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PANEL PAPERS

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Netspar Network for Studies on Pensions, Aging and Retirement

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PREFACE

Netspar stimulates debate and fundamental research in the field of pensions, aging and retirement. The aging of the population is front-page news, as many baby boomers are now moving into retirement. More generally, people live longer and in better health while at the same time families choose to have fewer children. Although the aging of the population often gets negative attention, with bleak pictures painted of the doubling of the ratio of the number of people aged 65 and older to the number of the working population during the next decades, it must, at the same time, be a boon to society that so many people are living longer and healthier lives. Can the falling number of working young afford to pay the pensions for a growing number of pensioners? Do people have to work a longer working week and postpone retirement? Or should the pensions be cut or the premiums paid by the working population be raised to afford social security for a growing group of pensioners? Should people be encouraged to take more responsibility for their own pension? What is the changing role of employers associations and trade unions in the organization of pensions? Can and are people prepared to undertake investment for their own pension, or are they happy to leave this to the pension funds? Who takes responsibility for the pension funds? How can a transparent and level playing field for pension funds and insurance companies be ensured? How should an acceptable trade-off be struck between social goals such as solidarity between young and old, or rich and poor, and individual freedom? But most important of all: how can the

benefits of living longer and healthier be harnessed for a happier and more prosperous society?

The Netspar Panel Papers aim to meet the demand for understanding the ever-expanding academic literature on the consequences of aging populations. They also aim to help give a better scientific underpinning of policy advice. They attempt to provide a survey of the latest and most relevant research, try to explain this in a non-technical manner and outline the implications for policy questions faced by Netspar's partners. Let there be no mistake. In many ways, formulating such a position paper is a tougher task than writing an academic paper or an op-ed piece. The authors have benefitted from the comments of the Editorial Board on various drafts and also from the discussions during the presentation of their paper at a Netspar Panel Meeting.

I hope the result helps reaching Netspar's aim to stimulate social innovation in addressing the challenges and opportunities raised by aging in an efficient and equitable manner and in an international setting.

Roel Beetsma
Chairman of the Netspar Editorial Board

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ASSET ACCUMULATION AND DECUMULATION OVER THE LIFE CYCLE

Abstract

We review the literature on the role of financial literacy in planning wealth patterns over the life cycle. We initially look at the first stage of the life cycle, when individuals are active in the labor market and wealth increases over age, and we focus on the role of financial literacy in fostering wealth accumulation. Financial literacy also matters in portfolio composition efficiency. A subtopic that we also explore is whether financial literacy can help individuals better plan asset depletion in the last part of their life cycle. We emphasize housing, since the majority of household wealth is tied to housing assets.

Policy implications

Financial illiteracy is often identified as one of the key elements which must be tackled to prevent bad financial planning from leading to low pension wealth. Making households better equipped to comprehend financial tools lowers the risk of unpreparedness for retirement. Financial vulnerability is, in other words, associated with lack of financial literacy (Lusardi, 2011). Financially more literate households are better investors and better planners, reaching higher levels of wealth. Providing households with adequate financial knowledge will generate positive spill−over effects. In this vein, many courses on financial literacy have been introduced in American schools, to provide the minimum financial tools necessary for better wealth accumulation planning. From a policy standpoint, raising the level of financial knowledge and, more importantly, informing people about the portfolio diversification 'safety' rule would increase the ability to invest better and to increase household wealth more effectively.

We add policy implications to the lifecycle perspective: while portfolio diversification and asset accumulation are important during working life, people should also receive advice on efficient use of their accumulated wealth. The decumulation phase has been largely absent from the picture so far. Indeed, with an ageing population and increased longevity, the non−working phase of the life cycle can span a large number of years. Many workers enter retirement knowing their pension income but little more. Around the time of retirement, we claim, households should be informed about the possible strategies they could rely upon to increase their pension income by drawing from their accumulated asset.

Asset-efficient decumulation might guarantee a substantial flow of income, which has become crucial nowadays in Western countries, with public pensions shrinking steadily. Public pension provisions are becoming progressively less generous in most developed countries as a consequence of ageing populations, which strain the sustainability of public systems. As individuals are increasingly asked to provide for their own maintenance in old age, concerns about the adequacy of their accumulated wealth and their ability to make sophisticated financial choices have been raised. Not only do financial products require considerable financial knowledge; adequate financial knowledge might also improve portfolio performance and equip individuals with a buffer stock of wealth at retirement. While financial literacy is generally very scarce, especially among certain categories of the population, it has been found that financially literate individuals tend to accumulate more wealth and also to hold a more efficient portfolio. Greater financial knowledge might thus reduce the risk that households are left without sufficient resources upon retirement.

The decumulation phase after retirement has attracted far less attention in the literature until now than other phases. One exception is a work in progress by Romiti and Rossi (2012), which stresses how more effective use of personal wealth determines a higher welfare level for the elderly: it is therefore of crucial relevance to understand how people plan their decumulation phase. We expect that financial literacy enables households to have a deeper understanding of complex financial products such as reverse mortgages. In this way, they will be more aware of the options available to better utilize their assets.

Overall, our main policy implication is that individuals should be assisted in their financial knowledge both during and after

their working life. Improving financial literacy levels among the population, particularly for those groups which display low literacy levels (such as women, the young, and the elderly), would encourage them to accumulate more and more efficiently, as summarized in Box 1. When retirement approaches, workers should be provided with advice on how to raise their pension income by drawing on their assets (including the home they live in). Retirement advice is necessary given the complexity of the products and the consequences of subscription to products such as reverse mortgages, as the subscriber has to clearly understand the mechanics of the product and its cost.

Improving financial literacy during the *accumulation phase* would enhance planning for retirement and lead to increased accumulation of wealth and its more efficient allocation. As some groups of the population are less financially literate than others, targeting those groups, such as women or the young, also implies designing policies that are appropriate to the scope of the issue, for example introducing financial literacy programs in schools. In addition, policies aimed at improving the functioning of the financial advice market – especially in terms of trustworthiness and the comprehensiveness of information – would also help individuals to manage their lifecycle savings more efficiently.

Most recent studies highlight the factors that serve to enhance financial literacy. In particular, this research shows that the level of financial literacy acquired at an early stage of the life cycle is a major determinant for the subsequent acquisition of financial knowledge. This finding further emphasizes the importance of the educational system: providing financial education in school would lead to greater understanding and consequently enhance the level of financial knowledge and wealth accumulation.

As far as the *decumulation phase* is concerned, from a policy standpoint, efficient use of assets is of paramount importance. If assets are privately held, their misuse has important consequences at the social level. While ownership is very much emphasized at policy level, there is no information on how housing wealth can be drawn upon in old age. At retirement, households have to cope with a lower income and, sometimes simultaneously, a substantial amount of wealth. While it is important that households become financially literate and are thus able to accumulate wealth efficiently, the same holds for the later stages of the life cycle. How can the assets of the elderly be used more efficiently? An advisory institution could provide a set of alternatives based on household preferences. For example, optimal decumulation and investment policies could be articulated, taking account of the desire to bequeath or the willingness to help offspring with school fees or with cash installments to help start a business or provide a start on the homeownership ladder.

Raising the level of financial literacy after retirement might increase the likelihood of efficient decumulation patterns and better balanced portfolios. In addition, more effort should be made to design and explain decumulation-friendly products such as reverse mortgages. Conversely, the supply of such products is very thin, if existent at all. Targeting the young and women in general, groups that display low financial literacy levels, would help them make smart life-cycle saving decisions and prepare for retirement. Targeting the elderly, on the other hand, would help them use their accumulated assets more efficiently in the decumulation phase after retirement.

Improving financial literacy at a young age has two objectives. First, it fosters the accumulation process so as to equip households

Box 1 – Summary of policy interventions

Life cycle phase	Objective	Instruments	Implementation
Accumulation phase	Increase wealth accumulation and financial return	Financial courses	Courses at school or work on financial tools
Decumulation phase	Reduce vulnerability of the elderly to out–of–balance portfolio	Teaching basic financial knowledge

Counseling and advice | Agency at retirement to illustrate options for decumulation

Retirement planning advice agency |

with sufficient retirement wealth. Second, it improves the awareness of households on how to efficiently decumulate wealth after retirement.

After retirement, we think advice is crucial to prevent vulnerability of the elderly. All aspects of decumulation products must be understood. That calls for transparent and clear information, as well as for advice on the various products.

1. Introduction

Economic theory predicts how the wealth of an individual should evolve over time, at least theoretically. According to Modigliani's Life Cycle and Friedman's Permanent Income Hypothesis (LCPIH), individuals aim to accomplish consumption smoothing irrespective of whether their income fluctuates. To achieve this goal they borrow when young, save when middle-aged, and dissave when old. Different stages in life are therefore characterized by different saving and dissaving patterns, depending on whether current income is higher or lower than permanent income. Public pension provision clearly has an important effect on the decisions of individuals, affecting the saving-for-retirement motive.

Concerns about the adequacy of the wealth accumulated by individuals have been raised as public pension provisions become less generous, especially in countries where population ageing is particularly pronounced. In most developed countries, individuals are increasingly required to take direct responsibility for their retirement savings and to be able to make sophisticated financial choices. Recent studies linking the financial knowledge of individuals to retirement preparedness and wealth accumulation highlight that a large percentage of the population is financially illiterate, and that financial knowledge is positively related to wealth accumulation.

When it comes to the later part of the life cycle, the rate of wealth decumulation of elderly people actually appears to be slower than LCPIH predicts (Lydall, 1955; Ando, Guiso and Terlizzese, 1993), as particularly reflected in the consumption drop which typically occurs at retirement (Borella, Coda Moscarola and Rossi, 2011). The precautionary saving motive, which arises from

uncertainty regarding future health and life expectancy, plus the desire to leave part of one's assets as a bequest, are the main explanations put forward for the sluggishness of draw-down rates.

The main purpose of this paper is to analyse the role of financial literacy over the entire life cycle. In particular, we expect financial literacy to have a specular role, as it can contribute towards more efficient wealth accumulation during the working years and better shape decumulation during the retirement years. Our aim is to review the existing studies, focusing on the accumulation and decumulation phases, in order to understand what policies may be implemented to help individuals make sound savings decisions and manage their resources over the life cycle.

Financial literacy has been advocated as one of the main factors that affect savings and portfolio decisions (Van Rooij, Lusardi and Alessie, 2012) and that enhance home-ownership (Lusardi and Mitchell, 2007a), as people who are better educated have been found to be more likely to climb the home-ownership ladder.

Financially literate individuals might also make more efficient portfolio choices and therefore get higher returns from their savings and accumulate more wealth. Indeed, Lusardi and Mitchell (2007a, 2007b) found that financial literacy is associated with better planning for retirement and with higher levels of wealth at the time of retirement. We review the literature on this theme for the US and for several European countries.

While we acknowledge that investing in financial literacy is a strong channel to prevent complete passivity and incautious choices, we are aware, as recently pointed out by Willis (2011), that financial literacy is not a panacea. Investing in financial literacy comes at a cost, and a serious cost-benefit analysis could reveal that some other investment might be more efficient (such

as mandatory access to certified advice for financial product subscription). Willis (2011) argues that financial literacy courses might generate a loss of control as people are expected to be open about their financial situation. Moreover, Willis argues, in order to make these courses effective, they should be tailored at the personal level since individuals differ in their risk preference, loss aversion, and preferences in general.

As to the later stage of the life cycle, much less research has been done so far. One exception is a work in progress by Romiti and Rossi (2012), which stresses how more effective use of personal wealth determines higher welfare levels for the elderly: it is therefore crucial to understand how people plan their decumulation phase. We expect that financial literacy enables households to gain a deeper knowledge and understanding of complex financial products such as reverse mortgages. In this way, they become more aware of the options available to make better use of their assets.

We also review the existing literature on home-ownership change after retirement, particularly how it is linked to financial knowledge and to what extent private wealth decumulation takes place at this stage (Van der Schors et al., 2007; Chiuri Jappelli, 2010). On the other hand, some countries may already have excessive annuitization of wealth (e.g. Brown and Nijman, 2011). In general, however, it appears that the use of public money through increase of public pension benefits could be reduced if private wealth were used more efficiently.

Our analysis leads us to conclude that the main policy conclusion we can draw is the need to improve financial literacy levels among the population, targeting in particular those groups which display low literacy levels, such as women, the young, and the elderly. We believe that financial literacy, as well as

advice on financial products and planning, plays a crucial role in the decumulation phase, by making people conscious of the potential income they could generate from efficient use of their wealth. Indeed, research has found that financial illiteracy is quite widespread, particularly for some groups of the population, and that more financially literate individuals (typically white males aged 25–65 years) make smarter savings and portfolio choices during all stages of the life cycle.

The rest of this paper is structured as follows. In Section 2 we review the basic literature on savings and life–cycle wealth accumulation and the related empirical evidence, while in Section 3 we provide some empirical evidence on wealth profiles in Europe, using the SHARE data set. In Section 4 we review the literature on the link between financial literacy and wealth accumulation during the first part of the life cycle, with Section 4.1 concentrating on the more recent literature that is aimed to capture the causal link between financial literacy and wealth accumulation. Section 5 concentrates on the link between financial literacy and decumulation of wealth after retirement, with Section 5.1 especially considering housing wealth. Section 6 concludes the paper.

2. Household savings over the life cycle: An overview

While households have various reasons for saving (as originally listed by Keynes, 1936, and reported by Browning and Lusardi, 1996), the main motive is prompted by a desire to smooth the marginal utility of consumption over the life cycle so as to be able to meet anticipated as well as unforeseen circumstances. Saving for expected events, such as a reduction in income in old age, is known as life-cycle saving, which was emphasized and modelled by Modigliani (1986) with a simple version of the life cycle model capable of capturing wealth accumulation for old age. Saving for unexpected events, or precautionary saving, was first modelled by Kimball (1990) and Caballero (1990), who showed how, under more realistic utility functions, a mean-preserving increase in uncertainty reduces current consumption, thereby increasing savings.

Following these seminal works, the theoretical model that serves as a basis for the analysis of household savings is an intertemporal optimization model for consumption, which has proven to be a good characterization of consumer behavior over the life cycle (for a review see Attanasio, 1999). In this model the individual (or household) chooses how much to consume in each period, and savings are defined in a residual way. If labor income is earned at younger ages, then wealth is accumulated to smooth the marginal utility of consumption at retirement. Public pension provision clearly affects the decision to accumulate wealth for old age, and public pension wealth can substitute for private wealth, an idea that dates back to Feldstein (1974).

Another important reason for accumulation of wealth is, as already mentioned, the precautionary motive, which follows from the desire of households to self-insure against various risks,

such as unemployment, health, and longevity risks. Many other motives for savings, most notably the desire to bequeath wealth to descendants, can be easily accommodated into a flexible intertemporal optimization model.

The basic theory thus assumes that individuals are able to predict the future, plan their savings, and generally make complex financial decisions. We review empirical evidence on wealth accumulation in Section 2.2, after covering the basic definitions of savings and wealth in Section 2.1. In practice, however, financial literacy levels are quite heterogeneous, with a portion of individuals lacking basic financial knowledge. Recent research on financial literacy attempts to determine the consequences of a low level of financial literacy on the behavior of individuals and to uncover the reasons why some individuals do not engage in financial education. After examining empirical evidence on financial literacy and wealth profiles over the life cycle in Section 3, we review in subsequent sections the literature to determine the effects of financial education on wealth accumulation and decumulation.

2.1 Savings and wealth

Household wealth and, consequently, savings can be defined in various ways. Here we sketch the main issues involved in defining wealth, as highlighted by Brugiavini and Weber (2003). We start by defining the evolution of *At+1* over time, the sum of real and financial wealth at time *t* + 1, as

$$A_{t+1} = (1+r_t)A_t + y_t + b_t - \tau_t - c_t \tag{1}$$

where r_t is the real interest rate at time t, y_t is labor income net of tax, b_t is social security benefits, τ_t is social security contributions,

and c_t is consumption. It is important to stress that A_{t+1} is implicitly defined as the sum of various assets, both financial and real, yielding interest at rate r_t, which is the weighted average of returns on single assets, with weights assigned to each asset share. To be more explicit, one can distinguish between real and financial wealth, in which case the budget constraint becomes

$$A_{t+1} = S_{t+1} + H_{t+1} = (1+r_{s,t})S_t + (1+r_{h,t})H_t + y_t + b_t - \tau_t - c_t \quad (2)$$

where S_{t+1} is the stock of financial wealth (e.g. shares) at time $t + 1$ and H_{t+1} is the stock of housing wealth, net of any mortgage debt, held by the household at time $t + 1$. The rate of return on non-housing wealth is $r_{s,t}$, while that on housing wealth is $r_{h,t}$, with the latter reflecting price changes net of capital depreciation.[1]

Using budget constraint (1) for simplicity purposes, discretionary savings D_t are defined as

$$D_t = A_{t+1} - A_t = y_t + r_t A_t + b_t - \tau_t - c_t \quad (3)$$

In other words, discretionary savings are the difference in financial and real wealth (A) between times $t + 1$ and t, equal to the sum of earned income y (labor income net of income tax), real interest (r_t) gained on wealth at time t, and social security benefits (b_t), minus social security contributions (τ_t) and consumption (c_t).

In the above definition of savings, social security contributions are treated as taxes and pension benefits as income. As Jappelli and Modigliani (1998) emphasize, this measure underestimates the amount of resources that households accumulate for retirement. An alternative definition of savings, then, takes social

1   If consumption is broadly defined to include imputed rent, then the return of housing equity includes its rental value as well.

security wealth into account. We define social security wealth (*SSW*) as

$$SSW_{t+1} = (1+\rho_T)SSW_t + \tau_t - b_t \tag{4}$$

where ρ_T is the internal rate of return of social security wealth for a household with a certain end of life at time *T*.

Adding up discretionary and social security wealth, we obtain total household wealth,

$$A_{t+1} + SSW_{t+1} = (1+r_t)A_t + (1+\rho_T)SSW_t + y_t - c_t \tag{5}$$

and total household savings are equal to the difference between the sum of discretionary wealth and mandatory social security wealth at times $t+1$ and time t :

$$A_{t+1} + SSW_{t+1} - A_t - SSW_t = y_t + r_t A_t + \rho_T SSW_t - c_t \tag{6}$$

This formula explicitly highlights the role of social security wealth on a household's total wealth and savings. Similarly, it would be possible to add private pensions and, in particular, occupational pensions, which in countries such as the United Kingdom and the Netherlands represent an important part of total household wealth.

It is clear from (5) or (6) that in an international comparison, institutional differences in public or private pension provisions are likely to matter greatly, since they can displace discretionary savings (Feldstein, 1974). Nonetheless, public or private pension wealth is rarely explicitly considered, given the measurement difficulty that it raises. In addition, it is important to note that pension wealth is usually not a substitute for discretionary wealth,

since households typically cannot borrow against future pension benefits at the rate ρ_T.

2.2 Empirical evidence

Various predictions of the life–cycle model have been extensively tested in the literature. Among the many aspects that have received research attention, the life–cycle wealth profile has attracted a considerable amount of attention, to determine whether and how much households prepare for retirement. The existence and scope of public pension systems have an obvious and direct influence on the amount of retirement savings undertaken by households, so that different pension systems, implemented by different countries but also faced by different generations within the same country, contribute to shaping the life–cycle wealth profile. Alessie, Angelini, and Van Santen (2011) studied the displacement effect of public pension wealth on private pension wealth, exploiting cross–country variations in Europe. Using the Survey of Health, Ageing and Retirement (SHARE), they found a displacement effect of about 50–60%, depending on the estimation method. Interestingly, they found a much higher displacement effect for highly educated households than for low–educated ones, a result they attribute to the higher financial literacy typical of individuals with high education, who are consequently more prone to think about and save for their retirement. This is discussed in detail in Section 4.

However, the wealth profile over the life cycle is influenced not only by retirement savings but also by precautionary and bequest savings. Uncertainty about income and other economic variables influence the amount of savings undertaken by households, especially during the active part of the life cycle, while uncertainty in health becomes increasingly important at older ages. In this

respect, in a recent paper Mastrogiacomo and Alessie (2011) used the DNB Household Survey (DHS) and found that the precautionary savings of Dutch households are substantial, accounting for about 30% of total savings. A desire to leave a bequest also influences the shape of the wealth profile. The issue of whether households accumulate sufficient wealth for retirement is highly debated and obviously very important, as the baby-boomer generation approaches retirement in both the United States and Europe. Warshawsky and Ameriks (2000) and Bernheim et al. (2000) provide evidence that US middle-class households save too little to sustain their living standards into retirement.[2] In particular, Warshawsky and Ameriks (2000) use a financial planning program to calculate how much households should save to maintain their living standards, with current wealth levels derived from the Survey of Consumer Finances (SCF). They find that about half of working middle-class American households will not have fully funded retirements.

Bernheim et al. (2000) used a new financial planning program to make similar calculations on the adequacy of wealth accumulation. They used data from the Health and Retirement Study ("HRS") and found that the saving rates required to sustain living standards should be quite high, with the exception of the poorest households. Similar conclusions were drawn by Moore and Mitchell (2000). These authors likewise used data from the HRS and determine the amount of wealth that households on the verge of retirement have, as well as how much they would need to save if they wish to preserve consumption levels after retirement. The authors' definition of wealth carefully includes social security

2   Note that this literature refers to 'living standards' and not to consumption, since the theory posits that households want to smooth the marginal utility of consumption and not consumption itself.

and pensions. They found great heterogeneity in wealth levels; nonetheless, the median household would still have to save an additional 16% of its income to smooth consumption after retirement.

The issue is, however, hotly debated, since Scholz, Seshadri, and Khitatrakun (2006) reached quite different conclusions from the abovementioned works. They used a realistic life-cycle model that includes uncertain lifetimes, uninsurable earnings and medical expenses, progressive taxation, government transfers, and pension and social security benefit functions derived from the American HRS data. The authors numerically solved the problem for each household and compare actual wealth holdings with projected optimal holdings. They found that 80% of households actually save enough for retirement, while 20% do not. In a more recent paper, Scholz and Seshadri (2008) extended their previous model and found that only 4% of households born before 1954 do not save enough to smooth consumption at retirement. However, they also find higher proportions of unprepared households among the younger generations.

This line of research is not, however, without criticism, since the intertemporal optimization model, although numerically solved, imposes a considerable structure, through the choice of the functional utility form and its parameters, which are not undisputed in the literature.

In Europe, evidence on adequate wealth accumulation for retirement is scantier and is mainly based on the adequacy of replacement rates, defined as ratios of resources available during retirement (social security benefits, pensions, and other income) to those available before retirement (labor income and

other income).[3] Concentrating our attention on works for the Netherlands, Binswanger and Schunk (2012) used measures of intertemporal and risk preferences based on survey questions that are explicitly framed in terms of retirement preparation. They used this survey information, collected for the United States and the Netherlands, to calculate adequate ratios of old-age to working-life consumption, as well as 'minimum absolute adequate consumption levels' during retirement, defined as the lower limits on old-age spending below which individuals do not want to fall. The authors found that for the United States, the minimum replacement rates range from 45% to 95%, depending on income quintile, with the lowest value applicable to the highest quintile. Interestingly, in the Netherlands the range is narrower, with values between 60% and 75%. The authors suggest that this result partly reflects the less unequal income distribution there.

Knoef et al. (2012) also studied adequacy in the Netherlands, comparing estimated income levels with different reference levels defined as adequate for retirement. The relative poverty measure they used is mainly the one applied by the European Union (60% of median equivalent income), but they also showed the results for a poverty line of 50% of median equivalent income. While their work is still preliminary, it is important since they explicitly consider housing wealth. Housing wealth is rather illiquid and, as we shall discuss in Section 5.1, reverse mortgages are seldom chosen to sustain consumption in old age. To give an indication of the importance of this wealth component, Knoef et al. (2012) compared replacement rates that take into account housing wealth with their analogues that exclude property. In particular, they computed the ratio of annuitized total wealth and current

3   See, for example, Borella and Fornero (2009), who study comprehensive replacement rates across Europe.

gross income: they found an overall median replacement rate of 94% when including housing wealth, and of 75% when excluding property from the calculation. They thus demonstrated that also in the Netherlands housing wealth is a major component of wealth.

Another strand of the literature takes a different perspective, testing whether households actually smooth consumption (or, better, its marginal utility) around the time of retirement. If households have prepared for retirement, having accumulated wealth while active, their standard of living should not be observed to drop upon retirement. Indeed, many empirical studies find a sizeable one-off reduction in consumption at retirement, which is hard to reconcile with the life-cycle model. For the United Kingdom, Banks, Blundell, and Tanner (1998) showed that consumption at retirement exhibits a substantial drop, which cannot be reconciled within the LCPIH unless retirement and the related income drop are unexpected. If retirement is an unforeseen event that causes an unexpected reduction in lifetime resources, then according to the theory, households should indeed react by modifying their consumption rule.

Following this work, many other empirical studies found evidence of the so-called consumption puzzle: Smith (2006) for the United Kingdom; Haider and Stephens (2007), Hurd and Rohwedder (2005) and Aguiar and Hurst (2005a, 2005b, 2008) for the United States; and Battistin et al. (2009), Miniaci, Monfardini, and Weber (2010), and more recently Borella, Coda Moscarola, and Rossi (2011) for Italy, just to name a few. Explanations for the consumption puzzle proposed by these works include unexpected retirement, the decrease in work-related expenditures, the non-separability of preferences between leisure and consumption, and home production.

An additional explanation for the consumption puzzle could be the unpreparedness of households for the reduction in income that normally follows retirement: households may not have saved adequately during their working life and may therefore have to cut their expenditures. Bernheim, Skinner, and Weinberg (2001) found that for the United States the wealth accumulation behavior of individuals seems to follow a 'rule of thumb', for example consuming disposable income (or a constant fraction thereof) in each period. Lusardi (1999, 2000) found that, ceteris paribus, households that have given little thought to retirement have far less wealth than those that paid more attention to the subject. Subsequent studies are devoted to determining a link between lack of planning and financial literacy, as reviewed in more detail in Section 4.

3. Household wealth profiles

Before reviewing the literature that explores the relationship
between wealth accumulation and financial literacy, we show
in this paragraph how financial literacy can shape the wealth
profile, at least at first sight, using the European SHARE dataset.
To do so, we graph the age profile of wealth, distinguishing
between households with different levels of financial literacy. We
use the first two waves of the European SHARE dataset for eleven
countries: Austria, Germany, Sweden, the Netherlands, Spain,
Italy, France, Denmark, Greece, Switzerland, and Belgium.[4] Having
data for different countries allows us to group them according to
geographical area (Northern, Continental, and Mediterranean),
which also captures the different welfare state configurations,
as in Esping–Andersen's 1996 study. Having only two waves of
data limits our analysis, since we are unable to disentangle age,
cohort, and time effects: cohort effects have been shown to be
particularly important in determining age profiles of wealth. For
example, Kapteyn, Alessie, and Lusardi (2005), using the Dutch
Socio–Economic Panel, showed that generational differences are
present in both average net worth and financial wealth. Instead
we aggregate the data from the two waves and draw simple cross-
sectional age profiles of our variables of interest to determine
their differences between literate and illiterate households.
We construct the financial literacy indicator using questions on
numeracy, reported in detail in Box 2. This indicator takes on
values from one (lowest numeracy) to five (highest numeracy).
We then define an individual as financially literate if his or her
numeracy level is four or five and financially illiterate if lower.

4   The first wave was undertaken in 2004–2005 and the second one in
    2006–2007.

Box 2. Numeracy questions in the SHARE

The questions in the SHARE dataset for measuring numeracy are as follows.

1. *If the chance of getting a disease is 10 per cent, how many people out of one thousand would be expected to get the disease?*

If the answer to question 1 is incorrect, then question number 2 is asked. Otherwise, question number 3 is asked.

2. *In a sale, a shop sells all items at half price. Before the sale a sofa costs 300 euro. How much will it cost in the sale?*
3. *A second hand car dealer sells a car for 6,000 euros. This is two-thirds of what it costs new. How much did the car cost new?*
4. *Let's say you have 2,000 euros in a savings account. The account earns 10% interest each year. How much would you have in the account at the end of two years?*

Note that the interviewer does not read any possible answer. Usually, in empirical work, an index is built following Dewey and Prince (2005); this index takes values from 1 to 5, with higher values indicating higher financial literacy. In particular, it is equal to 1 if there is no correct answer; 2 if only question number 2 is correct – recall this is a very simple question asked only if the answer to question 1 is wrong; 3 if only question 1 is correct, in this case question number 2 is not asked; 4 if questions 1 and 3 are correct; or 5 if questions 1, 3 and 4 are correct.

We defined net wealth as net real wealth plus financial wealth. In particular, financial wealth includes the value of checking and saving accounts, stocks, mutual funds, and retirement savings, less financial liabilities. Net real wealth is obtained by subtracting the value of mortgages from the value of the primary residence and other real estate.

To highlight the wealth profile and its correlation with financial literacy, Figure 1 shows the cross-sectional age profile of average wealth for all the countries considered (upper left panel), distinguishing for macro areas. Since the cohort and age effects are intertwined and data from only two waves make it impossible to distinguish between the two, we cannot draw any conclusions on the trend of wealth over time. However, we can draw some con-

clusions for any age level by comparing the wealth levels between the financially literate and their less financially literate peers.

As shown in the upper left panel of Figure 1, households with higher financial literacy tend to be richer than illiterate ones, irrespective of age. This finding is consistent with empirical work that shows that financially literate individuals tend to save more and invest in financial assets with higher returns and lower costs than financially illiterate individuals do. However, financial knowledge is likely to be positively correlated with other factors that influence wealth accumulation, such as education and income, so the higher wealth of more literate households could reflect a relationship between wealth and other determinants. While this section aims to provide only descriptive evidence, subsequent sections review the literature examining the link between financial literacy and wealth while controlling for the many factors that may influence wealth accumulation.

Figure 1 also shows a clear positive trend during working age, a peak, and then a decline in the cross-sectional profile. The age at the peak is higher for financially literate individuals (who peak around 60) than for the less literate, whose average wealth starts to decline around 55. However, we are well aware that the pattern of wealth can be opposite from that depicted in the graph if the cohort effect is mixed up with the age effect (Shorrocks, 1975). For this reason, we do not draw any conclusion about this pattern but focus on the difference, for each given age range, between the assets of literate and less literate households. This inverted U shape may be due to the accumulation and decumulation of wealth over the life cycle, but it could also reflect generational differences in lifetime resources: if older cohorts are poorer than younger ones, then the down-sloping wealth profile reflects the lower average wealth held by the older individuals.

*Figure 1: Relationship between Net Wealth and Age* (Source: SHARE)
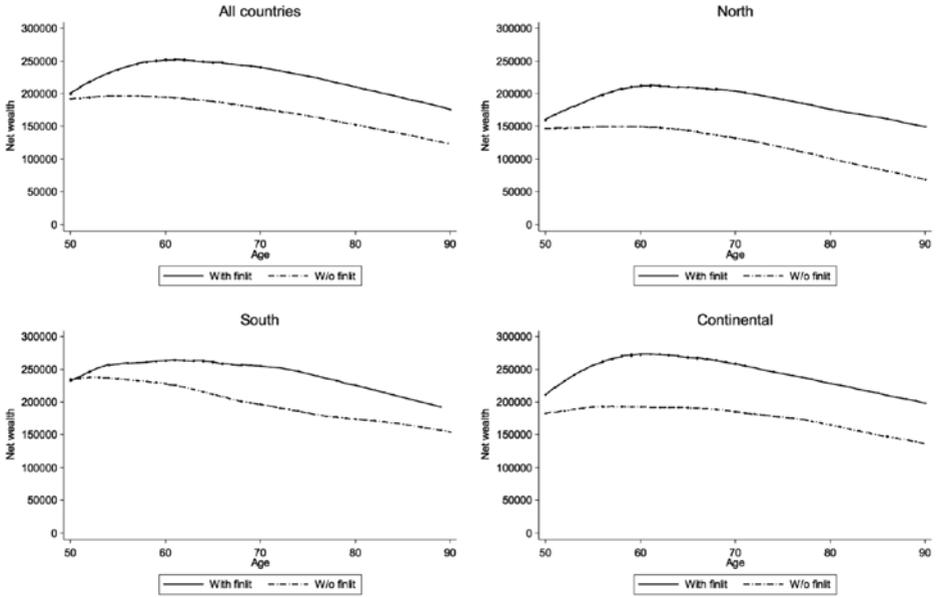
Figure 2: Relationship between Real Wealth and Age (Source: SHARE)
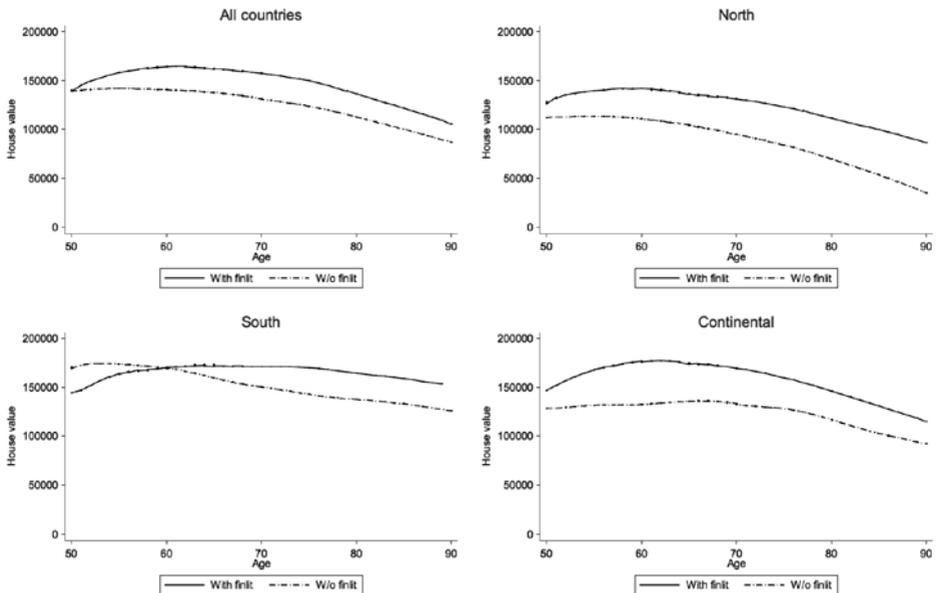
We next divide the countries in our sample into three macro areas: Southern Europe (Spain, Italy, and Greece), Northern Europe (Sweden, the Netherlands, and Denmark), and Continental Europe (Austria, Germany, Switzerland, Belgium, and France). As expected, households in Northern Europe are typically 'rich in income, poor in assets' and their wealth levels are lower than average. On the other hand, households in Southern Europe are "rich in assets, poor in income", accumulating more wealth than average, and their behavior across age/cohort is rather flat, although financially literate individuals show a steeper downward sloping profile after age 70. More rigidities in the financial markets of Southern European countries where few possibilities are available for efficient depletion (i.e. housing) might be responsible for that evidence. The introduction (and explanation to the elderly population) of products such as reverse mortgage, which would allow withdrawing liquidity out of housing assets, would thus be of paramount importance to put part of housing equity investment back into the economy.

To deepen our analysis, Figures 2 and 3 disaggregate net wealth between real and financial wealth. In particular, Figure 2 focuses on the net value of the primary residence. Financially literate households show higher levels of housing wealth at all life stages. As confirmed by several studies, we also find in the SHARE dataset that households in Northern Europe tend to invest less in the real estate market than their counterparts in Southern and Continental Europe. On the other hand, in Southern Europe the effect of financial literacy seems to be smaller, the two curves being less distant from each other. It is worth noting the higher starting wealth for the second group: illiterate households have a lower net total wealth but nevertheless tend to overinvest in real estate, a point that should be emphasized. Our interpretation

Figure 3: Relationship between Financial Wealth and Age (Source: SHARE)
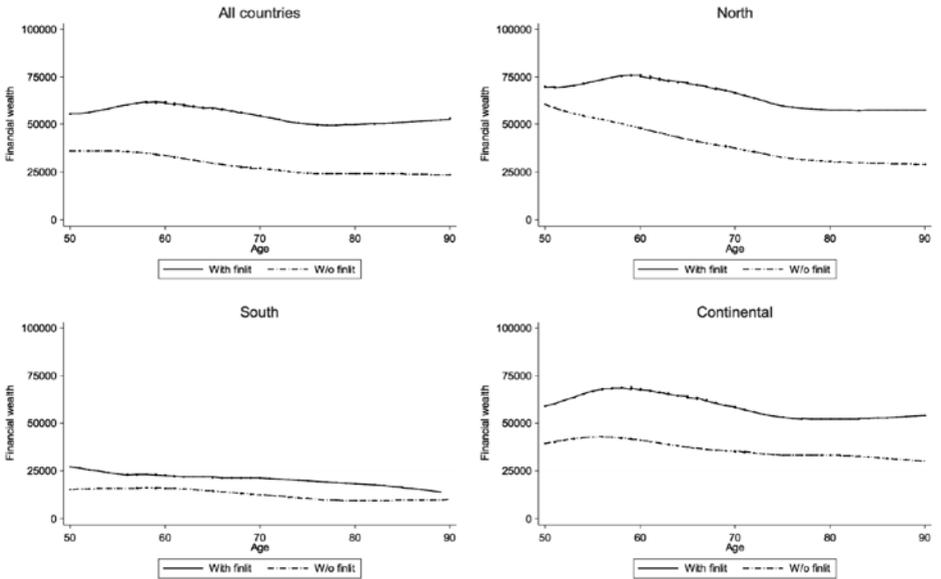

Figure 4: Relationship between House Wealth and Age (Source: SHARE)
Zero house value not considered
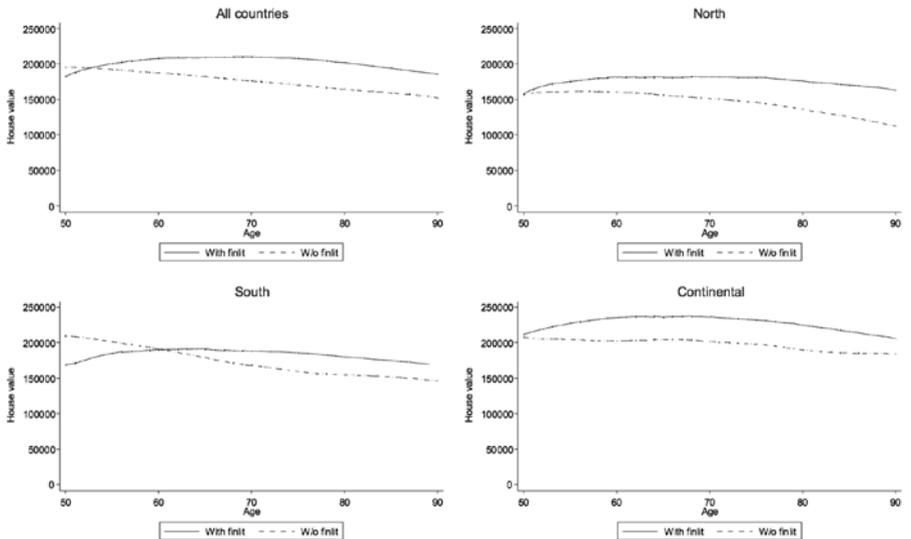
is that when financial markets are far from perfect, as in the Mediterranean countries, financial sophistication and efficiency are low, and existing products are not well tailored to new needs and preferences (the non-existence of reverse mortgages is a good example). We expect that in these settings the effect of financial information is likely to vanish with respect to financially advanced countries, where more sophisticated investors may be matched with more sophisticated financial instruments.

Figure 3 shows the analogous patterns for financial wealth. Again, more literate households have higher financial wealth. Symmetrically reflecting the real estate graph, households in Sweden, the Netherlands, and Denmark have the highest amount of wealth invested in financial assets, while their peers in Southern Europe invest only a minimum amount in this category. Valuable insight is provided by the last two graphs: the declining trend evident from Figure 2 may be due to both groups selling their houses and downsizing. We focus on downsizing in Figure 4 by dropping observations for which the house value of the primary residence is zero. As a result, the curves flatten out greatly, signalling a low propensity for downsizing, especially among the financially literate. The same result is replicated when we distinguish between geographical areas, with Continental households having, on average, higher non-zero housing values than others.

Very intriguingly, we note that the gap in wealth between the two groups seems to vanish with respect to housing wealth in Southern Europe. One reason could be that financial literacy cannot help much in countries with more imperfect financial markets and thin stock markets. Housing equity is, nevertheless, the only possible channel for investment, no matter how many financial instruments households have.

Figure 5: Relationship between Homeownership and Age (Source: SHARE)
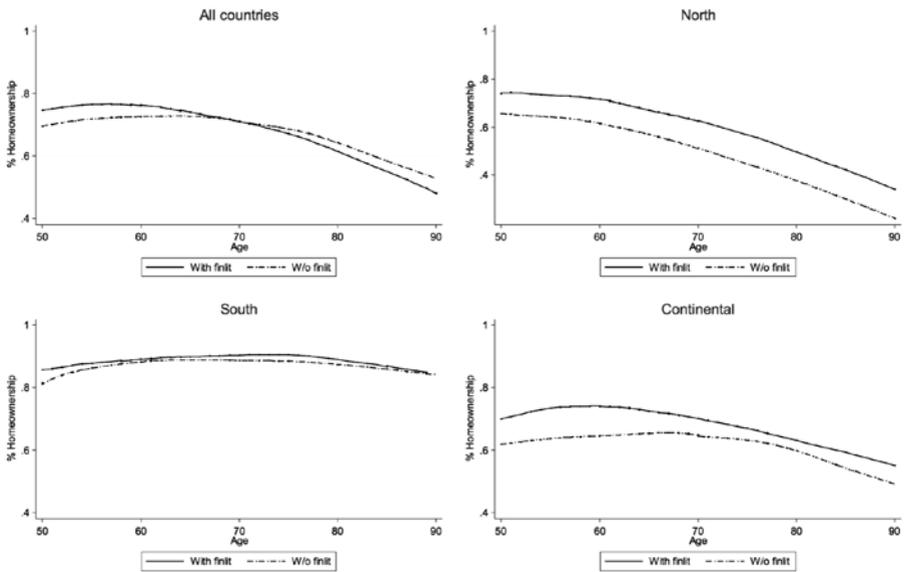
By contrast, Figure 5 shows the percentage of people who own the house in which they live. The outcome is rather impressive: after the age of 60 the percentage of homeowners declines sharply. While we do not know whether this is due to generational or age effects, it is interesting to note that the profiles for average housing wealth conditional to owning a house shown in Figure 4 are almost flat. When distinguishing between geographical areas, it appears that homeownership declines with age/generation in the Nordic and Continental countries. The profile exhibited by Southern countries, on the contrary, is rather flat. These differences in homeownership among the elderly are quite important and call for careful policy design that considers country-specific institutional settings.

Box 3. Financial literacy questions in the HRS

The questions used to measure financial literacy as introduced by Lusardi and Mitchell in the 2004 HRS data are the following.

1) Suppose you have $100 in a savings account and the interest rate is 2% per year. After 5 years, how much do you think you will have in the account if you leave the money to grow?
– More than $ 102
– Exactly $ 102
– Less than $ 102
– Do not know
– Refuse to answer

2) Imagine that the interest rate on your savings account is 1% per year and inflation is 2% per year. After 1 year, how much will you be able to buy with the money in this account?
– More than today
– Exactly the same
– Less than today
– Do not know
– Refuse to answer

3) Please tell me whether this statement is true or false. 'Buying a single company's stock usually provides a safer return than a stock mutual fund'.
– True
– False
– Do not know
– Refuse to answer

Note: The interviewer read the possible answers.

4. Wealth accumulation and financial literacy

Financial literacy has been advocated to be responsible for a more savings-oriented attitude. A fertile strand of literature focuses on the effect of financial literacy on savings behaviour and its impact on wealth accumulation. Starting in the mid-1990s, a number of studies started looking at the effects of financial education in the workplace on private savings or contributions to pension funds. These studies (e.g. Bayer, Bernheim, and Scholtz, 1996, 2009) found that both participation in and contributions to voluntary savings plans are significantly higher when employers offer retirement seminars, while they find no effect from printed information, such as newsletters or summary plan descriptions. As has been recognized in the literature, selection effects may impact the evaluation of financial programs: if participation is voluntary, workers attending the seminars may differ from those who do not attend them, both in terms of economic characteristics, such as wealth, and in terms of personal characteristics, such as patience. Studies that try to overcome this problem, such as Bernheim and Garret (2003), Muller (2003), Duflo and Saez (2003) and others surveyed in Lusardi and Mitchell (2007c), found mixed evidence of the effect of financial education.

Lusardi (2004) also pointed to the importance of using a comprehensive measure of wealth that includes social security contributions when studying the effect of financial education on total savings. As pension and social security wealth is an important component of wealth, failure to include these components into the definition of total wealth may have a distorting effect on empirical findings. The author therefore used information collected in the US HRS to construct a comprehensive measure of wealth that includes social security benefits and

studies how it relates to 'retirement seminars', a form of financial education that is conducted in the workplace. Lusardi found that seminars are effective and especially affect those at the bottom of the wealth distribution. When social security and private pension wealth are included in the definition of wealth, the effects of retirement seminars on wealth become even stronger for every education group and quartile of the wealth distribution.

While many studies have been devoted to examining the effectiveness of financial education programs not only in the workplace but also in schools and other venues, there is considerable discussion about their effectiveness and particularly about their economic impact. This point has been forcefully put forward by Willis (2011), who claims not only that effective financial education programs are extremely costly, but also that they have paradoxical effects on autonomy deriving from financial education. However, alternatives to financial education, such as substantial regulation, are said to neglect the heterogeneity in personal preferences and life courses, which results in differences in optimal behavior that would be pursued if individuals were left free to decide (as also pointed out by Lusardi and Mitchell, 2013).

Suitable information on household financial literacy became available in the 2004 HRS, with a module designed for that purpose by Lusardi and Mitchell, as they described in their 2006 paper. Their primary goal was to test for a link between poor planning for retirement (which in turn is associated with low levels of wealth) and financial illiteracy. Financial literacy was defined as knowledge of fundamental economic concepts, particularly referring to compound interest, inflation, and portfolio diversification. In addition, the module asked detailed questions on retirement planning. The results showed that older persons are often financially illiterate. In particular, only half of

the respondents aged 50 and older correctly answered the first two simple questions on interest compounding and inflation, and only one-third correctly answered all three questions regarding financial literacy. The authors highlighted that women, minorities, and persons without a college degree are particularly at risk of displaying low financial knowledge. They also investigated whether interviewed households plan for retirement. The results were quite disappointing, as less than one-third of the respondents ever tried to devise a retirement plan and, of those who tried, only two-third claimed to have succeeded.

Finally and most importantly, Lusardi and Mitchell (2006) provided regression evidence that financial literacy and retirement planning are positively related. In particular, they found that planners are more likely to correctly answer the basic financial literacy questions. In addition, the authors found that higher financial literacy is positively associated with higher savings and investment in complex assets, such as stocks. Subsequent work by Lusardi and Mitchell (2007a, 2007b) also provides evidence of a positive link between financial literacy and retirement planning. In a similar vein, Kimball and Shumway (2006) built an index of investor sophistication and relate it to portfolio choices, finding that more sophisticated investors participate more in the stock market and hold more diversified portfolios. The authors also found evidence that financial sophistication is positively related to basic financial literacy.

Van Rooij, Lusardi, and Alessie (2011) used the specific measures of financial literacy, introducing these in a special module of the DHS, and found that financial sophistication is associated with higher wealth, as well as with a higher probability to invest in the stock market and a higher propensity to plan for retirement. Using the same dataset, Van Rooij et al. (2012) found a strong positive

association between financial literacy and household wealth, even after controlling for many determinants of wealth, including education, income, and household composition. The authors also proposed as likely channels the positive relation between financial literacy and stock holdings, which on average yield a higher return, and the positive relation between financial literacy and planning for retirement, which has been found to be linked to higher levels of wealth (Ameriks, Caplin, and Leahy, 2003).

Another useful source of data is SHARE, which provides a representative sample of individuals aged 50 and older in various European countries.[5] SHARE contains detailed information on a variety of topics, ranging from an individual's economic position to health status, and includes several standard measures of cognitive abilities, such as memory, orientation in time, and numeracy. While these characteristics differ from the definition of financial literacy introduced by Lusardi and Mitchell, they can be used as proxies of an individual's abilities. Christelis, Jappelli, and Padula (2010) used SHARE's first wave to study the link between the probability of investing in stocks and cognitive abilities, which is used as a proxy for financial literacy. In particular, they used numeracy as a measure of the ability to perform basic numerical operations, which in turn affects how people make financial decisions. In addition, the authors used indicators for verbal fluency and memory and find that these all have a positive and strong relationship with stock ownership, even after controlling for age and education.

In a similar vein, McArdle, Smith, and Willis (2011) used the American HRS to study the effect of cognitive abilities on wealth holdings among individuals around the age of retirement. These

5   Data were collected for eleven countries in the first wave, with additional countries added in subsequent waves.

authors also found that cognitive outcomes are positively related to total wealth, financial wealth, and investment in stocks.

For the United Kingdom, Banks and Oldfield (2007) used the English Longitudinal Survey of Ageing (ELSA), a dataset that records cognitive abilities as well as economic and health variables among English individuals aged 50 and older, to explore the link between, on the one hand, numeracy and other cognitive abilities and, on the other hand, retirement savings, investment portfolios, and the understanding of pension arrangements. They found that numeracy levels are strongly correlated with retirement savings and investment portfolios, even when controlling for other dimensions of cognitive ability and educational attainment.

Using the same dataset, Banks, O'Dea, and Oldfield (2010) examined the extent to which differences in numeracy predict trajectories of key economic outcomes, such as wealth, retirement income, and retirement expectations. They found that persons with lower numeracy have different wealth trajectories, both before and after retirement, than their more numerate counterparts, but the distributions of retirement expectations and net replacement rates are similar across numeracy groups.

Finally, Financial Literacy around the World (Lusardi and Mitchell, 2011), an international project on financial literacy patterns in the United States and seven other countries, added the financial literacy questions originally designed for the United States – and introduced in the 2004 HRS dataset, as reported by Lusardi and Mitchell (2006) – to the national surveys. Project studies have been conducted in the United States, Germany, the Netherlands, Sweden, Italy, Japan, and New Zealand, and interesting patterns of financial literacy are found among persons from different countries: most notably, financial illiteracy is quite widespread, even in countries with well-developed financial markets.

All of the national analyses reported in the project find a positive association between basic financial literacy and planning for retirement, even after controlling for a wide variety of economic variables. Since planning for retirement is always associated with higher wealth (Lusardi, 1999; Lusardi and Mitchell, 2011), this association indicates a direct link between financial literacy and wealth accumulation. In addition, the project studies try to control for unobservable factors that would otherwise make the results difficult to interpret in terms of causation. In particular, in the Netherlands, information about financial literacy and retirement planning was collected for two different time periods, with the panel feature of the data allowing controlling for unobservables such as cognitive skills, intelligence, and interest in financial matters. More generally, the nexus of causality is explored with an instrumental variable (IV) approach to examine whether exogenous factors correlated with financial literacy but uncorrelated with retirement planning can shed light on the relationship between these factors. It is, however, possible to argue that financial literacy is itself a choice variable, so that the study of the causality of the association between financial literacy and retirement planning must take endogeneity into account.

4.1 A causal link between financial literacy and wealth accumulation

The literature reviewed so far mainly explores simple correlations between financial literacy and wealth, savings, and retirement planning. However, it is recognized that these simple regressions may be affected by endogeneity problems. In particular, it is possible that financial literacy correlates with factors that boost wealth. For example, if individuals with a high rate of time preference (i.e. impatient individuals) are less financially liter-

ate, simple regressions will show a positive correlation between financial literacy and wealth. In this case, however, improving the financial knowledge of impatient individuals would not result in an increase in accumulated wealth. An additional econometric problem arises from the imprecise measurement of financial literacy levels, since measurement errors lead to biased estimates. In this section we review the papers that tackle this issue (Behrman et al., 2010; Lusardi, Michaud, and Mitchell, 2011; Jappelli and Padula, 2012; Van Rooij, Lusardi, and Alessie, 2012). The bottom line is that they all find a substantial attenuation bias. In other words, the simple ordinary least squares (OLS) regression coefficients are downward biased, and the effect of financial literacy on wealth accumulation is greater than previously thought.

The first paper to explicitly estimate the impact of financial literacy and schooling on wealth accumulation using an IV technique is that of Behrman et al. (2010). These authors recognized that the link between financial literacy and wealth may not reflect causality since, for example, low-wealth individuals may have high rates of impatience or other unobservable characteristics that cause them to stay low in terms of financial literacy. In addition, financial literacy may proxy for schooling levels, at least partly, and therefore the coefficient of financial literacy would pick up the effect of education on wealth. Finally, the financial literacy variable may be hindered by measurement error, which would bias the OLS estimate. All these considerations drive the authors to propose an IV approach to estimate the impact of financial literacy and schooling on wealth accumulation.

Behrman et al. (2010) used the dataset from the Chilean Social Protection Survey, a representative sample of Chilean adults aged 24–65 years. Their results show that while financial literacy and

schooling attainment are both strongly positively associated with wealth outcomes in linear regression models, IV estimates show that the effects of financial literacy on wealth are stronger than those of schooling. In addition, they found no significant positive effects of schooling conditional on financial literacy in a linear specification, while the reverse is true when interacting schooling with financial literacy.

As already noted in the previous section, the studies included by Lusardi and Mitchell (2011) also recognize endogeneity and measurement error issues and provide IV estimates of the effect of financial literacy on retirement planning. The instruments used vary by country and can be based, for example, on siblings' financial conditions or parental financial knowledge. Most importantly, all studies reveal substantial attenuation bias.

Delavande, Rohwedder, and Willis (2008) propose a portfolio choice model in which individuals can increase their financial literacy level in a human capital framework. In this model, higher financial knowledge results in a higher expected rate of return on assets, with risk held constant. In this model, the cost of acquiring financial knowledge is expressed in terms of the existing stock of knowledge and payments for financial education or advice.

Jappelli and Padula (2012) also propose an analytical framework linking both financial literacy and wealth accumulation. In their work, financial literacy is considered a form of human capital. Individuals create their stock of financial literacy, similarly to educational stock, given a certain endowment. The endowment is determined by exogenous factors such as schooling. Optimal investment in financial literacy implies a comparison between cost and return: the cost of acquiring information and return that allows, on average, better investments, as in products with higher returns and lower volatility. Indeed, Christelis et al. (2010) and

Van Rooij et al. (2012) demonstrate that higher financial literacy is correlated with higher stock market participation, thus increasing expected returns. Another important aspect highlighted in Jappelli and Padula (2012) is that the more resources an individual has available to invest, the more such individual is inclined to accumulate financial literacy.

Jappelli and Padula plot the optimal accumulation and decumulation of wealth along with financial literacy. Both variables, wealth and financial literacy, have similar curves, increasing during working life, peaking at retirement, and decreasing in old age. The results show that net investment in literacy becomes negative at an older age due to the depreciation of stock and the reduced incentive to invest in literacy. Although agents still purchase financial literacy during retirement, the stock of financial literacy falls because the effect of depreciation dominates. In the final period the elderly in fact have no incentives to accumulate financial literacy, so that the dynamics of the stock of literacy are then driven only by the depreciation rate.

Interestingly, the Jappelli and Padula paper shows that the presence of a social security system lowers not only private accumulation wealth but also the incentive to invest in financial literacy. Mandatory savings displace private savings decisions as well as the incentive to invest in financial literacy (which, in turn, depends on the amount saved). This may explain why households in countries with more generous social security systems participate less in financial markets and have relatively simpler portfolios. To check the empirical robustness of the model, Jappelli and Padula used both microeconomic and cross-country data, the former comprising the SHARE and SHARELIFE datasets. The OLS regression for the current stock of financial literacy shows, as expected, a large and statistically significant coefficient for

the initial endowment of financial literacy. Furthermore, the age coefficient is negative, implying that individuals have less incentive to invest in financial literacy after retirement since they start to decumulate their wealth. In particular, women have lower financial literacy, which can be explained by the lower incentive to invest, given their lower stock of assets.

Jappelli and Padula (2012) show that financial literacy boosts wealth accumulation and that financial literacy differences across countries are largely explained by differences in mathematical skills early in life (using the Programme for International Student Assessment – PISA – results). Their international comparison suggests that by raising the incentive to invest in financial literacy, reforms associated with financial market deepening (e.g. the creation of private pension funds) may also lead to higher financial literacy and savings.

Lusardi et al. (2011) calibrate a stochastic life cycle model with endogenous financial literacy accumulation to account for the observed heterogeneity in financial literacy as well as in wealth accumulation. In particular, they propose a rich stochastic life cycle featuring uncertainty in income, capital market returns, and medical expenditures. In addition, the model includes an endogenous financial literacy accumulation process. In the model, financial literacy not only allows individuals to access more sophisticated financial products, but it also allows consumers to potentially raise the rate of return earned on financial assets. Individuals who wish to transfer resources over time by saving will benefit the most from financial literacy, because of the higher return. The model is calibrated using US Panel Study of Income Dynamics (PSID) data and The Nationwide Food Consumption Surveys (NFCS) data for financial literacy. The authors show that the model is able to replicate the heterogeneity in wealth

profiles observed in the population, particularly among groups
with different educational levels. The optimal financial literacy
profile is hump-shaped, and it differs among educational-level
groups to reflect lifetime income differences: since acquiring
financial knowledge is costly, low financial literacy is optimal for
individuals with low life-cycle resources.

The calibrated model is then used to perform several policy
simulations. In particular, Lusardi et al. (2011) studied the
consequences of a widespread increase in financial literacy, such
that all agents would be completely financially literate. The model
predicts that, the larger the increase in financial literacy level
of the individual, the higher the increase in retirement wealth:
individuals with a high education would have an increase in
median net retirement assets by 4.5%, while the percentage
for college dropouts would be 18%. Under this scenario, wealth
differences among groups with different educational levels would
consequently be considerably reduced.

As an additional policy experiment, Lusardi et al. (2011)
examined the effects of a cut in public pension benefits. The
results show an increase in both wealth and financial literacy
accumulation. However, since the model incorporates income
uncertainty and liquidity constraints, the increase in private
wealth less than offsets the cut in pensions. By raising the need
to accumulate private wealth, other policy experiments that,
for example, lower means-tested transfers or raise income
uncertainty, also provide an incentive to increase financial literacy
levels.

5. Decumulation

Wealth decumulation is often regarded as of secondary importance compared to the accumulation phase over the life cycle. While policymakers worry about the inability of citizens to have enough resources after retirement, little concern is given to the inability to spend accumulated wealth, as people are free to decide to live far below the attainable maximum standard, one of the simplest reasons being that they want to leave bequests.

American workers do not seem to be interested in planning for retirement (Lusardi, 1999): Among American respondents aged 51 and above, one-third did not plan at all for retirement. Lack of planning is found in particular among specific low-educated groups, such as African-Americans, Hispanics, and women. These findings are common to various studies (Yakoboski and Dickemper, 1997; Lusardi and Mitchell, 2007a, 2007b). In the Netherlands, Prast, Teppa, and Smits (2012) found that the majority of respondents, when asked what countermeasures they would take in case of a consistent drop in their pension assets, stated that they would take no action.

However, the European framework differs immensely from the American one, and pension systems are not homogeneous across countries. Some countries, such as Italy, show very high mandatory saving rates, with little room left for personal pension funds. Roughly stated, not much is left in countries such as Italy, where the contribution rate is above 30% of gross income. In other words, financial literacy is of little use when workers must save intensively in only one way for their pension.

When little concern is given to decumulation, as in the United States, where there is very little attachment to savings, policy-makers start paying attention to wealth depletion, particularly

nowadays, when retirement income is getting ever smaller. The
transition of Western countries towards a defined contribution
system has generated a close link between contributions paid and
pension income at retirement. Considerably less generous pension
systems have become the norm, although at a different pace,
across all Europe, with replacement rates dropping dramatically
in the last few decades due to the transition from PAYGO to a DC
system (see Figure A2.1 and Table A2.1 in Appendix II for illustration
of this). Indeed, the majority of OECD countries have moved or are
moving from PAYGO towards a more diversified pension system.
For this reason, occupational pension plans as well as private
pensions have become key to guaranteeing pension adequacy.
However, subscription to them being voluntary in most cases, it
is important to make people aware of their attainable income
at retirement (i.e. the income derived from the use of all assets,
thus both pension and non-pension assets) to understand the
standard of living they will have when they retire. Private pension
arrangements and other savings act as complements to pension
income to guarantee income adequacy at retirement (OECD 2012).
The net replacement rate average is 69% in OECD countries for
average earners, but it varies widely across different countries,
ranging from under 40% in Mexico, Ireland, and Japan to well
over 100% in Greece (OECD, 2011). In the UK and the US, where the
transition from PAYGO to a funded pension system has already
been accomplished, it is around 50%.

Under such recent scenarios where public pension income
is much reduced compared to the past, it is important that
households are aware of the basic economic principles implied by
life cycle theory.

While excess savings are not a concern for governments at
first sight, they may become one when the elderly start asking

governments to pay for their reluctance to decumulate assets by upholding social intervention as the only way to increase their retirement income. Means-tested interventions are generally based on income available to the elderly. Current income, however, is not a comprehensive measure of the welfare of individuals, since, for a given income level, people who have accumulated more assets are in fact less vulnerable to shocks. In addition to current income, assets should be considered the best proxy for attainable welfare.

An additional cause of concern is that the wealth of European households, particularly within the southern Mediterranean countries, is tied up in illiquid assets, which are difficult to deplete when hard times hit. Do the elderly face heavy consequences of the inability to use their assets efficiently? Research on this theme is scarce, although interest in the subject is growing.

The ability to generate sufficient (all-inclusive) pension income derives from total accumulated pension wealth and private wealth. The difference between the two is that pension wealth is (almost totally) annuitized at a rate that is not decided by the retiree. When people are given the possibility of choosing between annuitization of private wealth and not, little annuitization takes place. Contrary to the predictions of Yaari (1965), who asserted that everyone should annuitize all wealth at a certain point in life, retirees are little interested in annuitization plans. Brown and Nijman (2011) offer potential strategies to reach a more flexible annuitization rate by first eliminating the requirement that all pension wealth should be annuitized. The ratio of pension wealth to be annuitized should, instead, be targeted to reach a flow of annuities that guarantees the coverage of basic needs. The timing of the decision to bequeath can be made more efficient if less annuitization is mandated. If private

wealth does not suffer from mandated annuitization, retirees do not seem too concerned about optimally decumulating it.

If private wealth does not suffer from the mandated annuitization, retirees seem not too concerned of optimally decumulating it.

On top of the minimum annuity, additional annuitization should be encouraged but not mandated. The issue of too much annuitization becomes of particularly interesting when a large amount of pension wealth is tied to a high flow of annuity income, which thus cannot be converted into an early bequest. The right to choose, at least partially, between the two options would enhance welfare.

In recent work, Romiti and Rossi (2012) move away from the literature that focuses on whether individuals who are financially literate tend to have greater wealth and save more. That literature implicitly concentrates on the accumulation phase of the life cycle, by looking at savings attitudes. The authors instead concentrate on the final phase of the life cycle, during which dissaving rather than saving should take place. Are more financially literate people also more prone to use their wealth to accommodate an income drop at retirement? The authors focus on housing wealth, since this represents a major part of household wealth (up to 80% among the elderly in the Survey of Households Income and Wealth (SHIW)). The results show that older households tend to downsize or sell their house more frequently if they are more financially literate, corroborating the hypothesis that more financially literate people are better at planning the decumulation stage as well as their savings path.

Romiti and Rossi (2012) also examine whether less financially literate people bear an additional cost of being illiterate by being less efficient in planning their consumption over time. To do

so, the authors use a variable for making ends meet to detect whether more financial literacy helps smooth consumption over time through having, as a consequence, no problems in making ends meet. The results show that a higher ability at smoothing consumption could be explained by a higher degree of financial literacy, even when financial literacy is adjusted for endogeneity. Financial literacy thus impacts wealth decumulation in the expected direction.

Hung et al. (2009) explore how financial literacy affects retirement planning in the broadest way by examining whether households with a higher degree of financial sophistication also plan to have any decumulation withdrawals, and the withdrawal amount, from their private pension wealth and savings. The results show that this is indeed the case.

An increase of one standard deviation in the index of financial literacy is associated with an 18 percentage point higher probability of individuals figuring out how to withdraw their defined contribution assets after retirement. A related argument is that financial literacy is responsible for more efficient portfolio composition. However, little research attention has been directed at portfolios that include housing wealth.

We expect that financial literacy would help prevent the elderly from reaching the end of their life with excess (illiquid) wealth. Brunetti, Giarda, and Torricelli (2012) recently explored how an illiquid household portfolio can lead to financial vulnerability, which is defined as having insufficient liquid assets to cope with unexpected expenditures. The authors find that homeownership acts as a fragility factor, as do gender, wealth, and employment status. This evidence is particularly strong for the elderly. Instead of protecting against emergencies, homeownership actually increases an individual's inability to cope with unexpected

Figure 6 – Interest in Reverse Mortgage

Age category and Gender
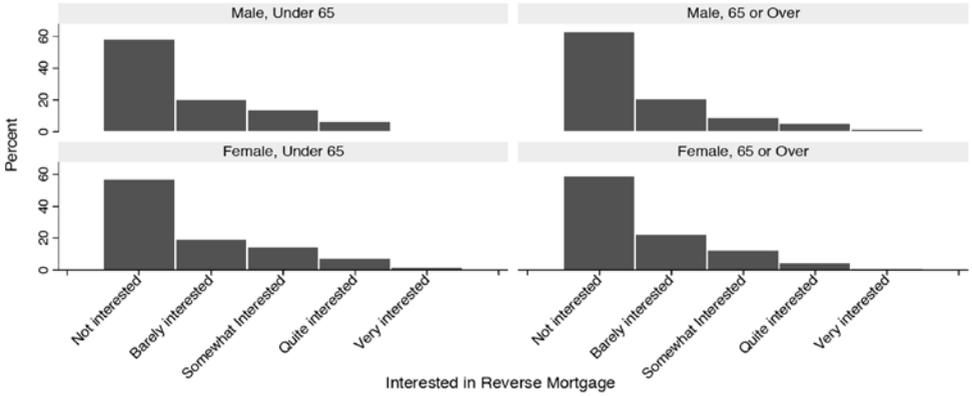
Source: Fornero et al (2012), UCS data

By Housing Quintiles
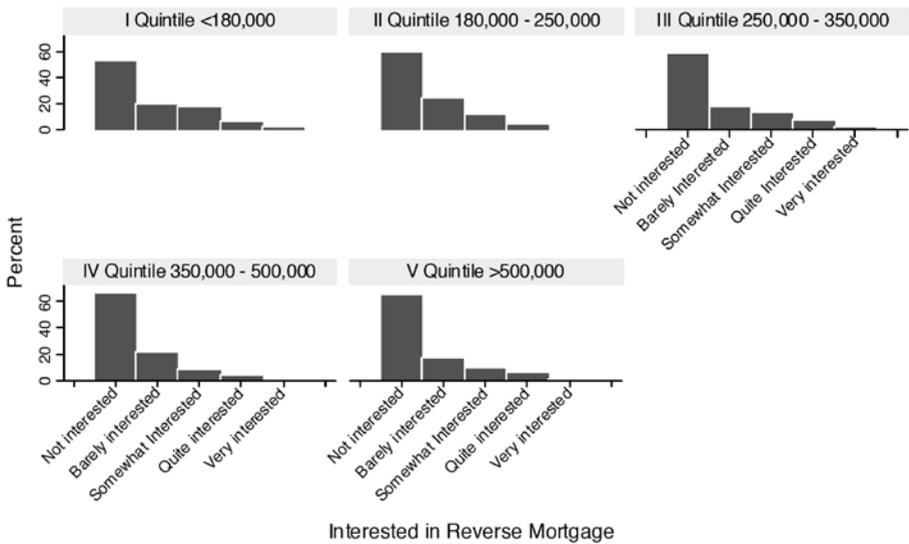
Graphs by housing value quintiles

Source: see above table

shocks. Romiti and Rossi (2012) confirm these results by showing that more financially literate people hold more balanced portfolios and that the ratio of illiquid assets to total assets is higher for less financially literate people.

Angelini, Brugiavini, and Weber (2010) stress the correlation between financial distress and the scarcity of products that release housing equity. Financial hardship among older Europeans is partly caused by the limited number of home equity release products, such as reverse mortgages. At the same time, these products, when they do exist, tend to be difficult to understand and very expensive (Fornero, Rossi, and Urzì, 2012). The authors analyze the interest in reverse mortgages for an Italian subsample of account owners at the Unicredit bank and find that the majority of households are not interested in such products. The figure below illustrates the distribution of the perception towards reverse mortgages.

Fornero et al. (2012) also examine interest in reverse mortgage products by wealth quintile to determine whether there is a positive correlation between wealth level and interest in reverse mortgage. Surprisingly, we find that richer people have even less interest in the product. In the regression analysis, run with an ordered probit to accommodate for the qualitative but ordered interest in the product, the authors find that additional financial literacy does not increase interest in the product.[6]

A reverse mortgage constitutes a loan whose amount, capitalized at the time of death, cannot exceed the housing value at the end of the life cycle. A reverse mortgage can provide cash

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6 The survey used, given to a sample of current account holders at the Italian bank Unicredit, contains a specific question about financial literacy, reported in the Appendix.

Figure 6 – Interest in Reverse Mortgage (continued)

By Gender and Debt Aversion
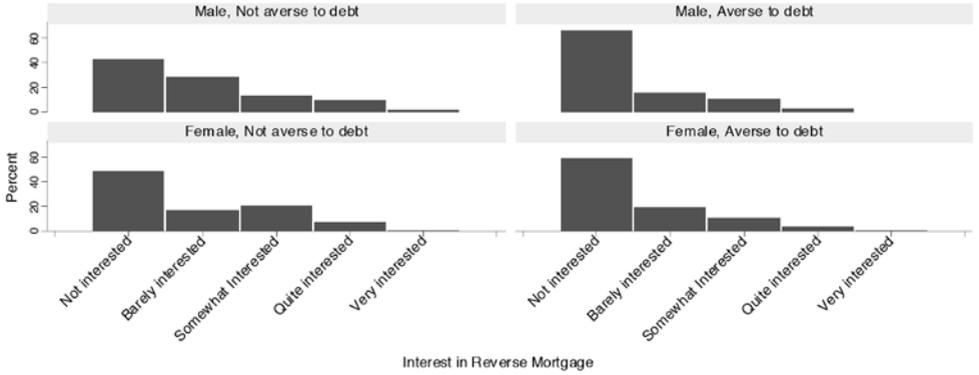
Source: see above table

By Gender and Retirement Expectations
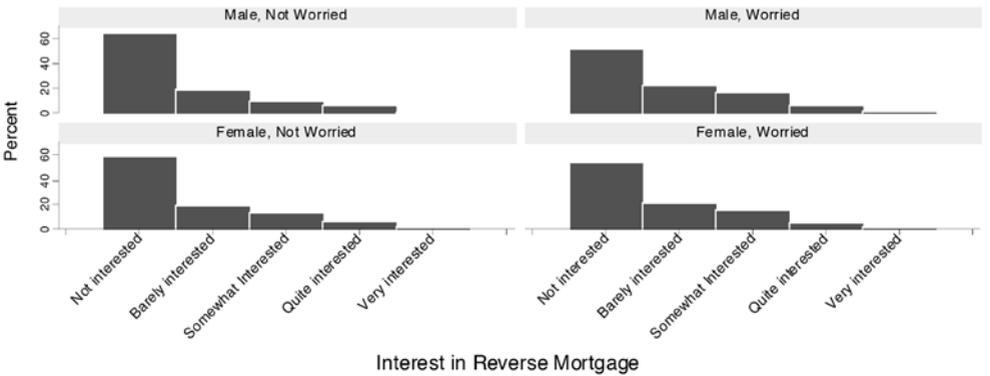
Source: see above table

as a lump sum or as a flow of income until death. If an annuity is chosen, its formula is

$$A_i = H(1+p)^{e_i} \times \frac{r}{(1+r)^{e_i} - 1}$$

where A is the annuity, p is the predicted annual growth rate in housing prices between the time of contract subscription and predicted death, r is the average interest rate during that time span, and e_i is the expected remaining lifetime of individual i.

Poorer households seem to be more interested in reverse mortgage products, although they can benefit less from them. While households with greater wealth but relatively little income flow could achieve a consistent welfare gain through a reverse mortgage, they do not seem interested in such products. Reverse mortgage products appear to be considered a last resort by households rather than as an instrument to help consumption smoothing. In this respect, it is worth noting that these products are often designed and advertised as products for the 'poor'. Over time and with more sophisticated product design, the targets for reverse mortgage products have become wider, and a segment of the rich population has been reached.

5.1 Housing

The elderly seem particularly attached to their homes, thus contradicting the life cycle theory when it comes to depletion of housing value. In fact, little evidence is found that the elderly draw down their housing equity. This finding, together with evidence of a consumption drop at retirement, is particularly puzzling. When workers retire, their expenditure levels drop (although not all of them, Borella et al., 2011) despite the fact that

tapping into their housing wealth could represent a useful tool for not doing so.

Do the elderly simply regard their owned assets as non-fungible wealth? If so, why do they tie up so much of their wealth in assets in that are not invested-related instead of buying the housing service alone (i.e. renting)? If homeownership would enable the purchase of housing services that cannot be avoided, it is unclear why renting is so little developed. Particularly when housing prices are high, buying housing services instead of owning a house would be a more flexible instrument and less of a burden on budget constraints.

Housing wealth can be depleted by selling the house, downsizing, or drawing on housing equity. Chiuri and Jappelli (2010) focus on explaining international differences in ownership rates. They show that market function imperfections – such as the scant availability of mortgage equity withdrawal, property taxes, and transaction costs – as well as the generosity of social security systems and the availability of nursing homes for the elderly affect ownership choices. The reason why households keep holding onto their house is mainly because it is difficult to (even partially) liquidate it. One can argue that it is rather difficult to understand why people are eager to become homeowners, since the asset is so difficult to make liquid.

What reasons do people claim for being a homeowner and keeping their housing equity until they die? A house is perceived as self-insurance, but also as a 'nice' form of unintended bequest if the individual dies earlier than expected. In the former case, a house can be made liquid in case a negative shock hits, such as a health shock leading to large medical expenditures (Davidoff, Brown, and Diamond, 2005). This strategy is particularly risky, since the illiquidity of the housing asset makes it particularly

inefficient for this purpose. An urgent need to sell a house is likely to lead to a huge loss in housing value for the owner. Subscribing to medical insurance is, instead, a more efficient strategy to cope with large medical expenditures. However, since health insurance product prices are far from fair, households buy less than optimal amounts of insurance.

Nevertheless, given that the health insurance market is not so appealing to consumers, the need to have cash available for contingencies may be particularly strong. For this reason, we would expect a broad development of products to help make the biggest asset of households, namely the house, at least partially liquid. Conversely, we find little evidence that consumers, particularly the elderly, are interested in such products. Moreover, the development of such products is not very articulated, particularly in Europe. For example, in Europe, where a large part of pension wealth is translated into annuities (Brown and Nijman, 2011), it may be more interesting to develop a line of credit for a maximum amount, the repayment of which at the end of life cannot exceed the house value.

Housing can represent a good bequest for children, given that housing services have to be bought on the market anyway. Moreover, people attach more than monetary value to the house that they live in. Without denying this aspect, people rarely look at the downside of this. Having all assets invested in an illiquid asset is a great risk, not only for the owner but also for potential heirs. When the heir inherits the house, he or she may not be interested in moving into the inherited house and may decide to sell it immediately. The timing of bequests, moreover, does not necessarily overlap with the cash needs of children, whose liquidity constraints may be accommodated by their parents anticipating some part of their bequest through a reverse

mortgage. The timing difference between receiving a bequest and the need for cash could be neutralized by such a product, making future bequests available when children would benefit from them most.

6. Conclusions

The life-cycle model originally proposed by Modigliani (1986) posits that individuals should save when young and active in the labor market, and dissave when old. Although the literature has emphasized other important motives for saving, the life-cycle wealth profile is mainly influenced by saving for old age. The basic theory hence assumes that individuals are able to make forecasts about the future, to plan their savings and, in general, to make complex financial decisions. In practice, however, empirical research has found that financial literacy levels are quite diverse among individuals, with some individuals lacking basic financial knowledge. Recent research on financial literacy has tried to understand the consequences of a low level of financial literacy for the saving behavior of individuals and to discover why some individuals do not engage in financial education.

From a policy perspective, concerns have been raised because public pension systems are becoming less generous in all ageing societies, with the task of saving enough for retirement gradually shifting toward individuals.

Empirical evidence shows that financial illiteracy is quite widespread. For the US, Lusardi and Mitchell (2006) show that older households are substantially financially illiterate. In particular, women, minorities, and those without a college degree are particularly at risk of displaying low financial knowledge. Analogous results have been highlighted for European countries, such as those included in the Lusardi and Mitchell (2011) study, all of which show that significant fractions of the population are financially illiterate.

As far as the accumulation phase of the life cycle is concerned, the most relevant empirical findings are that financially literate

individuals tend to plan more for their retirement (Lusardi
and Mitchell, 2006, 2011). In addition, it has been found that
individuals who plan more for their retirement tend to accumulate
more wealth (Lusardi, 1999; Lusardi and Mitchell, 2011), hence
higher financial literacy implies higher accumulation of wealth.
A positive association between financial knowledge and wealth
has also been found by Van Rooij, Lusardi and Alessie (2012), using
the specific measures of financial literacy that they introduced in a
special module of the Dutch DNB Household Survey.

A potential weakness of this literature is represented by the
possibility of reverse causality: individuals with high wealth may
wish to improve their financial knowledge in order to better
manage their wealth. A recent strand of the literature recognizes
the endogeneity of financial literacy: in these models, financial
literacy is itself a choice variable, the optimal level of which is
derived in an intertemporal setting. Jappelli and Padula (2012)
and Lusardi, Michaud, and Mitchell (2011) show that literacy and
the amount of savings in the active part of the life cycle are jointly
determined and positively correlated. In both models, the initial
level of financial knowledge is a major determinant of financial
literacy later in life. Other factors, such as higher working income,
elasticity of intertemporal substitution, discount factors, income
uncertainty, and the lower generosity of retirement benefits all
imply a higher optimal level of financial education.

While more research is needed on this crucial point, so far
the main policy implications that can be gleaned from these
models are linked to the factors that boost financial literacy. Most
importantly, the idea that the initial level of financial literacy
(at an early stage of the life cycle) is a major determinant of the
subsequent acquisition of financial knowledge points directly
to the education system. Lowering the cost of acquisition of

financial literacy, for example by providing it in school, would obviously increase its optimal level and would enhance wealth accumulation.

While the importance of financial literacy is supported by many studies, more research efforts should be devoted to assess its efficacy, also in comparison to other alternative instruments that could increase financial investment awareness. Notably, one of the drawbacks is that investing in financial education is extremely costly. The relative benefit gained from the cost should thus be carefully assessed in future research, as already put award by Lusardi and Mitchell (2013).

While much has been written on the boosting role that financial literacy might have on savings, comparatively little work has been devoted so far to the decumulation phase. It is understandable that over-saving is not a big concern for governments. However, a more thorough look at inefficient dissaving may indeed raise concerns. The potential mismatch between pension income and asset income (the income that could be derived from assets converted into cash) might represent a powerful source for anti-poverty measures. Means-tested interventions are generally based on income available to the elderly. Current income, however, is not a comprehensive measure of welfare of individuals since, for a given level of income, people who have accumulated more assets are in fact less vulnerable to shocks. Assets, in addition to current income, should be considered as the best proxy for attainable welfare. What if assets are not efficiently utilized at retirement, particularly because there are few products that help the decumulation process?

Particularly within the Southern Mediterranean countries, assets are tied up in illiquid equity that is difficult to deplete when hard times hit. Do the elderly bear heavy consequences for the inability

to use their assets efficiently? In other words, do households fall into poverty despite having high housing equity? From a policy standpoint this issue deserves intense debate as populations are ageing rapidly and pension assets are shrinking. If the management of housing and wealth in general were made more flexible, housing equity could generate cash flow, and the welfare of the elderly could substantially increase.

Overall, the literature we reviewed suggests that improving financial literacy and the existence (and comprehension) of 'decumulation-friendly' financial products, also by retirement advice agencies, would enhance planning in both stages of life: the working stage and the retirement stage. Additional financial literacy would lead to greater accumulation of wealth and its more efficient allocation, while understanding of products such as reverse mortgages would permit more efficient depletion after retirement. This research highlights that specific groups of the population, such as women and the young, are less financially literate than others. Hence, from a policy point of view, targeting these particular groups by designing dedicated programs is of primary importance.

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Appendix
Financial literacy questions in the Italian Unicredit Survey

A1
The question on reverse mortgage in the UniCredit Survey is asked at household and not at individual level.

Before asking to rank the interest in reverse mortgage, a brief description of the product – only the tenure option – was given by the interviewer, who then asked respondents to assign a value between 1 and 5 according to their level of interest; 1.1% claimed to be "Very interested", 6.2% "Quite interested", 12.9% "Somewhat interested", 20.4% "Barely interested" and 59.4% "Not interested".

A2. Questions on financial literacy in Unicredit Sample

Financial literacy:
The respondent is awarded one point for answering correctly.

Inflation – money illusion.
Suppose a bank account yields 2% interest per annum (after expenses and taxes). If actual inflation is 2% per year (assuming you did not access your account) after two years, the amount deposited can buy you (select one answer):
a) More than it can buy today;
b) less than it can buy today;
c) the same as it can buy today (correct); and
d) cannot answer/do not understand.

Interest rates

Imagine having a 'tip' and knowing for certain that in six months interest rates will rise. Do you think it is appropriate to purchase fixed rate bonds *today*?

a) Yes;
b) no (correct);
c) do not know.

Diversification

In relation to investments, people often talk about diversification. In your opinion, to have proper diversification of one's investments means (select one response):

a) To have in one's investment portfolio bonds and shares;
b) not to invest for too long in the same financial product;
c) to invest in the greatest possible number of financial products;
d) to invest simultaneously in multiple financial products to limit exposure to the risks associated with individual products (correct);
e) to not invest in high-risk instruments;
f) do not know/cannot understand.

Figure A2.1: Historical changes in average expected replacement rates in old-age pension systems
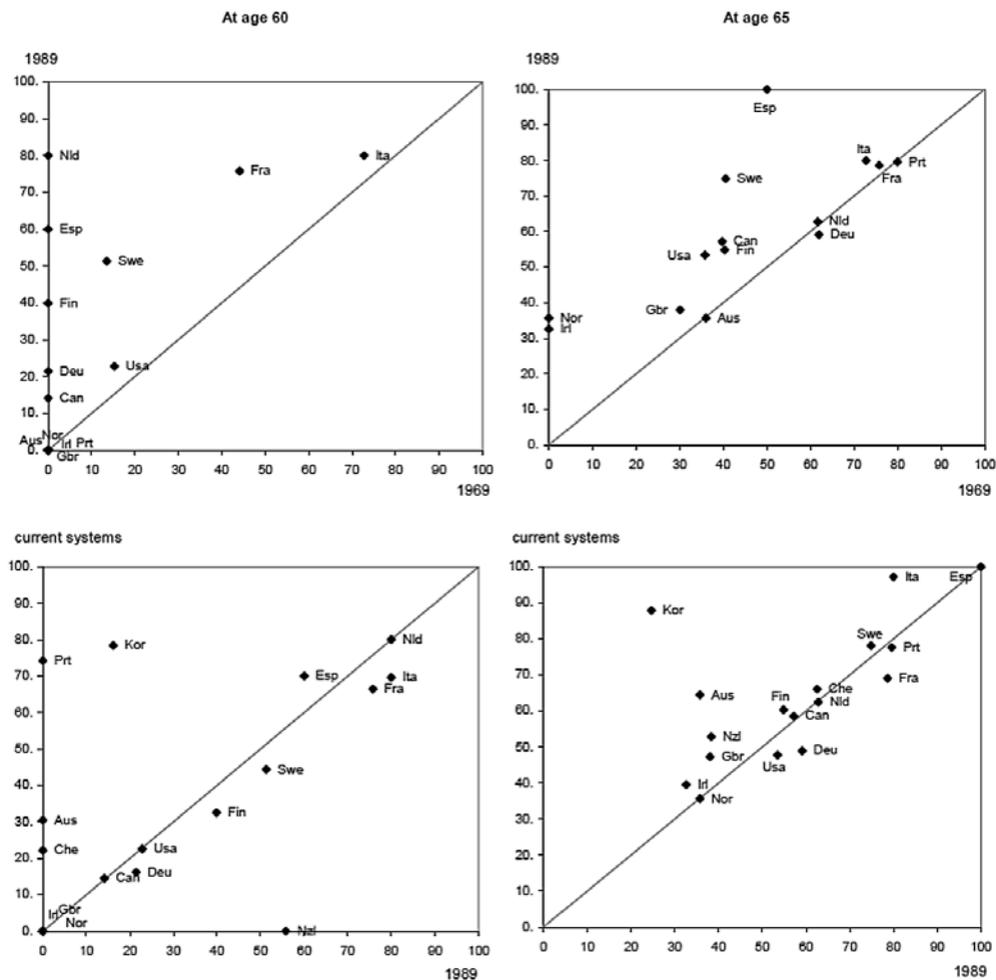
Source: Duval, 2003

Table A2.1 Gross Replacement Rate. Multiple of mean earner

country	Male			Female		
	1	1.5	2	1	1.5	2
Austria	76.6	72.3	54.3	76.6	72.3	54.3
Belgium	42.0	32.7	24.5	42.0	32.7	24.5
Cyprus	65.0	65.8	66.2	65.0	65.8	66.2
Czech Republic	50.2	37.4	29.7	50.2	37.4	29.7
Denmark	79.7	66.1	59.2	79.7	66.1	59.2
Estonia	48.0	44.0	41.9	48.0	44.0	41.9
Finland	57.8	57.8	57.8	57.8	57.8	57.8
France	49.1	41.3	37.1	49.1	41.3	37.1
Germany	42.0	42.0	32.3	42.0	42.0	32.3
Greece	95.7	95.7	95.7	95.7	95.7	95.7
Hungary	75.8	75.8	75.8	75.8	75.8	75.8
Iceland	96.9	87.0	85.7	96.9	87.0	85.7
Ireland	29.0	19.3	14.5	29.0	19.3	14.5
Israel	69.6	46.4	34.8	61.2	40.8	30.6
Italy	64.5	64.5	64.5	50.6	50.6	50.6
Latvia	51.0	51.0	51.0	51.0	51.0	51.0
Lithuania	56.2	48.4	44.5	45.6	38.3	34.6
Luxembourg	87.4	83.8	82.1	87.4	83.8	82.1
Malta	64.0	44.0	33.0	64.0	44.0	33.0
Netherlands	88.1	86.5	85.7	88.1	86.5	85.7
Norway	53.1	41.7	33.4	53.1	41.7	33.4
Poland	59.0	59.0	59.0	43.2	43.2	43.2
Portugal	53.9	53.1	52.4	53.9	53.1	52.4
Romania	72.6	72.6	72.6	67.0	67.0	67.0
Slovak Republic	57.5	57.5	57.5	57.5	57.5	57.5
Slovenia	62.4	62.4	49.1	62.4	62.4	49.1
Spain	81.2	81.2	64.5	81.2	81.2	64.5
Sweden	58.4	72.1	77.6	58.4	72.1	77.6
Switzerland	57.9	40.9	30.7	57.1	40.3	30.2
Turkey	64.5	64.5	64.5	64.5	64.5	64.5
United Kingdom	31.9	22.6	16.9	31.9	22.6	16,9

Source: OECD Pension at a Glance, 2011

PUBLICATIONS IN THE PANEL PAPERS SERIES

Asset accumulation and decumulation over the life cycle

Margherita Borella and Mariacristina Rossi (both University of Turin) review the literature on the role of financial literacy in planning wealth patterns over the life cycle. They initially look at the first stage of the life cycle, when individuals are active in the labor market, and focus on the role of financial literacy in fostering wealth accumulation. Financial literacy also matters in portfolio composition efficiency. An understudied topic that they also explore in this paper is whether financial literacy can help individuals better plan asset depletion in the last part of their life cycle.