To Love or to Pay: Savings and Health Care in Older Age
Author(s): Loretti I. Dobrescu
Source: *The Journal of Human Resources*, Vol. 50, No. 1 (WINTER 2015), pp. 254-299
Published by: University of Wisconsin Press
Stable URL: https://www.jstor.org/stable/24735414
Accessed: 12-08-2025 12:53 UTC

To Love or to Pay

Savings and Health Care in Older Age

Loretti I. Dobrescu

ABSTRACT

This paper develops a dynamic structural lifecycle model to study how heterogeneous health and medical spending shocks affect the savings behavior of the elderly. Individuals are allowed to respond to health shocks in two ways: They can directly pay for their health care expenses (self-insure) or they can rely on health insurance contracts. There are two possible insurance options, one through formal contracts and another through informal care provided by family. Formal contracts may be affected by asymmetric information problems whereas informal insurance depends on social ties (cohesion) and on bequeathable wealth. I estimate the model on SHARE data using simulated method of moments for four levels of wealth in a sample of single retired Europeans. Counterfactual experiments show that health, medical spending, and health insurance are indeed the main drivers of the slow wealth decumulation in old age. I also find that social cohesion rises with age, declines with wealth, and is higher in Mediterranean countries than in Central European and Scandinavian countries. Finally, high social cohesion appears typically associated with increased life expectancy.

I. Introduction

Why do the elderly decumulate their wealth so slowly? The economic literature has mainly focused on explanations based on bequest and precautionary sav-

Loretti I. Dobrescu is an assistant professor of economics at the University of New South Wales and associate investigator at the ARC Centre of Excellence in Population Ageing Research in Sydney.

This paper was previously circulated as "To love or to pay: On consumption, health and health care." The author is especially grateful to Chris Carroll, Dimitris Christelis, Mariacristina De Nardi, Denise Doiron, Randall Ellis, Zvi Eckstein, Rebecca Edwards, Eric French, Michalis Halissos, John Jones, Larry Kotlikoff, Alberto Motta, Mario Padula, Marco Pagano, Jose-Victor Rios-Rull, Guglielmo Weber, two anonymous referees, and seminar participants at many institutions for helpful comments and suggestions. The author further thanks Rob Alessie for providing some of the data. Financial support from the European Commission 6th framework projects SHARE-I3 RII-CT-2006–062193 and COMPARE CIT5-CT-2005–028857 is gratefully acknowledged. The data used in this article are available from July 2015 through June 2018 from the author at School of Economics, Australian School of Business UNSW Kensington 2052, Australia. Email: dobrescu@unsw.edu.au

[Submitted February 2013; accepted March 2014]

ings motives (Kotlikoff and Summers 1981; Bernheim et al. 1985; Dynan et al. 2002). Among the sources of risk that induce the elderly to engage in precautionary savings, health and medical spending have long been recognized as two of the most significant (Hubbard et al. 1994, 1995; Palumbo 1999; Dynan et al. 2004; De Nardi et al. 2010). Other factors, such as the availability of formal (market provided) and informal (family provided) health insurance, also appear to be important (Starr-McCluer 1996; Guariglia and Rossi 2004) but relatively little is known about their effect on wealth profiles. This is mainly because a comprehensive analysis of these contracts typically requires comparisons between (rather than within) countries.

The current paper addresses this issue by studying the joint effect of health, medical spending, and insurance on old-age savings in 11 European countries. In this respect, the paper is related to De Nardi et al. (2010), which models the savings behavior of retired U.S. households and accounts for heterogeneous medical expenses and life expectancy. I further extend its framework to consider the availability of private (formal) health insurance and family transfers and study their effect on savings in old age. To this purpose, I develop a rich lifecycle model with endogenous medical spending where the elderly can: (a) insure, either formally by purchasing private insurance or informally via family transfers provided in anticipation of a future bequest; and (b) self-insure by accumulating wealth. Formal contracts may be affected by asymmetric information problems, whereas informal insurance depends on social ties (family cohesion) and bequeathable wealth. Because wealth holdings encourage family members to provide retirees with informal care, the model also allows for a strategic bequest motive. With this formulation, it is possible to study the interactions between the public, private, and informal health insurance markets. Moreover, the model captures the effect of social norms regarding caring for one's elderly parents on the demand for private (formal) insurance and wealth decumulation.

To the best of my knowledge, this is the first European structural study on wealth decumulation in old age. I estimate the model on data from the Survey of Health, Ageing and Retirement in Europe (SHARE), using the simulated method of moments (SMM) for four levels of wealth and three European regions: Scandinavia — Denmark and Sweden; Central Europe — Austria, Belgium, France, Germany, Netherlands, Switzerland; and the Mediterranean — Italy, Spain, and Greece (Gullestad and Segalen 1997). For each region, several region-specific details on public, private, and informal insurance are accounted for.

I find that health risks and potentially high medical spending can explain much of the slow wealth decumulation (and consequently of bequests) after retirement in Europe. Moreover, the absence of perfect formal insurance markets coupled with borrowing constraints and health dynamics creates a strong incentive for the elderly to keep wealth for strategic reasons (that is, to induce family to provide care). Indeed, because informal care is likely to increase with bequeathable wealth (Bonsang 2007; Alessie et al. 2011) and family cohesion rises with age (Hank 2007), individuals have an incentive to slow down their dissaving. My estimates confirm these dynamics and also show a positive association between social cohesion and life expectancy. In Mediterranean countries, survival probabilities are high and the level of formal insurance is relatively low, as health care is mainly covered by the family (Bolin et al. 2008). On the contrary, in Scandinavian and Central European countries, individuals register shorter life expectancies despite the high formal coverage.

The results on health and insurance being the main drivers of savings are confirmed by several counterfactual experiments. For instance, maintaining the same health as one had at age 65 throughout one's life would lead to an average drop in wealth of roughly 40 percent in Southern Europe and 60 percent in Central and Northern Europe. Because health deteriorates with age, a scenario that keeps health constant will make health care less needed and diminish the incentive to save for its (formal or informal) future provision. Moreover, with no private formal insurance available, wealth profiles would have been considerably or remarkably lower across all regions. However, Mediterraneans would reach the age of 90 with only 20 percent less wealth, whereas the equivalent reduction would be 54 percent for Central Europeans and 64 percent for Scandinavians. This is not surprising, as both Central and Northern Europeans spend a larger share of their budget on formally provided medical goods than the Mediterraneans. With no access to this type of arrangement, they will therefore decumulate faster than the Mediterraneans. Conversely, the absence of informal insurance has a much stronger effect on wealth in the Mediterranean than in the rest of Europe. With no incentive to keep wealth for health care provision, Southern Europeans will start to decumulate early and keep roughly 47 percent less wealth than what they would have otherwise saved. In contrast, the effect is almost inexistent for Scandinavians who rely less on informal care and decumulate only roughly 5 percent of their wealth by age 90.

With the current demographic and socioeconomic trends, understanding the main drivers of savings for the elderly is crucial for policymakers. If the slow dissaving in old age is due to longevity or medical spending risks, then changes in health insurance programs or in social and family policies may influence the saving behavior of the elderly by controlling risk exposure. For the Europeans, any changes should, however, account for country-specific factors such as the characteristics of the health care system, social cohesion, life expectancy, and wealth. In this sense, a model that is capable of explaining the choices of European elderly can significantly improve the understanding and design of reforming policies.

The remainder of the paper is organized as follows: Section II gives a general overview of the systems in Europe. Section III develops the dynamic model, and Section IV describes the data. Section V presents the estimation method (using the SMM) and discusses identification. Results are illustrated in Section VI, and experiments are conducted in Section VII. Section VIII concludes.

II. Health Care in Europe

Health insurance arrangements vary enormously across Europe, providing an ideal setting to study the effect of institutional and cultural differences across countries. Some of these differences are reflected in the design and financing of health care. This section summarizes several interesting insurance patterns that will be accounted for in the model.

First, health insurance can be provided formally (by the market) and informally (via family arrangements). The formal health insurance schemes may be classified into public and private ones—that is, provided as prepaid financial mechanisms (Colombo and Tapay 2004). Table 1 provides selected statistics related to the prevalence

Table 1
Health Care in Europe, Sources of Funding

		Formal Sector								Informal Sector#			
		Public Sector		Private Sector						Money		Time	
Country	Average Health Care Cost per Capita^ (€)	Public Medical Insurance +	% of Population Covered by Public Insurance	Private Medical Insurance +	Average Premium per Insured (€)	Benefits Paid +	Claims Ratio §	% of Population Covered by Private Insurance	Out-of-Pocket Costs +^	% People Receiving Transfers from Family	Median Amount from Family (€)	% People Receiving Transfers from Family	Median Hours of Care from Family
Austria	2,658	73.8%	98.0%	3.2%	529	4.5%	86%	31.1%	16.9%	6.0%	800	32.2%	580
Belgium	2,639	75.6%	99.0%	4.9%	119	1.7%	94%	44.1%	17.6%	1.5%	1250	41.1%	308
Switzerland	4,527	58.5%	100.0%	8.7%	2,370	8.7%	76%	22.9%	31.9%	5.9%	847	23.7%	372
Germany	2,723	73.4%	89.8%	9.3%	1,087	9.3%	124%	29.6%	19.2%	3.8%	600	36.6%	886
Denmark	3,166	84.1%	100.0%	1.5%	n.a.	6.6%	n.a.	n.a.	14.0%	2.2%	1344	31.4%	116
Spain	1,565	70.1%	99.5%	5.9%	373	4.5%	76%	25.6%	23.0%	5.6%	1532	22.1%	1716
France	2,317	78.5%	99.9%	13.2%	451	3.1%	79%	21.9%	21.2%	2.1%	1500	34.9%	846
Italy	1,921	75.0%	100.0%	*(2006) 0.9%	n.a.	1.0%	80%	*(2006) 6.1%	21.3%	0.9%	578	23.4%	782
Netherlands	2,321	70.1%	71.2%	13.2%	590	18.1%	83.3%	87.3%	18.8%	2.4%	2250	32.6%	374
Greece	^1,608	^61.8%	100.0%	*(2002) 1.6%	n.a.	n.a.	n.a.	*(2002) 12%	5.9%	16.8%	821	44.0%	1250
Sweden	2,837	82.3%	100.0%	*(2006) 0.3%	417	0.1%	n.a.	1.9%	17.0%	3.3%	763	38.0%	87

+ As percent of total health care expenditure. § As percent of premium.
Sources: CEA Statistics No. 41: The European Health Insurance Market in 2008, ^ 2006 OECD Health Data: Health expenditure and financing, * Thomson and Mossialos (2009), # Share 2004 data (singles, age 65+, total transfers received in a year)

of formal versus informal and public versus private medical care funding across the 11 European countries in SHARE.

A quick glance reveals that the public policy in these states is based on the principle of health care funded by the state or by social insurance, made available to all individuals and covering most of the major health shock. There are three types of public health care systems following a north-south gradient: (1) national health services in Scandinavia, (2) social-insurance systems in Central Europe, and (3) a mixed type of systems that can be seen as "third way" (Freeman 2000), established in the early 1980s in the Mediterranean.

The common feature of these systems is that they provide almost universal health care across two dimensions. First, because they are financed through taxation or contributions from employers and employees, participation in the public system is usually mandatory.[1] Second, these systems cover all severe (life-threatening) medical conditions, offering comprehensive benefits that account for more than 70 percent of the total health care expenditure.[2]

The remaining costs are financed out-of-pocket and/or via private health insurance. In Germany, Sweden, Denmark, and Greece, more than 80 percent of SHARE households had at least some out-of-pocket expenditure in 2004. In France, Spain, and the Netherlands, this percentage is less than 45 (Holly et al. 2005).[3] Looking at amounts, we see that the share of out-of-pocket expenses in total health care costs is not trivial. Indeed, Table 1 shows that on average roughly 17, 21, and 16 percent of the total health costs are financed out-of-pocket in the Mediterranean, Central Europe, and Scandinavia, respectively. Across all countries, the poorest spend a higher share of their income on health than the better off.

The existence of near universal public coverage reduces the basic need for additional insurance. However, the exclusion of certain health services from the statutory coverage, like specialist or diagnostic outpatient services, drugs, dental care, medical appliances, glasses, alternative medicine, occasional choice of better or faster inpatient care for important interventions (Paccagnella et al. 2008), has led to the development of a private supplementary health insurance market. This type of insurance can be offered as a short-term or as a long-term contract, with premiums used to finance medical costs. The norm for private health insurance in the European Union is short-term contracts (typically annual), with roughly €500 premiums (as shown in Table 1).[4] Note that such amounts are not trivial. Compared to out-of-pocket expenses in SHARE, the amounts individuals pay as premiums exceed on average these costs by about 32 and 43 percent in Central Europe and Scandinavia. In the Mediterranean, on the other hand, where individuals rely less on formal insurance, the premium is smaller on average than the out-of-pocket expenses by 24 percent. In terms of cover-

1. Around 99 percent of the European population is covered by these schemes. The exceptions are Germany and the Netherlands, where people with income above a certain threshold have to be privately insured.
2. The exceptions are Switzerland, which has a private compulsory health care system, and Greece, which has a mix of national health, social, and private insurance systems.
3. In Spain, only 27 percent of the 65+ have positive out-of-pocket expenses because prescribed medicines (usually paid out-of-pocket) are covered via the National Health System.
4. As for the long-term contracts, some insurers terminate contracts when people reach retirement age but this is more common among group rather than individual policies. In this case, subscribers often have the option of switching to individual policies, sometimes for the same level of benefits and at a reasonable rate.

age, roughly a third of the SHARE countries population had private medical insurance in 2004. The benefits, however, accounted on average for less than 5 percent of the total expenditure on health in most countries.[5]

As expected, the private insurance market may be affected by adverse selection and moral hazard. For instance, individuals who are unwell benefit more from buying health insurance and hence are more willing to buy it. Healthy individuals will opt out, choosing informal coverage (via family arrangements) or paying out-of-pocket. In Europe, however, this effect is strongly mitigated by two factors. First, informal insurance becomes more important with age. As an individual ages and the prevalence of poor health rises, family cohesion generally increases (Hank 2007) and bequeathable wealth becomes more valuable for informal care provision (Bonsang 2007). To the extent that formal and informal care are substitutable, informal insurance can considerably reduce the private (formal) insurance demand for sick people. Second, healthy individuals are typically richer and can more easily afford to pay for insurance, whereas the poor face tighter budget constraints. With potentially high premiums to pay, those who would most benefit from private insurance are less likely to buy it. Data regarding the distribution of private health insurance coverage in the European Union confirm that most subscribers come from higher income groups (Thompson and Mossialos 2009). As a result, Mediterraneans and generally poor Europeans have lower private coverage and rely mainly on informal care (Bonsang 2007).

Formal insurance can also affect health spending as insured individuals tend to spend more on medical services due to moral hazard. This effect is moderated by the extensive European public health coverage and by the limited access to formal insurance. To this effect, private insurers attempt to prevent moral hazard through higher premiums and "getting tougher on claims" (Thompson and Mossialos 2009). They can also delay payments to raise justifiable questions about submitted claims. These practices limit the access of the poor and sick, who typically have higher morbidity rates, to private (formal) insurance. Data on the costs-sharing structure in Europe are limited, but available evidence suggests that claims ratios are around 80 percent in most SHARE countries (see Table 1).[6]

Several empirical studies have documented the strong correlation between the amount of care provided via the formal schemes and the care supplied informally by close relatives or neighbors. For instance, Bolin et al. (2008) finds that informal and formal homecare are substitutes, while informal care is a complement to doctor and hospital visits. These relationships also differ according to a European north-south gradient: Compared to those residing in Italy, Spain, or Greece, the negative effect of informal care on formal homecare is significantly lower for Central Europeans and absent for Danes and Swedes. On the other hand, Bonsang (2009) shows that informal care is an effective substitute for long-term care only as long as the needs of the elderly are low and require an unskilled type of care.

Informal care can be provided in the form of time and financial transfers given to parents. First, time transfers appear to be much more common than financial transfers.

5. The outlier is the Netherlands with 87.3 percent of the population having insurance and 18.1 percent of total health costs covered by formal benefits. This is due to the Dutch higher-earners being excluded from statutory cover and covered only by private insurers.
6. The exception is Germany, with very high levels of provisions for ageing (roughly 124 percent).

In SHARE, 32.8 percent of the single individuals aged 65 and above receive help in the form of time,[7] which is almost seven times higher than the prevalence of financial help. Providing time support is slightly more widespread in Northern and Central Europe (34.7 and 33.5 percent respectively) compared to the Mediterranean (29.8 percent). A quick glance at the amount of hours devoted to the elderly, however, reveals a staggering reversed north-south gradient. While Northern and Central European families provide on average 102 and 561 hours of support annually, Mediterraneans provide help for 1,249 hours.[8] Conversely, the prevalence of financial transfers appears roughly twice as high in the Mediterranean (7.8 percent) than in Central Europe (3.6 percent) and Scandinavia (2.8 percent), although the amounts of money actually transferred by Italians or Greeks are slightly smaller.

One reason for the north-south gradient in informal care provision is related to cultural factors that refer to family norms on filial and parental responsibility. The differences in social cohesion between the Mediterranean, Central Europe, and Scandinavia have been well documented. Reher (1998) argues that family ties in the northern and continental countries are generally "weak"—that is, the elderly do not rely on their children and the youths detach from their parents relatively early. In the southern regions, a "strong" family cohesion implies children taking care of their parents in old age and intragenerational coresidence. Using SHARE, Kohli et al. (2005) also associates the "weak-strong" dichotomy to a north-south European gradient: The Scandinavian countries are found to have the "weakest" family ties, the Mediterranean countries the "strongest," with all the continental countries in between.[9]

Besides social cohesion, the existing welfare systems have a strong impact on family transfers (Esping-Andersen 1999). The Nordic countries have a highly developed social protection system, whereas in the Mediterranean countries less welfare is provided through the institutionalized systems. Accordingly, more than 60 percent of SHARE respondents receive practical help from a child outside the household in Spain, Italy, and Greece, compared to less than 45 percent in the other SHARE countries. In southern countries, help is mostly given within families, whereas in Sweden, Denmark, and partially in the Netherlands, help tends to take place between households.

Another motive for providing informal care could be related with the strategic effect of future bequests on current informal care provision. Unlike the United States, succession rules in many European countries prohibit parents from completely disinheriting their children. As a result, more than 89 percent of the bequests left by single parents in SHARE are transferred to children. Toward the end of their life, the elderly also face relatively low risks of large out-of-pocket medical expenses because of the

7. Time support usually concerns personal care (that is, dressing, bathing or showering, eating, getting in or out of bed, using the toilet), help with practical household tasks (that is, home repairs, gardening, transportation, shopping, household chores), and help with paperwork (that is, filling out forms, settling financial or legal matters).

8. Surprisingly, French and German families appear to provide slightly more time support than the Italian ones. Unlike Italy, however, public insurance in both these countries pays not only for formal care, but also for informal care provided by relatives (Brodsky and Hirschfield 2003).

9. According to SHARE data, in Spain and Greece (the two countries with the highest amounts of support hours) most of the elderly (81 percent and 73.2 percent, respectively) live with their children, either in the same building or even in the same household (Kohli et al. 2005). Furthermore, a staggering 85 percent of Spaniards or Greeks have daily contact with their children, and another roughly 10 percent see their children several times per week.

generous public insurance system. This makes bequeathable wealth more certain, giving the elderly more leverage to elicit informal care in exchange of bequest.

All these country-specific factors have a strong impact on the elderly wealth decumulation patterns. Thus, the model will be separately estimated for three regions corresponding to the Mediterranean, Central Europe, and Scandinavia. Moreover, decumulation patterns are well known to vary with wealth, and so within each region the model will also be separately estimated for three distinct levels of wealth.

III. The Model

A. *Preferences*

For simplicity, consider a single retired individual[10] who wishes to maximize her expected lifetime utility at time t by choosing current and future level of medical and nonmedical consumption. The model consists of a series of one-year periods indexed by t, starting at age 65 when the individual retires and ending with her death (restricted to occur by maximum age 100). In each period the individual is facing a survival probability $s_t \in [0, 1]$. The within-period utility depends on health m_t, nonmedical consumption C_t, and health care provided via formal and informal insurance, F_t and I_t respectively,

$$(1) \quad u(m_t, C_t, F_t, I_t) = \delta(m_t)\frac{C_t^{1-\gamma}}{1-\gamma} + \mu(m_t)\frac{[\alpha(m_t)F_t^{\theta} + (1-\alpha(m_t))I_t^{\theta}]^{(1-\sigma/\theta)}}{1-\sigma},$$

where $1/\gamma$ and $1/\sigma$ are the intertemporal elasticities for the two types of goods and θ is the substitution parameter between formal and informal care.

Note that health care (provided via insurance) directly increases one's well-being. However, the utility derived can vary substantially depending on the provider (Byrne et al. 2009). Formal health insurance can cover for instance more expensive drugs, treatment by a specialist, or a single room during hospital stays. On the other hand, health care provided by the family, especially at advanced age, addresses mostly long-term care and can offer additional benefits to the elderly. For instance, family members can provide emotional support, and they are generally endowed with better information on the elderly's tastes and preferences. By modeling medical consumption as above, it is possible to study these additional elements and analyze the complementarities between formal and informal health care.

Health status m_t takes four values between 0 and 1, increasing as health improves. State 1 is death ($m_t = 0$), while State 2 implies some form of long-term care (invalidity or poor health). In State 3 the individual has medical problems but no need for long-term care (fair health), and State 4 is good health ($m_t = 1$).

The terms $\delta(m_t)$ and $\mu(m_t)$ capture the dependency of utility on health. As health deteriorates, the marginal utility for nonmedical consumption decreases (consumption goods are complements for good health), whereas the marginal utility for medical consumption increases (medical goods are substitutes for good health). Specifically,

10. This approach allows one to focus on consumption, health insurance, and savings decisions without considering choices related to retirement timing or household dynamics.

$\delta(m_t)$ determines how a person's utility from nonmedical consumption depends on her health status (Palumbo 1999), and is given by

$$(2)\quad \delta(m_t) = \begin{cases} 1 + m_t, & for \quad m_t \neq 0 \\ 0, & for \quad m_t = 0. \end{cases}$$

Therefore, the healthier an individual is, the more she enjoys consumption. Similarly, $\mu(m_t)$ captures the need for health care, as follows:

$$(3)\quad \mu(m_t) = \begin{cases} 1 - m_t, & for \quad m_t \neq 0 \\ 0, & for \quad m_t = 0, \end{cases}$$

such that being sick has a positive effect on the utility from health care.[11]

Finally, $\alpha(m_t)$ represents the consumption value of care financed formally relative to that provided by the family. This parameter depends on health $\alpha(m_t) = \alpha \cdot m_t$, and captures the possibility that, in bad health states, individuals may get less utility from care provided formally than informally.

B. Insurance

The model considers two main insurance schemes:

1. Formal insurance

All Europeans 65 or older are eligible for government-provided universal health care. Some choose to further supplement the public plan with private insurance. This type of insurance gives access to certain specialist or diagnostic outpatient services and better or faster inpatient care for important interventions but can also cover expenses related to drugs, dental care, medical appliances, glasses, or alternative medicine. Private health insurance is financed by risk-rated premiums that vary with the extent of the costs-sharing and with the benefit levels. Generally, the costs-sharing schemes are used to prevent moral hazard. With no form of copayment, individuals will consume more care than if they were to pay for all (or some) of it. In Europe, however, it has been repeatedly reported that insurers contain costs by increasing premiums and "getting tougher on claims" (Thomson and Mossialos 2009) rather than by adjusting the copayment schemes. As a result, I model a simplified version of a typical contract. In exchange for paying an annual premium, individuals are eligible to receive a certain level of benefits that will cover a share of their health costs. For these contracts, the premium exceeds the expected discounted benefit by a certain loading factor.[12]

The timing is as follows: In period $t - 1$, the individual chooses the premium f_{t-1}.

11. To check the validity of these assumptions in the data, I independently estimate the effect of health on the ratio of consumption to out-of-pocket expenditure directly from SHARE and found the relation to be strongly positive. The result is robust against the inclusion of wealth and various demographics.

12. This assumption is quite important: It captures the supplementary nature of the formal insurance, while it also avoids the "double counting" problem, as discussed later in the paper.

Next period, depending on the realized health state m_t, the total (public and private) value of the formal insurance coverage (that is, formal care received) is

$$(4) \quad F_t(f_{t-1}, m_t) = \begin{cases} \underline{F}(m_t) + \omega f_{t-1}, & for \quad 0 < m_t < 1 \\ 0, & for \quad m_t \in \{0,1\}, \end{cases}$$

where $\underline{F}(m_t)$ is time-t health-specific public coverage (that is, the minimum medical consumption floor) and ω is the inverse loading factor.[13] This timing prevents individuals from waiting until they receive an adverse health shock before increasing their insurance coverage.

2. Informal insurance

The informal health insurance I_t is related to the value of in-kind and financial transfers that an individual receives from the family. Bonsang (2007) showed that these two types of transfers are substitutes. Thus, the value of in-kind transfers is considered equivalent to what the individual saves by receiving care from the family.[14] The results in Bonsang (2007) also suggest that the parent's age and bad health significantly increase the likelihood of family transfers. On the other hand, the expectation of receiving an inheritance has a dual effect: It significantly increases the occurrence of time assistance, but it slightly decreases the chances of providing financial transfers. As a result, I assume informal care to be function of: (a) the total bequeathable wealth B_{t+1}, (b) the probability of dying before the next period $(1 - s_t)$, and (c) a social cohesion coefficient $\eta(t)$, [15]

$$(5) \quad I_t(\eta_t, s_t, B_{t+1}) = \begin{cases} \eta(t)(1 - s_t)B_{t+1}, & for \ 0 < m_t < 1 \\ 0, & for \ m_t \in \{0,1\} \end{cases}, \quad and$$

$$(6) \quad \eta(t) = \eta_0(1 + \eta_1.t + \eta_2.t^2 + \eta_3.t^3 + \eta_4.t^4), \eta(t) \in [0,1],$$

where η_0 is the time-invariant level of family cohesion, while the fourth-order polynomial captures its age-structure. Note that informal insurance offers individuals a strong incentive not to decumulate wealth quickly. As health deteriorates with age, the chance of severe medical conditions and high health costs increases. This boosts the demand for care and the need for insurance in general. Moreover, family cohesion makes bequeathable wealth increasingly valuable (via its impact on informal care). Hence, the model allows for intentional bequests through the strategic motive for care provision. Also note that this model does not feature altruistic bequests. This assump-

13. $\omega > 1$ allows for tax subsidies; $\omega < 1$ captures administrative costs or adverse selection.

14. An alternative approach would set the value of hours of care function of the caregiver's opportunity cost of time. Thus, in higher income families, time would tend to be substituted for financial assistance. However, Bonsang (2007) found that household income has a very weak negative impact on time transfers to parents (for example, if income doubles, hours of care decrease only by 5 percent and the coefficient is only significant at the 10 percent level).

15. It captures the social ties strength or the social norm on caring for one's elderly parents.

tion is consistent with Alessie et al. (2011), which uses the European SHARE data and rejects pure altruism in favor of exchange.[16]

Unlike formal insurance, the informal market is assumed perfect from the informational point of view. In each period, the family (modeled as one unit) knows exactly what states are realized and provides informal care equivalent to a fraction of the elder's wealth. Also, the informal benefits are received each period, but the costs are paid only after one's death. However, since bequests include total wealth (that is, real and financial), this arrangement does not imply a complete lack of commitment (Bernheim et al. 1985; Venti and Wise 2004; Chiuri and Jappelli 2010). The family thus expects the bequest with certainty, which is consistent with the data.

C. Uncertainty

There are two main sources of uncertainty.

1. Out-of-pocket medical spending risk.

Out-of-pocket medical spending h_t is defined as the share of total health costs not covered by insurance (formal and informal) and includes a shock ψ generated via an $AR(1)$ process as follows:

$$(7)\quad h_t = \begin{cases} 0, & \text{for } m_t = 1 \\ Max\,(\tilde{h}(m_t) - (F_t + I_t) + \psi_t, 0), & \text{for } 0 < m_t < 1, \quad and \\ \tilde{h}(0), & \text{for } m_t = 0 \end{cases}$$

$$(8)\quad \psi_t = \bar{\psi}^{1-\rho}\psi_{t-1}^{\rho}e^{\varepsilon_t},\ \varepsilon_t \sim N(0,\sigma_\varepsilon^2).$$

where $\tilde{h}(m_t)$ is the base value of total health care spending in one period and $\tilde{h}(0)$ is the deterministic funeral cost. Note that if total insurance (formal and informal) exceeds the amount of health care needed, the individual chooses the utility-maximizing quantities of formal and informal care that sum to the amount of care needed (that is, $F_t + I_t = \tilde{h}(m_t) + \psi_t$), and pays nothing out-of-pocket.[17]

Finally, also note that formal insurance provides both monetary and nonmonetary benefits. First, because formal insurance can cover medical expenses, such as those related to drugs, glasses, or medical appliances, it enters the out-of-pocket costs equation. Second, insurance gives access to some special medical goods needed when sick (that is, specialist out-patient visits, better or faster impatient care), and so, it enters the utility directly.[18] This formulation is consistent with the European context, but might

16. This is also consistent with results from De Nardi et al. (2010) for the United States.

17. Setting $F_t + I_t = \tilde{h}(m_t) + \psi_t$ implies that one needs to reoptimize the problem to account for this new condition because the values of both F_t and/or I_t when $F_t + I_t > \tilde{h}(m_t) + \psi_t$ will be different from what they would have been if $F_t + I_t \leq \tilde{h}(m_t) + \psi_t$.

18. Paying directly for these goods is sometimes not possible (that is, shortening the waiting time for a transplant) or it implies a much higher cost than obtaining the goods via insurance (that is, shortening waiting times for diagnosis or better hospital room). And even if the individual can pay out-of-pocket the higher cost, priority is still generally given to the ones with formal insurance. In fact, the model assumes that these costs are so high that individuals can only access the goods via insurance.

give rise to the concern that it creates a "double counting" problem: Formal insurance both increases nonmedical consumption (by reducing out-of-pocket costs) and enters utility directly as medical consumption. This issue is, however, avoided because the loading factor is biasing the model against formal insurance. Indeed, the net cost one pays for formal insurance increases (not decreases) the out-of-pocket costs.[19] As a result, dropping formal care from the utility function means that individuals never buy insurance. Thus, in the model formal insurance is not primarily about mitigating medical spending risks but about giving access to extra medical goods (in exchange for a loading cost). This formulation captures well the supplementary nature of the formal insurance in Europe.

2. Health risk.

Individuals face heterogeneous health risks,[20] modeled as Markov chains with age-varying one-period state transitions. The one-period ahead transition matrix at age $(65 + t)$ allows current health to depend on age and previous health as follows:

$$(9)\quad p_{kj}(t) = Pr(m_t = j|m_{t-1} = k, t)$$

where k, j represent the four possible health states. To capture the age effect, I use the age-adjustment matrix $A(t)$, It shifts probability mass from the right (better health) toward the left (worse health, death), relative to transitions at age 65, P (1) (Ameriks et al. 2005),

$$P(t) = P(1)\cdot A(t) = P(1)\cdot\begin{bmatrix} 1 & 0 & 0 & 0 \\ c_1 t^{\xi} & 1 - c_1 t^{\xi} & 0 & 0 \\ c_1 t^{\xi}\dfrac{1}{1+c_2} & c_1 t^{\xi}\dfrac{c_2}{1+c_2} & 1 - c_1 t^{\xi} & 0 \\ c_1 t^{\xi}\dfrac{1}{1+c_2+c_2c_3} & c_1 t^{\xi}\dfrac{c_2}{1+c_2+c_2c_3} & c_1 t^{\xi}\dfrac{c_2c_3}{1+c_2+c_2c_3} & 1 - c_1 t^{\xi} \end{bmatrix}$$

The three parameters c_1, c_2 *and* c_3 control how fast this shift occurs: c_1 controls transitions from invalidity to death as age increases, c_2 determines how much more likely is death relative to invalidity if in fair or good health, and c_3 controls the chance to persist in good health.

Besides age and previous health, one could also account for the impact of education on health transitions. Avendano et al. (2009) finds, however, that education is not significantly associated with transitions to or out of (long-term) illness. As for disability, switching from primary school to postgraduate levels matters only in Central Europe and the Mediterranean and only for transitions into this state (not out of

19. To see this point, consider the decision to save \$1 or buy \$1 worth of insurance. If one doesn't buy insurance, next period she will have $(1+r)$ * \$1 to spend on the set of available goods. Conversely, if one buys insurance and a negative health shock occurs, next period she will receive only ω * \$1 to spend on the same set of goods, with $0 < \omega < 1$. Thus, even in the event of a negative health shock, the individual is poorer after buying \$1 of insurance.
20. Older people already have shaped their health and lifestyle but can still choose how to respond to the medical spending risks via savings and insurance.

it). The relative association between education and health also diminishes with age (Huisman et al. 2005) and even disappears after retirement (due to stable incomes and universal health insurance coverage). Since the focus is on retirees, not accounting for education at this stage seemed reasonable.

D. Budget constraint

Assuming there is one composite riskless asset in which a household can invest and that yields a constant interest rate r, the next period's wealth is given by

(11) $a_{t+1} = (1 + r)a_t + y_t - h_t - f_t - C_t,$

where y_t is the nonasset income flow. On the other hand, if the individual dies, the family receives as bequest all her wealth net of funeral costs, $B_{t+1} = [a_{t+1} \mid m_t = 0] = a_t(1 + r) - \tilde{h}(0)$.

Wealth must satisfy the borrowing constraint $a_{t+1} \geq 0$, which eliminates the possibility that individuals die in debt. However, an individual with very high health costs currently stillcould have zero net worth in the next period. Including out-of-pocket expenses h_t in the borrowing constraint is reasonable given that time-t medical spending risk is not completely unknown at time $(t-1)$ when individuals decide to maintain their health insurance coverage or not.[21]

E. Timing of the model

At the beginning of the period, the individual has wealth a_t and receives income y_t. Then, the health and medical spending shocks are realized. If she is alive and healthy, she consumes, pays the formal premium (to access next period's formal private coverage), and saves. If in fair or poor health, health costs are incurred, insurance transfers are received, she consumes, pays the premium for the next period, and finally saves. If she does not survive, funeral costs are paid and the remaining wealth is transferred as bequest next period.

F. Recursive framework

The individual chooses the optimal medical and nonmedical consumption paths to maximize the value function

(12) $V_t(m_t, \psi_t, f_{t-1}, a_t) = Max_{C_t, f_t}\{u(m_t, C_t, F_t, I_t) + \beta s_t E_t[V_{t+1}(m_{t+1}, \psi_{t+1}, f_t, a_{t+1})]\},$

with discount factor $\beta > 0$, subject to: (a) an initial level of wealth and formal health insurance, (b) the wealth accumulation Equation 11, and (c) the no-borrowing constraint. An individual's decision depends on her state space, $\nabla_t = (m_t, \psi_t, f_{t-1}, a_t) \in \mathbb{R}^4_+$, and the overall set of parameters, $\varnothing = (\sigma, \gamma, \theta, \alpha, \beta, \rho, \sigma_\varepsilon, c_{i=\overline{1,3}}, \eta_{j=\overline{0,4}}, \underline{F}, \omega, \bar{h}, \bar{\psi}, \xi, r) \in \mathbb{R}^{21}$.

By discretizing the state variables, I solve for the optimal medical and nonmedical consumption path iteratively from the final period ($T = 36$) backward. In the last period, the decision is trivial, with the individual consuming and transferring the remaining wealth as bequest. Each period, the individual indirectly decides how much to informally insure via the amount she leaves as a bequest. She does so by directly

21. Due to its $AR(1)$ structure.

choosing consumption and formal premium, whereas the family provides informal care according to the cohesion measure η_t. The solution is found in two steps. The first step consists of finding the set of rules for consumption $\{C_t(\nabla_t, \varnothing)\}$, and formal premium $\{f_t(\nabla_t, \varnothing)\}$ in every point of the discretized state space ∇_t for each period t. Optimality requires

$$(13)\quad C_t^{-\gamma} = \beta s_t(1+r)E_t\left[\frac{(1+m_{t+1})}{(1+m_t)}\frac{(1-\eta_{t+1}(1-s_{t+1}))}{(1-\eta_t(1-s_t))}C_{t+1}^{-\gamma}\right].$$

Unlike consumption, formal premium does not have a closed-form solution, but it also depends on both current and expected future health. Inserting the decision rules for $\{C_t(\nabla_t, \varnothing)\}$ and $\{f_t(\nabla_t, \varnothing)\}$ into the wealth accumulation equation yields the next period's wealth $\{a_{t+1}(\nabla_t, \varnothing)\}$, for all the values that compose the grid of current assets and previous period premium, f_{t-1}. Using these optimal values for wealth in the second step, the value function is maximized and the optimal $\{C_t^*(\nabla_t, \varnothing)\}$ and $\{f_t^*(\nabla_t, \varnothing)\}$ are found.

IV. Data

The estimation uses the SHARE data, a cross-national microeconomic database that contains household-level information on health, socioeconomic status, and social and family networks of noninstitutionalized individuals age 50 and over. SHARE's first wave was conducted in 2004 in 11 countries representing the main three regions in Europe: Scandinavia (Denmark and Sweden), Central Europe (Austria, France, Germany, Switzerland, Belgium, and the Netherlands), and the Mediterranean (Spain, Italy, and Greece). The total sample included 28,853 observations, out of which 4,564 refer to 65+ single individuals.

The three variables of interest are wealth, consumption, and premium. Wealth represents the value of all financial and real assets net of any debts and liabilities (that is, loan repayment, mortgage, taxes) and is captured in SHARE by a variable denoting total net worth in 2004 PPP adjusted Euros. Consumption is denoted by total expenditures on nondurables, excluding out-of-pocket medical expenses. Despite the fact that SHARE collects information on total nondurables expenditures, it has been shown that this type of survey data is not reliable (Browning et al. 2003). However, consumption on "food at home," "food outside the home," and expenditures that are regularly billed (like phone bills) are. Moreover, SHARE total expenditure on nondurables also includes out-of-pocket medical expenses. As a result, I follow Browning et al. (2003) and impute consumption using: (a) the amount spent on food (at home and outside home) and on phone bills from SHARE, and (b) weights from two external expenditure surveys, namely ISTAT—for Italy, Spain, and Greece—and DBS (Dutch Budget Survey) for the other countries. Specifically, I impute total consumption in SHARE using the estimated coefficients of a regression of total consumption on a series of consumption items (food at home, outside home, phone bills) present in both SHARE and ISTAT (or DBS, respectively). The regression is estimated with ISTAT (or DBS) data.[22]

22. See Appendix A for details.

Finally, formal health insurance premium is represented in SHARE by a variable denoting the annual voluntary (supplementary) private insurance premium. The missing values for the premium are imputed using the coefficients of age, health, wealth, consumption, and number of children from an OLS regression on the existing premium data.[23] The resulting imputed premiums compare quite well with the values reported by the European Insurers Association (CEA) data (as shown in Table 1). Note that CEA generally reports the cost of voluntary insurance per insured, except in Switzerland (where private insurance is compulsory) and Germany (where CEA reports premiums on overall private insurance that covers also informal care). Excluding these two countries, the CEA premium per insured is €413 while the imputed SHARE average is €399 (with standard deviation of 590).

I further exclude individuals with missing or negative wealth (due to no-borrowing constraint), with missing or negative consumption, and with wealth less than consumption of food at home or outside home or phone bills, which results in 2,425 observations.

The question on the amount spent on premium was asked only in the 2004 wave, which is restricting the available data to a cross-section. In order to obtain life profiles, I follow several steps. First, for every region (the Mediterranean, Central Europe, and Scandinavia), I group individuals into three wealth categories, as follows: (1) below the first wealth quartile, (2) between the first and the third wealth quartile, and (3) above the third wealth quartile. Second, for each of the three wealth groups, I recreate individual life profiles by taking the mean wealth, consumption, and premium values at each age. Finally, to obtain the region-specific "sample mean" profiles, I use pooled regional data to compute the sample mean wealth, consumption, and premium at each age for each region. This procedure yields 12 (3 regions x 3 wealth groups and 3 regional sample means) separate sets of data profiles. Each profile was then double smoothed using a five-year moving average filter.

There are two main problems with constructing life profiles (over time and by wealth) using cross-sectional data. First, there is the general issue of wealth and mortality bias. Due to technical progress, individuals from earlier birth cohorts appear poorer at every age (wealth bias). As in De Nardi et al. (2010), endowing a simulated individual with a certain age, wealth, and premium from the data distribution will recreate some of the wealth bias in the simulation. Unless one uses panel data in the estimation, however, the resulting estimates will overstate wealth decumulation. Also, advanced age observations are more biased toward rich people, who live longer and hence run down their wealth slowly (mortality bias). To assess the magnitude of the mortality bias, I use the recently available second wave SHARE data that took place in 2006–2007. Figure 1A plots the median and mean wealth profiles of all individuals interviewed in 2004 (solid line) versus the corresponding profiles of those who survived to 2006 (dotted line). A quick glance shows that the people who died between the two waves were not significantly or systematically poorer than the survivors[24] (that

23. The imputation affected 66.8 percent of the whole sample of individuals reporting both wealth and consumption. Several alternative specifications were explored (see Table A3.3 in Appendix A).

24. One might argue that this is due to low mortality rates in the two years between the waves (5.8 percent in the Mediterranean, 3.4 percent in Central Europe, 3.5 percent in Scandinavia). Even with low mortality, however, if wealth differences between survivors and deceased were high, the profiles should have been more diverse.

is, wealth differences are registered only for few age groups and there is no systematic bias when the profiles are indeed different). The same conclusion is reached when looking at Figure 1B, which reproduces the mortality bias figure in De Nardi et al. (2010) for the SHARE data. It plots the median wealth profiles by birth cohort over the two years between waves, giving a measure of the decumulation over that period. The solid line plots the median wealth of the 2004 unbalanced sample, while the dotted line plots the median wealth of individuals who survived to 2006. Note that again wealth discrepancies appear only for a few age groups and are quite small relative to the wealth scale of either of the two samples.[25]

The second potential issue with using cross-sectional data to construct life profiles by wealth arises if one's wealth relative to others changes over time. For example, someone who starts with a high wealth at retirement might receive a series of negative shocks and ends up, say, in the lowest quartile. To rule this out, I use the 2006 SHARE data to check the extent to which the individual relative position in the wealth distribution changed between the first and second wave. I found that only a small fraction of respondents decumulated to the extent of actually changing their wealth quartile.[26] This is not surprising as wealth includes illiquid assets, and their value remained fairly stable over the two years between waves.[27]

V. Calibrations and Estimation Methodology

The lifecycle literature based on European data is limited and the institutional differences are potentially significant. Therefore, I estimate most of the model parameters for each wealth and region separately and calibrate only those parameters that appear as instruments for the dynamic programming model (Gourinchas and Parker 2002; Cagetti 2003; French and Jones 2011). The grid and the initial level of wealth, consumption, and formal insurance are set to match the data. Annual nonasset income y_t was set to match the sum of any pension or invalidity benefits (both public and private) and welfare payments (that is, housing allowances, child benefits, poverty relief) in SHARE. The two middle levels of health are set to 1/3 and 2/3. The real risk-free asset return is $(1 + r) = 1.04$,[28] ξ is set to 1.5, and the loading factor ω is set to the mean administrative costs of insurance (Comino 2003).

SHARE does not collect information on the public insurance coverage. The 2004 OECD data (OECD 2006) contains, however, country-specific information on: (a) public long-term care expenditure (LTC henceforth), and (b) public curative and rehabilitation expenditure (CR henceforth). These values, however, are in per capita amounts and do not account for the share of population actually needing (and using)

25. The mean wealth discrepancy in the unbalanced versus the balanced sample represents 4.8 percent (Mediterranean), 6.1 percent (Central Europe), and 4.2 percent (Scandinavia) of mean survivors' wealth, and 4.9 percent (Mediterranean), 6.9 percent (Central Europe), and 4.3 percent (Scandinavia) of mean wealth of all first-wave respondents. These differences are, however, likely to grow over the next 10–20 years.

26. The share of respondents changing wealth quartile was 15.4 percent in the Mediterranean, 16.2 percent in Scandinavia, and 12.5 percent in Central Europe. The variation in wealth that led to this position change is, however, small (that is, 3.9 percent, 7.7 percent and 3.6 percent in median terms, respectively).

27. Spain, the Netherlands, and partially Greece even experienced a slight housing market appreciation.

28. The 2004 average long-term interest rate for Mediterranean countries was 4.2 percent, for Central Europe 3.9 percent, and for Scandinavia 4.4 percent (OECD Stats 2010, Key Economic Indicators).

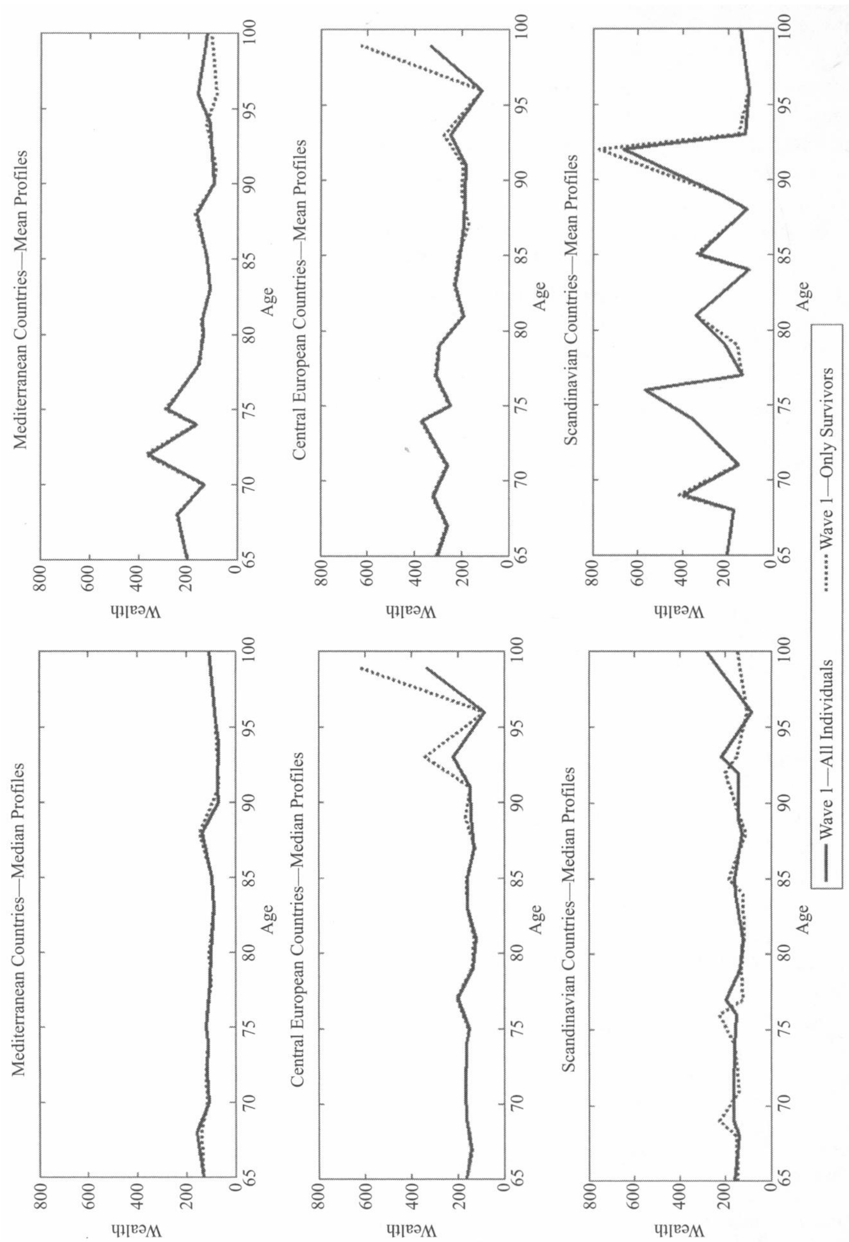

Figure 1A
Wealth Profiles, All Individuals Versus Survivors (Thousands of 2004 Euros)

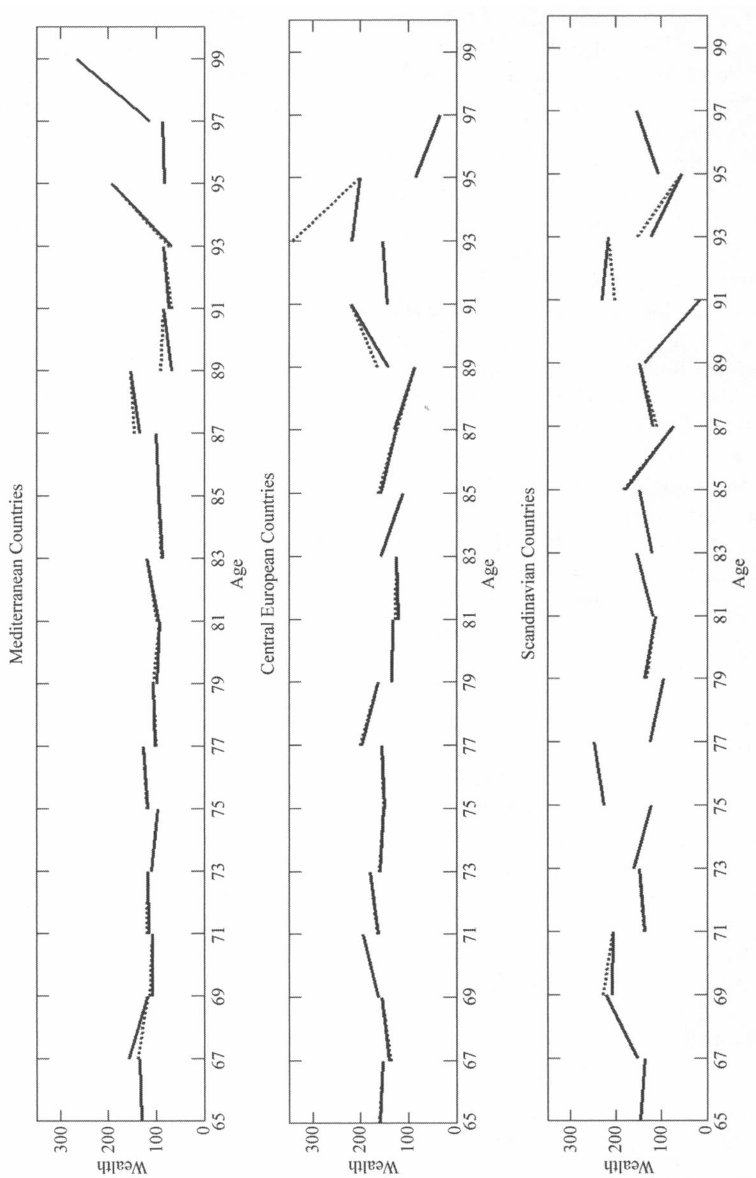

Figure 1B
Median Wealth by Birth Cohort (Thousands of 2004 Euros)

medical services.[29] To correct for this bias, I use the Eurostat share of population in very good/good/fair/bad/very bad health in 2004 in each country (Eurostat 2012). Multiplying the LTC cost per capita by the inverse of the population share in bad/very bad health should yield a more accurate estimate of LTC costs per capita. Similarly, multiplying the CR cost per capita by the inverse of the population share in good/fair health should yield a more accurate per capita CR cost. Finally, I set the public insurance coverage $\underline{F}$ equal to these adjusted public CR and LTC costs if the individual is in fair or poor health, respectively.

In terms of health costs, SHARE collects data on LTC costs, but the number of observations corresponding to this variable is very low.[30] SHARE also collects information on out-of-pocket inpatient, outpatient, and drugs costs, but there is no information on what the total expense on these three cost items is. This makes it impossible to compute any measure of CR costs. Hence, I use the 2004 OECD country-specific data (OECD 2006) and set the total health care spending $\tilde{h}$ to: (a) per capita total CR costs, if in fair health; and (b) per capita total LTC costs, if in poor health, both adjusted by employing the same procedure as for $\underline{F}$. If the individual dies, $\tilde{h}$ is set to the 2004 level of funeral costs (Bjornerud et al. 2005).[31] Finally, the parameter $\bar{\psi}$ is set to match the OECD 2004 PPP adjusted total expenditure on health per capita.

In order to solve the model and produce the simulated data, I proceed as follows: To compute the optimal choices, I use the Gauss-Hermite quadrature method to discretize the state space of the shocks. I solve the model numerically by backward induction and simulate wealth, consumption, formal premium, health, and medical spending histories for $N = 200$ artificial individuals,[32] using Monte Carlo draws for the two stochastic variables. I then take the mean of wealth, consumption, and formal premium across individuals at each age to obtain the final corresponding age profiles. Finally, I use these three data profiles (that is, wealth, consumption, and formal premium) to compute the set of moments shown in Table 2, conditional on the initial values of the state variables ∇_0 and on parameters $\phi' = (\sigma, \gamma, \theta, \alpha, \beta, \rho, \sigma_\varepsilon, c_{i=\overline{1,3}}, \eta_{j=\overline{0,4}}) \in \mathbb{R}^{15}$.

To get the real (or true) data moments, for each of the 12 SHARE profile sets I use the corresponding wealth, consumption, and premium profiles and calculate the moments in Table 2.[33] I proceed this way for two reasons. First, this procedure will prevent the variability induced in the data by the small number of observations (especially at advanced ages) to be interpreted as actual variability in values. Second, one response to the findings on wealth decumulation of poor versus rich, for instance, is that estimating a lower discount factor (that is, a smaller weight on future welfare) for poor than for rich was virtually guaranteed given that I fit a slower wealth decumulation for the rich (relative to their wealth at retirement). The response to this argument

29. Assuming that being in very good health involves almost no medical expense, the average amount spent by an individual on LTC or CR (and covered by the public health system) will likely be higher in the subsample of individuals actually incurring these expenses than in the entire population.

30. This is because only Denmark and Sweden interviewed institutionalized individuals in Wave 1, and even among these very few reported their LTC costs.

31. Further details on health and funeral costs are provided in Appendix A.

32. Note that setting $N = 200$ allows one to capture the sample variability while satisfying the condition $N \geq \bar{T}$, where $\bar{T}$ is the model's average number of periods ($\bar{T} = 20$).

33. This means that, given a certain subsample (Mediterraneans with median wealth, for instance), one looks at, say, their entire real wealth profile (between ages of 65 and 100) and takes its mean, standard deviation, etc.

Table 2
Choice of Moments

$\bar{a}, \sigma_{\ln(a)}$	$\sigma_{\ln(F)}$	$corr(a,f)$,	$corr(C, C/a)$,	$corr(C_{t,t-1})$,
$\bar{C}, \sigma_{\ln(C)}$	$\sigma_{\ln(C/a)}$	$corr(a, C/a)$,	$corr(f, C/a)$,	$corr(F_{t,t-1})$,
$\bar{F}, \overline{C / a}$,	$corr(a, C)$,	$corr(C,f)$,	$corr(a_{t,t-1})$,	$corr((C/a)_{t,t-1})$.

is that I am not fitting age-by-age wealth levels but only the mean and variance of wealth across all ages together with means and second order moments for other variables as listed in Table 2.

Finally, parameters are chosen to minimize the difference between these artificial moments and their empirical counterparts. The goodness of fit between the two series is assessed by a χ^2 - test statistic or corresponding p-value. This statistic assesses whether or not the real data moments (m_R) are equal to the realized data moments ($m_n(\nabla_0, \varnothing')$, $n = \overline{1, N}$) given the stochastic processes for which the true time series is only one realization. The matrix W is the weighting or distance matrix that almost surely converges to $W = S^{-1}$, where S is the limit, as $NT \to \infty$, constant full-rank matrix of the covariance of the estimation errors. Analytically, if the weighting matrix W is chosen optimally, then

$$T\left(\underset{\tilde{\phi}'}{\operatorname{argmin}} \left[\left(m_R - \frac{1}{N}\sum_{n=1}^{N} m_n(\nabla_0, \tilde{\phi}')\right)' \widehat{W} \left(m_R - \frac{1}{N}\sum_{n=1}^{N} m_n(\nabla_0, \tilde{\phi}')\right)\right]\right) \to \chi^2(j-k),$$

where j is the number of moments, k is the number of estimated parameters, and $\phi' \in R^k$ is the unknown parameter vector.[34]

A. Identification

In this section, I discuss which moments help to pin down which parameters. Although it is not possible to provide an analytic proof that the parameters are identified using a given set of moments, I address the question of identification in two ways. First, I informally argue that each parameter has a significant effect on a subset of moments and give some intuition for why this is the case. Second, to support the intuitive arguments, I also established identification in a local neighborhood of a selected subset of parameters via simulation.[35]

Clearly, altering one of the target data moments changes more than one parameter.

34. The standard errors of the parameters are obtained using the Newey and West (1994) weighting matrix W and the first order derivatives of the moments conditions with respect to each parameter:

$$\text{se} = \frac{1}{\sqrt{T}}\left(DW^{-1}D'\right)^{-1} \textit{ with } D' = \operatorname{plim}_T \left\{\frac{\partial\left[m_R - \frac{1}{N} m_N\left(\nabla_0, \phi'\right)\right]}{\partial \phi'}\Bigg|_{\phi' = \tilde{\phi}'}\right\}.$$

35. This procedure entails two steps: First, I compute the moments and criterion function value at and around the estimated parameter values. Second, I check to what extent the resulting simulated profiles fit the empirical ones as I vary the value of the selected parameter and verify the criterion function shape in the neighborhood of the selected parameter value.

The parameters γ, σ, and β, for instance, are jointly identified by the first and second order moments of the wealth profiles. For instance, a small estimate of the coefficient of relative risk aversion for consumption (or health care) makes individuals decumulate faster. Similarly, a lower discount factor means they are more present oriented and dissave more than with a higher β. To acquire additional identification for these parameters I require the model to also match consumption and premium first and second order moments, their correlation, and the correlation between premiums and consumption to wealth ratio. Here is the rationale.

First, note that the Euler equation can give some intuition for the estimates of γ, β, and c_1, c_2, and c_3 (that determine s_{t+1}) and their identification. Ignoring cohesion, the Euler equation determines the shape of the consumption profile and so, the age-profile of consumption is dictated largely by a combination of time discounting (β) and taste for smoothing (γ). Note, however, that this equation identifies the product $\beta s_{t+1}(1 + r)$, but not its individual elements. Therefore, lower values of r and/or s_{t+1} can lead to higher estimates of β.

To investigate whether the interest rate can be identified separately, I increase its value to the maximum empirically observed rate (that is, from 4 percent to 5.6 percent registered in Mediterranean countries) and reestimate the sample mean models. As expected, I find that this 1.6 percent increase in r led indeed to lower values for β. Hence, I cannot separately identify β and $(1 + r)$, but only their product.

Next, I perform a similar exercise to check whether health transition parameters $\{c_1, c_2, c_3\}$ can be identified separately. To this effect, I increase these coefficients by 1/1000 and find the correlations between premium and consumption, as well as between premiums and consumption to wealth ratio, to be considerably affected. This is due to the effect of health transition probabilities (and implicitly future health) on formal insurance and on medical expenses, which will change the composition of total spending. When I reestimate the model, I find β estimates largely unchanged, but the fit between data and model moments significantly worsened. In each new estimation, the difference in χ^2-stat is higher than the critical value of a χ^2 of degree 1 (3.8) imposed because of one parameter restriction. Hence this restriction is rejected and the set $\{c_1, c_2, c_3\}$ is identified separately.

Looking at the second part of the utility function, we note that as the coefficient σ (the relative risk aversion for total utility from health care) increases individuals become less willing to substitute formal and informal care across time. The parameters α and θ are identified by noting that the within-period utility function is CES between formal and informal care. Hence, α gives the share of resources corresponding to formal rather than informal care, while θ indicates the within-period substitution between the two. Because informal care is actually a direct measure of adjusted expected bequest, α, θ, and σ are identified by some measure of correlations between premiums and wealth, premiums and consumption, as well as the first and second order moments of premiums.

The parameters of the out-of-pocket costs shock (ρ and σ_ε) are identified by noting that incurring these cost shocks affects one's optimal ratio of consumption to wealth. Given the autoregressive nature of the underlying process, these parameters are also identified by the first order autocorrelations in wealth, consumption, and premiums.

Turning to cohesion, it is worth noting that consumption increases with wealth, but the rate of this increase varies depending on the presence of the bequest motive. Because potential bequests enter the model via informal care (that is, all else being equal, the strength of the bequest motive is related to the cohesion parameters η_i, $i = 0,..4$), cohesion will also affect premiums. Intuitively, the amount of wealth people will keep (rather than consume) will be different if they know that this wealth will bring them more informal care in time. This in turn will also affect the amount of formal insurance they are willing to purchase. Thus, different cohesion parameters will produce different premium patterns and consumption to wealth ratios across years and across regions. To pin down the five cohesion parameters I use the correlations between premiums and consumption to wealth ratio and the lagged correlation of consumption to wealth ratio.

Finally, note that in my estimation I target only consumption, wealth, and formal premium but not medical expenses. In the next section, I show the model's performance in fitting the out-of-pocket profiles, effectively presenting an informal overidentification test of the model. As will be seen, except for very old age, the model is able to endogenously generate an age profile of out-of-pocket costs that is fairly close to the data. Specifically, each model is able to recreate increasing medical expenses with age, while the models for rich generate higher average out-of-pocket costs than the models for poor.

VI. Results

For each wealth quartile and region, Tables 3–5 show the parameters estimates, whereas Tables A6–A8 in Appendix present the simulated and empirical moments. A quick glance shows that the estimates are economically reasonable across models and that the models fit quite well. The goodness of fit between the simulated and the actual moments is assessed by a χ^2-test or the corresponding p-value. In most cases, the model easily passes the χ^2-test, with χ^2 values well below the 1 percent critical value of 11.345. Thus, we cannot reject the null that the simulated and the actual moments are the same at standard significance levels.

A. Data Profiles

Figures 2–5 display the simulated and the real profiles of the decision variables, together with 95 percent confidence intervals.[36] In each of these figures, the charts in the first three columns plot wealth, consumption, and formal premium, respectively. Note that the simulated profiles generally resemble the real ones quite well (especially for the wealth-specific models), which is remarkable given that the latter came from cross-sectional data. The only exception to some extent is the Scandinavian countries: For the top wealth group, as well as for the average (that is, sample mean) agents, wealth and consumption profiles appear more volatile than the corresponding profiles in the other two European regions. The reason is twofold: First, the sample size for

36. Any missing values in the actual profiles are obtained by linear interpolation within the grid. With nonlinear decision rules, extrapolation (for ages beyond the last age reported) proved less reliable than did interpolation. Hence, I extrapolate to age 100 using the mean relative growth rate of the variables in the last 15 years.

Table 3
Parameter Estimates, Central European Countries

Parameter	< 1st Quartile	1st–3rd Quartile	> 3rd Quartile	Sample Mean
σ	0.6946	1.3464	1.0709	1.8785
	(0.8982)	(1.1811)	(0.4133)	(0.7146)*
γ	5.5137	5.8465	4.0661	2.9278
	(0.0147)**	(0.9700)**	(0.6272)**	(0.4467)**
θ	3.1228	1.0033	0.6162	1.7264
	(0.0799)	(0.0423)	(0.5004)	(0.3524)**
α	1.5138	1.3360	1.3514	0.0105
	(1.4933)	(0.2382)	(1.4761)	(0.0022)*
β	0.7889	0.9206	0.9662	1.0038
	(0.1701)	(1.4421)	(0.1996)**	(0.3089)*
ρ	1.6056	1.9182	0.0179	1.2923
	(0.00001)***	(0.00001)***	(0.00001)***	(0.0098)***
σ_ε	0.0991	0.0942	0.1368	0.0739
	(0.00001)***	(0.2012)	(1.1293)	(0.0140)**
c_1	0.0001	0.0002	0.0003	0.0001
	(0.0062)	(0.0779)	(0.0075)	(0.0001)**
c_2	0.9481	0.2792	0.1810	0.3168
	(0.00001)***	(0.00001)***	(0.0001)	(0.0021)***
c_3	$1.7 * 10^{-5}$	0.00001	0.0002	0.0002
	(0.0011)	(0.0387)	(0.0488)	(0.0013)
η_0	0.0247	0.0839	0.1210	0.1558
	(0.0424)	(0.3093)	(0.1055)	(0.0223)**
$\eta_1 * 10^2$	0.0621	0.0513	0.0779	0.0503
	(0.0949)	(0.0283)	(0.0708)	(0.0192)
$\eta_2 * 10^4$	0.0005	0.0007	0.0016	0.0018
	(0.0023)	(0.00001)*	(0.00007)	(0.00001)***
$\eta_3 * 10^4$	0.0004	0.0020	0.0020	0.00387
	(0.0001)*	(0.0071)	(0.0023)	(0.0025)
$\eta_4 * 10^8$	0.0029	0.0029	0.0141	0.0046
	(0.6031)	(0.0017)	(0.0040)*	(0.00009)*
Observations	183	389	210	782

Notes: Standard errors are in parentheses. (*), (**), (***) indicate significance at 10 percent, 5 percent, and 1 percent.

Denmark is generally quite small and this affects both consumption and net worth profiles. Second, in 2004 Denmark and Sweden also interviewed institutionalized individuals, which is likely to affect consumption of food at home. Hence, the "rich" and the average Scandinavian profiles are slightly different with respect to the Mediterranean or Central European ones.

Unsurprisingly, wealth appears extremely heterogeneous both across and within

Table 4
Parameter Estimates, Central European Countries

Paramameter	< 1st Quartile	1st–3rd Quartile	> 3rd Quartile	Sample Mean
σ	0.6947	1.0709	2.4285	1.9285
	(1.4977)	(1.9219)	(0.0307)***	(0.0821)***
γ	5.5140	4.0661	4.7152	4.7152
	(0.7353)**	(0.5555)**	(0.0587)***	(0.0848)***
θ	3.1228	0.6142	1.0117	1.0117
	(8.8873)	(5.2805)	(0.0096)***	(0.0537)**
α	1.5135	1.3514	0.1898	0.1898
	(5.3659)	(9.0734)	(0.0033)	(0.0047)***
β	0.8890	0.9904	0.9237	0.9179
	(0.4386)	(1.4421)	(0.0339)***	(0.0850)***
ρ	1.8124	1.5202	0.6173	0.6080
	(0.0001)***	(0.00001)***	(0.0147)***	(0.00001)***
σ_ε	0.1026	0.1382	0.2263	0.0263
	(8.2386)	(0.00001)***	(0.0009)***	(0.0019)**
c_1	0.0001	0.0002	0.0001	0.0002
	(0.4771)	(0.0636)	(0.0018)	(0.0070)
c_2	0.0038	0.0739	0.0002	0.0018
	(0.0513)	(0.3212)	(0.0008)	(0.0002)**
c_3	0.0002	0.00001	0.0001	0.0001
	(0.9743)	(0.0031)	(0.0016)	(0.0035)
η_0	0.0405	0.0014	0.0638	0.0638
	(1.4221)	(0.0045)	(0.0005)***	(0.0024)***
$\eta_1 * 10^2$	0.1596	0.1959	1.5404	1.5404
	(0.7600)	(0.2543)	(0.0135)***	(0.0361)***
$\eta_2 * 10^4$	0.0049	0.0021	−0.0011	−0.0011
	(0.1784)	(0.0080)	(0.00001)	(0.00001)
$\eta_3 * 10^4$	0.0018	0.0008	0.0025	0.0025
	(0.0544)	(0.0115)	(0.00001)***	(0.0001)***
$\eta_4 * 10^8$	−0.0029	0.0056	0.0389	0.0389
	(0.6034)	(0.0258)	(0.0002)***	(0.00001)***
Observations	307	638	333	1,278

Notes: Standard errors are in parentheses. (*), (**), (***) indicate significance at 10 percent, 5 percent, and 1 percent.

the three European regions. It increases from South to North and, regardless of the region, the profiles show slow decumulation in older age. For instance, rich Scandinavians have about €655,000 at age 70 and end up running down their savings by 12.3 percent by age 90. Similarly, poor 70-year-old Mediterraneans have roughly 15 times less than rich Scandinavians, but will keep only a third of this wealth 20 years later. This wealth pattern implies that rich elderly are dissaving more slowly than the

Table 5
Parameter Estimates, Scandinavian Countries

Parameter	< 1st Quartile	1st–3rd Quartile	> 3rd Quartile	Sample Mean
σ	1.4193	2.4285	1.4195	1.5707
	(0.0360)***	(0.1283)**	(0.0007)***	(0.0800)**
γ	3.4465	4.7152	3.4684	3.4778
	(0.0157)***	(0.0072)***	(0.0003)***	(0.0272)***
θ	1.0730	1.0217	1.0798	0.9826
	(0.0104)***	(0.0251)***	(0.0019)***	(0.0264)***
α	0.1113	0.1898	0.1146	0.2954
	(0.0015)***	(0.6039)	(0.0379)*	(0.0327)**
β	1.0123	1.0979	1.0254	1.0283
	(0.0667)**	(0.0014)***	(0.0047)***	(0.0011)***
ρ	0.2523	0.8080	0.2478	0.2485
	(0.00001)***	(0.00001)***	(0.00001)***	(0.00001)***
σ_ε	0.0590	0.0263	0.0594	0.1097
	(0.0065)	(0.0720)	(0.0040)**	(0.0072)**
c_1	0.0004	0.0007	0.0002	0.0002
	(0.0001)*	(0.4796)***	(0.0001)	(0.0024)
c_2	0.1428	0.0071	0.0256	0.0257
	(0.0005)***	(0.0010)**	(0.0209)***	(0.00001)***
c_3	0.0003	0.0001	0.0001	0.0001
	(0.0001)*	(0.0681)	(0.00001)	(0.0001)
η_0	0.0912	0.0192	0.1004	0.0998
	(0.0026)***	(0.0064)*	(0.0041)**	(0.0074)**
$\eta_1 * 10^2$	0.0823	0.2273	0.5873	0.5997
	(0.0037)**	(0.3374)	(0.0031)***	(0.0232)***
$\eta_2 * 10^4$	0.0039	−0.0008	0.001	0.0001
	(0.0001)***	(0.0012)	(0.00001)**	(0.00001)**
$\eta_3 * 10^4$	0.0022	0.0093	0.0039	0.0039
	(0.00001)	(0.0214)	(0.0005)**	(0.0001)***
$\eta_4 * 10^8$	0.0034	−0.0075	0.0110	0.0110
	(0.0001)***	(0.0200)	(0.0040)*	(0.0009)**
Observations	78	182	105	365

Notes: Standard errors are in parentheses. (*), (**), (***) indicate significance at 10 percent, 5 percent, and 1 percent.

poor, which complements Dynan et al. (2004) and De Nardi et al. (2010) findings on the United States. As wealth finances consumption, most of the simulated and actual consumption profiles also fall slowly during retirement (with certain exceptions for Scandinavian countries, as discussed above). These profiles confirm Banks et al.'s (1998) results suggesting that old-age consumption falls with age: As individuals age, life expectancy falls and they allocate less wealth for future consumption (since they

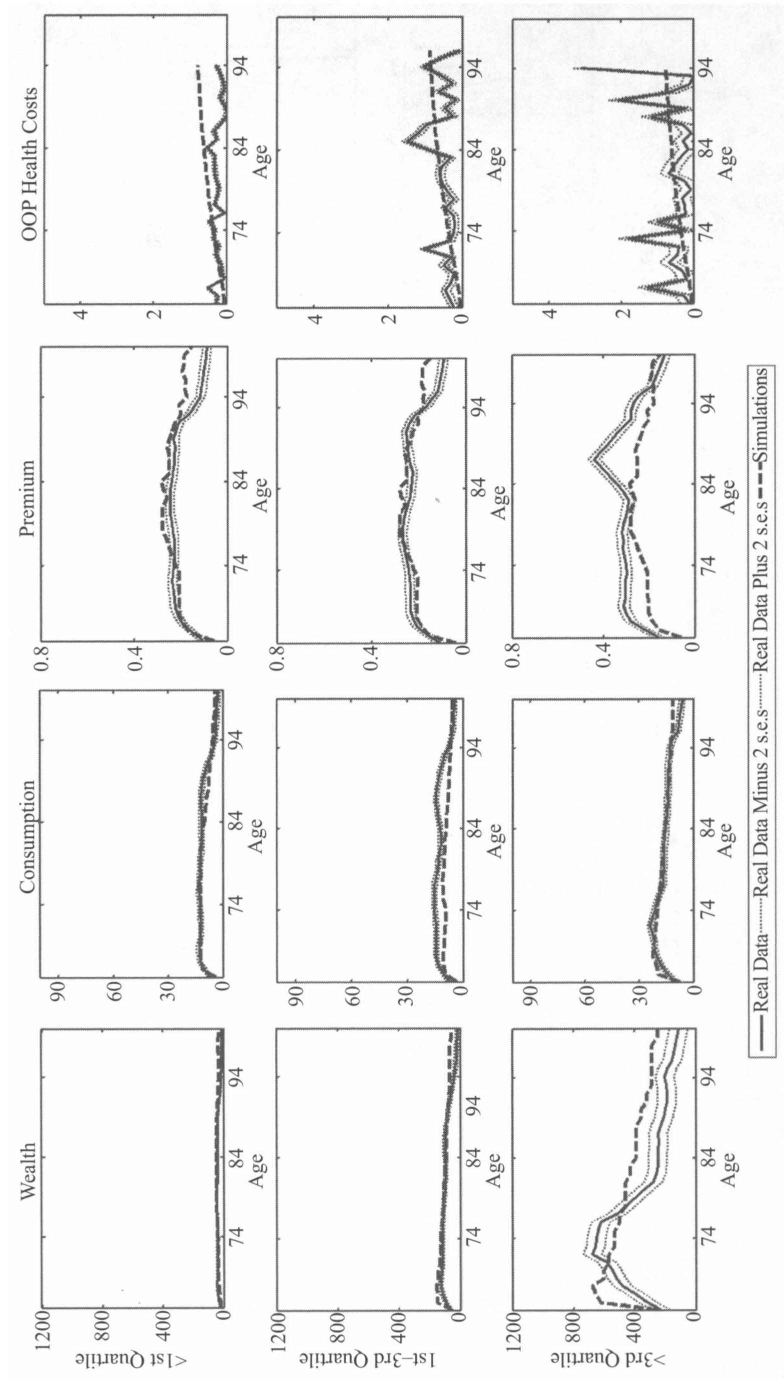

Figure 2
Data Profiles by Wealth Quartile, Mediterranean Countries (in 2004 Thousands of Euros)

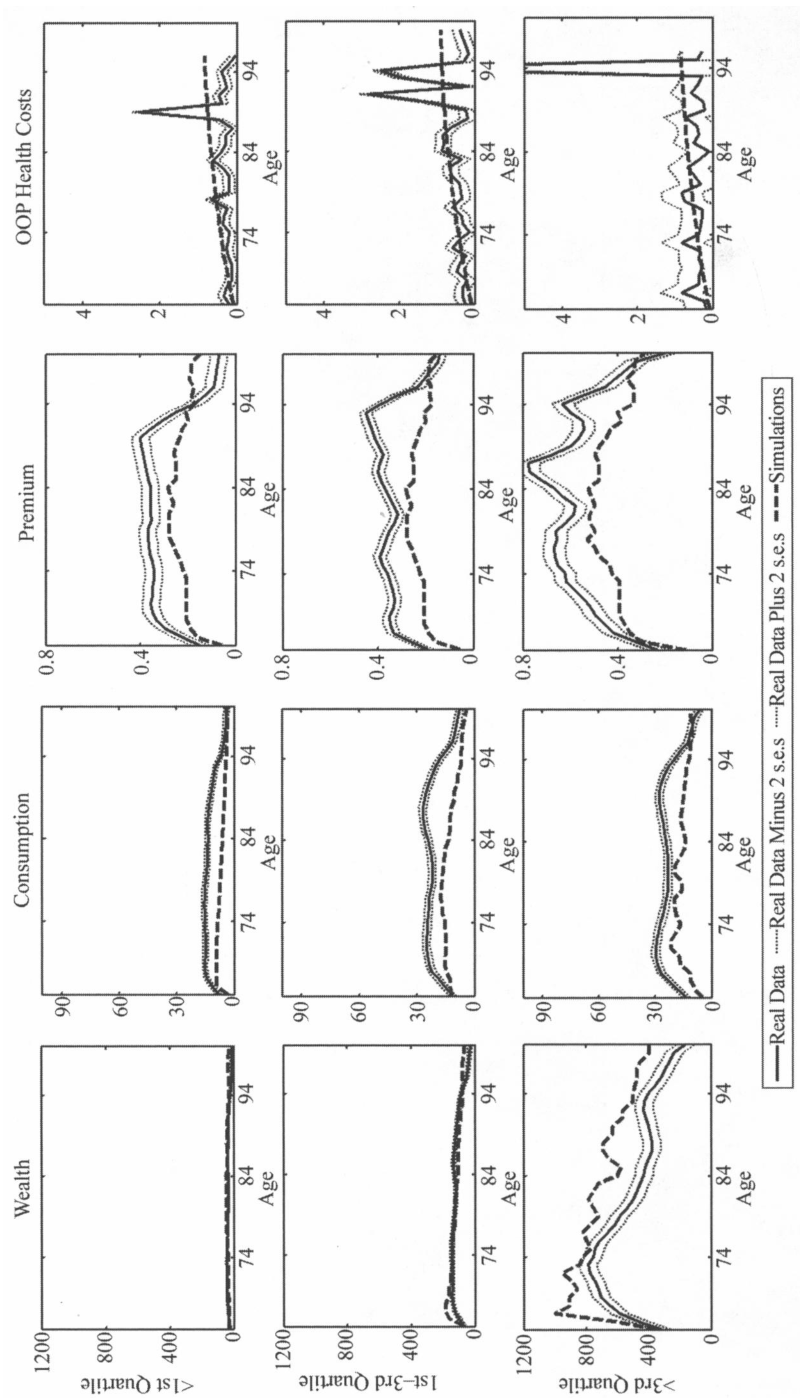

Figure 3
Data Profiles by Wealth Quartile, Central European Countries (in 2004 Thousands of Euros)

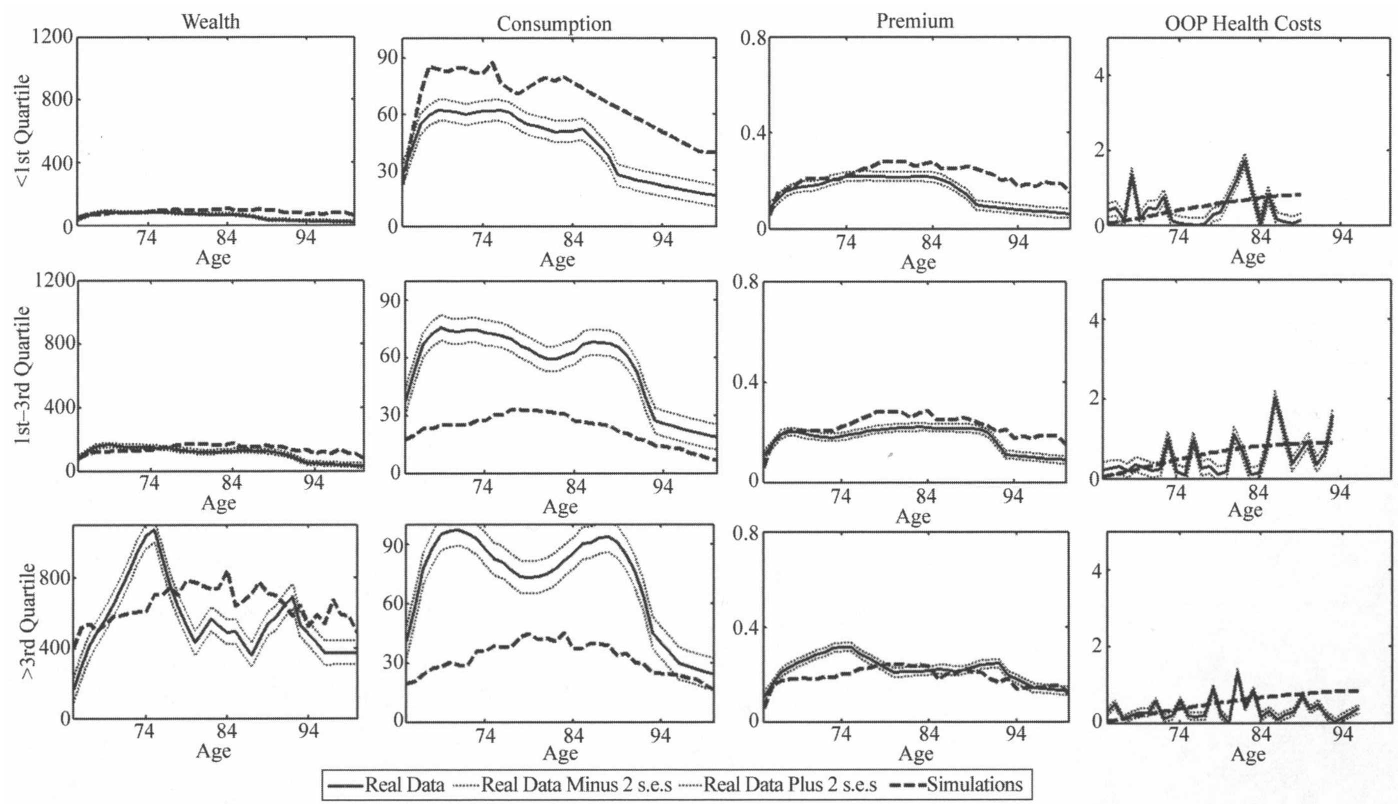

Figure 4
Data Profiles by Wealth Quartile, Scandinavian Countries (in 2004 Thousands of Euros)

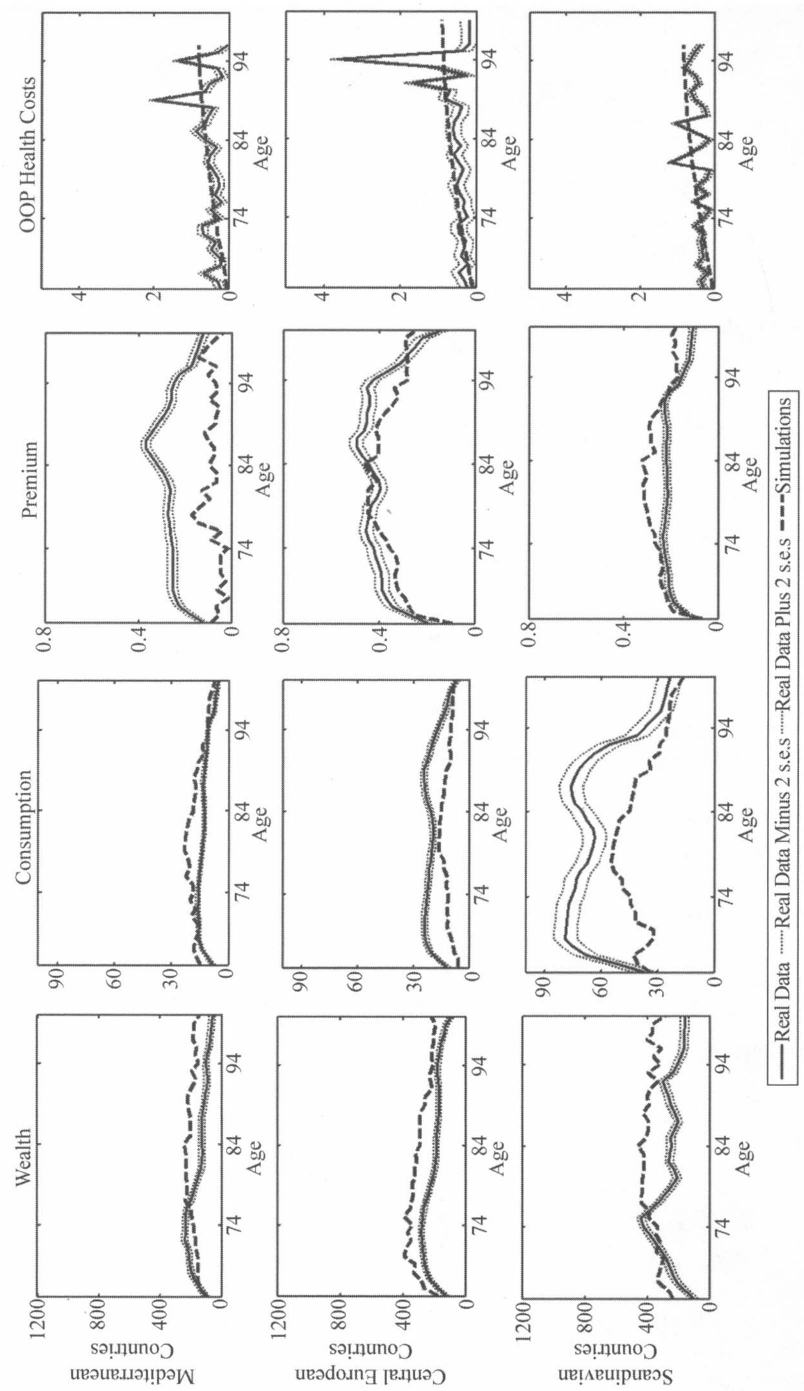

Figure 5
Data Profiles by Region, Sample Mean Agent (in 2004 Thousands of Euros)

are less likely to benefit from it). Thus, the decline in consumption is also faster for individuals with higher mortality rates. Finally, premium profiles appear slightly increasing throughout the age of 90, after which they fall. If insurance reduces health cost volatility, risk averse individuals may value health insurance at well beyond the cost paid. As a result, they will maintain and even slightly increase their insurance coverage. At advanced ages, however, they may value formal insurance differently, conditional on the availability of informal insurance.

B. Medical Spending and Health Status

Health costs can impose a significant financial burden on individuals and families, especially at advanced ages and especially for the poor. The European public insurance system, however, extensively covers prescription drugs and doctor visits, as well as inpatient and outpatient care. For the current sample, the mean (annual) out-of-pocket expenses (conditional on positive values) is €566 (with standard deviation of 1,260), which represents roughly 12 percent of the annual gross income. Unsurprisingly, not only are the oldest ones and those suffering from poor health more likely to pay out-of-pocket, they also face larger out-of-pocket expenses. For instance, the average annual out-of-pocket cost is roughly €400 at age 75 (with standard deviation of 934), but rising to €750 (with standard deviation of 1,135) by age 90.

The out-of-pocket spending profiles are shown in the last column of Figures 2–5. Interestingly, even if the models did not specifically fit this variable, note that the simulated and actual data profiles are quite similar.[37] As expected, health costs for the elderly significantly increase with age as health worsens over time. Their persistence, however, at any wealth level, appears to be lower in the Scandinavian countries compared to the rest of Europe. The rationale is twofold. First, few Scandinavians remain in the highest-cost categories for more than one year. Second, the high mortality rates of the Scandinavians (who use medical services heavily) limit the extent of expenditure persistence.

This finding is replicated within each region, as the wealth-specific estimates indicate that medical spending persistence is significantly weaker for the rich compared with the poor, except for Scandinavians. The reason lies in the health status dynamics. In Southern and Central Europe, the poor experience the worst health with age, but also have high life expectancy. With high expenditures in one year, they are likely to have above-average expenditures in other years. In Denmark and Sweden, on the other hand, the poor and the rich have almost the same (small) health costs persistence. This is due to the extensive health system that makes the persistence gap between the rich and the poor smaller.

Since the poor can afford to pay less than the rich, their out-of-pocket spending will tend to be less volatile and this holds true in each of the three European regions. On the same principle, the variation in medical spending is higher for Scandinavians (0.1097) than for the Mediterraneans (0.0739). However, given the national health care systems coverage of some Central European countries (like Germany), it is not surprising that the lowest health costs variation (0.0263) is registered in this region.

37. The out-of-pocket health costs data has not been smoothed or extrapolated and so, the high volatility of the real profiles is not surprising.

Finally, the level of medical spending is strongly correlated with health status. Figure 6 plots selected health transition profiles by wealth quartile and region. A quick analysis reveals the expected age-dependent health decline (see the top charts in Figure 6), but an unexpected north-south gradient in Europe. Overall, it seems that while maintaining good health becomes less possible as one ages in all three regions, the Mediterraneans register the most elevated morbidity rates in Europe. These profiles are confirmed by several other SHARE health indicators (for example, self-perceived health, long-standing health problems, daily activity limitations) that point to worse health in the South than in the North (Avendano et al. 2005). Interestingly, these high morbidity rates do not translate into low life expectancies for the Mediterraneans. Although Mediterraneans are sicker, the bottom right chart in Figure 6 shows that Scandinavians and Central Europeans generally die faster.

To illustrate these dynamics in more detail, consider first the Mediterraneans. The three charts in the first column of Figure 6 plot the probability of maintaining good health, becoming invalid, or die if in good health, respectively, for this region. Results show that the probability of dying in the next year for a healthy individual rises roughly from 0.2 percent at age 65 to 3.6 percent at age 100. Moreover, invalidity appears to be quite persistent: Being a 70-year-old in poor health implies a 55.6 percent chance of remaining in poor health next year. This probability falls with age, as the survival probability decreases. As expected, the rich are more likely to persist in good health and less likely to die than are the poor.

This health gap between rich and poor is almost insignificant in Central Europe (see the second column charts in Figure 6), which complements the finding on medical spending volatility. However, when comparing healthy poor Mediterraneans to their Central European counterparts, I find the latter to be roughly 10 percent less likely to become invalid and around 69 percent more likely to die than the former.

Turning finally to Scandinavians, it is interesting to note that the death probability if healthy, although it starts fairly close to what the other two regions register (roughly 0.2 percent at the age of 65), it quickly rises with age (15 percent at 100). Interestingly, this probability is considerably higher than in the Mediterranean (3.6 percent) or Central Europe (4.2 percent). As expected, persisting in good health is less likely as age increases, but the poor do so at an average rate of roughly only 2 percent lower than the rich.

C. Social Cohesion

The morbidity and mortality estimates presented above are consistent with the real trends observed in Europe. They, however, contradict the expected outcome of longer (and healthier) life for Central and North Europeans, who benefit from more generous and efficient health care systems than do Italians, Spaniards, or Greeks. Also, the results did not display a strong health gradient by wealth, which challenges the belief that the poor are considerably more likely to die than are the rich.

These discrepancies can be related, among other factors, to social cohesion. Figure 7 plots the relative cohesion coefficients by wealth quartile and region. The estimates confirm two crucial social literature findings (Reher 1998; Kohli 2005) on social cohesion: (1) it rises with age and decreases with wealth, and (2) the "map" of family ties displays a north-south gradient—that is, Central and Northern Europeans

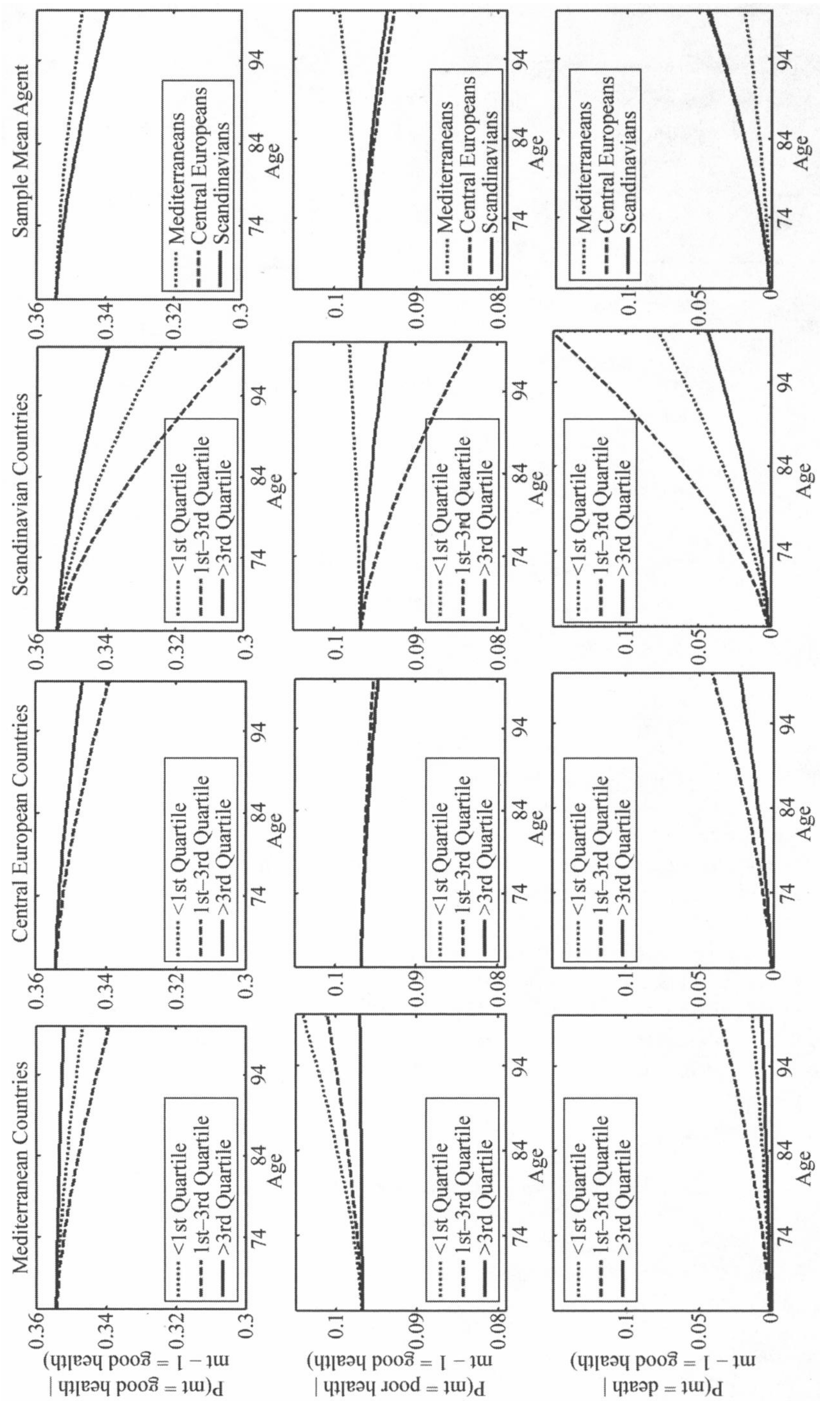

Figure 6
Health Transitions by Wealth Quartile and Region

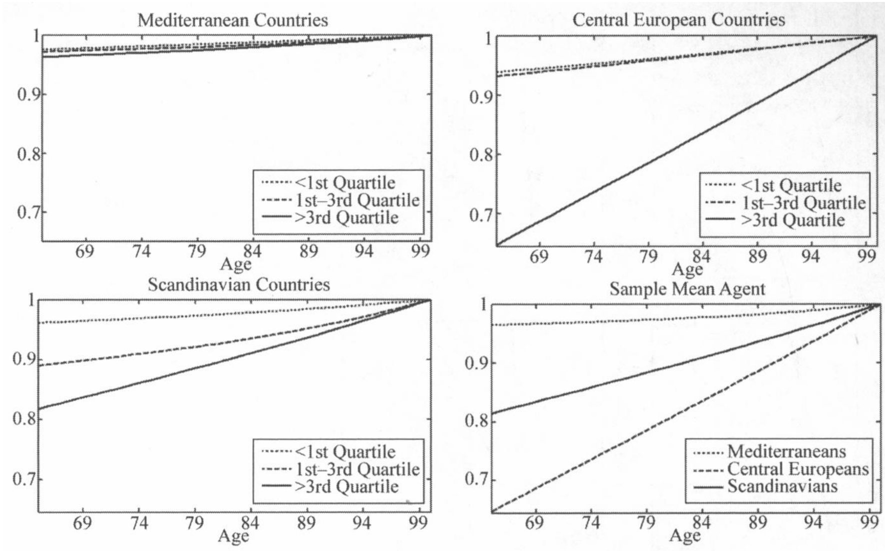

Figure 7
Cohesion Coefficient by Wealth Quartile and Region

have relatively weak family ties, while the Mediterraneans show much stronger cohesion. Note that the same map of social cohesion emerges when looking at the informal care statistics shown in Table 1. A quick glance reveals not only that Mediterraneans receive more than ten times the hours of help than do the Scandinavians, but they are also roughly three times more likely to receive financial help.

The social cohesion findings are also well mirrored by the health profiles. First, despite significant wealth differences, the poor generally appear to be only slightly more likely to die than the rich, although these differences are somewhat higher in Denmark and Sweden. Second, among Europeans, the Mediterraneans have both the highest chances to have medical problems and the lowest probability of dying. Both results are supported by family ties estimates: poor rather than rich and Mediterraneans rather than Central Europeans or Scandinavians display stronger social ties. High family cohesion seems therefore typically associated with higher life expectancy and vice-versa.

VII. The Drivers of Wealth Decumulation

In this section, I perform several counterfactual experiments to evaluate the effect of different factors on the elderly wealth decumulation patterns. Specifically, I considered how wealth would have changed over time had the individuals (1) maintained their initial (65-years-old) health status throughout their life (referred to as "No Health Shock" scenario); (2) experienced no out-of-pocket medical spending risk ("No OOP Shock" scenario); (3) not had access to formal insurance ("No

Formal Insurance" scenario); (4) not had access to informal insurance ("No Informal Insurance" scenario); and (5) placed no value on insurance-provided health care (that is, utility is defined solely over consumption, "No Value for Insurance" scenario). Figure 8 plots wealth for the sample mean model in each of these scenarios. Every simulation modifies certain parameters, solves the model numerically and generates the corresponding wealth profiles. The issue is how wealth in each scenario compares with the wealth profile generated by the baseline model ("Baseline" scenario).[38]

Consider first the lefthand charts in Figure 8. The wealth profile labeled "Baseline" and shown in solid is the one generated by the sample mean model. The dashed lines referred to as "No Health Shock" show how wealth would have evolved had individuals remained at their initial level of health. Note that in the absence of health risks, the retirees would have run down their assets significantly faster: Mediterraneans would have saved on average roughly 40 percent less, while Central Europeans and Scandinavians would have conversely kept only around 40 percent of what they would have otherwise saved. The reason for this decumulation is that health deteriorates with age. As a result, keeping health constant will make medical goods less needed and diminish the incentive to save for their (formal or informal) future provision.

Second, completely cancelling out the out-of-pocket risks had almost no effect on wealth. A quick glance at Figure 8 reveals that wealth in the "No OOP Shock" scenario (as shown by the dotted line in the lefthand charts of Figure 8) almost perfectly coincides with "Baseline" wealth. This complements the results in Palumbo (1999) and De Nardi et al. (2010), which find eliminating the health expense risk to have only a very small impact on the asset profiles for U.S. elderly.

Next consider the scenarios presented in the righthand charts in Figure 8. The dotted and dashed lines plot the wealth profiles obtained by shutting down formal and informal insurance, respectively. According to the simulations, wealth would have been significantly or dramatically lower in all three European regions had individuals not benefitted from formal insurance coverage. Without this type of insurance, individuals have no incentive to save for this type of goods and this induces them to decumulate their wealth more rapidly. However, both the magnitude and the shape of the profiles are different across regions. On the one hand, formal care generally seems to matter more in Northern and Central Europe than in the South. For instance, having no access to formal insurance will make Mediterraneans dissave up to 33 percent of their wealth by age 70, but only 20 percent at age 90. These figures are small compared to the decumulation effect for the other Europeans: wealth at age 70 appears 45 and 76 percent lower than the baseline wealth for Scandinavians and Central Europeans, respectively. Moreover, by age 90, the former will be left with only 36 percent of the wealth they would have otherwise had, while the latter will retain only 46 percent. On the other hand, wealth becomes more valuable for the provision of informal care as one grows old and so, individuals will slightly increase their savings. The exception is the Mediterranean, where individuals start to increase their savings toward the middle of the life cycle. This is not surprising, however, given that they rely significantly on informal care and much less on formal services.

38. All scenarios rely on the implicit assumption that individuals can frictionlessly extract their home equity. An alternative approach would be to conduct the analysis for renters and homeowners, separately. However, the vast majority (85 percent) of old Southern Europeans own their houses, making the sample size of renters too small to warrant such an analysis.

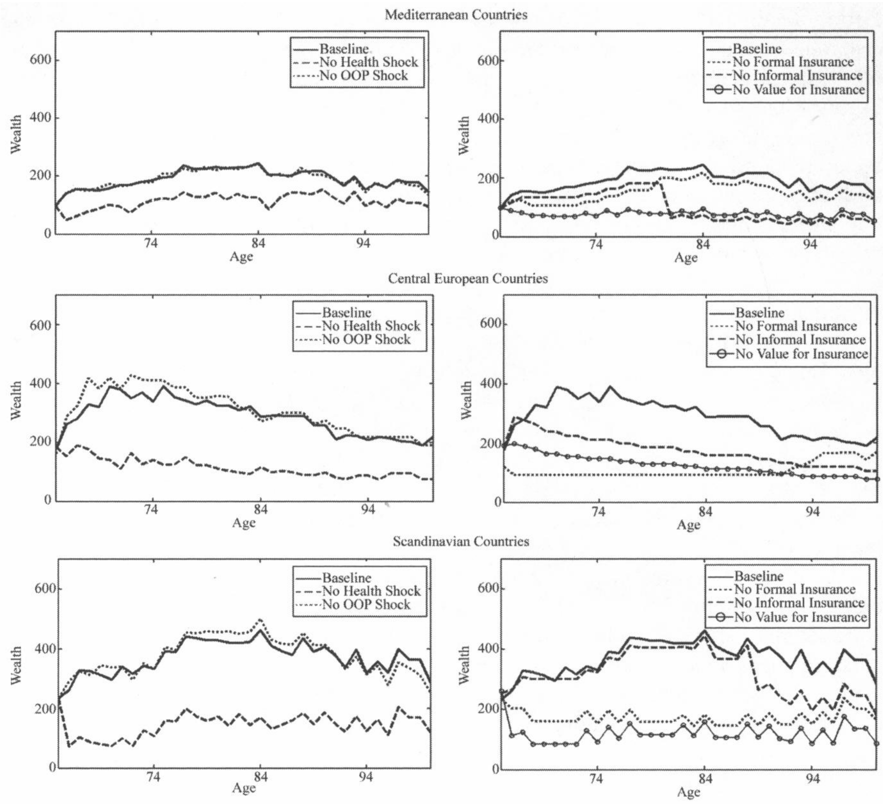

Figure 8
Wealth Profiles, Baseline Model vs. Alternative Scenarios (in 2004 Thousands of Euros)

The fourth scenario, "No Informal Insurance," sheds light on the importance of the bequest motive in Europe. Without informal insurance, using bequeathable wealth to encourage family members to provide informal care is no longer possible. As a result, the strategic bequest motive vanishes, with negative effects for wealth in old age (as shown by the dashed lines in the righthand charts of Figure 8). This effect is more accentuated in the Mediterranean, where the lack of incentive to keep wealth for informal care reasons induces individuals to hold significantly less wealth (roughly 53 percent on average). As expected, informal care matters less for Central Europeans, who experience a relatively milder drop (by 38 percent compared to baseline), while the smaller effects are registered in Scandinavia for most of the lifecycle span (around 5 percent decrease on average by age 88 and 34 percent if above 88).

The last two scenarios provide a clear picture of the relative weight attached to formal versus informal care in shaping wealth profiles in Europe: Formal care matters more in Central Europe and Scandinavia, while informal care is more important in the Mediterranean. However, one might ask to what extent the results are driven by one's well-being depending on the (insurance-provided) medical goods. To check this, one interesting experiment to run completely removes the insurance-provided medical good and define utility solely over consumption. The circle solid lines labeled "No Value for Insurance" in the righthand charts in Figure 8 consider this scenario. Unsurprisingly, if individuals place no value on the formal or informal insurance-provided health care, the wealth profiles would be significantly lower than the baseline. Specifically, the simulations for the Mediterranean, Central Europe, and Scandinavia produce roughly 58, 55, and 66 percent lower wealth profiles compared with the baseline value, respectively. All in all, for all three regions, formal and informal insurance appear to be key decision variables in old age, with direct spillover to saving rates.

VIII. Conclusions

This paper presents a lifecycle model that considers the effects of both health and medical spending risks on the insurance and savings decisions of retired single households. Health insurance can be provided formally by the market and informally by the family. Formal insurance contracts may be affected by asymmetric information problems, whereas informal insurance depends on social cohesion and bequeathable wealth. Using SHARE data and the SMM, the model is estimated separately for four levels of wealth and three European regions and provides several interesting results.

First, counterfactual experiments show that health risks, as well as the availability of formal and informal health insurance, are crucial determinants of the slow wealth decumulation. The magnitude of their impact, however, differs by level of wealth and region. For instance, the absence of formal insurance has a relatively small effect on Mediterraneans, but it makes the other Europeans significantly run down their assets to pay their health costs. Conversely, without access to informal care, wealth will generally drop considerably, though more rapidly for the Mediterraneans than for the Scandinavians.

Second, the model provides the first estimates on medical spending persistence and volatility for Europe. It also captures the increase of out-of-pocket medical costs with age, and shows that medical spending risks have almost no effect on dissaving.

Third, the morbidity and mortality profiles by wealth and region fit well the existing trends. As expected, health deteriorates with age throughout Europe, and Scandinavians have lower morbidity rates than Southern Europeans due to their wide and efficient health system. Interestingly, the latter, however, register the highest life expectancy, which confirms the north-south health gradient reported in Europe.

Fourth, results show that life expectancy is positively associated with social cohesion: People with informal support appear to live longer than those without it, and this is especially true for those in poor health. This finding confirms the commonly observed tendency, particularly in Southern Europe, of substituting professional care for family care if possible. As a result, morbidity rates increase but life expectancy rises also.

This paper provides an initial exploration into the determinants of the savings behavior of the elderly Europeans. Clearly, further work is needed to help resolve the puzzle of retirement savings. To this effect, in ongoing work, Dobrescu and Iskhakov (2014) explicitly models the strategic interaction between parents and children. The work provides a richer framework for understanding the decumulation patterns observed in old age by considering additional elements related to income and education and by modeling time and money transfers separately to capture the differential role of bequests in the provision of care.

Appendix

A. Data

A.1 Nonresponse and Attrition in SHARE Data

SHARE W1 Nonresponse rates: The overall response rate among the 11 SHARE countries that were part of Wave 1 (with data collection in 2004–2005) was 61.6 percent.[39] This response rate is only slightly lower than the response rate of the two official Eurostat surveys (the European Community Household Panel—62 percent, and the European Labour Force Survey—63.2 percent), and substantially higher than the response rate of the other five scientific surveys (European Social Survey—54.9 percent, the European Value Study—46.4 percent, the European Election Study—43.9 percent, and the International Social Survey Project—36.7 percent) (Luca and Peracchi 2005). SHARE response rate was lowest in Switzerland (37.6 percent) and highest in France (73.6 percent).[40] To draw a parallel with the U.S. Health and Retirement Survey (HRS), note that the initial (1992) cohort had a response rate of 82 percent, but the 1998 and 2004 waves achieved only 70 percent and 69 percent, respectively. These rates remain, however, higher than in Europe or SHARE.

Attrition $W1 - W2$: The "raw" attrition rate in SHARE is based on respondents with completed interviews in 2004–2005 that drop from the panel (that is, are not reinterviewed in 2006–2007). This rate is roughly 31.77 percent. However, one needs to account for those individuals that could not participate in Wave 2 because they died, moved out of the country (and did not leave a forwarding address), or declined maintaining their address on file for future waves[41] (Rendtel 2002). This brings the attrition rate to 27.93 percent, with the lowest rate registered in Greece (13 percent) and the highest in Germany (41 percent) (Schroder 2008).

In terms of individual characteristics, there is no consistent attrition pattern across the countries regarding gender. As for age, in the youngest group (below age 58) the attrition is the highest, in the second or third quartile (between ages 58–74) is the lowest, and it increases slightly from the third quartile to the oldest group (age 75+). Finally, individuals living in free-standing homes in all countries are more likely to have a Wave 2 interview. This effect is likely to be correlated with wealth and income, which have been shown to positively influence response behavior (for example, Hill and Willis 2001).

39. http://www.share-project.org/data-access-documentation/sample.html

40. Switzerland is well known for a low response rate (as shown by the response rates in the other cross-national surveys), while in France the survey operation of SHARE was conducted by INSEE (the official statistical French agency). Elsewhere in SHARE, survey agencies were private companies.

41. The option of dropping out the contact lists was offered only in Italy.

A.2 Construction of moments

To construct the moments for the sample mean agent in each region, for instance, I proceed as follows: First, I split the main sample of 65+ single Europeans (2,425 observations) into three separate subsamples corresponding to the Mediterranean, Central Europe, and Scandinavia. Second, for each of the three regional subsamples, I create the age profiles of wealth, consumption, and formal insurance by calculating cell means for each age (that is, computing mean wealth, mean consumption, and mean premium by age).[42] Third, for each of the three sets of profiles, I calculate the 18 moments presented in Table 2 using the 36 age-cell means of our variables of interest (corresponding to age 65 to 100). The values of these moments are presented in the last column of Tables A6–A8 in Appendix C (for Mediterranean, Central European, and Scandinavian countries separately).

For the wealth-specific moments, I split each region-specific sample by three wealth levels and redo the second step (to get the wealth-specific profiles) and the third step (to get the wealth-specific moments). As before, each moment has minimum 29 and maximum 36 observations, depending on the length of the profile based on which is calculated (that is, some age- cells have little or no observations).

A.3 Imputed Variables

A.3.1 Consumption

To impute total consumption in SHARE, I use the procedure described in Browning et al. (2003). Specifically, since SHARE asks a nonexhaustive list of consumption subitems, I first regress total consumption expenditure (that is, the sum of groceries, eating out, phone bills and other utilities, transportation, clothing, entertainment, etc.) on the individual expenditures known in SHARE (amount spent on food at home, outside home, and phone bills):

$$X = a_0 + a_1 * foodin + a_2 * foodout + a_3 * phones + error,$$

using external expenditure survey data (ISTAT or DBS). I then use these estimates to impute total consumption using

$$\hat{X} = \widetilde{a_0} + \widetilde{a_1} * foodin + \widetilde{a_2} * foodout + \widetilde{a_3} * phones,$$

where the expenditures on individual goods are taken from SHARE. This formally corresponds to using the OLS coefficients as imputation weights.

A.3.2 Health and Funeral Costs

When no country data on long-term care or curative and rehabilitation care was available, I used the benchmark countries below. The primary data for funeral costs in the OECD countries analyzed are drawn from the AGIR data set (Westerhout and Pellikaan 2005, based on EPC 2001) for EU-15 countries and from OECD calculations for 2005. To obtain the 2004 funeral costs, I applied the health expenditure real growth rate to the 2005 series (OECD Health Data 2008). The cost of death for the

42. Because these are imputed variables, means and medians are not very different.

Table A.3.3
Formal Premium

	Formal Insurance Premium				
	1	2	3	4	5
Demographics					
Age	2.192*	1.886*	2.028	2.239*	2.238*
	(1.257)	(1.085)	(1.700)	(1.385)	(1.385)
Gender		−0.570		0.224	0.125
		(29.222)		(29.203)	(29.218)
Number of children	−12.931*	−13.083*	−9.120	−12.884*	−12.956*
	(7.492)	(7.608)	(7.377)	(7.578)	(7.587)
Physical health					
Self-reported health	40.772***	43.539***	39.116***	40.723***	40.752***
	(14.143)	(15.226)	(15.173)	(14.469)	(14.474)
Number of limitations with ADL		11.969	9.388		
		(17.892)	(17.766)		
Number of limitations with IADL		−0.445	4.157		
		(19.858)	(19.949)		
Occupational status					
Employed in a 24+ employees firm			32.636		
			(29.987)		
Self-employed			−21.416		
			(31.759)		
Civil servant			250.213***		
			(65.711)		
Economic and financial status					
Consumption of nondurables	−1.433***	−1.441***	−1.488***	−1.435***	−1.434***
	(0.352)	(0.354)	(0.368)	(0.351)	(0.357)
Total net wealth	0.102***	0.102***	0.102***	0.102***	0.085**
	(0.037)	(0.037)	(0.037)	(0.037)	(0.043)
Total income				0.045	0.046
				(0.088)	(0.089)
House ownership					0.025
					(0.071)
Observations	804	804	804	804	804

Notes: All specifications are OLS models. Standard errors (robust) are in parentheses below estimated parameters. ***p-value < 0.01, ** p-value < 0.05, * p-value < 0.1.

oldest group (95+) is assumed to be the lowest and was proxied by their observed health expenditure per person when available. For France, Germany, Italy, Spain, and Netherlands, where expenditure data for the oldest group were not available, the cost of people aged 75–79 was taken as a proxy. In fact, when available, expenditure at age 95+ is roughly equal to the level of expenditure at age 75–79. For the countries with no data available, the cost of death for the oldest group was estimated by taking three times the average health expenditure per capita, adjusted by the country-specific residual (Bjornerud et al. 2005; OECD 2006).

Country estimated	Benchmark countries
Belgium	Netherlands
Denmark	Average (Norway, Sweden)
France	Germany
Greece	Spain
Italy	Average (Germany, Spain)
Switzerland	Germany

B. Comment on Preferences Estimates

To my knowledge, this is the first study that estimates some of the key parameters of the lifecycle model for Europe. First, note that there is substantial heterogeneity in the estimated discount factor and risk aversion parameters across models. These heterogeneous preferences play a significant role in explaining the large wealth dispersion observed in the data, even for individuals with similar health histories. For instance, the discount factor varies quite a lot with wealth and region: Scandinavians have the highest discount factor, whereas across all regions the poor discount the future less than do the rich. As a result, the rich (and Scandinavians) will decumulate their wealth at a smaller rate than do the poor, which is consistent with the data. In valuing the future, however, one must also consider the interaction between the discount factor and survival probability.

Standard values for consumption relative risk aversion are generally between 1 and 6. The results show values between roughly 2.9 and 5.8 for the Mediterranean countries, 4.0 and 5.5 in Central Europe, and between 3.4 and 4.7 for Scandinavia. These high values are likely to reflect the relationship between risk-aversion, age, and wealth: Ceteris paribus, risk aversion increases with age and decreases with wealth (Riley and Chow 1992; Morin and Suarez 1983). Consistently, rich Scandinavians are less risk-averse than are both Central Europeans and Mediterraneans in the top wealth quartile. Also, within each region, the poor are generally more risk-averse than are the rich. The exception is Scandinavian countries, where the poor are less risk-averse. Interestingly, they also benefit more from additional social support programs and thus need to save less for consumption.

The opposite applies for medical consumption: The rich appear to be more risk-averse than the low-wealth individuals. Given the public health programs in place, the basic health care spending associated severe health shocks, even if substantial, is extensively covered. This is not the case with the additional services (that is, specialist visits, alternative medicine, choice of better or faster inpatient care) mainly demanded by the rich. Across Europe, however, Scandinavians have the widest public coverage and, as expected, also a lower risk-aversion coefficient (1.57) than Mediterraneans (1.88) and Central Europeans (1.93).

C. Tables

Table A6
Estimated Moments and Goodness of Fit Test – Mediterranean Countries

	< 1st Quartile		1st–3rd Quartile		> 3rd Quartile		Sample Mean	
Moments	Artificial	Empirical	Artificial	Empirical	Artificial	Empirical	Artificial	Empirical
$\bar{a}$	0.50	0.39	0.98	0.95	4.22	3.38	2.24	1.45
$\bar{C}$	0.09	0.11	0.08	0.12	0.15	0.15	0.34	0.12
$\bar{F}$	0.27	0.21	0.27	0.23	0.27	0.26	0.06	0.17
$\overline{C\ /\ a}$	0.18	0.28	0.09	0.15	0.16	0.22	0.35	.20
$\sigma ln(a)$	0.31	0.25	0.31	0.39	0.30	0.53	0.31	0.40
$\sigma ln(C)$	0.38	0.28	0.25	0.26	0.24	0.34	0.22	0.29
$\sigma ln(F)$	0.35	0.22	0.35	0.22	0.34	0.24	0.38	0.28
$\sigma ln(C/a)$	0.16	0.05	0.13	0.19	0.12	0.27	0.16	0.18
$corr(a, C)$	0.85	0.97	0.88	0.89	0.94	0.90	0.88	0.89
$corr(a, F)$	0.99	0.90	0.99	0.64	0.99	0.71	0.49	0.29
$corr(a, (C/a))$	0.09	0.30	–0.74	–0.87	–0.75	–0.86	–0.79	–0.80
$corr(C, F)$	0.89	0.82	0.88	0.85	0.93	0.86	0.37	0.65
$corr(C, C/a)$	0.58	0.50	–0.36	–0.59	–0.51	–0.59	–0.44	–0.46
$corr(F, C/a)$	0.15	0.03	–0.74	–0.31	–0.72	–0.38	–0.52	0.24
$corr(a_{t,t-1})$	0.77	0.90	0.86	0.95	0.85	0.97	0.79	0.97
$corr(C_{t,t-1})$	0.91	0.90	0.88	0.91	0.84	0.95	0.73	0.95
$corr(F_{t,t-1})$	0.82	0.88	0.85	0.87	0.80	0.92	0.38	0.94
$corr((C/a)_{t,t-1})$	0.91	0.89	0.88	0.99	0.86	0.96	0.77	0.97
$\chi^2(3), p - value$	3.61	30.7%	8.77	3.2%	7.61	5.5%	24.55	$2*10^{-3}$%

Table A7
Estimated Moments and Goodness of Fit Test – Central European Countries

	< 1st Quartile		1st–3rd Quartile		> 3rd Quartile		Sample Mean	
Moments	Artificial	Empirical	Artificial	Empirical	Artificial	Empirical	Artificial	Empirical
$\bar{a}$	0.48	0.36	1.17	1.19	6.08	5.05	2.83	2.46
$\bar{C}$	0.06	0.13	0.26	0.22	0.15	0.22	0.12	0.20
$\bar{F}$	0.28	0.32	0.28	0.35	0.42	0.55	0.27	0.40
$\overline{C/a}$	0.13	0.36	0.31	0.25	0.18	0.39	0.16	0.39
$\sigma ln(a)$	0.31	0.27	0.30	0.32	0.27	0.36	0.23	0.26
$\sigma ln(C)$	0.34	0.29	0.29	0.28	0.28	0.34	0.27	0.29
$\sigma ln(F)$	0.35	0.35	0.35	0.23	0.38	0.31	0.43	0.28
$\sigma ln(C/a)$	0.08	0.06	0.09	0.13	0.20	0.23	0.22	0.19
$corr(a, C)$	0.96	0.97	0.96	0.87	0.70	0.69	0.56	0.68
$corr(a, F)$	0.99	0.84	0.99	0.57	0.76	0.32	0.60	0.44
$corr(a, (C/a))$	0.20	0.20	–0.30	–0.55	–0.39	–0.51	–0.34	–0.33
$corr(C, F)$	0.96	0.85	0.97	0.77	0.80	0.67	0.88	0.84
$corr(C, C/a)$	0.46	0.44	–0.06	–0.09	0.34	0.27	0.58	0.46
$corr(F, C/a)$	0.23	0.29	–0.25	0.09	0.07	0.38	0.44	0.55
$corr(a_{t,t-1})$	0.83	0.92	0.87	0.93	0.84	0.95	0.89	0.93
$corr(C_{t,t-1})$	0.90	0.93	0.86	0.92	0.86	0.93	0.92	0.91
$corr(F_{t,t-1})$	0.81	0.91	0.82	0.81	0.72	0.89	0.91	0.88
$corr((C/a)_{t,t-1})$	0.77	0.94	0.73	0.94	0.79	0.96	0.87	0.96
$\chi^2(3), p-value$	3.39	33.5%	9.82	2.0%	9.69	2.1%	3.66	30.0%

Table A8
Estimated Moments and Goodness of Fit Test – Scandinavian Countries

	< 1st Quartile		1st–3rd Quartile		> 3rd Quartile		Sample Mean	
Moments	Artificial	Empirical	Artificial	Empirical	Artificial	Empirical	Artificial	Empirical
$\bar{a}$	1.01	0.72	1.62	1.29	7.54	6.92	4.17	2.61
$\bar{C}$	0.65	0.55	0.48	0.60	0.68	0.76	0.74	0.67
$\bar{F}$	0.26	0.18	0.26	0.19	0.22	0.23	0.28	0.20
$\overline{C / a}$	0.23	0.26	0.15	0.14	0.17	0.26	0.20	0.28
$\sigma In(a)$	0.28	0.25	0.32	0.26	0.30	0.39	0.26	0.31
$\sigma In(C)$	0.30	0.24	0.31	0.24	0.21	0.27	0.22	0.24
$\sigma In(F)$	0.48	0.26	0.42	0.18	0.50	0.23	0.34	0.19
$\sigma In(C/a)$	0.13	0.02	0.16	0.06	0.25	0.34	0.19	0.24
$corr(a, C)$	0.90	0.99	0.85	0.96	0.47	0.41	0.72	0.56
$corr(a, F)$	0.97	0.74	0.97	0.49	0.96	0.93	0.95	0.71
$corr(a, (C/a))$	–0.19	–0.32	–0.44	–0.47	–0.78	–0.76	–0.65	–0.70
$corr(C, F)$	0.93	0.78	0.85	0.64	0.63	0.68	0.81	0.82
$corr(C, C/a)$	0.23	–0.24	0.06	–0.20	0.13	0.16	0.03	0.12
$corr(F, C/a)$	–0.02	0.18	–0.33	0.30	–0.66	–0.56	–0.49	–0.26
$corr(a_{t,t-1})$	0.89	0.82	0.83	0.88	0.79	0.89	0.86	0.87
$corr(C_{t,t-1})$	0.90	0.80	0.88	0.84	0.85	0.85	0.94	0.84
$corr(F_{t,t-1})$	0.86	0.85	0.74	0.77	0.86	0.86	0.88	0.78
$corr((C/a)_{t,t-1})$	0.85	0.91	0.83	0.95	0.91	0.88	0.81	0.89
$\chi^2(3), p - value$	9.64	2.2%	15.55	0.14%	2.91	40.6%	4.84	18.4%

References

Alessie, Rob J.M., Viola Angelini, and Giacomo Pasini. 2011. "Is it True Love? Altruism Versus Exchange in Time and Money Transfers." Netspar Working Paper 02/2011–012.

Ameriks, John, Andrew Caplin, Steven Laufer, and Stijn Van Nieuwerburgh. 2005. "Strategic Surveys and the Bequest Motive." Paper presented at the 2006 Annual Meeting of the American Economic Association. Boston.

Avendano, Mauricio, Arja R. Aro, Johan Mackenbach, and Karen A. Ranberg. 2005. "Physical Health" In *First Results from the Survey of Health, Ageing and Retirement in Europe*, ed. Borsch-Supan, Brugiviani, Jurges, Mackenbach, Siegrist, Weber. Mannheim: Research Institute for the Economics of Aging.

Avendano, Mauricio, Hendrik Jurges, and Johan.P. Mackenbach. 2009. "Educational Level and Changes in Health Across Europe: Longitudinal Results From SHARE." *Journal of European Social Policy* 19(4):301–16.

Banks, James, Richard Blundell, and Sarah Tanner. 1998. "Is There a Retirement-Savings Puzzle?" *American Economic Review* 88(4):769–88.

Bernhein, Douglas B., Andrei Shleifer, and Lawrence H. Summers. 1985. "The Strategic Bequest Motive." *Journal of Political Economy* 93:1045–76.

Bjornerud, Simen, and Joaquim Oliveira Martins. 2005. "Disentangling Demographic and Non-demographic Drivers of Health Spending: A Possible Methodology and Data Requirements." OECD Economics Department, Presented at the Joint EC/OECD Workshop 2005.

Bolin, Kristian, Bjorn Lindgren, and Peter Lundborg. 2008. "Informal and Formal Care Among Single-Living Elderly in Europe." *Health Economics* 17 3:393–409.

Bonsang, Eric. 2007. "How Do Middle-Aged Children Allocate Time and Money Transfers to Their Older Parents in Europe?" *Empirica* 34:171–88.

——. 2009. "Does Informal Care from Children to Their Elderly Parents Substitute for Formal Care in Europe?" *Journal of Health Economics* 28:143–54.

Brodsky, J., J. Habib, and M. Hirschfield, eds. 2003. "Key Policy Issues in Long-Term Care." Geneva: World Health Organization.

Brown, Robert J., and Amy Finkelstein. 2008. "The Interaction of Public and Private Insurance, Medicaid and the Long Term Care Insurance Market." *American Economic Review* 98:1083–102.

Browning, Martin, Thomas F. Crossley, and Guglielmo Weber. 2003. "Asking Consumption Questions in General Purpose Surveys." *Economic Journal* 113:F540–67.

Byrne, David, Michelle S. Goeree, Bridget Hiedemann, and Steven Stern. 2009. "Formal Home, Informal Care and Family Decision Making." *International Economic Review* 50:1205–42.

Cagetti, Marco. 2003. "Wealth Accumulation Over the Life Cycle and Precautionary Savings." *Journal of Business and Economic Statistics* 21(3):339–53.

CEA EIRF. 2010. "CEA Statistics No. 41: The European Health Insurance Market in 2008." CEA European Insurance and Reinsurance Federation, http://www.cea.eu/index.php?page=health-2.

Chiuri, Concetta M., and Tullio Jappelli. 2010. "Do the Elderly Reduce Housing Equity? An International Comparison." *Journal of Population Economics* 23(2):643–63.

Colombo, Francesca, and Nicole Tapay. 2004. "Private Health Insurance in OECD Countries: The Benefits and Costs for Individuals and Health Systems." OECD Health Working Paper 15.

Comino, Stefano. 2003. "Analisi di Casi Esteri di Assicurazione Sanitaria Complementare: Un Quadro Comparativo." In *I Fondi Sanitari Integrativi: Quale Futuro per la Sanita' Italiana?*, ed. Milano Franco Angeli, Chapter 2. Milan: Nomisma/CRIEP.

De Luca, Giuseppe, and Franco Peracchi. 2005. "Survey Participation in the First Wave of SHARE." In *Health, Ageing and Retirement in Europe: First Results from the Survey of*

Health, Ageing and Retirement in Europe, ed. Axel Borsch-Supan, Agar Brugiavini, Hendrik Jurges, Johan Mackenbach, Johannes Siegrist, and Guglielmo Weber, 355. Mannheim: Mannheim Research Institute for the Economics of Aging.

De Nardi, Mariacristina, Eric French, and John B. Jones. 2010. "Why do the Elderly Save? The Role of Medical Expenses." *Journal of Political Economy* 118(1):39–75.

Dobrescu, Loretti I., and Fedor Iskhakov. 2014. "Bequest Motives in a Life-Cycle Model with Intergenerational Interactions." CEPAR Working Paper.

Dynan, Karen, Jonathan Skinner, and Stephen P. Zeldes. 2002. "The Importance of Bequests and Life-Cycle Saving in Capital Accumulation: A New Answer." *AER Papers and Proceedings* 2:274–78.

——. 2004. "Do the Rich Save More?" *Journal of Political Economy* 112(2):397–444.

Esping-Andersen, Gosta. 1999. *Social Foundations of Postindustrial Economies*. Oxford: Oxford University Press.

Freeman, Richard. 2000. *The Politics of Health in Europe*. Manchester: Manchester University Press.

Eurostat. 2012. "Self-Perceived Health by Sex, Age and Activity Status (%)." http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database.

French, Eric, and John B. Jones. 2011. "The Effects of Health Insurance and Self-Insurance on Retirement Behavior." *Econometrica* 79:693–732.

Gourinchas, Pierre-Olivier, and Jonathan A. Parker. 2002. "Consumption Over the Life Cycle." *Econometrica* 70(1):47–89.

Guariglia, Alessandra, and Mariacristina Rossi. 2004. "Private Medical Insurance and Saving: Evidence from the British Household Panel Survey." *Journal of Health Economics* 23(4):761–83.

Gullestad, Marianne, and Martine Segalen, ed.. 1997. *Family and Kinship in Europe*. UK: Pinter Publishing.

Hank, Karsten. 2007. "Proximity and Contacts Between Older Parents and Their Children: An European Comparison." *Journal of Marriage and Family* 69:157–73.

Hill, Harvey D., and Robert J. Willis. 2001. "Reducing Panel Attrition: A Search for Effective Policy Instruments." *Journal of Human Resources* 36(3):416–38.

Holly, Alberto, Karine Lamiraud, Helene Chevrou-Severac, and Tarik Yalcin. 2005. "Out-of-Pocket Payments for Health Care Expenditures." In *Health, Ageing and Retirement in Europe: First Results from the Survey of Health, Ageing and Retirement in Europe*, ed. Axel Borsch-Supan, Agar Brugiavini, Hendrik Jurges, Johan Mackenbach, Johannes Siegrist, and Guglielmo Weber, 126–32. Mannheim: Mannheim Research Institute for the Economics of Aging.

Hubbard, Robert G., Jonathan Skinner, and Stephen P. Zeldes. 1994. "The Importance of Precautionary Motives in Explaining Individual and Aggregate Saving." Carnegie-Rochester Conference Series on Public Policy 40:59–125.

——. 1995. "Precautionary Saving and Social Insurance." *Journal of Political Economy* 103(2).

Huisman, Martijn, Anton E. Kunst, Matthias Bopp, Jens K. Borgan, Carmen Borrell, Giuseppe Costa, Patrick Deboosere, Sylvie Gadeyne, Myer Glickman, Chiara Marinacci, Christoph Minder, Enrique Regidor, Tapani Valkonen, and Johan Mackenbach, 2005. "Educational Inequalities in Cause-Specific Mortality in Middle-Aged and Older Men and Women in Eight Western European Populations." *Lancet* 365:493–500.

Kohli, Martin, Harald Kunemund, and Jorg Ludicke. 2005. "Family Structure, Proximity and Contact." In *Health, Ageing and Retirement in Europe: First Results from the Survey of Health, Ageing and Retirement in Europe*, ed. Axel Borsch-Supan, Agar Brugiavini, Hendrik Jurges, Johan Mackenbach, Johannes Siegrist, and Guglielmo Weber, 164–70. Mannheim: Mannheim Research Institute for the Economics of Aging.

Kotlikoff, Laurence J., and Lawrence H. Summers. 1981. "The Role of Intergenerational Transfers in Aggregate Capital Accumulation." *Journal of Political Economy* 59(4):706–32.
Morin, Roger A., and Antonio F. Suarez. 1983. "Risk Aversion Revisited." *Journal of Finance* 38(4):1201–16.
Newey, Whitney K., and Kenneth D. West. 1994. "Automatic Lag Selection in Covariance Matrix Estimation." *Review of Economic Studies* 61(4):631–53.
OECD. 2006. "Health Spending and Resources." in OECD in Figures 2006–2007, http://dx.doi.org/10.1787/427077022807.
———. 2008. OECD Health Data 2008, http://www.oecd.org/document/ 27/0,3343,en_2649_34631_40902299_1_1_1_1,00.html.
OECD Statistics. 2010. Key Economic Indicators. OECD.Stat extracts. Organization for Economic Cooperation and Development 2010, http://stats.oecd.org.
Paccagnella, Omar, Vicenzo Rebba, and Guglielmo Weber. 2008. "Voluntary Private Health Care Insurance Among the Over Fifties in Europe: A Comparative Analysis of SHARE Data." University of Padua, "Marco Fanno" Working Paper 86.
Palumbo, Michael G. 1999. "Uncertain Medical Expenses and Precautionary Saving Near the End of the Life Cycle." *Review of Economic Studies* 66:395–421.
Reher, Sven D. 1998. "Family Ties in Western Europe: Persistent Contrasts." *Population and Development Review* 24(2):203–34.
Rendtel, Ulrich. 2002. "Attrition in Household Panels: A Survey." CHINTEX Working Paper Number 4.
Riley, William B., and Kenneth V. Chow. 1992. "Asset Allocation and Individual Risk Aversion." *Financial Analysts Journal* 48:32–37.
Schroder, Mathis. 2008. "Attrition." In *First Results from the Survey of Health, Ageing and Retirement in Europe (2004–2007): Starting the Longitudinal Dimension*, ed. Axel Borsch-Supan, Agar Brugiavini, Hendrik Jurges, Johan Mackenbach, Johannes Siegrist, and Guglielmo Weber, 327–32. Mannheim: Mannheim Research Institute for the Economics of Aging.
Starr-McCluer, Martha. 1996. "Health Insurance and Precautionary Savings." *American Economic Review* 86(1):285–95.
Thomson, Sarah, and Elias Mossialos. 2009. "Private Health Insurance in the European Union." Final report for the European Commission, Directorate General for Employment, Social Affairs and Equal Opportunities, London School of Economics and Political Science.
Venti, Steven F., and David A. Wise. 2004. "Aging and Housing Equity: Another Look." In *Perspectives on the Economics of Aging*, ed. D.A. Wise, 127–75. Chicago: University of Chicago Press.
Westerhout, Ed, and Frank Pellikaan. 2005. "Can We Afford to Live Longer in Better Health?" CPB Bureau for Economic Policy Analysis Netherlands Document Number 85.