Demand for supplementary health insurance when a NHS exists

CEISUC

CENTRO DE ESTUDOS E INVESTIGAÇÃO
EM SAÚDE DA UNIVERSIDADE DE COIMBRA

Evidence from Portugal

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1

Outline

- Motivation,
- Purpose of the work,
- The dependent variable,
- Some exploratory statistics,
- Econometric specification,
- Main findings,
- Conclusions
- Future research...

Motivation

❖ National Health Services are a form of health insurance provided by the Government, to guarantee full access to medical care;

❖ Despite usual objectives of universality and wide access to medical care services of the NHS, voluntary health insurance (VHI) is also present in countries with NHS.

Motivation

❖ Despite NHS, the VHI has been witnessing a steady increase in the last decade,

Quadro 1 - Número de clientes e apólices

	1998	2000	2001	2002	2003	2004
Número de pessoas seguras		1.421.381	1.424.690	1.270.822	1.712.654	1.759.740
Número de pessoas seguras –individual	314.366	534.854	710.018	558.024	906.849	895.986
Número de pessoas seguras –grupo	783.927	886.527	714.672	712.798	805.805	863.754
Número de apólices – grupo		7.511	11.027	11.942	18.505	17.151
Número de apólices – individual[46]		335.449	496.945	340.417	612.303	612.137

Fonte: (Instituto de Seguros de Portugal 2004)

Motivation/Objective

❖ In such countries (those with NHS), understanding the motives that drive individuals to buy SHI is, therefore, key to assess the performance of the NHS.

❖ To contribute to this knowledge base we use data reflecting the Portuguese context, taken from the National Health Survey (NHSur)

Institutional setting

- In regards to Portugal:
  - NHS provides full access to medical care
    - Mostly in public facilities
    - Financed mainly through taxation
  - Almost free at the point of delivery
    - Some co-payments, which have been increasing over time, vary with the type of service. Many individuals are exempt.
- In addition to the NHS
  - About 25% of the population enjoys from a second layer of health insurance coverage through health subsystems

Purpose of the presentation

❖ This work aims at:

  ❖ Exploring the factors that drive individuals in the decision of subscribe a VHI contract,

  ❖ Given VHI, discerning the determinants of the quantity of coverage chosen,

❖ Among all the factors, we will focus primarily on the effect of **income**, asking whether the income-elasticity of demand has changed in the course of the last decade.

Related literature

❖ King, D. and E. Mossialos (2005). "The determinants of private medical insurance prevalence in England, 1997-2000." Health Services Research **40(1): 195-212.**

❖ Besley, T., J. Hall, et al. (1998). "Private and public health insurance in the UK." European Economic Review **42(3-5): 491-497.**

❖ Harmon, C. and B. Nolan (2001). "Health insurance and health services utilization in Ireland." Health Economics **10(2): 135-145.**

❖ Mossialos, E. and S. M. S. Thomson (2002). "Voluntary health insurance in the European Union: A critical assessment." International Journal of Health Services **32(1): 19-88.**

❖ Propper, C. (1993). "Constrained Choice Sets in the Uk Demand for Private Medical Insurance." Journal of Public Economics **51(3): 287-307.**

❖ Liu, T. C. and C. S. Chen (2002). "An analysis of private health insurance purchasing decisions with national health insurance in Taiwan." Social Science & Medicine **55(5): 755-774.**

❖ Costa, J. and J. Garcia (2003). "Demand for private health insurance: how important is the quality gap?" Health Economics **12(7): 587-599.**

❖ Franc, C., M. Perronnin, et al. (2008). "Private Supplementary Health Insurance: Retirees' Demand." Geneva Papers on Risk and Insurance-Issues and Practice **33(4): 610-626.**

DATA – Dep. variable

- NHSur1998/1999 -- 2005/2006
    - Merged the two datasets
    - Independently pooled cross-section (**not Panel data**)
    - Workable database containing information of approximately 50.000 individuals;
- **DepVars**: Relevant questions:
    - Do you enjoy from a health insurance contract? [YES/NO]→[**Binary variable**]; (if yes)
    - Which kind of medical care does the SHI covers? [1,2,3,4,5] [**Ordered variable**]

Relevant questions at NHSur

Question 2.6

Benefit from VHI?

Question 2.7

Quantity of coverage

6. E [O (A) SR(A) _____] TEM ALGUM SEGURO DE SAÚDE ?

Sim 1

Não .... 2 → P.8

Não sabe .... 9 → P. 8

7. QUAIS OS RISCOS CUJA COBERTURA ELE LHE GARANTE ?

Apenas internamento 1

Internamento, Consultas e Meios Complementares
de Diagnóstico e Terapêutica 2

Internamento, Consultas e Meios Complementares
de Diagnóstico e Terapêutica e Medicamentos 3

Outras combinações de riscos 4

Todos os riscos 5

Não sabe 9
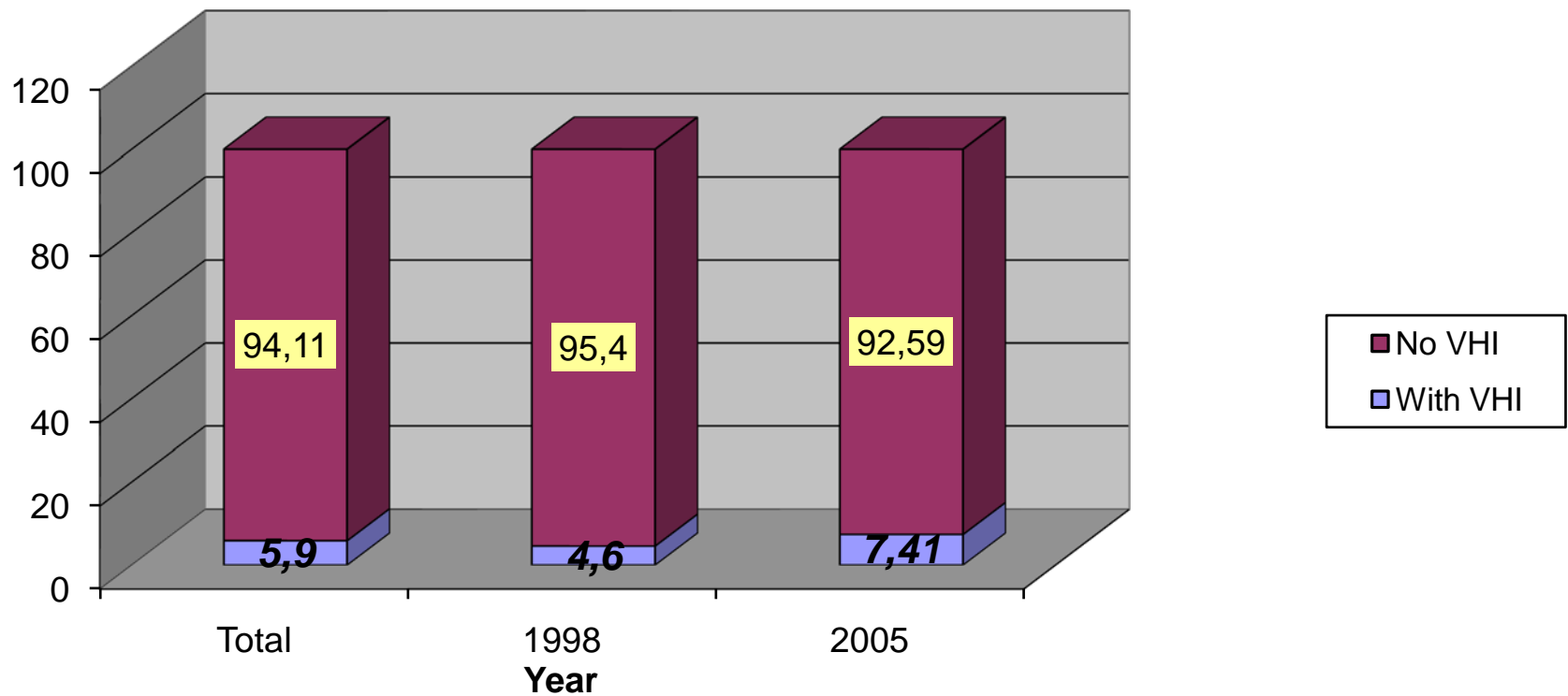
$$y = \begin{cases} 0 & \text{if no VHI} \\ 1 & \text{if VHI only covers inpatient care} \\ 2 & \text{if } 1 + \text{consultations and complementary exams and diagnosis and treatment} \\ 3 & \text{if } 2 + \text{pharmaceutcals} \\ 4 & \text{if all goods and services} \end{cases}$$
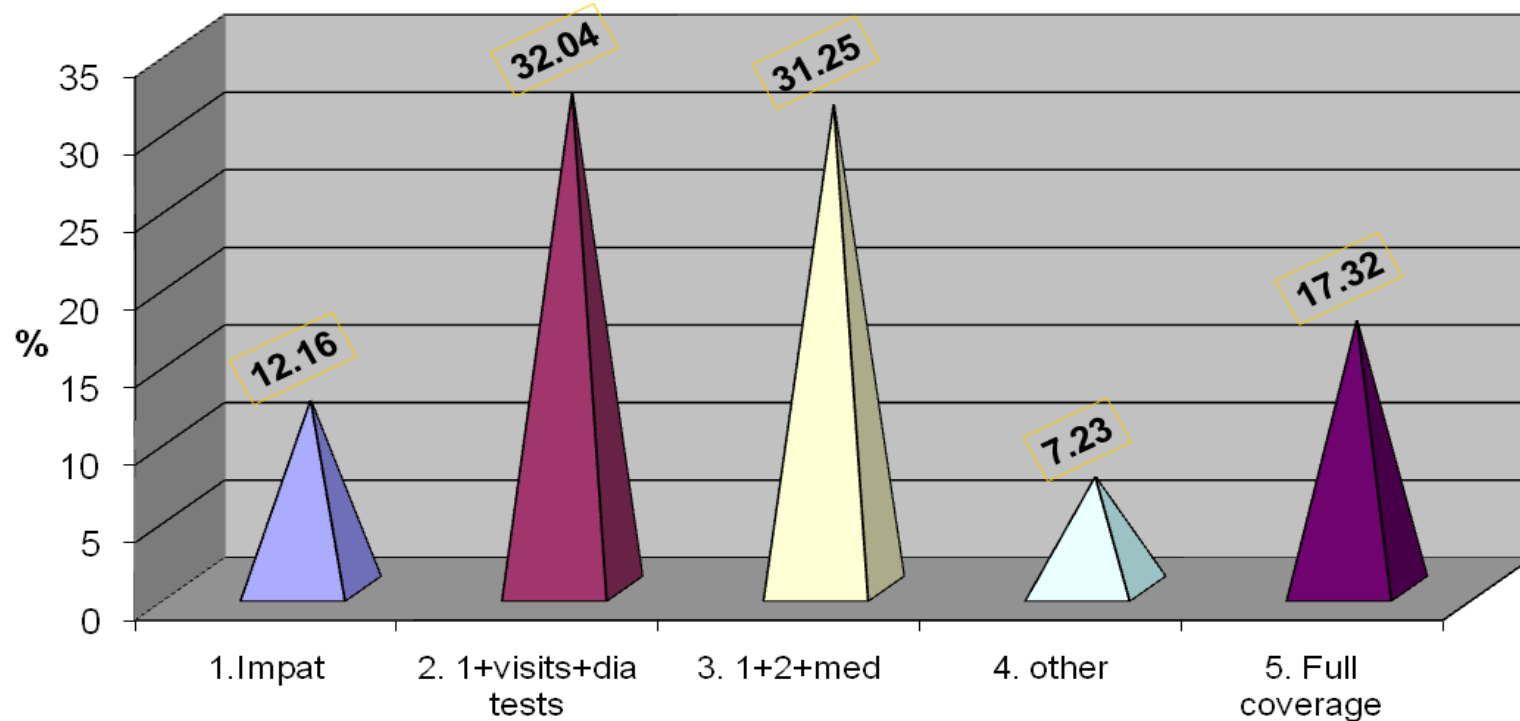
Exploratory analysis I
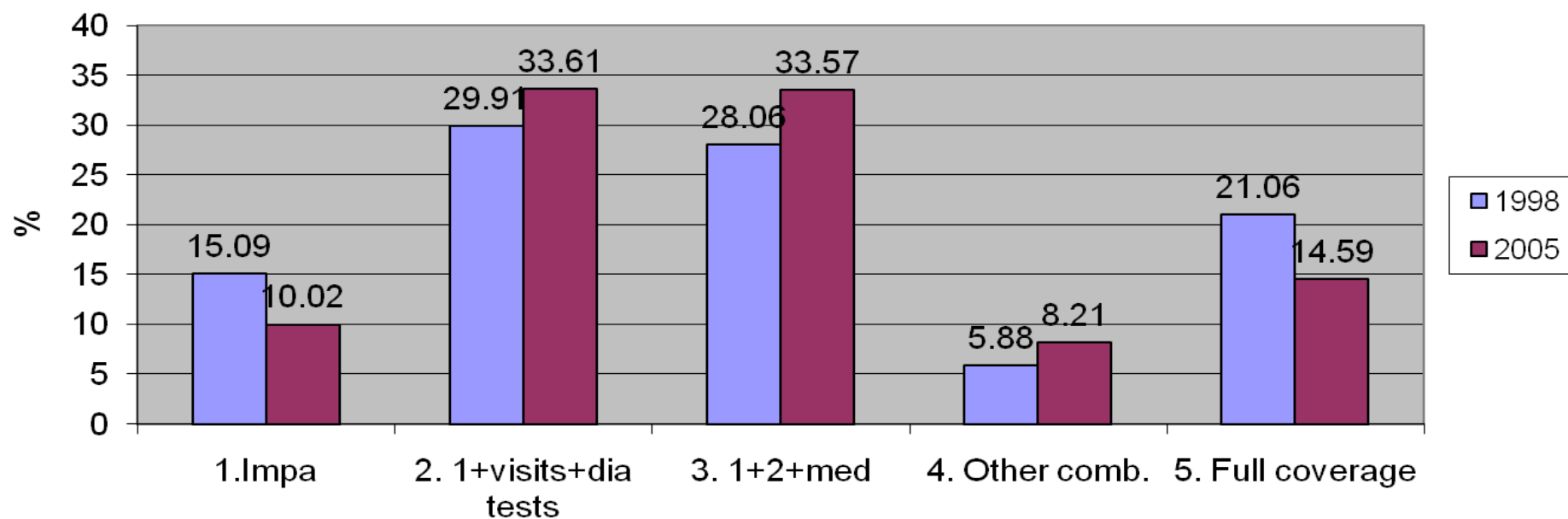
VHI – Some figures

Exploratory analysis II

Quantity of coverage

- 1.Impat — 12.16
- 2. 1+visits+dia tests — 32.04
- 3. 1+2+med — 31.25
- 4. other — 7.23
- 5. Full coverage — 17.32

%

Exploratory analysis III

Evolution in the quantity of coverage

Legend: 1998, 2005

Category	1998	2005
1.Impa	15.09	10.02
2. 1+visits+dia tests	29.91	33.61
3. 1+2+med	28.06	33.57
4. Other comb.	5.88	8.21
5. Full coverage	21.06	14.59

Y-axis: %

SHI and income: evolution

Health insurance and income

More income
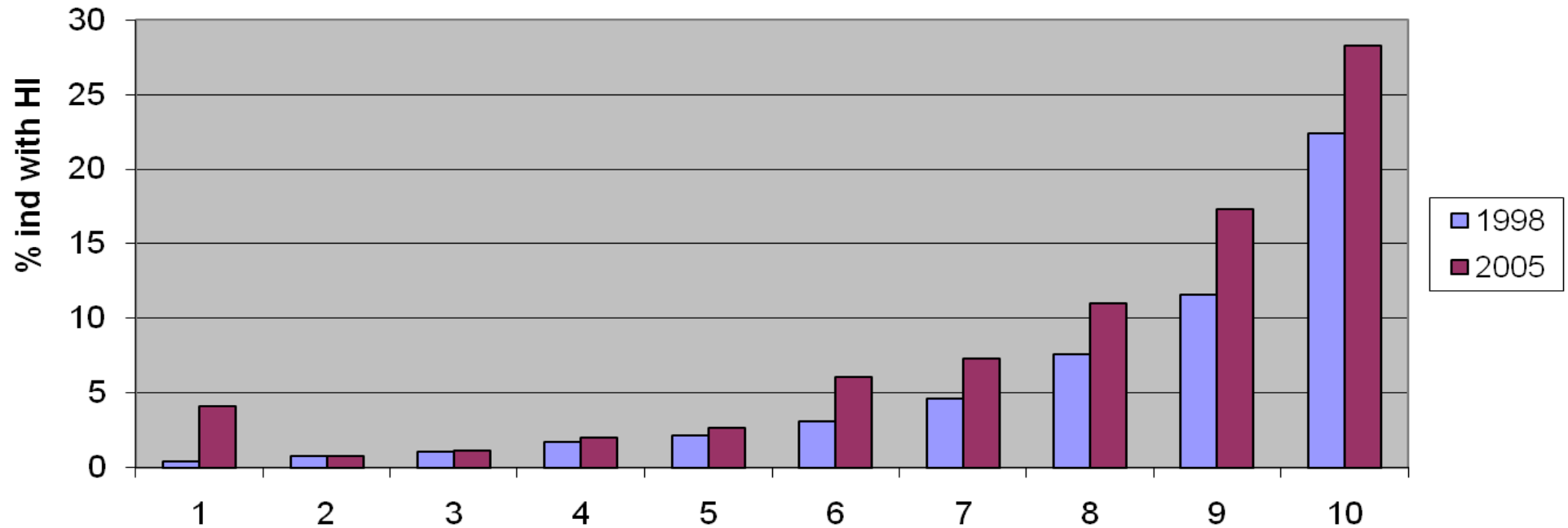
Exploratory analysis

y	Definition	Overall		1998/99		2005/2006	
0	No VHI	46,830	93.87%	27,466	95.47%	19,364	91.69%
	Yes VHI	3,058	6.13%	1,303	4.53%	1,755	8,31%
1	VHI that covers inpatient care	425	13.90%	229	17.57%	196	11.17%
2	plus consultations and complementary exams and diagnosis and treatment	1,045	34.17%	378	29.01%	667	38.01%
3	plus pharmaceuticals	1,056	34.53%	395	30.31%	661	37.66%
4	all risks	532	17,40%	301	23,10%	231	13.16%
		N = 49,888		N = 28,769		N = 21,119	

Exploratory analysis

	Overall	1998	2005
1 st income quintile (%)	1.01%	0.74%	1.69%
2 nd income quintile (%)	1.56%	1,25%	2.01%
3 rd income quintile (%)	3.35%	3.47%	4.34%
4 th income quintile (%)	6.48%	5.32%	7.85%
5 th income quintile (%)	18.21%	15.98%	20.08%

Percentage of individuals with VHI by income quintile

16

Methodology I – Regression model

- **Dependent variable: Ordinal**

- **Decision made in two steps**

  1) Decision to buy SHI;

  2) Decision about the quantity, given the individual does buy it;

- **Large proportion of the zeros**

$$\begin{cases} y_1^* = x\beta + \varepsilon_1 \\ y_2^* = z\theta + \varepsilon_2 \quad if \quad y_1^* = x\beta + \varepsilon_1 > 0 \end{cases}$$

- $Y_1^* \rightarrow$ Propensity to buy SHI

- $Y_2^* \rightarrow$ Propensity to buy more quantity of coverage

  - Two statistical specifications (depends on the assumptions of the error terms)

    - Random errors are assumed independent (estimation into two separate/independent steps)

    - Dependent errors (distributed according a bivariate normal distribution, with var=1, and corr(.,.)=r:

SHI in Portugal

Methodology II

Assuming independent errors...

- ❖ The two dependent variables
  - ❖ Binary (first part)
  - ❖ Ordinal (second part decision)

- ❖ Model can be estimated in two separate steps:
  - ❖ **First step**: Probit model: show the determinants of the decision to buy VHI
  - ❖ **Second step**: ordered probit model: find the determinants of quantity of insurance bought, given SHI =1

$$\begin{cases} P(y = 0 \mid x_1, x_2) = 1 - \Phi(x_1'\beta_1) \\ P(y = 1 \mid x_1, x_2) = \Phi(x_1'\beta_1) * \left[\Phi(-x_2'\beta_2)\right] \\ P(y = 2 \mid x_1, x_2) = \Phi(x_1'\beta_1) * \left[\Phi(\mu_1 - x_2'\beta_2) - \Phi(x_2'\beta_2)\right] \\ P(y = 3 \mid x_1, x_2) = \Phi(x_1'\beta_1) * \left[\Phi(\mu_2 - x_2'\beta_2) - \Phi(\mu_1 - x_2'\beta_2)\right] \\ P(y = 4 \mid x_1, x_2) = \Phi(x_1'\beta_1) * \left[\Phi(-\mu_2 + x_2'\beta_2)\right] \end{cases}$$

* Is independent assumption a good assumption? **Possibly no...**

assume that the disturbances of equations 2 and 3 $(\varepsilon_1, \varepsilon_2)$ follow a bivariate normal distribution with mean **0** and covariance matrix $\Sigma = \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}$. In this new context, it can be demonstrated that the expressions for the probability function of y is given by:

$$
\begin{cases}
P(y = 0 \mid x_1, x_2) = 1 - \Phi(x_1'\beta_1) \\
P(y = 1 \mid x_1, x_2) = \Phi_2(x_1'\beta_1, -x_2'\beta_2, -\rho) \\
P(y = 2 \mid x_1, x_2) = \Phi_2(x_1'\beta_1, \mu_1 - x_2'\beta_2, -\rho) - \Phi_2(x_1'\beta_1, -x_2'\beta_2, -\rho) \\
P(y = 3 \mid x_1, x_2) = \Phi_2(x_1'\beta_1, \mu_2 - x_2'\beta_2, -\rho) - \Phi_2(x_1'\beta_1, \mu_1 - x_2'\beta_2, -\rho) \\
P(y = 4 \mid x_1, x_2) = \Phi_2(x_1'\beta_1, -\mu_2 + x_2'\beta_2, \rho)
\end{cases}
\qquad (9)
$$

where $\Phi_2(z, k, \rho)$ denotes the c.d.f. of a bivariate standard normal distribution correlation parameter ρ.

Methods – Linear index

We adopt the following functional form for both linear indexes involved in the models,

$$\mathbf{x}\beta + \alpha_1 year_{2005} + \alpha_2 \ln\_income + \alpha_{12} \ln\_income * year_{2005} + \varepsilon \qquad (16)$$

Where $year_{2005}$ is a dummy variable that equals 1 if the respondent belongs to the 2005 survey, zero otherwise, and ln_income is the logarithm of equivalent income. Therefore, the parameter α_{12} gives an estimate of the evolution of income on the propensity represented by the linear index. A positive parameter means that the effect of income is higher in 2005 than in 1998, while a negative sign means the opposite.

Determinants of SHI

- ❖ Which are the determinants of VHI demand?
  - ❖ Individual preferences
  - ❖ Risk aversion
  - ❖ Income
  - ❖ Education
  - ❖ Health status
  - ❖ Probability of an illness occurring
  - ❖ Magnitude of the loss that illness might incur,
  - ❖ Level of satisfaction with the public services
  - ❖ Price
  - ❖ Level of advertising (marketing)
  - ❖ Etc., etc.., etc..

Determinants of SHI

- ❖ From all factors, some may be harder to measure than others, however,

- ❖ As argued by Mossialos, 2004, in the context of EU, factors such as **price** (we don't have it!), **income** and **education** are important determinants,

Explanatory factors in the model

- Gender
- age
- Civil status
- Education
- Area of residence
- Work
- Health status
  - Chronic diseases
  - C.Mass Index
  - Daily smoker

- Type of health coverage
  - NHS
  - ADSE (insurance for civil servants)
  - Other subsystem (Excluded cat.)

- Log(equiv. income) [a]
- Ano_2005 (dummy var.) [b]
- Interaction variable: a*b

Independent variables

Variable	Definition	Mean	S.D.	Min.	Max.
Income (log)	Logarithm of monthly equivalent income	5.97	0.70	3.034	7.994
year 2005	= 1 if the respondent filled the survey in 2005	0.42	0.49	0	1
ln_income*year2005	Intercation between income and year	2.58	3.04	0	7.92
North	= 1 if the individual lives in the North region of Portugal	0.26	0.44	0	1
Centre	= 1 if the indivual lives in the Centre	0.20	0.40	0	1
LVT	= 1 if the individual lives in the Lisbon and Tagus Valley	0.23	0.42	0	1
Alentejo	= 1 if the individual lives in Alentejo	0.16	0.36	0	1
Male	= 1 if the individual is male	0.42	0.49	0	1
Age	Age in tens of years	4.31	2.45	0	10
SqAge	Square of age	24.60	20.85	0	100
Married	= 1 if the individual's civil status is married	0.54	0.50	0	1
Single	= 1 if the individual's civil status is single	0.33	0.47	0	1
Widow	= 1 if the individual's civil status is widow	0.10	0.30	0	1
Live alone	=1 if the respondent lives alone (a family with only one member)	0.11	0.31	0	1
Education	Educational achievment (number of years of school completed with success)	6.29	4.64	0	26
Curr. Working	= 1 if the respondent is currently in a paid employment	0.37	0.48	0	1
Housewife	= 1 if the respondent is housewife	0.10	0.30	0	1
Unemployed	= 1 if the respondent is unemployed	0.03	0.18	0	1
Reform	= 1 if the respondent os rertired	0.23	0.42	0	1
HSVG	= 1 if the respondent's SAH is very goog	0.07	0.25	0	1
HSG	= 1 if the respondent's SAH is very goog	0.37	0.48	0	1
HDF	= 1 if the respondent's SAH is very goog	0.36	0.48	0	1
Ill long run	= 1 if the respondent is on sixk leave due to health resaons for 3 or more month	0.01	0.09	0	1
Diabethes	= 1 if the respondent has Diabethes	0.07	0.25	0	1
Asthma	= 1 if the respondent has asthma	0.06	0.24	0	1
HBP	= 1 if the respondent has high blood pressure	0.22	0.42	0	1
Chronique Bronchitis	= 1 if the respondent has chronique bronchitis	0.04	0.19	0	1
Pain	= 1 if the respondent has chronic pain	0.32	0.47	0	1
NHS-only	= 1 if the respondent enjoys only from statutory NHS	0.81	0.39	0	1

Results I

1. The correlation parameter does not present statistical significance,

Thus, based on the "uncorrelated "TPM:

1. Income has a positive effect on the probability of buying VHI,

2. After the initial decision, individual's income do not affect the quantity of coverage.

3. **Concerning the evolution of the gradient of income in the last decade, our estimates suggest a similar income effect in the years 1998 and 2005.**

Results II

1. The results indicate that in 2005, relatively to 1998, individuals present a higher probability of buy VHI.

2. Contrarily, regarding the quantity of coverage, the year factor does not show any statistically relevant effect.

	TPM	
	First part	**Second part**
IncPer20	0.259	-0.141
	(0.042)***	(0.098)
IncPer40	0.260	-0.133
	(0.038)***	(0.089)
IncPer60	0.262	-0.126
	(0.034)***	(0.079)
IncPer80	0.265	-0.111
	(0.0309)***	(0.066)*
IncMean	0.262	-0.123
	(0.033)***	(0.077)

Table 3 – Estimates of the effect of the covariate $year_{2005}$

Final remarks

❖ Our analysis suggests that the observed increase in the number of individuals enjoying from VHI is not explained by changes in individual's income.

❖ In our view, it may correspond to an effort that insurance companies have been making to supply health insurance contracts that meet the specific needs of the population.