caregivers	-1.3	-0.7	-6.8	+18.8	-1.6
Cost (million euros/year)	45,165.0	74,838.3	45,165.0	45,165.0	45,165.0
Cost (% GDP)	0.8%	1.3%	0.8%	0.8%	0.8%

Note: Each row reports the change of each rate in percentage points between each policy experiment (in columns) and the baseline simulations. The last two rows report the total cost of each policy and the share of the GDP that it represents for the region (Austria, Belgium, France and Germany) in 2015.

Table B.6.4: Results of the policy experiments – Southern Europe

Outcome	Parents receiving FC	All parents with care needs	Employed children giving IC	Non-employed children giving IC	All children giving IC
Rate of only FC users	+8.8	-0.1	-2.4	-2.2	-2.5
Rate of only IC users	-8.5	+2.2	+11.8	+10.4	+13.2
Rate of users of both types of care	+9.5	-1.1	+1.9	+1.4	+1.7
Rate of users of FC	+18.3	-1.2	-0.5	-0.8	-0.8
Rate of users of IC	+1.0	+1.2	+13.7	+11.8	+14.9
Rate of care users	+9.9	+1.0	+11.3	+9.6	+12.4
Employment rate	+2.7	+2.5	+7.2	-5.0	+1.7
Employment rate of non-caregivers	+2.5	+2.2	+3.6	+4.1	+3.7
Employment rate of caregivers	+3.9	+4.2	+19.7	-17.9	+4.2
Employment rate gap non-caregivers/caregivers	-1.4	-2.0	-16.0	+22.0	-0.5
Cost (million euros/year)	35,695.5	85,069.0	35,695.5	35,695.5	35,695.5
Cost (% GDP)	1.3%	3.0%	1.3%	1.3%	1.3%

Note: Each row reports the change of each rate in percentage points between each policy experiment (in columns) and the baseline simulations. The last two rows report the total cost of each policy and the share of the GDP that it represents for the region (Italy and Spain) in 2015.

Appendix C: Chapter 3

C.1 Variable Definitions

C.1.1 Hours of informal care given to parents

I obtain this information from the answers to the question of the survey about the frequency with which they provided care in the last twelve months. They are able to choose among "almost every day", "almost every week", "almost every month" and "less often". Next, they are asked about the number of hours of care which they gave on a typical day/week/month or in the last twelve months. In order to obtain the number of hours of care provided weekly, I multiply the number of hours given on a typical day by 7 if the respondent chose this alternative. If they reported giving care almost every week, I keep the number of hours reported. If care was given on a monthly basis, I divide this number by 4.28, and in the remaining case, I divide it by 52.

C.1.2 Hours of formal care received by parents

In the second wave of SHARE, respondents are asked whether they received professional or paid nursing or personal care, help for domestic tasks that they cannot perform themselves due to health problems, or meals-on-wheels at home during the last twelve months. Following that, they are asked for how many hours a week they received professional or paid nursing care, and for how many hours they received professional help with domestic tasks. Thus, the sum of these two numbers constitutes a measure of the number of hours of formal care received weekly at home.

To account for the use of nursing homes, I look at the answers of the respondents when they are asked whether they have been in a nursing home overnight during the last twelve months. Respondents can say "yes, permanently" if they have stayed in a nursing home non-stop during the past twelve months; "yes, temporarily", in case they definitely moved to a nursing home less than twelve months ago; or "no". I assign those respondents that stayed in a nursing home 168 hours of formal care received weekly.

Next, I impute survey respondents in my sample a number of hours of formal care for their parents. I compute this number as the mean of the number of hours of formal care observed by health status, age and household income decile. Thus, I assign the values obtained from individuals of health h, age a, and income decile d to those individuals who report having parents of health h, age a, and income decile d in my sample.

C.1.3 Expenditure on formal care received by parents

The SHARE questionnaire asks respondents how much they paid out-of-pocket for all the care they received in nursing homes and day-care centers, and for home care services in the last twelve months, not counting health insurance premia. To approximate the expenditure on formal care received by the parents of survey respondents in my sample, I compute the average expenditure on formal care for each group of respondents of health h, age a, and income decile d, and impute that number to those individuals who report having parents of health h, age a, and income decile d.

C.1.4 Hours of care required by parents

SHARE respondents are asked whether they have difficulties to perform daily-life activities because of physical, mental, emotional or memory problems. I build a measure of the number of hours of care that respondents would need to receive every week by assigning a certain amount of time to each activity with which they mention to have problems. The daily-life activities considered are dressing, walking across a room, bathing, eating, getting in or out of bed, using the toilet, preparing a hot meal, shopping for groceries, making telephone calls, taking medications, doing work around the house, and managing money. Because of the lack of information about the parents of the respondents having difficulties to perform these activities, I impute a number of hours of care required to those individuals with at least one parent alive in my sample. In particular, the average number of hours of care required by individuals of health h and age a is assigned to those respondents who report having parents of health h and age a. The outcome of this process is a variable which takes values from 0 to 56 hours of care weekly.

C.1.5 Health status

The SHARE questionnaire includes a question that asks whether the respondent perceives their health as excellent, very good, good, fair or poor. I use this information about self-perceived health to generate a bad-health dummy which takes value 1 if the individual reports that their health is fair or poor, and 0 otherwise. Analogously, I construct a dummy for the health status of the parents of the respondent, using the information which respondents give about the health of their parents. If both the father and the mother of the respondent are alive, I take the worse health status of the two.

C.1.6 Employment and hours worked

Respondents are asked to describe their current employment situation, which can be categorized as "retired", "employed or self-employed", "unemployed and looking for work", "permanently sick or disabled", "homemaker", and "other" (landlord, living off own property, student, doing voluntary work). I generate a dummy variable which equals 1 if the individual is employed or self-employed, and 0 if they are unemployed or homemaker (non-employed). As for the number of hours worked, respondents report how many hours they usually work a week, excluding meal breaks but including any paid or unpaid overtime.

C.1.7 Labor income

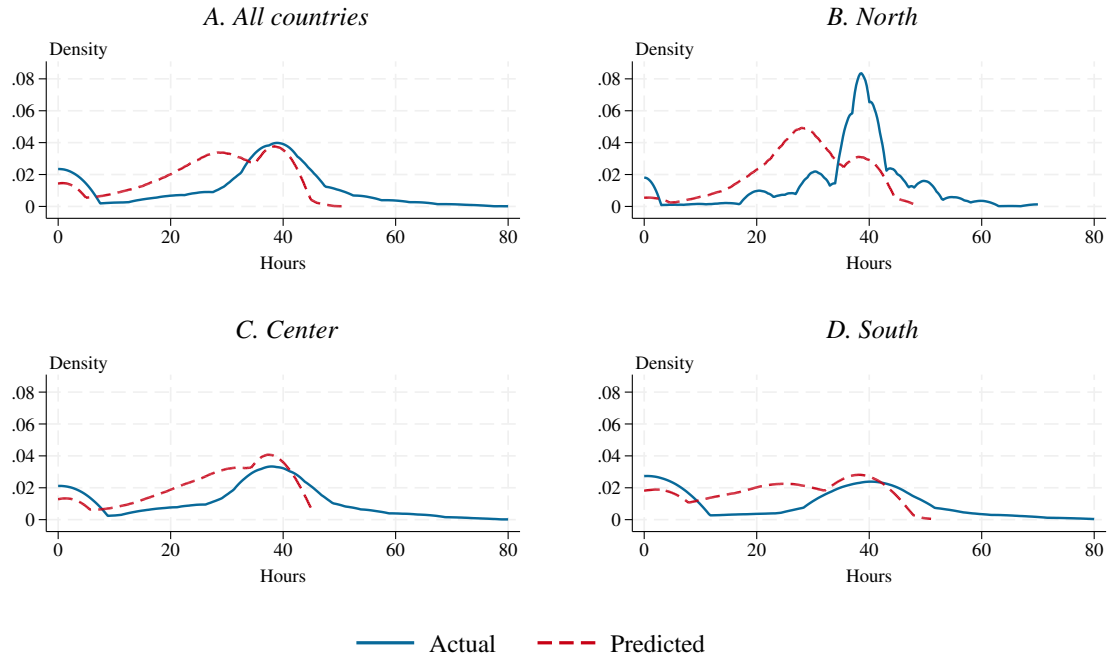
Survey respondents are asked whether they received any wages, salaries or other earnings from dependent employment, and whether they received any income at all from self-employment or work for a family business in the previous year. If they reply affirmatively, they are asked how much income (after taxes, contributions and production costs) they received from these activities. Using this information, and the number of months which the respondents spend working, I compute the income from employment and self-employment that they would have received every week. Next, I sum the amounts corresponding to these two concepts of labor income, adjust the results by purchasing power parity, and express all quantities in euros.

C.1.8 Non-labor income

This variable comprises all income sources of the household except for the labor earnings of the respondent. This number is obtained as the sum of annual net income from pensions, unemployment benefits and insurance, social assistance, disability and sickness benefits, rent or sublet, bank accounts, bonds, stocks, mutual funds, other regular payments from private pensions or transfers, and other household members. I adjust this amount by purchasing power parity, express it in euros, and divide it by 52 to have a measure of weekly non-labor income.

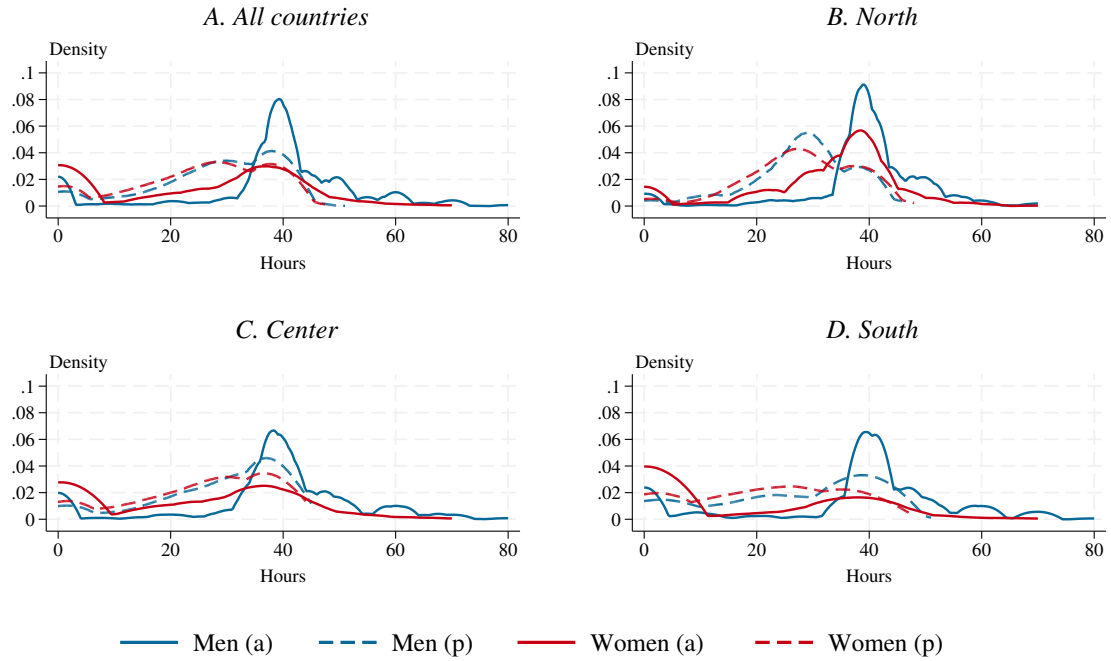
C.2 Model fit

Figure C.2.1: Hours worked weekly – Data and model predictions – Kernel density estimates



Note: The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France, and Germany) and Southern Europe (Italy and Spain).

Figure C.2.2: Hours worked weekly by men and women – Data (a) and model predictions (p) – Kernel density estimates



Note: The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France, and Germany) and Southern Europe (Italy and Spain).

C.3 Counterfactual Simulations

Table C.3.1: Labor supply and elderly care decisions in baseline and counterfactual simulations (means)

	Central Europe		Southern Europe	
	Baseline	Counterf.	Baseline	Counterf.
	A. Same w than Northern Europe			
Being employed (dummy)	0.92	0.92	0.85	0.94
	(0.007)	(0.007)	(0.014)	(0.009)
Hours worked	28.90	29.06	27.10	33.84
	(0.291)	(0.287)	(0.480)	(0.259)
Being a caregiver (dummy)	1.00	1.00	1.00	0.39
	(0.000)	(0.000)	(0.000)	(0.018)
Hours of informal care	1.50	1.46	2.96	1.13
	(0.030)	(0.029)	(0.154)	(0.039)
Use of formal care (dummy)	0.92	0.94	0.61	1.00
	(0.008)	(0.007)	(0.018)	(0.000)
Hours of formal care	2.31	2.32	3.16	4.54
	(0.102)	(0.102)	(0.215)	(0.222)
	B. Same w and p than Northern Europe			
Being employed (dummy)	0.92	0.92	0.85	0.94
	(0.007)	(0.007)	(0.014)	(0.009)
Hours worked	28.90	28.95	27.10	33.47
	(0.291)	(0.288)	(0.480)	(0.263)
Being a caregiver (dummy)	1.00	1.00	1.00	1.00
	(0.000)	(0.000)	(0.000)	(0.001)
Hours of informal care	1.50	1.60	1.93	1.24
	(0.030)	(0.031)	(0.069)	(0.033)
Use of formal care (dummy)	0.92	0.85	0.61	0.91
	(0.008)	(0.010)	(0.018)	(0.011)
Hours of formal care	2.41	2.38	3.16	3.48
	(0.109)	(0.109)	(0.215)	(0.219)

Note: Standard errors in parenthesis. The standard error of the prediction does not take into account the error in the estimation of the coefficients. The two country groups represented are Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain). Continued on next page.

TABLE C.3.1: (CONTINUED)

	Central Europe		Southern Europe	
	Baseline	Counterf.	Baseline	Counterf.
	C. Same w, p and δ than Northern Europe			
Being employed (dummy)	0.92	0.92	0.85	0.94
	(0.007)	(0.007)	(0.014)	(0.009)
Hours worked	28.90	28.83	27.10	33.21
	(0.291)	(0.290)	(0.480)	(0.267)
Being a caregiver (dummy)	1.00	1.00	1.00	1.00
	(0.000)	(0.000)	(0.000)	(0.000)
Hours of informal care	1.50	1.86	1.93	1.77
	(0.030)	(0.035)	(0.069)	(0.045)
Use of formal care (dummy)	0.92	0.78	0.61	0.86
	(0.008)	(0.011)	(0.018)	(0.013)
Hours of formal care	2.55	2.47	3.16	3.41
	(0.119)	(0.118)	(0.215)	(0.217)

Note: Standard errors in parenthesis. The standard error of the prediction does not take into account the error in the estimation of the coefficients. The two country groups represented are Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain).

C.4 Policy Experiments

Table C.4.1: Labor supply and elderly care decisions in baseline and policy simulations (means)

	Northern Europe		Central Europe		Southern Europe		Ful > l sample	
	Baseline	Policy	Baseline	Policy	Baseline	Policy	Baseline	Policy
				A. Cash benefit				
Being employed (dummy)	0.97	0.97	0.92	0.90	0.85	0.81	0.92	0.90
	(0.005)	(0.006)	(0.007)	(0.008)	(0.014)	(0.015)	(0.005)	(0.005)
Hours worked	28.72	25.59	29.52	26.35	28.29	22.54	28.99	25.28
	(0.280)	(0.280)	(0.273)	(0.274)	(0.448)	(0.446)	(0.182)	(0.184)
Being a caregiver (dummy)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hours of informal care	1.78	1.88	1.50	1.60	1.93	2.10	1.69	1.80
	(0.018)	(0.018)	(0.030)	(0.030)	(0.069)	(0.069)	(0.022)	(0.022)
Use of formal care (dummy)	0.85	0.80	0.92	0.91	0.61	0.53	0.82	0.79
	(0.012)	(0.013)	(0.008)	(0.008)	(0.018)	(0.019)	(0.007)	(0.007)
Hours of formal care	3.69	3.64	2.32	2.31	3.47	3.39	2.95	2.92
	(0.194)	(0.194)	(0.103)	(0.102)	(0.241)	(0.241)	(0.092)	(0.092)
				B. Formal care price discount				
Being employed (dummy)	0.97	0.97	0.92	0.92	0.85	0.86	0.92	0.92
	(0.005)	(0.005)	(0.007)	(0.007)	(0.014)	(0.013)	(0.005)	(0.005)
Hours worked	28.55	29.00	28.92	29.44	27.10	27.69	28.40	28.91
	(0.287)	(0.277)	(0.290)	(0.284)	(0.480)	(0.467)	(0.192)	(0.188)
Being a caregiver (dummy)	1.00	0.39	1.00	0.25	1.00	0.24	1.00	0.30
	(0.000)	(0.016)	(0.000)	(0.012)	(0.000)	(0.016)	(0.000)	(0.008)
Hours of informal care	2.16	1.01	2.53	1.13	3.54	1.29	2.57	1.11
	(0.023)	(0.006)	(0.095)	(0.039)	(0.236)	(0.083)	(0.061)	(0.022)
Use of formal care (dummy)	0.85	1.00	0.92	1.00	0.61	1.00	0.82	1.00
	(0.012)	(0.000)	(0.008)	(0.000)	(0.018)	(0.000)	(0.007)	(0.000)
Hours of formal care	3.53	9.81	2.31	8.39	3.16	8.33	2.86	8.85
	(0.185)	(0.192)	(0.102)	(0.110)	(0.215)	(0.258)	(0.088)	(0.096)

Note: Standard errors in parenthesis. The standard error of the prediction does not take into account the error in the estimation of the coefficients. The three country groups represented are Northern Europe (Denmark and Sweden), Central Europe (Austria, Belgium, France and Germany) and Southern Europe (Italy and Spain).