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Abstract

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Introduction

We propose to study the risk of poverty according to holding behaviours among elderly people in France. In France, in 2010, the at-risk-of-poverty rate[4] of elderly people (People aged of 65 and more), amounted to 10%. In the context of pension reforms, we put forward the hypothesis that the risk of poverty among elderly people is expected to increase in the case of pension cuts. We assume that a complementary retirement income source could avoid a strong increase in the poverty risk among the pensioners. According to OECD (2005), increased retirement savings is urgently needed, particularly in countries where the benefits from a Pay-As-You-Go (PAYG) pension system are due to decrease. Reforms that have been undertaken in many OECD countries have cut benefits and will lead to lower pension expenditures. These major reforms have been introduced in most OECD countries where public pension spending is projected to rise. Indeed, over the period 2004-2050, public pension spending is projected to rise by 2.3 % of GDP on average in the EU15 Member states. In 2015, in France, Portugal, and Italy, the public spending could represent respectively 14.8%, 20.8%, 14.7% of GDP (Salomaki, 2006). In these countries, the pension systems are public and earnings-related.

To face the significant challenge of increasing public expenditures on pensions, pension reforms encouraging private pension funding are carried out in OECD countries. Pension reforms in the United Kingdom differ from those in most other European countries. Funded pensions have already been largely developed in the United Kingdom. Thus, pension reforms in the UK are more focused on providing adequate pensions for low income earners, who are more affected by the low replacement rate of the first pillar. In Germany, the 2001 reform brought changes in the first pillar pension levels through the introduction of the sustainability factor and trough the development of supplementary pension schemes, notably through the creation of the strong state supported *Riester rente*. In 2008, 12 million of Riester annuities had been contracted, for a population of 35 million Insured. In France, the situation is quite different as funded pensions are more recent: individual and professional pension plans[5] have been introduced only in 2003. The 2003 Pension Reform (Fillon Law of 2003) increased the required contribution period and attempted to homogenize the private and public sector pension regimes. The reform also strongly pushed for an increase in the importance of the second and third pillars. The introduction of new private savings vehicles encouraged employers to motivate their employees to save for retirement. Important tax benefits 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.

Reforms will increase the extent to which individuals are responsible for their retirement income. Low-income earners and women are particularly vulnerable during their working life and then during their retirement period. Over the past decades, we observe that French households have been prone to make long-term investments by contracting life endowment

[4]Defined by Eurostat as the share of persons with an equivalent disposable income before social transfers below the risk-of-poverty threshold at 60% of the national median equivalized disposable income after social transfers.

[5] These private plans are called " Plan d'épargne retraite entreprise " (PERE) and " Plan d'épargne pour la retraite collectif " (PERCO)

contracts, also called “life insurance” in France. However, they contract individual retirement savings products more rarely.

In many countries the relationship between private pensions and poverty exposure might be obvious: people who saved enough during their activity period are less exposed to poverty. However, the situation is quite different in France. The pension system used to offer high replacement rates, and people were not used to save for maintaining their standard of living during retirement. Readers have to understand the French state of mind: a great proportion of older workers consider that they signed a social contract with the welfare state. They contributed to a system promoting intergenerational risk sharing. As a result, they do not understand why the rules are changing. Only youngest cohorts of workers are aware of the demographic and economic constraint that the system is facing. It justifies our important and actual issue: if we understand how incomes from different retirement savings contracts impact the poverty risk before redistribution in France, we will be able to provide retirement policies recommendations.

Using an original representative French household data, we define econometric specifications to estimate the role of incomes from different assets in reducing the exposure of pensioners to poverty. This paper will be structured in four sections. After introducing the subject, we conduct a literature review and show how our paper complements the existing literature on poverty during the retirement. Then we expose several facts about poverty and private pension holding in France. Third, the econometrics estimates is presented. Finally, we conclude and present policy recommendations for pension systems and social savings in European countries.

I. Poverty risk, retirement and assets accumulation: a literature review

The elderly, including particularly widow and disabled, usually support a higher risk of poverty than other citizens. An abundant literature puts into perspective this overexposure in many countries. However, researchers also underline the decline of this poverty through retirement related spending programs (Albuquerque, 2003; Rupp et al., 2003; Engelhardt and Gruber, 2004, Franco et al., 2008). Poverty into retirement is no longer the major issue of retirement policies in developed countries, as the standard of living improved. Engelhardt and Gruber (2004) arrive to the conclusion that the growth of Social Security directly explains the decline in poverty among the elderly in post-World War II.

However, older widows, divorcees and single women experience the highest risk of poverty in many countries (Smeeding and Williamson 2001). The women's poverty status remains a concern in rich societies. Smeeding and Sandstrom (2005) establish that poverty is especially a problem for oldest women living alone. Different specific factors impact the women' poverty risk, but widowhood is a major cause of elder women poverty (Burkhauser et al., 2003; Yamada and Casey, 2002). Women often earned lower wages than their husbands, spent fewer years in the labour force, and experience a longer life expectancy, implying a high risk of becoming a

widow (Rupp et al., 2003). In OECD countries, older women experience a poverty rate of about 15%, compared to 10% for men (Zaidi, 2012). Only in few countries the poverty rate is higher among older men than among older women: New Zealand, The Netherlands, Luxembourg.

In the United States and in United Kingdom, the oldest pensioners suffer specifically from a higher poverty risk than younger cohorts of retirees. In the United States, when men and women age, the differential in poverty rate between both increases. Low levels of social and income-tested benefits account for the over-exposure of women in English speaking nations (Smeeding and Williamson, 2001).

In Italy the large share of public spending devoted to the elderly allowed them to fare relatively well. Franco et al. (2008) show that the economic conditions of pensioners vary a lot with age, gender, region and family characteristics. The pensioners are in average less frequently poor than younger cohorts, but some of them experience very bad economic conditions. The authors put into perspective the risks endorsed by the young generations whose job's quality and entry salaries are lower. The pension reform of 1992 could increase the risk of future poverty for these current young cohorts. They conclude that the aim of poverty reduction should be pursued through other expenditure programs.
On the opposite, the incidence of poverty is larger for retired than for not retired people in Portugal. According to Albuquerque et al. (2003), retirement is still associated with a high risk of becoming poor. The oldest cohorts of pensioners are poorer, whereas younger cohorts are better protected. This is due to the fact that many individuals do not meet the requirements to apply to social security retirement benefits.

According to Zaidi (2012), 9 OECD countries[6] experience a low poverty rate (less than 6%) among people aged of 66 and more. In general, when this poverty rate is low, the corresponding rate among the working age population is considerably higher[7]. Ten countries[8] have a lower-than-average poverty rate (7 to 13%) and eleven[9] have a higher-than-average poverty rates (higher than 15%).

In earlier articles, Bernheim et al. (2001), Hausman and Paquette (1987), Bernheim (1993) suggested that workers do not save enough to maintain their consumption level during the retirement. According to Love et al. (2007), when considering the value of Social Security and Welfare benefits, 12% of households do not have enough wealth to finance the consumption equal to the poverty line.

Some countries are able to better maintain the relative standard of living of Elder. In France, we know from the National Statistics Office (INSEE) that current retirees have in average the same standard of living than the working age population. The redistributive architecture allows to reduce the pensioners' vulnerability to poverty and inequality (Legendre, 2012). But recent reforms will increase the extent to which individuals are responsible for their retirement income. People just about to retire and younger cohorts might not have saved enough and not have anticipated the consequences of these reforms. Consequently, the risk of poverty among

[6] The Slovak Republic, Iceland, Poland, Hungary, Canada, Luxembourg, the Czech Republic, the Netherlands and New Zealand
[7] New Zealand and Poland
[8] Belgium, Italy, Finland, the United Kingdom, Denmark, Germany, Norway, France, Sweden and Austria
[9] Ireland, Mexico, Australia, the United States, Greece, Japan, Switzerland, Portugal, Spain and Turkey

elderly people is expected to increase. We know from the literature (Rupp, Strand, and Davies, 2003; Davies and Favreault, 2004) that targeted income transfer program[10] allow reducing deepen poverty among vulnerable population such as elder women. We put forward the hypothesis that retirement savings contracts could reduce the poverty risk exposure. The promotion of investment in institutional private savings could provide supplemental retirement income sources in retirement. However, less is known about the role of assets and income from savings in protecting the most vulnerable against a standard of living' fall: the literature reports on one hand the risk of poverty among pensioners in different countries, and on the other hand several researches are carried out on the topic of holding of assets generally, and retirement savings contracts especially. We propose in this paper to bridge the gap between these two important issues and to show the relationship between poverty exposure in retirement and incomes from assets.

In the US, 33.9 % of families report that the first motive to save is retirement related (Bucks, Kennickel, March and Moore, 2009). 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). In 1992, 12.3% of French households held at least one financial asset retirement related11. In 2004, they were 15.1% to hold such a contract (Brun-Schammé and Duée, 2008).

Life endowment contracts 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 a death insurance.

- And what we call "life annuities", which include 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 annuities 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 "annuities", "life annuities".

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

[10] Using simulations, Rupp, Strand and Davies show that the Supplemental Security Income in the United States targets quite efficciently benefits to poor elderly people and more specifically elder widow women.
[11] 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.

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 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), 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 is consistent with the life cycle hypothesis. Using the French Wealth survey (Patrimoine) of 1992, 1998 and 2004, Brun-Schammé and Duée (2008) 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 strongly 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 (Schammé and Duée, 2008).

Girardot and Marionnet (2007) identify three factors that most influence the type of asset detention: age, revenue, and the total amount of assets. These factors are commonly cited in the literature. In addition to considering age and revenue, Chaput and Salembier (2011) acknowledge the importance of one’s profession, family background, and even events during youth on the choice of assets. They note that households without any assets are characterized by weak financial resources, difficulties to pay their bills, social origin, and living in a large city. In terms of long-term asset detention to finance retirement, Brun-Schammé and Duée highlight the importance of the level of revenue on the amount of long term assets held. They argue that this can be explained in different ways. The higher one’s revenue is, the more one has access to

such products. Richer households tend to have more diversified portfolios, and a higher level of education is correlated with both the level of revenue and the desire to save for the future.

According to Chaput and Salembier (2011), diversified portfolio with an emphasis on real estate constitutes 13% percent of French asset holders who do not have retirement savings but who have acquired at least one or more types of property. The rich and the elderly are likely to fall within this category. They also identify a modest portfolio at the end of the life cycle which includes a savings account and the principal residence, but little else. This concerns 13% of the population, especially retired people who had a modest income. A portfolio oriented for inheritance characterizes 15% of asset holders and includes savings accounts and life insurance, but not retirement savings or real estate savings. The middle class tends to hold this type of portfolio as they age and hope to pass their wealth on to their children. The final type of portfolio concerns 9% of French asset holders and is an atypical portfolio, or one that does not include a savings account and is not very diversified. In fact, 79% of these households only have one type of financial asset and/or own their own residence. Families that of modest income at the end of their active life tend to make up a large part of these portfolios.

Garnier and Thesmar (2009) provide comparison between French asset detention with that of other countries in the OECD and divide the literature into two major approaches: macroeconomic comparisons using national accounts data and microeconomic comparisons that use household surveys. The advantage of macroeconomic studies is that the data is standardized and thus facilitates comparisons. Major results of such studies identify two groups of countries in the OECD. Southern Europe, France, Austria, Finland, and Norway all fall into a category in which financial assets represent two to three times the net revenue. On the other hand, Anglo-Saxon countries, Japan, the Netherlands, and Belgium all have total financial assets that represent about four to five times the net revenue. The authors explain that the differences in retirement systems between the countries accounts for a much of the differences in asset detention. The countries which have a retirement system based on capitalization tend to have higher asset detention rates.

Microeconomic studies look at the differences in households' asset detention in different countries; however, comparisons are more difficult to make because household surveys are not standardized. The literature has converged on several principal conclusions. First, richer households are more likely to own stocks or bonds. The interpretation of this result differs according to different authors; however, all agree with the basic principal. Calvet, Campbell and Sodini (2008) argue that richer households are less risk adverse than households of more modest income. Others argue that because poorer families may be more heavily indebted, they are not as free to invest in the stock market. On the other hand, Peress (2004) demonstrates that holding stocks or bonds has a fixed cost, which includes time to research investments and money to acquire professional advice. Households that do not have much to invest may not find the benefits worth the cost.

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 end of 2007, 2 million of individuals held a PERP, and 334 000 a PERCO

(Croguennec, 2009). 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.

II. Assets holding among French pensioners and poverty risk

II.1 Survey and methods

We use the last household survey (The Wealth 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, belonging to 15006 households. The wealth survey is particularly informative about the financial and non-financial assets of the households and questions individuals on their income, age, professional category, education/training, marital situation, and work 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.

To calculate the risk of poverty we use the income of elderly households over the twelve months prior to the survey. This income does not include redistribution. Each member of the household is assigned an income calculated using an equivalence scale. The economies of scale in housing and the consumption of goods and services are considered by controlling for household composition[12]. We assign the value of 1 to the first household member, 0.5 to each additional adult member and 0.3 to each child under 14. This methodology has the advantage of illustrating more precisely the living standard of individuals belonging to a household and to allow us to examine well-being.

To capture the exposure to poverty among retirees, we use the Foster- Greer-Thorbecke index (Foster, Greer and Thorbecke, 1984):

$$P_\alpha(y,z) = \frac{\sum_{i=1}^{q}\left((z-y_i)/z\right)^\alpha}{N}$$

Where z is the exposure-to-poverty threshold within the total population, set at 50% of the median equivalent income before redistribution, y the average income of individual i and α the

[12] Part of the existing literature underlines the potential asymmetry in the management of and access to the household's resources (Browning, Bourguignon, Chiappori and Lechene, 1994; Roy, 2005; Belleau et Proulx, 2010, 2011). Nevertheless, assuming that most households share and manage their income fairly, we deflate household resources by the number of consumption units in the household.

sensitivity aversion parameter. If $\alpha = 0$, $P_\alpha(y, z)$ provides the poverty rate, measuring the incidence of the poverty exposure. The poverty gap ($\alpha = 1$), defined as the difference between the average income among poor families and the poverty line, allows calculating the intensity of poverty. Finally, when $\alpha = 2$, the index reflects the effect of a change in income distribution among the poor.

II.2 Statistical analysis

In France, recent statistical analyses show that current retirees do not have a lower standard of living than active individuals (COR, 2008). The table 1 reports income per unity consumption (PCU) before redistribution within the whole population, compared to retirees' income PCU. We do not see significant differences, except for the 20% the richest. The 20% the richest among retirees earn 65530 euros PCU whereas this income amounts to 73303 for the 20% the richest among the whole population (See table 1).

Only few current pensioners receive an annuity in addition to their social security benefit: in average, 13% receive an annuity from an individual retirement savings contract, 8% from an occupational pension plan. For the 20% the richest, these proportions increase to 18 and 13% (See table 1).

Table 1 Income, assets holding according to quintiles

	Quintile					
	1	2	3	4	5	
Average income per CU within the population	5077	14106	21110	30717	73303	N=13681
Pensioners' average income per CU	4031	14284	21062	30597	63510	N=3421
Exposure-to-poverty threshold	9575					N=13681
Proportion of retirees receiving an annuity from an individual retirement savings contract by decile	9%	9%	11%	13%	18%	N=3343
Average proportion of retirees receiving an annuity from an individual retirement savings contract in the sample	13%					
Proportion of retirees receiving an annuity from a professionnal retirement savings contract by decile	4%	4%	8%	7%	13%	
Average proportion of retirees receiving an annuity from a professionnal retirement savings contract in the sample	8%					
Proportion of retirees receiving a property income	20%	25%	24%	26%	43%	

by percentile						
Average proportion of retirees receiving a property income in the sample	29%					
Proportion of retirees receiving a life annuity by decile	5%	6%	6%	7%	9%	
Average proportion of retirees receiving a life annuity in the sample	7%					

Source: Wealth Survey 2009-2010, INSEE

We know from the literature that the French population declares preferring life endowment contracts to prepare the retirement. However, only 7% of current retirees receive an annuity from such a contract (See table 1).

Brun-Schammé and Duée (2008) showed that the life endowment contracts holding decreases only very slightly at old ages. The authors conclude that very few households liquidate their retirement related life endowment contracts, and change their holding motive.

They keep their wealth but for other reasons (bequests, disability risk, tax deductions). This behavior probably explains that although people prefer saving throw life endowment contracts for retirement, they do not really use their contracts to have an additional retirement income source.

We highlight different interesting trends of poverty exposure by age (table 2). Firstly, we could observe that the exposure to poverty rate is lower for retired than workers. Secondly, among older people, the exposure to poverty rate is higher at oldest ages. When we take into account the poverty depth, we observe the same trend.

Table 2 Foster, Greer and Thorbeck's indicator accroding to age

	Exposure - to - poverty rate	Exposure - to - poverty gap	Squared exposure - to - poverty gap
20-59	16,60%	8,87%	6,39%
60+	15,39%	10,72%	8,62%
60-69	11,42%	7,52%	5,90%
70-79	16,72%	11,68%	9,45%
80+	22,25%	16,32%	13,32%
Pop	19,27%	10,60%	7,76%

Source: Wealth Survey 2009-2010, INSEE

We consider four types of additional incomes during retirement: an income from an individual retirement contract, from a collective retirement contract, from an individual life endowment contract and from property, including housing and land revenues.

The exposure to poverty is lower for retired having such kind of additional income (table 3). However, receiving an income from collective retirement contract and/or from property seems to protect more efficiently against the exposure to poverty than other types of contract. For instance, the exposure-to-poverty rate attains 10,81% for Retired having an annuity from a collective retirement contract against 15,74% for those who do not receive such kind of additional income (table 3). Retired receiving an annuity from an individual retirement contract are on average 14,59% under the exposure-to-poverty line.

These previous results are reinforced when we observe the poverty depth (table 3). Indeed, the poverty gap is much lower for retirees having an annuity from a collective retirement contract and/or from property incomes. The gaps attain 7,76% and 7,27%, respectively. The lowest poverty severity is reached by retirees having collective contracts (6,03%) and property (5,76%).

Table 3 Foster, Greer and Thorbeck's indicator according to holding

	Exposure - to - poverty rate		Exposure - to - poverty gap		Squared exposure - to - poverty gap	
	Receive	Do not receive	Receive	Do not receive	Receive	Do not receive
Annuity from an individual retirement contract	14,59%	15,50%	10,17%	10,79%	7,99%	8,70%
Annuity from a collective retirement contract	10,81%	15,74%	7,76%	10,95%	6,03%	8,82%
Annuity from an individual life endowment contract	14,30%	15,50%	8,76%	10,83%	6,39%	8,75%
Property income	11,57%	16,23%	7,27%	11,48%	5,76%	9,25%

Source: Wealth Survey 2009-2010, INSEE

III. Econometric analysis

III.1 The models

We estimate the exposure to poverty among French retirees. Our strategy is to put into perspective the impact of annuities variables, controlling several socio-demographic characteristics.

We test probit models explaining the probability of being exposed to risk of poverty, formulated as:

$$Y_i^* = X_i\alpha_i + u_i$$

$$u_i \sim N(0,1)$$

Where :

$$Y_i^* \begin{cases} 1 \; if \; the \; per \; consumption \; income \; is \; under \; the \; \text{exposure-to-poverty} \; line \\ 0 \; if \; the \; per \; consumption \; income \; is \; above \; the \; \text{exposure-to-poverty} \; line \end{cases}$$

We test then a second model to analyse the relationship between annuities variables and the depth of the poverty risk. We keep the sample of people exposed to poverty before redistribution. Our dependant variable is now the probability for the individuals to be within the poverty gap defined by Foster, Greer and Thorbecke (1984). This poverty gap provides policy makers with crucial information: how poor are the poor? How much should the transfer policies provide to the mean poor for jumping the poverty line? In our regression, we target people in this poverty gap to evaluate to wich extent different annuities allow them moving closer to the "exposure to poverty line" compared to the poorest.

III.2 Variables definitions

Age-Life expectancy

Bloom et al. (2003) argued that higher life expectancy should lead to an increase of precautionary savings. It may also affect supplementary retirement incomes sources and exposure to poverty. Ages are usually introduced in regressions explaining poverty, or even holding behaviors. However, to our point of view, life expectancy provides more compete information than age. Life expectancy allows controlling for many factors such as social exclusion, including for example access to health care sytems. Life expectancy depends also on gender. We propose to compare models including ages or life expectancy at each age for assessing whether or not life expectancy provides more complete information. The average age of the sample attains 72,49, with a life expectancy of 14,45 years (See table 4).

Disability

Disability may reflect two different situations among old people. First, disability might be the consequence of aging, a deterioration of the state of health among the oldest. Second, an accident may have occurred earlier in the carrier, representing a shock, which has then repercussion over the whole life. In this second case, we expect to find a positive sign in our regressions: such a carrier accident compromises the ability to save for the retirement. Proportion of disable people is higher among people exposed to poverty: 5,78% against 2,92% in the total sample (See table 4).

Gender – Matrimonial status

We consider women and man living alone. The exposure to poverty among widow is frequently underlined, particularly among women who live longer than men. However, we assume that even among men, the exposure to poverty is higher than among couples. Indeed, provided that

people live alone, they do not benefit from economies of scale in current expenditures anymore. We expect to find positive signs for both men and women living alone, but marginal effects should be higher for women. We find a higher proportion of people living alone within the sample of people under the exposure-to-poverty line.

Children

According to Scholz and Seshadri (2007), children are a significant determinant of wealth accumulation. Using a life cycle model with endogenous fertility choices, they show that children largely account for the low levels of wealth accumulation by households with low lifetime income. The number of children may affect negatively the standard of living during retirement if household did not save enough to maintain their consumption levels. Furthermore, it impacts the activity choices within households. Consequently, pension provided by the PAYG pension system might be lower for women who decided to reduce their professional activity for raising children.

Tableau 4 Descriptive statistics

	Model 1	Model 2
Exposed to poverty risk	15,31%	9,40%
Age	72,49	74,86
Life expectancy	14,45	13,9
Disabled	29,20%	5,78%
Women living alone	34,34%	46,77%
Men Living alone	13,50%	19,51%
Children	2,22	2,15
Private debt (consumption)	19,60%	12,17%
Executives	10,22%	3,57%
Farmers	8,26%	12,90%
Self employed (shopkeeper, etc.)	8,70%	9,86%
Blue Collar workers	22,47%	25,82%
Master's degree	2,84%	1,22%
Bachelor's degree	2,83%	0,81%
No diploma	82,19%	91,18%
Received Pension estimate	3,53%	4,25%
Annuity from an individual pension contract	12,50%	11,09%
Annuity from an occupational pension contract	7,81%	5,08%
Life annuity	7%	5%
Property income	28,54%	13,47%
N	3343	418

Notes: the model 1 refers to the first estimates (Probability of being exposed to the poverty risk), the second one refers to second estimates (Probability, among people exposed to poverty, of being within the poverty gap)

Sources: Wealth Survey, 2010

Private debt

Private debt includes for example consumption credit. We expect a negative sign because mainly middle or high-income earners are offered credits in France.

Educational background – professional category

Education is a proxy for the quality of job and the general economic awareness (Amerik et al., 2003; Lusardi and Mitchell, 2005, 2007). 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). We believe also, as Lusardi, Mitchell and Curto (2009), that people who lack financial literacy are much less likely to plan for retirement. Joo and Grable (2000) showed that individuals with higher education, higher income, and financially literate better plan retirement. We consider the level of education as a proxy of financial literacy and expect to find a lower exposure of literate people to poverty. However, we know that elder people are less educated than younger cohorts. Consequently, it could be relevant to consider professional category instead of educational background. Indeed, the current retirees may have experienced carrier improvement without high level of diploma. We compare competing models: a first including the level of diploma, the second including only professional categories. We propose two alternative models rather than only one to avoid a potential endogeneity bias.

Pension information

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. 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 a dummy variable representing those having received an estimate of their benefits: it concerns cohorts born between 1949 and 1953. As we selected in our sample only retired people, aged of 60 and more, we kept here only cohorts from 1949 and 1950: they represent only 3,53% of our sample. The French law on the pension information being really recent, we do not expect a strong effect on the poverty risk at old ages.

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). Lusardi and Mitchell (2005, 2007) study the consequences of financial illiteracy in the US and in other countries to better understand why retirement planning is lacking. Arrondel *and al.* (2008) 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. From this point of view, education variables and variables about the individual statements reception are complementary.

Private pension types

We include in our regressions dummies variables for people receiving annuities from individual retirement savings contracts, occupational retirement savings contracts, life endowment contracts, and incomes from property.

The relationship between private pensions and poverty exposure is not obvious in France. The pension system used to offer high replacement rates, and people were not used to save for maintaining their standard of living during retirement. Only youngest cohorts of workers are aware of the demographic and economic constraints that the system is facing. Understanding how private pensions affect the exposure to poverty before redistribution will allow promoting some savings vehicles for young workers. We also consider property incomes. According to Williamson and Smeeding (2005), homeownership may be a particularly important factor to avoid poverty at old age in countries where public pension benefits are lower compared to other countries. In case of homes' value increase, housing could become an important source of financial support.

III.3 Regression diagnostics

We wish to calculate measures of how well our models fits. After computing usual test to check the overall significance of our models, we compare different competing models. Consequently, we implement first Hosmer and Lemeshow's goodness (2000) of fit test for 10 percentiles. The test assess whether or not observed exposure-to-poverty rates match expected exposure-to-poverty rates in 10 subgroups of the model population.

We then produce observed and predicted outcomes, calculating the sensitivity and the sensibilities of the models. The sensitivity of the probit model is the probability to predict exposure to poverty among people well exposed to poverty. The specificity is the probability of predicting non-exposure to poverty among people not exposed to poverty

When estimating the model 1, the Hosmer and Lemeshow's goodness of fit test shows that the regression including life expectancy rather than the age, and the level of diploma rather than the professional category allows the predicted frequency and the observed frequency matching the most closely. With a p-value of 0,26, Hosmer and Lemeshow's goodness-of-fit test indicates that this model fits the best the data.

When estimating the model 2, the Hosmer and Lemeshow's goodness of fit test indicates that the regression including life expectancy and previous professional categories fits the best the data. In this model, using a sample of poor people, many variables are omitted. For instance, we do not find enough individuals with high level of diploma or individuals having been executives during their carrier.

After computing the Hosmer and Lemeshow's goodness of fit test, we introduce the financial wealth as a determinant of the exposure to poverty. However, it might induce an endogeneity bias that we will correct using instrumental variables.

IV/ Results

The life expectancy variable is significant and impacts negatively the exposure to poverty. It suggests that lower life expectancy is, higher is the exposure to poverty (See table 5). We remind that we considered life expectancy because it permits to control for many factors such as social exclusion, including for example access to health care systems. When introducing an age variable instead of a life expectancy one, the result is consistent with this conclusion. We find a positive and significant effect on the poverty exposure. This result suggests that the oldest retirees are more frequently exposed to the poverty risk.

Although the descriptive statistics show that poor retirees are in average oldest (See table 4), the age and the life expectancy have no significant impact among them (See table 6). It implies that age and life expectancy have no effect on the poverty intensity among people under the exposure-to-poverty line.

As we have mentioned above, disability might be the consequence of aging or a consequence of an accident earlier during the career. Among the retiree population, the disabled are more exposed to the poverty risk. We find a positive and significant effect (See table 5). Disabled had a strong constraint on the pension right accumulation during their career. Because pension benefits are calculated by considering wages, they might get lower pensions.

However, when considering the intensity of poverty – the probability to be within the poverty gap- we find a positive and significant impact (See table 6). This result suggests that among poor retirees, those receiving disability benefits are better protect. Indeed, the social security contributes to reduce the poverty depth although it does not succeed in avoiding disabled retirees the exposure to poverty.

Single compared to couple are more exposed to poverty (See table 5). This result is robust for women as well for men. Among the single, widowers are very frequent particularly among women. Being single increases the exposure to poverty of about 10% compared to couples. This could be due to the economies of scale within the household. For single persons who were already single during the working life we could suspect a negative impact of raising children: single parent families may not be able to plan retirement, even when the career is negatively impacted by time spent for children education.

Among poor people, being single does not impact the probability to be within the poverty gap.

Children have an impact on exposure to poverty. We find a negative impact on the poverty exposure among household having several children (See table 5). Raising children has a cost and constraint the ability to save. It impacts also the women career: those choosing to reduce their activity to educate children often have lower pensions. This is particularly frequent among current retired women. Indeed, the women activity rate was lower among these elder cohorts than among current working women.

The number of children has also a negative impact on the poverty depth (See table 6). These results suggest a double deep impact on exposure to poverty: first, having raised many children increases the risk of being poor, second it increases the intensity of poverty. Among poor people, those having less children are less poor: they suffer from a less intensive poverty.

Being indebted impacts negatively the exposure to poverty. In France, mostly middle or high-income earners can get credits. However, among the poor retirees, we suspect the risk of over indebtedness. Indeed the result is different when considering people under the exposure-to-poverty line: although high and middle-income earners are offered more frequently credit than poor people, some poor households contracted consumption credits. Our econometric specifications show the two aspects of indebtedness (See table 5 & 6). When households are under the exposure- to-poverty threshold, the poverty depth is higher for those who are indebted.

Among older people, the level of education is very low (82% do not have any diploma and 91% among poor retirees, table 4). The lack of financial literacy is the characteristic of this population. They did not deal with retirement planning. Having diploma protects better against the exposure of poverty as literate people better prepare their retirement (Lusardi and Mitchell, 2007). The marginal effect on the poverty exposure for those having no diploma reaches 70%. Considering the professional category instead of the level of education, confirm our previous results. The exposure of poverty is lower for previous executives than for other professional categories.

We do not find a significant impact of the introduction of the pension information right on the exposure of poverty risk. We have to remind that in France, the pension system information is new. It was introduced in 2004. In our sample, only two cohorts are concerned by this pension information system. This explains our result.

We considered in our estimate several types of retirement security: individual retirement savings contracts, occupational retirement savings contracts, and incomes from property, including land revenues.
We find a strong effect of occupational retirement savings on the exposure of poverty risk (See table 5). To have contracted this type of contract during the working life decreases by 33% the exposure to poverty.
We have also considered property incomes. The possibility to have an additional property income for retirees seems to avoid them to be exposed to the poverty. However this result is not confirmed in all our estimates of the first model. To be homeowner and/or having land revenues may give an important source of financial support.
When estimating the second model, we show that property incomes have a negative impact on the poverty intensity (See table 6). This variable captures mainly the effect of the land revenues for previous farmers. Indeed, 27% of previous poor farmers receive land revenues.

Altough we cannot confirm the effect of property income in all our regressions of exposure to poverty, the effect on poverty depth is strong.

Following the Hosmer and Lemeshow's goodness of fit test, we notice that the first estimate of the first model, including life expectancy and level of education, fits better the data. They are

great financial inequalities among retirees (Arrondel *and al.* 2008). We assume that accumulated wealth during the working life impacts the exposure to poverty. We introduce a variable of accumulated financial wealth. However, the introduction of financial wealth as an independent variable might induce an endogeneity bias. Indeed, the exposure of poverty and the financial wealth may have similar determinants. Therefore, we compute an instrumental variables estimator for financial wealth. We use as instrumental variables previous professional categories. We use first the maximum likelihood estimation and then the Newey's (1987) two-step estimator.

These new estimates allow us to confirm the significant impact of several variables (See table 7): single women and men, compared to couples, education, and having an income from a collective retirement savings contract. Among the different categories of supplementary retirement incomes, only the holding of an occupational pension plan during the working life seems to protect against the exposure to poverty. In this estimate, we are not able to confirm the impact of the property income, although many retired households receive a supplementary income trough property, including land revenue.

Conclusion

The main contribution in this paper is to better understand retirement insurance mechanisms in France and particularly those decreasing the exposure of poverty risk at old age.

We study the relationship between old age exposure to poverty (level and intensity), retirement savings holding and socio-demographics characteristics among retired. To analyse the exposure to poverty risk and the poverty risk intensity, we take into account the following socioeconomics determinants: professional categories (blue collars, white collars, employees, self-employed) also taken as a proxy of the income, education, age, life expectancy, number of children and health status.

The type of retirement insurance (individual versus collective) and level of a household's education are key feature to understand the household exposure of poverty.

We find that among the retired population, the disabled are more exposed to poverty risk. But the social security contributes to reduce the poverty depth among poor disabled retirees although it does not succeed in avoiding disabled retirees to be exposed to poverty.

This risk increased for single compared to couple for women as well for single men. Retirees with no diploma and those having several children are more exposed to poverty. We have considered in our estimate several types of retirement security: individual retirement savings contracts, collective/occupational retirement savings contracts, and incomes from property. We find a strong effect of collective/occupational retirement savings on the exposure of poverty risk. Our results suggest that occupational retirement savings reduce strongly the exposure to poverty risk. Households having contracted this type of contract during their working life are in average less exposed to poverty, the marginal effect of this variable amounts to 33%.

Property incomes are also a key factor to reduce the exposure to poverty and the depth of poverty, particularly among retirees who were not well covered by the social security during

their working life. This is the case of previous farmers. Earning land revenues allow them to suffer from a less intensive poverty than other poor pensioners. However, these revenues do not allow them to avoid the exposure to poverty before redistribution.

This analysis may be of use to policymakers working to enhance retirement security.

One recommendation would be to support the educational/training system for workers and retirees. Education may increase a household's awareness of and access to retirement financial products. A second recommendation would be to support collective pension plans. There are not well developed in France. One way to improve access to collective retirement plan through encouraging private sector firms to offer collective pension plans to their employees. Furthermore, as less-educated workers have less coverage, policy could also push for insurance expansion among low-skilled labor.

The literature shows that poor and middle-income earners contract savings products in France. However, most of the time, they are not able to increase sufficiently their wealth to maintain their standard of living during retirement. This is particularly the case for single parent households, or families with an inactive adult. That is why we believe the welfare state has to contribute encouraging retirement savings trough targeted sponsored mechanisms. It would help families who cannot save enough and promote neutral actuarial pension funding.

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Appendix

Table 5 Results of the first model: estimate of the probability to be poverty exposed

	1/ Poor	2/Poor	3/ Poor	4/ Poor
Age	- -	0.011 (2.71)***	- -	0.011 (2.66)***
Life expectancy	-0.016 (2.87)***	- -	-0.016 (2.82)**	- -
Disabled	0.407 (2.50)**	0.399 (2.44)**	0.389 (2.39)**	0.382 (2.35)**
Women living alone	0.409 (6.20)***	0.387 (5.78)***	0.418 (6.17)***	0.398 (5.80)***
Men living alone	0.393 (4.10)***	0.414 (4.36)***	0.370 (3.83)***	0.390 (4.07)***
Children	0.041 (2.37)**	0.042 (2.38)**	0.035 (2.00)**	0.036 (2.02)**
Debt	-0.219 (2.67)***	-0.219 (2.66)***	-0.210 (2.55)**	-0.211 (2.55)**
Master's degree	-0.223 (1.23)	-0.212 (1.17)	- -	- -
Bachelor's degree	-0.347 (1.56)	-0.348 (1.57)	- -	- -
No diploma	0.373 (3.87)***	0.376 (3.90)***	- -	- -
Executives			-0.292 (2.36)**	-0.286 (2.30)**
Farmer	- -	- -	0.485 (4.53)***	0.489 (4.58)***
Self employed-Shopkeeper	- -	- -	0.263 (2.47)**	0.270 (2.54)**
Employee	- -	- -	0.261 (2.91)***	0.253 (2.83)***
Blue Collar workers	- -	- -	0.340 (3.61)***	0.348 (3.69)***
Received Pension estimate	0.184 (0.90)	0.161 (0.79)	0.176 (0.85)	0.151 (0.74)

Annuity from an individual pension contract	-0.162 (1.72)*	-0.156 (1.66)*	-0.157 (1.67)*	-0.151 (1.61)*
Annuity from an occupational pension contract	-0.320 (2.55)**	-0.317 (2.53)**	-0.306 (2.44)**	-0.303 (2.41)**
Property income	-0.104 (1.51)	-0.105 (1.52)	-0.157 (2.16)**	-0.158 (2.18)**
Intercept	-1.361 (9.88)***	-2.391 (7.76)***	-1.250 (10.19)***	-2.272 (7.35)***
N	3,343	3,343	3,343	3,343
Chi2(14)	169,38***	168,43***	181,05***	180,26***
Outcomes correctly classified	87%	87%	87%	87%
Hosmer-Lemeshow Chi2(8)	10,06 Prob>Chi2 = 0,2608	16,55 Prob>Chi2 = 0,0352	10,49 Prob>Chi2 = 0,2325	11,16 Prob>Chi2 =0,1928

Table 6 Results of the second model: estimate of the probability to be within the poverty gap

	1/ Poverty gap	2/Poverty gap	3/ Poverty gap	4/ Poverty gap
Age	- -	-0.010 (0.80)	- -	-0.007 (0.58)
Life expectancy	0.013 (0.78)	- -	0.009 (0.57)	- -
Disabled	0.586 (1.75)*	0.590 (1.76)*	0.560 (1.65)*	0.563 (1.65)*
Women living alone	0.002 (0.01)	0.021 (0.11)	0.003 (0.01)	0.015 (0.08)
Men living alone	0.033 (0.12)	0.018 (0.07)	0.036 (0.13)	0.026 (0.09)
Children	-0.094 (1.77)*	-0.094 (1.77)*	-0.087 (1.63)	-0.087 (1.63)
Debt	-0.764 (2.04)**	-0.767 (2.05)**	-0.780 (2.09)**	-0.781 (2.09)**
No diploma	0.437 (1.18)	0.441 (1.18)	- -	- -
Farmer	- -	- -	-0.066 (0.22)	-0.068 (0.22)
Self employed-Shopkeeper	- -	- -	-0.024 (0.08)	-0.028 (0.09)
Employee	-	-	0.133	0.135

	-	-	(0.49)	(0.49)
Blue Collar workers	- -	- -	0.155 (0.53)	0.148 (0.50)
Received Pension estimate	0.600 (1.11)	0.599 (1.11)	0.511 (0.98)	0.511 (0.98)
Annuity from an individual pension contract	-0.295 (0.86)	-0.294 (0.86)	-0.314 (0.93)	-0.313 (0.93)
Annuity from an occupational pension contract	-0.114 (0.27)	-0.116 (0.27)	-0.154 (0.36)	-0.156 (0.36)
Property income	0.496 (2.56)**	0.496 (2.56)**	0.573 (2.64)***	0.572 (2.64)***
Intercept	-1.668 (3.60)**	-0.784 (0.83)	-1.293 (3.47)**	-0.643 (0.68)
N	404			
Chi2(14)	21,43**	21,48**	20,37*	20,3*
Outcomes correctly classified	89%	89%	88%	88%
Hosmer-Lemeshow Chi2(8)	10,92 Prob>Chi2 = 0,206	10,17 Prob>Chi2 = 0,2533	7,26 Prob>Chi2 = 0,5086	9,68 Prob>Chi2 =0,2882

Table 7 Results of the first model with correction of the endogeneity bias

	Maximum likelihood estimation	Newey's 2 step estimator
Life expectancy	-0.007 (0.62)	-0.013 (1.07)
Disabled	-0.002 (0.01)	-0.026 (0.07)
Women living alone	0.642 (4.68)***	0.723 (4.65)***
Men living alone	0.562 (2.98)***	0.658 (3.61)***
Children	0.047 (1.32)	0.058 (1.57)
Debt	-0.204 (1.06)	-0.292 (1.61)
Master's degree	-0.012 (0.03)	0.143 (0.35)
Bachelor's degree	0.014 (0.04)	0.086 (0.23)
No diploma	0.794 (4.33)***	0.857 (3.10)***

Received Pension estimate	0.512 (1.60)	0.573 (1.52)
Annuity from an individual pension contract	-0.070 (0.45)	-0.099 (0.56)
Annuity from an occupational pension contract	-0.340 (1.79)*	-0.382 (1.68)*
Property income	-0.228 (1.44)	-0.176 (0.86)
Financial wealth	0.000 (0.92)	0.000 (0.36)
Intercept	-2.040 (7.12)**	-2.238 (4.69)**
N	1,256	1,256
WaldChi2(14)	95,31***	67,48***