Consumption and Health in Old Age

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Motivation

- Key specification choice in many models: How consumption and health enter the utility function.
- Important for:
  - how wealth evolves in old age (De Nardi, French and Jones, 2010)
  - computing value of insurance against health and long-term care risks (Lockwood, 2014)
  - adequacy of retirement preparation (Scholz et al., 2006)
  - investments in health and other assets (Hugonnier et al., 2013, Fonseca et al., 2014)

Motivation

- We know more about the evolution of total spending with age than about its composition
  - There is some descriptive evidence of how the composition of consumption changes with age: Hurd and Rohwedder (2005), Aguiar and Hurst (2013), Banks et al. (2015)
  - Most empirical studies of dynamic demand systems on synthetic panels (e.g. Blundell et al., 1994)
- The response to health shocks may have effects on total spending as well as composition.
- Response may vary depending on type of health shock (ADL vs. IADL)

Earlier Work

Mixed results on state-dependence of marginal utility of consumption with health (from bad to good):

- Stated-preference studies: Viscusi and Evans (1990) [+], Sloan et al. (1998) [+], Evans and Viscusi (1991) [0]
- Structural models: Lillard et Weiss (1997) [-], De Nardi et al. (2010) [-], Scholtz et Seshadri (2010) [+]
- Direct estimates from well-being data: Finkelstein et al. (2013) [+]

This paper

For this talk:

- Investigation of changes in spending and composition as a function of changes in health (ADL and IADL).
- Using CAMS (2001-2011) and HRS (2000-2010): rich panel data on both spending, health and other ressources (income, wealth).

Theoretical Framework

- J consumption items which include health spending: $c_t = (c_{1,t}, ..., c_{J,t})$ and h_t (measured from bad to good).
- Within-period preferences:

$$u(c_t, h_t) = \frac{\psi(c_t, h_t)^{1-\sigma}}{1-\sigma}. \tag{1}$$

Theoretical Framework

The dynamic budget constraint is given by:

$$w_{t+1} = R(w_t + y_t - m_t)$$

- $m_t = \sum_j c_{j,t}$ is total expenditures.
- The agent has a discount factor β.
- Risks $p_m(h_t, t)$ and $p_h(h_{t+1}|h_t, t)$.

Solution

- The allocation of expenditures across categories does not affect the marginal utility of wealth next period.
- The choice of m_t is governed only by the intertemporal allocation problem.
- Given m_t, the intra-period allocation is to allocate m_t using within period preferences.

Indirect utility function

- The solution to the within-period problem yields to conditional expenditure shares $\alpha_j^*(h_t, m_t)$.
- Replacing in $u(c_t, h_t)$ we obtain the indirect utility function :

$$v(m_t, h_t) = \frac{\psi(m_t, h_t)^{1-\sigma}}{1-\sigma}$$

- The problem becomes one of choosing m_t

Euler Equation

The solution for the path of m, assuming the borrowing constraint is not binding, is governed by the Euler equation:

$$v'(m_t, h_t) = R\beta(1 - p_m(h_t, t)) \int_h v'(m_{t+1}, h_{t+1}) p_h(h_{t+1} = h | h_t, t) dh$$

Effect of a Health Shock

Hence the solution can be decomposed in two terms:

$$c_j^*(w_t, h_t) = \alpha_j(h_t, m_t^*(w_t, h_t))m_t^*(w_t, h_t)$$

A change in health can have three different effects on spending. Taking the total derivative with respect to h we get:

$$\frac{\partial c_j^*(w_t, h_t)}{\partial h} = \left(\frac{\partial \alpha_j(h_t, m_t^*)}{\partial h} + \frac{\partial \alpha_j(h_t, m^*)}{\partial m} \frac{\partial m^*}{\partial h} \right) m^* \quad + \alpha_j(h_t, m^*) \frac{\partial m^*(w_t, h_t)}{\partial h}$$

Identification of state-dependence effects is complicated by life-cycle and income effects.

Data

- The Consumption and Activities Mail Out Survey (CAMS), part of the Health and Retirement Study
  - Waves 2003-2011
- The Health and Retirement Study (HRS)
  - Waves 2002-2010
  - Match information for CAMS respondents

Spending Data

- CAMS has 36 spending items. We first group non-durable spending into 8 categories
  - housing, transportation, utilities, household services
  - leisure, donations-gifts, food
  - health (premiums + out-of-pocket)
- Total spending is the sum of non-durable spending and durable spending.
- Imputations are done by the RAND HRS team. Observations on total spending with more than 20 out of 36 missing values are dropped.

Health

- We use reports in HRS of the presence of at least one limitations with:
  - Activities of daily living (bathing, dressing, getting out of bed, walking)
  - Instrumental activities of daily living (shopping, preparing hot meals, using the phone, managing money, and taking medications)
- Since recorded at different moment than consumption data, care with assigning health changes to consumption changes (more later)

Wealth

- The HRS has extensive information on each respondent's balanced sheet. We use a measure of net household wealth:
  - **Assets**: checking accounts, CDs, stocks, bonds, housing (primary and other real estate), transportation, individual retirement accounts (IRAs)
  - **Debt:** mortgage (primary and other), home loans, other debt (credit card, etc)
- Net household wealth is the difference of assets and debt.

Other Characteristics

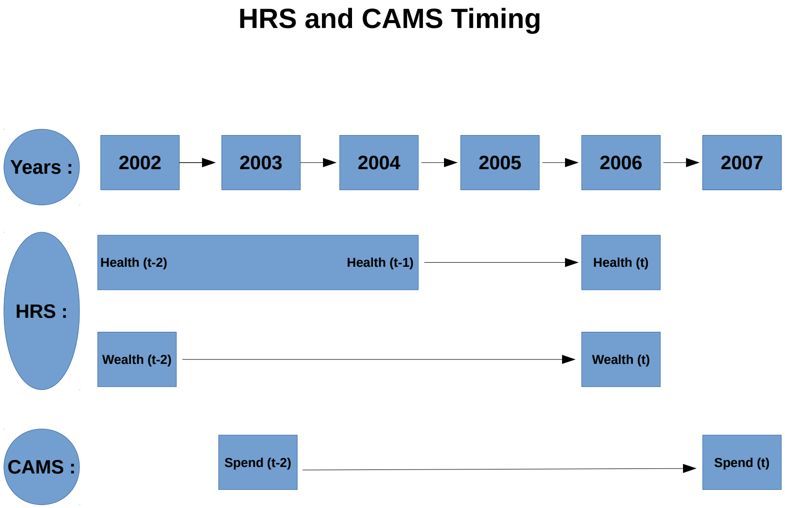
- **Expectations:** subjective probability survive +10 years, subjective probability enter nursing home < 5 years, subjective probability of leaving a bequest
- **Income:** household total income (before taxes and transfers)
- **Socio-demographics:** age, gender, education, race and ethnicity
- **Self-reported health:** 5 point scale recoded to 3, poor/fair, good, very good/excellent
- **Self-reported diagnosed health conditions:** diabetes, cancer, hypertension, heart disease, stroke

Empirical Strategy

The retrospective window for spending does not coincide with HRS interview

- **CAMS:** september to december of off HRS years (2003, 2005, 2007, 2009, 2011). Look back over last twelve months
- **HRS:** primarely march to december of (2002, 2004, 2006, 2008, 2010). Health questions ask about current health.

Design



HRS and CAMS Timing
Years :
2002
2003
2004
2005
2006
2007
HRS :
Health (t-2)
Health (t-1)
Health (t)
Wealth (t-2)
Wealth (t)
CAMS :
Spend (t-2)
Spend (t)

Sample restrictions

	Observations
CAMS wave 2	2094
CAMS wave 3	3442
CAMS wave 4	3236
CAMS wave 5	3041
CAMS wave 6	3835
CAMS total	**15648**
Age: 65-94	**8117**
Single	**5687**
Not in nursing home	**5479**
Non-missing $\Delta_4 \log c$	**2235**
No ADL and IADL baseline	**1516**

Specification

- Outcome quantities:
  - aggregates: $\log m_{i,j,t} - \log m_{i,j,t-4}$
  - items: $\alpha_{i,j,t} - \alpha_{i,j,t-4}$
- Treatment: $(ADL_{i,t-1}, IADL_{i,t-1})$

Controls

Controls x_i: Conditioning on $(ADL_{i,t-3}, ADL_{i,t-5}) = 0$,$(IADL_{i,t-3}, IADL_{i,t-5}) = 0$

- Baseline health: self-diagnosed conditions, self-reported health at $t-5$
- Baseline SES: log income, log net wealth and education at $t-5$
- Baseline expectations: subjective probability of survival and of entering nursing home.
- Socio-demographics: age, gender, race, ethnicity

Estimators

- Because of the potential importance of outliers on aggregates, median regressions:

$$Q_{\frac{1}{2}}(\Delta_4(y_{i,t})) = x_i\beta + \gamma_A ADL_{i,t-1} + \gamma_I IADL_{i,t-1} + \lambda_t$$

- x_i contains baseline outcomes (expectations, income, wealth, health) and socio-demographics)
- For shares, we use a tobit with random effect.

Effects on Aggregates

Outcome is change in logs over 4 years (estimates corrected for clusturing at individual level)

	Total Spending	Non-Durable	Net Wealth
ADL	0.031	0.019	-0.050
	(0.035)	(0.038)	(0.064)
IADL	0.127 ***	0.130 ***	-0.033
	(0.048)	(0.046)	(0.074)
Observations	1516	1516	1661

Clustered standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Effects on Expectations

Outcome is change in levels over 4 years

	Bequest $> 10k$	Nursing Home < 5 yrs	Survive 10 yrs
ADL	1.610	3.328*	0.393
	(2.373)	(1.996)	(2.171)
IADL	-5.673	6.663*	-9.299***
	(4.711)	(3.896)	(3.388)
Observations	1,600	1,346	1,453
R-squared	0.013	0.023	0.026

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Effects on Shares

Tobit with random effects Outcome is change in share over 4 years

	Housing	Transport	Utilities	HH Services	Health
ADL	-0.0165	0.0132*	-0.00583	-0.000725	-0.000503
	(0.0125)	(0.008)	(0.00759)	(0.00419)	(0.00938)
IADL	0.0108	-0.0269**	-0.0108	0.00337	0.0496***
	(0.019)	(0.0123)	(0.0116)	(0.00642)	(0.0141)
Observations	1,516	1,516	1,516	1,516	1,516
Individuals	861	861	861	861	861

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Effects on Shares

Tobit with random effects. Outcome is change in shares over 4 years.

	Gifts	Food	Leisure	Clothing
ADL	0.000703	-0.000347	0.00316	-0.00686**
	(0.00865)	(0.00958)	(0.00501)	(0.00319)
IADL	-0.0205	-0.0247*	-0.00879	-0.00225
	(0.0136)	(0.0145)	(0.00792)	(0.00487)
Observations	1,516	1,516	1,516	1,516
Individuals	861	861	861	861

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Composition of Net Wealth

Tobit with random effects. Outcome is change in share of net wealth

	Financial	Housing	Transport	Real Estates
ADL	-0.0137	-0.0074	0.0155	-0.0237
	(0.0284)	(0.0284)	(0.0182)	(0.0823)
IADL	0.0726*	-0.0542	-0.0613**	0.0882
	(0.0398)	(0.0403)	(0.0268)	(0.104)
Observations	1,636	1,636	1,636	1,636
Individuals	924	924	924	924

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

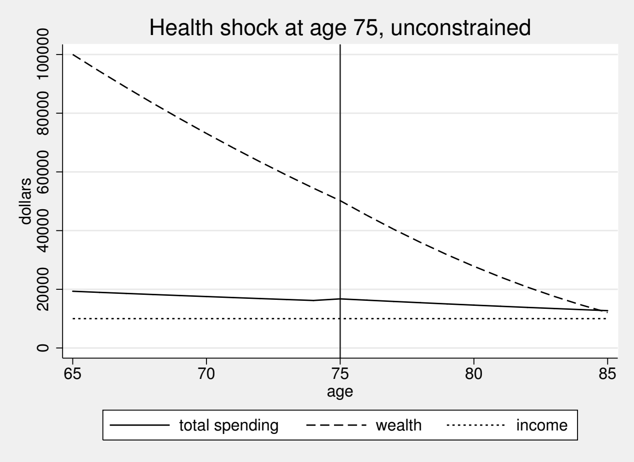
Summary of Descriptive Results

- Evidence that non-durable spending increases following onset of IADL
- Consistent with the change in spending, lower survival probability and increased likelihood of entering nursing home
- Increased allocation towards health spending, lower transportation and food spending
- No evidence of overall effect on net wealth, but evidence of a shift from transportation to financial wealth

Structural Model

- Assume $\psi(c_t, h_t) = \sum_j c_{j,t}^{\alpha_j(h_t)}$, with $\sum_j \alpha_j(h_t) = 1$. $J = 3$.
- Health is two states, good ($h_t = 0$) or bad ($h_t = 1$)
- Annuity income $y_t = y$
- Initial wealth w_0
- Starts in good health $h_0 = 0$.
- Mortality risk increases with $h_t = 1$, but constant with age.
- Simulation: Agent has good health until age 75, bad health after, simulate 1000 times
- Preferences: $\sigma = 2$, $\beta = 0.96$, $r = 0.04$, First two goods: $\alpha_j(1) < \alpha_j(0)$, last good (health spending), $\alpha_j(1) > \alpha_j(0)$
- Two situations: $(w_0, y) = (1e5, 1e4)$ (unconstrained), $(w_0, y) = (1e4, 1e4)$ (constrained)

Simulations



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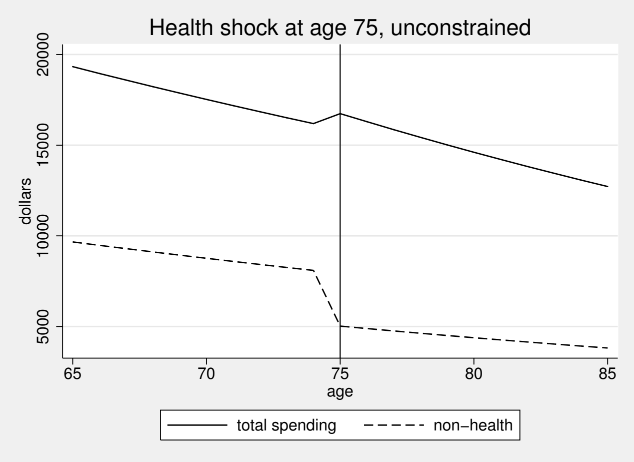

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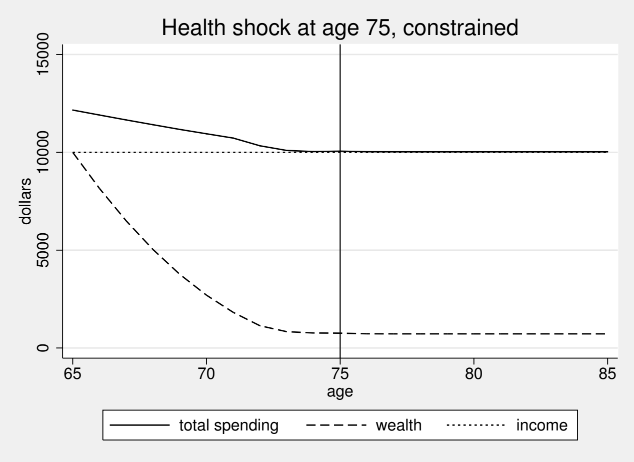

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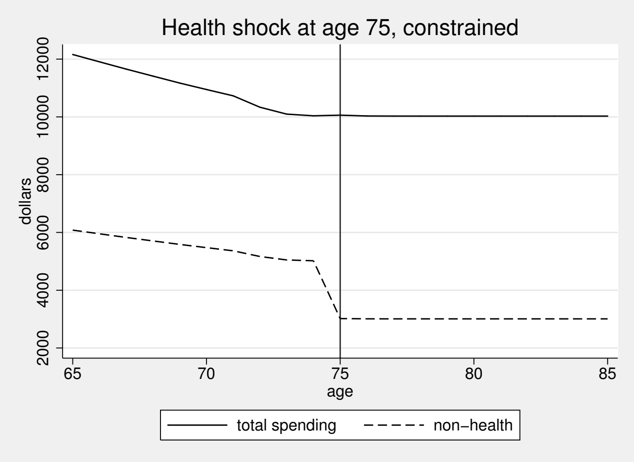

Conclusion and Future Work

- Robustness of results
- Other health shocks
- Structural estimation of parameters