

# Households' Age-Wealth Profiles and the Composite 'Life Cycle-Precautionary Saving' Motive

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Abstract: Our purpose is to point out that two classical saving motives (the 'Life Cycle' and the 'Precautionary saving' motives) can partially be associated in a meaningful saving motive: the motive to 'Covering an income risk concerning the retirement period'. If this composite motive turns out to explain the increased savings of French households observed since the middle of the 1980s, it might also enable us to characterize well the global saving behaviour over the life cycle of French households. We calculate different age-wealth profiles according to different measures of the composite saving motive, we have identified. Households, which have taken precautionary measures against long-term income risk concerning retirement, may have a stronger propensity to accumulate than other households may (We consider their gross total wealth). We control for cohort effects, observed heterogeneity among households, as well as supply effects, which may affect the financial products specialized in saving for retirement.

Key words: saving – ageing – income risk – age-wealth profiles

JEL: D91, C81, C13, J26.

## *1. Introduction*

Saving rates of French households have increased during the 1980s and 1990s. In 1986, households saved 13.4 % of their gross personal income. By 1992, this rate rises up to 14.7 % and in 1998, it reaches 15.6 %. This high level of caution does not lessen as the saving rate observed in 2002 represents 16.7 %<sup>1</sup> of gross personal income. As the same time, there is an increase of the financial saving rate of households (2.9 % in 1986; 5.6 % in 1992; 6.9 % in 1998; 7.9 % in 2002). This double phenomenon leads us to examine households' accumulation motives and its evolution during the 1980s and 1990s. Could not one reason for the important increase of the French households' savings rate be, that agents became progressively aware of the long-term income risk they will have to face: the 'retirement risk'<sup>2</sup>?

We are going to examine the importance of precautionary saving concerning the income risk during retirement, but our purpose is not to identify a new motive for accumulation that could be added to the classical motives, such as Life Cycle Hypothesis<sup>3</sup>, precaution<sup>4</sup>, downpayment and bequest<sup>5</sup>. Our aim is to show that the two classical motives, Life Cycle Hypothesis and precaution, can be partially<sup>6</sup> associated in one saving motive 'Covering an income risk concerning the retirement period'. This composite saving motive may be explanatory for global accumulation, in the sense that households having this motive may have a different saving behaviour during their life cycle than households, which do not have this saving motive. We are going to identify different age-wealth profiles according to different measures of this saving motive. These age-wealth profiles will be calculated after having controlled for cohort effects and observed heterogeneity. The comparison of the age-wealth profiles of households (inquired by the I.N.S.E.E. in 1986, 1992 and 1998) will then enable us to determine whether the composite accumulation motive has significantly modified the global accumulation behaviour since the middle of the 1980s, when French households became progressively aware of the 'retirement risk'.

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<sup>1</sup> Source: I.N.S.E.E. National Accounts.

<sup>2</sup> The 'retirement risk' groups all the uncertainties undergone during the retirement period: income, health, dependency, longevity...

<sup>3</sup> Cf. Pioneer works of MODIGLIANI F. and BRUMBERG R. (1954), ANDO A. and MODIGLIANI F. (1963).

<sup>4</sup> Formalized by KIMBALL M.S. (1990) with the third derivative of the utility function.

<sup>5</sup> Cf. Survey of KOTLIKOFF L.J. (1988) on the saving motives in relation with intergenerational transfers on American data.

<sup>6</sup> The precaution aims at covering the fluctuations of activity income at short or medium term but can equally serve to cover a fluctuation (decrease) in long-term income (retirement).

The precautionary motive concerning 'retirement risk' has to be defined from the classical accumulation motives of households, in theoretical terms. We then have to distinguish the impact of this particular motive on accumulation behaviour, which supposes to value the change of accumulation caused by motives other than this precaution against 'retirement risk'.

The motive of precaution against income risk during retirement comprises the motive of Life Cycle and a part of the classical Precautionary saving motive (the part that aims at covering the long-term income risk at the horizon of retirement). Let us give some theoretical background to this composite motive.

A Certainty Equivalence (CEQ) model<sup>7</sup> leads the representative agent with stationary incomes to accumulate over the Life Cycle without any precautionary behaviour<sup>8</sup>. In this case, the 'composite' motive and the 'Life Cycle' motive turn out to be the same. Because the incomes are supposed to be stationary, and because these forward-looking agents do not take the third derivative of the utility into account, there cannot be any long-term income risk related to retirement pension schemes in these CEQ modelizations. This is to say, agents are supposed to have a correct anticipation of retirement income distribution in the PAYG system: the parameters of the system do not change significantly during the agent's life cycle or these changes of parameters are correctly anticipated.

On the contrary, if the precautionary motive includes a long-term caution, due to the uncertainty about the evolution of the parameters of the PAYG pension scheme, then the saving motive 'covering an income risk during retirement' becomes composite, including the primary motives of 'Life Cycle Hypothesis' and 'Precautionary saving'. In a Non-CEQ model<sup>9</sup>, the forward-looking agents take the variance of future incomes into account so that the simulation of non-stationary incomes leads households to add a 'Precautionary saving' to their 'Life Cycle' saving. However, there is no way to distinguish theoretically between the precautionary motive concerning the short and the long term income risks, because income risk is unique for the short run and the long run. Our purpose is to separate these two precautionary behaviours with empirical methods.

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<sup>7</sup> HALL R.E. (1978).

<sup>8</sup> Defined by KIMBALL M. S. (1990).

We have to choose measures for the composite retirement motive, and for the accumulation motives, which we wish to control (short and medium term precautionary motive, downpayment motive, bequest motive).

Table 1 presents the measures of the saving motives we chose for our purpose.

**Table 1 - Accumulation motives of households: measures and controls**

<i>Classical accumulation motive</i>	<i>Accumulation motive in this study</i>	<i>Direct or indirect measure (PROXY variable of the motive)</i>
Precaution - short and medium term precautionary saving	- short and medium term precautionary saving	Income - Permanent income (control)
- Precaution linked to income risk during retirement (long-term)	<b>Composite motive Life Cycle.- Precautionary Saving (Covering a long term income risk concerning retirement)</b>	<b>Holding of a special retirement financial product (direct measure) and/or possession of real estate (indirect measure)</b>
Life cycle motive		
Downpayment motive	Downpayment motive	Home purchase financial product in the portfolio (control <sup>10</sup> )
Bequest motive	Bequest motive	Number of children or existence of descendants (control)

The motive of precaution against 'retirement risk' has been measured directly and indirectly. The direct measure consists in the indication of accumulation on specific supports intended to supply a differed income during retirement (binary variable). An indirect measure of this accumulation motive could be collected in a questionnaire by households' statements indicating that this is one of their motives. However, there were no questions concerning a precautionary motive linked to 'retirement risk' in the three inquiries, we have used for our study (cf. I.N.S.E.E. inquiries *Actifs financiers* 1986, and *Patrimoine* 1992 and 1998). Therefore, we use another indirect measure of the

<sup>9</sup> An example of recent Non-CEQ modelization, with a retirement income risk taking the form of uncertain medical expenses during retirement: PALUMBO M. G. (1999).

<sup>10</sup> In calculating the age-wealth profiles, we will control in a more general way the combinations of assets hold by a household.

precautionary motive concerning 'retirement risk' by taking into account the household's possession of real estates. The accumulation of real estate property is part of the prevention of income risk during retirement, because either it may economize a rent (in case the real estate owned is the main residence) or it can provide an income (in case of households owning several lodgings). Although the precaution against 'retirement risk' by this type of accumulation has an 'objective' dimension, a main residence has an inconvenient: its lack of liquidity. Because housing wealth may be correlated to the bequest motive, it cannot be used alone to be a proxy of the saving motive against long term income risks in retirement. Housing wealth is thus taken as an indirect proxy of this last mentioned motive.

We make the hypothesis that the conjunction of housing wealth and the holding of specific financial retirement assets gives a robust indication of the composite saving motive we try to identify empirically.

We now turn to the empirical study in order to estimate whether this later motive has changed global accumulation behaviour in France during the 1980s and 1990s.

## ***2. Data and measures***

We present the initial treatment of the three I.N.S.E.E. inquiries, which we used in this study, in a data frame (cf. following pages).

The fraction of households holding at least one special 'retirement' product has increased from 40% in 1986 to 45% in 1998 (39% in 1992). We define the 'Financial assets specialized for retirement' with a household's holding of at least one financial product specially designed to give a retirement asset or retirement annuities : they are of the "Life insurance" type, of the *P.E.R.* or *P.E.P* type, of the *Complementary Voluntary Pension* type (*COREVA*, *loi Madelin*, *Ancien Combattant*, *PREFON*, *CREF...*), of the "over-complementary" type or of other long-term saving assets intended for retirement.

The rate of holding assets specialized for retirement according to the 'year of birth' bracket of the reference person in the household (Cf. Figure 1, page 9) presents a hump shape profile. This distribution claims for the Life cycle hypothesis of saving, even if this hypothesis concerns accumulated amounts, not the rate of holding special financial assets. The shifting to the right of the curve (i.e. to the brackets of the elder agents) from the 1986's sample to the 1998's sample indicates that cohorts are changing their accumulation behaviour.

## ***The construction of a temporal dimension on three cross section databases***

### **The sources of the data**

We work on three inquiries of the I.N.S.E.E. (from 1986, 1992 and 1998) about financial assets and households' property. The answers have been collected during the years 1985, 1991 and 1997. The sample inquired have increased very much between these dates; the weights of extrapolation enable us to follow the characteristics of three wealth distributions, which are representative of the population of French households at regular intervals (every six years). We must indicate however that the households inquired at the three dates are not the same ones and that in the meantime the questionnaire of each of these inquiries has been transformed.

### **Constructing the data base in order to get a pseudo - panel**

We have organized a new coding of the variables of the three inquiries in order to extract a maximum of information that might be compared from one inquiry to another in order to characterize the wealth accumulation behaviour of households. This has led us to analyse the questions and the modalities of the three questionnaires. There were some variables in common, but the modalities of answers were different. Besides this, there were answers to questions asked differently that gave comparable and exploitable information.

#### **Frame 1 : The groups of variables created at the three dates**

- Retrospective variables concerning a household's personal and professional characteristics and its wealth: these variables identify elements of a household's past that a priori cannot change any more in the future, even if the composition of the household may change.
- The present characteristics of the household and its members: personal characteristics, professional activity, income, wealth.
- Variables that allow controlling a household's short and long-term accumulation behaviour even if these variables are not identical in the three inquiries.
- Variables describing opinions, which can be confronted with the stated accumulation behaviour.

The construction of identical variables for the three dates enables us to estimate cross section models and to compare these estimations in order to know the deformation of the system over time: this is an approach of comparative static. The comparison in temporal terms can also be made by bringing together the three databases into a single one of the 'pseudo-panel' type, where the accumulation behaviour of 'typical households' is observed over time.

In order to illustrate the bringing together of the three inquiries we present two examples of re-coding variables.

## Coding of the variables Wealth, Income and Social Level of a household

The 1986 inquiry does not ask any question about households' global wealth; the I.N.S.E.E. has simulated a continuous wealth variable based on the brackets of amounts of assets, which the households declared.

Income is declared in eight brackets in 1986 and in 9 brackets in 1992: the two last brackets have been grouped together in 1992; as for 1998, we have distributed the amounts of income that were declared continuously into the eight brackets of the 1986 inquiry.

**Table 2 - Characteristics of the three I.N.S.E.E. inquiries**

I.N.S.E.E. inquiry used	'Financial Assets' 1986	'Financial Assets' 1992	'Wealth' 1998
<b>Representative sample</b>		Census 1982	Census of 1990 and newly built housing constructed after 1990
<b>Method of poll</b>		Non uniform poll rate 1/400 to 1/10000	Average stratified poll rate of 1/2055.77. Second homes at a third of this rate; vacant housing at half. There is three times as much housing of self-employed persons or employers; 1.5 times as much housing of engineers, executives, professors, or public sector employees in high-ranking positions.
<b>Overrepresentation</b>		Executives and self-employed persons (particularly farmers)	Executives and self-employed persons
<b>Sample</b>	8000 households	13000 lodgings	14887 lodgings
<b>Number of responses</b>	5602 households	9530 households	10200 households 26000 persons
<b>Rate out of shot and rate of refusals</b>		15%  11,6%	14,1%  20%
<b>Correction of responses by weighting</b>		Correction on margins related to Inquiry on employment 1991	Correction on margins and correction of the non response

Sources: I.N.S.E.E. *Actifs Financiers* 1986, *Actifs Financiers* 1992 and *Patrimoine* 1998.

**Table 3 - Definition of classes of the annual income variable**

Bracket no.	1	2	3	4	5	6	7	8
<b>Range in thousands of current francs</b>	Less than 30	30 – 50	50 – 75	75 – 100	100 – 130	130 – 200	200 – 300	300 and more
<b>Median in thousands of current francs</b>	15	45	62,5	87,5	115	165	250	400 by hyp.

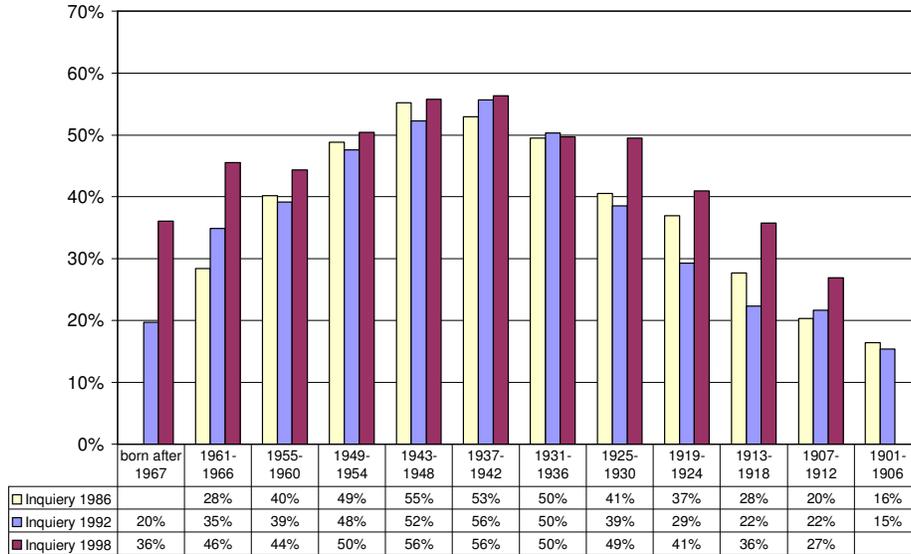
Source: I.N.S.E.E. *Actifs Financiers* 1986.

**Table 4 - Definition of the variable 'Social level of the reference person'**

Social level of the reference person (Terminology of the I.N.S.E.E.)	Socio-economic categories (grouped together)
1 Farmer ( <i>Agriculteur exploitant</i> )	11 Farmer on a small mainland ( <i>Agriculteur sur petite exploitation</i> )
	12 Farmer on a middle mainland ( <i>Agriculteur sur moyenne exploitation</i> )
	13 Farmer on a great mainland ( <i>Agriculteur sur grande exploitation</i> )
2 Craft and related trade self employed worker ( <i>Petit indépendant</i> )	21 Craft workers who manage enterprises on their own behalf ( <i>Artisan</i> )
	22 Trade workers who manage enterprises on their own behalf ( <i>Commerçant et assimilé</i> )
3 Corporate or general self employed manager ( <i>Gros indépendant</i> )	23 Head of a firm ( <i>Chef d'entreprise</i> )
4 Self employed professional ( <i>Profession libérale</i> )	31 General manager or professional who manages enterprises on their own behalf ( <i>Profession libérale</i> )
5 Senior official and manager, professional ( <i>Cadre</i> )	33 Government official ( <i>Cadre de la Fonction Publique</i> )
	34 College, University, higher and secondary teaching professional ( <i>Professeur, profession scientifique</i> )
	35 Information professional and creative or performing artist ( <i>Profession de l'information, des arts et spectacles</i> )
	37 Department manager ( <i>Cadre administratif et commercial d'entreprise</i> )
	38 Engineering science professional and associate professional ( <i>Ingénieur et cadre technique d'entreprise</i> )
6 Technician and associate professional ( <i>Profession intermédiaire</i> )	42 Primary and pre-primary teaching professional ( <i>Instituteur et assimilé</i> )
	43 Health and social associate professional ( <i>Profession intermédiaire de la santé et du travail social</i> )
	44 Religious professional ( <i>Clergé, religieux</i> )
	45 Government associate professional ( <i>Profession intermédiaire administrative de la Fonction Publique</i> )
	46 Business services agents, trade brokers, administrative associate professionals ( <i>Profession intermédiaire administrative et commerciale d'entreprise</i> )
	47 Technician ( <i>Technicien</i> )
	48 Foreman, supervisor ( <i>Contremaître, agent de maîtrise</i> )
	49
7 Clerk, service worker and shop and market worker ( <i>Employé</i> )	52 Official clerk ( <i>Employé civil et agent de service de la Fonction Publique</i> )
	53 Police and armed force ( <i>Policier, militaire</i> )
	54 Customer service clerk ( <i>Employé administratif d'entreprise</i> )
	55 Shop and market worker ( <i>Employé de commerce</i> )
	56 Personal service worker ( <i>Personnel des services directs aux particuliers</i> )
8 Plant and machine operator and assembler ( <i>Ouvrier qualifié</i> )	62 Industrial operator ( <i>Ouvrier qualifié de type industriel</i> )
	63 Craft operators ( <i>Ouvrier qualifié de type artisanal</i> )
	64 Motor vehicle driver ( <i>Chauffeur</i> )
	65 Material-recording and transport clerk ( <i>Ouvrier qualifié de la manutention, du magasinage et du transport</i> )
9 Elementary occupation ( <i>Ouvrier non qualifié</i> )	67 Industrial labourer ( <i>Ouvrier non qualifié de type industriel</i> )
	68 Craft labourer ( <i>Ouvrier non qualifié de type artisanal</i> )
	69 Farm worker ( <i>Ouvrier agricole</i> )

Sources: I.N.S.E.E. *Actifs Financiers* 1986, *Actifs Financiers* 1992 and *Patrimoine* 1998.

**Figure 1 - Rate of holding of financial 'retirement' assets according to the household's cohort**



Sources: Calculations are based on I.N.S.E.E. *Actifs Financiers* 1986, *Actifs Financiers* 1992 and *Patrimoine* 1998.

The cohorts<sup>11</sup> born after 1961 (cf. Figure 1) hold more and more specialized products for financing retirement. For the cohorts born between 1931 and 1942, the distribution remains steady. The decline of the rates of holding among the cohorts born before 1930, observed in the 1986 and 1992's samples is followed by an increase between 1992 and 1998. During the 1986-1998 period, the rise of holding rates of specialized products for financing retirement has taken place for all cohorts, except for those born between 1931 and 1942. This latter observation is also confirmed for the eldest cohorts (agents born between 1913 and 1930) and contradicts the expectation of a decumulation in the end of the life cycle.

The observed holding rate, according to the age and to the cohort, shows the existence of a cohort effect in the holding of Specialized products for financing retirement that we are

<sup>11</sup> The cohort effect is characterized by the behaviour of individuals of a given generation; it compares the average behaviour of holding assets of individuals born in the same year (or group of years) to the average behaviour of individuals born in another year. The age effect is characterized by the behaviour of individuals at a certain age whatever generation they belong to. Because the age of the individuals of a generation is necessarily the same, the cohort effect and the age effect are mixed up. The more important the temporal dimension of a panel, the easier it will be to distinguish an age effect, distinct from a cohort effect, in a particular behaviour.

going to correct, in order to identify a precautionary 'retirement' motive in the age-wealth profile of households.

Before we are going to carry out this correction of cohort effects, we identify the dominant characteristics of households having purchased specialized products for financing retirement. The estimation of a LOGIT model gives us the explicative factors of accumulation in order to prevent a 'retirement' income risk (cf. Table 5, page 10). The probability of holding a Specific 'retirement' financial asset becomes significantly higher with the household's wealth, its income and its permanent income, in case he is self-employed, has children or owns real estates. We consider in this study the holding of a specific 'retirement' financial asset as an indicator of the precautionary 'retirement risk' motive<sup>12</sup>, and we conclude that this latter caution is particularly great for households presenting the characteristics listed above.

**Table 5 - The marginal effects of LOGIT models explaining a household's holding (or absence of holding) of specialized products for financing retirement**

	Marginal effect of the 1986 model	Marginal effect of the 1992 model	Marginal effect of the 1998 model
Age	1.057*	1.106**	1.044**
Age <sup>2</sup>	0.999**	0.999**	1.000**
Number of children	1.063	0.939**	0.913**
Owing real estate	1.307	1.110	1.319**
Quartile 1 of wealth	2.352**	3.001**	5.661**
Quartile 2 of wealth	1.834**	1.997**	2.702**
Quartile 3 of wealth	1.223	1.674**	1.718**
Logarithm of current income	1.345**	1.204**	1.319**
Logarithm of permanent income	0.866**	0.985	0.986
Professional assets	0.541**	0.829**	0.841*
Number of observations	2640	4220	4447
Concordant percentage	63.1	65.4	68.7

Legend: \* significance at 5% of the corresponding estimate; \*\* significance at 1% of the corresponding estimate.

Owning real estate is a factor that increases the probability of holding of a specific 'retirement' financial asset; we have stated in a preliminary hypothesis, that real estate property is indirectly part of the precautionary 'retirement' saving motive. Thus, the joint

<sup>12</sup> To cover a income risk during retirement.

holding of Specialized products for financing retirement and real estate property becomes crucial in order to characterize the precautionary saving motive for retirement<sup>13</sup>.

We have just pointed out that there is a cohort effect in the holding of Specialized products for financing retirement; we show now that a cohort effect is also to be found in the conjoint holding of Specialized products for financing retirement and real estate property. The most frequent types of portfolio composition<sup>14</sup> enclose a cohort effect, which is presented in Table 6.

**Table 6 - Most frequent combination of assets, by representative persons of the same cohort: only real estate, home purchase financial assets and specialized products for financing retirement have been taken into account.**

Legend: 1 Home purchase financial assets (1) without specialized products for financing retirement (2) nor real estate (3)  
 1+2+3 Home purchase financial assets with specialized products for financing retirement and real estate  
 3 Real estate without specialized products for financing retirement nor home purchase financial assets  
 3+2 Real estate with specialized products for financing retirement without home purchase financial assets  
 N.C. Not calculated

Cohort	Inquiry 1986	Inquiry 1992	Inquiry 1998
Born after 1967	N.C.	1	1
1961-1966	1	1	1+2+3
1955-1960	1	3	1+2+3
1949-1954	3	3	1+2+3
1943-1948	3+2	1+2+3	1+2+3
1937-1942	3+2	3+2	1+2+3
1931-1936	3+2	3	3
1925-1930	3	3	3
1919-1924	3	3	3
1913-1918	3	3	3
1907-1912	3	3	3
1901-1906	3	3	N.C.

<sup>13</sup> We will calculate an age-wealth profile according to the holding of specialized products for financing retirement in general and for owners of real estate in particular.

<sup>14</sup> We create for our study a typology variable controlling the asset composition of wealth (its modalities are: - no assets - assets with neither real estate nor specific financial 'retirement' assets -

There is a substitution between different types of assets during the life cycle. The different cohorts seem to change the asset combination they hold in majority at the same age. Four important points mark this change in cohort's behaviour:

- The cohorts born before 1930 hold, at least the majority of them, real estate but no home purchase financial assets nor specific 'retirement' saving assets.
- The combination of real estate and specific retirement saving assets without home purchase financial assets prevails for the cohorts born between 1931 and 1948 in the 1986's sample. While the majority of the oldest agents, born between 1931 and 1936, liquidate their specialized products for financing retirement, younger ones, born between 1937 and 1948, acquire additionally home purchase financial assets in order to complete their portfolio. Between the 1992 and 1998's samples, this phenomenon concerns the cohorts born between 1937 and 1942, and between the 1986 and 1992's samples, it concerns the cohorts born between 1943 and 1948.
- The cohorts born between 1949 and 1966 hold as soon as possible the three types of assets.
- Most of the households with a representative agent born after 1967 just hold home purchase financial assets.

The change in the accumulation behaviour of different cohorts can thus be resumed in two ways. The cohorts born between 1943 and 1948 still hold home purchase financial assets in the 1992's sample, while the preceding cohorts most commonly did no longer hold this type of asset at the same age. The cohorts born between 1937 and 1942 do not liquidate their specialized products for financing retirement in the 1998's sample (unlike the preceding cohorts at the same age) and they even re-acquire home purchase financial assets (their seniors had not). These observations point out that a correction of the cohort effects is needed in order to explain the effects of the composition of wealth on its amount.

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real estate without specific financial 'retirement' assets - specific financial 'retirement' assets  
without real estate - specific financial 'retirement' assets and real estate)

### 3. The age-wealth profiles according to the existence of a precautionary motive to cover a 'retirement risk'.

We use a continuous measure for a household's global wealth which we deflate in the 1992 and 1998's inquiries in order to express wealth in 1985 current prices (1985 is the year of the collection of data of the first inquiry *Financial assets 1986*). The amount of the wealth includes the household's real estate and its financial and professional assets.

We first correct the cohort effect in order to be able to identify pure age effects in our final age-wealth profiles. This correction is possible because we work on data that can be transformed into a pseudo-panel: with information collected at three dates, we have one degree of freedom to separate age effects and cohort effects. For this purpose, we use the method of POTERBA (2001)<sup>15</sup>. We build up 107 pseudo-cohorts 'i' (or *pseudo-households*), which have the average accumulation behaviour of the agents grouped together in the pseudo-cohort. A pseudo-household groups households that are born in an interval of 6 years and are issued from the same social level<sup>16</sup>. The average accumulation behaviour of these pseudo-households is calculated at the three dates of the inquiries (1986, 1992 and 1998). We thus estimate the individual-temporal equation on pseudo-panel data with a fixed effect:

$$W_{it} = \sum_{i=1}^{12} \alpha_i AGE_{ijt} + \sum_{j=1}^{12} \beta_j COH_{ij} + u_{it} \quad [1]$$

With  $W_{it}$  the wealth of the cohort i at the date t, t=1986,1992,1998,  $AGE_i$ , the indicators of age brackets (every six years) and  $COH_j$ , the indicators of cohorts of the year of birth (every six years),  $u_{it}$  is a transitory wealth which is not correlated to age nor on the cohort's year of birth. This last term is not correlated with the total wealth  $W_{it}$ .

The estimates issued from this regression on pseudo-panel data which are associated with the indicators of cohorts ( $\beta_j$ ) measure the cohort effects. We subtract these cohort effects

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<sup>15</sup> POTERBA (2001) uses five dates to distinguish between age and cohort effects. Our three dates enable us to follow POTERBA's method with an unique degree of freedom.

<sup>16</sup> The social level variable is built up by the INSEE institute. This variable groups socio-professional categories, and does not distinguish retired agents and still active working agents; this allows a pseudo-household to pass over into retirement during the 12 years observed in the pseudo-panel. This variable is presented in the data frame.

from the original data (Cf. Table 7, page 14). This allows us to correct the cohort effects on the individual data<sup>17</sup> and to estimate the age-wealth profiles without cohort effects.

**Table 7 - Regression on data of pseudo-panel in order to distinguish the effects of age and of cohort**

Age 18 - 26	-107146 (-1.02)	Cohort <=1906	-441254 (-4.43)**
Age 27 - 32	-16785 (-0.18)	1907 - 1912	-458102 (-5.04)**
Age 33 - 38	56578 (0.66)	1913 - 1918	-417167 (-4.93)**
Age 39 - 44	117643 (1.50)	1919 - 1924	-336080 (-4.31)**
Age 45 - 50	161745 (2.29)*	1925 - 1930	-251405 (-3.69)**
Age 51 - 56	172700 (2.78)**	1931 - 1936	-191624 (-3.21)**
Age 57 - 62	169170 (3.09)**	1937 - 1942	-150387 (-2.97)**
Age 63 - 68	179254 (4.03)**	1943 - 1948	-116272 (-2.64)**
Age 69 - 74	172359 (4.85)**	1949 - 1954	-82100 (-2.31)*
Age 75 - 80	165851 (5.80)**	1955 - 1960	-48647 (-1.78)
Age 80 - 86	141790 (6.31)**	1961 - 1966	-28746 (-1.40)
Age >= 87	- -	1967 - 1972	- -

Number of observations : 107 pseudo-households \* 3 dates (86;92;98) = 321  
R<sup>2</sup> : 0,9914

Legend: estimates in FRF (Student statistics); \*\* significance at 1%; \* significance at 5%

The pseudo-panel data (previously built up) enable us to calculate a permanent income, which is then instrumented in order to be introduced into the final estimation of the age-wealth profiles: this permanent income is the control variable of a precautionary saving motive concerning the short-term or medium-term (Cf. Table 1, page 4). The different steps for calculating the household's permanent income are listed below.

We can estimate, according to the method of KING and DICKS-MIREAUX (1982), a permanent income for the pseudo-household 'i' ( $y_i$ ) by considering the expression of the current income of the household 'i' during the period t ( $REVCOUR_{it}$ ). We note  $Z_{it}$  the characteristics of the household, which are susceptible to change over time (such as the household's age, the household's size...), and  $s_i$  the characteristics, which can be considered as invariable over time (the number of years spent studying, the social level...).  $\bar{Z}$  corresponds to the standardized characteristics of the sample (the middle line of the sample's age, i.e. 49 years, the average size of the household, i.e. 2 persons, the average number of incomes of the household, i.e. 1). The permanent income of a pseudo-household over its life cycle can then be expressed by:

<sup>17</sup> A correcting coefficient is applied to the total wealth of each household according on the year of

$$y_i = \bar{Z}\gamma + s_i \quad [2]$$

$\gamma$  and  $s_i$  must be estimated. Now, it is possible to express the current income as a function of permanent income, of a year indicator ( $ENQ_i$ ) and of a transitory income which is not correlated with the other components of the income (Cf.[3]). This specification implies that the rises of income observed are exclusively linked with age, as the cohort effects have been neutralized and observed heterogeneity among pseudo-households has been controlled (in the vectors  $Z_{it}$  and  $s_i$ ).

$$REVCOUR_{it} = y_i + (Z_{it} - \bar{Z})\gamma + ENQ_t + u_{it} = Z_{it}\gamma + s_i + ENQ_t + u_{it} \quad [3]$$

We have estimated this equation on pseudo-panel data with a fixed effect: the current income is built as the sum of labour income and social transfers, net from social contributions. The vector of the characteristics  $Z_{it}$  of the pseudo-household comprises a polynomial of degree three of the age of the reference person of the household and the household's size. The characteristics, which are invariant over time, are simplified into the number of years spent studying.

**Table 8 - Regression on data of pseudo-panel for the calculation of a permanent income of the pseudo-household**

Intercept	-526670	(-10,34)**
Age (continuous)	26687	(11,60)**
Size of the household	14267	(4,14)**
Age <sup>2</sup>	-383.087	(-11,33)**
Age <sup>3</sup>	1.721	(10,72)**
Number of observations : 107 pseudo-households *		
3 dates (86;92;98) = 324		
R <sup>2</sup> : 0,9624		

Legend: estimates in FRF (Student statistics); \*\* significance at 1%; \* significance at 5%

In order to identify the permanent income of the household, we calculate a standard pseudo-household's permanent income  $\hat{y} = \bar{Z}\gamma$ , which will allow us to find the permanent income of the pseudo-household  $\hat{y}_i = \hat{y} + s_i$ . This permanent income is attributed to households having the same characteristics as the pseudo-household. However, as this permanent income is the result of a regression that may contain errors in

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birth of its reference person.

the measurement of the variables, we have to instrument it in order to integrate it into our final estimation. We proceed to double least squares using as instruments the number of years studied by the reference person of the household. It is the permanent income foreseen by this regression that is introduced into the final regression explaining the total wealth of a household.

If we separate different sections in the life cycle, the estimation of age-wealth profiles will give us the moment, when agents transform their accumulation behaviour. For this reason, we linearize the life cycle hump shape profile<sup>18</sup>. We undertake an approximation in four linear sections of this life cycle profile by the distinction of four age-brackets, with thresholds corresponding to the age quartiles (37, 49 and 65 years). We proceed to the linear regressions on indicators of the four age brackets in order to measure the declivity of the profile corresponding to the four age groups delimited by the quartiles. This allows us to build up a new control variable which is a measure of the difference of the inclinations of age-wealth profiles, for each age bracket, according to whether there is a specific retirement accumulation motive or not (cf. Variables 'Precaution for retirement' \*Group of age 1 to 4). This variable controls the supply effect of the specialized products for financing retirement. A positive difference of declivity indicates that there is a more important accumulation or decumulation by households with a precautionary saving motive concerning the retirement income risk, than there is by those households that have no such motive.

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<sup>18</sup> Following the method of JUERGES H. (2001).

**Table 9 - Age-Wealth profiles according to different measures of the long term precautionary behaviour, with a control of the difference in behaviour of groups having this long term precautionary behavior or not**

Measure of the 'Precaution for retirement'	Holding of specialized products for financing retirement			Holding of specialized products for financing retirement AND real estate		
	1986	1992	1998	1986	1992	1998
Group of age 1	<b>-147</b> (-2.29)*	<b>-403</b> (-8.58)**	<b>-61</b> (-2.14)*	<b>-157</b> (-2.59)**	<b>-420</b> (-9.60)**	<b>-62</b> (-2.44)*
Group of age 2	<b>69</b> (0.80)	<b>-269</b> (-4.87)**	<b>117</b> (3.98)**	<b>52</b> (0.64)	<b>-266</b> (-5.01)**	<b>115</b> (4.20)**
Group of age 3	<b>350</b> (5.08)**	<b>145</b> (2.66)**	<b>336</b> (11.12)**	<b>352</b> (5.26)**	<b>129</b> (-2.48)*	<b>328</b> (11.66)**
Group of age 4	<b>412</b> (5.88)**	<b>282</b> (6.14)**	<b>504</b> (19.90)**	<b>420</b> (6.10)**	<b>285</b> (6.37)**	<b>503</b> (21.39)**
Self-employed worker	738 (10.09)**	772 (13.88)**	659 (23.18)**	713 (9.75)**	734 (13.21)**	620 (22.04)**
'Precaution for retirement' * Group of age 1	13 (0.11)	-40 (-0.48)	85 (1.96)	280 (1.80)	<b>283</b> (2.37)*	<b>398</b> (7.03)**
'Precaution for retirement' * Group of age 2	159 (1.23)	109 (1.36)	<b>239</b> (6.03)**	<b>372</b> (2.65)**	<b>248</b> (2.91)**	<b>441</b> (10.66)**
'Precaution for retirement' * Group of age 3	<b>533</b> (4.56)**	<b>181</b> (2.32)*	<b>324</b> (8.29)**	<b>754</b> (6.01)**	<b>343</b> (4.25)**	<b>478</b> (12.25)**
'Precaution for retirement' * Group of age 4	<b>304</b> (1.64)	<b>616</b> (6.50)**	<b>307</b> (8.05)**	<b>541</b> (2.52)*	<b>916</b> (8.76)**	<b>480</b> (11.98)**
Short and medium term precaution (income-permanent income)	4.55 (14.42)**	6.65 (34.52)**	2.33 (23.01)**	4.38 (13.82)**	6.46 (33.38)**	2.09 (20.83)**
Number of observations :	5602	9514	9748	5602	9514	9748
R <sup>2</sup> :	0.1818	0.2977	0.4216	0.1857	0.3018	0.4369

Legend: estimates in thousand FRF (Student statistics); \*\* significance at 1%; \* significance at 5%.

In Table 9<sup>19</sup>, we present the age-wealth profiles of households according to different measures of the long-term precautionary behaviour, with a control of the difference in behaviour of groups having (or not) this long-term precautionary behaviour. The two measures of the 'Precaution for retirement' are the holding of both specialized products for financing retirement and real estate<sup>20</sup> or only the holding of specialized products for financing retirement.

The control we realized on the difference of behaviour between the households, which have - or do not have - a precautionary motive to cover a 'retirement risk', captures the additional accumulation of households that are saving especially for retirement. These control variables are not significant for Group of age 1 and 2 in 1986 and 1992, with 'Precaution for retirement' measured by the holding of specialized products for financing retirement. The increased significance of these control variables between 1986 and 1998 for the youngest households indicates an earlier long-term precautionary behaviour that could be the sign of better information of households concerning the long-term income risk they have to face.

The estimated age effects go along with the pure life cycle hypothesis of saving, in the 1986's sample: the sum of the estimates concerning each age group<sup>21</sup> increase until age bracket 3 and then decline (as age bracket 4 corresponds to retirement). They do not decline for the 1992 and 1998's samples: there is a non-decumulation of households at the end of their life cycle, for households with a precautionary motive concerning 'retirement risk' (i.e. holding at least one Specific 'retirement' financial asset or holding a real estate and a Specific 'retirement' financial asset). The Retirement Saving Puzzle discovered is robust with different measures of the composite 'Life cycle-Precautionary saving' motive.

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<sup>19</sup> Page 17.

<sup>20</sup> The composite motive 'Life cycle - Precautionary Saving' is measured in a more robust way because we have a combination of the direct and the indirect measures of the saving motive of "covering a retirement income risk". This robustness is confirmed with the highest R<sup>2</sup> of the second series of regressions.

An independent activity increase global accumulation, as expected. Global accumulation rises also with a higher difference between income and permanent income: the short and medium term precautionary savings will be higher, which contributes to raise the global accumulation.

<sup>21</sup> [Group of age x]+['Precaution for retirement' \*Group of age x]

#### ***4. Conclusion***

The cohort effects and the observed heterogeneity having been controlled, we can conclude that the non-decumulation in old age is a mere age modification in saving behaviour, proper to the motive of precaution against 'retirement risk'. Another finding is that the information going along with the long term-term income risk (the 'retirement risk') has spread among the youngest households between 1986 and 1998. This modification in behaviour has taken place between the years 1986 and 1992, and it may explain the high rate of households' savings observed in France since the middle of the 1980s.

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