

Long-term care: Macroeconomic implications and optimal policy

iid seminar at Carlos III – preliminary!!!

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Long-term care (LTC): Definition

Person becomes dependent on assistance from another person in performing everyday-life activities.

- Specifically: “Activities of daily living” (ADLs):
 - Get in and out of bed
 - Get dressed
 - Shower
 - Eat
 - Shop for groceries
- Dependence has to be long-lasting

⇒ Typically elderly (over 70) with chronic diseases: Disabilities, Alzheimer etc.

LTC: A growing concern in rich countries

- Elderly requiring LTC as fraction of 25- to 64-year-old population in U.S. (source: Urban Institute)

2010	2020	2030
6.4%	7.4%	9.6%

- Rising labor-force participation of usual/potential care-givers: 50- to 60-year-old women
- Health-care costs increase faster than other prices

⇒ Debate about policy reform (or actual reform) in many countries

What countries are doing

- U.S.: Means-tested minimal care
- **Germany:** Introduced mandatory LTC insurance in 1996
 - Subsidizes institutional and family-provided care
 - Pay-roll tax, i.e. pay-as-you-go: 2% of a salaried income, matched by employer
 - Government-approved doctors classify disabled in 3 groups (*Pflegestufen*)
 - Private insurance companies offer contracts conditioning on this classification (evidence: my parents)
- **Spain:** *Ley de Dependencia* (since 2007)
 - Nice ideas
 - Law is passed
 - But not (yet?) carried out in practice

Our question

What is the optimal government LTC policy?

- Study consequences of different policy options...
 - laissez-faire/"consumption-floor"
 - mandatory insurance
 - Subsidizing family-provided care and/or nursing homes
- ... for:
 - Private welfare (potentially conflicting interests between generations)
 - Government budget
 - Labor supply (of caregivers, especially female)

Why room for government intervention?

- 1 Market failure: Private insurance markets largely absent in U.S. (Cutler, 1996; Brown & Finkelstein, 2007)
 - Adverse selection?
 - Aggregate risk (health technology)?
 - Difficult state verification?
- 2 Classical failure of welfare theorems in OLG
- 3 Our paper: Allocations inside family may be inefficient
 - Commitment problems
 - Incomplete contracts

And: If governments are already active, better study what they are doing/should be doing!

Literature

Many micro studies and data work, but no macro paper on LTC.

Related macro work:

- De Nardi, French and Jones (2006):
 - Structurally estimate model of savings behavior
 - Out-of-pocket medical expenses (especially nursing homes) go long way in explaining high savings of elderly \Rightarrow Retirement savings puzzle
- Attanasio, Kitao, and Violante (2008):
 - OLG model for U.S. economy with health shocks
 - Study alternative funding schemes for Medicare
 - **But:** Not specifically LTC, no home care/family

Data

Health and Retirement Study (HRS)

Health and Retirement Study (HRS) by the University of Michigan:

- Representative for U.S. universe of non-institutionalized individuals
 - Panel data: 2-year frequency
 - Interviews
 - 3 samples of interest:
 - 1 Asset and Health Dynamics of the Oldest Old (AHEAD): respondents > 70 years, since 1993
 - 2 Core sample (HRScore): Respondents 51-61 years-old, since 1992
 - 3 Children of the Depression (CODA): Respondents born 1923-1930, since 1998
 - RAND: Provides cleaned-up version + disability index
- ⇒ Great data on care recipient's health and assets, but info on care-givers often worse

Other data sources

- **National Long-Term Care Survey (NLTCS)**: Has better info on care-givers (wage, household income, hours forgone by care)
 - **Survey of Health, Ageing and Retirement in Europe (SHARE)**:
 - various European countries
 - standardized interviews, modeled after HRS
- ⇒ Advantage: Variation in governmental policies

Home care vs. nursing homes

Facts for elderly in U.S. (Brown & Finkelstein, 2006; Brown, 2007; Ameriks et al., 2008):

- 23-24 percent disabled
- Three-quarters of disabled live outside institutions
- Men have 27-percent chance of ever entering nursing home, women 44-percent chance
- Men spend on average 1.3 years in nursing home, women 2 years.
- Government pays more than 50% of nursing homes and home care.
- Current average annual cost of nursing home:
 - 66,000\$ for semi-private room
 - 75,000\$ for private room

⇒ **Home care matters**

Importance of family-provided care

Source of care for non-institutionalized by age group:

<i>Helper</i>	<i>65–74 years</i>	<i>75–84 years</i>	<i>+85 years</i>
<i>Spouse</i>	33.2	25.1	8.6
<i>Child</i>	36.0	39.0	42.9
<i>Relative</i>	24.6	24.2	34.8
<i>Formal</i>	6.2	11.8	13.6

Table: HRS cross-section 2002, percentage of care provided by source for different age groups of care-receiver. Respondent level weights used.

Importance of family (II)

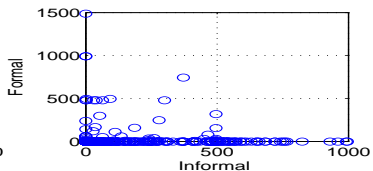
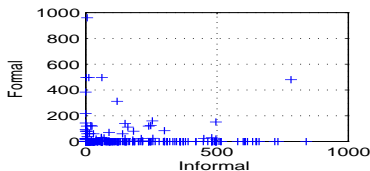
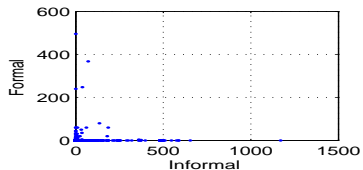
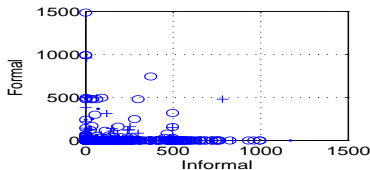
Hours of care per month (non-institutionalized, over 70 years, at least one functional limitation)

<i>Helper</i>	<i>% of total hours</i>	<i>Mean</i>	<i>Median</i>	<i>90th percentile</i>
<i>Spouse</i>	33.0	144.2	62	480
<i>Child</i>	31.4	78.1	30	240
<i>Relative</i>	26.8	88.7	31	256
<i>Formal</i>	8.8	85.9	35	240

Table: HRS cross-section 2002, hours of care provided to non-institutionalized over-70-year-olds with at least one functional limitation (by source of care).

⇒ **Suggests to model family explicitly**

Complementarity of formal and informal care?



- ⇒ **Model formal and family care are substitutes**
- ⇒ **Relative subsidies to one kind of care can have large effects**

Best predictor for home care: IncDiff

- HomeCare: Elderly lives at home, not in nursing home (i.e. non-institutionalized)
- Constructing IncDiff:
 - KidInc: Poorest child's household income (Categories 0-3)
 - ⇒ opportunity cost for care-giver
 - OldWealth: Elderly's wealth (categories 0-3)
 - ⇒ "market" power of elderly
 - IncDiff = KidInc - OldWealth (7 categories)

IncDiff	-3	-2	-1	0	1	2	3
% HomeCare	95.6	90.2	86.9	79.9	68.6	56.9	53.3

Table: HRS cross section 2002

⇒ **Suggests non-cooperative model with imperfect altruism**

Model

Framework

Dynamic general-equilibrium OLG model with (imperfectly-)altruistic agents

- Allow for:
 - Crowding-out of private care by government policies
 - Preference for family-provided care
 - Conflicting interests between elderly and young
E.g.: Under-provision of home care if nursing homes subsidized
- Calibrate to data from Health and Retirement Study (HRS) in U.S.
– or SHARE from Europe?
- Use dynamic-altruistic framework from Barczyk & Kredler (2010a,b)

Demographics

- Time t is discrete
- Continuum of families
- Two households per family:
 - 1 old (65 to 90-year-old)
 - 2 young (40 to 65-year old)
- Old are first healthy, then sick and then die
 - σ : Probability of becoming sick when healthy
 - δ : Probability of dying when sick
- Young household turns old upon olds' death, new young household enters.

Young household: Labor supply

Two workers in each young household:

- Endowments in labor time: $l_t^0 \in [0, \bar{l}^0]$, $l_t^1 \in [0, \bar{l}^1]$.
- Worker 1 (infra-marginal worker) can work in goods sector (l) and formal-care sector (f):

$$l_t^1 + f_t^1 \leq \bar{l}^1$$

- Worker 0 (marginal worker) can also do home care h :

$$l_t^0 + f_t^0 + h_t \leq \bar{l}^0$$

- Efficiency units in goods sector $x_t^0 \leq x_t^1$: Follow Markov chain.
- All workers have same efficiency at formal and home care: 1 unit of time gives 1 unit of care.

Markets

- Small open economy: Riskless asset with gross interest rate $R > 1$
- Consumption good:

$$Y_t = A_t \underbrace{\int l_t^0(j)x_t^0(j) + l_t^1(j)x_t^1(j) dj}_{\equiv L_t}$$

Competitive firms \Rightarrow Wage rate $w_t^i = A_t x_t^i$

- Formal care, price p_t :

$$F_t = \int f_t^0(i) + f_t^1(i) di$$

Competitive firms \Rightarrow Wage rate is $w_t^{f,i} = p_t$

\Rightarrow Lowest- x workers will do care

Old household

- Receives pension $P(x^0, x^1)$ depending on last earnings
- Sick: Need one unit of care (formal or private) . . .
- . . . or give assets to government and stay in Medicaid nursing home forever
- Death: Assets are bequeathed to young household (subject to estate tax $\tau_{est} \in [0, 1]$)

Preferences

- Felicity functions:

- Young: $u^y(c_t^y, l_t^1 + f_t^1, l_t^0 + f_t^0 + h_t^s) = u(c_t^y) + \dots$

- Old, healthy: $u(c_t^o)$

- Old, sick: $u^o(c_t^o, h_t) = u(c_t^o) + \eta h_t$, or $u(c_{mc})$ if on Medicaid.

- Preferences (recursive, including altruism $\alpha^o, \alpha^y \in [0, 1]$):

- 1 Healthy state:

$$U_t^{y,h} = u^y(\cdot) + \alpha^y u^o(\cdot) + \beta \left[(1 - \sigma) U_{t+1}^{y,h} + \delta U_{t+1}^{y,s} \right]$$

$$U_t^{o,h} = u(c_t^o) + \alpha^o u^y(\cdot) + \beta \left[(1 - \sigma) U_{t+1}^{o,h} + \delta U_{t+1}^{o,s} \right]$$

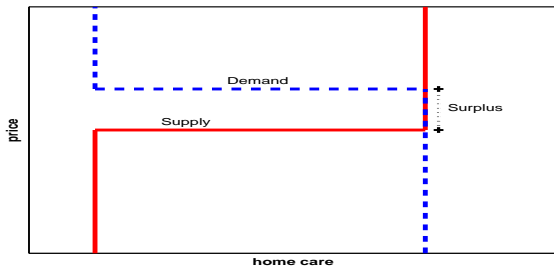
- 2 Sick state:

$$U_t^{y,s} = u^y(\cdot) + \alpha^y u^o(\cdot) + \beta \left[(1 - \delta) U_{t+1}^{y,s} + \delta U_{t+1}^{o,h} \right]$$

$$U_t^{o,s} = u^o(\cdot) + \alpha^o u^y(\cdot) + \beta \left[(1 - \delta) U_{t+1}^{o,s} + \delta \alpha^o U_{t+1}^{o,h} \right]$$

Determination of home care

- Determine home-care demand $h_t^D \in \{0, 1\}$ and supply $h_t^S \in \{0, 1\}$ for given intra-family transfer T_t



- If market clears at $h_t = 1$, get T_t by symmetric Nash bargaining \Rightarrow picks transfer half-way
- If market clears at $h_t = 0$, have $T_t = 0$.

Government

- Subsidy s_h to young for each unit of home care delivered
- Subsidy s_f to old for each unit of formal care bought
- Tax τ_t on labor (goods and formal-care sector)
⇒ Government has to use distorting taxation to finance care
- Medicaid (MA) nursing homes cost C_{ma} per person/year, but get assets from those going into Medicaid: MAA_t .
- Finance other expenditures G_t

Balanced budget each period:

$$\tau_t(A_t L_t + F_t) + MAA_t = s_h \int h_t(j) dj + s_n F_t + C_{ma} \int \mathcal{I}(ma_t(j)) dj + G_t$$

Young household's problem

Define states as $\omega_t^y \equiv (a_t^y, x_t^0, x_t^1)$ and $\omega_t^o = (a_t^o, P)$.

Given home-care price $T_t(\omega_t^y, \omega_t^o)$, wages (w_t^1, w_t^0) , tax τ_t and subsidy s_h :

$$V_t^y(a_t^y, x_t^0, x_t^1; \omega_t^o) = \max_{c_t^y, a_{t+1}^y, l_t, f_t, h_t^S} \left\{ U(c_t^y, l_t^1 + f_t^1, l_t^0 + f_t^0 + h_t^S) + \alpha_y U(c_t^o, h_t^S) + \beta E_t V_{t+1}(x_{t+1}^0, x_{t+1}^1, a_{t+1}^y; \omega_{t+1}^o) \right\}$$

s. t.

$$c_t^y + a_{t+1}^y \leq (1 - \tau_t)(l_t^1 w_t^1 + l_t^0 w_t^0 + f_t^1 + f_t^0) + h_t^S (T_t + s_h) + R a_t^y$$

$$a_{t+1}^y \geq 0$$

$$l_t^1 + f_t^1 \leq \bar{l}^1$$

$$l_t^0 + f_t^0 + h_t^S \leq \bar{l}^0$$

$$h_t^S \in \{0, 1\}.$$

Old healthy household's problem

$$V_t^{o,h}(a_t^o, P; \omega_t^y) = \max_{c_t^o, a_{t+1}^o} \left\{ u_o(c_t^o) + \alpha_o U(c_t^y, l_t^y) + \right. \\ \left. + \beta E_t \left[(1 - \sigma) V_{t+1}^{o,h}(a_{t+1}^o, \cdot) + \sigma V_{t+1}^{o,S}(a_{t+1}^o, \cdot) \right] \right\}$$

s.t.

$$c_t^o + a_{t+1}^o \leq P + Ra_t^o$$

$$a_{t+1}^o \geq 0$$

Old sick household's problem

- Value of Medicaid:

$$V_t^{o,ma}(\omega_t^y) = \frac{u(c_{ma})}{1 - \beta(1 - \delta)} + \alpha_o V_t^y(\omega_t^y; \omega_t^o)$$

- Value without Medicaid:

$$V_t^{o,s}(a_t^o, P; \omega_t^y) = \max_{c_t^o, a_{t+1}^o, h_t^D \in \{0,1\}} u_o(c_t^o) + \eta h_t^D + \alpha_o U(c_t^y, l_t^y) + \beta E_t \left[(1 - \delta) V_{t+1}^{o,s}(a_{t+1}^o, \cdot) + \delta \alpha_o V_{t+1}^{o,h}(\tilde{a}_{t+1}^o, \cdot) \right]$$

s.t.

$$P + Ra_t^o \geq c_t^o + (T_t - s^h)h_t^D + (p_t - s^n)(1 - h_t^D) + a_{t+1}^o$$

$$a_{t+1}^o \geq 0$$

$$\tilde{a}_{t+1}^o = a_{t+1}^y + (1 - \tau_{est})a_{t+1}^o$$

⇒ Choose Medicaid or not:

$$V_t^o(a_t^o, P; \omega_t^y) = \max \{ V_t^{o,ma}(\omega_t^y), V_t^{o,s}(a_t^o, P; \omega_t^y) \}$$

Equilibrium definition (I)

A **decentralized equilibrium** consists of

- a set of market prices (consumption good, formal care, wages in both sectors)
- a home-care pricing function $T_t(a_t^o, P; \omega_t^y)$

and

- policy rules for young agents
- policy rules for old agents
- firm decisions
- a government policy $s_h, s_f, \{\tau_t\}$

such that...

Equilibrium definition (II)

... **such that:**

- Young agents' policy rules are optimal given the government's policy, the home-care pricing function and the old agents' policy rules.
- Old agents' policy rules are optimal given the government's policy, the home-care pricing function and the young agents' policy rules.
- Firms' decisions are optimal given prices.
- $T_t(\cdot)$ is the symmetric-Nash-bargaining solution between young and old for all (ω_t^y, ω_t^o) .
- The government's budget is balanced in every period (given agents' optimal decisions).

Some results

Home-care supply

Consider a simplified model (no Medicaid, no healthy state for old, only one earner in young household) in continuous time.

Result 1: *Home-care is supplied (i.e. $h^s = 1$) if and only if*

$$\underbrace{T \frac{\partial V^y}{\partial a^y}}_{\text{benefit}} + \underbrace{\alpha^y \eta + p \frac{\partial V^y}{\partial a^o}}_{\text{indirect benefit}} \geq \underbrace{w \frac{\partial V^y}{\partial a^y}}_{\text{opportunity cost}} + \underbrace{T \frac{\partial V^y}{\partial a^o}}_{\text{indirect cost}} \quad (1)$$

where we can back out the reservation wage for the young to give home care

$$\underline{T}^s = \frac{w \frac{\partial V^y}{\partial a^y} - \alpha^y \eta - p \frac{\partial V^y}{\partial a^o}}{\frac{\partial V^y}{\partial a^y} - \frac{\partial V^y}{\partial a^o}}.$$

Home-care demand

Result 2: Home care is demanded (i.e. $h^d = 1$) if and only if

$$\underbrace{\eta + p \frac{\partial V^o}{\partial a^o}}_{\text{benefit}} + \underbrace{T \frac{\partial V^o}{\partial a^y}}_{\text{indirect benefit}} \geq \underbrace{T \frac{\partial V^o}{\partial a^o}}_{\text{cost}} + \underbrace{w \frac{\partial V^o}{\partial a^y}}_{\text{indirect cost}} \quad (2)$$

where the willingness to pay for home-care by the old is

$$\bar{T}^d = \frac{\eta + p \frac{\partial V^o}{\partial a^o} - w \frac{\partial V^o}{\partial a^y}}{\frac{\partial V^o}{\partial a^o} - \frac{\partial V^o}{\partial a^y}}.$$

Home care: Market clearing

Write supply/demand conditions as linear functions in T and use Barczyk & Kredler (2010b):

$$h^s = 1 \quad \Leftrightarrow \quad \underbrace{\alpha^y \eta + p \frac{\partial V^y}{\partial a^o} - w \frac{\partial V^y}{\partial a^y}}_{\equiv k_y} + \underbrace{\left[\frac{\partial V^y}{\partial a^y} - \frac{\partial V^y}{\partial a^o} \right]}_{\geq 0} T \geq 0$$

$$h^d = 1 \quad \Leftrightarrow \quad \underbrace{\eta + p \frac{\partial V^o}{\partial a^o} - w \frac{\partial V^o}{\partial a^y}}_{\equiv k_o} - \underbrace{\left[\frac{\partial V^o}{\partial a^o} - \frac{\partial V^o}{\partial a^y} \right]}_{\geq 0} T \geq 0$$

Note: For **perfect altruism** ($\alpha_y = \alpha_o = 1$), we have $V = V^y = V^o$ and $\partial V / \partial a^y = \partial V / \partial a^o$

\Rightarrow **Always agree on h**

Outlook

Outlook

- Confident we can solve model of this degree of complexity
- My questions to you on the modeling:
 - 1 How to do bargaining over home-care transfer?
 - 2 Distorting taxes to assess welfare costs of financing LTC spending or not?
 - 3 Two workers in young household or not?