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# What Are the Driving Forces of Individuals' Retirement Savings?\*

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## Abstract

*The purpose of this paper is to analyze what factors are driving the retirement savings of European individuals and whether there are marked differences in retirement preparation among a sample of European countries. Our evidence is based on a sample of 6,036 individuals from eight European countries. The results show that although the percentage of savers for retirement varies widely across countries, the driving forces of the decision to save for retirement are quite similar. Thus, this decision is positively related to individuals' age, financial literacy, household income, and saving habit. In addition, the results suggest that country-level institutional factors also play a crucial role in an individual's retirement attitudes.*

## 1. Introduction

In light of current trends in ageing and employment, OECD governments and policymakers are struggling to find new ways to secure the economic welfare of their retirees. According to OECD (1998), during the coming decades increasing life expectancy, the continued trend toward early retirement, and the passage of the baby-boom generation from work to retirement will reduce the amount of time that Western societies devote to employment. Under these circumstances, the old model of sharing societies' resources between working people and retirees by pay-as-you-go (PAYG) transfers is becoming unsustainable. As a consequence, in several countries the onus is inevitably shifting to individual savings to supplement the necessary minimum provided by public pension schemes (European Commission, 2007).

In addition to public pension schemes, employer pensions play an important role as a source of retirement income. An important structural change in employer-sponsored plans is the shift from employer-sponsored defined-benefit (DB) plans (where, in broad terms, the benefits are linked to the final salary) to defined-contribution (DC) retirement plans (where the benefits will depend on a number of factors, such as the market value of the assets held in individual accounts). This trend places a large share of the asset allocation responsibility and investment risk directly on workers rather than employers.

Both DB and DC plans have been badly hit by the ongoing financial crisis. Funding levels in DB plans of OECD countries have sharply deteriorated, creating

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a funding gap at the end of October 2008 as high as USD 2 trillion (OECD, 2008a). As the company insolvency rate increases, participants in DB plans risk having their pension benefits cut. In DC plans, workers close to retirement have also experienced large losses. This is the case of countries where DC systems are mandatory.

This state of affairs makes it essential to properly understand to what extent individuals are interested in saving, in order to enable them to prepare adequately for retirement. Retirement preparation is a complex task because the information required for making decisions is extensive, and the rules concerning social security and pensions are rather elaborate (Lusardi, 2001). As a consequence, some experts suggest that planning for retirement is least pursued by those who need it the most, namely, women, single heads of households, and the economically disadvantaged (Hayes and Parker, 1993).

The purpose of this paper is to analyze what factors are driving the saving behavior of European individuals for their retirement and whether there are marked differences in retirement preparation among a sample of European countries. This analysis offers interesting opportunities for a better understanding of the retirement attitudes of European investors, which is important for two main reasons. Firstly, the European public pension reforms and the increasing trend toward DC retirement plans are likely to increase reliance on individual saving efforts and investors' decisions. In this context, ill-advised household choices in allocating retirement wealth, especially during periods of financial crises, can create major financial distress at a point in the life-cycle where the potential for offsetting adjustments is quite limited (Christelis et al., 2006). Secondly, this paper also complements the studies focused on the European context, which present important institutional differences to the ones focused on the U.S. In this regard, most of the continental European countries have been characterized by a short tradition of individual retirement accounts and a greater reliance on public pension schemes. As a consequence, in some of them pension markets are still not sufficiently developed.

This paper is organized as follows. Section 2 describes the theoretical background of the models and the hypotheses. In section 3 the methodology is explained. In section 4 the empirical results are presented. In section 5 we conclude by summarizing the most important findings, discussing several implications for policy-makers, introducing the potential limitations of the research, and discussing areas for further research.

## **2. Framework**

There is an extensive theoretical and empirical literature related to the decision to save for retirement. Two categories of empirical research on saving attitudes are relevant to this study: studies focused on the relationship between relative risk aversion and wealth, and the literature studying the topic of household savings in general and retirement savings in particular. *Table 1* summarizes the results of some of the most recent and relevant empirical studies on these topics.

Previous empirical studies indicate that a variety of socio-demographic factors are important determinants of saving for retirement. Based on a review of literature, we identify a set of individual characteristics that might influence retirement savings.

**Table 1 Summary of Empirical Research**

AUTHORS	COUNTRY: UNIT OF ANALYSIS – SOURCE (YEAR)	DEPENDENT VARIABLE (MODEL)	RESULTS	
Jianakoplos and Bernasek (1998)*	US: 2,594 households – Survey of Consumer Finance (1989)	Ratio of risky asset holding to household wealth (Tobit regression)	Common results for single women, single men and married couples	Wealth (+) Employed by others (-)
Bajtelsmit (1999)*	US: 9,927 households whose heads aged 51–61 years – Health and Retirement Study (HRS) (1994)	Ratio of risky asset holding to net household wealth (not including housing) (Censored Tobit Model)	Wealth (+) Education: Lower education level (-)	Gender x Marital status: single women(+) Race: Black (-) Homeowner (-) Age quoted (+)
Dohmen et al. (2005)*	Germany: 17,337 individuals – Socioeconomic Panel (2004)	Willingness to take risks in financial matters (1 o 0) (Probit model)	Gender: Female (-) Age (-) Marital status: Married (-) Unemployed (-) Life satisfaction (+)	Parents' education (+) Respondents' education (+) 1 Child (+) Household wealth (+) Household debt (+)
Diaz-Serrano, and O'Neill (2004)*	Italy: 4,265 household heads – Bank of Italy Surveys of Household Income and Wealth (1995 and 2000)	Hartog et al. (2002) approximate expression for the Arrow-Pratt measure of absolute risk-aversion (OLS and Probit model)	Gender: Female (-)	Education (-) Income (-)
Harrison and Rutstrom (2007)*	Denmark: 253 individuals aged 19–75 years – Experiment	Constant relative risk aversion (Maximum likelihood model)	Age quoted (-)	Education (+)
Malroux and Xiao (1995)**	US: 1,971 households with full time workers – Survey of Consumer Finance (1989)	Preretirees' perception of having adequate retirement income (Probit model)	Age quoted: < 39 years (+) Gender: Male (+) Race: White (-) Long term planner (+)	Income: 10,000–20,000 \$ (low income) (-) Employed (vs self employed) (+)
Li et al. (1996)**	US: 972 Male preretirees – National Longitudinal Survey of Older Men	Male preretirees' financial adequacy for retirement (Probit model)	Planned retirement age (+) Income (-) Assets ownership (+)	Service occupation (-) Race: White (+)
Jelinek and Schneider (1998)**	Czech Republic: 1,151 individuals aged 18 or more – Authors' survey	Saving in a private pension fund (Linear probability model)	Another household member saves in a pension fund (+)	Age (+) Gender: Female (+)
	Czech Republic: about 2,400 households – Czech Statistical Office	Saving in a private pension fund (Logit model)	Age of the household head (+) Number of economically active household members (+)	Income per head (+) Household size (including children and pensioners) (+)
Sundén and Surette (1998)**	US: 6,197 working individuals – Survey of Consumer Finance (1992 and 1995)	Having a DC plan (Probit model)	Gender: Female (+) Female x married (-)	Age (+) Education (+)
Seong-Lim et al. (2000)**	Korea: 3,913 households – Survey of Consumer Finance (1995)	Saving (1 o 0) (Logit model)	Income (+) Education (+) Age x children: dependent children (-)	Financial planning horizon (+) Saving goals (+) Credit card balance (-) Race: White (+)

Lusardi, (2001)**	US: households whose heads aged 51–61 years – Health and Retirement Study (HRS) (1992)	Lack of planning for retirement (1 o 0) (OLS (IV))	Older siblings (-) Older siblings with worse financial situation (-)	Negative past shocks (-); Parents with health problems before dying or living in nursing homes (-)
		Financial and total net worth (OLS (IV))	Education (+) Marital status: Married (+) Children (-) Bequest motives (+)	Negative past shocks (-) Receiving inheritance (+) Planning for retirement (+)
Papke (2003)**	US: 1,961 households whose heads aged 51–61 years – Health and Retirement Study (HRS) (1992)	Contributing to a DC plan (1 o 0) (Linear Probability Model)	Choice over assets (+) Education (+)	Income (+) Single females (+)
DeVaney and Chiremba (2005)**	US: 3,428 households where either the head of household or the spouse was preretired – Survey of Consumer Finances (2001)	Holding a retirement account (1 o 0) (Logit model)	Age Cohort (+) Education (+) Risk tolerance (+) Saver (+) Planning horizon (+) Race: white (+)	Spending behavior (-) Self-employment (-) Homeowners (vs renters) (+) Marital status: married (+)
Huberman et al. (2007)**	US: 793,794 employees eligible to participate in DC pension plans – Vanguard Group (2001)	Contributing to a DC pension plan (1 o 0) (Probit model)	Income (+) Financial wealth of the neighborhood (+) Gender: Female (+)	Tenure (+) and Tenure squared (-) Age (+) and Age squared (-) Plan policies (+)
Johannisson (2008)**	Sweden: 130,820 preretirees - Longitudinal Income Data (2002)	Starting to save in tax deferred pension account (1 o 0) (Tobit model)	Age Cohort (-) Income (+) Gender: Female (+) Marital status: married (+)	Marital status x gender (+) Spouse's pension saved amount (+) Public old-age pension wealth (+)

Notes: \* Studies focused on the relationship between relative risk aversion and wealth.

\*\*Studies focused on household savings.

## 2.1 Age

The life-cycle theory of savings predicts that savings will increase over the life cycle; the older a person gets, the more likely he/she is to save for retirement (DeVaney and Chiremba, 2005). The life-cycle economic approach implies that people try to save before retirement in order to finance consumption during retirement. Thus, Richardson and Kilty (1989) find that age was one of the important predictors of financial planning. The closer people were to retirement, the more likely they were to invest or save (Malroux and Xiao, 1995). Huberman et al. (2007) also find a positive relationship between individuals' age and their contributions to a DC pension plan, but the probability of contributing to a DC pension plan is decreasing with age.

*H1a: Older individuals will be more likely to save for retirement than younger individuals.*

*H1b: The probability of saving for retirement will be rising with age, but at a progressively lower rate.*

## 2.2 Education and Financial Literacy

Formal education is likely to be positively related to planning skills (Berheim and Scholtz, 1992; Seong-Lim et al., 2000), and thus is expected to increase the probability of having adequate financial resources for retirement (Li et al., 1996). People with a low level of education have to make much effort to obtain and understand information about complex investment assets (Lusardi, 2001). Thus, individuals facing high search costs will be less likely to save for retirement purposes.

*H2: Individuals who have more education will be more likely to save for retirement than individuals who have less education.*

Based on the theory of risk aversion, a number of studies have also examined the effects of formal education on savings. However the results are mixed, partly because education, income, and wealth tend to be highly correlated (Bajtelsmit, 1999; Berheim and Scholtz, 1992). Thus, Jianakoplos and Bernasek (1998) do not find evidence that more years of schooling increase household risk taking. Moreover, Moreno-Badía (2006) shows that the Irish households with higher levels of education save less.

These mixed results suggest that in the context of financial decisions, a more important effect to measure may be access to financial knowledge rather than formal education (Bajtelsmit, 1999). Researchers are beginning to study the reasons and consequences of financial illiteracy in order to understand why retirement planning is lacking and why so many households arrive close to retirement with little or no wealth (Lusardi and Mitchell, 2007b). Thus, Lusardi and Mitchell (2007a) find that more financially literate individuals are much more likely to have thought about retirement. Moreover, the aforementioned shift from DB plans to DC retirement plans implies that it is becoming more important for households to acquire and manage financial knowledge.

*H3: More financially literate individuals will be more likely to save for retirement than less financially literate individuals.*

## 2.3 Family Size

The family life-cycle stage has also been recognized as a key variable related to saving (Seong-Lim et al., 2000). According to the family life-cycle theory of saving, the greatest possibility to save is enjoyed by those households which have achieved the stage of “empty nest 1”; after children are raised and home mortgages are paid, resources are finally freed up for retirement saving (Malroux and Xiao, 1995). Seong-Lim et al. (2000) find that households with dependent children are less likely to save. As the data used in our study do not show the number of dependent children in a household, according to Jelinek and Schneider (1998) we use household size as a proxy.

*H4: Individuals with a larger family size will be less likely to save for retirement.*

Another common finding in the empirical literature is that single and married people differ in their saving behavior. According to Li et al. (1996), married individuals are more likely to be concerned about the financial stability of the family, and thus are expected to be more likely to save for retirement. Lusardi (2001) also finds that individuals who have not thought about retirement are also less likely to be

married. Johannisson (2008) indicates that the decision on whether to save for retirement is made jointly within the marriage.

*H5: Single individuals will be less likely to save for retirement.*

## **2.4 Income and Employment Status**

Higher levels of income mean higher resources available for saving and investment. Thus, individuals with greater incomes are more able to accumulate wealth for their retirement. Richardson and Kilty (1989) find that income was one of the important predictors of financial planning. Other empirical results that support this hypothesis are Browning and Lusardi (1996), for the United States, and Moreno-Badía (2006), for Ireland. Additionally, Huberman et al. (2007) suggest that low-income employees expect higher salary replacement rates from public pension systems upon retirement than high-income employees. This expectation may reduce low-income workers' desire to save for retirement.

*H6: Individuals with greater household income will be more likely to save for retirement than individuals with lower household income.*

Income level and employment status tend to be highly and positively correlated. Therefore, employment status indirectly affects the ability to save for retirement. But, employment status also has a direct influence on retirement attitudes. First, individuals with a higher employment status are more likely to have included in their job conditions several benefits such as health and disability insurance or life insurance coverage. This means higher resources available for saving.

Second, individuals with a higher employment status are more likely to participate in DB and DC retirement plans. As they are used to thinking about retirement in their jobs, they will have improved their financial planning skills, and thus are expected to increase their retirement saving rates. In particular, professional, "skilled white-collar" or full-time workers are more likely to have a DC plan than "unskilled blue-collar" or part-time workers (Sundén and Surette, 1998). DC plans place more of the asset allocation responsibility on workers. This trend toward self-directed investment of plan assets may act as a driving force of individuals' retirement savings. Thus, Papke (2003) finds that participant control over assets increases the likelihood of DC plan participation.

Finally, certain occupations allow for longer work activity, namely, professional and "skilled white-collar" workers. That implies people in these occupations have a choice: either save more for retirement or work longer (or both).

*H7: Individuals with a higher employment status will be more likely to save for retirement than individuals with a lower employment status.*

## **2.5 Saving Habits**

Saving for retirement should be considered in the context of wider financial planning. If households intend to achieve their financial goals (for instance, maintaining their consumption levels during retirement), they have to save (Seong-Lim et al., 2000). Thus, some empirical studies indicate that financial management practices such as having longer financial planning horizons or saving habits have a positive

influence on household savings (Li et al., 1996; DeVaney and Chiremba, 2005; Malroux and Xiao, 1995; Seong-Lim et al., 2000).

*H8: Savers will be more likely to save for retirement.*

## **2.6 Gender**

A common finding in the empirical literature is that women are less likely to save than men (Diaz-Serrano and O'Neil, 2004; Dohmen et al., 2005; Malroux and Xiao, 1995). This could be partially explained by gender differences in some of the previous individual characteristics, particularly in financial literacy, income levels, and employment status.

Bajtelsmit and Bernasek (1996) suggest that women on average have less interest in collecting and processing financial information. As a consequence, they may have less confidence in their financial decisions and less of a desire to become knowledgeable about financial matters. Other studies also show that financial illiteracy was particularly acute for women and those individuals with low educational attainment (Lusardi and Mitchell, 2007a, in the United States; and Australia and New Zealand Banking Group, 2005, in Australia and New Zealand).

In addition, there is substantial evidence that women have lower life-time income and earn less than men. According to OECD (2008b), women are 20% less likely than men to have a paid job in OECD countries and they earn on average 17% less than men. Therefore, we can expect that women have lower resources available to save for retirement.

Finally, women are still much more likely to have part time and temporary jobs. In these kinds of jobs, individuals who desire health insurance, disability insurance or life insurance coverage must pay for it, reducing the resources available for saving and investment (Bajtelsmit and Bernasek, 1996). Thus, Shaw and Hill (2002) find that the most common reasons for lower participation rates in employer pension plans among women are short job tenure and part-time employment.

On the contrary, empirical results suggest that women are more risk averse than men, which may act as a driving force of saving behavior (Huberman et al., 2007; Johannisson, 2008; Sundén and Surette, 1998). Moreover, as public pension systems and occupational pension plans are based on earnings in paid labor forces, women are conscious that they will have lower income when retired compared to men. In order to compensate for the lost pension income, women may save privately for retirement more than men (Johannisson, 2008). Similarly, Jelinek and Schneider (1998) and Huberman et al. (2007) suggest that women have a stronger preference for saving, perhaps because they typically live longer than men.

Finally, another common finding in the empirical literature is that investment decisions, especially for retirement purposes, are driven more by a combination of gender and marital status than gender in itself (Gerrans and Clark-Murphy, 2004; Jianakopulos and Bernasek, 1998; Johannisson, 2008; Sundén and Surette, 1998). Thus, Bajtelsmit (1999) and Papke (2003) find that single females are more likely to hold a higher ratio of risky assets to net household wealth and to contribute to a DC plan, respectively.

As a consequence of the previous results we leave it to the estimations to show whether or not there is a significant effect of the gender variable on saving for retirement. We also test for the interaction between gender and single variables.

*H9: Women will be more/less likely to save for retirement.*

## 2.7 Country

The previous empirical studies on retirement savings analyze the behavior of households and individuals belonging to the same country. Nonetheless, the scope of our work is broader as it takes into account individuals residing in eight European countries. Hence, to the aforementioned socio-demographic characteristics we have to factor in a number of explanatory elements determined by the specific institutional and cultural features of each country.

Retirement income has been traditionally seen as a “three-legged stool” consisting of social security (publicly managed pension schemes with DB and PAYG finance), employer pensions, and private savings (DeVaney and Chiremba, 2005; OECD, 1998). National public policies to a large extent shape these “three pillars” of retirement income, which, in turn, have an impact on individual saving decisions. Particularly, what the individual thinks she/he will receive from the public old-age pension system and employer pensions affects private pension savings (Johannisson, 2008).

Therefore, it is worthwhile to describe the situation of the sampled countries around both issues: the public old-age pension system and employer pensions. Using OECD data on pension markets, our goal is to present an overview of the state of affairs that allows us to understand national differences in individuals’ retirement savings. Additionally, we provide U.S. data, as the results of our research will be mainly compared to those of empirical studies focused on the U.S.

By and large, in European countries existing public pension systems are likely to remain the major source of income for many retirees. In order to secure the future viability of public pension systems, many OECD countries have established public pension reserve funds (PPRFs). The ratio of PPRF assets to the annual value of public pension benefits can be used as a proxy of the sustainability of public pension systems. The larger this ratio is, the less likely it is that there will be a need to raise contributions or cut benefits to meet the rising fiscal burden of population ageing (OECD, 2008a). *Table 2* (Column 3) shows that in 2006 Sweden’s PPRF assets covered more than three times its annual expenditure on public pensions, whereas in France, Italy, and Spain PPRF assets hardly covered 50% of their annual expenditure on public pensions.

The importance of public pension systems can also be gauged by looking at workers’ average public pension benefits calculated as percentages of their final salaries before retirement, assuming a full career (gross replacement rates). In 2007, France, Italy, and Spain had gross salary replacement rates above 50% (Column 4).

*Table 2* shows that by 2007, the United States, the United Kingdom, and the Netherlands had accumulated the greatest shares of financial pension wealth in private pension funds. This could partially be explained by a long tradition of occupational pension funds that started decades ago, linked to employment contracts (OECD, 2007). These three countries also had the largest private pension funds re-



**Table 2 U.S. and European Pension Markets**

	PPRF assets	Public expenditures	Ratio (PPRF assets/ /Public expenditures	Gross replacement rate		Value of assets (% of GDP)		DB pension plans' assets	DC pension plans' assets
	(1)	(2)	(3)=(1)/(2)	(4)	(5)	(6)	(7)	(8)	(9)
Year	2006	2006	2006	2007	2007	2007	2007	2007	2007
Source	OECD (2008a)	OECD (2008a)	OECD (2008a)	OECD (2009)	OECD (2009)	OECD (2009)	OECD (2009)	OECD Stat.	OECD Stat.
Units	National currency (mil.)	National currency (mil.)	Units	From public pension schemes (%)	From mandatory private pension schemes (%)	Public pension reserves	Private pension funds	% of Occupational assets	% of Occupational assets
France	31,200	178,737	0.175	53.3	-	1.9	1.1	100	0
Germany	n.d.	n.d.	n.d.	43	-	n.d.	4.1	100*	0*
Italy	n.d.	n.d.	n.d.	67.9	-	n.d.	3.3	14.498	85.502
Netherlands	n.d.	n.d.	n.d.	30.2	58.1	n.d.	138.1	91*	9*
Poland	2,442	110,258	0.022	30	31.3	0.3	12.2 <sup>1</sup>	0	100
Spain	35,771	76,340	0.469	81.2	-	4.5	7.5	3.555	96.445
Sweden	866,705	224,125	3.867	37.8	23.7	31.7	8.7	95*	5*
United Kingdom	n.d.	n.d.	n.d.	30.8	-	n.d.	78.9	78*	22*
United States	2,048,112	628,676	3.258	38.7	-	16.6	76.7	64.254	35.746

Notes: n.d. No data.

\* data referred to 2004.

<sup>1</sup> The data could reflect part of privately run public parts of the system.

lative to their economies. As shown in *Table 2* (Column 7), in 2007 they had private pension fund assets to GDP ratios above 20%, which is considered the minimum for meeting the OECD's definition of a "mature" pension fund market (OECD, 2008a).

On the other hand, many European countries have followed a different model where public pensions play a dominant role in the retirement system (for instance, France, Italy, and Spain) and private pensions are voluntary (Germany). In 2007, these countries displayed private pension fund assets to GDP ratios below 8%.

In addition to the two groups of countries referred to above, Sweden and Poland have reformed their pension systems over the past decade, introducing mandatory private personal pension plans and working along the DC regime. In these countries, a part of the public system is privately managed and uses financial markets. However, privately managed public pensions do not allow for individual decisions, so are not comparable with additional voluntary retirement savings.

Although DB plans accounted for virtually all occupational pension assets in France, Germany, the Netherlands, and the United Kingdom, DC pension plans are increasing in popularity. Statistics in *Table 2* (Columns 7 and 8) show that, as of 2007, DC plans comprised over 90% of the total occupational pension assets in Italy, Poland, and Spain.

In sum, the characteristics referred to above reflect some important differences in the design and development of national pension systems that may influence

individuals' decisions to save for retirement. Thus, it can be expected that countries where private funded pensions are long-time established (notably the Netherlands and the United Kingdom) will tend to enjoy a high proportion of long-term retail savings in pension funds. On the other hand, countries where such funds have remained purely voluntary (Germany) and countries where public pension systems play a major role in the old-age retirement system (France, Italy, and Spain) will tend to allocate a small proportion of long-term retail savings to pension funds. Finally, it is difficult to predict a trend for Poland and Sweden as a consequence of the changes introduced in their public pension systems. Although a part of the public system is privately managed, participants in that public scheme are not allowed to take any decisions, as the scale and form of participation is standardized.

*H10: Individuals living in a country with mandatory private pension plans or a longer tradition of private pension funds will be more likely to save for retirement.*

### **3. Methodology**

#### **3.1 Data and Sample**

The data used for the analysis are from the study *The EU Market for Consumer Long-Term Retail Savings Vehicles. Comparative Analysis of Products, Market Structure, Costs, Distribution Systems and Consumer Saving Patterns*, sponsored by the European Commission, and conducted by BME Consulting. Data collection was carried out in 2007 using computer-assisted personal interviewing (CATI) and a structured questionnaire. The survey was performed in eight EU countries: France, Germany, Italy, the Netherlands, Poland, Spain, Sweden, and the United Kingdom. These eight economies account for nearly 90% of total household financial assets in the EU. While the United Kingdom, Germany, and Italy are the three largest member states of the EU, the Netherlands, Sweden, and Poland were chosen to be representative of particular groups of countries with a high degree of cultural, political, and/or institutional homogeneity, namely Benelux countries, Scandinavia, and the transition economies of Central and Eastern Europe (EC, 2007).

*The EU Market for Consumer Long-Term Retail Savings Vehicles. Comparative Analysis of Products, Market Structure, Costs, Distribution Systems and Consumer Saving Patterns* gathers information on the range of financial products that retail clients invest in when they save for the long term, their attitudes toward financial intermediaries, and their reasons for saving, as well as socio-demographic information.

The universe of the present research was made up of general individuals aged 18–65 years. A sample of 8,044 individuals was selected to be representative of all investors in the eight countries. 2,088 observations were dropped from the analysis due to missing information on monthly net household income, resulting in a sample size of 6,036 observations. *Table 3* shows the technical data of the survey.

#### **3.2 Definition and Measurement of Variables**

##### **3.2.1 Dependent Variable**

The dependent variable is a dummy variable (RETIREMENT). The decision to save for retirement was tested by asking: “*What do you/would you save for? (retirement, housing, consumption, holidays, contingency reserve, particular purposes such*

**Table 3 Technical Data of the Study**

Universe	Individuals aged 18–65 years
Information collection	Telephone interviews (CATI) using a structured questionnaire
Sample selection	Multi-stage sampling. In the first part, households are considered as the sampling unit, whereas in the second part individuals are the sampling unit.
Sample size	8,044 interviews. The sample distribution is as follows: France (1,002), Germany (1,011), Italy (1,001), the Netherlands (1,002), Poland (1,010), Spain (1,000), Sweden (1,018) and the United Kingdom (1,000).
Sampling error	The sampling error for the sample as a whole is $\pm 1.1\%$ for a confidence level of 95.5% and assuming $p=q=0.5$ .
Fieldwork dates	From July 2007 until August 2007

as a car, for the family, long-term care planning, special event, no specific reason, all the above).” Respondents who answered that they do/would save for retirement as a first option, as well as those who had pension funds, were coded 1 (otherwise 0).

However, this measure of the dependent variable could be overestimating voluntary retirement savings in Poland, since many of the participants in pension funds are just “forced” participants as a consequence of the introduction of mandatory private personal pension plans. Therefore, for the Poles we measure the decision to save for retirement by considering both respondents who answered that they do/would save for retirement as a first option, and those who had shares, fixed income bonds or collective investment funds (otherwise 0). In this way, we constructed a more accurate proxy of Poles’ “voluntary” decision to save for retirement.

### 3.2.2 Independent Variables

As independent variables, we selected a number of factors that presumably would influence the retirement savings of European individuals (*Table 4*).

In order to test the life-cycle savings hypothesis we consider the investor’s age (AGE). We also use the age squared to capture potential non-linearities (AGE-SQUARED). Both are continuous variables.

Formal education is measured using three dummy variables which depend on the level of educational attainment of the respondent, ranging from primary to university degree (PRIM, SECOND, UNIV).

FIN\_LITERACY is a dummy variable used as a proxy of the individual’s financial literacy. Financial literacy was tested by asking: “*Saving products: Which ones are you familiar with? (bank deposits, bonds and public debt, shares, collective investment funds, pension funds, insurance)*.” The variable was coded 1 if the individual knew at least four products (high financial knowledge), otherwise 0 (low financial literacy).

In order to measure family size, we use the number of family members (FAM\_SIZE) and a dummy variable where singles are coded 1 (SINGLE)

To test the effect of the individual’s income on his decision to save for retirement, we create the variable INCOME. We consider the monthly net household income of the respondents, which was obtained by asking them: “*What is the current*

**Table 4 Definitions of the Variables and Predictions**

Factor	Variable	Prediction	Definition
AGE	<i>Age</i>	+	Respondent's age
	<i>Agesquared</i>	-	Respondent's age squared
FORMAL EDUCATION	<i>Univ</i>	+	Whether or not respondent has a University degree (1 0 0)
	<i>Second</i>	+	.... Secondary degree (1 0 0)
	<i>Prim</i>	Reference group	.... Primary degree (1 0 0)
FINANCIAL LITERACY	<i>Fin_literacy</i>	+	Whether or not respondent knows at least four of the following financial products: bank deposits, bonds and public debt, share, collective investment funds, pension funds and insurance (1 0 0)
SIZE FAMILY	<i>Fam_Size</i>	-	Number of family members
	<i>Single</i>	-	Whether or not respondent is single (1 0 0)
INCOME	<i>Income</i>	+	Individual monthly net household income / Average monthly net income of private households of the individual's country
EMPLOYMENT STATUS	<i>Hwhitecoll</i>	+	Whether or not respondent is a High white collar (1 0 0)
	<i>Whitecoll</i>	+	.... White collar (1 0 0)
	<i>Bluecoll</i>	Reference group	....Blue collar (1 0 0)
SAVING HABIT	<i>Saving</i>	+	Whether or not respondent is saving at the present time (1 0 0)
GENDER	<i>Female</i>	?	Whether or not respondent is female (1 0 0)
COUNTRY	<i>France, Germany, Italy, Netherlands, Poland, Spain, Sweden, UK</i>	Reference group: Netherlands	Whether or not respondent is French/ German/ Italian/ Dutch/ Polish/ Spanish/ Swedish/ British (1 0 0)

monthly net income of your household? 1) less than €600; 2) €600–€900; 3) €900–€1,500; 4) €1,500–€3,000; 5) more than €3,000.” Then, we divided the mean of these intervals by the average monthly net income of private households of each country (expressed in purchasing power standards of 2006, last year available in the European Community Household Panel). In this way, we deal with the fact that the income level in some countries (for instance, in a post-transition country such as Poland) is lower than in affluent Western countries. Therefore, the resulting variable (INCOME) indicates whether or not the monthly net household income of the respondent is higher than the average for his country. We also experimented with several ways to represent the individual’s income, namely, we consider three dummy variables (LOWINC, MEDINC, HIGHINC) which depend on the monthly net household income of the respondent, ranging from less than €1,500 to more than €3,000. Since the specific form did not substantially alter the results, we only present one form, namely, the INCOME variable.

HWHITECOLL, WHITECOLL, and BLUECOLL are dummy variables indicating three categories of labor force status of the individual.

SAVING is a dummy variable used as a proxy of the respondent’s saving habits. Saving habit was tested by asking: “Do you save?” The variable was coded 1 if the respondent was currently saving, otherwise 0.

FEMALE is a dummy variable where women are coded 1.

**Table 5 Summary Statistics**

Variable	Europe	France	Germany	Italy	Netherlands	Poland	Spain	Sweden	U.K.
<i>Obs.</i>	6,036	801	812	754	682	787	698	740	762
<i>Retirement</i>	35.5%	24.7%	33.7%	25.6%	30.9%	31.5%	33.4%	67.3%	37.9%
<i>Age</i>	40.2	44.5	45.3	43.7	40.2	29.9	35.1	44.3	37.9
<i>Age-squared</i>	1791.5	2165.9	2215.2	2079.5	1766.6	1022.3	1334.6	2119.4	1578.5
<i>Univ</i>	37.7%	46.1%	29.4%	56.1%	12.9%	38.6%	49.7%	34.3%	32.8%
<i>Second</i>	57.4%	48.6%	65.4%	36.5%	84.0%	59.7%	42.4%	61.8%	62.3%
<i>Prim</i>	2.8%	4.1%	3.4%	3.4%	1.6%	1.7%	6.3%	1.6%	0.5%
<i>Fin_literacy</i>	53.2%	39.2%	56.4%	68.6%	53.1%	51.5%	64.2%	53.9%	40.6%
<i>Fam_Size</i>	2.74	2.62	2.29	3.03	2.55	3.17	2.88	2.47	2.92
<i>Single</i>	18.8%	17.4%	26.6%	12.2%	25.5%	11.4%	11.2%	28.6%	17.7%
<i>Income</i>	1.77	1.49	1.33	1.43	1.14	4.16	1.77	1.72	1.02
<i>Hwhitecoll</i>	38.9%	49.8%	37.1%	43.9%	27.6%	41.2%	52.9%	25.0%	33.3%
<i>Whitecoll</i>	28.8%	20.0%	29.8%	22.4%	42.7%	21.0%	19.3%	41.6%	35.0%
<i>Bluecoll</i>	19.4%	19.0%	16.9%	17.2%	12.5%	28.8%	20.8%	17.7%	21.8%
<i>Saving</i>	76.7%	86.2%	79.4%	74.4%	80.1%	67.3%	83.8%	78.4%	64.3%
<i>Female</i>	47.9%	50.9%	49.5%	51.1%	41.2%	40.7%	51.0%	51.8%	46.7%

Finally, eight country dummy variables are considered (FRANCE, GERMANY, ITALY, NETHERLANDS, POLAND, SPAIN, SWEDEN, and UK). The FRANCE dummy variable, for example, is a variable taking the value 1 for that country and 0 for all others.

## 4. Results of the Empirical Analysis

### 4.1 Descriptive Findings

Descriptive statistics relating to the selected dependent and independent variables are reported in *Table 5*.

In 2007, 35.5% of the respondents were saving for retirement. *Table 5* reveals that retirement has indeed established itself as an important driving force of saving behavior. It was identified as the main purpose of saving by individuals in Sweden (67.3%). By contrast, lower figures were recorded in France (24.7%) and Italy (25.6%).

The final sample comprised 6,036 individuals, mostly men (52.1%) and savers (76.7%), with a mean age of 40.2, and whose monthly net household income was higher than the average for their country (1.77). With regard to educational level, 2.8% had completed primary education as the highest level of education attained, 57.4% had completed up to high school level, and 37.7% had a university degree. 53.2% of the sample enjoyed a high level of financial literacy. 31.2% of the individuals were living on their own at the time of the survey, and the mean family size was 2.74. With respect to employment status, most of the individuals (38.9%) were high white-collar workers.

## 4.2. Multivariate Analysis

Most empirical studies test the hypotheses established in the theoretical framework by means of conditional likelihood models. Therefore, we have chosen to apply a *probit* model in order to analyze the decision to save for retirement. This model establishes a nonlinear relation between a dummy dependent variable and a set of independent variables. The model specification is carried out with the following normal distribution equation:

$$Y = \int_{-\infty}^z \frac{1}{(2\pi)^{1/2}} e^{-\frac{s^2}{2}} ds + u_i \quad \text{where } z_i = X_i\beta \quad (1)$$

The dependent variable quantifies the probability of saving for retirement. Apart from the signs, the coefficients in the probit models are not easy to interpret directly. One way to interpret the parameters is through marginal effects, which in this case are equal to:

$$\frac{\partial \Phi(x_i\beta)}{\partial x_i} = \beta_i \phi(X_i\beta) \quad (2)$$

where  $\phi(X_i\beta)$  denotes the standard normal density function. Therefore, the impact that a variation in one variable has on the likelihood of saving for retirement depends both on the estimator of parameter  $\beta$  and on the values of the density function at the  $i$ -th point. Since the probit models are not linear, they should be estimated by maximum likelihood methods.

To test the previous hypotheses, four different (nested) empirical models are estimated (*Table 6*). The estimates in *Table 6* include seven country dummy variables in order to capture idiosyncratic cultural or institutional factors for each country. These are aspects shared by individuals in one country that affect decisions to save for retirement. In short, these dummy variables reflect the support for retirement saving in each country once the individual factors, such as education, gender, age, employment status or financial literacy, have been discounted. The NETHERLANDS dummy variable was omitted to avoid perfect multicollinearity, so the institutional country effects must be interpreted in relation to the Netherlands.

As *Table 6* shows, there is a group of variables that are significant in all the models estimated. Thus, the decision to save for retirement is negatively related to age squared and positively related to age, financial literacy, household income, employment status, female gender, and saving habit. On the contrary, the variables related to education and family size do not prove to be significant, although UNIV and SEC have the expected sign.

*Table 6* also shows the results for the seven country dummy variables introduced in the models. Accordingly, the positive (negative) coefficient associated with the United Kingdom (France) indicates that, once the effects of the individual characteristics of the British (French) interviewees have been discounted, residing in the United Kingdom (France) increases (decreases) the likelihood of saving for retirement in relation to residing in the Netherlands. It is observed that four of the country dummy variables (FRANCE, ITALY, SWEDEN, and UK) are highly significant, confirming that, in addition to individual characteristics, institutional country factors affect investors' attitudes toward retirement.

**Table 6 Probit Regression Estimates of the Likelihood of Saving for Retirement**

	Model 1	Model 2	Model 3	Model 4
<i>Age</i>	0.124*** (0.010)	0.124*** (0.010)	0.125*** (0.010)	0.124*** (0.010)
<i>Agesqua</i>	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
<i>Univ</i>	0.141 (0.092)	0.145 (0.092)		0.169 (0.091)
<i>Sec</i>	0.13 (0.089)	0.133 (0.089)		0.138 (0.088)
<i>Fin_literacy</i>	0.276*** (0.036)	0.277*** (0.036)	0.278*** (0.036)	
<i>Famsize</i>	-0.011 (0.016)		-0.013 (0.016)	-0.015 (0.016)
<i>Single</i>	0.134 (0.073)	0.156* (0.065)	0.135 (0.072)	0.13 (0.072)
<i>P_incpss</i>	0.114*** (0.031)	0.114*** (0.031)	0.116*** (0.031)	0.130*** (0.031)
<i>Hwhitecollar</i>	0.172*** (0.047)	0.171*** (0.047)	0.185*** (0.045)	0.181*** (0.047)
<i>Whitecollar</i>	0.124** (0.047)	0.125** (0.047)	0.134** (0.046)	0.128** (0.047)
<i>Saving</i>	0.357*** (0.046)	0.357*** (0.046)	0.358*** (0.046)	0.360*** (0.046)
<i>Female</i>	0.182*** (0.040)	0.181*** (0.039)	0.184*** (0.039)	0.190*** (0.039)
<i>Femalexsingle</i>	-0.183* (0.090)	-0.181* (0.090)	-0.183* (0.090)	-0.177* (0.089)
<i>France</i>	-0.251*** (0.074)	-0.250*** (0.074)	-0.250*** (0.073)	-0.305*** (0.073)
<i>Germany</i>	0.005 (0.070)	0.008 (0.070)	0.004 (0.070)	0.006 (0.070)
<i>Italy</i>	-0.244** (0.076)	-0.247** (0.076)	-0.244*** (0.074)	-0.214** (0.076)
<i>Poland</i>	0.01 (0.124)	0.009 (0.124)	0.01 (0.124)	-0.051 (0.124)
<i>Spain</i>	0.005 (0.076)	0.006 (0.076)	0.002 (0.075)	0.013 (0.075)
<i>Sweden</i>	0.900*** (0.073)	0.900*** (0.073)	0.900*** (0.073)	0.876*** (0.073)
<i>UK</i>	0.344*** (0.072)	0.342*** (0.072)	0.345*** (0.071)	0.304*** (0.071)
<i>_Cons</i>	-4.054*** (0.233)	-4.087*** (0.228)	-3.946*** (0.220)	-3.933*** (0.229)
<i>Wald <math>\chi^2</math></i>	819.72***(20)	819.38***(19)	817.09***(18)	779.98***(19)
<i>R<sup>2</sup> mcfadden</i>	0.1170	0.1170	0.1167	0.1096
<i>Pseudolikelihood</i>	-3467.473	-3467.74	-3468.65	-3496.68
<i>Hosmer-Lemeshow <math>\chi^2</math></i> (8 d.f.)	12.98 (0.1125)	12.70 (0.1225)	19.70* (0.0115)	11.76 (0.1624)

Notes: Probit regression estimates of the relation between the likelihood of saving for retirement and the listed variables. \*\*\*, \*\*, \* denote significance at 0.001, 0.01 and 0.05, respectively. Number of observations = 6,036. Robust standard errors are in parentheses. d.f. denotes degrees of freedom. In addition, we analyzed possible problems of heteroskedasticity and multicollinearity. We applied the Glesjer test

through the regression between the different variables included in the models and the residuals. The fact that the regression coefficients were not significant indicates that there were no heteroskedasticity problems. To determine the extent to which multicollinearity was a problem, a previous analysis was performed in order to compute variance inflation factor (VIF) scores. With the exception of the *Age* and *Agesquared* variables, it was found that the VIF scores did not exceed 6, which is not close to the rule of thumb "threshold" value of 10 (Hair et al., 1998). Afterwards, we estimated several models considering only *Age* and obtained similar results to those in *Table 6*. In addition, traditional specification tests indicated that the models which include both variables related to age were more properly specified than those considering only *Age*. Therefore, multicollinearity was not a major problem in our analysis. We also experimented with logit models. Since the logit regression models did not substantially alter the results, we only present probit regression estimates.

To compare the previous competing models, we used some common measures of fit, which provided support for Model 3. Thus, *Figure 1* shows the predicted probabilities of saving for retirement for a "European average" individual in the different countries computed according to Model 3. At mean values, we are 95% confident that the probability of saving for retirement is between 19.40% and 25.41% for a French person, whereas for a British person it is between 39.39% and 47.66%. The outcome indicates that country matters in decisions to save for retirement.

However, as we have already mentioned, the results for Poland and even for Sweden are not completely comparable to the results for the other countries analyzed. In addition, country dummies are too crude a way of capturing country differences. Therefore, we divide the data into the eight subsamples. Using Model 3, new estimations are made based on these groups (*Table 7*). Henceforth, the results for both the full sample and the subgroups are discussed below.

The results of the empirical analysis ratify some of the outlined hypotheses (*Table 8*).

The life-cycle savings hypothesis is supported (*Hypothesis 1*) in the global model and for all countries with the exceptions of the United Kingdom and Poland; age is strongly and positively associated with retirement planning. These results are consistent with the findings of DeVaney and Chiremba (2005), Huberman et al. (2007), Jelinek and Schneider (1998), and Sundén and Surette (1998).

Moreover, the results suggest an inverted U-shaped relationship between age and retirement saving, as shown by the negative and significant coefficient of the squared age variable. However, Lind and Mehlum (2007) show that this criterion for determining concavity in an empirical relationship is too weak and propose a more appropriate test for a non-linear relationship. We performed the Sasabuchi *t*-test to detect the significance of the non-linear relationships. This provides us with robust evidence of an inverted U-shaped causal relationship between saving for retirement and age for every country, with the exceptions of Poland, Spain, and the UK. Thus, the probability of saving for retirement is rising initially with age, but at a progressively lower rate. *Figure 2* shows that the probability of saving for retirement follows an inverted U-shaped pattern in age, with a maximum in the mid- to late 40s for most of the countries.

Our results fail to find support for *Hypothesis 2* about the importance of formal education, as the UNIV and SEC variables did not prove to be significant for any of the global models tested. These results differ from those found by DeVaney and Chiremba (2005), Papke (2003), Seong-Lim et al. (2000), and Sundén and Surette (1998). These papers used a continuous variable (years of education) to measure the investor's formal education. In the *Survey of the EU Market for Long-Term Retail Sav-*



**Table 7 Probit Regression Estimates of the Likelihood of Saving for the Retirement (by country)**

	France		Germany		Italy		Netherlands		Poland		Spain		Sweden		UK	
	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.
<i>Age</i>	0.280*** (0.042)	0.079	0.116*** (0.029)	0.042	0.141*** (0.031)	0.044	0.161*** (0.033)	0.054	0.053 (0.083)	0.018 (0.083)	0.178*** (0.039)	0.062 (0.039)	0.153*** (0.030)	0.054 (0.030)	0.048 (0.026)	0.018
<i>Agesqua</i>	-0.003*** (0.000)	-0.001	-0.001*** (0.000)	-0.001	-0.002*** (0.000)	-0.001	-0.002*** (0.000)	-0.001	-0.001 (0.106)	-0.001 (0.106)	-0.002*** (0.000)	-0.001 (0.000)	-0.002*** (0.000)	-0.001 (0.000)	-0.000 (0.000)	-0.001
<i>Fin_literacy</i>	0.256* (0.107)	0.074	0.370*** (0.097)	0.132	0.330** (0.116)	0.098	0.283* (0.112)	0.094	0.240* (0.020)	0.081 (0.020)	0.215 (0.114)	0.074 (0.114)	0.203* (0.102)	0.072 (0.102)	0.335*** (0.097)	0.128
<i>Famsize</i>	-0.073 (0.053)	-0.021	-0.048 (0.048)	-0.017	0.007 (0.049)	0.002	0.073 (0.050)	0.025	-0.030 (0.479)	-0.010 (0.479)	-0.059 (0.050)	-0.021 (0.050)	-0.003 (0.040)	0.001 (0.040)	-0.049 (0.045)	-0.019
<i>Single</i>	0.353 (0.222)	0.108	0.149 (0.178)	0.055	0.159 (0.252)	0.052	0.324 (0.202)	0.113	0.056 (0.810)	0.019 (0.810)	0.298 (0.252)	0.109 (0.252)	0.002 (0.183)	0.001 (0.183)	-0.129 (0.208)	-0.048
<i>Income</i>	0.055 (0.135)	0.016	-0.001 (0.131)	-0.001	0.013 (0.107)	0.004	0.760*** (0.158)	0.255	0.085 (0.063)	0.029 (0.063)	0.269* (0.113)	0.094 (0.113)	0.127 (0.090)	0.045 (0.090)	0.358** (0.123)	0.135
<i>Hwhitecollar</i>	0.038 (0.129)	0.011	0.002 (0.129)	0.001	0.127 (0.121)	0.040	0.075 (0.158)	0.026	0.509*** (0.000)	0.175 (0.000)	0.108 (0.135)	0.038 (0.135)	0.193 (0.141)	0.066 (0.141)	0.204 (0.128)	0.078
<i>Whitecollar</i>	-0.040 (0.158)	-0.011	0.112 (0.125)	0.041	0.077 (0.143)	0.024	0.101 (0.139)	0.034	0.103 (0.462)	0.035 (0.462)	-0.012 (0.163)	-0.004 (0.163)	0.144 (0.122)	0.050 (0.122)	0.229 (0.119)	0.088
<i>Saving</i>	0.383* (0.164)	0.095	0.207 (0.135)	0.073	0.195 (0.125)	0.058	0.253 (0.145)	0.081	0.775*** (0.000)	0.238 (0.000)	0.333* (0.158)	0.109 (0.158)	0.873*** (0.128)	0.328 (0.128)	-0.146 (0.118)	-0.056
<i>Female</i>	0.135 (0.118)	0.038	0.089 (0.113)	0.032	0.338** (0.112)	0.105	0.096 (0.126)	0.033	0.464*** (0.000)	0.160 (0.000)	0.176 (0.112)	0.061 (0.112)	0.036 (0.120)	0.013 (0.120)	0.156 (0.106)	0.059
<i>Femalex-single</i>	-0.457 (0.272)	-0.108	-0.352 (0.212)	-0.119	0.151 (0.304)	0.049	-0.454 (0.262)	-0.134	-0.117 (0.701)	-0.038 (0.701)	-0.588 (0.341)	-0.172 (0.341)	0.242 (0.231)	0.081 (0.231)	0.137 (0.251)	0.053
<i>_Cons</i>	-7.355*** (0.899)		-3.229*** (0.620)		-3.966*** (0.650)		-5.558*** (0.684)		-2.827*** (0.000)		-5.431*** (0.838)		-4.066*** (0.640)		-2.040*** (0.548)	

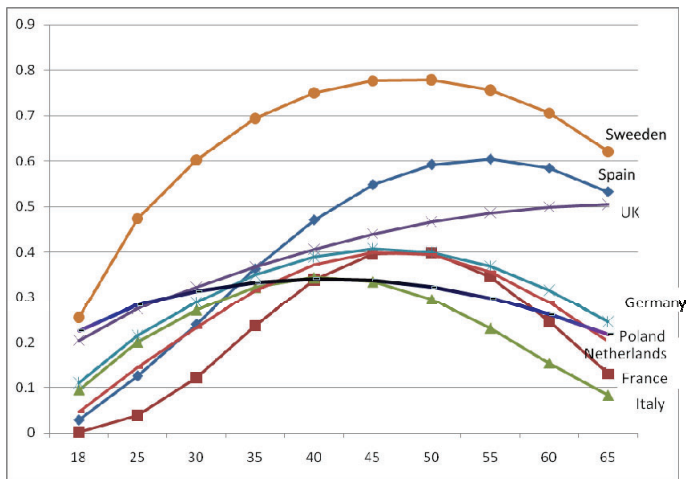
	801	812	754	682	787	698	740	762
<i>N</i>								
Wald $\chi^2$ (11 d.f.)	78.71***	45.95***	54.68***	94.55***	103.96***	97.18***	104.75***	55.26***
<i>R</i> <sup>2</sup> McFadden	0.112	0.04	0.059	0.125	0.138	0.155	0.128	0.059
Pseudo-likelihood	-397.906	-497.006	-403.452	-369.01	-422.36	-375.63	-407.799	-476.089
Slope at lower bound of Age	0.027	0.115	0.139	0.160	0.053	0.176	0.152	0.047
T-test (p-values)	6.748*** (0.000)	3.931*** (0.000)	4.550*** (0.000)	4.911*** (0.000)	1.734* (0.042)	4.541*** (0.000)	5.055*** (0.000)	-
Slope at upper bound of Age	-0.102	-0.048	-0.082	-0.064	-0.031	-0.035	-0.055	0.001
T-test (p-values)	-5.418*** (0.000)	-3.151*** (0.001)	-5.081*** (0.000)	-3.219*** (0.001)	-1.396 (0.081)	-1.499 (0.067)	-3.341*** (0.000)	-
Sasabuchi test for inverse U-shape (p-values)	5.42*** (0.000)	3.15*** (0.001)	4.55*** (0.000)	3.22*** (0.001)	1.40 (0.082)	1.50 (0.067)	3.34*** (0.000)	-
Extreme point	47.72	46.01	41.02	46.64	41.08	54.39	47.93	66.39
95% Conf. int. (Fleiler method)	[46.09,49.88]	[42.94,51.18]	[37.75,43.49]	[43.72,52.50]	[-,-]	[48.91,72.35]	[45.23,53.12]	[-,-]

Notes: Probit regression estimates of the relation between the likelihood of saving for retirement and the listed variables. \*\*\*, \*\*, \* denote significance at 0.001, 0.01 and 0.05, respectively. Robust standard errors are in parentheses. d.f. denotes degrees of freedom. M.E. represents the marginal effects of independent variable changes on the value of the dependent variable, calculated for the average values of the independent variables. In addition, we analyzed possible problems of heteroskedasticity and multicollinearity. We applied the Glesjer test through the regression between the different variables included in the models and the residuals. The fact that the regression coefficients were not significant indicates that there were no heteroskedasticity problems. To determine the extent to which multicollinearity was a problem, a previous analysis was performed in order to compute variance inflation factor (VIF) scores. With the exception of the Age and Agesquared variables, it was found that the VIF scores did not exceed 6, which is not close to the rule of thumb "threshold" value of 10 (Hair et al., 1998). We estimate the implied extremum point and its 95% confidence interval using the Fleiler method and Sasabuchi test for inverse U-shape. Both of these are done by using the u-test program in Stata written by Lind and Mehlum (2007).

**Figure 1 Predicted Probability of Saving for Retirement for a “European Average” Individual (by country)**



**Figure 2 Predicted Probability of Saving for Retirement for an Average Individual (by age and country)**



**Table 8 Hypotheses**

HYPOTHESES	PREDICTION	Global (Model 3 of Table 6)	France	Germany	Italy	Netherlands	Poland	Spain	Sweden	UK
<i>H1a: Older individual will be more likely to save for retirement than younger individuals.</i>	+	+	+	+	+	+		+	+	
<i>H1b: The probability of saving for retirement will be rising with age, but at a progressively lower rate.</i>	-	-	-	-	-	-		-	-	
<i>H2: Individuals who have more education will be more likely to save for retirement than individuals who have less education.</i>	+		na	na	na	na	na	na	na	na
<i>H3: Individuals more financially literate will be more likely to save for retirement than individuals who are less financially literate.</i>	+	+	+	+	+	+	+		+	+
<i>H4: Individuals with a higher family size will be less likely to save for retirement.</i>	-									
<i>H5: Single individuals will be less likely to save for retirement.</i>	-									
<i>H6: Individuals with greater household incomes will be more likely to save for retirement than individuals with lower household incomes.</i>	+	+				+		+		+
<i>H7: Individuals with a higher employment status will be more likely to save for retirement than individuals with a lower employment status.</i>	+	+					+			
<i>H8: Savers will be more likely to save for retirement.</i>	+	+	+				+	+	+	
<i>H9: Female will be more/less likely to save for retirement.</i>	?	+			+		+			
<i>H10: Individuals living in a country with mandatory private pension plans or a longer tradition of private pension funds will be more likely to save for retirement.</i>	+	France - Germany () Italy - Netherlands (Reference group) Poland () Spain () Sweden + UK +	na	na	na	na	na	na	na	na

Note: na denotes not appropriate.

*ings Vehicles* we lack a similar measure, which could partially explain the lack of significance of the formal education variables.

On the contrary, financial literacy is strongly and positively associated with retirement savings both for the global model and for all countries with the exception of Spain, and the results are statistically significant at conventional levels (*Hypo-*

thesis 3). Thus, the coefficient estimated in the global model indicates that if an individual has more financial knowledge, his probability of saving for retirement is 0.10 greater than that of an individual who is less financially literate, holding other variables at their mean. These results are consistent with the findings of Lusardi and Mitchell (2007a). Furthermore, in the models where financial knowledge is significant, the marginal effect values usually indicate that the FIN\_LITERACY variable has the second greatest impact on the decision to save for retirement, just after the variables related to individuals' economic characteristics or saving habits. As there is no necessary link between education level and financial literacy, this result additionally confirms the proposal of Bajtelsmit (1999), indicating that in the context of financial decisions it is worth analyzing the effect of financial knowledge rather than exploring the influence of formal education.

Since neither the FAMSIZE variable (*Hypothesis 4*) nor the SINGLE variable (*Hypothesis 5*) prove to be significant for most of the models tested we did not find evidence of an effect of family size on the decision to save for retirement. The lack of significance in both variables could be associated with the data collected by the *Survey of the EU Market for Long-Term Retail Savings Vehicles*, which does not distinguish dependent children within members of the family or marital status.

As a consequence, we used the number of family members as a proxy of the dependent members in the household, but the FAMSIZE variable is not significant for any of the models tested. Our results differ from those by Seong-Lim et al. (2000) and Lusardi (2001), who find a strong negative relationship between the number of dependent children and savings. They also differ from those by Jelinek and Schneider (1998), who obtain a positive relationship between family size and the probability of participating in a private pension fund for Czechs.

Similarly, we were only able to distinguish the single respondents and we do not find evidence that single individuals will be less likely to save for retirement. In addition, the results of previous empirical studies (Johannisson, 2008; Papke, 2003; Sundén and Surette, 1998) suggest that it is worth exploring possible interactions of marital status with gender, rather than analyzing marital status alone.

The monthly net household income of the respondents proves to be significant for the global, British, Spanish, and Dutch cases (*Hypothesis 6*). The marginal effect value of the INCOME variable in the global model indicates that doubling (tripling) the average monthly net income of the country increases the individual's probability of saving for retirement by 0.044 (0.089) with regard to those whose monthly net household income equals the average of their country. Furthermore, in the Netherlands and the United Kingdom the marginal effect values of income variables indicate that household income has the greatest impact on the decision to save for retirement. These results are consistent with the findings of Huberman et al. (2007), Jelinek and Schneider (1998), Johannisson (2008), Malroux and Xiao (1995), Papke (2003), and Seong-Lim et al. (2000).

Although there is some evidence that the employment status of the respondents is positively related to the decision to save for retirement in the global models, our results fail to find support for *Hypothesis 7* in the country models with the exception of Poland. Thus, the coefficients estimated in the global model indicate that the probability of saving for retirement of a high white-collar worker (or just a white-

-collar worker) who is average on all characteristics is 0.06 greater than that of a blue-collar worker.

*Saving habit* is strongly and positively associated with retirement savings for the global model, France, Poland, Spain, and Sweden, and the results are statistically significant at conventional levels (*Hypothesis 8*). Furthermore, in the models where it is significant, the marginal effect values usually indicate that saving habit has the greatest impact on the decision to save for retirement. The estimated coefficients imply that savers' probability of saving for retirement is 0.09 and 0.095 greater than non-savers' in the global model and in the French and the Spanish models, respectively. This effect is even greater in Sweden and Poland. These results are consistent with the findings of DeVaney and Chiremba (2005).

Although there is some evidence that the gender variable (FEMALE) is positively related to the decision to save for retirement in the global models, our results fail to find support for *Hypothesis 9* in the country models with the exceptions of Italy and Poland. Thus, the estimated coefficient in the global model indicates that women's probability of saving for retirement is 0.039 greater than men's, holding other variables at their mean. Our results differ from those by Diaz-Serrano and O'Neil (2004), Dohmen et al. (2005), Huberman et al. (2007), Johannisson (2008), Malroux and Xiao (1995), and Sundén and Surette (1998), who find a strong negative or negative relationship between gender and savings.

According to Gerrans and Clark-Murphy (2004), Jianakopulos and Bernasek (1998), Johannisson (2008), and Sundén and Surette (1998), exploring gender alone may be missing some valuable information which can partially explain the lack of significance in the gender variable. To overcome this problem we also test for the interaction between the gender and single variables. Unlike Bajtelsmit (1999) and Papke (2003), we do not find support for the hypothesis that gender affects retirement savings differently by single status.

Finally, country-level institutional factors also affect individuals' decision to save for retirement. The marginal effect values of the country dummies in Model 3 imply that, relative to the Dutch (the omitted group), the British and the Swedish are between about 13% and 35% more likely to save for retirement. This result supports *Hypothesis 10* – living in a country with mandatory or a long tradition of private pension plans (Sweden and the United Kingdom) has a positive influence on saving for retirement. On the contrary, living in France or Italy, where public pension systems still play a major role in the old-age retirement system, has a negative effect on saving for retirement (always relative to the Netherlands). Thus, the marginal effect values in Model 3 imply that, relative to the Dutch (the omitted group), the French and the Italians are about 7% less likely to save for retirement.

## 5. Conclusions

Over the next two decades, Europe is set to experience significant ageing of its population, raising the question of whether households are saving enough for retirement. The bulk of the evidence presented in this paper suggests that there is a significant group of Europeans with little savings for retirement purposes.

Many studies emphasize that there is huge heterogeneity in individual saving behavior (Browning and Lusardi, 1996). These differences persist when looking among

individuals of similar age and economic status in the same society (Lusardi, 2001). In this paper we show that this heterogeneity even increases when one analyzes the saving behavior of individuals in different European countries.

However, although the percentage of savers for retirement varies widely across countries, the driving forces of this saving behavior are quite similar. Thus, a first finding of our study is that age positively influences retirement savings, supporting the life-cycle savings hypothesis. Furthermore, the results find robust evidence for an inverted U-shaped relationship between saving for retirement and age. Thus, the probability of saving for retirement is rising initially with age and reaches a maximum in the mid- to late 40s.

Our second finding relates to the impact of the individual's financial literacy on retirement preparation. Individuals with a higher level of financial knowledge have a greater tendency to save for retirement. This result firstly highlights the critical importance of financial literacy in retirement planning. Secondly, it also suggests that in empirical studies on financial decisions, access to financial knowledge, rather than level of education, may be a more important effect to explore.

A third finding of our study provides evidence that an individual's income positively influences his decision to save for retirement; the higher his level of income, the higher his probability of saving for retirement. This outcome is consistent with the opinion of Hayes and Parker (1993), indicating that retirement planning is least pursued by those who need it the most, particularly the economically disadvantaged.

A fourth finding of our study shows that, in general, saving habit has a positive effect on retirement savings. This result highlights the critical importance of financial management practices in retirement planning.

Our fifth finding relates to the impact of country-level institutional factors on individual-level retirement savings. The results suggest that country factors play a crucial role in individuals' retirement attitudes. Thus, living in a country with mandatory or a long tradition of private pension plans (such as Sweden and the United Kingdom) has a positive effect on saving for retirement. On the other hand, living in France or Italy, where public pension systems still play a major role in the individual's pension benefits, has a negative influence on saving for retirement (relative to the Netherlands).

This study contributes to the literature in two ways. First, it provides a description of Europeans' decision-making process when saving for retirement as well as of the existence of marked differences across EU countries. Thus, this study affords a better understanding of the decisions made by European individuals regarding their retirement savings. Other studies have previously covered some of the issues analyzed here mainly focusing on the U.S. case. However, our reported results are particularly important because of the size and characteristics of the sample used, including individuals from eight different EU countries.

In general, the driving forces of Europeans' decision to save for retirement are quite similar to those highlighted by the empirical literature for Americans. Similarly to the U.S., our results reveal that retirement savings are positively related to individuals' age, financial literacy, household income, and saving habit. Unlike other findings relating to the U.S., we do not find evidence of an effect of formal education,

single status, and gender on the decision to save for retirement. In the case of the first two, these differences may be partially explained by the different ways of representing such variables. Finally, the gender-based factors behind saving decisions seem to be more complex in reality and even the results for Americans are contradictory.

Second, our findings provide quantitative evidence on the determinants of individuals' retirement attitudes. With our results in mind, policy-makers responsible for designing pension schemes will be able to make better decisions in order to develop policy responses that would encourage sufficient additional saving. This objective is particularly important in the present economic context, where both trends in ageing and employment and the ongoing financial crisis will put intense pressure on already overstretched public pension systems. Likewise, the increasing importance of DC retirement plans will increase the dependence on individuals' saving decisions. These changes are particularly dramatic if we take into account the short history of private pension funds and the excessive dependence on public pension schemes which have characterized most continental European countries.

However, this paper also presents some limitations that could open the way for further research. In particular, our results are based on a cross section of data that show different people at the same moment. Although it is tempting to draw conclusions about how the decision to save for retirement varies over the life cycle based on these results, it would be incorrect to do so. In addition, some country samples might have some problems with representativeness (for instance, in Poland richer groups may be overrepresented), biasing the results for those countries. Future research on this topic might benefit from collecting data with a longitudinal nature and improving the representativeness. Finally, we are not absolutely confident about the comparability of the results for Sweden and especially for Poland with the results of the remaining countries analyzed.

The previous findings have important implications. First, it is crucial to ensure that individuals and households are able to save to maintain current living standards in old age.

Second, the results show the importance of accounting for heterogeneity in retirement savings. Therefore, any strategy targeted at enabling individuals to prepare adequately for retirement should take into account that different population groups show marked differences in retirement saving behavior.

Third, our study provides evidence that financial literacy increases the probability of saving for retirement. Individuals – especially the economically disadvantaged – should have access to educational and financial planning programs. In some countries (for instance, the U.S.), retirement seminars are often provided by firms that offer DC retirement plans or by some employers in the workplace. But government involvement in financial education programs has also become important in light of the many state pension reforms. In any case, the government should coordinate with the private sector in promoting such financial education. In addition, retirement seminars will be most effective if they are targeted at particular population subgroups in order to address differences in saving needs and in preferences.

Fourth, our findings show that the higher the individual's level of income, the higher his probability of saving for retirement. Therefore, any tax scheme to promote retirement savings should consider targeting the less economically prepared for retirement.



Finally, the aforesaid policies should be implemented without delay in countries that have: 1) a low ratio of PPRF assets to annual expenditure on public pensions, 2) a low ratio of private pension assets to GDP, and 3) private pensions that are purely voluntary.

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