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In Sickness and in Health?

Dynamics of Health and Cohabitation among older people
(Work in Progress)

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Outline

- Brief overview of past LTC research
- Purpose of current research
- Theoretical Background: The Grossman Model
- Empirical Approach
- Preliminary Results
- Conclusion and Outlook

Previous LTC Research

The Rickayzen/Walsh disability projection model has been applied in various contexts:

- Projecting implications for public finances of various health scenarios (*Health Policy*, 2005).
- Projecting the balance between supply of and demand for informal care
- Comparing financial consequences of different systems, from the point of view of the individual as well as the public sector in general

Purpose of research

The project: estimate the potential market for 'topup' LTC insurance, in which individuals get benefits tailor made to their individual needs.

The Rickayzen/Walsh model cannot be used for this purpose as

- It only differentiates according to *gender* and *cohort*
- Other covariates such as *marital status*, *education* etc are not taken into account
- We also need information on variance and covariance of the relevant variables

To develop a model that overcomes these problems has been the purpose of this research.

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Problems in LTC insurance markets

- Adverse selection (aggravated by dynamic perspective)
- Too much coverage?
- Is part of the problem lack of distinction between '*disability*' (i.e. health) and '*need*' (i.e. circumstances)?
- Cohabitation status and socioeconomic variables are of particular interest as they
  - Have strong impact on health
  - Determine financial needs in case of disability
- Increasing our knowledge of these factors allows for
  - More accurate pricing
  - Tailor-made products

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Theoretical Background: The Grossman Model

The Grossman (1972) model has two main pillars:

- **The household production model of consumption**: health is a commodity produced in the household
- **The human capital perspective**: health is at the same time a commodity and a capital stock, from which a stream of earnings is derived

Grossman's twist: good health increases the amount of *time* available for consumption and production

The main empirical interest has been in the role of *schooling/education* in the production of health.

The effect of *cohabitation* has not been analysed so far.

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Empirical Strategy

Decompose the observed variation in health (and cohabitation) into different components:

Component	*Health*	*Cohab*	*Cov*
Unobserved structural differences	ω^H	ω^C	ω^{HC}
Transitory shocks	σ^H	σ^C	σ^{HC}
Persistence in transitory shocks	ρ^H	ρ^C	-
State dependence	H_{t-1}	C_{t-1}	-
Exogenous factors	A_t,E_t,Y_t	A_t,E_t,Y_t	-
Causal links	C_{t-1}	H_{t-1}	

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Estimating equations

Estimating *cohabitation*: a *probit* model

$$C_{it}^* = c + \underbrace{\beta_1 E_{it} + \beta_2 A_{it}^1 + \beta_3 A_{it}^2 + \beta_4 A_{it}^3 + \beta_5 Y_{it}}_{\text{Exogenous Variables}} + \underbrace{\beta_5 \hat{C}_{it-1} + \beta_4 \hat{H}_{it-1}^1 + \beta_5 \hat{H}_{it-1}^2}_{\text{State Dependence}} + \varepsilon_{it}^C$$

$$\hat{C}_{it} = \begin{cases} cohabiting & \text{if } C_{it}^* \geq 0 \\ single & \text{otherwise} \end{cases}$$

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Estimating equations II

Estimating *health*: an *ordered probit* model

$$H_{it}^* = \underbrace{\delta_1 E_{it} + \delta_2 A_{it}^1 + \delta_3 A_{it}^2 + \delta_4 A_{it}^3 + \delta_5 Y_{it}}_{\text{Exogenous Variables}} + \underbrace{\delta_6 \hat{C}_{it-1} + \delta_7 \hat{H}_{it-1}^1 + \delta_8 \hat{H}_{it-1}^2}_{\text{State Dependence}} + \varepsilon_{it}^H$$

$$\hat{H}_{it} = \begin{cases} healthy & \text{if } H_{it}^* \leq \alpha_1 \\ moderate & \text{if } \alpha_1 \leq H_{it}^* \leq \alpha_2 \\ severe & \text{if } \alpha_2 \leq H_{it}^* \leq \alpha_3 \\ dead & \text{if } \alpha_3 \leq H_{it}^* \end{cases}$$

The α's are cutoffs for the latent health variable H_{it}^*

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Estimating equations III

The error terms: correlation patterns

$$\varepsilon_{it}^{j} = \mu_i^j + \eta_{it}^j, \quad \eta_{it}^j = \rho^j \eta_{it-1}^j + \nu_{it}^j, \quad j = C, H$$

Fixed effect | Auto-correlation | Random Disturbance

$Corr\left(\nu_{it}^{H}, \nu_{it}^{C}\right) = \sigma^{HC}$ { Allowing for correlation between health shocks and cohabitation shocks

$Cov\left(\mu_i^{H}, \mu_i^{C}\right) = \omega^{HC}$ { Allowing for correlation between fixed health effects and fixed cohabitation effects

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Dataset

We make use of the **British Household Panel Survey**:

- All 12 waves of the panel
- All permanent members of the panel
- Definition of Disability: ADL
  - Healthy: <2 ADLs
  - Moderate: 2 ADLs
  - Severe: >2 ADLs
- Problem: excluding individuals with missing information would bias mortality rates. Hence, information has to be imputed.
- A total of 6,000 individuals are divided into four groups:
  - Males & females
  - Pre- and post retirement (1991)

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Results: Older Men

Component	*Health*	*Cohab*	*Cov*
Unobserved struct. differences	0.648**	0.794**	-0.236**
Transitory shocks	1	1	-0.285**
Persistence in transitory shocks	0.185**	0.911**	-
State dependence	0.166** 0.295**	0.937**	-
Exogenous factors	Y_t: 0.0785*	Y_t:-0.0717*	-
Causal links	0.0785**	-0.0311** 0.0233	-

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Results: Implications

- Individuals are systematically different even after age, gender and education has been controlled for
- There is a strong positive correlation in unobservables for health and marital status (i.e. self-selection)
- This implies an adverse selection problem, that can be mitigated by conditioning on more than health, e.g. marital status, education.
- Cohabitation is potentially more important for health (and vice versa) than education

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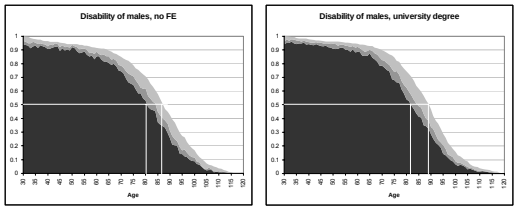
Results: Men, Disability



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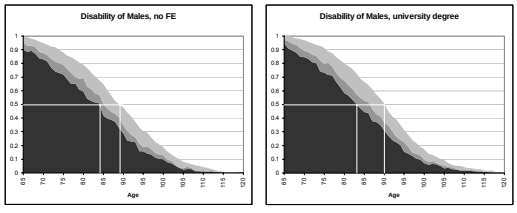
Results: Men, Disability



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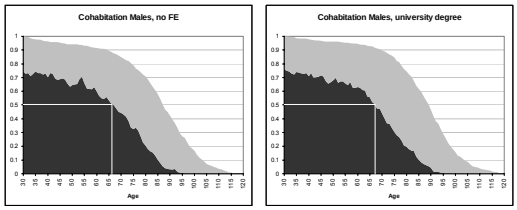
Results: Men, Cohabitation



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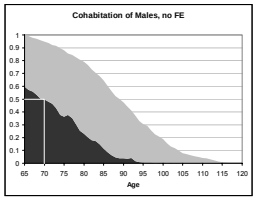
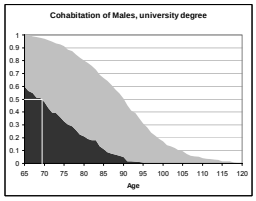
Results: Men, Cohabitation





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Results, Implications

- People with higher education have higher life expectancy at all ages
- There is less of a difference in Healthy Life Expectancy
- Males with higher education seem to spend more time in disability, especially at older ages
- For cohabitation, no great education differences

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Conclusions and outlook

- Some interesting and some surprising findings
  - E.g. Marriage is **bad** for health – is it really?
  - The time effect is *negative* – are people becoming less healthy?
- Robustness checks need to be done
  - Extending to the other subgroups
  - Hypothesis testing

Future research topics:

- Assess whether demand would rise if *premiums* were conditioned on marital and socioeconomic status (i.e. increased accuracy)
- Assess whether demand would rise if *benefits* were conditioned on marital and socioeconomic status (i.e. new definition of 'need')