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Life Cycle Accumulation and Aging Risks

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Life cycle accumulation and aging risks

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Abstract

How to define the most appropriate institutional framework that could encourage to better plan retirement? The French population used to consider that the PAYG public pension system should finance pensions. The pension system being based on an insurance principle and intergenerational risk sharing, once retired, households estimate that the public system has to provide them an adequate level of pension. But in the context of pension reforms, the replacement rates provided by the PAYG pension system are going to decrease. Households will need to increase their savings rates to maintain their standard of living during retirement.

We test the impact of new risks and aspects of the aging issue on retirement related asset holding behaviour. We integrate the longevity and disability risks, the impact of the public pension information system, which is a way to improve private financial education and awareness, and psychological variables. We estimate bivariate probit models to better understand these behaviours. Our results indicate that the households change their mind and adapt their behaviour to new economic and demographic issues. The implementation of the pension information right allows them to increase their private savings for the retirement and the life expectancy at old age increases the probability to hold an annuity contract.

Key words : retirement, private pension
JEL Codes : J26, J32

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Introduction

In the current context of pension reforms and population aging in OECD countries, the extent to which people are responsible for their own retirement planning increases.

To face demographic challenges, reforms encourage private pension funding and increase the contributory characteristics of the pension system in OECD countries. Private wealth is an important pillar to maintain the standard of living after the retirement. Holding behaviours, especially retirement saving contracts detention, and standards of living are interconnected throughout the entire life cycle. The relationship between accumulation behaviour and socio-economic characteristics of the households has been extensively treated, but very few studies include new factors linked specifically with the aging context of developed countries. We make several contributions to the literature by considering new risks and aspects of the aging issue: the longevity and disability risks, the psychological variables impacting the retirement savings and the impact of the public pension information system, which is a way to improve private financial education and awareness.

In 1995, French men expected to live until the age of 73.8. In 2010, their life expectancy reached 78. With the increasing life expectancy, the longevity and the disability risks strengthen, threatening the financial security and the standard of living of households. To our best knowledge, such risks have not been included in researches on holding behaviours due to lack of data. Using data on mortality rates at old ages, we consider the life expectancy during the retirement, including the differences between different social categories. How do households appreciate the rising likelihood of disability? Few data are available; however, we have information on the households' reaction when disability occurred. Do households manage adequately the disability consequences?

Education is a proxy for the quality of job and the general economic awareness. The impact of such education variables has been extensively studied. However, pension information is different from education. The pension information right is intended to be universal. Pension system reforms over the last two decades in Europe and in the US have insisted on the need to provide information on retirement issues to the insured. The two primary aims behind providing this information is to promote transparency as well as to provide the insured with the information they require to make educated decisions on their retirement. Despite this overwhelming need for accurate and clear information on pensions, research on this topic has not yet been fully developed or explored.

We also explore the impact of psychological variables, such as the state of mind, which might influence the decision to save, and the way of looking at the retirement.

A few questions on the French case deserve to be addressed as it constitutes a paradox: despite the generous PAYG pension system, the savings rate is high, it amounts to 16% in 2009 (Eurostat), while it amounts only to 13.9 in the European Union and 15.6% in the Euro Zone. But, private pension plans are not well developed. The French population used to consider that the PAYG public pension system should finance pensions. The pension system being based on an insurance principle and intergenerational risk sharing, households used to estimate that, once retired, the public system had to provide them with an adequate level of pension. Although the minds are changing, the

French case remains a special case. So we aim to provide an estimate of the holding behaviours across different ages, linked with the standard of living. Using a very recent households database, **we seek to highlight personal and households' characteristics that could impact the savings behaviour in order to define the most appropriate institutional framework that could encourage to better plan retirement.**

The remainder of this paper is organized as followed: after presenting the literature in a first part, we point out in a second part a precise statistical analysis of the retirement related assets accumulation in France in 2009. Then we present our econometric methodology to put into perspective the characteristics of the French behaviours in terms of assets accumulation. The fourth part reports and discusses the results. The last section concludes.

Literature overview

Saving motives: micro-economic patterns

The most well known theory of savings is the life cycle theory proposed by Modigliani and Brumberg (1954[45]), Ando and Modigliani(1957[2],1963[3]). The life cycle hypothesis has been largely used to understand households' savings and accumulation behaviour. While the main predictions of this theory tend to be supported by empirical evidences, some empirical facts have raised the need for further research. Those include the low or insignificant estimated impact of increased longevity on saving rates, the existence of significant savings at old-age and the observed fall of consumption after retirement (Borsch Supan *et al.* 2000[20]; Borsch-Supan and Winter, 2001[19]; El Mekkaoui de Freitas and Oliveira-Martin, 2008[33]). Indeed, individuals continue to save after retirement. According to Bosworth and Anders (2008[15]), US families with a head over age 60 did exhibit negative savings rates over the period 1984-1994. This fact was consistent with the life cycle theory. But they provide evidence that after 1994, their savings rate become substantially positive. Dynan, Skinner and Zeldes (2004[30]) find little evidence of dissaving among the elderly. They also conclude that retired high income households increase slightly their saving rates after retirement. Several reasons explaining these results may be advanced: the consideration of the longevity risk and the increase of precautionary savings (Bloom *et al.* 2003; Sheshinski, 2006[13]), the funding for the disability or the health risk (Essig, 2005[34]; Tourdjman and Benoist-Lucy, 2006[47]), the desire to accumulate wealth for its descendants, or to obtain some tax advantages when wealth is accumulated through specific vehicles (Bernheim *et al.*, 2001[9]; Bernheim *et al.*, 2004[10]). However, Essig (2005) concludes that retired German households do not consider the health expectations when saving.

Save once retired offers the possibility to reduce taxes, by contracting annuities or encouraging donations during the lifetime. Hurd and Mundaca (1989[39]), Menchik and David (1983[44]) considered in a more complex life cycle model the desire to leave bequests. The bequests motive seems strong.

However, Cagetti (2003[21]) suggests that it has a small effect on wealth accumulation and savings before the retirement. In order words, a real bequest motive occurs but essentially among retirees. The bequest motive may explain the wealth concentration among the top 1% of the population (De Nardi, 2004[28]).

The willingness to leave bequests may impact the savings and the wealth accumulation, but the expectation to receive an inheritance could also be considered as a determinant of the accumulation decision. Haurin, Wachter and Hendershott (1995[36]), and Cheng, Hanna and Montalto (1998[25]) showed that saving is related to expectations about future gifts and inheritances. Brun-Schammé and Duée (2008[17]) report that perceiving an inheritance impacts positevely and significantly the retirement savings in France.

More recently, savings and wealth have been modeled as a function of economic, sociological, demographic and psychological variables (Beverly and Sherraden, 1999[12]; Bernard *et al.*, 2002[8]; Arrondel, Masson and Pestieau[4], 2003; Hogarth, Hazembuller and Wilson, 2006[37]). According to Yieh and Chen (2000[48]), age, gender, number of children and educational level impact the precautionary savings of consumers. Bucks, Kennickel, Mach and Moore (2009[18]) describe the economic, demographic and sociological characteristics of US families that saved over the period 2004-2007. The proportion of US households that saved reached 56.5%. The real net worth rose from 492 thousands of 2007 dollars in 2004 to 556 thousands of dollars in 2007. Savings is concentrated among young and middle aged families (Bosworth and Anders, 2008[15]) but it appears that the 65-74 age group holds the highest net worth (Bucks, Kennickel, Mach and Moore, 2009[18]). Saving rates and real net worth differ with educational attainment. Family headed by a person with a college degree experienced a higher net worth than other diploma groups. Using the 1999 American retirement investment survey, Joo and Grable (2000[40]) showed that individuals with higher education and higher income, and those financial literate invest more frequently in a retirement program. The education is closely linked with the financial literacy issues (Lusardi and Mitchell, 2005[41], 2007[42][43]). Households having a higher degree have a better understanding of the economic and financial mechanisms, of the economic and demographic constraints facing their environment.

Financial literacy or illiteracy has strong impacts on the retirement planning. Financial education, awareness could explain the excess or the lack of accumulated wealth to maintain the standard of living during the retirement. A prerequisite for the desire to leave bequests (Hurd and Mundaca, 1989[39]), to obtain tax advantages, or to anticipate the disability risks (Tourdjman and Benoist-Lucy, 2006[47]; Essig, 2005[34]) is a good financial literacy.

According to Lusardi and Mitchell (2005[41], 2007[42] [43]), financially educated individuals are not only more likely to plan their retirement, but they also invest more efficiently (Calvert, Campbell, and Sodini, 2005[22]). More educated people have a better propensity to plan, are able to better control their spending and consequently have a more efficient life cycle wealth accumulation (Amerik *et al.*, 2003[1])

When the head of household is self-employed, the family has a higher net worth than families whose head is retired, salaried or non-working (Bucks, Kennickel, Mach and Moore, 2009[18]). Net worth of retired households is higher than net worth of families whose head works for someone else. According to Caroll, Dynan and Krane (2003[24]), the risk of unemployment has a negative impact for middle income earners, while it does not affect the level of savings for low income earners.

Using the 1998 French Wealth survey (Patrimoine), Bernard *et al.* (2002[8]) show how the demographic structure and the age impact the holding of annuities or private voluntary pension contracts. The authors test a probit model to explain the determinants of endowment insurance and voluntary retirement savings. Households aged of 50 and more hold more contracts than younger households. Whereas pension contracts holding tend to decrease after the age of 60, it is not the case for annuities. Using the same survey, Arrondel *et al.* (2003[4]) analyze socio-economic determinant of annuities holding in France. They conclude that French households without children buy more annuity contracts in order to prepare their retirement, whereas households with children prefer pure life insurance in case of death in order to protect their family.

The age impacts the retirement savings. According to Cagetti (2003[21]), a real retirement motive for the precautionary savings can be identified, but mainly at the end of the carrier. The longevity perception changes also the attitude toward accumulation. According to Dummann (2008[29]), in Germany, if individuals expect to have a longer life, they are more likely to participate in a pension plan. Studying Economics in transition, Bloom, Caning and Graham (2002[13]) empirically demonstrate that an increased life expectancy implies a higher saving rate.

Dynan, Skinner and Zeldes (2004[30]) conclude that the Rich do save more. They find a positive relationship between the current incomes and the savings rates among all income groups, including the richest families at the top of the distribution: the saving rates increases across the entire distribution. They find an even stronger positive correlation when including imputed social security savings and pension contribution.

Some researchers have explored more precisely the capacity of low and middle income households to save, and the determinants of this savings (Carney and Gale, 2000[23]; Hogarth and Anguelov, 2003[38]; Hogarth, Hazembuller and Wilson, 2006[37]). Hogarth, Hazembuller and Wilson (2006[37]) ask "how much can the Poor save?". Bucks, Kennickel, Mach and Moore (2009[18]) show that the common assumptions that poor and near-poor families cannot save is false: 80% of the lowest quintile of 2009 had some financial assets, however, the net worth of the lowest quartile was negative: - 2.3 thousands of dollars. Although the authors provide the evidence that low and middle income households do hold assets, Carney and Gale (2000[23]) show that the low accumulation of these households cannot be disputed. They find that 20% of American households did not have a transactions account at the beginning of the 90's. Factors like income, age, education and marital status were correlated with important shifts in the level of net worth. Beverly and Sherraden (1999[12]) argue that institutional savings mechanisms, financial education, savings incentive are important determinants of savings, and particularly among low and middle income households. Low and middle income house-

holds have a limited access to institutionalized savings, to targeted financial education and attractive savings incentives. Poor and near poor families could increase their savings if their access to this mechanism were facilitated.

The retirement related savings

In the US, 33.9% of families report that the first motive to save is retirement related (Bucks, Kennickel, March and Moore, 2009[18]). Savings for retirement has increased notably since 1995 in the US. In France, over the past decades, we observed that households are prone to make long-term investment by contracting life annuities. However, they contract more rarely individual retirement savings products. In 2004, 44% of French households held long term assets (annuities or retirement savings). The first motive to save trough an annuity contract is the retirement planning (28% of annuities holders) (Darmon and Pagenelle, 2005[27]). In 1992, 12.3% of French households held at least one financial asset retirement related[1]. In 2004, they were 15.1% to hold such a contract (Brun-Schammé and Duée, 2008[17]).

Life annuities are typical french long term savings vehicles. French households have the possibility to contract two types of life insurances:

- Pure life insurances as in other countries: term, or whole-life, policy providing payments to beneficiaries if death occurs during the contract, nothing being paid in case of survival of the insured. This is actually death insurance.

- And what we call "life annuities", which includes annuities and endowment insurance (i.e. mix of term life insurance and term annuity). What is commonly called "life insurance"in France is a double contract: a death insurance and life insurance over a single period. This is a real savings product, with the tax benefits of insurance. Life endowment contracts allow funds to grow while maintaining a long-term goal: retirement, investment real estate, etc.. It also offers significant tax benefits for succession. At the end of the contract, the beneficiary may receive an annuity or a capital. To avoid confusion, we use in the article the terms "life annuities", or "life endowment contracts".

To face the significant challenge of increasing public expenditures on pensions, pension reforms encouraging private pension funding and retirement savings are carried out in France. Funded pensions are recent: individual and professional pension plans have been introduced only in 2003. These private plans are the "Popular retirement savings plan"(Plan d'épargne retraite populaire, PERP), "Corporate retirement savings plan"(Plan d'épargne retraite entreprise, PERE) and "Collective retirement pension plan"(Plan d'épargne pour la retraite collectif, PERCO). The PERP is an individual

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[1]Life annuities, popular saving schemes, retirement saving contracts held specifically to prepare the retirement. Surveyed households declare that the first holding motive is the retirement planning.

retirement savings contract, the PERE and the PERCO are two professional retirement saving contracts. Among other measures, the 2003 and 2010 pension reforms increased the required contribution period and attempted to homogenize the private and public sector pension regimes. The reforms also strongly pushed for an increase in the importance of the second and third pillars. The introduction of new private savings vehicles in 2003 encouraged employers to motivate their employees to save for retirement. Important tax deductions were introduced in order to develop the private savings schemes. Company contributions were exempted from taxes and individuals were placed under "unique"tax regimes and personal retirement plans.

We observe a strong intergenerational imbalance among the French population: the standard of living of the elder and their assets rose while the situation of working households deteriorated. Young families need to wait longer before being homeowners. Simultaneously, assets accumulated by households aged of 50 and more increased. However, according to OECD, an increased retirement saving is urgently needed, particularly in countries where benefits from a Pay-As-You-Go (PAYG) pension system are due to decrease. Reforms that have been undertaken in many OECD countries cut benefits and lead to lower pension expenditures. In France, even if we observe a high household savings rate, inequalities in retirement planning remain. Among the 50-70 age group, we observe strong inequalities of accumulation. Some households retire with a high level of financial and non financial level of assets (Arrondel, Masson and Verger, 2008[5]), and other did not save enough to maintain their standard of living during the retirement period.

In France, the holding behaviour with a retirement related motive[2] is consistent with the life cycle hypothesis. Using the French Wealth survey (Patrimoine) of 1992, 1998 and 2004, Brun-Schammé and Duée (2008[17]) distinguish the age effect from the cohort effect by describing the long term assets holding for several cohorts. The holding rate for retirement motive increases significantly among households until the age of 60. The highest holding rate is observed for households headed by a 60 years old individual. Then, the holding rate decreases to 5% for households aged of 72 years. However, the possession of such long-term assets, for any motive, decreases only very slightly after the age of 55. The authors conclude that very few households liquidate their retirement related wealth, and change their holding motive. They keep their wealth but for other reasons (bequests, disability risk, tax deductions). It appears that retirement related saving behaviour depends mainly on the age and the professional status. However, financial long term assets holding behaviour, for any motive, highly depends on the income level (Brun-Schammé and Duée, 2008[17]).

Since Brun-Schammé and Duée's article, new data on holding behaviour, including the recent individual and professional pension plans, the PERP and the PERCO, have been published. At the

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[2]Once again, Annuities, popular saving schemes, retirement saving contracts held specifically to prepare the retirement.

end of 2007, 2 million of individuals held a PERP, and 334 000 a PERCO (Croguennec, 2009[26]). Introduced in 2003, the development of the PERP experienced an increase of 6%, and the PERCO 66%, of the covered employees. Before the implementation of these retirement pension plans, the possibility the save for retirement through a funded pension plan concerned only few professional categories, mainly executives. Being a collective professional pension plan, the PERCO concerns all of the Employed, whereas the PERP concerns all working individuals. The PERP and the PERCO are defined contribution contracts. 30% of the PERP holders belong to the 40-49 age group, and 35% of the PERCO holders belong to the 50-59 age group.

Data and statistic analysis

The data source

Asset accumulation is linked with various socio-economic characteristics. We aim particularly to highlight savings behaviours, linked with the aging risks in a country where the retirement income depends usually on the public PAYG pension system.

We use the last household survey conducted in France in 2009-2010 by the French National Institute of Statistics and Economic Studies - Institut National de la Statistique et des Etudes Economiques (INSEE). The database includes a representative sample of the French population, consisting in 35729 individuals, which belong to 15006 households. The survey is composed of four questionnaires: the first one includes questions on the households' characteristics, the second one concerns the individual characteristics of the respondents, while the two others inform on the savings and financial products holding, and the different transfers of capital between ancestors and descendants within the family.

This survey particularly informs on the financial and non-financial assets of the households and questioned individual, their income, their age, their professional category, their education/training, their marital situation, and their status (active, inactive, retired). Furthermore, the survey also includes the type of asset held by the household (checking account, savings account, real estate, corporate savings, etc.). Retirement pensions, both state and private (type and amounts by range), are also reported.

We particularly focus on income data, assets variables, individual and household's demographic, sociological and psychological variables. To calculate the standard of life, we use the income variable including activity and replacement incomes among the household over the twelve months before the survey. This income does not include redistribution. Each member of the household is assigned the equivalent value of the income, calculated using the OECD equivalence scale. The economies of scale in housing and in the consumption of good and services are considered by controlling for the household composition. Part of the existing literature underlines the potential asymmetry in the management and the access to the household's resources (Browning, Bourguignon, Chiappori

and Lechene, 1994[16]; Roy, 2005[46]; Belleau et Proulx, 2010[6], 2011[7]). Nevertheless, assuming that most households share and manage fairly the income, we deflate the household resources by the number of consumption unities in the household. We assign the value of 1 for the first household member, 0.5 to each additional adult member and 0.3 to each child under 14[3]. This methodology has the advantage to illustrate more precisely the living standard of individuals belonging to household and to allow us examining the well being. Indeed, it avoids for instance to consider an individual as a poor one if another member of its households is a high income earner.

In the following developments, we focus on two long term assets used to finance retirement: the life endowment contracts described above, and the specific retirement savings vehicles. The retirement savings includes individual and occupational contracts. Before the implementation of the recent pension plans (PERP, PERCO, PERE), private ways to finance the retirement were related only to some professional categories. Indeed, pension plans were open exclusively for Self-employed[4], for farmers[5], civil servants[6], etc. Using the last wealth survey, we take into account all the new types of retirement contracts.

The retirement related asset holding in France in 2010

A large part of the French households save in the long run by contacting life annuities. A cross sectional observation, considering consequently the age effect but not the cohort effect, shows that this savings vehicle does not respond to the life cycle hypothesis. The older the individuals are, the higher the holding rate is (See figure 1). What is quite surprising is the holding profile according to the age among households under the poverty threshold. Although poor households hold less frequently an annuity contract, the age effect is the same than among non poor individuals. The strong growth of the detention with age shows the preference of the French for this type of financial asset. The holding rate remains moderately high among poor families compared to non poor families. However, these statistics confirms, as Bucks et al. (2009) pointed out in the US, that poor households do save. The point is: what is the appropriate framework to encourage low income earners to save for retirement? Should the financial institutions, intermediaries propose a more flexible way to save? For instance mixed contracts with part of the capital blocked until the retirement and part liquid in case of necessity?

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[3]We use the OECD equivalence scale rather than the Oxford equivalence scale. The Oxford equivalence scale assigns the value of 0.7 to each additional adult member and 0.5 to each child under 14. It allows to represent a more individual consumption structure within a household. This equivalence scale is often preferred in the case of developing countries.

[4]Contracts "Madelin law", since 1994. The annual contribution is mandatory, and the Self-employed receive an annuity during the retirement.

[5]Since 1997. This is a defined contribution pension plan. The contributions are facultative. Farmers receive a annuity during the retirement.

[6]A facultative defined contribution pension plan, the PREFON since 1967. Civil servants receive at the end an annuity during the retirement

Figure 1: Life endowment contracts holding rates according to age, 2010
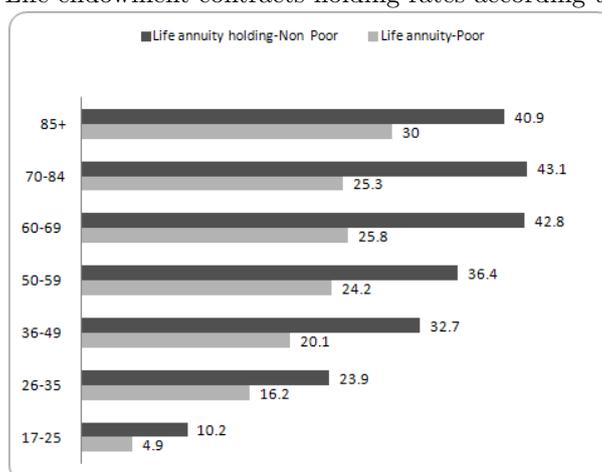
Pensioners hold more frequently an annuity contract than people belonging to the workforce (See figure 2). Over the whole distribution, the holding rate is higher among retirees. Workers belonging to the first quartile of the distribution are 18.7% to hold an annuity. Pensioners are 26.3%. This observation is totally inconsistent with the life cycle hypothesis. As Brun-Schammé and Duée pointed out in 2003, although most of active holders declare that the life endowment contract is retirement related, we note that the detention improves even after the retirement. Life endowment contracts holders benefit from tax allowances of 4600 euros per year when they carry out withdrawals after 8 years of detention[7].

Figure 2: Life endowment contract holding rates according to standard of living, 2010
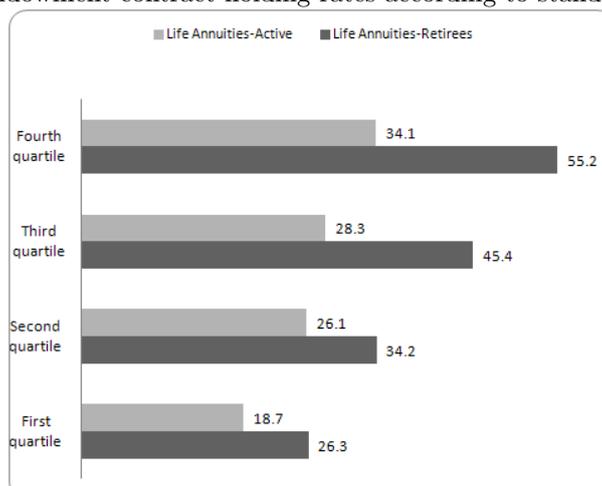
[7]on the fraction of the withdrawal corresponding to earnings, the portion corresponding to the payments is not taxed

The retirement contracts holding remains low compared to the life annuities holding. While non poor individuals increase their holding rate over the activity period, the holding among the poor population remains very low (See figure 3). Non poor people aged from 36 to 49 years are 15.5% to hold a retirement contract. They are only 4.7% among poor people. Among poor families, the holding of life annuities then progresses with age, while retirement savings contract never really takes off. This difference could be explained by the flexibility offered by an annuity contract. Although the annuities are long term contracts, they could be liquidated before the retirement. In case of necessity, families have the possibility to withdraw this money. On the contrary most of the retirement contracts have to be kept until the retirement.

The capital accumulated on a PERP is repaid as an annuity. It can also be repaid in a lump sum, up to 20%. Although the PERP is supposed to be kept until the retirement, the use of the accumulated savings to finance the acquisition of a first primary residence is allowed [8]. The PERCO is an occupational pension plan, it allows employees to accumulate savings, available at the time of retirement[9] as an annuity or, if the collective agreement allows it, under the form of capital. While the tax base represents 30% of the life annuity amount, annuities from a PERP or PERCO are taxed so as PAYG pension benefits. Consequently, even if the payments on the PERP and the PERCO are not taxable, the withdraw taxation remains less favorable than with life annuities.

Figure 3: Retirement contracts holding rates according to age, 2010
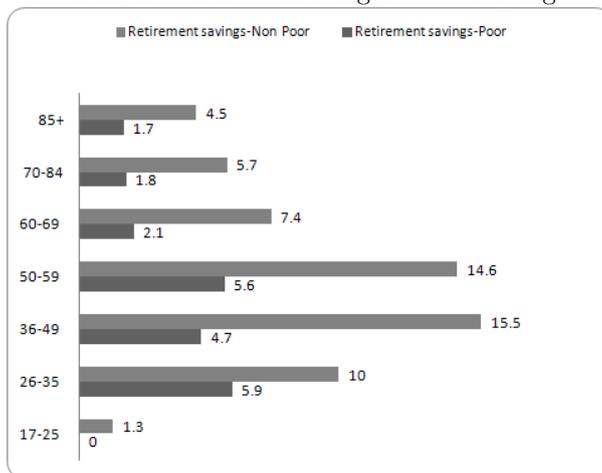
Source: 2009-2010 Wealth Survey

Most of the holders liquidate their retirement contract when they retire: not surprisingly, the detention rate decreases significantly for the retirees (See figure 4). However, almost 12% of the retirees belonging to top quartile still hold such a contract. They delay the date of first entitlement.

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[8]In some cases, the holder is allowed to withdraw its capital: disability, death of the partner, end of the unemployment benefits.

[9]Special cases of withdrawal are the same with the PERP and the PERCO

Figure 4: Retirement contracts holding rates according to the standard of living, 2010

These statistics provide a picture of the holding per age in 2010. We cannot draw any conclusions about the progress of detention throughout the period of activity.

Econometric analysis

Estimation model and estimation method

We estimate a bivariate probit model to exhibit the determinants of savings behaviours. The model includes separate probit models with correlated disturbances. Our two binary dependant variables represent the probability to hold an annuity contract $(y_1^\star)$, and the probability to hold a retirement savings contract $(y_2^\star)$. We assume that these two variables represent two interrelated decisions by the households. French households usually made long term investments by contracting annuities. New retirement saving contracts have been implemented after the 2003 reforms. We estimate a biprobit model to highlight the correlation between the holding decisions of these two saving vehicles: are they substitutable or complementary?

We estimate the following model:

$$y_1^\star = x_1\,\beta_1 + \epsilon_1 \tag{1}$$

$$y_2^\star = x_2\,\beta_2 + \epsilon_2 \tag{2}$$

Where $y_1^\star$ and $y_2^\star$ are unobservable and are related to the binary dependant variables y_j $(j = 1, 2)$ by the following rules:

$$y_j = \begin{cases} 1 & \text{if the individual declares holding a savings contracts} \\ 0 & \text{if the individual declares not holding such a contract.} \end{cases}$$

(ϵ_1, ϵ_2) represent the error terms of the two probit models. If they were independent of one another, we would have $Cov(\epsilon_1, \epsilon_2) = 0$. In the bivariate probit model, we assume that the error terms are correlated:

$$\epsilon_{1i} = \xi_i + u_{1i} \tag{3}$$

$$\epsilon_{2i} = \xi_i + u_{2i} \tag{4}$$

The error terms follow a standard multivariate normal distribution, where V represents the residual covariance matrix, with ρ as the correlation coefficient.

$$\begin{pmatrix} \epsilon_1 \\ \epsilon_2 \end{pmatrix} \to N \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \quad V \right)$$

$$V = \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}$$

We consider joint probabilities for non independant events. It follows:

$$\begin{aligned} \Pr(y_1 = 1, y_2 = 1) \quad &= \Pr(y_1 = 1 | y_2 = 1) * \Pr(y_2 = 1) \\ &= \Pr(y_1 = 1) * \Pr(y_2 = 1 | y_1 = 1) \end{aligned}$$

We assume joint distributions for the y_j. For the two standard normally distributed ϵ_j, we have the following joint probability density function (pdf):

$$\phi(\epsilon_1, \epsilon_2) = \frac{1}{2\pi \sqrt{1 - \rho^2}} exp \left[-\frac{1}{2} \left(\frac{\epsilon_1^2 + \epsilon_2^2 - 2\rho \epsilon_1 \epsilon_2}{1 - \rho^2} \right) \right] \tag{5}$$

Their joint cumulative density function (cdf) will be:

$$\Phi(\epsilon_1, \epsilon_2) = \int_{\epsilon_1} \int_{\epsilon_2} \phi(\epsilon_1, \epsilon_2) d\epsilon_1 \, d\epsilon_2 \tag{6}$$

The distribution $\Phi(\epsilon_1, \epsilon_2)$ is used to estimate the bivariate probit models. It follows from this:

$$E[\epsilon_1 | x_1, x_2] = E[\epsilon_2 | x_1, x_2] = 0$$

$$Var[\epsilon_1|x_1, x_2] = Var[\epsilon_2|x_1, x_2] = 1$$

$$Cov[\epsilon_1, \epsilon_2|x_1, x_2] = \rho$$

The log-likelihood for the bivariate probit is the sum across the four possible transition combinations of y_1 and y_2, multiplied by the associated probabilities. It follows from this:

$$\ln L = \sum_{i=1}^{N} \Big[y_{i1}\, y_{i2} \ln \Phi(x_1\beta_1, x_2\beta_2; \rho)$$
$$+ y_{i1}(1 - y_{i2})\ln\big[\Phi(x_1\beta_1) - \Phi(x_1\beta_1, x_2\beta_2; \rho)\big]$$
$$+ (1 - y_{i1})\, y_{i2} \ln\big[\Phi(x_2\beta_2) - \Phi(x_1\beta_1, x_2\beta_2; \rho)\big]$$
$$+ (1 - y_{i1})\,(1 - y_{i2}) \ln\big[1 - \Phi(x_1\beta_1) - \Phi(x_2\beta_2) - \Phi(x_1\beta_1, x_2\beta_2; \rho)\big]\Big]$$

Where $\Phi(x_1\beta_1, x_2\beta_2; \rho)$ is the bivariate standard normal cdf, and $\Phi(x_j\beta_j)$ denotes the univariate standard normal cdf.

We estimate two biprobit models. In the first model, we integrate as dependant variables the probability of annuities holding, for any motive, and the probability to hold a private retirement savings contract. In the second, we change the first dependant variable, which becomes the probability, exclusively for a retirement motive, to hold an annuity. In the second estimate, the respondents to the survey declare that they hold an annuity to prepare the retirement.

Conducting likelihood ratio tests, we confirm that the bivariate probit models fit the data better than two separate probit models. The probability of annuities holding, for any motive, and the probability to hold a private retirement savings contract on one hand, and the probability of annuities holding, for a retirement motive, and the probability to hold a private retirement savings contract on the other hand, are interrelated.

The variables definitions

The originality of this paper is to integrate in one model economic, demographic, sociological and psychological variables (See table 2) to explain the long term holding behaviours. Contrary to the existing literature, we take into account demographic and psychological variables to complete the explanation of retirement savings. Firstly, we introduce life expectancy according to the sex and the professional category in order to analyze the longevity risk (See table 1). We also consider disability at old age implying long term care[10].

Secondly, we consider new psychological variables such as the perception of the carrier (is it bad?), the employment horizon, or the financial problems in the childhood. Such analysis has been

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[10]Consequently this variables is included only in the first estimates. In the second one, we consider life annuity holding for a retirement motive and disabled people are already old.

Table 1: Life expectancy at 60 according to professional category

	Farmer	Shopkeeper	Executive	White Collars	Employee	Blue Collars
Men	22.3	22.2	24	22.3	21	19.6
Women	26.2	27.1	27.8	27.4	26.4	25.5

Source: *: French National Institute of Statistics and Economic Studies*

carried out in Germany by Essig(2005[34]) and Dummann(2008[29]). They analyze the impact of expectations capturing the job risks on precaution savings and pension plan participation. According to Essig (2005) and Dummann (2008), the unemployment risk has no significant impact on households' retirement savings behaviour. In our sample, 31% of the individuals experienced a strong financial constraint during childhood and 11.2% estimate that their carrier is bad.

Thirdly, we estimate the impact of the introduction of the pension information right in France. Since 2004, households receive a letter containing some information about their accumulated pension rights.

This third point is allowed by the last wealth survey as it was conducted after the introduction of the information system. It was not the case with the precedent waves of the survey. According to the available information, individuals are able to make an optimal decision. In the context of retirement decision, it is assumed that rational agents are able to anticipate the longevity and sustainability risks of their current pension system. Consequently, the agents optimize their allocation decisions throughout their lifetime. However, we do not always observe this behaviour. This is mainly due to the fact that rational agents are often subject to imperfect information. Many studies have been devoted to the subject of imperfect information, but information in the context inter-temporal allocation decisions between consumption and leisure remains for the most part untreated. From a microeconomic perspective, an information system allows the individual to foresee their future pension amount and to optimize consumption and saving decisions over their life cycle. By informing the insured, political authorities encourage citizens to better anticipate their retirement financing. Pension information is meant to inform individuals on financial and demographic constraints which strongly affect the current pension schemes. For these reasons, we introduce also new important variables in our estimates, two dummies representing the recent French pension information system.

A dummy variable represents those having received the individual earnings records since the implementation of the pension information right (cohorts born in 1957, 1958, 1959, 1963, 1964 and 1969). A second one represents those having received an estimate of their benefits (cohorts born between 1949 and 1953). 8.7% of our sample received the estimate of their pension, and 10.5% received a pension record.

The lack of information and education explains partly the fact that many households do not accumulate enough in order to finance retirement. The pension information right contributes to improve the financial literacy (El Mekkaoui *et al.*, 2010[32]). Lusardi and Mitchell (2005[41], 2007[42][43]) study consequences of financial illiteracy in the US and in other countries to better understand why

retirement planning is lacking. Arrondel *and al.* (2008[5]) explain that there are in France great inequalities between older households having accumulated an important wealth and other arriving close to retirement with a weak or no wealth. The lack of information and education explain partly this fact. From this point of view, education variables and variables about the individual statements reception are complementary.

Table 2: Explanatory variables

Dependant variables	Definition	Expected sign	Examples of related literature
AGE	6 dummies for the 17-30 age group, 31-40,..., 41-50 is the ref.	Negative for the Youngest, positive for the elder	Yieh & Chen (2000[48]) Bernard *et al.* (2002[8]) Bosworth & Anders (2008[15])
DISABILITY	Dummy: elder individuals receiving disability benefits	Negative: when the risk occurs, the capacity to accumulate may decrease. Positive if people anticipate the expenses related to long-term care	-
LIFE EXPECTANCY	Life expectancy by sex and professional category	Positive if we assume that households are aware of the aging issues	Bloom *et al.*(2003[13]) Dummann (2008[29])
MARITAL STATUS	2 dummies for : women or Men living alone (single, divorced, widow)	Negative for individuals living alone, especially for women	Yieh & Chen (2000[48])
LIVING AREA	Dummy for Paris, Paris' surroundings	Positive for Paris, given the higher standard of living	Brun-Schammé & Duée (2008[17])
CHILDREN	Dummies: no child or 4 and more	Positive if we assume that in average large families are richer. Negative if the standard of living is on the contrary lower in these families	Yieh & Chen (2000[48]) Arrondel *et al.* (2003[4])
HOMEOWNERSHIP	Dummy	Positive	Brun-Schammé & Duée (2008[17])
EMPLOYEMENT STATUS	Dummies: Employed (Ref.), Unemployed, Retired and Inactive	Negative for Unemployed and Inactive, positive for Retired	Bosworth & Anders (2008[15]) Dynan *et al.* (2004[30])
STANDARD OF LIVING	Dummies: Poor, higher income earner (above the average income)	Negative for the Poor positive for higher income earner	Carney & Gale (2000[23]) Hogarth *et al.* (2006[37])
DEBT	Dummy: indebted for private reasons (buying a car,..)	Positive: in France, mainly high income earners are offered	-
INHERITANCE AND GIFTS IN THE CAPITAL	Dummy: is your capital composed for at leats 25% of gifts or inheritances received?	Positive	Brun-Schammé & Duée (2008[17])
DIPLOMA	Dummies : 3 levels of degree. The reference is an intermediary level.	Positive for the most educated individuals, negative for less educated.	Joo & Grable (2000[40])
RISKY WORKING HORIZON	Dummy: temporary contract, partial employement	Positive if households anticipate the impact on their pension	Caroll *et al.*(2003[24]) Dummann(2008[29])
BAD CARRIER	Dummy: bad personal feeling about the carrier	Negative: individual worries about the present carrier and not its futur retirement	-
MONEY PROBLEMS	Dummy: individual experiencing strong money problem during their own childhood	Positive: learning effect	-
ESTIMATE OF THE PENSION	Dummy: individual having received their personal estimate of the pension	Positive: the pension right should increase the awareness about the necessity to personally and privately better plan the retirement	Beverly & Sherraden (1999[12]) for the institutionnal saving mechanisms and financial education. Lusardi & Mitchell (2005[41], 2007[42][43]) for the financial literacy.
PERSONAL RECORD	Dummy: individual having received the record of their carrier and pension rights accumulated		

Estimation results and policy implications

In the context of demographic pressures, providing information on private savings behaviours to policy makers allows them to design the adequate public framework to make the public pension system sustainable. Policy makers have to increase the public's awareness of the challenges facing the pension system and to encourage them to make the appropriate decisions on their pension, and their savings level. Providing incentives to make individuals more responsible for their own pension funding requires a better understanding about the issues the households are facing over the life cycle, including their standard of living according to their socioeconomic characteristics.

In our estimates, we found that life annuity contracts and private retirement contracts are complementary and provide a guaranteed retirement income. The correlation coefficient is significant in our two estimates (See table results 3 and 5 in appendix).

Demographic and socio-economic variables

According to Blundell *et al.* (1994[14]) demographic characterisitcs and labor market variables impact significantly intertemporal behaviour. Dumann (2008[29]) confirms these results showing that demographic and socio-economic variables influence the demand for occupational pension plan in Germany. Younger households hold less frequently annuities and retirement savings contract than their elders. This result is confirmed in our two estimates: in other words, for any motive, being young has a negative and significant impact on the holding probability.

Individuals behave as if they anticipated the longevity risk. Indeed, the life expectancy at 60 increases the probability to hold an annuity contract. However, why do household select an annuity rather than a pension contract? We assume that households prefer a more flexible asset: an annuity contract might be liquidated before the retirement, or during the retirement. They may use it for the disability risk, or keep it for their descendants. In addition to this flexibility, when households choose to receive an annuity from their contract after the age of 60, the tax base represents only 30% of the annuity.

The composition of the household has a strong impact: living with a partner increases the holding of a pension contracts and annuities compared to single. An opposite effect is observed for woman living alone (single, widow, divorced). Some of these single women are also often single parent families. Consequently, they might not be able to save for the retirement, or for any other motive because of their strong income constraint. For these women, we found a negative marginal effect (-4.2% to have simultaneously two types of contracts).

Families with four children and more hold less frequently a pension contract than household with fewer children. The probability to hold simultaneously an annuity contract and a retirement contract decreases of 7% compared to families with 1, 2 or 3 children. Households with no child have also fewer probabilities to hold such contracts. Two effects might be distinguished: on one hand large families

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may suffer from a strong budget constraint and do not have enough resources to plan correctly their retirement, on the other hand, families without children do not feel the need to save. They can choose to postpone the retirement funding as they have no expenses related to children raising.

Being disabled has a significant and negative impact on the probability to hold an annuity contract. We expected to potentially find a positive sign indicating that households anticipate the expenses related to the long-term care. But the negative sign is not so surprising, given the low level of income of disabled people. We find no statically significant impact on the probability to hold a retirement savings contract.

The ability to save for the retirement depends on the resources. Poverty impacts significantly and negatively the holding of life annuities, whatever the motive. Families whose income is above the average income hold more frequently pension contracts and life annuities.

Policy makers should have in mind these characteristics when implementing fiscal incentives: targeted measures would allow prioritizing objectives. Does the government want to develop retirement related savings among youngest cohorts? Or does it pursue a rawlsian objective of equity by improving the situation of the poorest through a subsidizing savings?

Education variables

Education is a proxy for the quality of job and the general economic awareness (Amerik et al., 2003[1]; Lusardi and Mitchell, 2005[41], 2007[42][43]). Well educated people being better informed about retirement related savings, being better aware of tax deductions possibilities, are more likely to hold financial assets for the retirement (Bernstein, 2002[11]).

Highest and lowest degrees have significant impacts on holding behaviour. Individuals with a master degree hold more frequently life annuities and pension contracts: the marginal effect reaches 5.3% (See table 4). On the contrary, when individuals have no diploma they hold less frequently a life annuity or a pension contract: having no diploma decreases the probability to hold simultaneously a life annuity and a retirement savings contracts of 4.5% (See table 4). Those are poorly informed on the necessity to save for the retirement, and even on basic financial mechanisms. Institutional disposals complement the impact of the education level. If we assume that households with a low level of diploma have not enough financial education and general economic awareness, the pension information right allows overcoming this problem.

Psychological variables

We assume that the state of mind might influence the decision to save, and the way of looking at the retirement. Current young cohorts suffer from increased job flexibility. The unemployment rate for the youths reaches nearly 24% in France in 2010. When they are employed, they also might earn particularly low wages. Their priority may not be to prepare for retirement, but rather to meet their short term needs.

Indeed, two scenarios impact negatively the probability to hold a life annuity and a pension contract:

when people feel that their carrier is bad and when their parents encountered serious income troubles during their own childhood.

On the contrary, when people anticipate losing their job, their hold more frequently life annuities and pension contracts. Not surprisingly, holding a private pension contract allows compensating partly the carrier setbacks. In a country where pension depends mainly on the public pay-as-you-go system, experiencing inactivity or an unemployment period can decrease significantly the pension amount (El Mekkaoui De Freitas *et al.*, 2011[31]). In other words, individuals act as if they anticipated this risk: the marginal effect of the risky employement horizon on the probability to hold simultanesously a life annuity contract and a retirement savings contract is statiscally significant and positive: 5.1% (See table 4 in appendix).

Dummann (2008[29]) found on the contrary that the risk of becoming unemployed did not have a statistically significant impact on the probability to participate in a pension plan in Germany. However, it is difficult to compare the situation in the both cases: firstly, Dummann used data of 2005, before the beginning of the financial crisis. In our work, we use more recent database (2009-2010). Secondly, we might assume that in France, like in other European countries, the awareness about the economic and demographic constraints facing the public pension systems has improved between 2005 and 2009.

Individuals make up their own minds on their professional situation. Judging his carrier "bad" is purely subjective. "Bad" absolutely does not mean that individuals fear losing their job. We could expect that people having repetitive tasks, earning low incomes, and who do not expect any progression in their jobs feel disappointed about their carrier. Consequently, these individuals are more concerned about the present than the future. They do not contract any life annuity or pension savings asset: being disappointed about his/her carrier decreases the probability to hold a life annuity contract and a retirement savings contracts of 4.3% (See table 4 in appendix).

According to Dummann (2008[29]), important determinants of retirement related savings are individual attitudes and satisfaction with standard of living. The author shows that the more satisfied people are at present, the more they want to maintain it in future and therefore care more about providing for retirement.

Preserve quality of job in a bad economic context is important. Firstly, carrier setbacks impact the current standard of living but also the pension amount. Secondly, as our results show, individuals that are not satisfied with their professional situation tend to hold less retirement related private contracts.

When people experienced serious problems of money during their childhood, they tend to hold less frequently annuities contracts or retirement related contracts. They may prefer using their current income in the present rather than postponing their consumption. We would expect that individuals having experienced a strong financial constraint would be more long-sighted than others. However, in case of consumption frustration during the childhood, individuals may have strong present biased

preferences. This issue is related to psychological theories. Amerik *et al.* (2003, [1]) argue that planning influence the achievement of a long-term goal, which has been explained in the psychological literature. The authors explain how that is difficult for individuals to match long term goals and current consumption actions. If agents have present biased preferences, they may experience a conflict between the desirable savings plan and the desired consumption. Having experienced such money problems during childhood decreases the probability to hold simultaneously an annuity contract, for any motive, and a retirement savings contract of 2.3% (See table 4 in appendix).

New institutional framework: pension information variables

Because of the recent nature of the pension information right in many countries, the topic of the pension information has not been extensively treated. However, the United States implemented the pension records in 1989, before European countries. Gustman and Steinmeier (2001,[35]) reported in 2001 the misinformation of the American population about the social security benefits they could expect for their retirement. Not surprisingly, our first results indicate that the estimate of the pension benefits sent to the insured has a positive and significant impact on the decision to contract an annuity for a retirement motive. Indeed, the estimate of the pension allows individuals to better specify their intertemporal budget constraint. Gustman and Steinmeier (2001,[35]) explain how imperfect knowledge may result from an inability to compute correctly the information, which is characteristic linked with a low productivity and low level of wage. El Mekkaoui, Legendre and Kukla (2010, [32]) show that in many European countries, the recent information right evolved to a simplified information transmission. Indeed, European households declare that they are satisfied with pension information, provided it is simple and comprehensive. Ceteris Paribus, having received an estimation of the pension increases significantly the probability to hold simultaneously retirement related life annuity and retirement savings contracts of 1.2% (See table 6 in appendix).

Such results should encourage tpolicy makers to improve the pension information. The last pension reform of 2010 was designed in this way.

Conclusion

The French population used to consider that the PAYG public pension system should finance pensions. The pension system being based on an insurance principle and intergenerational risk sharing, once retired, households estimate that the public system has to provide them an adequate level of pension. This way of thinking is quite surprisingly for populations living in a country where pensions are largely privately financed. However, we should understand that French households are attached to their social model: they behave as if they signed an immutable intergenerational contract. Part of the French population does not understand why this contract is broken, after they contributed to the system during their whole active life.

However, last pension reforms tried to change the minds, and introduced, among other measures,

the pension information right. This measure allows people to be aware of the macroeconomic issues facing the country, and the microeconomic issues facing the households.

In this paper, using the most recent data on French households' wealth, we try to understand the determinants of the retirement savings. We used common demographic and socio-economic variables to identify the retirement related savings, but also tested the impact of new variables such as the life expectancy, the psychological characteristics or the new pension right in France.

Our estimates show that life annuities and pension contracts are complementary.

Younger households hold less frequently annuities and retirement savings contract than their elders. Having four children or more at home has a negative impact on the probability to hold a pension contract. Our results show also that couple tend to contract more frequently life annuities or retirement savings vehicles than individuals living alone, particularly women. Younger individuals save less for their retirement, but households, at any ages, behave as if they anticipated the longevity risk. Indeed, the life expectancy at 60 increases the probability to hold an annuity contract.

We conclude that psychological aspects impact the decision the hold a long term retirement related asset. The theory of the rational agent is not always able to provide explanation on the individual behaviours. Having an unsecured employment horizon increases the probability to hold a pension contract but having a bad feeling about his carrier decreases this probability.

However, when French are better informed, they seem to change their mind and to adapt to new economic and demographic issues. The implementation of the information right allows them to increase their private savings for the retirement. People having received an estimate of their pension amount tend to hold more frequently a life annuity for a retirement related motive.

Being poor decreases significantly the probability to hold a life annuity and seems to have no impact on the pension contract holding. However, our statistical analysis shows that even poor people often hold an annuity. They are 17.1% among poor workers to hold one, and 26.7% among the poor retirees, whereas these proportions reached 29% and 42.9% among non poor populations. Although the poor retirees hold an annuity contract almost as frequently as non poor workers, their access to annuity and retirement contract is very weak. These results show that the willingness to save is different from the ability: in average, compared to non poor people, the poor one hold less frequently an annuity contract, but their holding rate should not be neglected. Our results shows that it exists a way to improve the Poors' savings. The government could encourage private savings through annuity contracts or retirement savings among poor people by proposing matching contributions according to the number of children, the disposable income within the household. Among non poor people, the issue is different: as they prefer contracting life annuities, it could be useful to make the private

retirement contract more attractive by reinforcing the fiscal incentives. However, recent tax measures go against this recommendation: the social contributions levied on this investment have been increased in 2011. This tax policy could have strong consequences on household savings.

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Table 3: Bivariate probit model: annuity holding rate and retirement saving contract holding rate

Variable	Coefficient	(Std. Err.)
Equation 1 : life endowment contract holding		
Age: 17-30	-0.449***	(0.093)
Age: 31-40	-0.102	(0.065)
Age: 51-60	-0.161**	(0.072)
Age: 61-70	0.067	(0.099)
Age: > 70	0.086	(0.105)
Life expectancy at old age	0.010*	(0.005)
Single women	-0.125***	(0.047)
Single man	-0.059	(0.049)
Live in Paris or in the suburbs	0.133***	(0.050)
No child	-0.026	(0.049)
4 children or more	0.067	(0.142)
Homeowner	0.375***	(0.040)
Unemployed	-0.290**	(0.114)
Inactive	-0.004	(0.141)
Retiree	-0.048	(0.085)
Under the poverty treshold	-0.201***	(0.052)
Household income above the average income	0.318***	(0.042)
1/4 of the capital coming from an inheritance	0.278***	(0.047)
Private debt (mortgage, consumer credit)	-0.059	(0.041)
Master's degree	0.253***	(0.067)
High school	-0.024	(0.065)
No diploma	-0.226***	(0.053)
Has a precarious employement status	0.070	(0.049)
Judges his/her carrier bad	-0.145**	(0.060)
Experienced strong money problems in the childhood	-0.112***	(0.037)
Has received an estimation of the pension	0.118	(0.085)
Has received a pension record	0.060	(0.063)
Disabled	-0.288*	(0.174)
Intercept	-0.434***	(0.147)
Equation 2 : retirement savings contract holding		
Age: 17-30	-0.587***	(0.118)
Age: 31-40	-0.174**	(0.074)
Age: 51-60	-0.018	(0.079)
Age: 61-70	0.049	(0.107)
Age: > 70	0.010	(0.115)
Life expectancy at old age	0.004	(0.006)
Single women	-0.235***	(0.053)
Single man	-0.038	(0.054)
Live in Paris or in the suburbs	-0.141***	(0.054)
No child	-0.093*	(0.054)
4 children or more	-0.643***	(0.204)
Homeowner	0.098**	(0.045)
Unemployed	-0.860***	(0.174)
Inactive	-0.504***	(0.178)
Retiree	-0.108	(0.090)
Under the poverty treshold	-0.081	(0.061)
Household income above the average income	0.287***	(0.046)
1/4 of the capital coming from an inheritance	0.026	(0.050)
Private debt (mortgage, consumer credit)	0.083*	(0.045)
Master's degree	0.185***	(0.069)
High school	-0.153**	(0.071)
No diploma	-0.175***	(0.058)
Has a precarious employement status	0.336***	(0.054)
Judges his/her carrier bad	-0.245***	(0.071)
Experienced strong money problems in the childhood	-0.095**	(0.042)
Has received an estimation of the pension	0.067	(0.092)
Has received a pension record	-0.002	(0.070)
Disabled	0.090	(0.189)
Intercept	-0.898***	(0.170)
Equation 3 : athrho		
Intercept	0.152***	(0.024)
N	5927	
Log-likelihood	-6655.003	
$\chi^2_{(56)}$	1072.989	

Significance levels :   ∗ : 10%   ∗∗ : 5%   ∗ ∗ ∗ : 1%

Table 4: Marginal effect after bivariate probit model: life endowment contract and retirement savings contract holding rate

Variable	Coefficient	(Std. Err.)
$\Pr(y_1 = 1, y_2 = 1) = 0.116$		
Age: 17-30	-0.088***	(0.009)
Age: 31-40	-0.032***	(0.011)
Age: 51-60	-0.016	(0.013)
Age: 61-70	0.013	(0.019)
Age: > 70	0.009	(0.02)
Life expectancy at old age	0.001	(0.001)
Single women	-0.042***	(0.008)
Single man	-0.01	(0.009)
Live in Paris or in the suburbs	-0.01	(0.009)
No child	-0.016*	(0.009)
4 children or more	-0.071***	(0.017)
Homeowner	0.046***	(0.008)
Unemployed	-0.096***	(0.009)
Inactive	-0.062***	(0.018)
Retiree	-0.02	(0.016)
Under the poverty treshold	-0.027***	(0.009)
Household income above the average income	0.070***	(0.008)
1/4 of the capital coming from an inheritance	0.027***	(0.01)
Private debt (mortgage, consumer credit)	0.007	(0.008)
Master's degree	0.054***	(0.015)
High school	-0.023**	(0.011)
No diploma	-0.046***	(0.011)
Has a precarious employement status	0.052***	(0.008)
Judges his/her carrier bad	-0.043***	(0.009)
Experienced strong income troubles in the childhood	-0.023***	(0.007)
Has received an estimation of the pension	0.02	(0.017)
Has received a pension record	0.004	(0.012)
Disabled	-0.014	(0.029)

Significance levels : ∗ : 10% ∗∗ : 5% ∗ ∗ ∗ : 1%

Table 5: Bivariate probit model: life endowment contract holding rate for retirement motive, and retirement savings contract holding rate

Variable	Coefficient	(Std. Err.)
Equation 1 : life endowment contract holding rate for retirement motive		
Age: 17-30	-0.533***	(0.131)
Age: 31-40	-0.291***	(0.083)
Age: 51-60	-0.108	(0.083)
Age: 61-70	-0.074	(0.116)
Age: > 70	-0.255**	(0.127)
Life expectancy at old age	0.013*	(0.008)
Single women	-0.114*	(0.062)
Single man	-0.218***	(0.066)
Live in Paris or in the suburbs	0.042	(0.061)
No child	0.047	(0.060)
4 children or more	0.096	(0.171)
Homeowner	0.291***	(0.053)
Unemployed	-0.038	(0.139)
Inactive	-0.207	(0.187)
Retiree	-0.424***	(0.100)
Under the poverty treshold	-0.236***	(0.075)
Household income above the average income	0.135**	(0.054)
1/4 of the capital coming from an inheritance	0.060	(0.057)
Private debt (mortgage, consumer credit)	-0.013	(0.051)
Master's degree	0.080	(0.079)
High school	-0.020	(0.081)
No diploma	-0.025	(0.066)
Has a precarious employement status	0.038	(0.059)
Judges his/her carrier bad	-0.133	(0.081)
Experienced income troubles in the childhood	-0.133***	(0.049)
Has received an estimation of the pension	0.191**	(0.096)
Has received a pension record	0.087	(0.073)
Intercept	-1.288***	(0.206)
Equation 2 : retirement savings contract holding		
Age: 17-30	-0.579***	(0.118)
Age: 31-40	-0.167**	(0.075)
Age: 51-60	-0.010	(0.079)
Age: 61-70	0.052	(0.107)
Age: > 70	0.013	(0.115)
Life expectancy at old age	0.003	(0.006)
Single women	-0.242***	(0.053)
Single man	-0.045	(0.054)
Live in Paris or in the suburbs	-0.145***	(0.055)
No child	-0.084	(0.054)
4 children or more	-0.644***	(0.206)
Homeowner	0.100**	(0.045)
Unemployed	-0.868***	(0.175)
Inactive	-0.500***	(0.179)
Retiree	-0.109	(0.091)
Under the poverty treshold	-0.068	(0.062)
Household income above the average income	0.290***	(0.047)
1/4 of the capital coming from an inheritance	0.028	(0.050)
Private debt (mortgage, consumer credit)	0.088**	(0.045)
Master's degree	0.190***	(0.069)
High school	-0.155**	(0.072)
No diploma	-0.172***	(0.059)
Has a precarious employement status	0.336***	(0.054)
Judges his/her carrier bad	-0.242***	(0.071)
Experienced income troubles in the childhood	-0.097**	(0.042)
Has received an estimation of the pension	0.044	(0.093)
Has received a pension record	-0.001	(0.070)
Intercept	-0.879***	(0.171)
Equation 3 : athrho		
Intercept	0.101***	(0.030)
N	5820	
Log-likelihood	-5001.849	
$\chi^2_{(54)}$	670.815	

Significance levels :   * : 10%   ** : 5%   *** : 1%

Table 6: Marginal effect after bivariate probit model: life endowment contract for retirement motive, and retirement saving contract holding rate

Variable	Coefficient	(Std. Err.)
Pr($y_1 = 1, y_2 = 1$) = 0.029		
Age: 17-30	-0.027***	(0.003)
Age: 31-40	-0.016***	(0.003)
Age: 51-60	-0.005	(0.005)
Age: 61-70	-0.002	(0.007)
Age: > 70	-0.01*	(0.006)
Life expectancy at old age	0.0007*	(0.0004)
Single women	-0.013***	(0.003)
Single man	-0.011***	(0.003)
Live in Paris or in the suburbs	-0.003	(0.003)
No child	-0.0008	(0.004)
4 children or more	-0.017**	(0.006)
Homeowner	0.017***	(0.003)
Unemployed	-0.023***	(0.003)
Inactive	-0.019***	(0.005)
Retiree	-0.023***	(0.006)
Under the poverty treshold	-0.012***	(0.003)
Household income above the average income	0.017***	(0.003)
1/4 of the capital coming from an inheritance	0.004	(0.004)
Private debt (mortgage, consumer credit)	0.003	(0.003)
Master's degree	0.012**	(0.006)
High school	-0.006	(0.004)
No diploma	-0.008*	(0.004)
Has a precarious employement status	0.013***	(0.003)
Judges his/her carrier bad	-0.013***	(0.003)
Experienced strong income trouble in the childhood	-0.009***	(0.003)
Has received an estimation of the pension	0.012*	(0.007)
Has received a pension record	0.004	(0.005)

Significance levels : *: 10%   **: 5%   ***: 1%