Joint Determination of Health Insurance and Life Insurance Choice Using Data from Consumer Expenditure Survey

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Outline

- Introduction
- Literature Review
- Research Questions
- Model
- Data
- Results
- Implications
- Summary and Future Research

Introduction

- Financial Risk
  - Health
  - Death
  - Accident
- Insurance against Financial Risk
  - Health Insurance
  - Life Insurance
  - Car Insurance
- Joint Purchase Decision for Insurances
  - Basket of Risk Minimizing Goods
  - Correlation between choices of Health and Life Insurance

Introduction

- 2007 – U.S. Population Statistics
  - 253.4 million – with health insurance
  - 30.8 million – with life insurance
- Joint decision for choices of health and life insurance
  - A structural model
  - Factors affecting the insurance choice
  - Interaction among various insurance choices
    - Complements vs. Substitutes

Literature Review

- Insurance as Risk Minimizing Actions
  - Ehrlich and Becker (1972), Doherty and Schlesinger (1983)
- Factors affecting choice of Insurance
  - Shower and Shotick (1994), Van De Van and Van Praag (1981)
- Spending pattern and Insurance Choice
  - Paulin and Weber (1995), Rubin and Koeln (1993) , Levy and Delire (2003)
- Health Status, Life Style, Psychological & Biological Factors
  - Fienstein (1993), Gertham et al. (1999)
- Importance of disaggregate model for insurance choice
  - Shower and Shotick (1994)

Research Questions

- Investigation of individual choice for health insurance and life insurance
  - Accounting for
    - Individual characteristics (Demographics – age, family, race etc.)
    - Financial Information
    - Educational Information
    - Health Status
    - Insurance Characteristics
  - Estimating the structural model of individual choice for health and life insurance jointly
    - How the choice of health insurance affects the choice of life insurance

Research Questions

- The correlation between health insurance and life insurance choice
  - How unobserved factors affect the joint decision for choice of health and life insurance
  - Analyzing the nature of goods in the basket of individuals' risk minimizing goods
    - Complements
    - Substitutes

Model

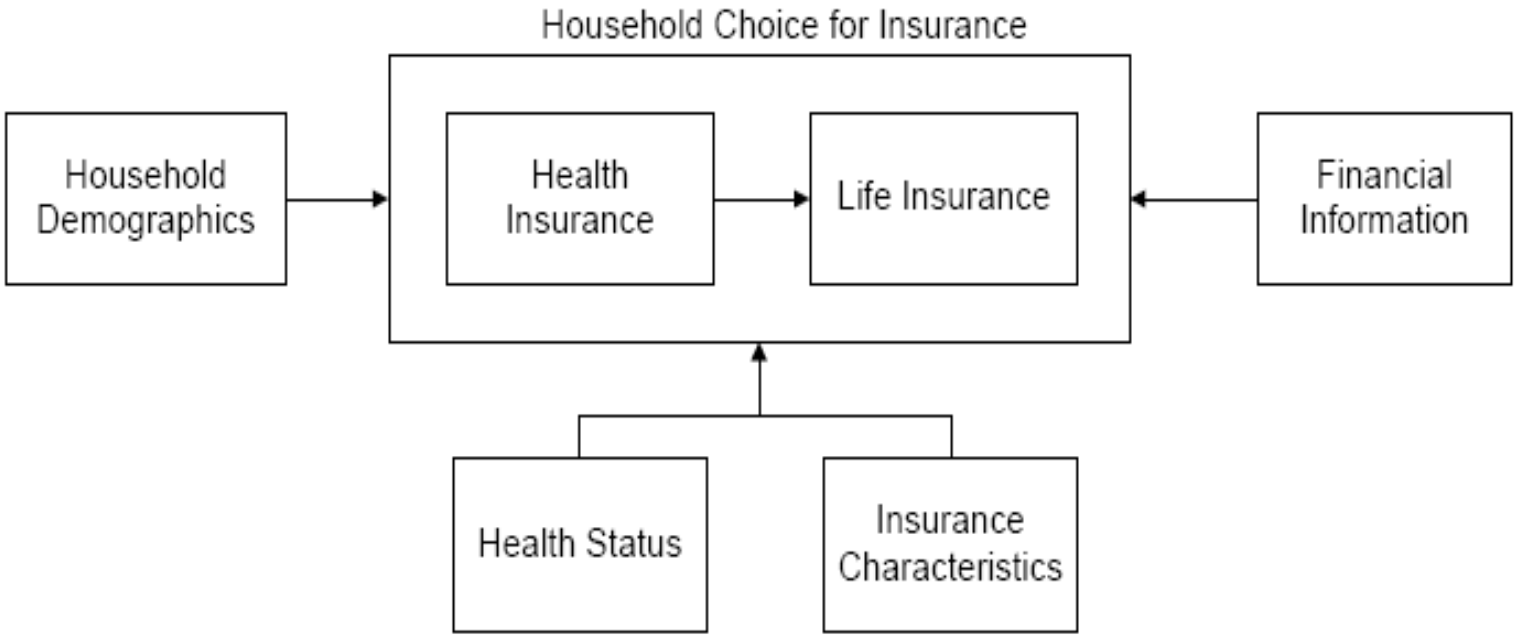
- Grossman Model

$$\sum_{t=1}^{T} E(\delta^t U_t) + B(A_{T+1})$$

$$U_t = U(Q_t, C_t, L_t; \boldsymbol{X}_t, u_1, \epsilon_{1t})$$

- Health is considered important by individuals
- Bequest function depends on assets which is determined by individual investment in health

Model : Conceptual Framework



Model: Econometric

- Recursive Bivariate Probit Model

$$y_{1i}^{*} = \alpha_1 + \mathbf{x}_i'\beta_1 + \mathbf{z}_{1i}'\gamma_1 + \epsilon_{1i}, \qquad y_{1i} = 1 \; if \; y_{1i}^{*} > 0, 0 \; otherwise$$

$$y_{2i}^{*} = \alpha_2 + \mathbf{x}_i'\beta_2 + \mathbf{z}_{2i}'\gamma_2 + y_{1i}\delta_2 + \epsilon_{2i}, \quad y_{2i} = 1 \; if \; y_{2i}^{*} > 0, 0 \; otherwise$$

- x – variables associated with household demographics, financial information, and health status
- z – variables associated with insurance characteristics

Model: Econometric

- Assuming ϵ_{1i} and ϵ_{2i} have joint normal distribution

$$\begin{pmatrix}\epsilon_{1i}\\ \epsilon_{2i}\end{pmatrix} \sim N\left(\begin{bmatrix}0\\0\end{bmatrix}, \begin{bmatrix}1 & \rho\\ \rho & 1\end{bmatrix}\right)$$

- Bivariate Probit Model
- Estimation Method
  - Maximum Likelihood method

Data

- CE Data (Interview Survey)
  - 2008-2009 – cross-sectional data of panels

- Individuals making conscious decision for choice of health and life insurance
  - Households with more than one consumer unit were dropped
  - Households receiving Medicare were dropped
  - Free medical insurance plan such as Medicaid were dropped
  - Final Sample Size - 20551

Data

- Choice of Health Insurance
  - Net positive present and past quarter expenditure for health insurance
  - Health and Hospitalization expenditure file (IHC)
- Choice of Life Insurance
  - Net positive present and past quarter expenditure for life insurance
  - Insurance file other than Health (INB, policyyb = '100')

Data

- Household Characteristics
  - Age
  - Household Composition
  - Sex
  - Earner Type
  - Family Composition
  - Education
  - Occupation
  - Race
  - Residence
  - Region

Data

- Financial Information
  - Income after tax
  - Income from asset
  - Retirement and pension deductions
- Insurance Characteristics
  - Premiums paid (IHB, INB, current and past insurance expenditure)

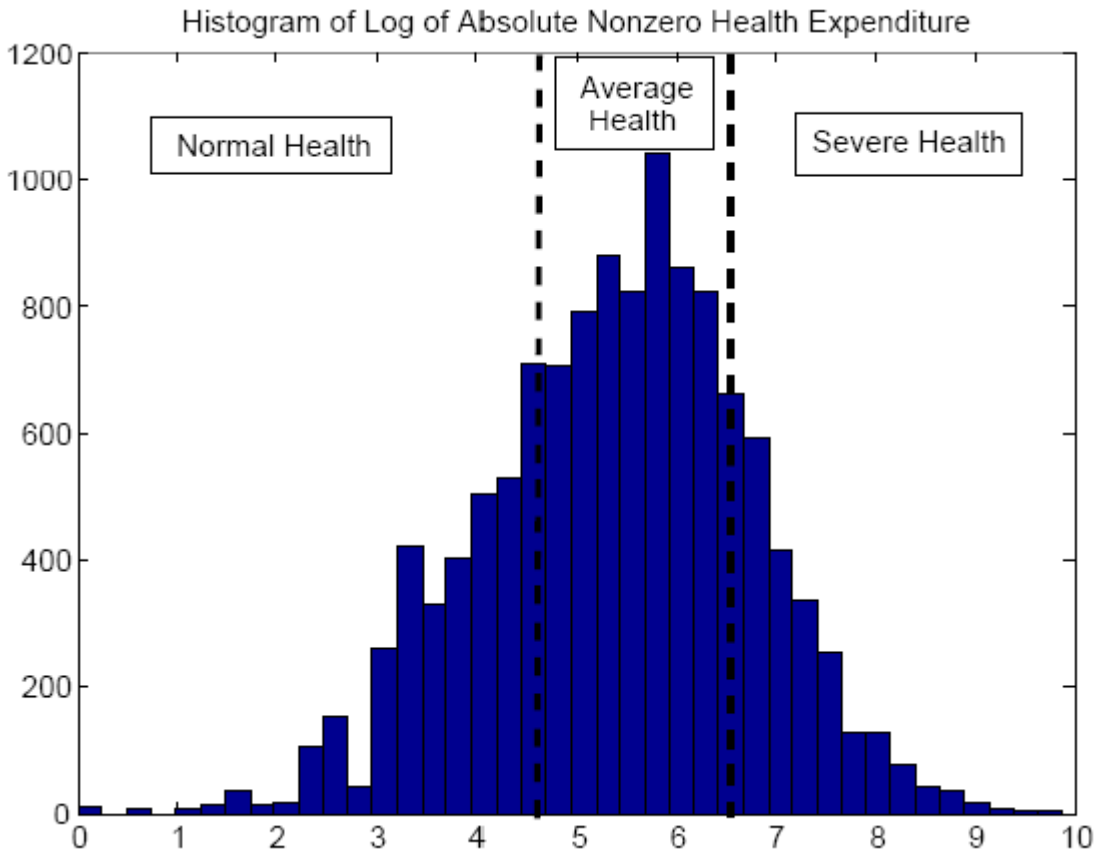
Health Status

- CE Data do not provide health status of the individuals
- Health Expense (Y_h) : sum of current and past quarter expenditure on
  - medical services
  - drugs
  - medical supplies
- We assume

$$Y_h \sim \log N(\mu, \sigma^2)$$

Data

- Different Health Groups



Data Descriptive

Table 1: Cross Tabulation of Health and Life Insurance

			Life Insurance		
			0	1	Total
Health Insurance	0	Frequency	3357	781	4138
		Percent	16.33	3.80	20.14
		Row Percent	81.13	18.87	
		Col Percent	30.93	8.05	
	1	Frequency	7498	8915	16413
		Percent	36.48	43.38	79.86
		Row Percent	45.68	54.32	
		Col Percent	69.07	91.95	
	Total		10855	9696	20551
	Percent		52.82	47.18	100.00

Data Descriptive

Table 2: Cross Tabulation of Health Insurance and Health Insurance Premium Paid

			Health Insurance Premium Paid by Self		
			0	1	Total
Health Insurance	0	Frequency	4138	0	4138
		Percent	20.14	0.00	20.14
		Row Percent	100.00	0.00	
		Col Percent	57.12	0.00	
	1	Frequency	3107	13306	16413
		Percent	15.12	64.75	79.86
		Row Percent	18.93	81.07	
		Col Percent	42.88	100.00	
	Total		7245	13306	20551
	Percent		35.25	64.75	100.00

Data Descriptive

Table 3: Cross Tabulation of Life Insurance and Life Insurance Premium Paid

			Life Insurance Premium Paid by Self		
			0	1	Total
Life Insurance	0	Frequency	10855	0	10855
		Percent	52.82	0.00	52.82
		Row Percent	100.00	0.00	
		Col Percent	89.50	0.00	
	1	Frequency	1274	8422	9696
		Percent	6.20	40.98	47.18
		Row Percent	13.14	86.86	
		Col Percent	10.50	100.00	
	Total		12129	8422	20551
	Percent		59.02	40.98	100.00

Data Descriptive

Table 5: Overall Data Descriptive

	Mean	Std.Dev.	Median	Maximum	Minimum
Family Information					
Age	43.2164	11.6258	44.0000	64.0000	16.0000
Infants (Members below 2)	0.0694	0.2672	0.0000	3.0000	0.0000
Juvenile (Members between 2-16)	0.6069	0.9682	0.0000	7.0000	0.0000
Adults (Members above 16)	2.0145	0.9057	2.0000	9.0000	1.0000
Old (Members above 64)	0.0140	0.1298	0.0000	3.0000	0.0000
Financial Information (in terms of thousands of $)					
Income after tax	77.1930	65.8210	61.0000	1174.0205	-77.0563
Income from asset	5.7008	25.5278	0.0000	943.1294	-72.2926
Pension and retirement deductions	6.6735	6.0687	5.2020	70.4010	0.0000
Sex					
Female					50.54%
Male					49.46%
Earner Type					
Reference person only					33.73%
Reference person plus spouse					34.05%
Spouse only					5.90%
Others					22.34%
No earner					3.98%

Data Descriptive

Family Type	
Single person	23.54%
Husband/Wife with children	34.45%
Single parent	6.14%
Other type	16.07%
Husband/Wife only	19.80%
Education	
Non-high school graduate	8.93%
College graduate	46.63%
High school graduate	44.44%
Occupation	
Technical and sales	20.21%
Service	11.70%
Blue collar and other	12.33%
Self employed	8.89%
Retired	2.84%
Out of labor force	2.01%
Manager/Professional/Supervisor	42.02%
Race	
Black	10.73%
White	89.27%

Data Descriptive

House Ownership	
House not owned	30.70%
House owned	69.30%
Residence	
Rural	4.92%
Urban	95.08%
Region	
Northeast	18.11%
Midwest	24.51%
West	23.04%
South	34.34%

Data Descriptive

- Health Status Groups

Table 4: Household Health Groups

Household Health Group	Health Expense	Percentage
Healthy Households	$Y_h = 0$	40.98
Normal Health Status Household	$Y_h < 102$	16.55
Average Health Status Household	$102 \leq Y_h < 702$	31.30
Severe Health Status Household	$Y_h \geq 702$	11.17

Results

		Health Insurance		Life Insurance	
		Param	SE	Param	SE
	Intercept	0.1719	0.0016	-2.5382	0.0020
	Age	-0.0604	0.0001	0.0281	0.0001
	Square of Age	0.0708	0.0001	-0.0215	0.0001
Sex (base male)	Female	0.0916	0.0003	-0.0605	0.0003
	Members below 2 years	0.1731	0.0005	0.1192	0.0005
	Members between 2-16 years	-0.0479	0.0002	-0.0342	0.0002
	Members above 16	0.0162	0.0002	-0.1762	0.0003
	Members above 64	-0.3939	0.0010	0.0727	0.0011
Earner Type (base No Earner)	Reference Person earn only	0.1743	0.0007	0.3862	0.0010
	Reference Person + spouse earn only	0.1697	0.0008	0.4016	0.0011
	Spouse earn only	-0.0610	0.0008	0.4154	0.0011
	Other type	0.0499	0.0008	0.5733	0.0011
Family Type (base Husband/Wife only)	Single person	0.0244	0.0006	-0.1092	0.0006
	Husband/Wife with child	0.0037	0.0005	-0.0096	0.0005
	Single Parent	0.2286	0.0007	-0.0859	0.0008
	Other family type	-0.1417	0.0006	-0.0843	0.0006
Region (base South)	Northeast	0.6466	0.0004	-0.1288	0.0004
	Midwest	0.6171	0.0003	0.0791	0.0003
	West	0.3728	0.0003	-0.2347	0.0003
Education (base High School)	Non high school graduate	-0.4410	0.0004	-0.2073	0.0005
	College graduate	0.1826	0.0003	-0.0526	0.0003
Race (base White)	Black	-0.0729	0.0004	0.1345	0.0004

Results

		Health Insurance		Life Insurance	
		Param	SE	Param	SE
Occupation (base Manager/ Professional/ Supervisor)	Technical and sales	0.0271	0.0004	-0.0946	0.0003
	Service	-0.1963	0.0004	-0.3975	0.0005
	Blue collar and other	-0.1331	0.0004	-0.0511	0.0004
	Self employed	-0.3732	0.0005	-0.5474	0.0006
	Retired	0.2394	0.0009	-0.0144	0.0010
	Out of labor force	-0.1615	0.0008	-0.5187	0.0013
Residence (base Urban)	Rural	-0.1454	0.0005	-0.0399	0.0005
House Ownership(base owned)	House not owned	-0.1810	0.0003	-0.0586	0.0003
	Income after tax	0.0041	0.0000	0.0004	0.0000
	Income from asset	-0.0061	0.0000	-0.0033	0.0000
	Retirement and pension deduction	0.0187	0.0000	0.0235	0.0000
Health Status (base Healthy)	Normal Health Status	0.3554	0.0004	0.2864	0.0003
	Average Health Status	0.2034	0.0003	0.2999	0.0003
	Severe Health Status	0.2858	0.0005	0.2767	0.0005
Premium Paid (base Others)	Premium paid by Self	5.5458	0.0215	0.6780	0.0270
	Health Insurance			0.5080	0.0006
			Param		SE
	Correlation Coefficient		0.2425		0.0004
	Log likelihood				-138483905

Implications

- Explanation for correlation
  - Causal relationship
  - Reverse causality
  - No causal relationship
- Positive correlation states
  - Health Insurance and Life Insurance are complements
- Structural model states
  - Choice of Health Insurance has positive impact on choice of Life Insurance
- Policy implications

Summary

- Study of individual choice for health and life insurance
- Propose a structural model to estimate the disaggregate model of choice for health and life insurance
- Control for household characteristics, financial information, insurance related information, and health status
- In the basket of individuals' risk minimizing goods, health and life insurances act as complements
- The choice of health insurance by an individual positively affect the subsequent choice for life insurance.

Future Research

- The choice of insurance also depends on actual amount spent on the policy
  - A tobit model to study the effect of amount spent on health and life insurances
- Individuals make decision for other insurances such as car insurance, house insurance etc.
  - A comprehensive multivariate probit model to study the interactions among various kinds of insurance purchase decisions

Thank You