WHAT IS THE IMPACT OF DUPLICATE COVERAGE ON THE DEMAND FOR HEALTH CARE IN GERMANY?

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Outline

1 Motivation
   - Health Insurance in Germany
   - A Literature Review

2 Health services demand and duplicate coverage demand
   - Assumptions
   - Health Care Demand
   - Endogenous Switching Model

3 Data and Results
   - Our Data
   - Variables description
   - Results
1. **Motivation**
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Everyone living in Germany to be insured for at least hospital and out-patient medical treatment (The health insurance reform 2007).

There is the Government Health System (Gesetzliche Krankenversicherung or GKV) and if your gross salary is below 3,975 Euros per month, membership in the GKV is mandatory.

GKV benefits include in-patient (hospital), out-patient care with registered doctors (Kassenärzte) and basic dental care. Non-working dependents are included at no additional cost.
Duplicate Coverage

- Duplicate coverage involves those individuals who hold public health insurance, and purchase additional private coverage.

- For to upgrade their medical coverage, for instance the right to consult a private doctor, to homeopathic remedies, a private room in hospital and higher dental reimbursements.

- The cost of full medical insurance is based on the benefits chosen, as well as on the age, gender and any pre-existing conditions of the insured.
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A Literature Review

- **Health Care Demand and Health Insurance**
  - Cameron et al (1986) *Mechanism of decisions*
  - Vera Hernandez (1997) *Duplicate Coverage*

- **Econometrics Methods**
  - Terza (1998) *FIML*
  - Windmeijer (1992) *GMM*
A Literature Review

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Basic Assumptions

- 1 period of time two moments
- He knows his initial health.
- He decides about the insurance policy \((dc = 0, 1)\) at the very beginning \(\tau = 0\) and decides about the health care demand at a moment \(\tau = 1\)
- Health care is measured as number of visit to the doctor \((v)\).
- Individual maximizes the final health’s level and the consumption during the period.
Sequence of decisions

\[ \tau = 0 \quad \tau = 1 \quad \tau = 2 \]

**Figure:** Decisions schedule and information

- \( h \) is the pretreatment health’s level
- \( h_1 \) final health’s level
- \( h_0 \) initial health’s level.
The final health’s level

\[ h_1 = H(h_0 + \epsilon + \mu v | A) = H(h + \mu v | A) \]  

- \( H(\cdot | A) \) is increasing
- \( A \) (age, gender, and so on).
- \( \epsilon \) random variable (diseases, accidents, and so on)
- \( F_\epsilon(\epsilon | Z) \) is the distribution of \( \epsilon \)
- \( Z \) (risk factors).
- \( m \) medical care and \( \mu \) is a parameter of effectiveness (given).
Assumptions: Utility Function and Budget Constraint

- an utility function $U(c, H)$
- 2 goods $c$ (without risk) and $H$ (risky)
- $U$ is $C^2$ strictly increasing and strictly concave in $c$ and $H$
- Budget constrain $Y - Pdc = c + (1 - dc)p_v v + kv$
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How Solve the Problem

at moment $\tau = 1$ $h$ and $dc$ are given, then

$$V(Y, h, dc, A) =$$

$$\arg \max_V U(Y - Pdc - (1 - dc)p_v v - kv, H(h + \mu v|A))$$  (2)

applying this at moment $\tau = 0$

$$DC(Y, h_0, Z, A) =$$

$$\arg \max_{dc} \int U(Y - Pdc - (1 - dc)p_v v - kv, H(h_0 + \epsilon + \mu v|A))$$

$$F_\epsilon(\epsilon|Z) d\epsilon$$  (3)
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FIML ES Terza (1998)

\[
\ell(\Gamma) = \sum_{i=1}^{N} \ln f(V_i, DC_i|\Gamma, x_1i, x_2i)
\]

\[
f(V_i, DC_i|\Gamma, x_1i, x_2i) = \frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} f(V_i|\Gamma_v, x_1i, DC_i, \xi_i\sigma\sqrt{2}) \times \\
\times \left[ DC_i \Phi_i^*(\xi_i\sigma\sqrt{2}) + (1 - DC_i)(1 - \Phi_i^*(\xi_i\sigma\sqrt{2}) \right] \exp(-\xi_i^2) \, d\xi_i
\]

\[
\Phi_i^* = \Phi \left( \frac{x_1^2 + (\rho/\sigma)\zeta_1i}{\sqrt{1 - \rho^2}} \right)
\]

\[
f(V_i|\Gamma_v, x_1i, DC_i, \xi_i\sigma\sqrt{2}) \text{ can be Poisson, Binomial or Zero inflated.}
\]
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The SOEP is a wide-ranging representative longitudinal study of private households.

The Panel was started in 1984.

It provides information on all household members, consisting of Germans living in the Old and New German States, Foreigners, and recent Immigrants to Germany.

Some of the many topics include household composition, occupational biographies, employment, earnings, health and satisfaction indicators.
Our Sample

- 10327 of Observations
- Over 17 years
- One or more visits.
- In the public system.
- In the SOEP’s wide 2004 and 2005
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Dependent Variables.

- Duplicate Coverage (DC, 0 without and 1 if duplicated coverage)
- Number of Visits (VISITS, number of visits in the last 3 months)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
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<tbody>
<tr>
<td>DC</td>
<td>10327</td>
<td>0.1277</td>
<td>0.3338</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>VISITS</td>
<td>10327</td>
<td>3.6468</td>
<td>4.1895</td>
<td>1</td>
<td>90</td>
</tr>
</tbody>
</table>
Variables.

- **Income Variables (Y)**
  - Income (INC, INC1 0-1000, INC2 1000-1500, ..., INC6 4000- ...)
  - West Germany (WG 1 in WG and 0 EG)
  - Number of members in the Household (NHH)

- **Health variables (h)**
  - Health Status (2005), (HEA HEA1 Very good, HEA2 Good, HEA3 Satisfactory, HEA4 Poor or bad).
  - Disability (WG 0 without and 1 if there is present disability)

- **Individual characteristics (A)**
  - Gender (GENDER 1 for females and 0 for males).
  - Age (AGE years divided by 100).
  - Education (EDUHS Education With Respect to High School, EDUHS1 Less than H S, EDUHS2 High School, EDUHS3 More than H S)
Variables Cont.

- **Risk likelihood ($Z$)**
  - Head of HH (PRI 1 for Head HH and 0 i.a.c.)
  - Education level of the head (EDUHSPRI like EDUHS)
  - Occupation (Blue collars, White collars, Others).
  - Frequency of sport or exercise (SPORT Almost never or never 1, Several times a year 2, At least once a month 3, At least once a week 4)

- **Previous Health Status ($h_0$)**
  - Health Status (2004), (HEA0 like HEA).
  - Pressed for time in the last 4 Weeks (2004) (PRESSED Always 1, Often 2, Sometimes 3, Almost Never 4, Never 5)
  - Strong Physical Pain in the last 4 Weeks (2004) (PHYS Always 1, Often 2, Sometimes 3, Almost Never 4, Never 5)
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## Results

**Table: Health care estimations (n= 10,327)**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>NB2 VISITS</th>
<th>POIS VISITS</th>
<th>ES VISITS</th>
<th>ES DC</th>
<th>PROBIT DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC</td>
<td>0.112*</td>
<td>0.116*</td>
<td>0.739*</td>
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</tr>
<tr>
<td>GENDER</td>
<td>0.078*</td>
<td>0.072*</td>
<td>0.077*</td>
<td>0.086*</td>
<td>0.094*</td>
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<tr>
<td>AGE</td>
<td>-1.008*</td>
<td>-0.801*</td>
<td>-0.946*</td>
<td>0.088</td>
<td>0.204</td>
</tr>
<tr>
<td>AGE_SQR</td>
<td>0.954*</td>
<td>0.749*</td>
<td>1.008*</td>
<td>-0.408</td>
<td>-0.497</td>
</tr>
<tr>
<td>EDUHS2</td>
<td>-0.015</td>
<td>-0.015</td>
<td>-0.037</td>
<td>0.342*</td>
<td>0.347*</td>
</tr>
<tr>
<td>EDUHS3</td>
<td>0.002</td>
<td>-0.002</td>
<td>-0.025</td>
<td>0.377*</td>
<td>0.370*</td>
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<tr>
<td>CONS</td>
<td>1.053*</td>
<td>1.010*</td>
<td>0.801*</td>
<td>-2.127*</td>
<td>-2.297*</td>
</tr>
<tr>
<td>ALPHA</td>
<td>0.290*</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SIGMA</td>
<td></td>
<td></td>
<td></td>
<td>0.587*</td>
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<tr>
<td>RHO</td>
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<td></td>
<td></td>
<td>-0.615*</td>
<td></td>
</tr>
<tr>
<td>Pseudo R2</td>
<td>0.071</td>
<td></td>
<td></td>
<td></td>
<td>0.096</td>
</tr>
</tbody>
</table>

* significant at 5%
### Results Income

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<tr>
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<tbody>
<tr>
<td>INC2</td>
<td>0.087*</td>
<td>0.103*</td>
<td>0.068*</td>
<td>0.238*</td>
<td>0.242*</td>
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<tr>
<td>INC3</td>
<td>0.093*</td>
<td>0.101*</td>
<td>0.077*</td>
<td>0.357*</td>
<td>0.403*</td>
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<tr>
<td>INC4</td>
<td>0.071</td>
<td>0.076</td>
<td>0.038</td>
<td>0.609*</td>
<td>0.632*</td>
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<td>INC5</td>
<td>0.037</td>
<td>0.048</td>
<td>-0.015</td>
<td>0.760*</td>
<td>0.782*</td>
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<tr>
<td>INC6</td>
<td>-0.012</td>
<td>-0.009</td>
<td>-0.136*</td>
<td>1.058*</td>
<td>1.081*</td>
</tr>
<tr>
<td>WG</td>
<td>0.083*</td>
<td>0.093*</td>
<td>0.026</td>
<td>0.357</td>
<td>0.410*</td>
</tr>
<tr>
<td>NHH</td>
<td>0.001</td>
<td>0.000</td>
<td>0.024*</td>
<td>-0.128*</td>
<td>-0.130*</td>
</tr>
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</tr>
</thead>
<tbody>
<tr>
<td>HEA2</td>
<td>0.122*</td>
<td>0.117*</td>
<td>0.127*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEA3</td>
<td>0.383*</td>
<td>0.381*</td>
<td>0.375*</td>
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<tr>
<td>HEA4</td>
<td>0.913*</td>
<td>0.911*</td>
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<tr>
<td>DISAB</td>
<td>0.247*</td>
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<td>0.268*</td>
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<tr>
<td>PRESS</td>
<td>-0.015</td>
<td>-0.018</td>
<td>-0.007</td>
<td>-0.063*</td>
<td>-0.060*</td>
</tr>
<tr>
<td>PHYS</td>
<td>-0.050*</td>
<td>-0.049*</td>
<td>-0.050*</td>
<td>0.013</td>
<td>0.013</td>
</tr>
<tr>
<td>HEA02</td>
<td></td>
<td></td>
<td></td>
<td>-0.075</td>
<td>-0.047</td>
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<tr>
<td>HEA03</td>
<td></td>
<td></td>
<td></td>
<td>-0.053</td>
<td>-0.020</td>
</tr>
<tr>
<td>HEA04</td>
<td></td>
<td></td>
<td></td>
<td>0.030</td>
<td>0.027</td>
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</thead>
<tbody>
<tr>
<td>PRI</td>
<td>0.121*</td>
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<td>EDUHSPRI2</td>
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<tr>
<td>WHITE_CO</td>
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<td></td>
<td></td>
<td>-0.040</td>
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<tr>
<td>SPORT</td>
<td>0.121*</td>
<td></td>
<td></td>
<td></td>
<td>0.110*</td>
</tr>
</tbody>
</table>

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Summary

- The results show that the duplicate coverage have a positive impact in the demand for health services.
- We found enough evidence for reject the hypothesis of exogeneity in the choice of duplicate coverage respect to the use of health services.
Outlook

- Improve the quality of the variables representing the previous health ($h_0$)
- Implement a ES model using a negative binomial distributions instead of the Poisson distribution that is used in this work and/or Zero inflated.
References


