Who is willing to pay for Long-Term Care Insurance in France? Evidence from bank data

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Abstract : Private insurance for long-term care is underdeveloped in European countries and in the US. In order to better understand this market failure, we use original French bank data to study the main characteristics of long-term care insurance demand and test the existence of adverse selection. Our main results highlight a non linear effect of age, income and estate on the likelihood of purchasing a long-term care insurance contract. Moreover, estimates do not provide evidence of adverse selection on the LTC insurance market in France

JEL Classification: HO ; G22 ; I11 ; J14

Keywords: long-term care, long-term care insurance, insurance demand

1 Introduction

Long-Term Care (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]. In France, dependency is directly related to the age of individuals and applies to those over 60 which is not the case in English-speaking countries. The dependent population is estimated in France between 1 and 1.2 million people, if we consider an administrative criterion but rises to 3.6 million when we consider people receiving formal or informal care (Soullier, 2011).

From a macroeconomic point of view, LTC represents around 2% of GDP in 2011[2] (Plisson, 2011). For individuals, the net cost of institutional care varies between €1800 and €6500 per month in France. The average net cost is estimated at €2200 in rural areas and at €2900 in town and cities (Rosso-Debord, 2010). The cost of home help varies from €340 to €5300 with an average of €1800 per month in 2010 (Ennuyer, 2006).

If we compare the individual average cost with the average sum made available as part of the "dependency allowance"[3] scheme by the French Local Government (€409), we note that, on average, the government contribution represents only 30% of the average cost (Ennuyer, 2006). Given an average pension amount of €1 588 for men and €1 102 for women[4], 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. Despite the "dependency allowance", the public support remains too low to cover this financial risk.

In addition, the ageing of the population should therefore increase the dependent population by 100% by 2060 (Charpin, 2011). Given the current situation of public expenditures in

[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] We consider public and private expenditures to get this amount of 2%.
[3] called « Allocation Personnalisée d'Autonomie » in France
[4] These data are available on the INSEE web site:
http://www.insee.fr/fr/themes/tableau.asp?reg_id=0&ref_id=NATCCF04564

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 expenditure 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 supplemental health insurance in France is 86%[5]. 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 weak demand; others refer to a non suitable offer. We focus in this article on the demand side based on empirical results using data from on a portfolio of policyholders. These data comes from one of the biggest French bancassurance company which is the market leader on the LTC insurance. As insurance data, information about the usual socioeconomic and actuarial characteristics is provided. As bank data, information on the income and the wealth of individuals is available. Crossing insurance data and bank data is an original aspect of our data. A second originality is that they are not based on reported preferences (like SHARE for example) but on revealed preferences. Thus, we study in this article the influence of observed variables on the likelihood to purchase LTCI and we test the effect of adverse selection on LTCI market.

The article is organized as follows: Section 2 presents briefly the theoretical background on LTCI; Section 3 is devoted to the description of the database, in Section 4 we estimate the

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

main drivers of the insurance demand and in the Section 5 we test the presence of adverse selection in this insurance market. Finally, the final section presents a conclusion.

2 Background

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). Indeed, in 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 (Finkelstein and McGarry, 2006).

However, as Brown and Finkelstein note, supply side market failures are unsatisfactory and we should also ask why demand for long-term care insurance is so low (Brown and Finkelstein, 2007). Limited consumer rationality or misconceptions about the extent of public insurance seems less and less relevant in France (CSA, 2006). It has been shown that the crowding out effect is weak when public insurance does not take into account LTC insurance benefits, which is the case in France (Brown and Finkelstein, 2008). It is possible, however, that the demand for LTC insurance has suffered from an intergenerational moral hazard (Zweifel and Struve, 1996).

While the theoretical literature on the subject is rather abundant, relatively little empirical research has been done into the factors affecting the decision to purchase coverage, and it

relates almost exclusively to the situation in the United States and Spain to a lesser extent[6]. However, given the differences in the institutional design and in the eligibility criteria of public allowances, it remains difficult to compare the results between countries.

Consequently, in order to better understand the LTC insurance puzzle in France, we have first to understand who is buying it. This is what we set out to do as part of this research. To our knowledge this the first research to deal with bank data in the French market. One other study deals with survey data from SHARE (Courbage and Roudaut, 2007). But the SHARE survey is not suitable to study LTCI. Indeed, the dependent variable (to be insured) is built using several questions on long term health insurance. A confusion may exist for people between "to be insured against long term health care" and "to be insured against LTC". Some people, holding a health insurance might answer "yes" to this question.

3 Data

Insurance's contracts characteristics

The LTC contract offered is not really an insurance contract but rather an annuity contract. The person can take out this contract up to the age of 75 for an annuity sum defined upon subscription. Over the period considered the minimum annuity was €600 a month. The monthly premium paid by the insured person depends on the age at which he or she subscribed and the total benefits he or she wishes to receive in the event of long-term care. When his or her level of LTC is certified by the regional medical unit linked to the bank offering the insurance services, the insured person ceases to pay his or her premiums and receives a monthly annuity allowing him or her to finance their care. This benefit doesn't depend on the care expenditure. It depends on the premium paid by the policyholder. In the present case, the contract covers heavy LTC needs corresponding to GIR 1 and 2 but there is an option to receive a benefit in case of "light dependency" (GIR 3 and GIR 4). The rates do

[6] For Spain and more precisely Catalonia see: Costa-Font and Rivera-Forns (2008), for USA see Kumar and al (1995), McCall and al (1998) and Brown and Finkelstein (2006, 2007).

not take into account gender, despite the fact that, on average, women have a higher likelihood of needing long-term care and of remaining in this condition for longer than men.

Population

The data used in our study comes from a large bank in France which proposes to its clients LTC insurance. The bank offering insurance services represents approximately 20% of the long-term care insurance market in France (Decoster, 2006). Since 2001, the bank offered all its customers in a position to take out a policy (customers aged between 18 and 75 years) an individual LTC insurance.

We have two different databases. The first concerns all bank customers who started an application procedure for LTCI. This database we call further the Whole France Database. Of the 293 351 persons who applied to LTCI, 168 827 are currently covered by this contract. The others have either terminated their LTCI; or the insurer refused to insure them after having examined their application; they decided to stop the application procedure; they are dependant and they receive an annuity; they died and are consequently not insured any more.

Furthermore, we used data from "Centre" Region (region with 6 districts: Cher, Eure, Eure-et-Loire, Indre, Indre-et-Loire et Loiret). This database will be called further the Region Data. Of the 275,257 persons insurable in the portfolio of this region, 5,027 took out the contract (1.82% of the customer portfolio). We had access to a representative sample of 37.45% of the portfolio of uninsured people (a random sample of 101, 205 of uninsured customers of the bank offering insurance services) and of all the 5,027 insured customers. Descriptive statistics of this data are set out in the table 1 in Appendix. Furthermore, as this involves a bank offering insurance services, we accessed bank data (income and financial assets), which is rarely the case with insurance companies or mutual benefit societies.

The Whole France Database gives information on age, socioeconomic status, the option about partial dependency or funeral, the level of annuity chosen, the level of a premium surcharge if

the insured individual is riskier, the amount of the premium and the other insurance contracts bought by the same individual. The Region Database gives additional information about income and the person's estate. Furthermore, the Region data gives information about insured people but also about non insured people. Our data cover the period between 2002 and 2010.

Statistical treatment of data

The main advantage of the data we used is that it is data based on revealed preferences not on reported preferences. Unlike surveys by questionnaire sent to homes, we do not need to calculate the rate of participation or the rate of return since all customers were contacted. There is therefore no bias in our study caused, for example, by the over-participation to surveys by questionnaire of certain socio-economic categories (particularly the most educated). The trade-off for the exhaustive nature of this data is that we have fewer variables than in declarative survey and there are at least two other potential biases.

People owning several bank accounts

By definition, we observe the income and the financial assets in only one Bank. There is a possibility that an individual owns several bank accounts. In this case the explaining variables income and financial assets are not reliable. There is substantial likelihood that some individuals (especially high incomes) own bank accounts in other financial institutions. We applied three methods to manage this statistical bias.

- We deleted the individuals whose income was inferior to the minimum allowance for unemployed people[7] and retired people[8].

[7] This minimum allowance is called RMI in France
[8] This minimum allowance is called « Minimum Vieillesse » in France

- We introduced an explaining variable which allows classifying the customers based on their income and financial assets. This variable is very reliable because the sales programmes are based on it. Consequently, we deleted the individuals whose the income or the financial assets doesn't fit with this customers segmentation. For example, a customer of the Bank identified as a high income by the marketing department but who has a capital of €2 000 in this bank is deleted. Indeed, we can assume that that person has several bank accounts. We have also a variable which informs about the fact that the salary is deposited on the bank account. We have deleted all the individuals whose characteristics seemed inconsistent. Thus, we checked with a Logit model if these deleted individuals were not peculiar. We did not find any significant variables to explain being deleted. Hence, we were not obliged to weight the remaining data to keep the initial structure of the database.
- Finally, we estimated the models by excluding the explaining variables income and assets. The results remain robust. It leads us to think that even the income and the assets may be discussed; these variables do not destabilize the whole estimation.

Regarding the dependant variable (to be insured against LTC), it is possible in theory that an individual held another LTCI from another insurer. Nevertheless, this phenomenon should be very limited. This type of insurance is not widespread enough to prompt over insurance behaviours. Furthermore this contract is quite expensive. These over insurance behaviours would be very costly for an individual. Up to now, the LTCI is not sold in a package including other insurance contracts. Consequently, these over insurance behaviours have a very low probability. Finally, the competition on LTCI is very low in the Region we observe. For all these reasons, this potential bias should be very limited.

The potential bias of the commercial policy

The advertising campaign could prompt another bias. Here we analyze the insurance behaviors against some differences related to the demand and not related to the supply. If the commercial policies were very specific to a group of the population, our analysis could be biased. In fact, all customers were subject to the same commercial policy. For the period we observe there were no commercial policies about LTCI. This product was not a priority for the retail network of the Bank. For this reason, there is no statistical bias due to the supply side.

4 Empirical Strategy

What does determine the probability of subscribing?

In this section, we firstly look at the influence of conventional factors on the probability of subscribing to LTC cover $P(A_i = 1)$: age, sex, socio-professional category (csp), income, the person's estate using the Region database. We use the Region database because it contains some information about income and assets and about the non insured persons. We will model the effect of these variables on the probability of taking out insurance using a logit model.

(A) $$P(A_i = 1) = \alpha + X_i'\boldsymbol{\beta} + u_i$$

The matrix X contains the age, the gender, the socio-professional category, the income, assets and some family information. The age, income and assets factors have been introduced has a discrete variable in deciles and in percentiles.

Unfortunately, the data we have does not provide information directly on the preferences of individuals facing the risk of dependence. However, taking out a death & disability insurance or sick leave insurance for liberal professions may be considered as a proxy for risk aversion.

Incorporating an aversion variable in the independent risk also enables us to some extent to eliminate the effects of the other variables of the specific effect of aversion.

The results of these estimations are presented in Table 1.

Is the LTCI market subject to adverse selection?

The review of literature leads us to think that LTCI market is subject to opportunistic behaviors. These behaviors would be due to asymmetric information in favor of policyholders (Finkelstein and *al.*, 2005 ; Finkelsein and McGarry, 2006 ; Oster et *al.*, 2009 ; Webb, 2009 ; Einav and Finkelstein, 2011). Furthermore, the results from the previous section show us that the likelihood of needing LTC has a positive influence on LTCI underwriting. For all these reasons, testing adverse selection seems appropriate.

We study adverse selection rather than moral hazard. Indeed it seems difficult to imagine a moral hazard behavior on LTC, especially on heavy LTC. For this reason, the literature on moral hazard on LTC is rare.

A standard method to test adverse selection is to use a bivariate probit model as set out by Chiappori and Salanié (2000). Given the features of our data, it is not possible to apply directly this method. We do not observe the health status of people who did not buy LTCI. Therefore, we propose to adapt this method to our data. We consider only the insured people and we estimate if policyholders who bought a high level of annuity have a higher probability of needing LTC. We can test this behavior with the following model:

(B)
$$\begin{cases} Prob(high\ annuity = 1\ /\ standard\ annuity) = C + \boldsymbol{X\beta_1} + u_1 \\ Prob(dep = 1\ /\ Non\ dep) = C + \boldsymbol{X\beta_2} + u_2 \end{cases}$$

with

$$\binom{u_1}{u_2} \sim N\left(\binom{0}{0}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}\right)$$

Our goal is to observe if people who buy more insurance than the average of the insured persons are riskier than the rest of the population. In case we observe an opportunistic behaviour on this particular LTCI market of high annuity, there could be also opportunistic behaviours on the whole LTCI market.

Table 1 Demand for LTC Insurance (Region database)

method		**Logistic regression**
		Model A
Constant		-8.0346***
Age	25-29	0.5847***
	30-34 (ref)	ref
	35-39	0.9933***
	40-44	1.1819***
	45-49	1.9639***
	50-54	2.1300***
	55-59	2.2204***
	60-64	2.5319***
	65-69	2.5779***
	70-74	2.2785***
	75-79	ns
Woman		1.7968***
Socio-Professional category	Farmers and farm workers (csp1)	-0.3949*
	Craftsmen, commerce employees and company directors (csp2)	ns
	Managers and upper intellectual professions (csp3)	ref
	Intermediary professions (csp4)	0.7753***
	Office workers (csp5)	1.4418***
	Manual workers (csp6)	1.8450***
	Pensioners (csp7)	1.6605***
	Other persons with no professional activity (csp8)	1.6089***
Income	Income1 (5 000-9 745)	-0.5047***
	Income 2 (9 745-13 659)	-0.3212
	Income 3 (13659-17 130)	ns
	Income 4 (17 130-20 751)	ns
	Income 5 (20 751-25 155)	ns
	Income 6 (ref) (25 155-30 777)	ref
	Income 7 (30 777-38 531)	0.1496*
	Income 8 (38 531-49 787)	0.1669***
	Income 9 (49 787-74 469)	ns
	Income 95 (74 469-109 215)	ns
	Income 99 (109 215-252 220)	-0.3323***
	Income 100 (252 220-8 002 493)	-1.5040***
Assets (pat)	Assets1 (0)	-1.1068*
	Assets2 (1-41)	ns
	Assets3 (41-446)	0.2105***
	Assets4 (446-1 955)	0.3696***
	Assets5 (1 955-5 238.5)	ns
	Assets6 (ref) (5 238.5-10 961)	ref
	Assets7 (10 961-21 337)	ns
	Assets8 (21 337-42 618)	0.2003**
	Assets9 (42 618-94 845)	0.7519***
	Assets95 (94 845-168 551)	1.0549***
Family	Account in name of man (ref)	ref
	Account in name of woman	-0.8776***
	Joint account	-0.5933***
	Account in name of men	ns
Aversion		
Probability of dependency		
% concordant		87.5

* means Proba<0.05
** means Proba<0.01
*** means Proba<0.001

The various assets and income brackets are expressed in Euros.
The % concordant is an indicator of the quality of regression. It is calculated based on the ratio (decision of taking out insurance predicted by the model / actual decision to take out insurance).

Table 2 : Adverse selection (Whole France database)

		Bivariate Probit Model	
		LTC/	Sum insured
Constant		-8.0346***	-18.6570***
Age	25-29	0.5847***	ns
	30-34 (ref)	***ref***	***ref***
	35-39	0.9933***	ns
	40-44	1.1819***	ns
	45-49	1.9639***	10.0638***
	50-54	2.1300***	8.4420***
	55-59	2.2204***	7.9814***
	60-64	2.5319***	8.0666***
	65-69	2.5779***	7.9786***
	70-74	2.2785***	7.6666***
	75-79	*ns*	*ns*
Woman		1.7968***	-10.2933***
Socio-Professional category	Farmers and farm workers (csp1)	-0.3949*	ns
	Craftsmen, commerce employees and company directors (csp2)	ns	ns
	Managers and upper intellectual professions (csp3**)**	**ref**	**ref**
	Intermediary professions (csp4)	0.7753***	0.4780**
	Office workers (csp5)	1.4418***	1.4004***
	Manual workers (csp6)	1.8450***	1.6904***
	Pensioners (csp7)	1.6605***	1.8046***
	Other persons with no professional activity (csp8)	1.6089***	1.6243***
Premium surcharge	Extra premium0 (ref)	**ref**	**ref**
	Extra premium25	0.123*	-0.546***
	Extra premium50	0.867***	-0.897***
	Extra premium75	0.978***	-1.234***
	Extra premium100	0.124 (0.346)	-1.342***
Premium	Premium1 (0-175.2)	-3.234***	-2.345***
	Premium2 (175.2-217.2)	-2.432***	-3.453***
	Premium3 (217.2-256.56)	-1.324***	-2.324***
	Premium4 (256.56-303.6)	-0.674*	-1.342***
	Premium5 (303.6-354)	ns	-0.678***
	Premium6 (ref) (354-441.48)	**ref**	**ref**
	Premium7 (411.48-467.88)	0.234***	0.786***
	Premium8 (467.88-542.4)	1.243***	1.234***
	Premium9 (542.4-642)	2.342***	1.546***
	Premium10 (642-3 134.04)	3.765***	2.453***
Partial LTC		0.342***	0.567***
Family	widowed	-0.243 (0.324)	0.234***
	Split up	0.432 (0.453)	0.123 (0.174)
	married	-0.723***	ns
	divorced	-0.345 (0.342)	ns
	single (ref)	ref	ref
Rho	**Correlation coefficient**	**0.0324 (0.7916)**	

* means Proba<0.05
** means Proba<0.01
*** means Proba<0.001

5 Results

Our results should be seen with some caution. We attempt to explain a rare behaviour (the average probability of purchasing insurance is low) using relatively general variables. Our variables do not enable us to identify individuals who are highly likely to subscribe to coverage. We do not have sufficiently intimate variables (the case of having looked after dependent parents, of falling out with children, etc.) to identify a population in which the probability of insurance would be high. Our model does therefore not enable us to predict whether or not a specific individual subscribes insurance. It only helps to point to trends in a market that is slowly maturing.

The gender factor

Table 1 shows that, ceteris paribus, women subscribe to insurance more than men.

This could be due to a price effect. Women have higher prevalence rates than men. Under these conditions, when the premium level does not depend on sex, the loading rates are much lower for women than for men. Brown and Finkelstein (2007) even demonstrated that women may have negative loading rates.

A selection effect may also influence in conjunction with the price effect. Even if the premium was gender-determined, women could still subscribe to insurance more often than men due to their higher probability of dependence (selection effect) and their lower probability of receiving help in kind. Lastly, these differences in behaviour between men and women with regard to insurance could express a different degree of risk aversion.

Age

Age has two contrary effects on the demand for LTC insurance:

- a "risk proximity" effect which should encourage older people to take out insurance,
- a price effect which should encourage older people to cover themselves less.

The "risk proximity" effect should encourage older people to seek protections more than younger people. The younger the people, the lower their probability of becoming dependent in the short term (Duée and Rebillard, 2004). The price effect should have the opposite influence. The older people are when they subscribe, the higher the premiums they pay for the same benefits. Age is a good proxy variable for the price of insurance. Courbage and Roudaut (2008) demonstrate that the probability of subscribing insurance is negatively correlated to age, which leaves us to think that as people get older, the price effect has more influence than risk proximity in France.

In accordance with the literature, the effect of age on the probability of coverage is high, as demonstrated in Table 1. Figure 4 shows, however, a slight bell curve effect for the oldest individuals.

Socio-professional category (csp)

A person's socio-professional category is likely to have at least three types of effect on the demand for insurance:

- An "information effect" via the level of studies strongly correlated to the socio-professional category,
- An income effect via a high correlation between the socio-professional category and income,
- A selection effect via the negative correlation between the socio-professional category and the probability of becoming dependent.

The socio-professional category information effect should have a positive influence on the demand for LTC insurance. The socio-professional category is a good proxy variable for the level of qualifications. The more individuals are educated and the more they have access to information, the more they are aware of the risk of dependence. Under these conditions, the short-sightedness with regard to the risk should decrease with the level of qualifications ("information effect").

Table 1 and Figure 5 demonstrate that belonging to the categories of office workers or manual workers positively influences subscriptions. This result is further strengthened by the fact that pensioners taking out LTC insurance are very often retired office or manual workers. It therefore seems that the LTC product is rather used by the working classes. If we consider that the socio-professional category is a good proxy variable of the level of education, we obtain results that are contrary to those obtained from the SHARE database (Courbage and Roudaut, 2008). The results for farmers are difficult to interpret due to the low numbers.

Income

In theory, income can generate two contrary effects on the demand for insurance:

- As self-insurance increases with wealth, people with high income are encouraged to take out less insurance.
- As the crowding-out effect of social financing decreases with wealth, it discourages people with high income less than people with low incomes to take out insurance.

Empirical studies cannot be used to conclude that wealth has a single effect. Sometimes the self-insurance effect prevails, while at other times it is the crowding-out effect. The first American results show that the effect of income on the probability of taking out LTC insurance is not significant and that the person's estate has a very low marginal effect (Sloan

and Norton, 1997). For Mellor (2001), however, income and wealth have a positive effect on the demand for insurance. Costa-Font and Rivera-Forns (2008) also find that income has a positive effect on Spanish data while Courbage and Roudaut demonstrate a negative effect on French data taken from the SHARE survey (2007). However, in a more detailed analysis of the effect of income, Courbage and Roudaut showed in a later article that in reality income has a bell-curve effect (not linear) on the demand for LTC insurance (Courbage and Roudaut, 2008). The effect of self-insurance seems to prevail and limit demand. For lower incomes, the crowding-out effect or budget restrictions play a key role and limit demand.

Our results confirm that income has a bell-curve effect on the probability of taking out LTC cover, as shown in Table 1 and Figure 6. This bell effect should be compared with total public financing received (social benefits and tax breaks) for each income level. Figure 8 shows that the effect of income on public financing forms a U-shaped curve, which is particularly unfavourable to the middle classes, who stand to gain from taking out LTC cover as they receive the least public financing for their dependence.

The person's estate

Table 1 shows positive correlation between the level of a person's estate and the probability of insurance for the four first deciles of estate. However, the four first deciles concern persons with estates between 0 and 2000 Euros. It is therefore possible that people with other savings accounts in other banks are over-represented in this category. This is why we have chosen not to further interpret the results from these categories. The effect is subsequently stable for the following three deciles (D5, D6, D7). For the upper deciles, we observe a strong positive relationship between the level of estate and the probability of insurance. Two effects may explain this relationship.

Firstly, LTC insurance may be used to insure one's estate, and subsequently secure the amount of inheritance to be passed on. In other words, individuals may prefer to pay for insurance rather than run the risk of having to use their savings to fund their care. If this explanation is true, our results show that the very rich have a stronger aversion to the risk of using savings (individuals therefore have preferences such as IARA).

Furthermore, this effect may be strengthened by the relaxation of budget restrictions as the estate gradually grows.

The role of risk aversion

Risk aversion is another conventional factor of the demand for insurance. However, Norton and Sloan (1997) showed that risk aversion does not affect the demand for LTC insurance. According to the results of this model's estimation, presented in Table 1, risk aversion therefore has a strong influence on the probability of taking out insurance, thus confirming the results of Finkelstein and McGarry (2006). An individual who takes out a death & disability (D&D) insurance has, ceteris paribus, 9.54 times more chance of taking out LTCI than an individual who does not subscribe to D&D insurance. LTC insurance is therefore marked by a strong selection effect that concerns risk aversion. This selection effect does not disrupt market operations as long as it is not correlated to risk levels that differ from the average.

Adverse selection

The results of this model are set out in table 2. They show that the coefficient correlation between residuals is not statistically significant. This result shows that *ex post* highly insured people are not riskier than the average insured people. It leads us to conclude that there is no adverse selection effect on the LTCI market for high annuity in France. It doesn't mean that there are no opportunistic behaviors on LTCI market. However LTCI market for high annuity

can be seen as proxy for LTCI market. Using another type of data and in a completely different institutional environment, our result is consistent with Finkelstein and Mc Garry (2006). The non significance of the age variable should be noted. It is due to our model specification. The variable of age has a positive effect on LTC likelihood as on the probability of death. The older the policyholders, the higher is their LTC probability but the higher is their probability of near death. If they die, it means that they could not receive benefits for LTC.

However, this result has to be considered with caution.

Our policyholders' portfolio is relatively young. We did not observe a cohort until its death. A lack of LTC during the first years of a cohort doesn't mean that there will not be any adverse selection in the future. Moreover, we can't observe the effects of income and assets on the buying likelihood. However, our result is not consistent with the central prediction of many asymmetric information models. Some empirical research has also demonstrated that progress in genetics research could favor opportunistic behaviors (Oster and *al.*, 2009).

However, even we do not observe an adverse selection in the aggregate; it doesn't mean that there are no opportunistic behaviors on the LTCI market. Insurance markets may suffer from asymmetric information even absent a positive correlation between insurance coverage and risk occurrence. Two types of persons might purchase insurance: individuals with private information that they are riskier and individuals with private information that have a strong taste for insurance. Recent studies have shown that risk averse people (who have a strong taste for insurance) exhibit more cautious behaviors and invest more in preventive health care. For this reason, risk averse people are less risky against LTC than the rest of population (de Meza & Webb, 2001).

If individuals with private information that have strong taste for insurance are lower risk than the insurance company would predict, private information about risk type and private information about insurance preferences can operate in offsetting directions to produce an equilibrium in which those with more insurance are not more likely to experience the insured risk. Unobserved preference heterogeneity can offset the positive correlation between insurance coverage and risk occurrence that private information about risk type alone would produce.

As observed by Finkelstein and Mc Garry, we note some clues that lead us to think that this offsetting effect is at work on the French LTCI market (Finkelstein and Mc Garry, 2006).

We can observe with a basic Chi square test if the risk-averse people may pay less a premium surcharge than the rest of insured population. To pay a premium surcharge implies that the individual is riskier than the average insured population.

Table 3 shows that risk-averse individuals are significantly fewer in the population paying a premium surcharge.

Table 3 Chi square Test (risk-averse/premium surcharge)

Chi square test (risk-averse/premium surcharge)

		No surcharge	Premium surcharge
No risk-averse population	% total	64,93%	6,08%
	% row	91,44%	8,56%
	% column	70,05%	83,12%
Risk-averse population	% total	27,76%	1,23%
	% row	95,74%	4,26%
	% column	29,95%	16,88%
Chi square		29,5828 (P<0,0001)	

6 Conclusion

The first result of this study shows that the probabilities of taking out insurance do not vary strongly between the different categories of the population. If LTC insurance continues to develop and the trends observed are confirmed, it could become a mass product and not merely a product for the wealthy or for a very specific category of the population. The results show that age and income have a bell-curve effect on the probability of insurance. Even though all population categories take out LTC products, the middle classes are more likely to than others. More specifically, the categories of office worker or manual worker or retired office and manual workers take out such insurance the most. Within this category, those with above-average income and estates subscribe the most. These first results lead us to believe that LTC insurance could well become a mass product such as complementary health cover.

Going back to the initial issue, it seems that the small size of the market cannot be explained by the lack of demand or a demand confined to very specific strata of the population. The data we have does not enable us to observe this type of phenomena.

This article shows also that we do not observe any adverse selection phenomena on the LTCI market when we use standard test of risk aversion.

This article calls for further work on the role of asymmetric information differences in information in the slow development of the market. It will be interesting to estimate “true” adverse selection and not only a proxy of adverse selection when the market is more mature. Another surprising phenomenon is the high termination rate of LTC policies, even when the policy studied does not allow capital lump-sum withdrawals.

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APPENDIX 1

Table 4 Descriptives Statistics of Region database

	Insured	Non Insured
Size	5 444	95 971
% of women	54,95%	28,64%
Average age of women	55,30	51,17
Average age of men	51,84	49,23
Average income	35 302,62	40 101,59
Average assets	45 271,80	35 074,27
Farmers and farm workers (csp1)	1,31%	3,51%
Craftsmen, commerce employees and company directors (csp2)	1,44%	4,00%
Managers and upper intellectual professions (csp3)	1,71%	8,89%
Intermediary professions (csp4)	6,51%	11,93%
Office workers (csp5)	22,21%	15,33%
Manual workers (csp6)	24,57%	20,56%
Pensioners (csp7)	29,18%	23,07%
Other persons with no professional activity (csp8)	13,06%	12,72%

Figure 4

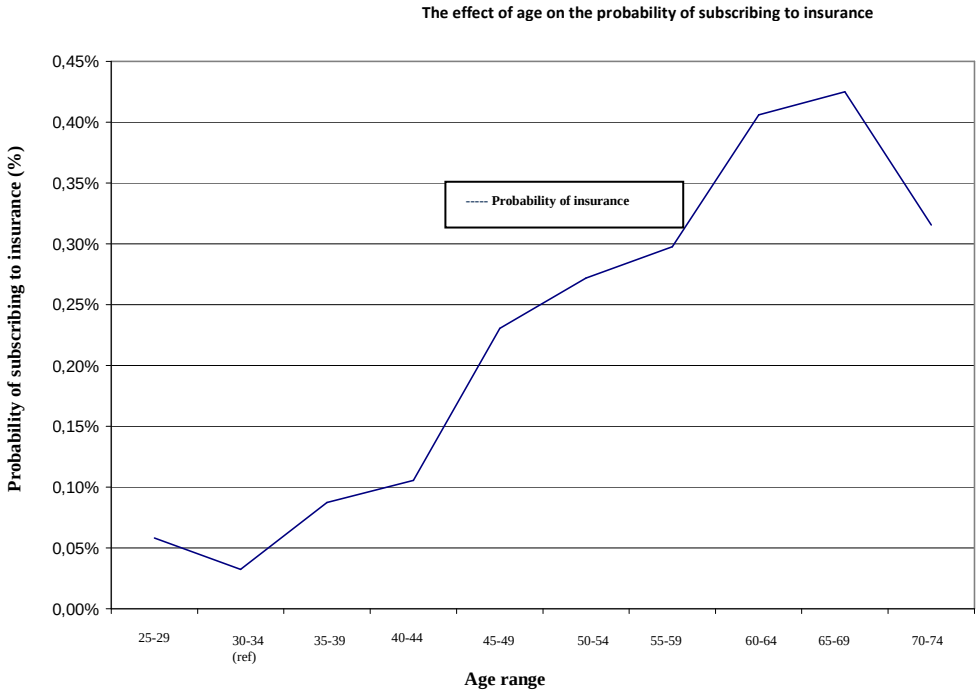


Figure 5

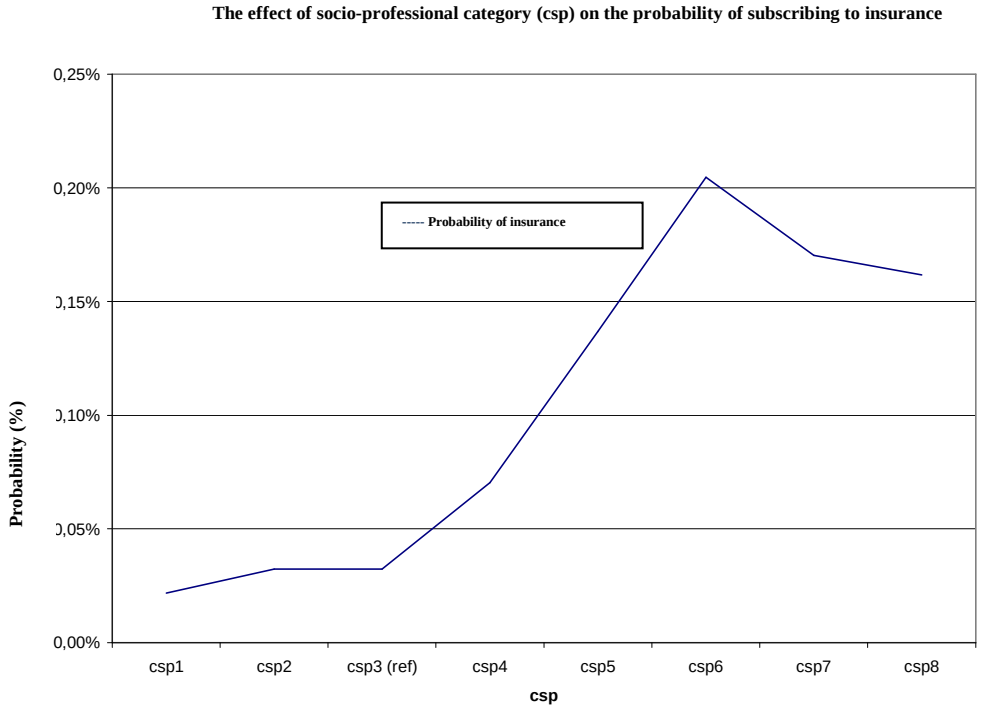


Figure 6

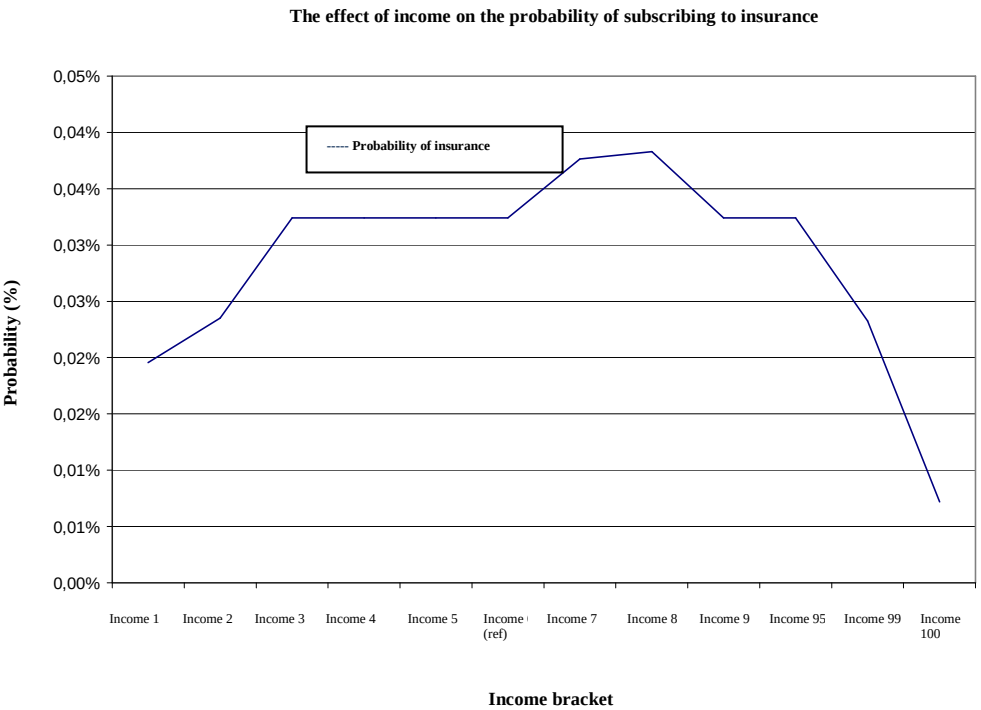
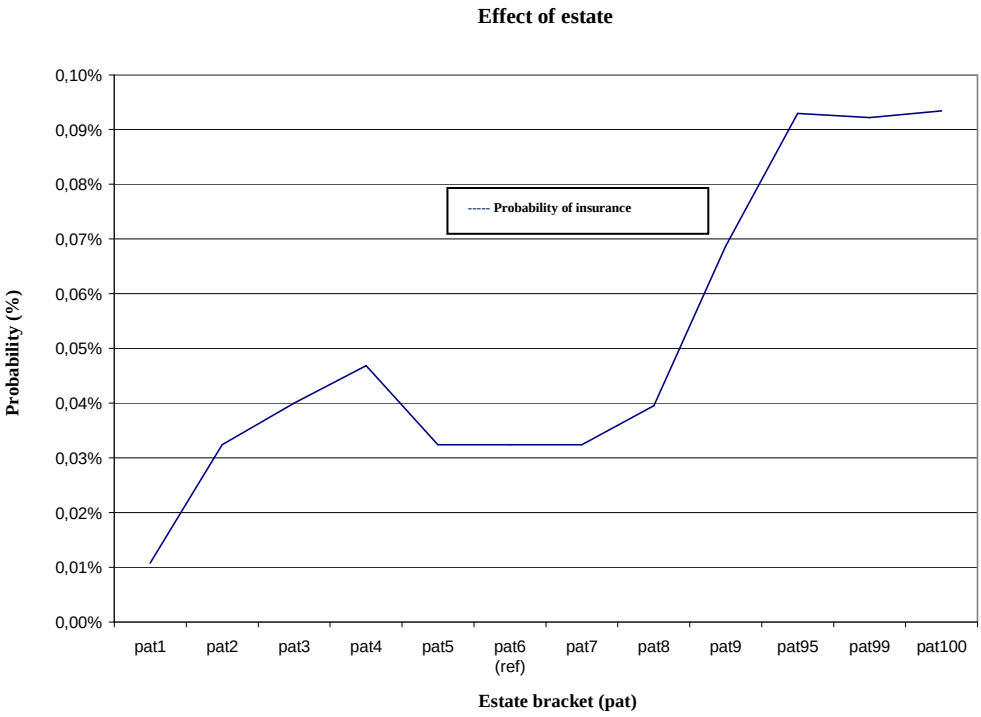


Figure 7


Effect of estate
0,10%
0,09%
0,08%
0,07%
0,06%
0,05%
0,04%
0,03%
0,02%
0,01%
0,00%
Probability (%)
----- Probability of insurance
pat1
pat2
pat3
pat4
pat5
pat6 (ref)
pat7
pat8
pat9
pat95
pat99
pat100
Estate bracket (pat)