Long-Term Care insurance versus self-insurance:

Are assets substitute or complementary to Long-Term Care Insurance?

Roméo Fontaine
LEDi, Université de Bourgogne – Franche Comté (UMR CNRS 630, U1200 Inserm)
et Fondation Médéric Alzheimer

Manuel Plisson
Fondation Médéric Alzheimer

Nina Zerrar
LEDa-LEGOS, PSL, Université Paris-Dauphine et Fondation Médéric Alzheimer

Very preliminary version, do not cite

Abstract: In the economic literature, many studies try to explain why so few individuals subscribe to long-term care insurance. This article focuses on the relationship between LTC insurance and assets by studying simultaneously LTC insurance demand and asset accumulation using the direct observation of five dimensions of individuals' preferences (risk aversion, time preference, family altruism, informal care preference, impatience) and a measure of financial literacy allowed by the 2012 wave of the "*Préférences et Patrimoine face au temps et au risque*" (PATER) survey. We estimate a five equations multivariate probit by maximum simulated likelihood method. The LTC insurance demand is modelled using a two-part model where the first step is the dependency risk perception. Three assets outcomes are also estimated: whether the individual owns his primary residence, whether the individual owns another real property and the amount of his financial assets.

Besides the effect of socio-demographic characteristics, our results highlight the role of individuals' preferences in the decision of hedging against the risk of dependency: preference for the present plays an important role in the perception of the risk of dependency, while risk aversion, preference for family based care and altruism explain LTC insurance demand. Second, none of the three assets outcomes is significantly associated with dependency risk perception. Third, financial asset and ownership of a holiday home are negatively associated with the probability to buy a LTC insurance given the risk perception. These results suggest the patrimony so accumulated is not exclusively dedicated to LTC, but for individuals considering being one day dependent, patrimony only is partially substitutable to LTC insurance.

Key words: LTC insurance, risk perception, patrimony, time-preference, risk aversion, informal care preference, family altruism.

JEL codes: D84, G02, I13, J14.

1. Introduction

Like most industrialized countries, France is facing an ageing of its population which creates long-term care (LTC) needs and questions the financial coverage of LTC risk. LTC is defined as a range of services required by persons with a reduced degree of functional capacity, physical or cognitive, and dependent for an extended period of time on help with basic activities of daily living (ADL) (Colombo and *al.*, 2011)[1]. These services costs can be partially supported by the government but not entirely and individuals face important out-of-pocket expenditures. To cope with this financial pressure, individuals have many options: they can rely on their family as informal caregivers – when available- to diminish the cost of their LTC and/or to help them financially. For the wealthier, it is possible to draw on their savings to pay for their care but this mechanically diminishes the bequest they could leave to their family. For those to whom these two alternatives are not reachable, a private LTC insurance market exists but in most countries, the market is very small.

LTC in France

In France, dependency is directly related to the age of individuals and applies to those over 60 which is not necessarily the case in other countries. The dependent population is estimated in France between 1 and 1.2 million people when considering French public subsidy beneficiaries but rises to 3.6 million when we look at elderly people receiving formal or informal care (Soullier, 2011).

In aggregate, in 2011, Government expenditures aiming to help French elderly dependent were about €21.1 billion, which represented 1.05 per cent of GDP (Roussel and Zaidman, 2014). The same year, out-of pocket expenditures were estimated €7.2 billion and the monetary cost of informal care at €8.3 billion (Davin et al., 2014). Then, we get approximately a global cost of €36.6 billion, which represents 1.65 per cent of GDP.

Microeconomic figures are also overwhelming. The monthly out-of-pocket care expensesfor people in nursing home is about€1 500 against €800 at home (Fragonard, 2011). Given an average pension amount of €1 588 for men and €1 102 for women[2], there remains a significant shortfall. Consequently, LTC represents a highly significant financial risk for the elderly, especially if we only consider the situation of the average person. Moreover, these out-of-pocket do not uniformly pressure French elderly dependent. The poorer have to invest up to 67% of their income to pay for their care against 38% for all classes of income (Bérardier, 2012).

---

[1] In this article we will use indiscriminately "needing LTC" and "dependent" which is the French concept for LTC. Because this article is based on French data, it is important to use the concept of dependency.
[2] These data are available on the INSEE web site:
http://www.insee.fr/fr/themes/tableau.asp?reg_id=0&ref_id=NATCCF04564

In addition, the ageing of the population should therefore increase the dependent population by 100% by 2060 (Charpin, 2011) and government expenditures are expected to reach 1.77 points of GDP (Roussel and Zaidman, 2014). Given the current situation of public expenditures in France and in most of the European countries, increasing the public LTC financing will be complicated in the future. Hence, one way to resolve this dilemma is to rely on private insurance market to finance LTC. Yet most of the risk is uninsured. Indeed, the French Long Term Care Insurance (LTCI) market remains small. The coverage rate of this risk in France and in United States of America, the two biggest markets in the world, is around 15% of the persons aged 60 years and more while the coverage rate for complementary health insurance in France is 86%[3]. Hence, if some governments rely on insurance market to finance LTC in the coming decades, it appears fundamental to understand why the LTCI market is so small and how to develop it.

Several explanations have been put forward to account for this "LTC insurance puzzle" (Pestieau, Ponthière, 2010). Some refer to a non-suitable offer; others refer to a weak demand.

Due to incomplete markets, insurers only offer an annuity, which may discourage people from buying insurance (Cutler, 1993). Furthermore, while there has been no apparent confirmation of moral hazard in the American market, adverse selection cannot be ruled out (Sloan and Norton, 1997) (Finkelstein and McGarry, 2006). Indeed, on the American market, high-risk people take out more insurance than low-risk people. This seems to be offset by the fact that the people with the highest risk aversion take out most LTC insurance. These people also invest most heavily in prevention, which reduces the likelihood that they will need long-term care (Brown and Finkelstein, 2008).

However, as Brown and Finkelstein note, supply side market failures are unsatisfactory to explain this puzzle and we should also ask why demand for long-term care insurance is so low (Brown and Finkelstein, 2007).
It has been shown that the crowding out effect due to public insurance is weak when public insurance does not take into account LTC insurance benefits, which is the case in France (Brown and Finkelstein, 2007). However, it is also interesting to see if total assets and LTCI are substitute or complementary goods. Theory mostly focuses on life insurance. To our knowledge, only Davidoff studies precisely this question taking a look at the impact of home equity on LTC insurance demand. In a first step, he showed on HRS data that the ownership rate falls down with first entry in a nursing home. Secondly, he founds a U-inversed shape relationship between the ratio of home equity to

---

[3] (Haut Conseil pour l'avenir de l'assurance maladie, 2005).

wealth and LTC insurance; this result is consistent with the U-inversed shape between wealth and LTC insurance on French Bank data (Plisson, 2009). It seems that up to a certain amount of total assets LTCI might be purchased to protect inheritance and above this amount, the wealthiest people could use their assets for self-insuring. Finally, in a simple one-period insurance problem without bequest motive, home equity has a negative impact on LTC insurance demand (Davidoff, 2010). Assets are also studied as incentives to informal care. Intergenerational moral hazard may reduce LTC insurance demand as if parents are insured against the dependency risk, their children will be more likely to institutionalise them (Pauly, 1990) so parents can use bequests to elicit informal caregiving (Zweifel and Strüwe, 1996). Here, lies in the complexity of the relationship between assets and LTC insurance and the ambiguous impact of bequest motive. Parents can buy LTC insurance to protect the wealth they will leave to their heirs but, if so, they may have to give up on their informal caregivers. On the contrary, if bequest motive reduces the opportunity cost of precautionary savings, it tops up savings and makes LTC insurance less attractive; this assumption match LTC insurance rate and savings distribution on HRS data (Lockwood, 2014).

Other studies examine empirically the link between bequest and LTCI purchase. SHARE Data showed a positive correlation between the amount of inheritance people want to leave to their descendants and LTCI purchase (Courbage and Roudaut, 2008). This is consistent with results on the RAND American Life Panel where people holding LTC insurance agreed more often that it is important to leave an inheritance to their loved ones (Brown et al., 2012) but, no evidence was found on HRS data (Sloan and Norton, 1997).

Consequently, the relation between LTCI and total assets looks ambiguous. Thus, this article aims at better understand this relationship and to analyse to what extent the substitution to LTCI by total assets can explain the small size of LTCI market by studying simultaneously LTC insurance demand and asset accumulation using the direct observation of four dimensions of individuals' preferences (risk aversion, time preference, family altruism, informal care preference) and financial literacy allowed by the 2012 wave of the "Préférences et Patrimoine face au temps et au risque" PATER survey.
In order to better analyse this relation, we split the total assets in real assets (ownership of the main residence and other real estate) and financial assets (deposit, savings, etc...) since the substitution to LTCI can depend on assets' type. The LTC insurance demand is modelled using a two-part model where the first step explains the dependency risk perception and the second step is a probit explaining LTC insurance ownership conditionally to the concern of being dependent one day.

The four dimensions of individuals' preferences and financial literacy are introduced in the 5 equations. Thus, estimating simultaneously these 5 equations allow us to study correlations between these decisions at given individuals' preferences and financial literacy. We are able to focus on 3 types of correlations – (i) between assets, (ii) between assets and risk perception and (iii) LTC insurance coverage and assets – which (i) describe individuals' wealth accumulation strategies, (ii) indicate to what extent wealth is accumulated to self-insure against dependency and (iii) show for individuals concerned by being dependent one day, the relationship between assets and LTC insurance.

The article is organized as follows: Section 2 is devoted to the description of the database and the scoring strategy implemented to measure individual preferences; in section 3 we outline our empirical approach aimed to test empirically the hypothesis given by the theoretical literature and in the section 4 we present the main results.

2. Data

2.1. PATER survey

The PATER survey[4] has been initially introduced in 1998 as a complementary module of the survey "*Patrimoine*" conducted every 6 years by the French National Institute for Statistics and Economic Studies (Insee). Since then, the PATER survey became an autonomous survey under the management of Luc Arrondel and André Masson.

The very first aim of this survey was to better understand the individuals' wealth accumulation. Besides the usual sociodemographic information and wealth composition of the household the respondent belongs to, the PATER survey includes a series of measurements of individuals' attitudes towards risk and time (Arrondel& Masson, 2013). The PATER survey allows for instance to measure risk aversion and preference for the present through the traditional methods used in the literature, such as lotteries choices (Barsky et al. 1997) or self-evaluation scales (Dohmen et al. 2012). Given the number of shortcomings of these traditional measures[5], Borghans et al. (2008)suggest a "multidimensional and domain-specific approach" to measure risk and time preferences. To do so, the survey allows us to implement an original alternative method based on the calculation of synthetic and ordinal psychometric "scores". This is the method we use in this paper (see section 2.3.).

---

[4]PATER for *"Préférences et Patrimoines face au TEmps et au Risque*" ("preferences and wealth in relation to time and risk").
[5] See for instance Arrondel and Masson (2013) or Frémeaux and Arrondel (2014) for a detail review of the traditional measurements of preferences.

In this article, we use the 2011 wave that includes a dependency-specific module. Within this section, respondents were asked questions on their LTC insurance status, their dependency exposition and their risk perception. Thus, the data collected in 2011 are unique because they enable the coupling of usual individuals' social and demographic information, a very detailed overview of respondents' wealth, innovative measures of individual preferences and information on LTC coverage.

The original sample includes 3.616 respondents. In our empirical analysis, we excluded individual younger than 45 years old to focus on the later-life wealth accumulation. We also excluded people who are already dependent to focus on a population for who the dependency is still a risk. Finally, we excluded all the non-respondent to our endogenous variables. The sample used here includes 1857 individuals.

2.2. Definition of outcomes

To empirically test to what extent individual preferences drive the purchase of LTCI and self-insurance behaviour, we simultaneously consider five outcomes.

The main outcome measures the LTCI coverage through a dichotomous variable:

$$LTCI_i = \begin{cases} 1 \ if \ individual \ i \ is \ covered \ by \ a \ LTCI \\ 0 \ otherwise \end{cases}$$

In PATER survey, the individual LTC coverage is nevertheless only known for people who declare to consider the dependency risk previously in the survey. The questionnaire includes indeed a filter question allowing us identifying individuals characterized by an extreme myopia. It appears that 40% of the individuals in the sample declare not to consider the dependency risk and are thus very unlikely to develop any specific strategies to cover this risk. To take into account the high proportion of individuals not considering the dependency risk, we thus define a second dummy variable:

$$PRISK_i = \begin{cases} 1 \ if \ individual \ i \ ideclares \ considering \ dependency \ risk \\ 0 \ otherwise \end{cases}$$

Individual assets are measured through 3 distinct outcomes, indicating whether individuals own their main residence or not, whether individuals are owner of other real estate or not, and, through an ordered polytomous variable, the amount of their financial asset:

$$HMR_i = \begin{cases} 1 \ if \ individual \ i \ is \ owner \ of \ their \ household \ main \ residence \\ 0 \ otherwise \end{cases}$$

$$ORE_i = \begin{cases} 1 \ if \ individual \ i \ is \ owner \ of \ other \ real \ estate \\ 0 \ otherwise \end{cases}$$

$$FIAS_i = \begin{cases} 1 \ if \ individual \ i \ declares \ a \ financial \ asset \ smaller \ than \ 3.000€ \\ 2 \ if \ individual \ i \ declares \ a \ financial \ asset \ between \ 3.000 \ € \ and \ 29.999€ \\ 3 \ if \ individual \ i \ declares \ a \ financial \ asset \ between \ 30.000 \ € \ and \ 149.999€ \\ 4 \ if \ individual \ i \ declares \ a \ financial \ asset \ greater \ than \ 150.000 \ € \end{cases}$$

Distinguishing these threetypes of assets instead of considering total assets allow us not to assume an unrealistic identical association between LTCI and each type of assets. In particular, these different types of assets are not likely to crowd out LTC coverage in the same way because they could not be used similarly to purchase LTC services.

Table 1 gives the distributions of the main residence ownership, other real estate ownership and financial assets regarding dependency risk concern and LTCI.Column (1) shows the distribution within the sub-sample of individuals not concerned by dependency risk. Columns (2) and (3) summarize the same frequencies for individuals considering that they might be dependent one day; column (2) focuses on individuals without LTC coverage whereas column (3) informs on LTCI subscribers. The last column describes these three outcomes on the whole sample.

All of the three outcomes have significantly a different distribution within the three subsamples regarding dependency risk concern and LTCI. More precisely, the rate of main residence owners grows with dependency risk concern and LTCI purchase. The bivariate statistical test suggests a positive relation between the two decisions. Thus, main residence and LTC coverage would appear as complementary goods.

Results on other real estate ownership are less linear. Considering dependency risk seems positively associated with the latter but the relationship between LTCI and ownership of other real estate is negative. The rate of other real estate owners would decrease with dependency risk concern. At given dependency risk perception, LTCI and Other real estate seem substitutable.

Financial assets distribution varies other real estate ownership. Individuals not considering being dependent one day have less important financial assets and at a given dependency risk concern, LTCI subscribers have smaller financial assets than individuals who did not bought a LTC coverage.

	$PRISK = 0$	$PRISK = 1$		All
	n= 759	$LTCI = 0$	$LTCI = 1$	n= 1 857
	(41 %)	n= 954 (51 %)	n= 144 (8 %)	(100 %)
	(1)	(2)	(3)	(4)
Ownership of the main residence	**71,54 %**	**77,88 %**	**81,94 %**	75,61 %
Ownership of other real estate	**20,03 %**	**27,57 %**	**21,53 %**	24,02 %
Financial assets:]- ; 2 999]	**27,01 %**	**18,13 %**	**16,67 %**	21,65 %
[3 000 ; 29 999]	**37,55 %**	**36,90 %**	**44,44 %**	37,75 %
[30 000 ; 149 999]	**27,93 %**	**33,12 %**	**32,64 %**	30,96 %
[150 000 ; +[	**7,51 %**	**11,84 %**	**6,25 %**	9,64 %

Table 1: Distributions of the three assets outcomes within the sample

Note 1: Figures in bold means that the null-hypothesis of independency between the corresponding

asset outcome and LTC (concern and insurance) has been rejected at a confidence level of 1%

Note 2: $PRISK = 1$ if individual declares to consider dependency risk, 0 otherwise; $LTCI = 1$ if

individual is covered by a LTCI, 0 otherwise.

2.3. Preferences' measure

As presented before, the PATER survey has been especially designed to measure different dimensions of individual preferencesdistinguished by the theorythanks to an original scoring method[6].

Basically, this method is based on the principal that no one question is by itself satisfactory (Fremeaux and Arrondel, 2014). As a consequence, the questionnaire includes more than a hundred questions related to preferences toward risk and time. It incorporates for instance questions approaching experimental protocols by questioning individuals on hypothetical situations such as: "*Suppose you are assured at the age of 20 to have a life without any health problem. In return, you will have a shorten lifespan. Do you accept this deal?*". These abstract questions are complemented by practical questions which are relatively easy to answer, that cover a wide range of areas of life (leisure, work, family, health, retirement, consumption, and so on) and refer to both life projects and anecdotal decisions and both behaviours and opinions. As an illustration, it is for example asked people: "*When you want to offer to you a product*

---

[6]For a more detailed discussion and presentation of the scoring methodology, see Arrondel and Masson (2013).

that you really want, what do you do most often? You buy it right away / You expect sales periods / It depends on the price" or "*Is foresight part of the three main values you would like to transmit to your children? Yes / No*".

Fromall these questions, scores of preferences are constructed in five fields distinguished by the theoretical literature on LTCI demand or wealth accumulation: risk aversion, preference for present, impatience, family altruism and preferences for family based-care. The introduction of these five dimensions of individual preferences is directly motived by wealth accumulation characteristics and dependency risk specificities.

First, both wealth accumulation and LTCI purchase are intertemporal decisions: wealth accumulation permits to transfer wealth to the future and LTC coverage insure a distant risk. Thus, future oriented individuals are expected to accumulate more wealth and buy more LTCI.

Short-term impatience is also measured in this paper. Short-term impatience goes hand in hand with time preference to testify for temporal inconsistency. It explains that future oriented individuals can procrastinate costly decisions. Real estate ownerships are usual decisions in France so impatience should not impact them but financial assets and LTCI are complex, impatience is expected to have a negative impact on them.

Wealth accumulation can be due to precautionary motive. In this case, it shares the same advantage of smoothing wealth across future periods than LTC coverage. Nevertheless, wealth accumulation can be done through risky assets. The two decisions involve risk aversion. Risk haters should purchase LTCI but the impact of risk aversion on wealth accumulation is ambiguous.

The two last parameters of individual preferences are specific to LTC. LTC involves family in two different ways. First, family is the main resource of caregivers. Since Informal care and formal care are partially substitutes, the decision to purchase a LTC insurance to pay for its cares is impacted by how the individual values informal care and the well-being of its relatives. Then, intergenerational moral hazard can occurs i.e., informal caregivers can reduce their help supply when their relatives buy insurance. This mechanism then reduces the propensity to buy LTC coverage(Zweifel and Struwe, 1998).The factual substitutability between the two types of care does not matter; the intergenerational moral hazard runs since the prospect anticipates this negative link during its making decision process.

Our two family-specific preferences parameters, namely preference for family based care and altruism, can reduce or increase intergenerational moral hazard. The more the individual prefers informal care relatively to formal, the costlier the intergenerational moral hazard will be making LTC coverage strongly unattractive. Conversely, individuals can buy LTCI to protect its family from the burden of

LTC. The latter mechanism echoes to the existence of family altruism. From a theoretical point of view, family altruism corresponds to the fact that the individual considers its relatives' well-being when making decisions.

Concerning LTC, this family altruism can occurs in two different ways (Pauly, 1990; Sloan and Norton, 1997). On one hand, an individual may prefer to take the responsibility of its cares off his family. In fact, if informal care is inexpensive, it goes with indirect non-monetary costs for informal caregivers. The more altruistic individuals are therefore encouraged to buy LTC coverage. On the other hand, family altruism can be expressed as a willingness to protect family wealth e.g. particularly the bequest one can leave to its relatives. Purchasing a LTCI allows individuals to finance their long-term cares without dramatically see their assets vanish.

For all these reasons, the introduction of family altruism and preference for family-based care is necessary when studying LTCI demand, particularly in this paper where we also study the association between LTCI and wealth accumulation.

The scoring methodology implemented in this paper involves 2 steps.The first step aims to select the appropriate items entering to the five scores[7]. For this purpose, we use the item response theory (Spector, 1992). For each preference dimension we aimed to measure, we consider T items and thanks to the item rest correlation, we study the correlation between this item and the scale based on the T-1 other items. The item will contribute to the final scale if its item-rest correlation is positive and greater than 0.05. To maximise the internal consistency of the final scale, we reject items incorrectly associated to the dimension measured and the noisiest items. So, this step needs to be iterative to check whether each item-rest correlation is driven by the scale or a noisy item. The procedure will stop when all items are sufficiently correlated to the scale after removing the last worst candidates. Thus, this algorithm retains the more informative items of the dimension that we aim to measure.

Then, a factorial analysis is implemented to summarize the information held in the selected items. This method permits to weight items according to their informativeness on the dimension measured. Because all items are polytomous, a multiple correspondence analysis was run. For each individual, the preference's score equals the mean of their responses (Z_{ih}) balanced by the standard coordinate (A_h) of the considered item on the first dimension given by the multiple correspondence analysis.

---

[7] Previously, we selected all the questions of the PATER questionnaire that might be informative of at least one dimension measured here. Then, all these questions had been encoded as "-1", "0", "+1" items according to the direction of the dimension they pretend to measure.

The score is also normalised by number of items entering in the score and the square root of the corresponding principalinertia.

$$Score_i = \sum_{h=1}^{H} \frac{Z_{ih}A_h}{q\sqrt{\phi}}$$

Hence, the more the item contributes to the scale, the more it tops up the individuals score.

Table 2 summarizes the implementation of this scoring strategy to these 5 dimensions of individual preferences. Preference for the present, risk aversion and impatience are constructed from a massive numbers of items which explains their higher Cronbach alpha compared to family specific preferences. Their inertias recovered by the first dimension are mechanically smallest too.

Dimension measured	Number of items selected	Number of items retained	Internal consistency (Cronbach alpha)	Inertia recovered by the first dimension
Preference for the present (PFP)	43	30	0,5682	36,15%
Risk aversion (RA)	47	37	0,5569	25,40%
Impatience (I)	31	21	0,4858	34,24%
Altruism (A)	8	5	0,4193	88,90%
Preference for family based care (PFC)	10	8	0,4291	72,76%

Table 2: Implementation of the scoring strategy on the 5 dimensions

Obviously, individuals are correlated one to another. Table 3gathers the correlation coefficients between the 5 preferences scores. These correlations are moderate; their absolute values do not exceed 0,37. Multicolinearity might not threaten our estimations. Preference for the present and impatience are both negatively associated to the remaining scores.

	PFP	RA	I	A	PFC
PFP	1				

RA	-0,072***	1			
I	-0,083***	-0,370***	1		
A	-0,020	0,123***	-0,063***	1	
PFC	-0,134***	0,322***	-0,048**	0,273***	1

Table 3: Correlations between the five preferences' scores

*** : p-value < 0,01 , ** : p-value < 0,05, * : p-value < 0,10

2.4. Financial literacy measure

A growing literature pays attention to financial literacy as an explanatory factor of every economic decision. Financial literacy can be defined as "*peoples' ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt and pensions*" (Lusardi and Mitchell, 2014). Introducing financial literacy in wealth accumulation models enable to relax the usual hypothesis whereby individuals have perfect information and can rationally evaluate each wealth accumulation alternatives.

Most works study financial literacy in a human capital framework. Financial literacy is then seen as health or education and investing in financial literacy increase the value of expected benefits earned on financial markets. Thus, the literature focuses on the simultaneous accumulation of wealth and financial knowledge. Using a two-period model, Delavande et al (2008), Hsu (2011) and Jappelli and Padula (2013) studied the evolution of financial knowledge. Delavande et al showed that people optimally invest in financial literacy to access to higher-return assets. Hsu studied intrahousholds financial knowledge accumulation and showed that husbands specialize in financial literacy while wives only invest if necessary (for example, death of the spouses). Adding a multiperiod life cycle with endogenously determined financial literacy, Jappelli and Padula showed a positive correlation between financial literacy and wealth, and a pernicious impact of social benefits generosity on financial knowledge investment.

Financial literacy measurement is based on three concepts: i) numeracy and capacity to do calculations related to interest rate, ii) understanding inflation and iii) understanding of risk diversification. Lusardi and Mitchell (2014) proposed a measurement strategy including one question for each concept.

Numeracy is measured through "Suppose you had €1 000 in a savings account and the interest rate was 2 percent per year. After 5 years, how much do you think you would have ih the account if you left the money to grow?"[Less than €1 100**;** exactly €1 100; **more than €1 100**; refuse to response].

Understanding of inflation is attested by the following question: "Imagine that the interest rate on your savings account was 1 percent and inflation was 2 percent per year. After 1 year, would you be able to buy?"[**Less than today;** exactly the same as today; more today; do not know; refuse to response].

To measure understanding of risk diversification, this last question was asked: "Do you think that the following statement is true or false? "Here are 4 financial products. Can you rank them from the less risky to the riskiest? [Savings Account; Stocks; Bonds ; UCITS/mutual funds; do not know; refuse to response: **Stocks riskier than UCITS/mutual funds**].

Finally, the financial literacy score is a counter of correct response[8] to each question.

Because LTC insurance is a complex financial product[9], financial knowledge might be an important indicator of comprehensiveness of LTC insurance and thus, an important explanatory factor of the decision to buy LTC insurance. Lusardi and Mitchell (2007) showed that financial literacy is associated with better retirement plan and greater retirement wealth accumulation.

2.5. Others covariates

The study of the impact of individual preferences on LTCI and the link of the latter with individuals total assets is done controlling for usual sociodemographic characteristics, i.e. gender,family composition, education, income dependency of their relatives and self-attested health.

The distributions of these variables are described in Table 4.

First, we control for age. Age impacts both LTCI and dependency risk concern. The more individuals are aging, the more they learn about their probability of being dependent and the more the LTCI premium they would have to pay increase. Besides, in France, insurers mainly refuse subscriptions to LTC coverage after 70 years old. Undeniable, our estimations need to be controlled from age.

Then,since informal caregivers are mostly women, female are better aware of LTC costs and dependency occurrence. Besides, women live longer than men and then are more likely to need LTC. All these effects advocate for the necessary introductionof the gender as a control variable when studying LTC issues.

$PRISK = 0$	$PRISK = 1$		All
n= 759	$LTCI = 0$	$LTCI = 1$	n= 1 857
(41 %)	n= 954 (51 %)	n= 144 (8 %)	(100 %)

---

[8] Correct responses are in bold in the text.
[9] LTC insurance is a mix product between savings and classical insurance giving access to a lump sum pension

	(1)	(2)	(3)	(4)
Age (average)	60,20	62,38	67,44	61,88
Gender:				
Male	52,31 %	47,59 %	42,36 %	49,11 %
Female	47,69 %	52,41 %	57,64 %	50,89 %
Family composition:				
Single without children	12,65 %	16,56 %	12,50 %	14,65 %
Partnership without children	5,80 %	4,40 %	2,78 %	4,85 %
Single with children	21,74 %	22,22 %	29,86 %	22,62 %
Partnership with child	58,23 %	55,45 %	52,78 %	56,38 %
No response	1,58 %	1,36 %	2,08 %	1,51 %
Education :				
Middle school	23,72 %	20,02 %	27,08 %	22,08 %
Technical school	34,78 %	29,77 %	29,86 %	31,83 %
High school	20,82 %	23,38 %	22,92 %	22,29 %
After baccalaureate	20,69 %	26,83 %	20,14 %	23,80 %
Income:				
]-; 8 000]	20,95 %	15,51 %	11,11 %	17,39 %
[8 000; 20 000]	41,50 %	42,56 %	52,08 %	42,86 %
[20 000; 30 000]	22,79 %	26,10 %	27,08 %	24,82 %
[30 000;+]	13,44 %	13,73 %	9,03 %	13,25 %
No response	1,32 %	2,10 %	0,69 %	1,67 %
Dependency of relatives:				
Grandparents	9,49 %	9,12 %	8,33 %	9,21 %
Father	9,22 %	17,92 %	16,67 %	14,27 %
Mother	20,95 %	33,12 %	33,33 %	28,16 %
Partner	2,11 %	4,30 %	4,17 %	3,39 %
Other	24,37 %	31,34 %	30,56 %	28,43 %
Self-attested Health:				
Very good/Good	44,40 %	35,74 %	43,06 %	39,85 %
Fair	50,07 %	54,61 %	48,61 %	52,29 %
Very bad/bad	4,87 %	9,33 %	7,64 %	7,38 %
No response	0,66 %	0,31 %	0,69 %	0,48 %

Table 4: Distributions of the control variables within the sample

Note: $PRISK = 1$ if individual declares to consider dependency risk, 0 otherwise; $LTCI = 1$ if individual is covered by a LTCI, 0 otherwise.

Keeping in mind that dependency is not an illness but a state depending on social environment (WHO, 2001), family composition has to be taken into account. As elicited before, existence of informal care supply and having successors have both an impact on LTCI respectively through the preference for family based care and altruism. These argue for controlling for family composition to appropriately estimate the impact of these two preferences dimensions on LTCI.

Education and income are included to attest for individuals' human capital, solvability of LTCI demand.

Dependency of the relatives attests for exposure to dependency and awareness of its consequences. It may strongly impact the decision to buy a LTC coverage, particularly through dependency risk concern.

At last, we control for self-attested health to testify for subjective dependency risk with the idea that it measure private information related to dependency risk in particular.

3. Empirical approach

To model the relationship between LTCI and assets after controlling for individual characteristics and individual preferences we define the following latent variables:

$$HMR_i^* = \beta_{HMR}.x_i + \alpha_{HMR}.pref_i + u_{HMR}$$

$$ORE_i^* = \beta_{ORE}.x_i + \alpha_{ORE}.pref_i + u_{ORE}$$

$$FIAS_i^* = \beta_{FIAS}.x_i + \alpha_{FIAS}.pref_i + u_{FIAS}$$

$$PRISK_i^* = \beta_{RISK}.x_i + \alpha_{IRSK}.pref_i + u_{IRISK}$$

$$LTCI_i^*/(PRISK_i^* > 0) = \beta_{LTCI}.x_i + \alpha_{LTCI}.pref_i + u_{LTCI}$$

And assume that:

$$HMR_i = \begin{cases} 1 \ if \ HMR_i^* > 0 \\ 0 \ otherwise \end{cases} ; ORE_i = \begin{cases} 1 \ if \ ORE_i^* > 0 \\ 0 \ otherwise \end{cases} ; FIAS_i = \begin{cases} 1 \ if \ FIAS_i^* \leq c_1 \\ 2 \ if \ c_1 < FIAS_i^* \leq c_2 \\ 3 \ if \ c_2 < FIAS_i^* \leq c_3 \\ 4 \ if \ c_3 < FIAS_i^* \end{cases}$$

$$PRISK_i = \begin{cases} 1 \ if \ PRISK_i^* > 0 \\ 0 \ otherwise \end{cases} ; LTCI_i = \begin{cases} 1 \ if \ LTCI_i^*/(PRISK_i^* > 0) > 0 \ and \ PRISK_i^* > 0 \\ 0 \ otherwise \end{cases}$$

Where:

- x_i is a set of covariates measuring social and demographic characteristics supposed to be associated with self-insurance and/or insurance demand. It includes the financial literary score?

- $pref_i$ is a set of scores of preferences, i.e. preference for present, impatience, risk aversion, altruism and preference for family based care.

- β_{HMR}, β_{ORE}, β_{FIAS}, β_{PRISK}, β_{LTCI}, α_{HMR}, α_{ORE}, α_{FIAS}, α_{PRISK} and α_{LTCI} are coefficients to estimate

- u_{HMR}, u_{ORE}, u_{FIAS}, u_{PRISK} and u_{LTCI} are error terms.

The error terms are assumed to be i.i.d according to a multivariate Normal distribution $N(0, \Omega)$, where :

$$\Omega = \begin{pmatrix} 1 & & & & \\ \rho_{ORE,HMR} & 1 & & & \\ \rho_{FIAS,HMR} & \rho_{FIAS,ORE} & 1 & & \\ \rho_{PRISK,HMR} & \rho_{PRISK,ORE} & \rho_{PRISK,FIAS} & 1 & \\ \rho_{LTCI,HMR} & \rho_{LTCI,ORE} & \rho_{LTCI,FIAS} & . & 1 \end{pmatrix}$$

The ρ parameters are of main interest with regard to the questions we address in this paper. First, after controlling for individual characteristics, $\rho_{ORE,HMR}$, $\rho_{FIAS,HMR}$, $\rho_{FIAS,ORE}$ measure the (likely positive) association between the 3 asset outcomes. Second, $\rho_{LTCI,HMR}$, $\rho_{LTCI,ORE}$, $\rho_{LTCI,FIAS}$ measure the association between dependency risk concern and assets. Ceteris paribus, a positive association between these outcomes is expected if individuals accumulate wealth with self-insurance motive. Third, $\rho_{LTCI,HMR}$, $\rho_{LTCI,ORE}$, $\rho_{LTCI,FIAS}$ allow to investigate the association between LTC coverage (conditional on conseidering dependency risk) and assets. Positive (respectively negative) correlation coefficients are expected if assets and LTCI are substitutes (resp. complements).

It is worth mentioning that the propensity of being covered by a LTC insurance ($LTCA_i^*$) is only defined for individuals considering the dependency risk ($PRISK_i^* > 0$). We thus adopt a conditional specification similar to the two-part model proposed by Duan et al. (1983), except that the outcome of the second step is a dummy variable. We thus specify here the propensity of being insured conditionally on the fact to consider the dependency risk. An alternative would be to implement a selection model, by modelling $LTCA_i^*$ thought a marginal specification rather than a conditional specification (Poirier et Ruud, 1981). We nevertheless choose not to adopt this approach because we do not succeed to identify an exclusion constraint in the first step.

Although the identification of a selection model is theoretically permitted by the functional form of the model, it appears very weak without exclusion constraints in the first step. Multicollinearity between the explanatory variables of the model and the conditional expectation of the second-step residuals leads to very unstable estimation results. Therefore, even when the goals of the econometrician lead to favour a selection model, Monte Carlo simulation invite to favour the two-part

model where no exclusion constraint is introduced (Yu and Leung, 1996; Manning et al, 1987). From our point of view, no theoretical justification allows here to identify a variable explaining the fact to consider the dependency risk but not the fact of being covered. The main consequence of adopting a conditional specification of the propensity to be covered (two-part model) rather than a marginal specification (selection model) is to constrain our analysis to the observed behaviours. In others words, the model do not allow to analyse potential subscription behaviours in the event that individuals are considering the risk (regardless of whether or not he or she actually consider the risk). Thus, the estimated model does not allow assessing the potential subscription behaviour of an individual not considering the risk in the hypothetical event that it would consider the risk.

Because our econometric specification incorporates five equations (4 involving a dichotomous outcomes and one a ordered outcome), the likelihood function involves 5-dimensional integrals. Therefore, the model is estimated by maximum simulated likelihood using the GHK simulator (Green, 2003; Stern, 1997). The simulation of the likelihood function and the optimisation were performed using STATA 14.0.

4. Results

Table 5 outlines the estimated coefficient associated with the individual preference scores and financial literacy after controlling for a set of individual social and demographic characteristics[10]. Preference for present appears as the most significant dimension of preferences impacting wealth accumulation: as expected, the more individuals are future oriented, the more they accumulate wealth. It is worth mentioning that preference for present also affects the propensity of individual to be aware of the dependency risk but it is not associated with LTCI demand conditional on being aware of the risk. By contrast, risk aversion only impacts the LTC outcomes, both in a positive way: unsurprisingly, the more the individuals are risk-haters, the more they are concern by the dependency risk and the more they are covered by a LTCI. Risk aversion is nevertheless not significantly associated with our three asset outcomes. It may due to the fact that we do not distinguish here safe financial asset from risky financial asset. Short-term impatience is negatively associated with the three asset outcomes, but the association is only significant for financial asset. This result suggests a contrasted impact of

---

[10] Complete estimations results are available upon request. [10] The amount of financial asset is introduced as a ordered polytomous variable. These coefficients are estimated in an ordered probit where 3 cut-off are estimated (c_1, c_2, c_3) and are each one significantly different from one another.

Cut-off	Estimation	CI $_{95\%}$
c_1	-2,297	[-2,664 ; -1,930]
c_2	-1,080	[-1,445 ; -0,715]
c_3	0,180	[-0,189 ; 0,589]

impatience regarding the liquidity of wealth. Contrary to our initial assumption, the purchase of a LTCI does not appear affected by procrastination behaviour.

Family altruism and preference for family based care both impact LTCI demand (for individuals considering being one day dependent) in expected ways. Altruism has a significant positive impact on the probability to buy a LTC insurance. This is consistent with the hypothesis that LTCI are bought either to protect the bequest that individuals can leave to their family or to alleviate the burden supported by family caregivers. Furthermore, all things being equal, altruism in particular, the more individuals tend to express an attachment to family ties, the less the propensity to be covered by a LTCI. This is consistent with the intergenerational moral hazard assumption according to which the willingness to subscribe a LTCI is weaken by the fear of discourage family care provision.

OUTCOMES	HMR^* (Household main residence)	ORE^* (Other real estate)	$FIAS^*$ (Financial asset)	$PRISK^*$ (Risk concern)	$LTCI^*/(PRISK^* > 0)$ (conditional LTC insurance)
	(1)	(2)	(3)	(4)	(5)
Preference for the present	-0,785***	-0,934***	-1,145***	-0,935***	0,101
	(0,154)	(0,151)	(0,096)	(0,142)	(0,236)
Risk aversion	0,215	-0,217	-0,041	0,470***	0,545*
	(0,162)	(0,168)	(0,112)	(0,152)	(0,301)
Impatience	-0,163	-0,116	-0,521***	-0,006	0,26
	(0,111)	(0,113)	(0,081)	(0,102)	(0,173)
Altruism	0,125	0,186	-0,038	0,012	0,499***
	(0,111)	(0,117)	(0,084)	(0,104)	(0,183)
Preference for family based care	-0,078	0,047	-0,035	-0,088	-0,478**
	(0,130)	(0,138)	(0,100)	(0,122)	(0,208)
Financial literacy	0,062**	0,071***	0,133***	0,042*	0,060
	(0,026)	(0,025)	(0,192)	(0,024)	(0,038)

Table 5: Estimations for Individuals' preferences and financial literacy

*** : p-value < 0,01 , ** : p-value < 0,05, * : p-value < 0,10

Figure 1allows assessing the explanatory power of each of preference dimension on the unconditional probability to own a LTCI. Even if preference for the present and risk aversion are associated with the probability of being covered by a LTCI, the family dimension underlying LTC-related behaviour appear as the key explaining factor of the LTCI demand: individual characterised by low family altruism and a high preference for family based care are very unlikely to own a LTCI.
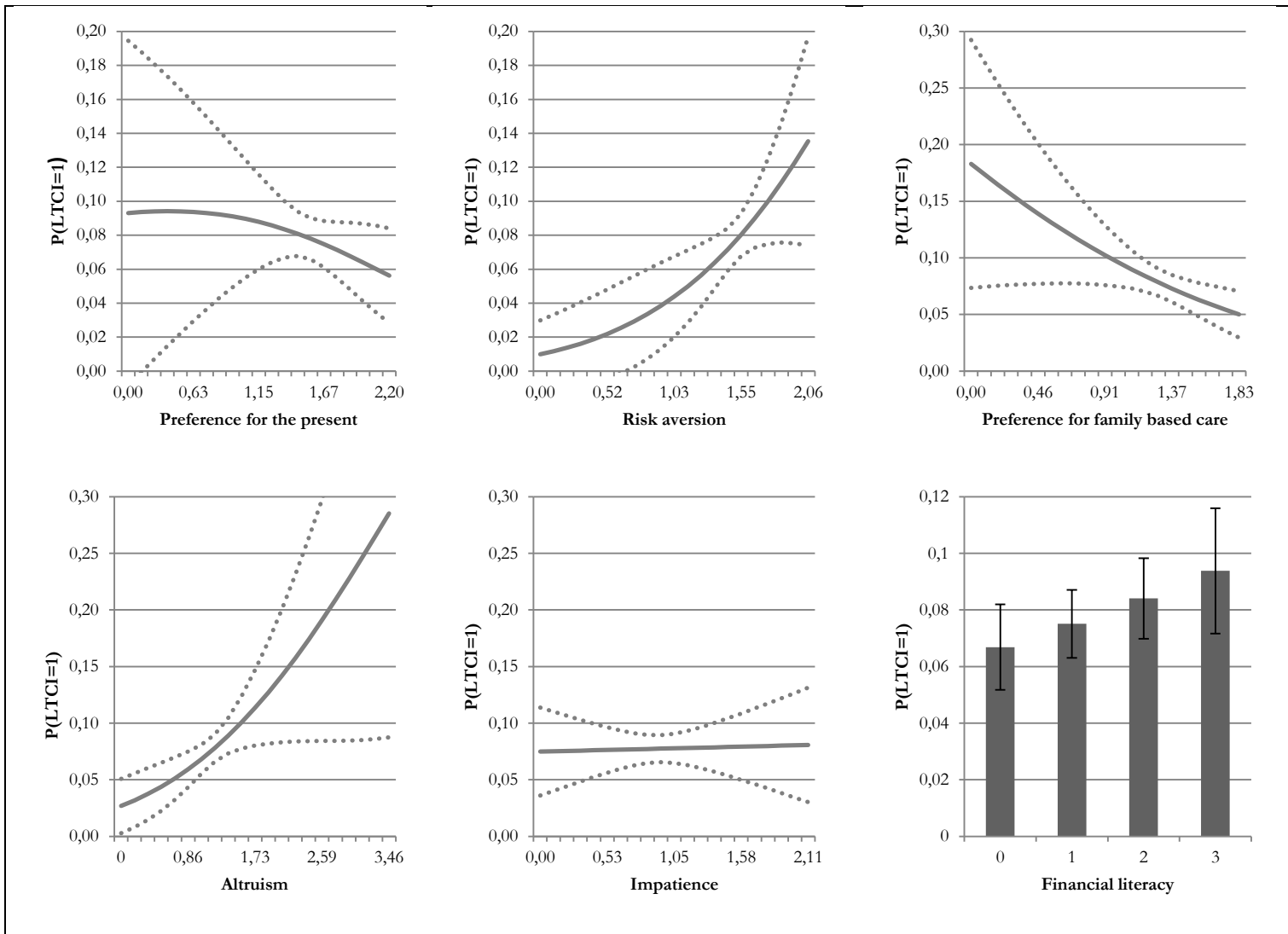
Figure 1: Mean predicted probabilities of being covered by a LTCI according to preferences scores and financial literacy

Dots lines or segments indicate 95% confidence intervals

We now turn to the association between the asset outcomes and the LTC coverage by paying attention to the estimates of the correlation coefficients. Correlation coefficients measure here the association between each outcome after controlling for potential confounding exogenous characteristics. Table 6 allows comparing the estimation results with or without controlling for preferences and financial literacy. When we do not control for preferences and financial literacy (column (1)), the three types of asset appear unsurprisingly positively and significantly associated: the higher the probability of owning one type of assets, the higher the probability of owning another type. This result is consistent with the fact that these types of asset are not substitutes and with the stylised fact that portfolio breadth increases with wealth (Arrondel et al. 2014). These positive associations remain after controlling for preferences and financial literacy (column (2)). But as expected, the association is lower in this case. Controlling for preferences – preference for the present in particular

with regard to our estimation results – and financial literacy allows controlling for confounding factors associated in the same way with the three types of asset.

The correlation coefficients between asset outcomes and dependency risk concern's residuals allow to identify self-insurance behaviours by assessing to what extent individual wealth accumulation is motivated by the dependency risk concern. When not controlling for preference and financial literacy, a positive and significant association is estimated between assets and propensity to be aware of the dependency risk. This positive association is due to individual preferences and financial literacy that tend to simultaneously explain wealth accumulation and dependency risk concern (see Table 5). Conditional on observed preferences and financial literacy, this significant correlation disappears.
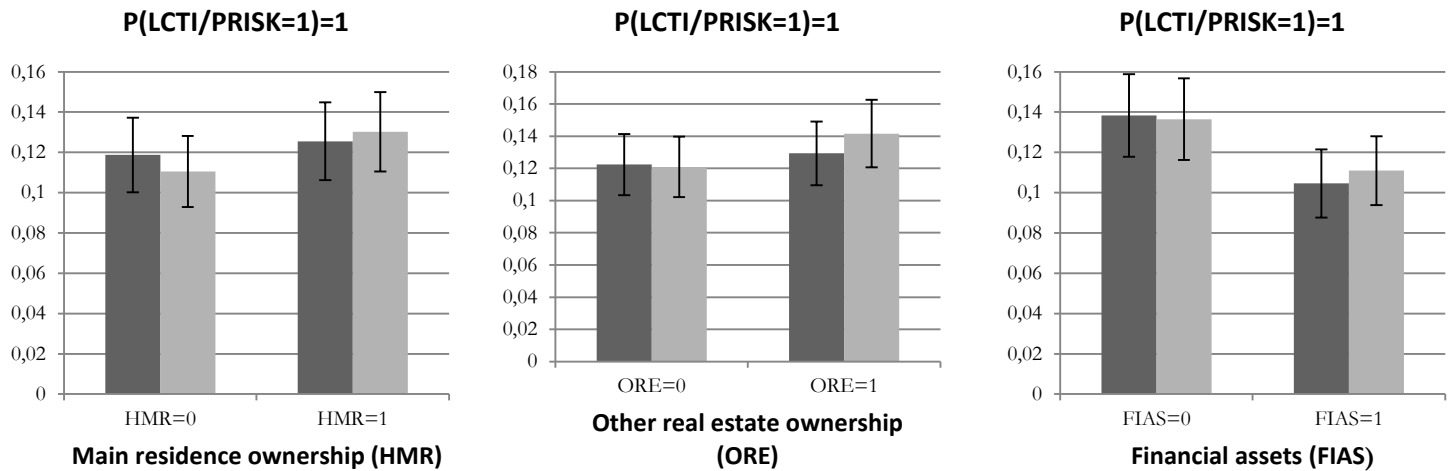
	Not controlling for individual preferences (1)	Controlling for individual preferences (2)
Associations between the three asset outcomes		
P(Main residence, Other real estate)	**0,231** [0,137 ; 0,325]	**0,196** [0,099; 0,294]
ϱ(Main residence, Financial assets)	**0,247** [0,181 ; 0,314]	**0,194** [0,125; 0,264]
ϱ(Other real estate, Financial assets)	**0,304** [0,238 ; 0,369]	**0,250** [0,181; 0,319]
Associations between assets and dependency risk concern		
ϱ(Main residence, Dependency risk concern)	**0,107** [0,024 ; 0,190]	0,059 [-0,027; 0,144]
ϱ(Other real estate, Dependency risk concern)	**0,093** [0,008 ; 0,178]	0,040 [-0,473; 0,128]
ϱ(Financial assets, Dependency risk concern)	**0.122** [0,059 ; 0,185]	0,055 [-0,010; 0,121]
Associations between assets and LTC insurance		
ϱ(Main residence, LTC insurance)	0,059 [-0,08 ; 0,200]	0,020 [-0,127; 0,167]
ϱ(Other real estate, LTC insurance)	-0.102 [-0.237 ; 0,033]	-0,109 [-0,245; 0,027]
ϱ(Financial assets, LTC insurance)	-0,080 [-0,184; 0,024]	**-0,108** [-0,214; -0,001]

**Table 6: Estimated correlation coefficient between residuals**

2.1. Mean predicted probability of owning household main residence (HMR), other real estate (ORE) and a financial asset (FIAS) higher than 30.000 €, according to dependency concern (PRISK)

P(HMR=1)   **P(ORE=1)**   **P(FIAS>30 000)**

Dependency risk perception (PRISK)
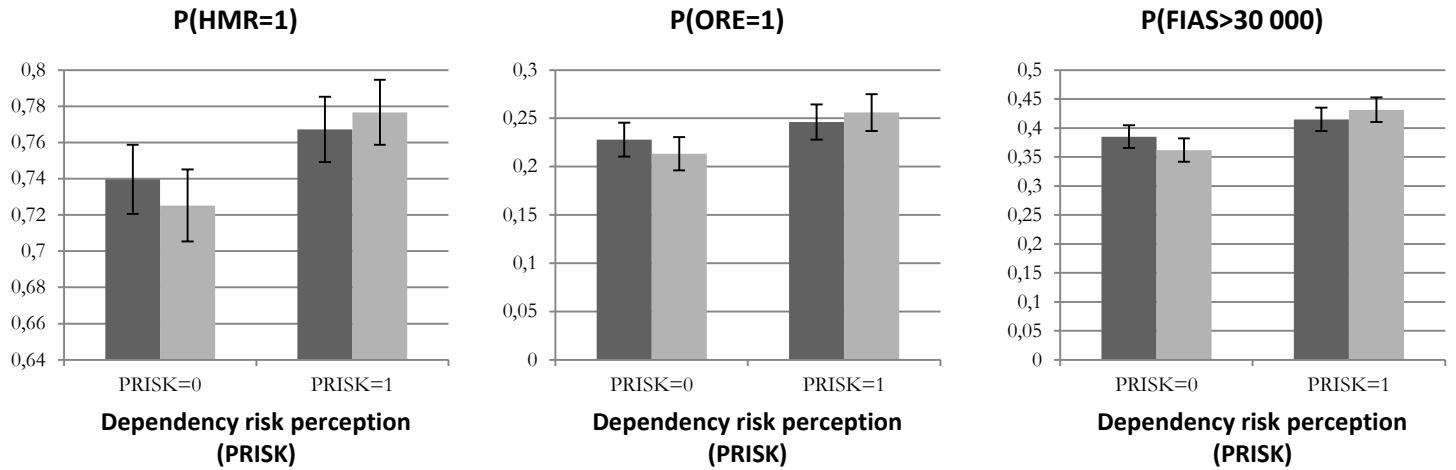
2.2. Mean predicted probability of owning a LTCI conditionally to consider the risk of being one day dependent, according to owning household main residence (HMR), other real estate (ORE) and a financial asset (FIAS) higher than 30.000 €

P(LCTI/PRISK=1)=1   **P(LCTI/PRISK=1)=1**   **P(LCTI/PRISK=1)=1**

Main residence ownership (HMR)   Other real estate ownership (ORE)   Financial assets (FIAS)

2.3. Mean (unconditional) predicted probability of owning a LTCI, according to owning household main residence (HMR), other real estate (ORE) and a financial asset (FIAS) higher than 30.000 €

LTC I   **LTC I**   **LTCI**

Main residence ownership (HMR)   Other real estate ownership (ORE)   Financial assets (FIAS)
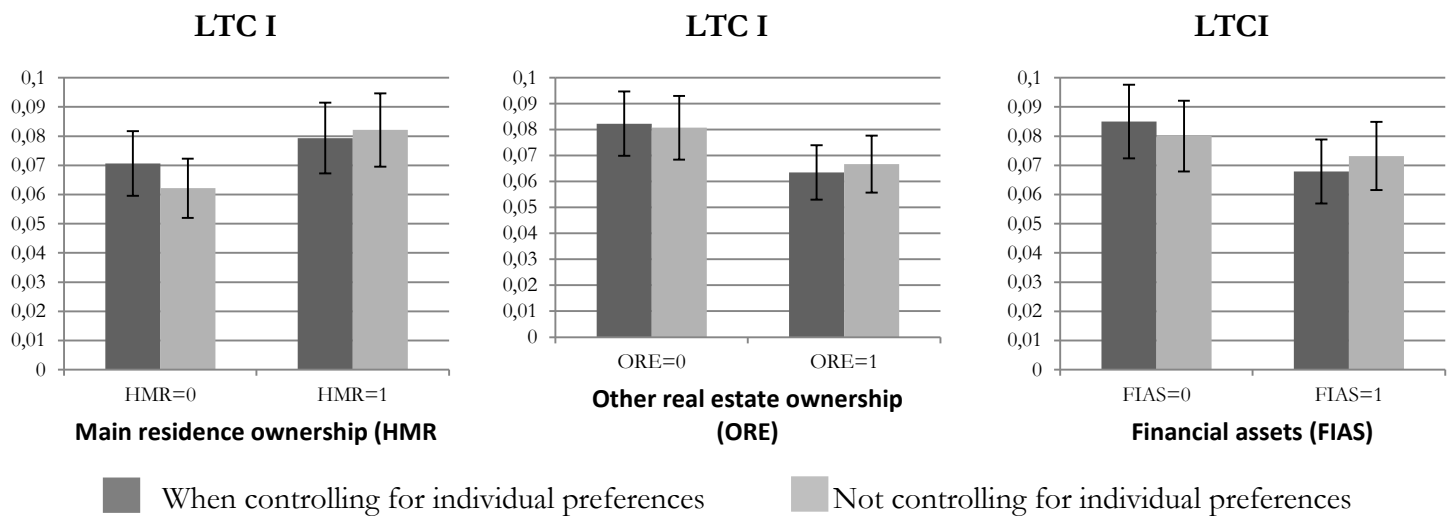
When controlling for individual preferences   Not controlling for individual preferences

Figure 2: Simulations for associations between the five outcomes

For each probability, the segment indicates the 95% confidence intervals

21

Figure 2(see 2.1) shows that the probability of owning one or another type of asset is not significantly associated with the fact of being concerned by the dependency risk when controlling for preferences and financial literacy. It means that unobserved factors increasing the propensity to be concerned by dependency risk do not modify wealth accumulation behaviour. Thus, wealth accumulation does not appear to be motivated by LTC self-insurance consideration.

But interestingly, for individuals perceiving a risk of being dependent one day, and after controlling for the main social and demographic characteristics, preferences and financial literacy, real estate[11] (other than main residence) and the amount of financial assets are negatively associated with the propensity to own a LTCI. Thus, even if wealth is not specifically accumulated to finance LTC, it is perceived as a substitute to LTCI once constituted: the higher financial asset, the lower the propensity to own LTCI. On the contrary, and not surprisingly, household main residence does not appear as a substitute to LTCI, illustrating the illiquid dimension of this asset but also presumably the very specific nature of this asset.

5. Conclusion

First, this paper highlights the impact of individual preferences on LTCI and self-insurance. In particular, family-specific dimensions of individual preferences much matter in LTC coverage purchase decision and are consistent with theoretical predictions. Hedging LTCI to protect the inheritance ones can leave to their relatives (bequest motive) and to shelter them from LTC burden look reasonable assumption regarding our empiric findings on the impact of altruism. Preference for family based care has a significant negative impact on the probability to buy LTC coverage.

Concerning the relationship between asset and LTCI, our analysis highlights two interesting results. First, wealth accumulation is not driven by a self-insurance behaviour aimed to cover dependency risk. We show in particular that after controlling for preferences and financial literacy, those who declare being concerned by the dependency risk are not characterised by higher wealth, regardless of the type of asset considered. Second, even if individuals do not accumulate wealth to self-insure against dependency risk, wealth appears *de facto* as a substitute to LTCI. Thus, precautionary savings taking the form of illiquid asset tends to crowd out LTCI demand.

To summarize, self-insurance through illiquid assets and preference for family based care are both explanatory factors of the low willingness of individuals to subscribe to a LTC insurance while the wish to protect its assets stimulate LTCI market development.

---

[11] The correlation coefficient is significant at the 11 % level.

References

Arrondel L., Bartiloro L., Fessler P., Lindner P., Mathä T. Y., Rampazzi C., Savignac F., Schmidt T., Schürz M., Vermeulen P.(2014), "How do households allocate their assets? – Stylised facts from the Eurosystem Household Finance and Consumption Survey" Deutsche Bundesbank n°12/2014.

Arrondel, L. and Fremeaux ,N. (2014),"For richer, for poorer : savings preferences and choice of spouse"THEMA Working Papers 2014-03.

Arrondel, L., and A. Masson(2013),"Measuring savers' preferences: how and why?"PSE Working Paper2013-18.

Barsky, R. B., Thomas F. Juster, Miles S. Kimball, and Mathew D. Shapiro(1997), "Preference Parameters and Individual Heterogeneity: An Experimental Approach in the Health and Retirement Study". *Quarterly Journal of Economics*, *112*(2), 537-579.

Borghans, L., Duckworth, A. L., Heckman, J. J., &TerWeel, B. (2008),"The economics and psychology of personality traits",*Journal of Human Resources*, *43*(4), 972-1059.

Brown, J. R. and Finkelstein, A. (2008), "The interaction of public and private insurance: Medicaid and the long term care insurance market", *American Economic Review* 98(3): 1083-1102.

Brown, J. and Finkelstein, A.(2007), "Why is the market for long-term care insurance so small", *Journal of Public Economics* 91: 1967-1991.

Charpin J.-M. (2011), "Perspectives démographiques et financières de la dépendance", Report of the working group number 2 chaired by Jean-Michel Charpin.

Colombo, F. et al. (2011), HelpWanted? Providing and Paying for Long-Term Care, OECD Health Policy Studies, OECD Publishing.

Courbage, C. and Roudaut, N. (2008), "Empirical evidence on Long‑term Care Insurance Purchase in France", *The Geneva's Paper*, n° 33, pp. 645‑658.

Cutler, D. (1993), "Why doesn 't the market fully insure Long term care?" NBER WP 4301.

Davin B., Paraponaris A. and Ponthière C. (2014), "L'évaluationéconomique du poids des solidaritésfamiliales", Séminaire de la Chaire Transitions démographiques – Transition économiques, Caisse des Dépôts, 20 février.

Delavande, A., Rohwedder, S., & Willis, R. J. (2008), "Preparation for retirement, financial literacy and cognitive resources", *Michigan Retirement Research Center Research Paper*, (2008-190).

Dohmen, T., Falk, A., Huffman, D., &Sunde, U. (2012), "The intergenerational transmission of risk and trust attitudes", *The Review of Economic Studies*, *79*(2), 645-677.

Duan, N., Manning, W. G., Morris, C. N., & Newhouse, J. P. (1983),"A comparison of alternative models for the demand for medical care", *Journal of business & economic statistics*, *1*(2), 115-126.

Finkelstein, A. and McGarry, K. M. (2006), "Multiple dimensions of private information: evidence from the long term care insurance market", *American Economic Review* **96**(4): 938-958.

Fragonard B. (2011), "Stratégie pour la couverture de ladépendance des personnesâgées", rapport du groupe n°4.

Greene, W. H. (2003), "Simulated likelihood estimation of the normal-gamma stochastic frontier function", *Journal of Productivity Analysis*, *19*(2-3), 179-190.

Hsu, J. W. (2011), "Aging and strategic learning: the impact of spousal incentives on financial literacy", *Networks Financial Institute Working Paper*.

Jappelli, T., &Padula, M. (2013), "Investment in financial literacy and saving decisions", *Journal of Banking & Finance*, *37*(8), 2779-2792.

Lusardi A. and Mitchell O. S. (2014), "The economic importance of financial literacy: Theory and evidence", *Journal of Economic Literature*, n° 52(1), pp. 5-44.

Manning, W. G., Newhouse, J. P., Duan, N., Keeler, E. B., & Leibowitz, A. (1987),"Health insurance and the demand for medical care: evidence from a randomized experiment",*The American economic review*, 251-277.

Pauly, M. V. (1990),"The rational nonpurchase of long-term-care insurance",*Journal of Political Economy*, 153-168.

Pestieau P. and Ponthière G. (2010), "Long Term Care Insurance Puzzle", Paris School of Economics, Working Paper N°2010-14.

Plisson, M. (2009), "Assurabilité et développement de l'assurancedépendance", thesis.report.

Poirier, D. J., and Ruud, P. A. (1981),"On the appropriateness of endogenous switching",*Journal of Econometrics*, *16*(2), 249-256.

Renoux, A., R. Roussel, and C. Zaidman (2014),"Le compte de la dépendanceen 2011 et à l'horizon 2060.",*Drees, Dossiers solidarité et santé* 50.

Sloan, F. A. and Norton, E. C. (1997),"Adverse selection, bequests, crowding out, and private demand for insurance: Evidence from the long-term care insurance market", *Journal of Risk and Uncertainty* 15: 201-219.

Soulier, N. (2011), "L'implication de l'entourage et des professionnelsauprès des personnesâgées à domicile », *Etudes et Résultats*, n°771.

Spector, P. E. (1992),"*Summated rating scale construction: An introduction*" (No. 82), Sage.

Stern, S. (1997),"Simulation-based estimation",*Journal of economic Literature*, 2006-2039.

World Health Organization (2001),"*International classification of functioning, disability and health: ICF*", World Health Organization.

Leung, S. F.and Yu, S. (1996),"On the choice between sample selection and two-part models",*Journal of econometrics*, *72*(1), 197-229.

Zweifel, P.and Struve, W. (1998),"Long term insurance in a two- generation model",*The Journal of Risk and Insurance*, *65*.