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DO THE RETIRED ELDERLY IN EUROPE DECUMULATE THEIR WEALTH? THE IMPORTANCE OF BEQUEST MOTIVES, PRECAUTIONARY SAVING, PUBLIC PENSIONS, AND HOMEOWNERSHIP

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We use microdata on a large number of European countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) to examine the wealth accumulation (saving) behavior of the retired elderly in Europe. We find that less than half of the retired elderly in Europe are decumulating their wealth and that the average wealth accumulation rate of the retired elderly in Europe is positive though relatively moderate (6.6 percent over a 3-year period). These findings suggest that the Wealth Decumulation Puzzle (the tendency of the retired elderly to not decumulate their wealth or to decumulate their wealth more slowly than expected) applies in the case of Europe. Moreover, our regression results suggest that bequest motives, generous public pension systems, and the reluctance of retired elderly homeowners to sell or borrow against their owner-occupied housing are the primary explanations for the existence of the Wealth Decumulation Puzzle in Europe.

JEL Codes: D14, D15, D64, E21, J14

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1. INTRODUCTION

The central tenet of the life-cycle hypothesis or model of Modigliani and Brumberg (1954) is that, when people are young, they work, earn income, and save part of their income (accumulate wealth) in order to prepare for living expenses

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during retirement and that, when people are old, they retire and finance their living expenses by dissaving (decumulating their previously accumulated wealth). Thus, the life-cycle hypothesis or model predicts that the elderly (especially the retired elderly) should be decumulating their wealth and that, in the absence of bequest motives and precautionary saving arising from longevity risk and uncertain future medical and long-term care expenses, they should be decumulating their wealth so as to precisely exhaust their wealth at the time of death. Thus, examining whether or not the retired elderly are decumulating their wealth and whether or not they are doing so at the expected rate are powerful tests of the validity of the life-cycle hypothesis or model.

Many researchers have analyzed the wealth accumulation (saving) behavior of the elderly in various countries, and most of them have found that the elderly (even the retired elderly) continue to accumulate wealth (save) or that they decumulate their wealth (dissave) but that their rate of wealth decumulation is too slow to enable them to exhaust their wealth by the time of death. For example, the country studies in Poterba (1994) show that median saving rates remain positive well beyond retirement in virtually all countries. This puzzle can be called the “Wealth Decumulation Puzzle” or the “Retirement Saving Puzzle” (Suari-Andreu *et al.*, 2019, uses the term “Retirement-Savings Puzzle” and Taylor *et al.*, 2018, use the term “Decumulation Paradox”).

At least two explanations have been proposed for the Wealth Decumulation Puzzle. The first explanation is that the retired elderly are continuing to accumulate wealth or are decumulating their wealth (dissaving) more slowly than expected because they want to leave bequests and other intergenerational transfers to their children and other family members (see, for example, Hurd, 1987, 1990, Laitner and Juster, 1996, Laitner, 2002, Kopczuk and Lupton, 2007, De Nardi and Yang, 2014, 2016, Lockwood, 2012, 2018, Horioka and Niimi, 2017, Niimi and Horioka, 2019, and Ventura and Horioka, 2020). The second explanation, which of course is not mutually exclusive with the first, is that the retired elderly are continuing to accumulate wealth or are decumulating their wealth (dissaving) more slowly than expected because they are worried about longevity risk (lifespan uncertainty) and/or the possibility of facing high medical and long-term care expenses in the future and that they are engaging in precautionary saving in response to these worries (see, for example, Davies, 1981, Kotlikoff, 1989, and Palumbo, 1999).

The purpose of this paper is to use microdata on a large number of European countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) to examine the wealth accumulation (saving) behavior of the retired elderly in Europe and to shed light on whether or not they are decumulating their wealth as predicted by the simple life cycle hypothesis and on whether or not their wealth accumulation (saving) behavior is influenced by bequest motives, precautionary saving, public pension arrangements, and homeownership. We are particularly interested in shedding light on whether or not the Wealth Decumulation (or Retirement Saving) Puzzle applies in Europe, and if so, what the explanation is for the Puzzle.

This paper makes at least nine original contributions to the existing literature. First, whereas most previous studies of the Wealth Decumulation (or Retirement Saving) Puzzle examine the case of a particular country, we include a large number

of European countries in our analysis, making it possible to make cross-country comparisons (the only similar study with which we are familiar is Romiti and Rossi, 2014, but this study focuses on the impact of financial literacy). We control for inter-country differences in government policies, institutions, customs, etc., by including country fixed effects and/or by including country-specific variables such as the average pension replacement ratio for the country in which the respondent lives (see, for example, Belloni *et al.*, 2020). Second, to the best of our knowledge, this is the first paper to shed light on the relative importance of bequest motives and precautionary saving as determinants of the wealth accumulation (saving) behavior of the retired elderly in the case of the major European countries. This is an important contribution because, as noted earlier, the two leading explanations for why the Wealth Decumulation (or Retirement Saving) Puzzle is observed are the presence of bequest motives and the presence of precautionary saving arising from longevity risk (lifespan uncertainty) and/or the possibility of facing high medical and long-term care expenses in the future. Third and related to the second contribution, whereas Hurd (1987, 1990) and many other previous studies make use of the presence of children and other variables as proxies for bequest intentions, our analysis is also unique in making use of direct data relating to bequest intentions. Fourth, we make use of unique data relating to precautionary saving arising from longevity risk (lifespan uncertainty) and/or uncertain future medical and long-term care expenses. Fifth, we shed light on the impact of the degree of risk aversion on the wealth accumulation (saving) behavior of the retired elderly. Sixth, whereas most previous studies examine the wealth accumulation (saving) behavior of all elderly (whether working or retired), we focus on the behavior of the retired elderly. Since it is the retired elderly rather than the working elderly who should be decumulating their wealth (dissaving), according to the life-cycle hypothesis or model, it is important to confine the sample to the retired elderly when examining whether or not the Wealth Decumulation (or Retirement Saving) Puzzle is observed. Seventh, whereas most previous studies look at all elderly regardless of their living arrangements, we focus on the elderly who live apart from their children because it is difficult to isolate the saving and wealth of the elderly who are living with their children. Eighth, bequest intentions may be endogenous so we consider if this is leading to a bias in our results. Ninth, we consider whether the reluctance of retired elderly homeowners to sell or borrow against their owner-occupied housing is one cause of the Wealth Decumulation (or Retirement Saving) Puzzle.

To summarize our main findings, we find that less than half of the retired elderly in Europe are decumulating their wealth and that the average wealth accumulation rate of the retired elderly in Europe is positive though relatively moderate (6.6 percent over a 3-year period). These findings strongly suggest that the Wealth Decumulation (or Retirement Saving) Puzzle (the tendency of the retired elderly to decumulate their wealth more slowly than expected) applies in the case of Europe, a finding that is consistent with the findings of previous studies for most countries. Moreover, our regression analysis of the determinants of the wealth accumulation (saving) behavior of the retired elderly in Europe suggests that those with bequest intentions are more likely to accumulate wealth and show higher wealth accumulation rates than others, which implies that the tendency

of the retired elderly to not decumulate their wealth at all or to decumulate their wealth more slowly than expected is attributable in large part to the presence of bequest motives. By contrast, we found only limited evidence that precautionary saving arising from longevity risk and uncertain future medical and long-term care expenses is important as an explanation of the tendency of the retired elderly to not decumulate their wealth at all or to decumulate their wealth more slowly than expected. However, we do find that generous public pension systems help to explain the existence of the Wealth Decumulation Puzzle in Europe, and we also find that the reluctance of retired elderly homeowners to sell or borrow against their owner-occupied housing is another contributing factor.

The analysis in this paper is meaningful not only because it sheds light on the wealth accumulation (saving) behavior of the retired elderly (who hold a substantial share of household wealth), on the applicability of the life-cycle hypothesis or model, and on why the Wealth Decumulation (or Retirement Saving) Puzzle arises but also because it has important policy implications. For example, whether and the extent to which the retired elderly decumulate their wealth (dissave) will determine what impact the aging of the population will have on future trends in the aggregate household saving rate, and knowing more about the determinants of the wealth accumulation (saving) behavior of the retired elderly will inform us about what policies would be most effective in raising the consumption spending and living standards of the retired elderly and alleviating their worries about lifespan uncertainty and future medical and long-term care expenses. We will return to the policy implications of our findings in the concluding section.

The remainder of this paper is organized as follows. In Section 2, we survey the literature on the topic of this paper; in Section 3, we explain the estimation model we use for our regression analysis of the determinants of the wealth accumulation (saving) behavior of the retired elderly in Europe; in Section 4, we explain the data source and sample selection criteria we use for our analysis; in Section 5, we present and discuss some descriptive statistics; in Section 6, we present and discuss our estimation results; in Section 7, we present and discuss the results of our robustness checks; and Section 8 is a concluding section that summarizes our findings and explores the policy implications thereof.

2. LITERATURE SURVEY

In this section, we survey the literature on the topic of this paper. This paper is closely related to at least two broad strands in the literature. First and most obviously, it is related to the many studies that have been conducted in the United States and other countries that analyze the wealth accumulation (saving) behavior of the elderly with the intention of shedding light on whether the Wealth Decumulation (or Retirement Saving) Puzzle is observed and, if so, what the possible explanations for this puzzle are. We will not survey this literature in detail because comprehensive surveys can be found in Hurd (1990), Poterba (1994), Horioka (2010), van Ooijen *et al.* (2015), De Nardi *et al.* (2016), Niimi and Horioka (2019), Suari-Andreu *et al.* (2019), Ventura and Horioka (2020), and Horioka (2021).

Virtually all previous studies find that both precautionary saving arising from longevity risk (lifespan uncertainty) and/or the possibility of facing high medical and long-term care expenses in the future and bequest motives play a role in explaining the Wealth Decumulation (or Retirement Saving) Puzzle, but they differ greatly with respect to the issue of which explanation is more important.

For example, Hurd (1987, 1990) concludes that bequest motives are not the explanation for the Wealth Decumulation (or Retirement Saving) Puzzle because elderly households with children (who are presumably more likely to have a bequest motive) decumulate their wealth more rapidly than those without children. However, Kopczuk and Lupton (2007) rebut Hurd's assertion by showing that the presence of children is not a good proxy for the presence of bequest motives and that households without children are almost as likely as households with children to have a bequest motive (63 percent vs. 79 percent) and that households with bequest motives spend about 25 percent less on consumption expenditures than households without bequest motives.

Alessie *et al.* (1995) analyze data from the VSB panel survey that was conducted in the Netherlands by the CentER for Economic Research at Tilburg University and find that the elderly with a bequest motive save more than those without a bequest motive but that the impact of bequest motives is statistically significant only in the representative sample and not when rich households are added to the sample. Similarly, Alessie *et al.* (1999) analyze data from the "data panel" conducted by the same CentER and find that the impact of bequest motives on the saving of the elderly is totally insignificant. Moreover, they find that the impact of life expectancy and health status on the saving of the elderly is also totally insignificant. This suggests that the failure of the elderly to dissave cannot be explained either by the presence of bequest motives or by the presence of precautionary saving arising from longevity risk (lifespan uncertainty) and/or the possibility of facing high medical and long-term care expenses in the future.

Turning to more recent studies, De Nardi *et al.* (2010, 2016) find that precautionary saving arising from longevity risk (lifespan uncertainty) and/or uncertain future medical and long-term care expenses, especially the latter, are more important than bequest motives in explaining the Wealth Decumulation (or Retirement Saving) Puzzle in the case of the United States, and Horioka *et al.* (1996), Horioka and Niimi (2017), and Niimi and Horioka (2019) obtain similar findings for Japan. By contrast, Ventura and Horioka (2020) find that bequest motives are more important than precautionary saving in explaining the Puzzle in the case of Italy.

One reason why no consensus has yet been reached about which explanation for the Wealth Decumulation (or Retirement Saving) Puzzle is more important is that, as Dynan *et al.* (2002) and De Nardi *et al.* (2016) correctly point out, it is difficult to differentiate between the two explanations just from examining the wealth accumulation (saving) behavior of the elderly and that many, if not most people, are likely to be driven by both motivations because the same dollar can simultaneously serve both purposes, because both motivations encourage saving, and because both motivations are strongest for the rich.

It is precisely for this reason that a number of authors have relied on evidence on participation in public insurance schemes such Medicaid in the United States (which cover medical and long-term care expenses) and the demand for

financial products such as life insurance, lifetime annuities and reverse mortgages (the demand for which is motivated by a desire to protect oneself against longevity risk), and long-term care insurance (the demand for which is motivated by a desire to protect oneself against uncertain future medical and long-term care expenses). To cite one excellent example of this line of research, Lockwood (2012, 2018) finds that his model cannot explain the data (in particular, the low take-up rate of annuities and long-term care insurance) unless he assumes the existence of a bequest motive.

Another novel approach that has been tried is to conduct attitudinal surveys that ask individuals to evaluate hypothetical scenarios that contain clear trade-offs between leaving a larger bequest and enjoying a higher quality of long-term care. For example, Ameriks *et al.* (2011) conduct such a survey and conclude that both precautionary saving and bequest motives are important as explanations for the Wealth Decumulation (or Retirement Saving) Puzzle because they find that respondents are willing to allocate part of their end-of-life wealth to bequests and part of it to improving the quality of long-term care. However, they find that even respondents who are willing to pay for a private long-term care facility to avoid having to enter a (lower quality) government (Medicaid)-funded long-term care facility are willing to allocate only one-quarter of their end-of-life wealth toward the cost of a private long-term care facility, which suggests that bequest motives are surprisingly strong and that being able to leave a bequest is more important to them than preparing for long-term care expenses (see also Ameriks *et al.*, 2015, 2018).

Thus, despite the existence of a large literature and the use of a number of novel approaches, it is still an open question whether precautionary saving arising from longevity risk (lifespan uncertainty) and/or the possibility of facing high medical and long-term care expenses in the future or bequest motives is the more important explanation for the Wealth Decumulation (or Retirement Saving) Puzzle, and one important contribution of this paper is to help resolve this issue.

The second strand of literature to which this paper is related is the literature that attempts to assess the relative importance of various saving motives. Horioka and Watanabe (1997) and Horioka *et al.* (2000) calculate the contribution of saving for each motive to net household saving and find that saving for precautionary purposes is far more important than saving for the purpose of leaving a bequest in both Japan and the United States. However, Horioka and Ventura (2022) find that, in Europe, the retirement motive is the most important motive for saving, that saving for bequests and inter vivos transfers ranks second, and that saving for precautionary purposes ranks third, and Horioka and Watanabe (1997) and Horioka *et al.* (2000) find that saving for children's educational and marriage expenses are both important in Japan and that including these in saving for intergenerational transfers narrows (but does not totally close) the gap between the share of saving for precautionary purposes and the share of saving for bequests and other intergenerational transfers. These findings provide further corroboration that both bequest motives and precautionary saving are important as explanations of the Wealth Decumulation (or Retirement Saving) Puzzle but that precautionary saving may be of greater relative importance (see Horioka, 2021, for a more comprehensive survey of the literature on saving motives, and Arrondel and Masson, 2006, Laferrere and Wolff, 2006, Horioka, 2014, 2021, for surveys on the literature on bequest motives).

3. THE ESTIMATION MODELS

In our empirical analysis, we will analyze the determinants of whether the retired elderly decumulate or accumulate wealth using a probit model and then analyze the determinants of the wealth accumulation (decumulation) rate (defined as the percentage change in wealth between the two waves) of the retired elderly using ordinary least squares (OLS). In both analyses, we place emphasis on the impact of bequest motives and precautionary saving on the wealth accumulation (saving) behavior of the retired elderly.

3.1. *The Estimation Model for the Probit Analysis*

The estimation model for our probit analysis of the determinants of whether the retired elderly accumulate or decumulate wealth is as follows:

$$\begin{aligned} \text{Pr ob(WEALTHACC} = 1) &= a1 \times \text{LARGEBEQ} + a2 \times \text{HEALTH} \\ &+ a3 \times \text{LIFEEXP} + a4 \times \text{ILLNESS} + a5 \times \text{PENSION} \\ &+ a6 \times \text{REPLRATIO} + a7 \times \text{LEASTRISK AVERSE} \\ &+ a8 \times \text{MODRISK AVERSE} + a9 \times \text{RISK AVERSE} + \text{error term,} \end{aligned}$$

where WEALTHACC is a dummy variable that equals one if the respondent's wealth increased between the two waves and zero otherwise, LARGEBEQ is the subjective probability that the respondent will leave a bequest of 150,000 euros or more and zero otherwise, HEALTH is a dummy variable that equals one if the respondent has a positive perception of his or her health and zero otherwise, LIFEEXP is a dummy variable that equals one if both the respondent and his or her spouse expect to live for more than 10 years and zero otherwise, ILLNESS is a dummy variable that equals one if the respondent suffers from a chronic or long-term health problem and zero otherwise, PENSION is the natural logarithm of gross pension income received, REPLRATIO is the average replacement ratio for pensions (excluding other social benefits) in the country in which the respondent lives, LEASTRISK AVERSE is a dummy variable that equals one if the respondent is willing to take substantial financial risks in order to earn substantial returns and zero otherwise, MODRISK AVERSE is a dummy variable that equals one if the respondent is willing to take above average financial risks in order to earn above average returns and zero otherwise, and RISK AVERSE is a dummy variable that equals one if the respondent is willing to take average financial risks in order to earn average returns and zero otherwise (the default category is respondents who are not willing to take any financial risks).

We also tried including SMALLBEQ, the subjective probability that the respondent will leave a bequest of less than 50,000 euros and zero otherwise, and MEDIUMBEQ, the subjective probability that the respondent will leave a bequest of 50,000 euros or more but less than 150,000 euros and zero otherwise, but they were dropped from the final specification because their marginal effects were often not statistically significant. It should be noted that different household members' probabilities of bequests were aggregated by using the max operator. We also tried using the mean probability, but this yielded very similar results.

REPLRATIO measures the median individual gross pension (including old-age and other pension benefits of people aged 65–74) relative to the median individual gross earnings of people aged 50–59 in 2006, and the data for this variable were taken from the European Union Statistics on Income and Living Conditions (EU-SILC), which are part of the Eurostat Data Base. They were obtained from the following URL: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_pnp3&lang=en

Learning from Alessie *et al.* (1995, 1999) and Spicer *et al.* (2016), we include a large number of control variables including those relating to the respondent's age, age squared, gender, number of non-coresident children, educational attainment, marital status, household wealth (net worth), and country dummies (except that country dummies were not included for Austria and Belgium because they are the reference countries). The reference category for gender is female, that for educational attainment is no schooling, and that for marital status is divorced. We will not discuss these control variables in detail due to space limitations.

3.2. The Estimation Model for the Wealth Accumulation Rate Analysis

The estimation model for our analysis of the determinants of the wealth accumulation (decumulation) rate of the retired elderly is as follows:

$$\begin{aligned} \text{WEALTHRATE} = & b_0 + b_1 \times \text{LARGEBEQ} + b_2 \times \text{HEALTH} \\ & + b_3 \times \text{LIFEEXP} + b_4 \times \text{ILLNESS} + b_5 \times \text{PENSION} \\ & + b_6 \times \text{REPLRATIO} + b_7 \times \text{LEASTRISKVERSE} \\ & + b_8 \times \text{MODRISKVERSE} + b_9 \times \text{RISKVERSE} + \text{error term}, \end{aligned}$$

where WEALTHRATE is the wealth accumulation (decumulation) rate, calculated as the percentage change in wealth between the two waves, where wealth is defined as the sum of financial assets and real assets minus liabilities. Thus, it is negative in the case of respondents whose wealth declined between the two waves. The explanatory variables are the same as in the case of the probit analysis.

Since it is likely that the behavior of those who are accumulating wealth and those who are decumulating wealth will differ, we split the sample into those who are accumulating wealth and those who are decumulating wealth and do separate estimations for the two subsamples in addition to doing the estimation for the full sample.

4. DATA SOURCE AND SAMPLE SELECTION

In this Section, we explain the data source and sample selection criteria we use for our analysis. The data source we use is the Survey of Health, Ageing and Retirement in Europe (SHARE), a longitudinal panel survey of about 140,000 individuals aged 50 or older from a large number of countries in Europe and Israel that has been conducted every 2 to 3 years since 2004. It is the European equivalent of the Health and Retirement Study (HRS), which has been conducted in the United

States since 1992 by the Institute for Social Research at the University of Michigan, and the English Longitudinal Study of Aging (ELSA), which has been conducted in the United Kingdom since 2002, and has become a role model for several ageing surveys worldwide. For more details on this survey, please go to <http://www.share-project.org/home0.html>

In our analysis, we used data from wave 1, which was conducted in 2004–2005, and wave 2, which was conducted in 2006–2007. We chose these waves because they are the only waves that included questions about leaving inheritances, which is one of the focuses of our study, and because at least two waves are needed in order to calculate the change in wealth over time. Both waves were conducted in 11 countries (Austria, Belgium, Denmark, France, Germany, Greece, Italy, Netherlands, Spain, Sweden, and Switzerland).

We confined our sample to only single-person or couple households in which both the husband and wife are 60 or older and retired because we wanted to avoid the problem of having to allocate saving, wealth, etc., to cohabiting household members and because the life-cycle hypothesis or model predicts not that all elderly will decumulate their wealth, only that the retired elderly will decumulate their wealth. We also confine our sample to households with at least one non-cohabiting child since we are interested in looking at the impact of bequest intentions on wealth accumulation (saving) behavior and since respondents with no living children are likely to have a weaker bequest motive, driven by different motivations. We also drop observations for which all the necessary information is not available as well as observations whose wealth accumulation rate is less than –100 percent or more than 200 percent in order to purge the sample of outliers.

Moreover, we drop observations for which wealth in the initial and/or final waves is zero or negative when estimating the wealth accumulation equations since we were not able to compute wealth accumulation rates in these cases and since we believe that there may be a large measurement or reporting error in cases in which wealth is zero or negative.

The data source that we used does not include any elderly who live in nursing homes, so we were not able to include them in our analysis. The elderly who live in nursing homes are more likely to be decumulating their wealth because of the high cost of nursing homes, and thus excluding them from the analysis may have biased our conclusion toward finding an absence of decumulation (see Ziegelmeier, 2012).

Finally, it should be noted that, throughout our analysis, we use the weights provided by SHARE to correct for sample selection bias.

5. DESCRIPTIVE STATISTICS AND CROSS-TABULATIONS

In this Section, we present and discuss some descriptive statistics and cross-tabulations of the data. First, Table 1 shows descriptive statistics (means, standard deviations, and minimum and maximum values) for all dependent and explanatory variables we used in our econometric analysis based on the sample we used for our wealth accumulation equations.

As can be seen from the breakdown of households by bequest intentions shown in Table 2, bequest motives are quite strong in Europe, with 90.4 percent

TABLE 1
DESCRIPTIVE STATISTICS

Variable	No. of Obs.	Mean	Std. Dev.	Minimum	Maximum
Wealth accumulation rate	811	6.607	57.850	-100.000	195.635
Age	811	73.136	7.239	60	98
Age ² /100	811	54.012	10.799	36	96.04
Male	811	0.485	0.500	0	1
Number of children	811	2.339	1.086	1	7
Primary education	811	0.328	0.470	0	1
Lower secondary education	811	0.141	0.348	0	1
Upper secondary education	811	0.279	0.449	0	1
Post-sec. non-tertiary education	811	0.028	0.166	0	1
Tertiary education	811	0.176	0.381	0	1
Married or in a registered partnership	811	0.508	0.500	0	1
Separated	811	0.009	0.093	0	1
Never married	811	0.020	0.139	0	1
Widowed	811	0.345	0.476	0	1
Wealth in wave 1 (euros)	811	218824.03	968575.72	100	25369542
Log of wealth in wave 1	811	11.189	1.625	4.605	17.049
Prob. of leaving a large bequest	811	35.526	43.885	0	100
Positive health perception	811	0.665	0.472	0	1
Expect to live more than 10 years	811	0.878	0.328	0	1
Long-term health problems	811	0.501	0.500	0	1
Average pension replacement ratio	811	51.494	9.918	37	65
Gross pension income (euros)	811	6975.505	11458.01	1	78101
Log of gross pension income	811	7.555	2.182	0	11.266
Least risk-averse	811	0.001	0.035	0	1
Moderately risk-averse	811	0.078	0.268	0	1
Risk-averse	811	0.131	0.337	0	1
Strongly risk-averse	811	0.790	0.407	0	1
Austria	811	0.085	0.279	0	1
Germany	811	0.096	0.295	0	1
Sweden	811	0.263	0.440	0	1
Netherlands	811	0.086	0.281	0	1
Spain	811	0.009	0.093	0	1
Italy	811	0.043	0.203	0	1
France	811	0.060	0.238	0	1
Denmark	811	0.129	0.336	0	1
Greece	811	0.127	0.333	0	1
Switzerland	811	0.046	0.209	0	1
Belgium	811	0.055	0.229	0	1

Source: Authors' calculations using data from the 2004–2005 and 2006–2007 waves of the Survey of Health, Ageing and Retirement in Europe (SHARE).

TABLE 2
PROPORTIONS OF ACCUMULATORS AND DECUMULATORS BY BEQUEST INTENTIONS

Category of Households	Bequest Intentions				Total
	No Bequest	Small Bequest	Medium Bequest	Large Bequest	
Wealth Decumulators	48	105	87	167	407
	11.79	25.79	21.37	41.03	100.00
	53.93	52.76	43.07	38.22	43.90
Wealth Accumulators	41	94	115	270	520
	7.88	18.08	22.11	51.92	100.00
	46.07	47.24	56.93	61.78	56.09
Total	89	199	202	437	927
	9.60	21.47	21.79	47.14	100.00
	100.00	100.00	100.00	100.00	100.00

Note: The first row shows frequencies, the second row shows row percentages, and the third row shows column percentages.

Source: Authors' calculations using data from the 2004–2005 and 2006–2007 waves of the Survey of Health, Ageing and Retirement in Europe (SHARE).

of households planning to leave a bequest and only 9.6 percent of households not planning to leave a bequest. Moreover, 21.5 percent of households plan to leave a bequest of less than 50,000 euros, 21.8 percent plan to leave a bequest of 50,000 euros or more but less than 150,000 euros, and 47.1 percent plan to leave a bequest of 150,000 euros or more.

Table 2 also shows data on the proportions of households accumulating and decumulating wealth, and as can be seen from this table, more than half (56.1 percent) of the retired elderly are continuing to accumulate wealth and only 43.9 percent are decumulating wealth. These findings are quite surprising since we would expect the retired elderly to be decumulating their wealth in order to finance their living expenses.

One possible reason for why the proportion of the retired elderly who are accumulating wealth is so high is that there is a considerable number of retired elderly who are planning to leave bequests, as a result of which they are continuing to accumulate wealth. In order to test this hypothesis, we stratify the sample by the size of the planned bequest and calculate the proportion of those who are accumulating or decumulating wealth for each subsample. As Table 2 shows, the proportion of those who are accumulating wealth is only 46.1 percent for those not planning to leave any bequests at all, whereas the proportion of those who are accumulating wealth is much higher for those planning to leave bequests, and moreover, this proportion increases with the size of the bequest (from 47.2 percent for those planning to leave small bequests to 56.9 percent for those planning to leave medium-size bequests and 61.8 percent for those planning to leave large bequests). These findings strongly suggest that bequest motives are an important reason for why a substantial proportion of the retired elderly are continuing to accumulate wealth, contrary to the prediction of the life-cycle hypothesis or model.

As can be seen from the data on average wealth accumulation rates shown in Table 3, the average wealth accumulation rate of the full sample is positive

TABLE 3
WEALTH ACCUMULATION RATES BY BEQUEST INTENTIONS

Bequest Intentions	No. of Obs.	Mean	Standard Deviation	Minimum	Maximum
No bequest	74	-12.038	66.774	-100.000	166.329
Small bequest	175	-3.000	58.866	-93.613	195.054
Medium bequest	180	6.042	51.961	-94.682	168.801
Large bequest	382	14.697	56.688	-98.959	195.635
Total	811	6.607	57.850	-99.999	195.635

Source: Authors' calculations using data from the 2004–2005 and 2006–2007 waves of the Survey of Health, Ageing and Retirement in Europe (SHARE).

though relatively moderate (6.6 percent over a 3-year period), which is surprising because we would expect the retired elderly to be decumulating their wealth, on average.

This figure is not shown in the table, but the average wealth accumulation rate of respondents who are decumulating wealth is -36.6 percent, which seems like a reasonable figure when we take account of the fact that this figure pertains to a 3-year period and of the fact that we would expect the retired elderly to live for another decade or more.

One possible reason for why the average wealth accumulation rate of the retired elderly is positive is that they are planning to leave bequests and are moderating their rate of wealth decumulation (or continuing to accumulate wealth) for this reason. In order to test this hypothesis, we stratify the sample by whether or not respondents are planning to leave a bequest and the size of their planned bequest and calculate the average wealth accumulation rate for each subsample. As Table 3 shows, the retired elderly who are not planning to leave any bequests at all or are planning to leave only small bequests are decumulating their wealth, with wealth accumulation rates of -12.0 percent and -3.0 percent, respectively. By contrast, the retired elderly who are planning to leave medium-size and large bequests are continuing to accumulate wealth, with wealth accumulation rates of 6.0, and 14.7 percent, respectively. These findings strongly suggest that bequest motives are an important reason for why the retired elderly are continuing to accumulate wealth, contrary to the prediction of the life-cycle hypothesis or model.

Our finding that less than half of the retired elderly in Europe are decumulating their wealth and our finding that the average wealth accumulation rate of the retired elderly in Europe is positive though small in magnitude strongly suggests that the Wealth Decumulation (or Retirement Saving) Puzzle applies in the case of Europe, a finding that is consistent with the findings of previous studies for most countries.

Moreover, our finding that those planning to leave large bequests are more likely to accumulate wealth and that they show a higher wealth accumulation rate than others strongly suggests that bequest motives are an important explanation for why the Wealth Decumulation (or Retirement Saving) Puzzle applies in the case of Europe. However, we need to conduct a regression analysis in order to confirm whether or not these findings hold up even after controlling for other factors, and this is precisely what we do in the next Section.

6. ESTIMATION RESULTS

In this Section, we present the estimation results of our regression analysis of the wealth accumulation (saving) behavior of the retired elderly in Europe.

6.1. *Estimation Results for the Probit Model*

As can be seen from the estimation results for the full sample shown in the first column of Table 4 (the results shown in the second and third columns of this table will be discussed in Subsection 7.4), LARGEBEQ (the probability of leaving a large bequest to one's children) has a positive and significant impact on the probability of accumulating wealth, with the estimated marginal effect implying that a 10 percentage point increase in the probability of leaving a large bequest is associated with a 4 percentage point increase in the probability of accumulating wealth. This finding indicates that the retired elderly with strong bequest motives are significantly more likely to accumulate wealth than other retired elderly and suggests that the higher than expected proportion of the retired elderly who continue accumulating wealth is due in large part to bequest motives.

Looking next at the impact of explanatory variables relating to precautionary saving, we found that HEALTH (having a favorable subjective perception of one's health status) significantly increases the probability of accumulating wealth, with the estimated marginal effect implying that the retired elderly with a favorable subjective perception of their health status are 7.0 percentage points more likely to accumulate wealth than other retired elderly. This is as expected because those in good health would be expected to incur fewer medical and long-term care expenses, which in turn would increase their probability of being able to accumulate wealth.

By contrast, LIFEEXP (the expectation of living more than 10 years) has a negative and significant impact on the probability of accumulating wealth, with the estimated marginal effect implying that the retired elderly who expect to live a long life are 6.3 percentage points less likely to accumulate wealth than other retired elderly. This is somewhat surprising since we would expect an individual expecting to live a long life to be more likely to continue accumulating wealth. Perhaps those expecting to live for a long time are more likely to decumulate their wealth because they are healthier than others and therefore more likely to engage in travel and other leisure-related consumption.

ILLNESS (whether or not the respondent suffers from a serious or chronic health condition) was found not to have a significant impact on his or her probability of accumulating wealth.

PENSION (the natural logarithm of pension income) as well as REPLRATIO (the average pension replacement ratio) have a positive and significant impact on the wealth accumulation rate. These results are somewhat surprising because public pensions provide insurance against longevity risk, as a result of which there is less need for precautionary saving arising from longevity risk in countries with relatively generous public pension benefits.

Finally, HIGHESTRISK (being least risk-averse) has a positive and significant impact on the probability of accumulating wealth, which is somewhat surprising since we would expect less risk-averse individuals to be less worried about running

TABLE 4
THE DETERMINANTS OF THE PROBABILITY OF ACCUMULATING WEALTH (PROBIT)

Explanatory Variable	Full sample	Homeowners	Renters
Age	-0.092 (0.016)***	-0.067 (0.021)***	-0.114 (0.042)***
Age ² /100	0.059 (0.011)***	0.041 (0.016)***	0.079 (0.028)***
Male	0.005 (0.029)	0.083 (0.055)	-0.110 (0.057)**
Number of children	-0.013 (0.017)	0.040 (0.036)	-0.064 (0.018)***
Primary education	-0.122 (0.081)	-0.073 (0.049)	0.109 (0.207)
Lower secondary education	-0.145 (0.085)*	0.034 (0.129)	-0.019 (0.220)
Upper sec. education	-0.093 (0.096)	0.031 (0.070)	0.073 (0.235)
Post-sec. non-tertiary education	-0.160 (0.097)*	0.059 (0.109)	-0.218 (0.254)
Tertiary education	0.030 (0.110)	0.123 (0.083)	0.252 (0.275)
Married or in a registered partnership	-0.038 (0.033)	0.003 (0.044)	0.071 (0.107)
Separated	-0.212 (0.043)***	-0.047 (0.132)	-0.278 (0.136)**
Never married	-0.105 (0.133)	0.349 (0.058)***	-0.206 (0.070)***
Widowed	-0.043 (0.041)	0.097 (0.072)	-0.087 (0.060)
Log of wealth in wave 1	-0.106 (0.009)***	-0.267 (0.049)***	-0.110 (0.013)***
Prob. of leaving a large bequest	0.004 (0)***	0.004 (0)***	0.003 (0)***
Positive health perception	0.070 (0.029)**	0.077 (0.030)***	0.073 (0.074)
Expect to live more than 10 years	-0.063 (0.038)*	-0.105 (0.062)*	0.102 (0.044)**
Long-term health problems	-0.057 (0.068)	0.011 (0.036)	-0.171 (0.103)*
Av. pension repl. ratio	0.002 (0.001)***	0.002 (0.001)	0.008 (0.002)***
Log of gross pension income	0.012 (0.006)*	-0.003 (0.004)	0.027 (0.018)
Least risk-averse	1.479 (0.060)***	1.160 (0.185)***	
Moderately risk-averse	-0.037 (0.123)	-0.048 (0.061)	0.334 (0.050)***
Risk-averse	-0.001 (0.034)	-0.036 (0.021)*	-0.017 (0.073)
No. of obs.	927	539	385

Notes: The table shows average marginal effects. Country dummies were included but their average marginal effects are not shown.

Source: Authors' calculations using data from the 2004–2005 and 2006–2007 waves of the Survey of Health, Ageing and Retirement in Europe (SHARE).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

out of wealth before passing away and hence less likely to continue accumulating wealth.¹

Thus, virtually all explanatory variables relating to precautionary saving either do not have a significant impact on the probability of accumulating wealth or their impact is contrary to expectation, with the only exception being that having a favorable subjective perception of one's health status significantly increases the probability of accumulating wealth. This suggests that precautionary saving is not an important determinant of whether or not the retired elderly continue accumulating wealth.

As for the impact of the other explanatory variables, the estimated marginal effects of age and age squared imply that the probability of accumulating wealth decreases with age until the age of 78.0. This finding is as expected since we would expect the probability of accumulating wealth to decrease as age increases and the end of life approaches.

Neither gender nor the number of children has a significant impact on the probability of accumulating wealth, and the impact of educational attainment is not clear or statistically significant.

Marital status does not have a significant impact on the probability of accumulating wealth except that the retired elderly who are married but living separately are less likely to continue accumulating wealth than other retired elderly, presumably because those who are separated are less well off financially and therefore less able to accumulate wealth.

Wealth has a negative and significant impact on the probability of accumulating wealth, which is as expected since the retired elderly with more wealth to decumulate should be more likely to be decumulating their wealth than other retired elderly and because wealth is in the denominator of the dependent variable.

6.2. Estimation Results for the Wealth Accumulation Rate Equations

As can be seen from the ordinary least squares (OLS) estimation results shown in Table 5, LARGEBEQ (the probability of leaving a large bequest) increases WEALTHRATE (the wealth accumulation rate) or decreases the wealth decumulation rate of the retired elderly in the full sample as well as in the sample of those who are decumulating wealth and the sample of those who are accumulating wealth, as expected. These findings suggest that the higher than expected wealth accumulation rates of the retired elderly is due primarily to bequest motives. In fact, our findings imply that lowering the probability of leaving a large bequest from the sample mean of 35.53 percent to zero would lower the wealth accumulation rate of the retired elderly (as before, over a 3-year period) by 15.88 percentage points from 6.61 percent to -9.27 percent, causing it to go from positive to negative.

Turning to the impact of the explanatory variables relating to precautionary saving, we found that HEALTH (having a favorable subjective perception of one's health status) significantly increases the wealth accumulation rate (reduces the

¹Perhaps less risk-averse individuals are more likely to accumulate wealth because they tend to be more financially literate than others and therefore are more cognizant of the need to accumulate wealth and/or are better able to minimize the risks associated with wealth accumulation.

TABLE 5
THE DETERMINANTS OF THE WEALTH ACCUMULATION RATE (ORDINARY LEAST SQUARES)

Explanatory Variable	Full sample	Wealth Decumulators	Wealth Accumulators
Age	-8.605 (6.480)	-2.591 (7.226)	9.253 (6.987)
Age ² /100	5.467 (4.547)	1.757 (5.003)	-6.394 (4.580)
Male	1.365 (5.639)	-1.240 (5.636)	-1.566 (6.374)
Number of children	0.556 (0.855)	-0.149 (1.354)	3.499 (2.203)
Primary education	-14.591 (20.419)	29.933 (10.171)**	-22.638 (9.261)**
Lower secondary education	-4.527 (19.119)	26.848 (11.248)**	-6.052 (11.517)
Upper secondary education	0.879 (19.666)	24.830 (11.195)*	-3.968 (8.613)
Post-sec. non-tertiary education	-9.115 (27.431)	44.812 (16.735)**	-20.514 (14.336)
Tertiary education	11.017 (26.135)	30.645 (14.247)*	-14.891 (8.220)
Married or in a registered partnership	-10.333 (6.430)	-2.554 (1.773)	4.952 (6.023)
Separated	-38.333 (9.604)***	-22.188 (9.087)**	-26.120 (13.651)*
Never married	-18.424 (16.819)	-23.226 (2.670)***	24.228 (14.978)
Widowed	-2.861 (7.434)	-7.284 (3.677)*	24.752 (8.557)**
Log of wealth in wave 1	-13.163 (2.741)***	-4.070 (1.621)**	-16.039 (2.992)***
Prob. of leaving a large bequest	0.447 (0.138)***	0.205 (0.037)***	0.211 (0.116)*
Positive health perception	12.905 (4.296)**	7.908 (3.278)*	10.645 (5.816)*
Expect to live more than 10 years	-6.435 (7.702)	-2.059 (3.093)	-0.314 (8.386)
Long-term health problems	-7.938 (8.211)	5.317 (2.903)*	-9.054 (5.246)
Average pension replacement ratio	-0.454 (0.109)***	-0.728 (0.112)**	-0.556 (0.177)**
Log of gross pension income	1.428 (0.943)	1.099 (0.350)**	-0.296 (0.905)
Least risk-averse	134.714 (12.480)***		112.677 (9.929)***
Moderately risk-averse	3.691 (11.662)	5.749 (6.443)	21.755 (13.104)
Risk-averse	11.106 (2.909)***	5.023 (2.975)	26.041 (25.057)
Germany	-10.443 (4.621)**	10.356 (2.868)***	-11.861 (3.867)**
Sweden	42.019 (5.200)***	22.073 (3.224)***	3.583 (6.140)

TABLE 5
CONTINUED

Explanatory Variable	Full sample	Wealth Decumulators	Wealth Accumulators
Netherlands	0.897 (3.376)	7.628 (2.091)**	-31.121 (6.671)**
Spain	49.167 (7.509)**	6.683 (3.396)*	-1.290 (4.351)
Italy	50.232 (4.080)**	18.178 (3.268)**	8.753 (2.793)**
France	8.354 (1.868)**	-4.159 (1.995)*	-3.179 (4.157)
Denmark	18.436 (3.816)**	-3.874 (1.565)**	-15.999 (4.393)**
Greece	15.909 (3.114)**	25.665 (4.205)**	-37.241 (5.832)**
Switzerland	12.735 (6.466)*	-5.060 (3.894)	-3.078 (12.904)
Constant	475.335 (192.709)**	87.862 (240.779)	-87.148 (239.966)
R ²	0.25	0.24	0.29
No. of obs.	811	401	410

Source: Authors' calculations using data from the 2004–2005 and 2006–2007 waves of the Survey of Health, Ageing and Retirement in Europe (SHARE).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

wealth decumulation rate) of the retired elderly in all samples. This is as expected because those in good health would be expected to incur fewer medical and long-term care expenses, which in turn would reduce their need to decumulate wealth.

However, our estimation results for LIFEEXP and ILLNESS indicate that the wealth accumulation rates of the retired elderly who expect to live for more than 10 years and the retired elderly who suffer from chronic or long-term health problems do not differ significantly from those of other retired elderly (with one exception).

We found that PENSION (the natural logarithm of pension income) does not have a significant impact on the wealth accumulation rate of the retired elderly but that REPLRATIO (the average pension replacement ratio) has a negative and significant impact on the wealth accumulation rate. This is not surprising because public pensions provide insurance against longevity risk, as a result of which there is less need for precautionary saving arising from longevity risk in countries with relatively generous public pension benefits, as first pointed out by Feldstein (1974).

As for the impact of risk aversion, we find that LEASTRISKVERSE (being least risk-averse) has a positive and significant impact on the wealth accumulation rate for the full sample of retired elderly and for the retired elderly who are accumulating wealth and that RISKVERSE (being risk-averse) has a positive and significant impact on the wealth accumulation rate in the case of the full sample only. The former result is somewhat surprising since we would expect the least risk-averse individuals to engage in less precautionary saving than other retired elderly.

There are at least three ways in which to explain this apparent puzzle. First, risk aversion can have a positive or negative effect on saving (and thus wealth accumulation) depending on the degree of patience (the coefficient of intertemporal preference), as can be seen below from a standard Euler equation for intertemporal utility maximization:

$$E_t (\Delta \log(c_{t+1})) = \frac{1}{c_t r(c_t)} \left(\frac{i_{t+1} - \theta}{1 + i_{t+1}} \right) + \frac{1}{2} p(c_t) E_t \left((\Delta \log(c_{t+1}))^2 \right)$$

where $r(c_t)$ is risk aversion, $p(c_t)$ prudence, and θ a coefficient of time preference. All else equal, all depends on the interest rate less time preference, which can be positive or negative. If θ is large, consumption will increase and accumulation will consequently decrease in risk aversion. Second, it seems reasonable to assume that the least risk-averse individuals will be more likely to invest in risky financial assets such as equities, which confer a higher return, and that they are able to accumulate more wealth as a result. Third, perhaps the least risk-averse individuals are more likely to accumulate wealth because they tend to be more financially literate than others and therefore are more cognizant of the need to accumulate wealth and/or are better able to minimize the risks associated with wealth accumulation.

Thus, we obtained some findings that suggest that precautionary saving is an important determinant of the wealth accumulation rate of the retired elderly (for example, our finding that having a favorable subjective perception of one's health status significantly increases the wealth accumulation rate and our finding that a higher pension replacement ratio significantly reduces the wealth accumulation rate), but most of our findings suggest that precautionary saving is not an important determinant of the wealth accumulation rate of the retired elderly.

Turning to the impact of other explanatory variables, age, age squared, the number of children, and gender do not appear to have a significant impact on the wealth accumulation rate. Educational attainment does not have a significant impact on the wealth accumulation rate of the full sample of the retired elderly and of the retired elderly who are accumulating wealth (with one exception) but generally has a positive and significant impact on the wealth accumulation rate of the retired elderly who are decumulating wealth, possibly because financial literacy increases with educational attainment. The impact of marital status on the wealth accumulation rate is not clear except that the retired elderly who are separated appear to have a significantly lower wealth accumulation rate than other retired elderly. Initial wealth has a negative and significant impact on the wealth accumulation rate, which is as one would expect since theory predicts that the retired elderly with more wealth should accumulate their wealth more slowly or decumulate it more rapidly than other retired elderly.

Turning finally to the country dummies, the retired elderly have significantly higher wealth accumulation rates in Denmark, Greece, Italy, Netherlands, Spain, Sweden, and Switzerland than in the reference countries (Austria and Belgium), whereas the patterns in the remaining countries (France and Germany) are less clear.

7. ROBUSTNESS CHECKS

In this Section, we conduct a number of robustness checks to shed light on how robust our estimation results are.

7.1. *Endogeneity Concerns*

In principle, it is possible that bequest intentions are endogenous and that the direction of causality is reversed, with those who are better able to accumulate wealth and/or who are able to accumulate wealth at a faster pace being more likely to have stronger bequest intentions (higher probability of leaving a bequest). If not controlled for, this will lead to a bias in the impact of bequest intentions on wealth accumulation. We therefore estimated our regression equations using instrumental variables, using the expectation of receiving one or more bequests in the future (as of wave 1) and gender as instruments for bequest intentions.² The results are not shown due to space limitations, but they are available upon request from the authors. The usual tests confirmed that these instruments are not weak and that they are not correlated with the residuals in the wealth accumulation equation.

We then performed a test of exogeneity and could not reject the null hypothesis that the variable expressing bequest intentions is exogenous with respect to wealth accumulation.

Moreover, simultaneously estimating the main wealth accumulation equation with a Tobit equation for bequest intentions within a conditional mixed process estimation using the same instruments as above yields a coefficient for bequest intentions in the main equation that is almost statistically significant (at the 10 percent significance level) and comparable in magnitude to that of the baseline OLS equation. These results are also not reported for brevity, but they are available from the authors upon request. Both of these findings convinced us that our OLS and probit models are the preferred ones.

7.2. *Estimates for the Switching Model*

We have thus far used only information on bequest intentions in the second wave of SHARE, but SHARE also collects information on bequest intentions in the first wave. In our next robustness check, we tested whether the wealth accumulation (saving) behavior of respondents who recently decided to leave a large bequest is different from that of respondents with a persistent intention of leaving a large bequest. We did so replacing the bequest probability variable with two variables: the probability of leaving a large bequest of those who intended to leave a large

²We use the expectation of receiving one or more bequests in the future as an instrument for bequest intentions because it is not necessarily correlated with wealth accumulation rates but is likely to be correlated with bequest intentions (for example, Niimi and Horioka, 2018, find that those who receive bequests and inter vivos transfers are significantly more likely to leave bequests than those who did not receive bequests and inter vivos transfers in both Japan and the United States, as do Cannari and D'Alessio 2008, in the case of Italy). Similarly, gender may also be suitable as an instrument for bequest intentions since bequest intentions may differ by gender whereas gender may not have a direct impact on wealth accumulation rates.

bequest in both waves (what we will call “stable bequest probability”) and the same probability of those who had no intention of leaving a bequest or intended to leave only a small or medium-size bequest in the first wave but who switched to intending to leave a large bequest in the second wave (what we will call “reinforced bequest probability”).

As can be seen from the results for the switching model shown in Table 6, the coefficients of both bequest probabilities are positive and significant, as expected (with one exception) but the magnitude of the coefficient of the reinforced bequest probability is much larger than that of the stable bequest probability in the full sample and in the sample of those who are decumulating wealth. This finding is as expected because those who recently decided to leave a large bequest will presumably have to accumulate wealth at a faster speed than those who have been intending to leave a bequest for a long time in order to accumulate the amount of their desired bequest by the time they die. Thus, this finding constitutes further evidence that bequest intentions are the primary explanation for why the retired elderly in Europe do not decumulate their wealth or decumulate their wealth (dissave) more slowly than expected. As for the other results of the switching model, they are broadly similar to the OLS estimates shown in Table 5.

Thus, our finding that bequest intentions have a substantial impact on the probability of accumulating wealth and on the wealth accumulation rate appear to be quite robust, holding up even if we control for the endogeneity of bequest intentions and even if we take account of changes over time in bequest intentions. Moreover, our finding that there is little evidence that precautionary saving has some impact on the probability of accumulating wealth and on the wealth accumulation rate also appears to be quite robust.

7.3. *Other Robustness Checks*

We tried estimating the equation designed to shed light on the determinants of whether or not respondents accumulate wealth using a logit model rather than a probit model and found that the estimation results were broadly consistent.

We also tried estimating the equation designed to shed light on the determinants of whether or not respondents accumulate wealth using an ordered logit or ordered probit model with the three ordered categories being (1) decumulating wealth, (2) keeping wealth more or less constant (defined as a percentage change in wealth of less than 5 percent in absolute value), and (3) accumulating wealth and again found that the estimation results are broadly consistent.

Finally, we tried replacing the subjective bequest probabilities with a dummy variable for those who are planning to leave a large bequest and found that the estimation results are broadly consistent and that the coefficient of the bequest-related variable remains positive and significant.

The results of these additional robustness checks are not reported due to space limitations but are available from the authors upon request.

7.4. *Results for Homeowner and Renter Households*

We have so far been using the change in total household net worth (inclusive of owner-occupied housing) as our dependent variable. However, as Sheiner

TABLE 6
THE DETERMINANTS OF THE WEALTH ACCUMULATION RATE (SWITCHING MODEL)

Explanatory Variable	Full Sample	Wealth Decumulators	Wealth Accumulators
Age	-8.986 (6.341)	-2.646 (7.189)	9.331 (7.058)
Age ² /100	5.739 (4.405)	1.822 (4.972)	-6.444 (4.633)
Male	-0.261 (5.287)	-2.108 (5.736)	-1.534 (6.016)
Number of children	-0.046 (0.957)	-0.125 (1.394)	3.542 (2.399)
Primary education	-12.261 (19.754)	31.219 (10.281)**	-22.727 (9.115)**
Lower secondary education	-3.880 (19.868)	28.451 (11.295)**	-6.019 (11.393)
Upper secondary education	1.121 (19.334)	26.229 (11.166)**	-3.929 (8.450)
Post-sec. non-tertiary education	-5.967 (25.914)	46.769 (16.431)**	-20.637 (14.375)
Tertiary education	12.217 (25.519)	32.100 (14.088)**	-14.926 (8.338)
Married or reg.d partnership	-8.946 (6.022)	-2.156 (1.887)	4.919 (5.785)
Separated	-36.147 (10.299)***	-21.726 (8.877)**	-26.154 (13.434)*
Never married	-18.461 (17.203)	-23.298 (2.695)***	24.226 (15.014)
Widowed	-3.631 (7.132)	-7.819 (3.733)*	24.820 (8.075)**
Log of wealth in wave 1	-12.829 (2.735)***	-4.123 (1.651)**	-16.056 (3.107)***
Prob. of a large bequest – stable	0.382 (0.123)**	0.199 (0.037)***	0.215 (0.110)*
Prob. of a large bequest – reinforced	0.676 (0.186)***	0.327 (0.066)***	0.204 (0.177)
Positive health perception	11.928 (4.805)**	7.793 (3.141)**	10.627 (5.832)*
Expect to live more than 10 years	-3.539 (7.987)	-1.570 (3.416)	-0.478 (9.887)
Long-term health problems	-7.952 (7.658)	5.531 (2.804)*	-9.034 (5.267)
Average pension replacement ratio	-0.510 (0.119)***	-0.741 (0.117)***	-0.553 (0.205)**
Log of gross pension income	1.185 (0.963)	1.019 (0.350)**	-0.294 (0.924)
Least risk-averse	110.100 (19.261)***		113.473 (17.827)***
Moderately risk-averse	6.683 (10.444)	6.873 (7.259)	21.669 (12.708)
Risk-averse	13.623 (2.878)***	5.760 (3.061)*	25.904 (24.404)
Germany	-10.295 (4.643)*	10.381 (2.930)***	-11.861 (3.881)**

TABLE 6
CONTINUED

Explanatory Variable	Full Sample	Wealth Decumulators	Wealth Accumulators
Sweden	42.042 (4.946)***	22.565 (3.321)***	3.524 (6.807)
Netherlands	2.266 (3.848)	8.196 (1.974)***	-31.195 (7.072)***
Spain	48.142 (7.580)***	6.787 (3.400)*	-1.398 (4.242)
Italy	50.144 (3.785)***	18.819 (3.316)***	8.670 (3.288)**
France	7.012 (2.168)***	-3.774 (2.022)*	-3.151 (3.967)
Denmark	18.511 (3.545)***	-3.490 (1.676)*	-16.037 (4.434)***
Greece	15.898 (3.118)***	26.342 (4.153)***	-37.296 (6.206)***
Switzerland	12.650 (6.043)*	-5.127 (4.043)	-3.072 (12.896)
Constant	487.548 (191.761)**	88.088 (240.484)	-90.030 (239.726)
R ²	0.26	0.24	0.29
No. of obs.	811	401	410

Source: Authors' calculations using data from the 2004–2005 and 2006–2007 waves of the Survey of Health, Ageing and Retirement in Europe (SHARE).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

and Weil (1992), Venti and Wise (2004), Poterba *et al.* (2011), Banks *et al.* (2012), Romiti and Rossi (2014), van Ooijen *et al.* (2015), Nakajima and Telyukova (2019), and Suari-Andreu *et al.* (2019) have pointed out, the elderly are often reluctant to decumulate their housing wealth due to its illiquidity and indivisibility, transactions costs, the fact the housing is an investment good as well as a consumption good, their desire to continue living in the same house and/or location until death, and/or the unavailability of financial products such as home equity loans and reverse mortgages that allow them to borrow against their housing equity, as a result of which homeowners are more likely to leave largely unintended bequests behind. Not surprisingly, therefore, the wealth accumulation rates of homeowners is much higher than that of renters (13.4 percent vs, -2.4 percent) and renters are, on average, decumulating their wealth, albeit very moderately. Thus, the Wealth Decumulation Puzzle applies primarily to homeowners, which suggests that the reluctance of retired elderly homeowners to sell or borrow against their owner-occupied housing is one cause of the puzzle.

In light of these substantial differences in the wealth accumulation (saving) behavior of homeowners and renters, we subdivided our sample into homeowner households and renter households and estimated our probit equations for both subsamples as our final robustness check. Our results for renter households will be easier to interpret because the unique characteristics of owner-occupied housing will not cloud the results.

As can be seen from Table 4, the determinants of whether respondents accumulate or decumulate wealth are very similar for both homeowners and renters, and in particular, LARGEBEQ (the probability of leaving a large bequest) has a positive and significant impact on the probability of accumulating wealth for both subsamples. One interesting difference is that the estimation results for LIFE-EXP indicate that the probability of accumulating wealth is significantly higher for respondents expecting to live more than 10 years, as expected, in the sample of renters but that the impact of subjective life expectancy is negative and significant, contrary to expectation, in the full sample and the sample of homeowners. Another difference is that the estimation results for ILLNESS indicate that the probability of accumulating wealth is significantly lower for respondents suffering from a chronic or long-term health problem, as expected, in the sample of renters but that the impact of chronic or long-term health problems is insignificant in the full sample as well as in the sample of homeowners. Thus, some of the estimation results pertaining to precautionary saving are more satisfactory in the sample of renters than in the full sample as well as in the sample of homeowners. By contrast, the estimation results for HEALTH indicate that respondents' subjective perception of their health status has a positive and significant impact on the probability of accumulating wealth, as expected, in the full sample as well as in the sample of homeowners but that its impact is not significant in the sample of renters.

8. CONCLUSIONS AND POLICY IMPLICATIONS

In this paper, we used microdata on a large number of European countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) survey to examine the wealth accumulation (saving) behavior of the retired elderly in Europe and to shed light on the extent to which they are decumulating their wealth and the extent to which their wealth accumulation (saving) behavior is influenced by bequest motives, precautionary saving, public pension arrangements, and homeownership. We were particularly interested in shedding light on whether or not the Wealth Decumulation (or Retirement Saving) Puzzle (the tendency of the retired elderly to not decumulate their wealth or to decumulate their wealth more slowly than expected) applies in Europe, and if so, what the explanation is for the Puzzle.

To summarize our main findings, we found that less than half of the retired elderly in Europe are decumulating their wealth and that the average wealth accumulation rate of the retired elderly in Europe is positive though relatively moderate (6.6 percent over a 3-year period). These findings strongly suggest that the Wealth Decumulation (or Retirement Saving) Puzzle applies in the case of Europe, a finding that is consistent with the findings of previous studies for most countries.

Moreover, our regression analysis showed that bequest motives have a significant impact on wealth accumulation (saving) behavior of the retired elderly in Europe, with those planning to leave large bequests being more likely to accumulate wealth and showing higher wealth accumulation rates than others. This implies that the tendency of the retired elderly to not decumulate their wealth or to decumulate their wealth more slowly than expected is attributable in large part to the presence of bequest motives. By contrast, we found only limited evidence that precautionary

saving arising from longevity risk (lifespan uncertainty) and/or uncertain future medical and long-term care expenses is important as an explanation of the tendency of the retired elderly not to decumulate their wealth or to decumulate their wealth more slowly than expected. However, we do find that generous public pension systems help to explain the existence of the Wealth Decumulation Puzzle in Europe, and we also find that the reluctance of retired elderly homeowners to sell or borrow against their owner-occupied housing is another contributing factor.

These results are broadly consistent with the results of Ventura and Horioka (2020) for Italy and in sharp contrast to the results of De Nardi *et al.* (2010, 2016) for the United States and the results of Horioka *et al.* (1996), Horioka and Niimi (2017), and Niimi and Horioka (2019) for Japan. Thus, it could be that the primary explanation for the Wealth Decumulation Puzzle varies from country to country and from region to region, with bequest motives being more important in Europe and precautionary saving being more important in Japan and the United States, perhaps because social safety nets are better developed in Europe, alleviating the need for precautionary saving.

Turning next to directions for further research, we plan to extend this line of research in the future by breaking down household wealth into its various components (financial assets, real assets, and liabilities) and examining differences among the various components in the speed of decumulation and in the determinants of decumulation. As already noted in Subsection 7.4, Romiti and Rossi (2014), van Ooijen *et al.* (2015), Nakajima and Telyukova (2019), and Suari-Andreu *et al.* (2019) have found that one of the main explanations for the Wealth Decumulation (or Retirement Saving) Puzzle could be that a large share of retirees' wealth is in the form of owner-occupied housing, that they are reluctant to decumulate such wealth for the reasons discussed in Subsection 7.4, as a result of which such wealth is more likely to be left behind as an unintended bequest. Our proposed research will enable us to shed light on whether this finding holds in the case of the major European countries.

We turn finally to the implications of our findings. First, our finding that the wealth accumulation rate of the retired elderly is negative once we eliminate the impact of large bequests implies that the wealth accumulation (saving) behavior of the retired elderly in Europe is consistent with the life-cycle hypothesis or model once we take account of bequest motives and that it is appropriate to use this model when analyzing household behavior in the real world. Second, our finding that the retired elderly in Europe are not decumulating their wealth, on average, implies that Europe's household saving rate will not decline precipitously as her population ages (see Weil 1994). Third, our finding that bequest motives are the primary explanation for the failure of the retired elderly in Europe to decumulate their wealth implies that we can stimulate their consumption by raising inheritance taxes, thereby possibly weakening their incentive to leave bequests. Fourth, our finding that public pension benefits alleviate the need for precautionary saving and increase the wealth decumulation rates of the retired elderly suggests that increasing the generosity of public pension benefits will, for better or worse, stimulate the consumption and increase the wealth decumulation of the elderly. Fifth, our finding that the Wealth Decumulation (or Retirement Saving) Puzzle applies primarily to homeowner households suggests that increasing the availability of

financial products such as home equity loans and reverse mortgages that allow retired elderly homeowners to borrow against their housing equity would also stimulate the consumption and increase the wealth decumulation of the elderly.

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