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Geary WP2015/09
May 27, 2015

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Keywords: financial wealth, pension wealth, life-cycle hypothesis,
longevity, subjective survival probability
JEL codes: D14, D84, D91

May 27, 2015

Abstract

The life-cycle hypothesis predicts that longer life expectancy should, *ceteris paribus*, lead to the accumulation of more wealth during working life to fund consumption in retirement. The prediction is tested by examining whether subjective survival probability (SSP) — a proxy measure of self-assessed life expectancy — affects wealth holdings among the pre-retirement older population. SSP is instrumented to address measurement error and reverse causality. The findings suggest that a 1 percentage point increase in the self-assessed probability of reaching age 75 increases an individual's financial wealth by approximately EUR 3,400 and total wealth (including pension wealth) by approximately EUR 6,200.

*I would like to acknowledge the Government of Ireland Postgraduate Scholarship funding provided by the Irish Research Council. I wish to thank my Ph.D. supervisor, Professor Alan Barrett, for his insightful comments and suggestions. I would also like to acknowledge the valuable suggestions from Professor Gaia Narciso and Professor Rob Alessie, seminar participants at TCD, TILDA, and the Nevin Economic Research Institute, as well as attendees at the Irish Economic Association conference, the Spring Meeting of Young Economists, and the Royal Economic Society Postgraduate Meeting. All errors are my own.

1 Introduction

The ageing of populations has made retirement income provision a policy concern in many countries. With retirement ages not increasing at the same rate as life expectancy, people are spending a longer time in retirement. To prevent declines in consumption in a longer retirement, people can either save more during working life or delay retirement. However, the latter option might not be available to all because of institutional factors restricting retirement timing or health issues that restrict the possibility of extending careers. Figure 1 presents trends in Irish longevity and retirement ages: between 1970 and 2005, life expectancy at birth increased by approximately six years for both men and women, whereas the effective retirement age[1] decreased by nearly ten years for both genders. Ireland provides an interesting setting for examining saving decisions because of the lack of mandatory earnings-related pensions in the private sector.

As a way to reduce the burden of pension provision on public finances, many countries are implementing policy reforms that increase individual responsibility for saving for retirement (Post and Hanewald, 2013). The success of such policies depends partly on the ability of the individuals to make rational decisions which incorporate assessments of future risks that include mortality risk. This article examines the extent to which saving behaviour is rational in this respect, by testing whether longevity expectations affect saving behaviour.

The traditional life-cycle model of saving and consumption predicts that individuals with lower mortality risk should accumulate more wealth during their working lives, *ceteris paribus* (Hurd et al., 1998; Alessie and Kapteyn, 2001; Bloom et al., 2004). As De Nardi et al. (2009) point out, an unhealthy 70 year old male at 20$^{\text{th}}$ percentile of the permanent income distribution expects to live to age 76, whereas a healthy woman of the same age at the 80$^{\text{th}}$ percentile of the permanent income distribution expects to live to age 86. This article examines the causal link between pre-retirees' subjective survival probability (SSP) — a proxy measure of self-assessed life expectancy — and wealth levels in order to test whether differences in expectations of length of life are reflected in saving behaviour. Subjective survival probability data collected in ageing studies have been found to have strong predictive power of observed mortality, high correlation with life table survival probability estimates, and to correlate with known mortality risk factors, thereby providing valuable information about individual heterogeneity in longevity.

The data come from The Irish Longitudinal Study on Ageing (TILDA) which includes a measure of SSP and data from which a comprehensive measure of retirement wealth can be estimated. Existing research in this are commonly suffers from sub-optimal measures of wealth: some studies have examined current period saving rates which fail to capture the long-run nature of wealth accumulation and are prone to mis-measurement (Hurd et al., 1998) or only focus on a single component of wealth such as financial wealth (Bloom et al., 2006, 2007). This analysis includes both financial wealth and pension entitlements.

This study adopts an instrumental variable (IV) approach where SSP is instrumented for with parental

[1] The average effective retirement age is defined as the average age of exit from the labour force during a 5-year period. It is below the official retirement age in most OECD countries apart from Japan and South Korea (Keese, 2006).

mortality data (Bloom et al., 2006, 2007). Also, smoking status as an additional instrument as suggested by O'Donnell et al. (2008) who examine the effect of SSP on retirement timing. The IV methodology addresses the issues of reverse causality, measurement error and focal points in SSP responses.

The findings suggest a positive and statistically significant effect of SSP on pre-retirees' wealth — a one percentage point increase in self-assessed probability of reaching age 75 increases an individual's financial wealth by approximately EUR 3,400. This effect corresponds to a 3.9 per cent increase at the mean level of financial wealth. A one percentage point increase in SSP increases an individual's total wealth (financial wealth and pension wealth) by approximately EUR 6,200, which corresponds to a 1.7 per cent increase at the mean total wealth level.

The findings are robust to the exclusion of annuity wealth held in defined benefit and State welfare pensions. Arguably, these types of pension wealth can be computationally linked to life expectancy because the wealth held in a defined benefit pension is estimated as the present value of future streams of payment from the pension (using life table estimates of longevity as the length of future payment period). Also, specifications that exclude people whose parents died before the age of 50 and respondents with focal responses to the SSP question provide findings similar to the main estimates.

The remainder of this article is structured as follows: Section 2 reviews the relevant literature, while Section 2 describes the data. Section 4 describes the methodology, and Section 5 presents the results of the econometric analysis. The final section offers concluding remarks. Appendix A contains supplementary regression estimates, while Appendices B and C detail the methodologies used in estimating the values of different wealth components and in imputing missing wealth data, respectively.

2 Existing research

2.1 Theory of mortality risk and saving

The length of the horizon over which an individual is assumed to maximise their utility is crucial in economic models (Hamermesh, 1985). Some theoretical work focuses on how differences in the expected length of life and differences in the uncertainty about longevity may affect saving behaviour: Yaari (1965), Levhari and Mirman (1977) and Hurd (1989) develop life-cycle models of consumption and saving that relax the assumption of a known length of life. These models suggest that the level of uncertainty about the length of life has an impact on the level of saving, asset allocation and the timing of retirement. Yaari (1965) builds on the initial work of Fisher (1930) and develops a life-cycle model of consumption in which the horizon of human lifetime is modelled as a set of possible survival probabilities and individuals differ when it comes to risk aversion. Levhari and Mirman (1977) show that, for individuals with a high degree of risk aversion, changes in uncertainty about length of life affect consumption and saving choices because of fear of outliving savings and because of preference over current (guaranteed) consumption. The relative sizes of these forces depend on risk aversion, the form of the utility function, and rates of return.

More recent theoretical work on the effect of longevity risk on retirees' saving (as opposed to pre-retirees) has been carried out by Gan et al. (2004) and De Nardi et al. (2006, 2009). Gan et al. (2004) develop a dynamic life-cycle model which estimates the effects of expected future mortality on saving and bequests. They find that subjective mortality data preforms better than life table estimates of mortality when predicting wealth levels among the Asset and Health Dynamics Among the Oldest Old (AHEAD) survey respondents. De Nardi et al. (2006, 2009) focus on the wealth holdings of those in retirement. They develop a structural model of elderly singles' saving behaviour that incorporates different mortality risk based on gender, income, health and medical expenses. Using the AHEAD dataset, they find that longevity risk[2] and the risk of unexpected medical expenses explain a large part of savings decisions among older people.

Cocco and Gomes (2012) develop a life-cycle model with differential mortality risk and endogenous saving and retirement decisions of pre-retirees. They find that individuals respond to longer life expectancy with higher saving rates, assuming that they are aware of increases in life expectancy, the associated implications for saving requirements and that individuals also adjust their behaviour by delaying retirement if retirement timing is flexible.

In this analysis, it is assumed that individuals' longevity expectations are constant over time. More specifically, longevity expectations are assumed not to have changed between the start of the wealth accumulation process and the point of measurement of survival beliefs. The evolution of health and longevity expectations are a dynamic, endogenous process, as discussed by Benitez-Silva and Ni (2008). However, as this analysis focuses on pre-retirees, this assumption is more likely to hold than if the focus was on retirees — who are more likely to experience health shocks that affect longevity expectations.

2.2 Subjective survival probability

As emphasised by Manski (2004) and Hurd and Rohwedder (2008), taking account of expectations is crucial in models of economic behaviour. An agent making inter-temporal decisions needs to incorporate probability distributions of future events in their decision-making process. In traditional life-cycle models, individuals are assumed to make decisions about saving and consumption based partly on mortality risk. The common assumption is that individuals' subjective and objective probability distributions of mortality risk are identical, and therefore survival probability estimates have usually been taken from cohort-generic life table estimates (Hurd, 1989; Bloom et al., 2003).

In some analyses, life expectancy estimates are stratified by observable characteristics such as age, gender, race or education in order to account for individual heterogeneity in mortality (Skinner, 1985; Hurd et al., 1998; De Nardi et al., 2009). This approach, however, does not account for (at least partly) unobservable traits, such as genetics and health behaviours, that also affect longevity. If the difference between objective and subjective mortality risk is correlated with unobserved factors that explain variation in saving, empirical estimates of the effects of mortality risk will yield biased results (Hamermesh, 1985; Salm, 2010). Using a subjective measure of survival beliefs — that take account of determinants of longevity that the

[2] De Nardi et al. (2006, 2009) stratify aggregate life expectancy data by some observable characteristics (gender, health and income) to estimate heterogenous mortality rates.

individual herself has valuable information — can potentially circumvent this issue.

To aid the modelling of inter-temporal decision-making, some surveys include measures of subjective probabilities of the likelihood of future events. The use of subjective probability measures has been established in empirical studies since the 1980s. Alessie and Kapteyn (2001) and Manski (2004) document the change in attitudes among applied econometricians towards using subjective probability measures in analyses of saving behaviour.

In an early analysis of the quality of SSP data, Hamermesh (1985) collects two relatively small samples of subjective life expectancy data from white males in the US, one from economists and one from the general public.[3] He compares the distribution of the SSP responses to the distribution of the actuarial life table figures for men, stratified by age. He finds that for both groups, on average, subjective life expectancies coincide relatively closely with actuarial life tables. However, when it comes to the distribution of these expectations, both groups are inconsistent: they underestimate the probability of reaching the age of 60 and overestimate the probability of surviving from 60 to 80. He also studies the effect of individual characteristics on SSP and finds that parental longevity is a strong predictor of SSP responses.

The properties of SSP data in more recent ageing surveys have been examined by Hurd and McGarry (1995, 2002), Smith et al. (2001), Elder (2007), Siegel et al. (2003) and Post and Hanewald (2013). Hurd and McGarry (1995, 2002) find that SSP responses in the Health and Retirement Study (HRS) have approximately the same mean as the corresponding life-table estimates and that SSP data are correlated with known factors associated with mortality risk, such as socio-economic status and smoking behaviour. Smith et al. (2001) find the HRS SSP data to be predictive of actual mortality observed in subsequent waves of the survey. Siegel et al. (2003) examines the validity of AHEAD survey SSP data and finds the SSP data to predict mortality even when self-rated health and socio-demographic characteristics are controlled for. Post and Hanewald (2013) analyse the SSP responses from SHARE (the Survey of Health, Ageing and Retirement in Europe) and find that the distribution of SSP values is positively linked to the distribution of objective survival probabilities, indicating that SHARE respondents are aware of average longevity risk.

Well-documented issues with SSP data are classical measurement error and focal points in the responses. The measurement error issue is discussed by Bloom et al. (2006, 2007) who describe the aggregate over- and underestimation of survival probabilities in the HRS and AHEAD data. The phenomenon where responses are clustered at certain points in the distribution is known as focal responses (Hurd and McGarry, 2002; Post and Hanewald, 2013). The issue of focal point in SSP data is discussed in existing work by Hurd and McGarry (1995), Hurd et al. (1998), Bassett and Lumsdaine (2001), Bloom et al. (2003), Bloom et al. (2007) and Post and Hanewald (2013). Previous studies have dealt with focal responses by using instrumental variables, imputing values for the focal responses, or by treating a focal response as an indicator of individual uncertainty about the underlying probability (Post and Hanewald, 2013).

[3]The two populations were chosen because economists are assumed to have a better-than-average understanding of expectations and probabilities.

2.3 Empirical studies of SSP and saving

Existing empirical research into the effect of individually heterogeneous mortality risk on saving behaviour — either using a measure of the uncertainty about longevity or a direct measure of individuals' mortality beliefs — has been carried out with data from the HRS, AHEAD and SHARE surveys. Using AHEAD data, Hurd et al. (1998) examine the relationship between saving behaviour and survival beliefs by estimating an ordered probit model of whether an individual is a net saver, a zero saver, or a net dis-saver. They find a significant positive correlation between SSP and saving among couples but not singles, and that people seem to respond to subjective beliefs about mortality rather than to life table probabilities. Post and Hanewald (2013) carry out an empirical analysis of uncertainty about survival on saving behaviour using data from SHARE. They measure survival uncertainty as dispersion of SSP data from their objective counterparts and find that individuals hold higher levels of wealth when faced with greater uncertainty about longevity.

Neither Hurd et al. (1998) nor Post and Hanewald (2013) address the possibility of reverse causality between survival beliefs and wealth: wealth can affect a person's survival beliefs through its impact on health. Explanations for the effects of wealth on health include differential access to healthcare and differences in consumption of alcohol, tobacco and certain foods (Alessie and Kapteyn, 2001; Attanasio and Hoynes, 2000; Meer et al., 2003; Adda et al., 2009). The reverse causality issue has been addressed by Bloom et al. (2006, 2007) by using instrumental variables: with data from HRS, they examine the effect of SSP on the probability of an individual retiring between two time periods and on the levels of financial wealth of households. They instrument for the SSP data with the respondent's parents' current age or, alternatively, their age at death. The shortcomings of Bloom et al. (2006, 2007) — as they acknowledge — are that they have no measure of social security or pension wealth, which clearly play a central role when deciding about retirement saving and wealth accumulation. They find a significant effect of SSP on financial wealth for two-person households, with a one percentage point increase in SSP of the husband increasing the household financial wealth by approximately USD 2,800. They find a positive but statistically insignificant effect of SSP on financial wealth for single households.

In related work, using data from the English Longitudinal Study of Ageing (ELSA), O'Donnell et al. (2008) examine the effect of SSP on retirement timing, using both parental longevity and smoking behaviour as instruments for SSP. They calibrate the SSP data on life table figures to generate an optimism index.[4] A measure of survival probability that combines objective and subjective information is also used by Salm (2010) who examines how SSP affects consumption growth.[5]

This article addresses the two major issues in the empirical study of effect of survival beliefs on saving: a narrow definition of wealth and the issue of reverse causality between survival beliefs and wealth. Although

[4] The optimism index methodology comes from Gan et al. (2005). O'Donnell et al. (2008) find that females are more pessimistic about their survival probabilities than men and that both genders on average overestimate their mortality risk when compared with life table information.

[5] Salm (2010) measures consumption using two waves of the Consumption and Activities Mail Survey which was administered to a subset of the HRS respondents. He finds that a one-percent increase in SSP leads to a 1.8 per cent decrease in consumption of non-durables.

some existing analyses deal with these concerns in isolation, no existing study addresses both issues simultaneously. As Bloom et al. (2006, 2007) acknowledge, pension wealth is a major component of retirement wealth. Modelling the stock of wealth (rather than the current-period flow of saving or consumption) also mitigates the issue of measurement error: saving behaviour in a given period may not reflect long-term saving behaviour, whereas the accumulated stock of wealth in the years leading up to retirement better reflects the saving behaviour of an individual over a longer period of time.

3 Data

The data come from the first wave of The Irish Longitudinal Study on Ageing (TILDA), collected between 2009 and 2011. The TILDA dataset provides information on the health, lifestyles and socio-economic characteristics of a nationally representative sample of Irish people aged 50 and over and their spouses. The first wave contains information on 8,504 individuals living in 6,279 households.[6] TILDA is an ideal dataset for examining retirement resources because the respondents are relatively close to retirement: pension wealth is likely to be estimated more accurately for older people (Scholz et al., 2006).

Table 1 presents data on the sample selection process, with the number of observations remaining after each round of excluding observations. As the SSP question was only included in the first wave of the study, any research using this data is restricted to cross-sectional analysis. The individuals included in this analysis are those living in households where both spouses are less than 65 years old[7] and neither spouse is retired. After excluding those aged 65 and over, and retirees, the remaining sample size is 3,304 individuals. A further 942 observations are excluded due to a missing financial respondent[8] for the household (and therefore no financial wealth data is available) or one of the spouses refuses to take part in the survey. The SSP data is missing for a further 105 individuals, and 125 have missing values for one or more of the control variables. Due to missing values for the variables used in the imputation of the missing wealth data, 16 individuals are excluded from the analysis sample.[9] The final sample contains 2,116 individuals living in 1,464 households.

3.1 Control variable summary statistics

Table 2 presents summary statistics for the main control variables, while the dependent variable and the SSP measure are discussed in more detail in the following sections. Two-thirds of the individuals in the

[6] Each participant underwent a face-to-face computer-assisted personal interview (CAPI) in their home, was given a self-completion questionnaire and was invited to a health assessment. The overall response rate of the first wave was 62 per cent. See Barrett et al. (2011) for a detailed description of the data, including sampling and the construction of survey weights (which are accounted for in this analysis).

[7] Some TILDA respondents' spouses are less than 50 years old. They are excluded from the analysis as the probability weights used to make the sample representative of the population are not available for them.

[8] The spouse who is most knowledgeable about family finances and retirement planning is assigned the role of financial respondent.

[9] Missing wealth data is imputed as described in Appendix C.

sample are either employed or self-employed, with the remainder either unemployed, sick, home-makers or in education. For the majority, a second-level qualification is the highest education obtained, with one-fifth having a third-level qualification. Working careers are long, particularly for men. Roughly a third of the respondents report their health as being good; however, a fifth rate their health as poor or fair. Two-thirds of the sample are married or cohabiting, 14 per cent have never married, 15 per cent are separated or divorced and 7 per cent are widows. Equivalised income[10] is between EUR 10,000 and EUR 19,000 for 32 per cent of the sample and between EUR 20,000 and EUR 35,000 for 31 per cent of the sample. Just under a third of the respondents report drinking less than one unit of alcohol weekly, whereas 9 per cent drink 20 units or more. Two thirds of the sample report no vigorous physical activity[11] in the past week.

3.2 Wealth

Total projected wealth for each individual is calculated by adding together:

1. Net financial wealth, which includes saving and deposit accounts, stocks, shares, life insurance, mutual funds, investment property, land, businesses, due loans or inheritance, less outstanding non-mortgage debt[12]
2. Present discounted value of occupational and private pensions
3. Present discounted value of Contributory and Non-contributory State welfare pensions

Housing wealth is not included in the analysis because it is rarely used to finance consumption in retirement due to the illiquidity of the asset and the associated transaction costs (Gan et al., 2004). TILDA financial wealth data is collected from the financial respondent only, and therefore the net financial wealth is measured at the household level and subsequently divided equally between the spouses in the case of a married couple. All other wealth components are observed at the individual level. The estimation of current value of pensions requires assumptions to be made about past and future contribution histories and wages. The methodology follows closely that of Banks et al. (2005) and Crawford and O'Dea (2012) who estimate pension wealth for the respondents of the English Longitudinal Study of Ageing (ELSA). The methodology for wealth calculation is explained in Appendix B, and the imputation methods are described in Appendix C.

Examining the wealth distribution, Table 3 shows the percentages of households holding different types of wealth while Table 4 presents the mean values. Overall, 55 per cent of the single-person households and three-quarters of the couples report having positive financial wealth. Just under 40 per cent of singles and nearly 50 per cent of couples have supplementary pension wealth. As the majority of individuals have worked at some point in their lives, they have acquired entitlements to the Contributory State welfare

[10] Current income has been equivalised by dividing total household income by 1.66 for two-person households.
[11] Such as heavy lifting, digging, aerobics, or fast bicycling.
[12] The quality of TILDA wealth data is discussed in O'Sullivan et al. (2014).

pension. Because the Non-Contributory State welfare pension is means-tested, the entitlements to it are lowest at the higher end of total wealth distribution. The mean total wealth held by single households is approximately EUR 307,000, and couples' mean total wealth is estimated to be EUR 855,000.

3.3 Subjective survival probability

TILDA respondents are asked about their self-assessed probability of reaching a certain "target" age: *"What is the percent chance that you will live to be 75?"*[13] Figure 2 depicts the distribution of the SSP responses for men and women. The responses are higher for women than for men, as expected. The distributions are characterised by focal responses with two noticeable peaks at 50 per cent and 100 per cent. This finding is consistent with evidence from other ageing studies.[14]

Figure 3 compares the mean SSP values with survival probabilities obtained from actuarial life tables for different age groups (obtained from the Irish Central Statistics Office life tables, conditional on year of birth and gender). Examining ELSA data, O'Donnell et al. (2008) find that on average, both men and women underestimate their survival probability when compared to actuarial life table estimates, with women being more pessimistic than men. In TILDA, women's subjective survival beliefs coincide very closely with their objective estimates in all age groups, whereas men's self-assessed estimates are higher than their life table counterparts.

Table 5 presents mean values of SSP for different categories of variables correlated with mortality. SSP is negatively associated with being male and smoking, whereas those with higher education or income, better self-reported health, and those whose parents died at an older age (or are older currently) report higher values of SSP. Actuarial survival probabilities increase with age, which is also reflected in the SSP responses.

4 Methodology

The OLS model for examining the effect of SSP on wealth is specified in Equation 1. The dependent variable is measured in levels instead of logarithms because of the negative and zero values, following Bloom et al. (2006, 2007).

$$Wealth_i = \alpha_0 + \alpha_1 SSP_i + \alpha_2 I_i + \alpha_3 H_i + e_i \tag{1}$$

where:
$Wealth_i$ = wealth of individual i

[13] For respondents who are older than 65, the "target" age is higher. Older age groups are not included in this analysis.

[14] See Post and Hanewald (2013) for SHARE, O'Donnell et al. (2008) for ELSA and Bloom et al. (2006, 2007) for HRS.

SSP_i = subjective survival probability of individual i
I_i = vector of individual-level control variables
H_i = vector of household-level control variables
e_i = error term of individual i

Vector I_i contains variables measured at the individual level that explain variation in wealth levels (i.e. gender, age, work history, education and self-assessed health). Vector H_i contains control variables measured at the household level (marital status, number of children and equivalised current income). The standard errors are clustered at the household level.

The OLS estimate of α_1 is expected to suffer from biases caused by reverse causality and measurement error. Reverse causality would bias the estimate upward, whereas measurement error is expected to result in downward bias. The net effect of these biases is ambiguous.

An instrumental variables Two Stage Least Squares (2SLS) approach is adopted in order to address the biases. The instruments used are parental longevity and current smoking status. Parental longevity is measured as the age at death of the individual's mother and father. If either of the parents is still alive, their current age is used.

The exclusion restriction is satisfied in the case of parental longevity if parents' age at death only affects wealth through its effect on the child's survival beliefs. There are arguments for why parental longevity may not be exogenous: if the parents die when the child is young (perhaps before finishing education), by affecting the education and employment choices of the child, parental longevity could directly affect the child's wealth later in life. In order to account for this possibility, a robustness check is carried out where individuals whose parents died before the age of 50 are excluded from the sample. The exclusion restriction may also be violated if parental longevity affects a person's wealth level directly via bequest receipt. As the TILDA dataset does not contain information about received inheritances, a dummy variable indicating whether both of the respondents' parents are deceased is added as a control variable.

When it comes to the smoking instrument, the satisfaction of the exclusion restriction is more of a concern. Smoking may be a proxy measure of an individual's discount rate — a person who values today much more than tomorrow is more likely to smoke and also less likely to accumulate wealth due to precautionary saving motives. Smoking is arguably also a measure of risk aversion, which may be correlated with saving behaviour. In an attempt to mitigate this effect, other proxy measures of discount rates and risk aversion (namely, exercise and alcohol consumption) are included in the models where smoking instrument is used. Additionally, all the models include a specification with only the parental longevity instrument.

The first stage of the 2SLS fits a linear regression:[15]

$$SSP_i = \beta_0 + \beta_1 PM_i + \beta_2 MM_i + \beta_3 S_i + \beta_4 I_i + \beta_5 H_i + u_i \tag{2}$$

[15]Robustness checks are carried out using a Tobit specification in the first stage, discussed in the next section.

where:
PM_i = age at death (or current age) of individual i's father
MM_i = age at death (or current age) of individual i's mother
S_i = current smoking status of individual i

The second-stage estimation equation is:

$$Wealth_i = \gamma_0 + \gamma_1 FSSP_i + \gamma_2 I_i + \gamma_3 H_i + v_i \tag{3}$$

where $FSSP_i$ is the fitted value of SSP obtained from Equation 2.

5 Results

5.1 Effect of SSP on financial wealth

The estimates of the baseline OLS[16] and 2SLS models[17] with net financial wealth as the dependent variable are presented in Table 7. The coefficient associated with the SSP variable can be interpreted as the *ceteris paribus* change in financial wealth (in thousands of EUR) as SSP increases by one unit, i.e. by one percentage point. The models are first estimated using only financial wealth as the dependent variable in order to compare the findings to those of Bloom et al. (2006, 2007).

In line with Bloom et al. (2006, 2007), the OLS estimation suggests no link between SSP and financial wealth. The 2SLS results in Columns 2 to 6 suggest a significant positive relationship between SSP and financial wealth: the estimate obtained using the parental mortality instrument suggests that a one percentage point increase in self-assessed probability of reaching age 75 increases an individual's financial wealth by approximately EUR 3,400 on average. At the mean value of financial wealth (EUR 87,470), this effect corresponds to a 3.9 per cent increase. Depending on the instruments used, the estimated effect of SSP is statistically significant at the 1 or 5 per cent levels of confidence, and the estimate value varies between 3.4 and 4.6. All of the estimated coefficients associated with the control variables have the expected signs. The coefficient estimate on the SSP variable has a larger magnitude and smaller standard error in Models 3, 4 and 5 where smoking status is used as an instrument. Model 5 includes additional

[16] The Durbin-Wu-Hausman test of the consistency of the OLS estimates (the p-value reported in "DWHtest" in Table 7) indicates that OLS estimate is not consistent.

[17] The estimates from the first-stage regressions are presented in Table 6. Parental longevity measures have positive and significant effects on SSP, with the father's longevity having a stronger effect. As expected, smoking status has a negative impact on survival beliefs. The result of the F-test of the joint significance of the instruments suggests a high level of instrument strength. Interestingly, when the first stage regressions are estimated separately for men and women, it is apparent that SSP is influenced more by the mortality experience of the parent of the same gender as the respondent (see Table 16 in Appendix A). This finding is in contrast with Hurd et al. (1998) who report significant associations only between daughters and fathers.

proxy measures for time preference, and the sample size decreases due to missing values for these variables.

5.2 Effect of SSP on total wealth

Table 8 presents estimates using total wealth (net financial wealth as well as the net present values of supplementary pensions and State welfare pensions) as the dependent variable. Depending on the instruments used, the estimated effect of the SSP variable is statistically significant at the 1 or 5 per cent level of significance, and the coefficient magnitudes are larger as expected, due to the dependent variable capturing more wealth components. The estimated coefficient value varies between 5.1 and 7.3. At the mean value of total wealth (EUR 374,350), the estimates correspond to a percentage increase in total wealth of between 1.4 and 2.0.

5.3 Analysis by marital status

There are 759 single households and 651 two-person households in the analysis sampl. The dependent variables remain the same as in the earlier models for single households, but in the case of couples, individual financial wealth is doubled (because financial wealth is only measured at the household level) and total wealth is the sum of the individual spouses' total wealth.

Modelling decision-making within a two-person household is complicated by the influences from both spouses, whose characteristics such as survival beliefs, education, age and income are likely to be correlated, therefore introducing multicollinearity to the models. A further difficulty is the increase in standard errors in both stages of the 2SLS estimation caused by the smaller sample size.

When it comes to the one-person households, the second stage results are presented in Table 9, where the dependent variable is net financial wealth in columns 1 to 5 and total wealth in columns 6 to 10. The effect of SSP is still statistically significant, but the significance levels are lower than the corresponding levels from the previous analysis, as expected.[18] In the case of two-person households, in models with the characteristics of both spouses as the determinants of wealth levels, none of the coefficient estimates are statistically significant. Therefore, the models are re-estimated using only one spouse's characteristics. When using the female spouse's characteristics, the effect of SSP on wealth is found to be insignificant (results omitted for brevity). When the male spouse's characteristics are used, the effect of SSP on both wealth variables is also found to be statistically insignificant in some specifications.[19] When using the parental mortality instrument, the effect of SSP on financial wealth is statistically significant at the 12 per cent level. The corresponding level of significance is 9 per cent when examining the effect on total wealth. The estimated coefficient associated with SSP in this case is 14.6, meaning that a percentage point increase in self-assessed probability of reaching age 75 increases a household's total wealth by approximately EUR 14,600. This effect corresponds to a 1.7 per cent increase at the mean value of financial wealth for two-

[18]The first stage results for single households are presented in Table 14 of Appendix A.
[19]See the OLS and 2SLS regression results using the husband's characteristics in Table 10.

person households.[20] The finding that the husband's characteristics are more significant than the wife's may reflect the traditional role of the male spouse as the financial head of household, especially considering the age group used in the analysis.[21]

The findings differ from those of Bloom et al. (2006, 2007), who find no effect of SSP on wealth for single households. They do, however, find a significant effect of SSP for two-person households when using both spouses' characteristics as the explanatory variables. The findings of this article are arguably more intuitive in the sense that the effect should be easier to identify among single households where financial decisions are made by one person only. In two-person households, financial decisions may have been made before the couple became a joint household. As both spouses influence decision-making within the household, the effect of one spouse is more difficult to disentangle.

5.4 Robustness analysis

5.4.1 Exclusion of Defined Benefit and social welfare pensions

A possible issue with including annuity wealth, held in Defined Benefit pensions and social welfare pensions, in the wealth variable is that, by definition, the current value of an annuity payment is a function of life expectancy. Therefore, there exists a computational relationship between wealth and life expectancy. For example, the net present value of a social welfare payment is calculated as the sum of the income payments received by the individual over their estimated remaining lifetime, discounted to present time. The SSP measure is not equivalent to an actuarial cohort level life expectancy estimate, but the two are potentially highly correlated. In order to test if the association between SSP and total wealth is caused or strengthened by this structural link, the models are re-estimated using only net financial wealth and defined contribution pensions in the wealth variable. The results of this estimation are presented in Table 11. Depending on specification, the estimated SSP coefficient is statistically significant at the 1 or 10 per cent significance level, and the estimate value varies between 3.3 and 6.2. Therefore, the findings presented here appear not to be driven by the computational relationship between wealth and life expectancy.[22]

5.4.2 Exclusion of early orphans

As discussed in Section 4, the exclusion restriction of the parental mortality instrument might be violated in the case of an early death of a parent influencing the child's wealth directly through their choices when it

[20] The first stage results are presented in Table 15 in Appendix A.

[21] As Smith et al. (2010) show, there is evidence that the characteristics of the financial respondent may be more influential in a family's financial decision-making. A robustness analysis is carried out using the characteristics of the financial respondent as the regressors, and results are largely the same as when using the male spouse's characteristics. Slightly over 60 per cent of TILDA financial respondents in two-person households are male (O'Sullivan et al., 2014).

[22] The null hypothesis of valid instruments in the Sargan chi-squared test is not rejected in any of the specifications.

comes to education and work. Therefore, the models are re-run only using the observations on individuals whose parents died after the age of 50. The results are presented in Table 12. The estimates are very close to the initial estimates with the early orphans included, therefore providing evidence that the link between SSP and wealth is not driven by the correlation between parental mortality and the child's later life wealth that might arise from losing a parent early in life.

5.4.3 Exclusion of focal responses

The main specifications (presented in Section 5.1) are re-estimated excluding the focal responses, i.e individuals whose SSP variable takes on value of 0, 50 or 100. This robustness analysis is carried out to establish whether the focal responses that are driving the results. The results are presented in Table 13. The estimate of the coefficient on SSP is now larger in magnitude, and the statistical significance is broadly unchanged despite the reduction in sample size. The findings suggest that the SSP on wealth is heterogeneous across the focal and non-focal response groups, but the significant result is not driven by the focal respondents.

5.4.4 Tobit model first stage

A robustness check is carried out fitting Tobit models in the first stage, constricting the fitted value between 0 and 100. When using parental longevity as the instrument, the second stage estimates remain largely the same: the second-stage coefficient of the SSP variable is 3.67 in the case of the financial wealth and 5.60 in the case of total wealth. The coefficient estimates are statistically significant at the 5 and 1 per cent levels of confidence, respectively. As Angrist and Krueger (2001) explain, the consistency of second-stage estimates does not depend on the functional form of first-stage the equations.

6 Conclusion

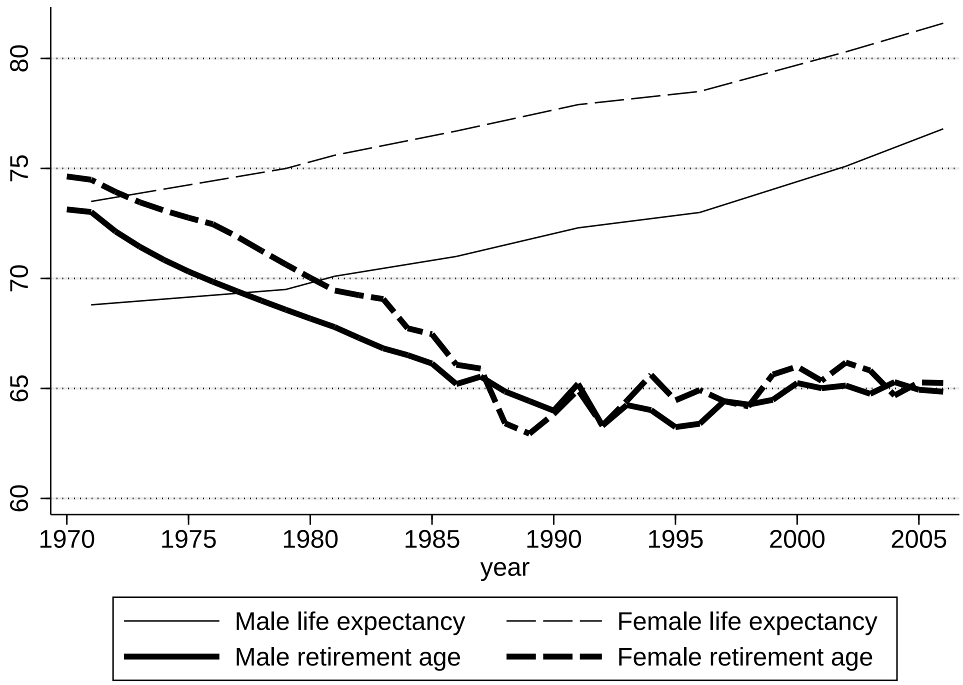
This article examines whether higher subjective survival probability (SSP) — a proxy measure of self-assessed life expectancy — leads to higher levels of wealth holdings among the pre-retirement older population. A comprehensive measure of wealth, including wealth held in State welfare pensions and supplementary pensions is used as the dependent variable. Parental mortality and smoking status are used as instruments for SSP to address the issues of reverse causality, measurement error and focal points in SSP responses.

A narrow definition of wealth and the issue of reverse causality between survival beliefs and wealth are the two major issues in the existing studies in this area. This research contributes to the literature by addressing both issues simultaneously. The findings presented in this article contribute to the existing body of literature that has found evidence of a causal link between survival beliefs and saving behaviour. The OLS estimation suggests no link between SSP and financial wealth. However, the IV estimates show a positive and statistically significant effect of subjective survival beliefs on the level of wealth — a one percentage point increase in self-assessed probability of reaching age 75 increases an individual's financial wealth by approximately EUR 3,400. This effect corresponds to a 3.9 per cent increase at the mean value of financial wealth.

Depending on the instrument used, the IV estimates show a positive and statistically significant effect of SSP total wealth. The estimated coefficient value varies between 5.1 and 7.3, suggesting that a one percentage point increase in SSP leads to an increase total wealth of EUR 5,100 to EUR 7,300 on average, corresponding to a 1.4 to 2.0 per cent increase in total wealth at the mean. The results are robust to a Tobit model specification in the first stage of the 2SLS, to the exclusion of annuity wealth held in defined benefit and social welfare pension wealth, to the exclusion of individuals who were orphaned relatively early, and to the exclusion of individuals with focal-point values for the SSP variable. When the analysis is carried out at the household level and the models are estimated separately for singles and couples, the results remain relatively constant for singles but the coefficient significance decreases for couples, possibly due to smaller sample sizes and to the difficulty of modelling both spouses' influences in the process.

People's lives are longer than ever before, with rapid declines in mortality rates the in the past few decades. Many pension systems incentivise retirement at certain ages, and healthy life expectancy is not increasing at the same rate as overall life expectancy. These facts suggest that delaying retirement may not be a solution to retirement funding issues. These developments have consequences for social security systems, insurance providers, employers and policy makers alike. Whether people are aware of declines in mortality rates, and whether they adjust their survival expectations accordingly, is important in saving decision-making. The findings of this research are relevant when it comes to the design of pension systems that increase the responsibility of the individual when making retirement provisions. For an optimal outcome in systems with an emphasis on the personal responsibility for pension saving, it is necessary that individuals make informed decisions based on realistic expectations about risks, with mortality risk being a crucial factor. From that point of view, it is of interest to policy-makers to find that individuals appear to adjust their saving behaviour in response to differential mortality.

Figure 1: Life expectancy at birth and average effective age of retirement in Ireland, 1970-2006



Sources: Irish Life Tables (Central Statistics Office, 2010) and Organisation for Economic Co-operation and Development (2013)

Table 1: Selection of the analysis sample

Sample description	Remaining observations
TILDA respondents in Wave 1	8,504
Between 50 and 64 years old*	4,062
Not retired*	3,304
Household has a financial respondent	3,219
Both spouses take part in survey†	2,362
Non-missing SSP data	2,257
Non-missing control variables	2,132
Imputable wealth data	2,116
Final sample size	**2,116**

*both spouses if married or cohabiting
†if married or cohabiting

Table 2: Descriptive statistics by gender

	Gender		
	Male	**Female**	**Total**
	%	%	%
Socioeconomic status			
Employed	43.0	52.7	47.5
Self-employed	29.4	6.1	18.5
Unemployed	15.2	6.5	11.2
Permanently sick / disabled	10.6	9.4	10.0
Looking after home	1.3	24.0	11.9
In education	0.5	1.2	0.8
Age			
50 - 54	31.2	40.1	35.4
55 - 59	40.9	38.9	39.9
60 - 64	27.9	21.0	24.7
Education level			
Primary/none	28.8	20.6	25.0
Secondary	52.5	54.9	53.6
Third level/higher	18.7	24.5	21.4
Years worked			
0-9	1.2	13.0	6.7
10-19	2.1	19.4	10.2
20-29	7.2	26.2	16.1
30-39	50.0	33.0	42.0
40+	39.4	8.5	25.0
Number of children			
0	21.7	14.1	18.2
1-2	27.7	29.4	28.5
3-4	38.5	42.1	40.1
5+	12.1	14.5	13.2
Health			
Poor/Fair	22.5	20.0	21.3
Good	33.4	31.7	32.6
Very good	29.4	29.2	29.3
Excellent	14.7	19.1	16.8
Marital status			
Married	68.0	60.4	64.4
Single (never married)	16.7	10.2	13.7
Separated / divorced	11.4	18.8	14.8
Widowed	3.9	10.5	7.0
Equivalised HH income (1000s)			
Less than 10	20.1	16.9	18.6
10 to 19	32.6	32.3	32.5
20 to 34	29.1	32.2	30.6
35 or more	18.2	18.6	18.3
Weekly alcohol units			
Less than 1	24.7	39.2	31.5
1 to 4	19.3	26.2	22.5
5 to 19	41.6	32.0	37.1
20 or more	14.4	2.6	8.9
Weekly exercise days			
Less than 1	57.9	76.8	66.7
1 to 2	13.0	11.5	12.3
3 to 4	10.5	5.7	8.2
5 or more	18.7	6.1	12.8
Sample size	996	1,120	2,116

Table 3: Percentages holding wealth, by total wealth quartile

a) Singles

	1st	2nd	3rd	4th	All
Financial wealth	24.9	50.4	67.6	83.8	54.8
Supplementary pension wealth	6.8	27.5	54.3	77.0	39.2
Contributory pension wealth	86.0	93.9	94.9	96.8	92.7
Non-Contributory pension wealth	14.0	5.6	4.3	1.8	6.7

b) Couples

	1st	2nd	3rd	4th	All
Financial wealth	52.9	78.1	83.7	91.7	75.5
Supplementary pension wealth	22.6	41.5	60.9	74.6	48.9
Contributory pension wealth	99.4	100.0	100.0	100.0	99.8
Non-Contributory pension wealth	30.1	4.6	0.6	0.0	9.5

Table 4: Mean values of wealth holdings (EUR), by total wealth quartile

a) Singles

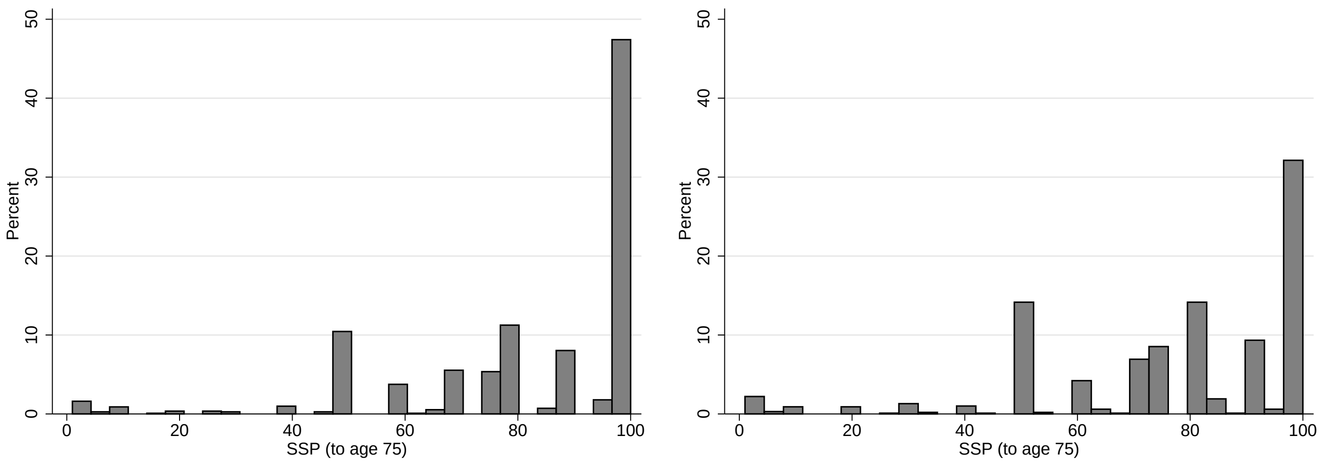
	1st	2nd	3rd	4th	All
Financial wealth	-390	15,454	46,233	242,323	66,089
Supplementary pension wealth	2,062	16,700	62,181	324,306	88,583
Contributory pension wealth	118,195	142,385	153,549	159,020	142,204
Non-Contributory pension wealth	17,648	7,623	5,104	2,546	8,570
Total wealth	137,516	182,162	267,067	728,195	307,094

b) Couples

	1st	2nd	3rd	4th	All
Financial wealth	23,473	54,486	158,938	660,861	208,354
Supplementary pension wealth	28,666	97,664	210,523	695,072	239,014
Contributory pension wealth	286,997	425,196	450,440	452,749	398,662
Non-Contributory pension wealth	33,378	3,841	744	0	10,256
Total wealth	372,515	581,187	820,645	1,808,681	855,243

Figure 2: The distribution of subjective probability of reaching age 75

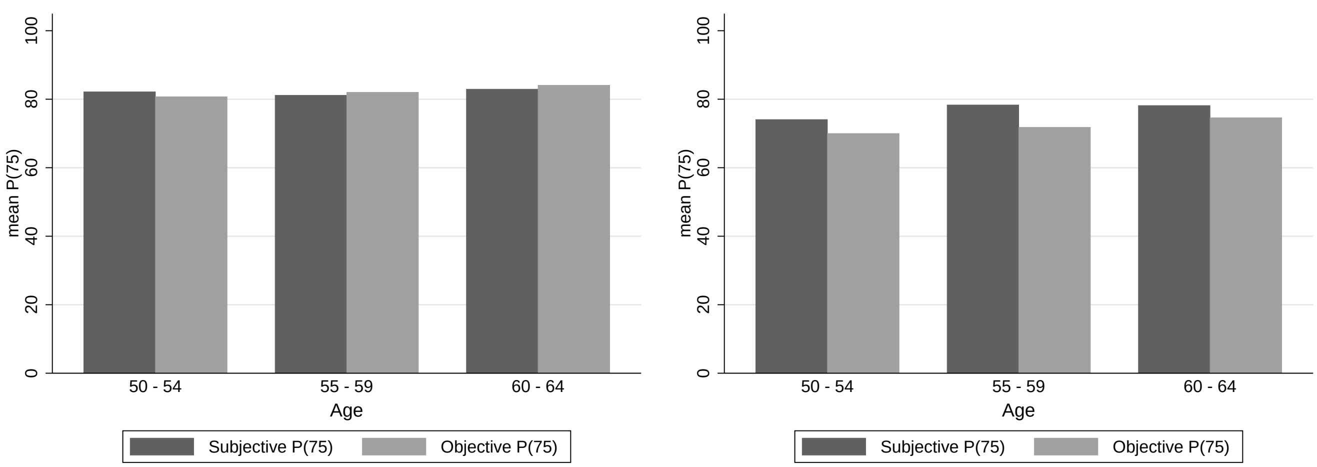
(a) Women (b) Men



Source of objective P(75) data: Central Statistics Office Irish Life Tables

Figure 3: Subjective and objective mean probability of reaching age 75, by age

(a) Women (b) Men



Source of objective P(75) data: Central Statistics Office Irish Life Tables

Table 5: Mean values of SSP, by variables correlated with mortality

	Mean
Gender	
Male	76.9
Female	81.9
Age	
50 - 54	78.3
55 - 59	79.6
60 - 64	80.1
Highest education achieved	
Primary/none	78.6
Secondary	79.0
Third/higher	80.9
Equivalised HH income (1000s)	
Less than 10	76.4
10 to 19	78.7
20 to 34	81.0
35 or more	80.4
Health	
Poor/Fair	69.8
Good	78.9
Very good	81.2
Excellent	88.6
Smokes now	
No	81.4
Yes	72.7
Mother's (death) age	
less than 70	73.8
70-79	81.7
80-89	79.8
90+	82.9
Father's (death) age	
less than 70	74.7
70-79	79.2
80-89	83.0
90+	86.2
Sample size	2,116

Table 6: First-stage results

	(1)	(2)	(3)	(4)	(5)
Mother's (death) age	0.17***		0.16***		0.18***
	(0.04)		(0.04)		(0.04)
Father's (death) age		0.22***	0.21***		0.20***
		(0.04)	(0.04)		(0.04)
Smokes now				-6.08***	-5.46***
				(1.55)	(1.55)
Female	6.87***	6.54***	6.81***	5.33***	5.63***
	(1.27)	(1.26)	(1.26)	(1.34)	(1.33)
Age	0.34**	0.36**	0.30**	0.35**	0.27
	(0.15)	(0.15)	(0.15)	(0.17)	(0.17)
Years worked	0.12**	0.10*	0.10*	0.07	0.06
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)
Number of children	0.17	0.23	0.22	-0.01	0.01
	(0.35)	(0.36)	(0.36)	(0.38)	(0.38)
Education					
Secondary	-2.38	-2.15	-2.60*	-2.58	-3.26**
	(1.50)	(1.49)	(1.48)	(1.66)	(1.64)
Third level/higher	-2.23	-2.09	-2.79*	-2.66	-3.80**
	(1.66)	(1.65)	(1.65)	(1.79)	(1.78)
Health					
Good	9.07***	9.05***	8.99***	8.14***	8.07***
	(1.69)	(1.67)	(1.67)	(1.92)	(1.89)
Very good	11.42***	11.35***	11.37***	10.99***	11.15***
	(1.72)	(1.70)	(1.71)	(1.95)	(1.91)
Excellent	18.56***	18.32***	18.34***	17.36***	17.30***
	(1.73)	(1.72)	(1.72)	(1.87)	(1.86)
Marital status					
Married	-0.17	-0.54	-0.31	-1.01	-0.84
	(1.85)	(1.88)	(1.85)	(2.02)	(2.00)
Divorced/separated	-4.54*	-5.13**	-4.74**	-5.10**	-5.02**
	(2.36)	(2.38)	(2.37)	(2.54)	(2.53)
Widowed	-0.88	-1.15	-0.92	1.01	0.96
	(2.48)	(2.49)	(2.47)	(2.82)	(2.80)
Equivalised HH income (1000s)	-0.02	-0.02	-0.02	-0.03	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Both parents alive	6.84***	5.31***	4.78**	5.66**	3.21
	(1.93)	(1.95)	(1.95)	(2.24)	(2.24)
Weekly alcohol				-0.06	-0.06
				(0.05)	(0.05)
Weekly exercise				0.04	-0.01
				(0.28)	(0.28)
Constant	33.35***	29.92***	21.11**	51.56***	29.08***
	(8.86)	(9.06)	(9.04)	(9.55)	(9.92)
Observations	2116	2116	2116	1714	1714
R^2	0.094	0.099	0.105	0.101	0.120
Ftest	16.78	28.12	22.82	15.45	19.85

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Subjective survival probability of reaching age 75.
Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)

Table 7: OLS and IV results, financial wealth

	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)
SSP (to age 75)	0.0510	3.416**	4.584***	3.960***	3.938***
	(0.160)	(1.658)	(1.497)	(1.214)	(1.510)
Female	-4.271	-26.46*	-34.15**	-30.04**	-21.97
	(8.445)	(13.76)	(14.29)	(12.30)	(14.32)
Age	1.309	-0.0206	-0.482	-0.236	-0.523
	(1.498)	(1.561)	(1.626)	(1.536)	(1.740)
Years worked	1.255***	0.860*	0.722	0.796*	0.864
	(0.406)	(0.446)	(0.503)	(0.456)	(0.535)
Number of children	-0.901	-1.520	-1.735	-1.620	-2.723
	(3.503)	(3.752)	(3.858)	(3.791)	(4.065)
Education					
Secondary	16.20*	22.63*	24.86**	23.67**	28.77*
	(9.397)	(11.76)	(12.32)	(11.84)	(14.74)
Third level/higher	76.81***	81.85***	83.60***	82.67***	90.29***
	(18.75)	(20.33)	(20.46)	(20.31)	(24.03)
Health					
Good	15.96	-14.78	-25.45	-19.75	-22.91
	(9.858)	(19.64)	(17.11)	(16.08)	(19.77)
Very good	21.00*	-17.37	-30.68	-23.57	-26.84
	(11.15)	(23.19)	(20.99)	(18.89)	(23.30)
Excellent	46.63***	-15.78	-37.43	-25.87	-37.36
	(15.80)	(35.45)	(31.51)	(27.86)	(33.70)
Marital status					
Married	23.10	24.48	24.96	24.70	33.96
	(19.96)	(21.23)	(21.85)	(21.50)	(23.78)
Divorced/separated	-22.65	-6.030	-0.263	-3.342	5.173
	(18.63)	(22.62)	(21.84)	(21.71)	(25.22)
Widowed	7.238	10.99	12.29	11.59	16.12
	(23.16)	(24.72)	(25.36)	(24.96)	(26.94)
Equivalised HH income (1000s)	0.529*	0.587**	0.607***	0.597***	0.525**
	(0.297)	(0.232)	(0.211)	(0.221)	(0.219)
Both parents alive	-20.83*	-45.88**	-54.58***	-49.93***	-43.26**
	(12.56)	(20.29)	(20.06)	(18.64)	(20.51)
Weekly alcohol					-0.00354
					(0.427)
Weekly exercise					4.846
					(2.998)
Constant	-93.58	-237.6*	-287.5**	-260.8**	-257.3*
	(91.42)	(129.1)	(121.4)	(117.8)	(146.5)
Observations	2116	2116	2116	2116	1714
R^2	0.047	.	.	.	.
DWHtest	0.0325				

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Financial Wealth, EUR 1000s
Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)
P = Parental longevity, S = Current smoker

Table 8: OLS and IV results, total wealth

	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)
SSP (to age 75)	0.143	5.098**	7.299***	6.118***	6.036***
	(0.307)	(2.280)	(2.635)	(1.695)	(2.051)
Female	41.45**	8.782	-5.730	2.060	18.75
	(16.47)	(25.03)	(24.57)	(22.00)	(26.36)
Age	1.549	-0.409	-1.279	-0.812	-1.999
	(1.853)	(1.979)	(2.196)	(1.951)	(2.206)
Years worked	5.331***	4.749***	4.490***	4.629***	4.820***
	(0.640)	(0.766)	(0.771)	(0.738)	(0.913)
Number of children	-9.879**	-10.79**	-11.20**	-10.98**	-11.19**
	(4.620)	(4.897)	(5.052)	(4.945)	(5.579)
Education					
Secondary	29.63*	39.09**	43.29**	41.03**	51.25**
	(15.79)	(17.78)	(21.00)	(18.95)	(21.03)
Third level/higher	207.3***	214.7***	218.0***	216.3***	233.4***
	(26.58)	(27.90)	(29.59)	(28.49)	(32.28)
Health					
Good	31.99*	-13.28	-33.38	-22.59	-16.29
	(16.81)	(30.12)	(27.48)	(24.20)	(28.73)
Very good	37.19**	-19.31	-44.41	-30.93	-29.86
	(15.28)	(31.84)	(34.58)	(26.34)	(31.18)
Excellent	103.8***	11.91	-28.91	-7.001	-11.16
	(29.26)	(47.94)	(52.94)	(37.99)	(45.04)
Marital status					
Married	107.5***	109.5***	110.4***	109.9***	116.8***
	(31.53)	(33.41)	(34.38)	(33.81)	(39.81)
Divorced/separated	-22.50	1.976	12.85	7.013	5.381
	(31.85)	(37.65)	(35.07)	(35.47)	(43.58)
Widowed	16.86	22.38	24.84	23.52	20.04
	(36.73)	(38.41)	(38.97)	(38.56)	(46.38)
Equivalised HH income (1000s)	1.454**	1.540**	1.578***	1.558**	1.517**
	(0.726)	(0.632)	(0.594)	(0.613)	(0.691)
Both parents alive	-29.09	-65.99**	-82.38**	-73.58**	-64.51**
	(22.31)	(31.05)	(34.27)	(29.62)	(32.01)
Weekly alcohol					0.538
					(0.689)
Weekly exercise					2.967
					(4.047)
Constant	-84.59	-296.6*	-390.8**	-340.2**	-298.6*
	(111.8)	(162.0)	(176.1)	(150.5)	(180.1)
Observations	2116	2116	2116	2116	1714
R^2	0.159	0.056	.	0.010	0.013
DWHtest	0.0187				

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Total Wealth, EUR 1000s
Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)
P = Parental longevity, S = Current smoker

Table 9: OLS and IV results for single households

	FINANCIAL					TOTAL				
	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)	(6) OLS	(7) IV(P)	(8) IV(S)	(9) IV(P+S)	(10) IV(P+S)
SSP (to age 75)	0.16	4.35**	4.56***	4.47***	4.19**	0.57	8.33**	7.85***	7.99***	7.11***
	(0.22)	(2.21)	(1.69)	(1.42)	(1.64)	(0.54)	(3.92)	(2.91)	(2.17)	(2.58)
Female	-35.78**	-71.60**	-73.35***	-72.59***	-76.46***	14.24	-51.93	-47.86	-49.07	-34.78
	(15.31)	(28.42)	(24.36)	(23.60)	(29.06)	(34.42)	(58.06)	(37.23)	(40.64)	(57.37)
Age	0.74	-1.39	-1.49	-1.44	-0.96	3.17	-0.75	-0.51	-0.58	-2.26
	(1.60)	(2.29)	(2.12)	(2.09)	(2.50)	(2.29)	(3.24)	(3.38)	(3.08)	(3.41)
Years worked	1.71***	1.08	1.05	1.07	1.27	6.80***	5.66***	5.73***	5.71***	6.68***
	(0.56)	(0.77)	(0.70)	(0.70)	(0.78)	(0.95)	(1.43)	(1.08)	(1.15)	(1.36)
Number of children	2.64	6.19	6.36	6.29	8.12	2.13	8.69	8.29	8.41	13.18
	(3.99)	(5.15)	(5.48)	(5.25)	(5.42)	(4.65)	(7.87)	(7.68)	(7.44)	(8.26)
Education										
Secondary	10.55	5.76	5.53	5.63	15.28	39.36	30.52	31.06	30.90	47.07
	(15.47)	(18.70)	(18.63)	(18.59)	(22.80)	(24.03)	(30.40)	(28.19)	(28.84)	(34.84)
Third level/higher	44.30**	40.38*	40.19*	40.28*	45.63	194.31***	187.07***	187.52***	187.39***	196.51***
	(21.55)	(23.67)	(24.02)	(23.85)	(29.42)	(30.87)	(36.20)	(35.98)	(35.93)	(39.68)
Health										
Good	26.17**	-29.68	-32.41	-31.22	-28.54	59.66*	-43.50	-37.16	-39.05	-0.37
	(12.18)	(32.97)	(26.66)	(23.84)	(31.90)	(30.86)	(70.15)	(45.91)	(45.08)	(62.73)
Very good	48.30***	-6.46	-9.13	-7.96	-0.19	67.07***	-34.08	-27.85	-29.71	17.20
	(15.27)	(34.65)	(27.96)	(25.81)	(32.70)	(24.06)	(58.86)	(48.78)	(41.28)	(47.35)
Excellent	73.37**	-12.39	-16.57	-14.75	-28.66	88.81**	-69.62	-59.87	-62.78	-39.65
	(28.69)	(52.77)	(42.39)	(38.64)	(43.91)	(35.56)	(85.51)	(70.60)	(56.76)	(61.84)
Divorced/separated	-22.20	-11.13	-10.58	-10.82	-5.07	-44.98	-24.53	-25.78	-25.41	-35.57
	(19.67)	(24.46)	(22.30)	(22.87)	(23.88)	(33.77)	(43.41)	(36.18)	(38.36)	(47.08)
Widowed	8.88	4.76	4.56	4.64	2.75	-8.29	-15.90	-15.43	-15.57	-34.30
	(25.56)	(28.70)	(29.77)	(29.33)	(29.78)	(38.86)	(43.85)	(45.38)	(44.71)	(53.69)
Equivalised HH income (1000s)	0.11	0.27**	0.28**	0.28**	0.23*	0.70	1.00**	0.98**	0.99**	0.88**
	(0.12)	(0.13)	(0.13)	(0.12)	(0.12)	(0.54)	(0.43)	(0.48)	(0.45)	(0.41)
Both parents alive	-10.25	-47.26	-49.07*	-48.28*	-49.99*	9.49	-58.88	-54.67	-55.93	-53.20
	(15.98)	(30.31)	(28.55)	(26.97)	(29.20)	(34.98)	(53.94)	(50.29)	(46.70)	(52.19)
Weekly alcohol					-0.38					0.34
					(0.48)					(0.93)
Weekly exercise					4.62					-0.71
					(5.13)					(6.76)
Constant	-68.45	-201.50	-207.99*	-205.15*	-225.78	-248.33*	-494.09**	-478.97**	-483.49***	-392.92**
	(92.80)	(122.37)	(121.56)	(115.21)	(138.43)	(137.47)	(220.89)	(187.08)	(183.24)	(199.44)
Observations	759	759	759	759	569	759	759	759	759	569
R^2	0.061	.	.	.	.	0.155	.	.	.	.

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Financial Wealth in Columns 1-6, Net Total Wealth in Columns 7-12 (EUR 1000s)
Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)
P = Parental longevity, S = Current smoker

Table 10: OLS and IV results for two-person households, using husband's characteristics

	FINANCIAL					TOTAL				
	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)	(6) OLS	(7) IV(P)	(8) IV(S)	(9) IV(P+S)	(10) IV(P+S)
Husband's subjective P(75)	-0.86	9.97	15.58	10.89*	11.81	-2.07	14.59*	12.48	14.21*	15.28*
	(0.76)	(6.45)	(11.87)	(6.03)	(7.41)	(1.33)	(8.67)	(14.72)	(7.91)	(9.26)
Age	-6.02	-7.22	-7.85	-7.33	-9.78	-8.25	-10.10	-9.87	-10.06	-7.16
	(5.24)	(5.95)	(7.23)	(6.13)	(7.29)	(6.59)	(7.95)	(7.54)	(7.84)	(9.86)
Years worked	8.26***	3.96	1.73	3.59	4.69	13.76***	7.14	7.98	7.30	4.89
	(2.26)	(3.99)	(6.05)	(3.95)	(5.01)	(3.25)	(5.93)	(7.50)	(5.74)	(7.65)
Education										
Secondary	-21.48	27.04	52.20	31.16	43.93	-9.36	65.28	55.83	63.56	87.76
	(37.00)	(59.73)	(81.70)	(59.75)	(67.94)	(54.30)	(83.54)	(105.65)	(83.39)	(87.68)
Third level/higher	169.89**	234.45**	267.93**	239.94**	241.55**	403.41***	502.73***	490.16***	500.44***	453.01***
	(75.15)	(100.78)	(116.20)	(99.01)	(117.35)	(99.57)	(122.49)	(148.69)	(122.20)	(138.88)
Health										
Good	-59.56	-110.73*	-137.26	-115.08*	-126.97*	-11.15	-89.86	-79.90	-88.04	-99.14
	(41.91)	(63.51)	(84.80)	(63.71)	(70.71)	(51.50)	(80.16)	(96.40)	(77.93)	(84.51)
Very good	-23.34	-109.09	-153.55	-116.37*	-151.92*	44.15	-87.76	-71.06	-84.71	-164.65
	(49.46)	(69.79)	(117.69)	(70.29)	(81.38)	(62.37)	(92.55)	(145.51)	(91.57)	(102.76)
Excellent	2.36	-173.84	-265.22	-188.82	-223.00	200.16*	-70.92	-36.61	-64.66	-111.96
	(58.12)	(130.22)	(207.14)	(124.63)	(144.82)	(109.82)	(162.51)	(255.97)	(152.82)	(171.95)
Equivalised HH income (1000s)	2.70***	2.57***	2.51***	2.56***	4.57***	6.00***	5.80**	5.82**	5.80**	13.74***
	(0.61)	(0.69)	(0.75)	(0.70)	(1.60)	(2.30)	(2.39)	(2.39)	(2.39)	(3.04)
Both parents alive	-113.85**	-213.80**	-265.64**	-222.30***	-224.69**	-143.01**	-296.78**	-277.31*	-293.23***	-254.06**
	(47.17)	(86.52)	(126.44)	(83.70)	(93.59)	(62.29)	(116.41)	(152.88)	(109.91)	(117.70)
Number of children	-1.63	-2.18	-2.47	-2.23	-7.15	-24.53	-25.38	-25.27	-25.36	-28.14
	(10.93)	(12.56)	(14.35)	(12.81)	(14.49)	(15.05)	(16.86)	(16.26)	(16.75)	(19.36)
Husband exercise					10.24					5.80
					(9.24)					(12.25)
Husband alcohol					-0.87					-0.37
					(1.43)					(2.18)
Constant	252.30	-329.01	-630.47	-378.41	-385.61	764.58**	-129.71	-16.50	-109.06	-426.70
	(313.34)	(559.54)	(810.45)	(548.39)	(664.61)	(347.42)	(682.06)	(960.55)	(662.13)	(785.29)
Observations	651	651	651	651	549	651	651	651	651	549
R^2	0.063	.	.	.	.	0.156	.	.	.	.

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Financial Wealth in Columns 1-6, Net Total Wealth in Columns 7-12 (EUR 1000s)
Reference categories: Education: primary/none. Health: poor/fair.
P = Parental longevity, S = Current smoker

Table 11: OLS and IV results, excluding Defined Benefit and social welfare pensions

	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)
SSP (to age 75)	-0.141	3.297*	6.209***	4.619***	4.533***
	(0.278)	(1.869)	(1.883)	(1.354)	(1.656)
Female	-1.654	-24.32	-43.51**	-33.03*	-22.64
	(14.94)	(21.94)	(19.78)	(19.24)	(23.72)
Age	1.217	-0.141	-1.292	-0.664	-1.057
	(1.608)	(1.643)	(1.900)	(1.671)	(1.895)
Years worked	1.492***	1.088	0.746	0.933	1.035
	(0.575)	(0.664)	(0.684)	(0.651)	(0.804)
Number of children	-2.316	-2.949	-3.484	-3.192	-4.278
	(4.137)	(4.396)	(4.691)	(4.498)	(5.039)
Education					
Secondary	26.08**	32.64**	38.20**	35.16**	41.17**
	(10.75)	(12.80)	(15.59)	(13.74)	(17.01)
Third level/higher	91.24***	96.39***	100.8***	98.37***	106.3***
	(20.64)	(22.13)	(23.31)	(22.45)	(26.22)
Health					
Good	27.06**	-4.340	-30.94	-16.42	-17.08
	(13.69)	(24.39)	(21.15)	(19.73)	(24.10)
Very good	26.22**	-12.98	-46.18*	-28.05	-28.71
	(12.02)	(25.51)	(26.20)	(21.03)	(25.91)
Excellent	71.50***	7.757	-46.24	-16.76	-23.02
	(27.61)	(39.07)	(41.60)	(31.87)	(38.44)
Marital status					
Married	24.84	26.25	27.44	26.79	33.35
	(28.86)	(30.18)	(31.61)	(30.72)	(36.96)
Divorced/separated	-29.13	-12.15	2.235	-5.618	-1.462
	(28.33)	(33.68)	(31.52)	(32.04)	(40.04)
Widowed	5.695	9.526	12.77	11.00	9.003
	(33.09)	(34.62)	(35.92)	(35.02)	(41.89)
Equivalised HH income (1000s)	0.852*	0.912**	0.962***	0.935**	0.862**
	(0.476)	(0.412)	(0.367)	(0.389)	(0.420)
Both parents alive	-32.66**	-58.25**	-79.93***	-68.10***	-60.99***
	(14.31)	(22.64)	(25.34)	(21.62)	(23.17)
Weekly alcohol					0.286
					(0.575)
Weekly exercise					4.234
					(3.488)
Constant	-83.74	-230.8	-355.4***	-287.4**	-275.3*
	(98.13)	(140.4)	(136.8)	(126.7)	(155.6)
Observations	2116	2116	2116	2116	1714
R^2	0.049	.	.	.	.

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: net financial wealth + supplementary Defined Contribution pension wealth, EUR 1000s.

Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)

P = Parental longevity, S = Current smoker

Table 12: OLS and IV results, excluding early orphans

	FINANCIAL					TOTAL				
	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)	(6) OLS	(7) IV(P)	(8) IV(S)	(9) IV(P+S)	(10) IV(P+S)
SSP (to age 75)	0.139	3.354**	4.761***	4.031***	4.606***	0.230	4.734**	7.047***	5.848***	6.360***
	(0.164)	(1.625)	(1.461)	(1.145)	(1.409)	(0.323)	(2.172)	(2.533)	(1.576)	(1.866)
Female	-3.368	-24.66*	-33.97**	-29.14**	-25.51	42.60**	12.78	-2.532	5.405	16.48
	(9.533)	(14.30)	(15.27)	(13.06)	(15.91)	(18.13)	(26.24)	(25.25)	(23.18)	(28.26)
Age	1.767	0.225	-0.449	-0.0994	-0.462	1.699	-0.461	-1.570	-0.995	-2.264
	(1.588)	(1.734)	(1.747)	(1.662)	(1.875)	(1.942)	(2.116)	(2.330)	(2.048)	(2.331)
Years worked	1.304***	0.962**	0.812	0.890*	0.896	5.433***	4.953***	4.706***	4.834***	4.984***
	(0.450)	(0.478)	(0.549)	(0.498)	(0.605)	(0.701)	(0.807)	(0.816)	(0.789)	(1.007)
Number of children	-1.507	-1.720	-1.813	-1.765	-3.464	-11.13**	-11.43**	-11.58**	-11.50**	-12.87**
	(3.431)	(3.668)	(3.869)	(3.756)	(4.027)	(4.595)	(4.798)	(5.068)	(4.911)	(5.579)
Education										
Secondary	16.44	23.45*	26.52**	24.93*	32.41*	30.03*	39.86**	44.91**	42.29**	55.20**
	(10.07)	(12.69)	(13.44)	(12.83)	(16.67)	(17.07)	(19.13)	(22.80)	(20.47)	(23.13)
Third level/higher	75.56***	80.14***	82.15***	81.11***	87.76***	209.0***	215.4***	218.7***	217.0***	232.1***
	(19.65)	(21.28)	(21.62)	(21.37)	(25.52)	(27.88)	(29.21)	(31.05)	(29.90)	(33.65)
Health										
Good	13.03	-16.61	-29.58*	-22.85	-30.89	26.39	-15.13	-36.46	-25.40	-26.07
	(10.25)	(19.45)	(17.04)	(15.68)	(19.26)	(17.50)	(29.59)	(26.60)	(23.36)	(27.42)
Very good	23.30*	-14.98	-31.74	-23.04	-33.30	41.61**	-12.02	-39.56	-25.29	-32.42
	(12.12)	(24.50)	(22.40)	(19.87)	(23.94)	(16.33)	(32.09)	(35.58)	(26.54)	(30.52)
Excellent	46.30***	-13.78	-40.07	-26.43	-47.66	106.2***	22.07	-21.15	1.248	-13.32
	(16.92)	(35.98)	(31.33)	(27.63)	(32.15)	(31.55)	(48.41)	(52.46)	(38.10)	(42.76)
Marital status										
Married	22.20	23.32	23.81	23.55	36.82	106.9***	108.5***	109.3***	108.9***	121.8***
	(21.08)	(22.33)	(23.18)	(22.70)	(25.51)	(33.46)	(35.16)	(36.26)	(35.63)	(42.28)
Divorced/separated	-20.92	-3.119	4.671	0.629	17.02	-21.92	3.016	15.82	9.187	20.60
	(19.79)	(24.24)	(23.30)	(23.13)	(27.37)	(33.63)	(40.19)	(36.35)	(37.32)	(46.07)
Widowed	7.346	10.01	11.17	10.57	16.64	17.93	21.66	23.57	22.58	23.29
	(24.45)	(25.81)	(26.74)	(26.19)	(28.15)	(38.59)	(39.61)	(40.25)	(39.82)	(47.73)
Equivalised HH income (1000s)	0.512*	0.580**	0.610***	0.595***	0.540**	1.399**	1.494**	1.543***	1.518**	1.491**
	(0.293)	(0.235)	(0.212)	(0.222)	(0.213)	(0.709)	(0.631)	(0.593)	(0.611)	(0.680)
Both parents alive	-21.38	-45.76**	-56.43***	-50.89***	-46.05**	-32.51	-66.66**	-84.20**	-75.11***	-68.89**
	(13.08)	(20.22)	(20.18)	(18.52)	(20.95)	(22.79)	(30.45)	(33.63)	(29.00)	(31.95)
Weekly alcohol					-0.181					0.196
					(0.446)					(0.682)
Weekly exercise					4.244					2.913
					(3.238)					(4.269)
Constant	-124.2	-249.1**	-303.7**	-275.4**	-308.0**	-96.61	-271.6*	-361.4**	-314.8**	-307.7*
	(96.74)	(125.3)	(122.2)	(117.1)	(149.1)	(116.3)	(156.1)	(171.4)	(148.4)	(180.4)
Observations	1938	1938	1938	1938	1574	1938	1938	1938	1938	1574
R^2	0.045	.	.	.	.	0.156	0.074	.	0.028	0.002

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Financial Wealth (Models 1-5), Net Total Wealth (Models 6-10), EUR 1000s. *Reference categories*: Education: primary/none. Health: poor/fair. Marital status: single (never married). P = Parental longevity, S = Current smoker

Table 13: OLS and IV results, excluding focal responses

	FINANCIAL					TOTAL				
	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)	(6) OLS	(7) IV(P)	(8) IV(S)	(9) IV(P+S)	(10) IV(P+S)
SSP (to age 75)	0.0176	10.49**	10.30**	10.53***	9.537***	0.305	12.02**	10.93**	11.71***	11.34***
	(0.317)	(4.716)	(4.122)	(3.311)	(3.259)	(0.449)	(5.544)	(5.185)	(4.042)	(3.988)
Female	-7.335	-16.68	-16.51	-16.71	8.033	36.24*	25.79	26.77	26.07	59.16*
	(17.70)	(24.24)	(23.45)	(23.81)	(27.70)	(20.83)	(27.83)	(26.70)	(27.25)	(31.31)
Age	1.725	-1.379	-1.324	-1.390	-1.387	1.235	-2.238	-1.915	-2.145	-2.641
	(2.135)	(2.812)	(3.054)	(2.826)	(2.973)	(2.581)	(3.353)	(3.475)	(3.282)	(3.690)
Years worked	0.890	0.550	0.556	0.548	0.817	3.933***	3.552***	3.588***	3.562***	3.682***
	(0.656)	(0.973)	(0.929)	(0.952)	(1.038)	(0.876)	(1.212)	(1.127)	(1.173)	(1.393)
Number of children	-2.544	4.357	4.235	4.382	0.826	-10.65	-2.923	-3.642	-3.132	-5.525
	(5.337)	(7.737)	(7.156)	(7.219)	(7.507)	(6.809)	(9.085)	(8.603)	(8.565)	(9.540)
Education										
Secondary	23.93	36.66	36.43	36.70	37.49	28.62	42.86	41.53	42.47	44.01
	(15.57)	(25.85)	(24.73)	(25.22)	(26.88)	(21.07)	(31.12)	(29.59)	(30.30)	(35.36)
Third level/higher	86.52***	113.9***	113.4***	114.0***	119.2***	214.0***	244.6***	241.8***	243.8***	262.4***
	(24.63)	(37.07)	(34.11)	(34.95)	(39.39)	(33.25)	(46.31)	(43.59)	(44.28)	(51.51)
Health										
Good	0.135	-86.91*	-85.37**	-87.23**	-99.40**	4.535	-92.87*	-83.80*	-90.24**	-104.6**
	(16.58)	(46.96)	(42.45)	(37.57)	(42.02)	(22.09)	(54.45)	(50.46)	(43.83)	(49.65)
Very good	5.953	-94.41*	-92.64*	-94.77**	-105.4**	2.424	-109.9*	-99.42*	-106.9**	-121.9**
	(18.07)	(50.23)	(47.65)	(40.14)	(44.22)	(22.06)	(59.38)	(56.37)	(47.34)	(53.08)
Excellent	34.97	-116.0	-113.3*	-116.5**	-120.7*	93.23**	-75.70	-59.96	-71.13	-86.36
	(27.64)	(75.93)	(67.97)	(58.36)	(61.80)	(40.55)	(92.74)	(83.96)	(72.51)	(77.95)
Marital status										
Married	31.36	22.09	22.26	22.06	39.54	147.7***	137.4***	138.3***	137.6***	159.6***
	(31.35)	(37.65)	(37.30)	(37.53)	(39.69)	(37.72)	(44.43)	(43.47)	(44.05)	(49.75)
Divorced/separated	-18.08	34.71	33.78	34.90	42.61	-0.501	58.57	53.07	56.97	63.45
	(28.99)	(47.40)	(46.34)	(44.71)	(46.74)	(35.56)	(55.86)	(52.05)	(51.28)	(57.00)
Widowed	6.043	51.77	50.96	51.94	69.50	19.34	70.51	65.75	69.13	82.25
	(31.74)	(50.36)	(50.67)	(49.23)	(52.04)	(40.86)	(60.19)	(58.30)	(57.86)	(65.38)
Equivalised HH income (1000s)	0.622	0.314	0.320	0.313	0.292	2.320**	1.976**	2.008**	1.985**	1.917*
	(0.424)	(0.454)	(0.463)	(0.451)	(0.439)	(0.929)	(0.926)	(0.945)	(0.931)	(0.979)
Both parents alive	-18.81	-105.1**	-103.5**	-105.4**	-102.3**	-43.25	-139.8**	-130.8**	-137.2**	-138.8**
	(21.28)	(52.64)	(50.24)	(45.60)	(48.48)	(29.87)	(64.50)	(61.07)	(56.01)	(62.63)
Weekly alcohol					1.393					1.489
					(1.140)					(1.384)
Weekly exercise					13.19**					15.58**
					(5.382)					(6.605)
Constant	-95.81	-620.7*	-611.4**	-622.6**	-597.3**	-55.78	-643.1*	-588.4*	-627.3**	-623.9*
	(133.1)	(317.9)	(263.9)	(252.0)	(276.4)	(158.6)	(370.0)	(329.3)	(302.2)	(330.1)
Observations	992	992	992	992	806	992	992	992	992	806
R^2	0.042	.	.	.	.	0.191	.	.	.	.

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Net Financial Wealth (Models 1-5), Net Total Wealth (Models 6-10), EUR 1000s. *Reference categories*: Education: primary/none. Health: poor/fair. Marital status: single (never married). P = Parental longevity, S = Current smoker

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A Supplementary tables

Table 14: First-stage results for single households

	(1)	(2)	(3)	(4)	(5)
Mother's (death) age	0.105		0.102		0.156**
	(0.0694)		(0.0691)		(0.0770)
Father's (death) age		0.206***	0.204***		0.242***
		(0.0751)	(0.0752)		(0.0796)
Smokes now				-5.596**	-5.240**
				(2.385)	(2.384)
Age	0.563**	0.566**	0.529**	0.619**	0.539**
	(0.253)	(0.250)	(0.252)	(0.268)	(0.260)
Years worked	0.0243	-0.00558	-0.000880	-0.0326	-0.0621
	(0.0918)	(0.0932)	(0.0932)	(0.100)	(0.0990)
Number of children	-0.724	-0.664	-0.666	-1.321*	-1.293*
	(0.667)	(0.659)	(0.658)	(0.758)	(0.752)
Education					
Secondary	1.501	1.402	1.057	0.725	-0.631
	(2.426)	(2.441)	(2.420)	(2.732)	(2.693)
Third level/higher	2.257	2.334	1.777	1.438	-0.139
	(2.753)	(2.713)	(2.737)	(3.063)	(3.002)
Health					
Good	13.95***	13.84***	13.80***	14.13***	13.73***
	(2.653)	(2.622)	(2.622)	(3.123)	(3.110)
Very good	13.41***	13.40***	13.44***	13.71***	13.91***
	(2.688)	(2.643)	(2.645)	(3.150)	(3.055)
Excellent	21.79***	21.43***	21.37***	21.38***	20.50***
	(2.683)	(2.660)	(2.669)	(3.095)	(3.129)
Marital status					
Divorced/separated	-1.209	-1.748	-1.461	-1.024	-0.949
	(2.807)	(2.785)	(2.802)	(3.001)	(3.034)
Widowed	2.995	2.697	2.891	5.769*	5.735*
	(2.969)	(2.967)	(2.955)	(3.382)	(3.367)
Equivalised HH income (1000s)	-0.0379*	-0.0386*	-0.0391*	-0.0409**	-0.0433**
	(0.0211)	(0.0210)	(0.0209)	(0.0178)	(0.0176)
Both parents alive	8.898***	7.356**	7.050**	8.008**	5.511
	(3.129)	(3.116)	(3.137)	(3.511)	(3.498)
Weekly alcohol				-0.0744	-0.0855
				(0.0587)	(0.0592)
Weekly exercise				0.0151	0.0676
				(0.461)	(0.459)
Constant	26.36*	20.48	14.87	36.76**	13.64
	(14.63)	(15.19)	(15.53)	(15.75)	(17.64)
Observations	759	759	759	569	569
R^2	0.115	0.121	0.123	0.154	0.173
Ftest	2.296	7.504	5.197	5.508	6.814

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Subjective survival probability of reaching age 75.
Reference categories: Education: primary/none. Health: poor/fair. Marital status: single (never married)

Table 15: First-stage results for two-person households, using the husband's characteristics only

	(1)	(2)	(3)	(4)	(5)
Husband's father's age	0.281***	0.269***		0.259***	0.216***
	(0.0762)	(0.0768)		(0.0754)	(0.0721)
Husband's mother's age		0.129*		0.126	0.129
		(0.0770)		(0.0771)	(0.0836)
Husband smokes			-4.499*	-3.721	-4.187
			(2.571)	(2.508)	(2.939)
Age	0.115	0.0739	0.0929	0.0596	0.127
	(0.336)	(0.339)	(0.336)	(0.333)	(0.403)
Years worked	0.345	0.339	0.371*	0.320	0.219
	(0.214)	(0.214)	(0.215)	(0.211)	(0.276)
Education					
Secondary	-4.457*	-4.511*	-4.980**	-4.924**	-4.547*
	(2.332)	(2.336)	(2.300)	(2.294)	(2.471)
Third level/higher	-6.589**	-6.736**	-6.823**	-7.421***	-7.240**
	(2.641)	(2.647)	(2.642)	(2.606)	(3.016)
Health					
Good	4.984*	4.828*	4.496	4.633*	3.502
	(2.785)	(2.786)	(2.822)	(2.774)	(3.006)
Very good	7.900***	7.862***	7.633***	7.627***	7.862**
	(2.809)	(2.806)	(2.825)	(2.783)	(3.152)
Excellent	16.38***	16.41***	15.65***	15.89***	15.42***
	(2.815)	(2.821)	(2.808)	(2.789)	(3.119)
Equivalised HH income (1000s)	0.0160	0.0129	0.00974	0.0109	-0.0396
	(0.0196)	(0.0199)	(0.0194)	(0.0202)	(0.0584)
Both parents alive	6.117**	5.524*	8.853***	5.340*	3.906
	(3.010)	(3.023)	(2.917)	(3.027)	(3.611)
Number of children	0.0558	0.0795	0.0760	0.0993	-0.0306
	(0.556)	(0.553)	(0.551)	(0.544)	(0.555)
Husband exercise					-0.108
					(0.413)
Husband alcohol					-0.0360
					(0.0689)
Constant	34.79**	28.39*	57.34***	32.26**	37.99**
	(16.15)	(15.87)	(15.37)	(15.44)	(16.74)
Observations	651	651	651	651	549
R^2	0.106	0.111	0.090	0.115	0.104
Ftest	13.59	8.924	3.063	6.337	5.562

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Husband's subjective survival probability of reaching age 75.
Reference categories: Education: primary/none. Health: poor/fair.

Table 16: First-stage results, by gender

	Females					Males				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Mother's (death) age	0.18***		0.19***		0.21***	0.14**		0.12**		0.13*
	(0.06)		(0.06)		(0.06)	(0.06)		(0.06)		(0.07)
Father's (death) age		0.16***	0.17***		0.13**		0.26***	0.25***		0.26***
		(0.06)	(0.06)		(0.06)		(0.06)	(0.06)		(0.06)
Smokes now				-8.08***	-7.49***				-3.55	-2.76
				(2.01)	(2.01)				(2.26)	(2.24)
Age	0.34*	0.34	0.30	0.25	0.20	0.16	0.22	0.17	0.27	0.21
	(0.21)	(0.21)	(0.21)	(0.22)	(0.22)	(0.25)	(0.25)	(0.25)	(0.28)	(0.28)
Years worked	0.03	0.02	0.02	0.02	0.02	0.31**	0.26*	0.26*	0.20	0.16
	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.14)	(0.14)	(0.14)	(0.16)	(0.16)
Number of children	0.28	0.41	0.33	0.05	-0.03	-0.01	0.01	0.03	-0.13	-0.07
	(0.49)	(0.48)	(0.48)	(0.56)	(0.55)	(0.50)	(0.50)	(0.50)	(0.52)	(0.52)
Education										
Secondary	-2.51	-1.66	-2.77	-3.12	-4.35*	-1.76	-1.86	-1.96	-1.96	-2.53
	(2.14)	(2.12)	(2.12)	(2.32)	(2.33)	(1.99)	(1.96)	(1.96)	(2.18)	(2.15)
Third level/higher	0.57	1.35	-0.05	-0.83	-2.68	-4.33*	-4.54*	-4.81**	-4.29	-5.02*
	(2.28)	(2.23)	(2.29)	(2.42)	(2.47)	(2.44)	(2.41)	(2.41)	(2.62)	(2.60)
Health										
Good	9.35***	9.00***	9.19***	8.18***	8.23***	8.03***	8.31***	8.14***	7.51***	7.60***
	(2.37)	(2.37)	(2.36)	(2.78)	(2.75)	(2.29)	(2.26)	(2.26)	(2.55)	(2.50)
Very good	10.72***	10.34***	10.66***	11.13***	11.55***	11.34***	11.50***	11.37***	10.37***	10.63***
	(2.37)	(2.35)	(2.35)	(2.69)	(2.66)	(2.33)	(2.28)	(2.29)	(2.71)	(2.65)
Excellent	15.87***	15.08***	15.59***	15.45***	15.81***	20.87***	21.04***	20.85***	19.39***	19.37***
	(2.46)	(2.47)	(2.46)	(2.76)	(2.73)	(2.36)	(2.34)	(2.35)	(2.61)	(2.60)
Marital status										
Married	-0.98	-1.74	-1.14	-0.99	-0.35	-0.19	-0.25	-0.22	-1.03	-1.10
	(2.64)	(2.63)	(2.61)	(2.76)	(2.69)	(2.53)	(2.54)	(2.52)	(2.84)	(2.83)
Divorced/separated	-3.21	-4.16	-3.35	-1.45	-0.67	-7.08**	-7.39**	-7.32**	-10.44**	-11.07***
	(3.16)	(3.15)	(3.16)	(3.08)	(3.05)	(3.39)	(3.36)	(3.36)	(4.15)	(4.09)
Widowed	-1.44	-2.01	-1.50	2.09	2.55	-1.13	-1.18	-1.01	-0.57	-0.85
	(3.17)	(3.17)	(3.15)	(3.65)	(3.57)	(4.41)	(4.40)	(4.41)	(5.29)	(5.24)
Equivalised HH income (1000s)	0.02	0.02	0.01	0.02	0.02	-0.04*	-0.03	-0.04	-0.05***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Both parents alive	4.37*	3.39	2.83	4.26	2.54	9.93***	7.78***	7.37**	8.06**	5.05
	(2.64)	(2.67)	(2.68)	(2.93)	(2.95)	(2.89)	(2.90)	(2.91)	(3.54)	(3.58)
Weekly alcohol				-0.21**	-0.20*				-0.04	-0.04
				(0.10)	(0.10)				(0.05)	(0.05)
Weekly exercise				-0.10	-0.08				0.00	-0.07
				(0.47)	(0.47)				(0.35)	(0.35)
Constant	40.03***	43.06***	30.81**	63.42***	41.26***	39.52***	29.51**	24.19*	52.28***	28.54*
	(12.60)	(12.40)	(12.89)	(12.76)	(13.45)	(12.96)	(13.51)	(13.49)	(14.18)	(14.71)
Observations	1120	1120	1120	911	911	996	996	996	803	803
R^2	0.069	0.067	0.076	0.092	0.109	0.115	0.127	0.130	0.116	0.138
Ftest	9.01	7.40	8.35	16.25	11.52	5.61	18.19	11.53	2.46	9.06

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dependent variable: Subjective survival probability of reaching age 75. *Reference categories*: Education: primary/none. Health: poor/fair. Marital status: single (never married)

B Wealth calculation

This appendix describes the methodology used in calculating the present value of different components of wealth.

General assumptions:

- Variables that are assumed constant from now until SPA in the wealth calculation:
  - Employment status
  - Marital status
  - Earnings
  - Future pension contributions (fraction of earnings)[23]
- A person pays (and has paid in the past) full PRSI contributions while working
- A person has been in full-time employment for the number of years that they state they have worked since leaving full-time education[24]
- A couple is categorised as "married" if they are married of cohabiting as if married[25]
- The State Pension Age (SPA) is assumed to depend on the year of birth of the individual as outlined in the Social Welfare and Pensions Act of 2011:
  - 66 if born before 1954
  - 67 if born between 1954 and 1960
  - 68 if born in or after 1961

B.1 Net financial wealth

Financial wealth is calculated at the household level, and subsequently divided equally between the spouses in the case of a married or cohabiting couple. Net financial wealth includes saving and deposit accounts, stocks, bonds, life insurance, mutual funds, investment property, land, businesses, due inheritance etc., less outstanding debt. If the asset value is not known, but the amount of interest earned on those assets is known, the value is estimated as the interest divided by an assumed interest rate. Financial wealth levels

[23] According to Banks et al. (2005), median pension contribution rates among the under 60s are relatively invariant with age, therefore suggesting that a constant contribution rate is a reasonably fair assumption.

[24] For the few individuals who don't know the number of years worked, a value is imputed using conditional hotdecking. The conditioning variables are gender, broad age group, marital status and education, following the methodology of Banks et al. (2005). See Appendix C for more information about the imputation methodology.

[25] Except when calculating entitlements to the Widow's Contributory State welfare pension. The entitlement is calculated only for those legally married.

are imputed for households that provide bracketed values or who refuse or don't know the value of the asset. The imputation methodology is described in Appendix C.

Present discounted value of financial assets:

$$\mathrm{W} = (\frac{1}{1+d})^{SPA-age}(1+i)^{SPA-age}A$$

Where:
age = age at interview
SPA = State Pension Age (retirement age)
d = discount rate (2.5 per cent)[26]
i = real interest rate (2.5 per cent)[27]
A = current value of asset

As d and i are assumed to be equal, the present discounted value of financial assets is equivalent to its current value, A.

B.2 Supplementary pension wealth

Wealth held in occupational and private pensions (collectively known as supplementary pensions) is calculated at the individual level. The methodology follows that of Banks et al. (2005) and Crawford and O'Dea (2012) who estimate the pension wealth of ELSA respondents using data very similar to that of TILDA. The TILDA data contains detailed information about the length of work histories, the current value of pension plans, the pension contributions of both employees and employers, and expected income from pension. However, estimating supplementary pension wealth requires certain assumptions to be made about past and future labour market participation, earnings, and pension contributions. Supplementary pension wealth is calculated separately for private sector occupational DC schemes, private sector occupational DB schemes, public sector occupational schemes, PRSAs, private pension plans, and other plans.

The present discounted value of wealth (W) held in a supplementary pension is calculated as

$$\mathrm{W} = \sum_{n=SPA}^{SPA+LE} (\frac{1}{1+d})^{n-age}(1+i)^{n-SPA}P \tag{4}$$

where:
age = age at interview
SPA = State Pension Age (retirement age)
LE = actuarial life expectancy at SPA
d = discount rate

[26] As per Crawford and O'Dea (2012).
[27] As per Crawford and O'Dea (2012).

i = real growth rate of pension payment
P = annual pension income at SPA

B.2.1 Private sector occupational pensions

If a private sector employee with an occupational pension does not know whether their pension scheme is of the Defined Benefit or Defined Contribution type, the TILDA questionnaire asks the respondent the questions related to a Defined Contribution scheme. Therefore, those who are unsure of their scheme type, Defined Contribution is assumed.

B.2.2 Public sector pensions

Public sector pensions are calculated by estimating the sum of all pension income for all years in retirement, and discounting this stream of income back to current year (year of interview). The pension income in first retirement year is estimated by multiplying the estimated plan participation years by estimated final salary and by a fraction of one eightieth.

B.2.3 Other pensions

PRSA (Personal Retirement Savings Accounts) wealth is calculated in the same way as private sector occupational pensions. PRSAs which were introduced in 2002 with an aim to increase pension coverage among low-coverage employee groups

Wealth in private pensions (up to 2 schemes) are calculated in the same way as private sector occupational pensions and PRSAs, and added together.

Those who refuse to say, or don't know if they have pension entitlements from previous employers are assumed to have wealth in these pensions. Other pensions from previous employers are calculated by estimating the present value of the stream of lump-sum payment and monthly payments that the individual expects to receive from these pensions (in total). The estimation technique differs from those of other pensions because the TILDA questionnaire does not include a question about the current value of or contributions to these additional pensions.

B.3 Social welfare wealth

The source of the rules and rates applied to the social welfare wealth estimation is obtained from the Department of Social Protection documentation. In the calculations, the payment rates and rules are assumed to remain at the 2010 levels in future years.

B.3.1 Contributory State welfare pension

State pension (contributory) is a social insurance payment made when an individual reaches the State Pension Age. It is based on social insurance (PRSI) contributions. The pension payment is not means-tested.[28] To qualify for State pension (contributory), an individual must have reached the SPA and fulfil the below conditions:

- started paying social insurance before reaching age 56
- a yearly average of either:
  - at least 10 appropriate contributions paid or credited from the year first entered insurance or from 1953, whichever is later to the end of the tax year before reaching SPA. This is called the *normal average rule*. A yearly average of 10 full rate contributions is needed for the minimum payment rate. A yearly average of 48 full rate contributions is needed for the maximum payment rate.
    OR
  - 48 Class A, E, F, G, H, N or S contributions (paid or credited) for each contribution year from the 1979/80 tax year to the end of the tax year before reaching SPA. This average would entitle the individual to the maximum pension. There is no provision for a reduced pension when this *alternative average rule* is used.
- a minimum of total contributions:
  - Born before Apr 1946

    No pension if <5 years worked before SPA

    Full pension if 5+ years worked before SPA
  - Born Apr 1946 - Jan 1954

    No pension if <10 years worked before SPA

    Full pension if 10+ years worked before SPA
  - Born after Jan 1954

    No pension if <10 years worked before SPA

    10 years worked by SPA= 10/30 of full pension

    11 years worked by SPA= 10/30 + 1/30 of full pension

    12 years worked by SPA= 10/30 + 2/30 of full pension

    ...

    30 years worked by SPA= 10/30 + 20/30 of full pension

Note: A person's average contributions are assessed in two ways - the usual average and the alternative average. If an individual does not have an average of 48 contributions from 1979, then the normal method of assessing the average will be looked at and the individual may get a reduced pension.

[28] However, Increase for a Qualified Adult is a means-tested payment.

The present discounted value of wealth (W) from future Contributory State welfare pension income is calculated as

$$\mathrm{W} = \sum_{n=SPA}^{SPA+LE} (\frac{1}{1+d})^{n-age}(1+i)^{n-SPA}P \tag{5}$$

where:
age = age at interview
SPA = State Pension Age (retirement age)
LE = actuarial life expectancy at SPA
d = discount rate
i = real growth rate of pension payment
P = annual pension income at SPA

B.3.2 Widow's Contributory State welfare pension

Widow's, Widower's or Surviving Civil Partner's (Contributory) Pension is paid to the husband, wife or civil partner of a deceased person. The payment is not means-tested. Weekly Widow's Contributory State welfare pension payment rates in 2010:

- EUR 230.30 for 48 + contributions
- EUR 225.80 for 36-47 contributions
- EUR 220.40 for 24-35 contributions

In order to qualify for this pension, a person must:

- be widowed or a surviving civil partner OR divorced from late spouse prior to spouse's death and not remarried OR have had their civil partnership dissolved and have not registered a new civil partnership

  AND

- not be cohabiting as a couple

  AND

- satisfy the following social insurance contribution conditions (before the death):
  either the surviving or the deceased spouse (or civil partner) must have at least 260 weeks' paid PRSI contributions.
  The surviving or the deceased spouse (or civil partner) must also have a yearly average of either:

  - 39 paid or credited social insurance contributions in the 3 or 5 tax years before the death of the spouse/civil partner or before they reach SPA. This gives entitlement to a *maximum* rate pension

OR

– at least 24 paid or credited social insurance contributions from the year of first entry into social insurance until either the year of death of the spouse/civil partner or the year they reached SPA, whichever is earlier. This gives entitlement to a *minimum* rate of pension. An average of 48 per year entitles the person to the *maximum* rate pension.

Increases:	Rate per Week
Living Alone Increase for people age 66 or over	EUR 7.70
Extra increase for people age 80 or over	EUR 10.00

Present discounted value of wealth from future Widow's pension income is calculated using formula:

$$\mathrm{W} = \sum_{n=SPA}^{SPA+LE} (\frac{1}{1+d})^{n-age}(1+i)^{n-SPA}P + I[\sum_{n=D^s}^{D^s+LE^d} (\frac{1}{1+d})^{D^s-age}(1+i)^{n-D^s}]$$

Where:

I = indicator that spouse is deceased

age = age at interview

$\mathrm{D^s}$ = age when spouse dies

$\mathrm{LE^d}$ = actuarial life expectancy at spouse's death

d = discount rate

i = real growth rate of pension payment

P = annual pension income at spouse's death

B.3.3 Non-contributory State welfare pension wealth

In order to qualify for the non-contributory State welfare pension, a person must fulfil the below four conditions:

1. aged 66 if born before 1955 / aged 67 if born between 1955-1960 / aged 68 if born in 1961 or later

2. not eligible for the contributory State welfare pension

3. pass a means test (see below)

4. meet the habitual residence condition (all TILDA respondents are assumed to meet)

Different assets are added together and derived into weekly means income as per Table 17.

Table 17: Means test for Non-contributory State welfare pension

Income	**Assets**
Included in calculation: cash income (income from supplementary pensions), employment income (assumed zero in this analysis) and maintenance (assumed zero in this analysis).	Included in calculation: Investment property, savings and investments.
Excluded from calculation: Income from property already assessed on its capital value. (A list of other income sources are also excluded from the income means test, however these are mostly social welfare payments that are not included in this analysis.)	Excluded from calculation: Owner-occupied housing.
	First EUR 20,000 is disregarded. The next EUR 10,000 is assumed to yield 0.1 per cent annual return. The next EUR 10,000 is assumed to yield 0.2 per cent annual return. Any wealth above EUR 40,000 is assumed to yield 0.4 per cent annual return.

The first EUR 30 per week of means does not affect the rate of Non-contributory State welfare pension payment. After that, the pension is reduced by EUR 2.50 per week for every EUR 2.50 of means. When the means test is carried out for couples, income and capital are divided equally between the spouses.

Weekly income from supplementary pensions (P) is calculated as:

$$P = \frac{r\,(PV)}{1-(1+r)^{-LE}} \tag{6}$$

Where:
r = annuity rate (assumed 5.367555 per annum[29])
LE = actuarial life expectancy at SPA
PV = value of supplementary pension at SPA

The present discounted value of wealth (W) from future Non-contributory State welfare pension income is calculated as

$$\mathrm{W} = \sum_{n=SPA}^{SPA+LE} (\frac{1}{1+d})^{n-age}(1+i)^{n-SPA}P \tag{7}$$

[29] Annuity rate is the average single life annuity rate of four Irish life insurance companies reported by the Department of Social Protection Report on Pension Charges in Ireland (2012), assuming a capital amount of EUR 500,000, with no escalation and no guarantee period.

Where:
age = age at interview
SPA = State Pension Age (retirement age)
LE = actuarial life expectancy at SPA
d = discount rate
i = real growth rate of pension payment
P = annual pension income at SPA

The maximum weekly payment of the Non-Contributory State Pension was EUR 219 per week, with EUR 10 increase for those aged 80 or over.

Note: If eligible for the non-contributory State welfare pension, a person may also be entitled to the following payments: Supplementary Welfare Allowance, Rent Supplement, Mortgage Interest Supplement, Living Alone Increase, Household Benefits Package, Free Travel Pass, Fuel Allowance, Island Increase, Centenarian's Payment, Respite Care Grant. In the calculations in this paper, income from these additional payments is assumed to be zero.

C Unfolding brackets and data imputation

For observations with missing or bracketed data for a wealth item, conditional hotdeck imputation is used to predict a value for that wealth category. Specifically, this method is carried out by replacing the missing data point with a random draw from observations with similar characteristics who report a continuous value for the wealth item. Similar observations are defined as those with same values for categorical variables such as broad age group and household type. The wealth level category is also used as a defining characteristic for cases for whom the wealth range is known (reported via unfolding brackets).

The methodology adopted in this paper broadly follows the imputation procedure of Crawford and O'Dea (2012) and Oldfield (2012) for ELSA data. The conditioning variables used in the hotdeck imputation for wealth sub-categories are listed below:

- Financial wealth

  Deposit and savings accounts: broad age group (under/over 55) and household type (married/single female/single male)

  Other financial assets (life insurance, mutual funds, bonds or shares): broad age group (under/over 55), household type (married/single female/single male) and wealth bracket (if given)

  Investment property: broad age group (under/over 55), household type (married/single female/single male) and wealth bracket (if given)

  Other assets (land, a firm or business, an inheritance or money owed, etc.): broad age group (under/over 55), household type (married/single female/single male) and wealth bracket (if given)

Debt (excluding mortgages): broad age group of the financial respondent (under/over 55) and household type (married/single female/single male)

- Supplementary pension wealth

  Private sector occupational pension contribution rate: gender and educational level (following Banks et al. (2005))

  Private sector occupational pension plan value: the quartile of current annual earnings multiplied by pension plan tenure (following Banks et al. (2005))

  Other pensions from previous employment, lump-sum and expected income amounts: unconditional hotdeck using values from individuals with non-missing data

- Equivalised household income

  Income bracket