Illiquid Housing as Self-Insurance: The Case of Long-Term Care

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May 6, 2008

Overview

1. Important links: housing $\Leftrightarrow$ old age actuarial products
2. Long Term Care Insurance Market
3. Illiquid home equity reduces demand for LTCI
   - Theoretically
   - Empirically
     - Simple correlation
     - *quasi*-experiment
4. Extension: 3-way interactions among:
   - Reverse mortgage
   - LTCI
   - Annuities
5. Conclusions:
   - Housing liquidity affects insurance demand
   - Insurance needs may affect housing and RM demand

Right Price for Housing?

$$\frac{\overbrace{\text{Adjusted Rent Today}}^{\text{Observable?}}}{\underbrace{\text{Riskless}}_{\text{horizon?}} - \underbrace{\text{growth}}_{\text{Dynamic urban model?}} + \underbrace{\text{Risk premium}}_{\text{???}}}$$

- Risk premium
  - Big part of wealth so very positive?
    - But cash out infrequent, even in old age
  - Negative? Hedging demand (SS)

Age profile of owner housing

From Annie Fang Yang

Figure 4: Housing consumption

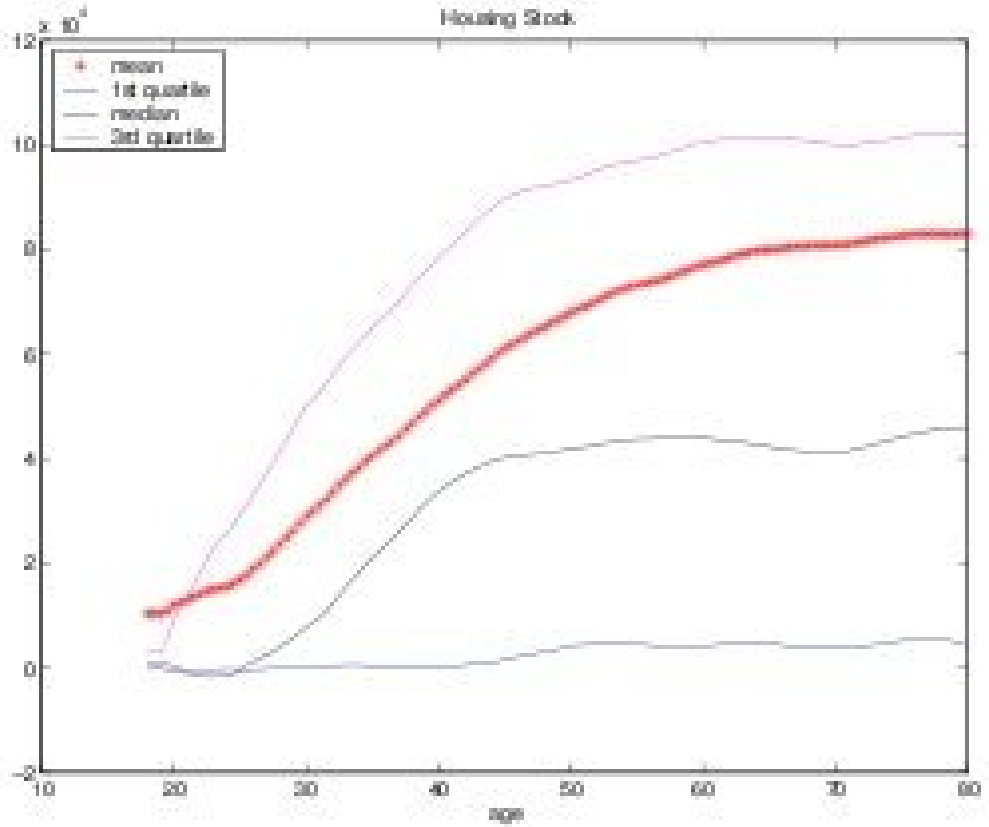


Figure 5: Housing consumption (quartiles)

Optimal Demand for Assets in General?

- Housing a dominant asset, correlated with labor income
- Need to know assets' covariance with a home's
  - Dividend
    - How do you measure dividend changes?
    - $\frac{\partial^2 u(c_t, h_t)}{\partial c_t \partial h_t}$?
  - Terminal value
    - $\approx$ 50% of retirees die without selling
    - HRS retiree homeowners: $\overline{\frac{Equity}{Value}} = 89\%$
    - Why not a bigger RM/HEL market? Not today

Today's Asset: Long Term Care Insurance

- A major missing market
  - Risk of $\approx$ \$50,000/year
  - 10-15% covered in HRS
- Up there with:
  - Reverse mortgage
  - Annuities
- Maybe these markets interact
  - Need to understand end of life to understand housing risks
  - Today: vice-versa

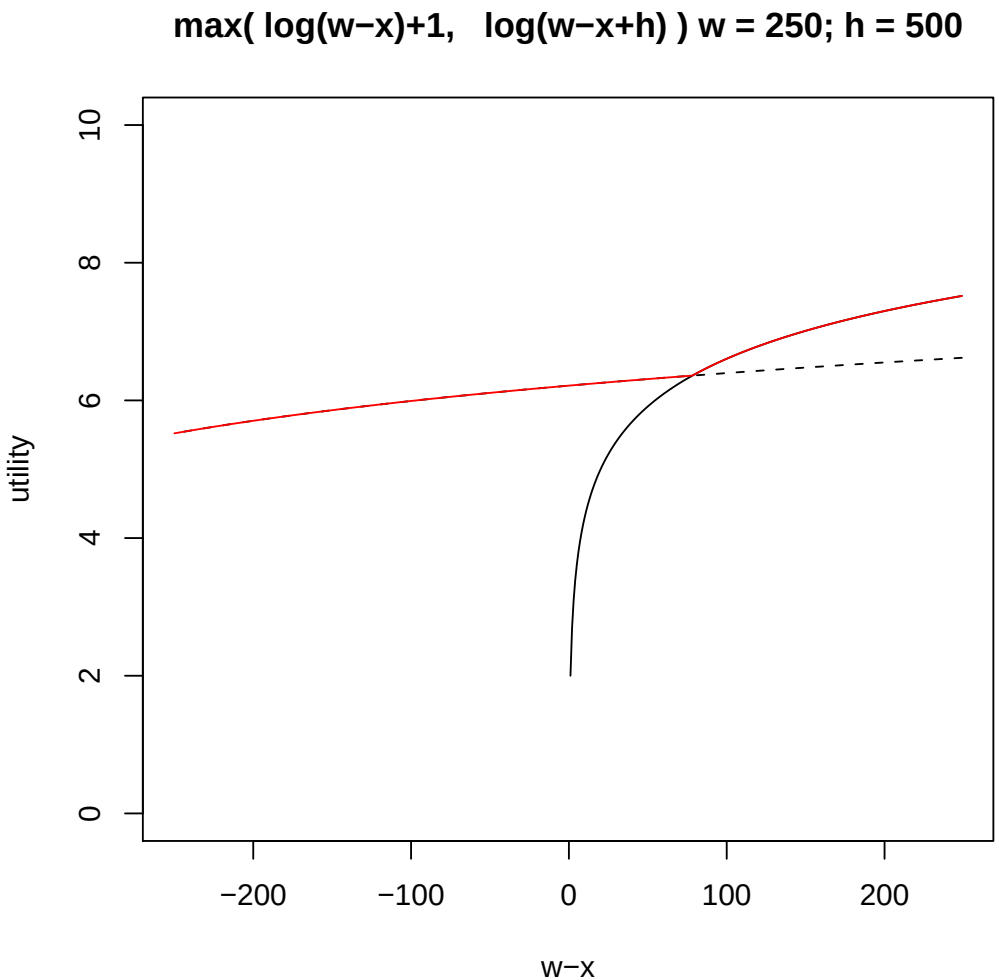
Why so little LTCI?

Existing Literature

- Moral hazard/adverse selection? (no, Finkelstein-McGarry)
- Medicaid + thin annuity market (Pauly, others)
  - But the rich? (Ameriks et al)
- Some other ideas (Lakdawala-Philipson: demographics)
- Today: another explanation

Home Equity as self-Insurance

Similar: Chetty and Szeidl, Shore and Sinai



Extending the analogy to LTCI

Does LTC trigger home sale per picture?

- Home sale is highly correlated with LTCI
  See Venti & Wise; Walker, . . .

	Lives in a Nursing Home in 2004?	
	No	Yes
	Homeownership rate	
2004 Insurance		
Medicaid	76%	37%
Private LTCI	95%	40%
Neither	90%	30%

LTCI Demand with Illiquid Home Equity

Formalities: assumptions

- Massive disutility to moving unless sick
  - Sell if sick
  - Don't sell if healthy
  - Not a terrible approximation of HRS data
- No mortgage debt available
- One period to avoid thinking about savings decisions
  - See extension for dynamic problem
- No bequest motive
- Stochastic taste for Medicaid care quality m
- Owners $i = 1$, Renters $i = 0$

Expected utility

$$U = \underbrace{u(w - t\pi, h, i)}_{\text{healthy: pay and stay}} + \underbrace{F(m*)v(w + t - x + hp)}_{\text{sick, hate medicaid, get insurance, sell}} + \underbrace{\int_{m*}^{\infty} [z(w + t, hp) + m] f(m) dm}_{\text{sick, ok w/ Medicaid, use for insurance, home?}} .$$

- $u_{11}, v'', z_{12} \leq 0$

Comparative statics on quantity of insurance t

- Homeowners: $\frac{dt}{dp} < 0$ if
  - small $\frac{f(m*)}{F(m*)}$:
    - Medicaid effect hard to sign
  - utility under LTCI sufficiently risk averse
- Homeowners: $\frac{dt}{dh} < 0$ if also u_{12} not too negative
- Homeowners: Not easy to show $\frac{d^2t}{dpdh} < 0$.
- Renters: no clear effect of p.

If Anyone Is Curious

The first order condition for insurance can be written:

$$-\pi u_1(w - t\pi, h + [1 - i]\, p, i) + F(m*)v'(w + hp + t) + [1 - F(m*)]\, z_1(w + t, hp) = 0. \tag{1}$$

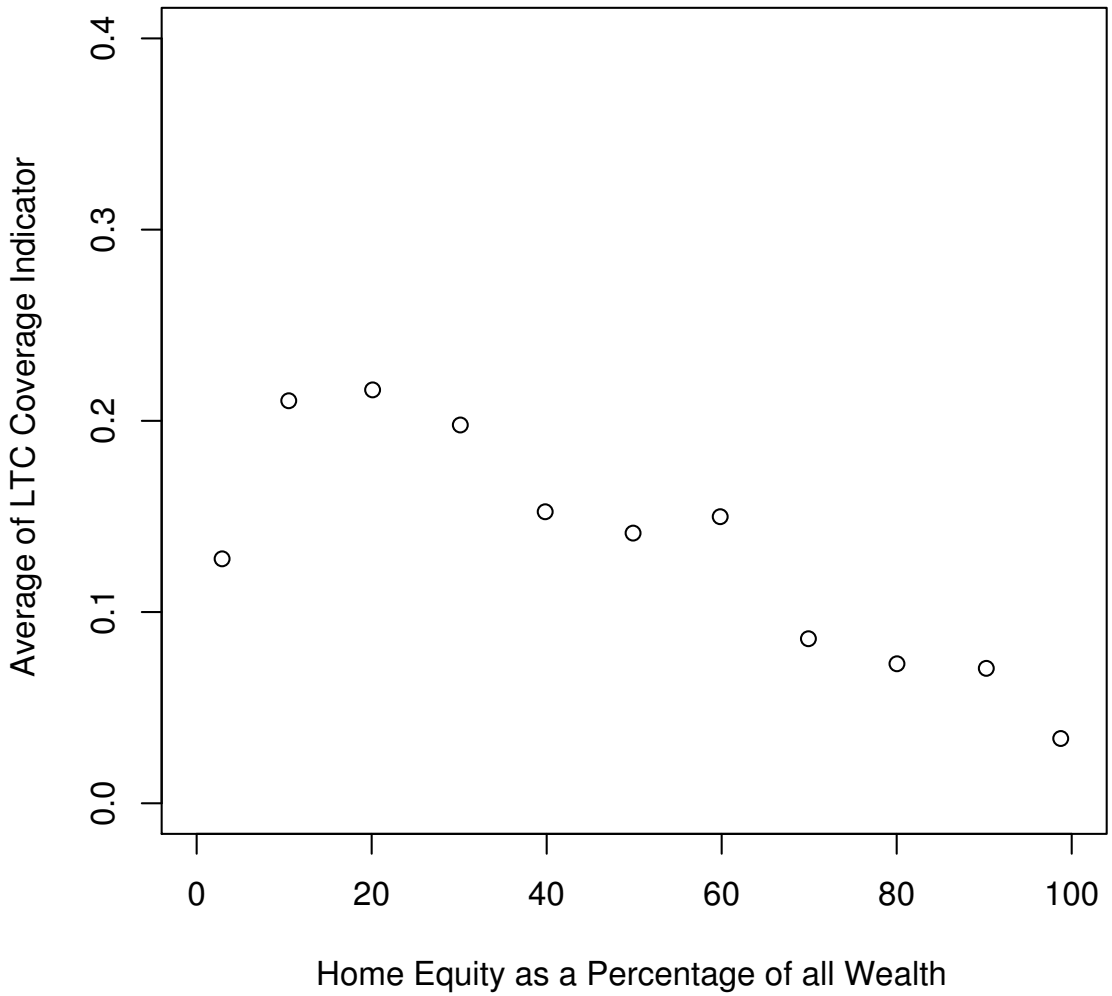
Differentiating (1), we have the following comparative statics for owners:

$$\frac{dt}{dp} = -h\frac{F(m*)v'' + [1 - F(m*)]\, z_{12} + f(m*)\left[v' - z_2\right]\left[v' - z_1\right]}{\pi^2 u_{11} + F(m*)v'' + [1 - F(m*)]\, z_{11} + f(m*)\left[v' - z_1\right]^2}, \tag{2}$$

$$\frac{dt}{dh} = -\frac{-\pi u_{12} + p\left[F(m*)v'' + [1 - F(m*)]\, z_{12} + f(m*)\left[v' - z_2\right]\left[v' - z_1\right]\right]}{\pi^2 u_{11} + F(m*)v'' + [1 - F(m*)]\, z_{11} + f(m*)\left[v' - z_1\right]^2}. \tag{3}$$

First pass at empirical analysis

HRS/AHEAD 2004 Wave



Empirical Challenges

- Want to show $\frac{\partial u^{Self} - u^{LTCI}}{\partial hor\ p} > 0$
- Observe $\max(u^{Med}, u^{LTCI}, u^{Self}) == u^{LTCI}$
- Spurious correlation problem:
  - Medicaid offers coverage
  - Medicaid treats home equity kindly
  - $\Rightarrow$ Medicaid$\succ$LTCI for high home equity
  - Home equity share correlated with poor

Empirical Test of Model

- OLS gives result (big vs small $\frac{h}{w}$) but idenitfied?
- Owners: $\frac{\partial t}{\partial p} < 0$.
- Renters: No such prediction
- Test via "triple difference" in
  1. LTCI coverage indicator
  2. by housing tenure
  3. by exposure to price changes
- Example:

$$\overbrace{\Delta \text{LTCI (Dubuque Owners - Dubuque Renters)}}^{\text{Expect small difference: small } \Delta p}$$

$$- \underbrace{\Delta \text{ LTCI (LA Owners - LA Renters)}}_{\text{Expect large difference: large } \Delta p}$$

Empirical Specification

$$\Delta LTCI_i =$$

$$f\left(\beta_1 H_i + \beta_2 g_m + \beta_3 H_i g_m + x_i\gamma_0 + g_m x_{i1}\gamma_1 + \gamma_2 g_s + \gamma_3 g_s H_i + \epsilon_i\right).$$

- Ordered Probit (some 1-way linear probability)

$$\Delta LTCI = \begin{cases} -1 & \text{Drop Coverage} \\ 0 & \text{Keep Coverage} \\ 0 & \text{Stay Without} \\ 1 & \text{Add Coverage} \end{cases}$$

- g_m: metropolitan growth
- g_s: state growth
  - State Medicaid policy
- Interactions with x_i
  - Only losers rent in Dubuque, not in LA?

Interpretation: a caveat

- Can't separate home equity from wealth
- Data: wealth highly positive
  - So we can interpret a negative coefficient per model?
  - Difficult to know where Medicaid wealth effect stops
  - And housing wealth is different from non- under Medicaid
- Available interpretation: housing wealth crowds out LTC

Data

1998 and 1998-2004

- HRS
  - LTCI indicator 1998 and 2004
  - Metro area (restricted)
  - Own home?
  - # kids, wealth, marital status, income, education, health, ...
    - Important fact: no controls or interactions significant ...
    - ...Except drinks per day (!?)
- Merge with OFHEO growth 1998-2004 (state, msa)

Summary Statistics

Variable (symbol)	Obs	Mean	Std. Dev.	Min	Max
Home value	2,823	.95	.84	0	7
Own home (H)	2,823	.86	.34	0	1
Metropolitan appreciation 1998-2004 (g_m)	2,823	1.45	.22	1.14	2.27
g_s	2,823	1.49	.22	1.21	1.95
Δ LTCI	2,823	.024	.33	-1	1
Add LTCI	2,493	.08	.27	0	1
Drop LTCI	330	.37	.48	0	1
Total assets	2,823	3.15	4.51	-1.73	43.92
Household Income	2,823	.40	.59	0	13.68
Age	2,823	71.40	6.18	62	92
Married?	2,823	.65	.48	0	1
No. Children	2,753	3.29	2.10	0	13
Yrs. Education	2,816	12.05	3.20	0	17
Female	2,823	.59	.49	0	1
Depression measure	2,693	1.22	1.63	0	8
Categorical self-assessment of health	2,823	2.66	1.013	1	5
Drinks per day	2,823	1.24	2.26	0	7
Smoke?	2,823	.10	.31	0	1

Main Ordered Probit Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
g_m (metropolitan growth)	0.984	1.399	-0.022	1.861	0.501	1.324	-0.540
	(0.256)**	(0.442)**	(2.489)	(0.915)*	(0.383)	(0.627)*	(0.249)*
Own	1.978	1.776	1.265	3.565	0.554		
	(0.553)**	(0.557)**	(0.708)	(1.416)*	(0.879)		
Own $\times g_m$	-1.220	-1.887	-1.584	-2.181	-0.263		
	(0.369)**	(0.580)**	(0.704)*	(0.958)*	(0.579)		
g_s		-0.488	-0.407			-0.596	0.348
		(0.429)	(0.538)			(0.607)	(0.231)
Own $\times g_s$		0.784	0.758				
		(0.538)	(0.631)				
Observations	2,823	2,823	2,622	1,060	984	355	2,267
Controls	No	No	Yes	No	No	Yes	Yes
Controls $\times g_m$	No	No	Yes	No	No	No	No
Lower cut pt.	-.11	-.24	-3.37	1.28	-.88	.30	-3.38
	(.38)	(.39)	(-.10)	(1.33)	(.57)	(1.18)	(.62)
Upper cut pt.	3.11	2.99	-.11	4.35	2.53	3.93	-.15
	(.39)	(.40)	(3.69)	(1.34)	(2.54)	(1.19)	(.61)
Subset	Full	Full	Full	"Rich"	Single	Rent	Own

Results Support Home Equity Crowd Out

- Owners more likely to increase LTCI . . .
- . . . But less so where large growth
- Not because of state growth $\Rightarrow$ Medicaid home equity policy (2)
- Not other stuff corr. w/ renter (3)
- Strong effect above median wealth, income (4) - Medicaid??
- No effect among singles - Medicaid? (5)
- Weird: significant + effect of g_m for renters (6)
- But also - for owners (7)
- se's clustered at metropolitan level
  - Low correlation within couples !?

Some Other Results

One-Way Linear Probability

	(1) Add	(2) Drop	(3) Add	(4) Drop	(5) Add	(6) Drop
g_m	0.118	-0.618	0.844	-0.362	0.009	-0.460
	(0.059)*	(0.278)*	(0.282)**	(0.380)	(0.058)	(0.508)
Own	0.291	-1.253	1.379	-0.769	0.081	0.254
	(0.103)**	(0.453)**	(0.379)**	(0.690)	(0.099)	(0.748)
Own $\times g_m$	-0.171	0.720	-0.956	0.371	-0.033	-0.236
	(0.071)*	(0.313)*	(0.285)**	(0.402)	(0.066)	(0.533)
Constant	-0.130	1.455	-1.089	0.954	0.014	1.214
	(0.084)	(0.402)**	(0.370)**	(0.653)	(0.085)	(0.712)
Observations	2,493	330	873	187	898	86
R-squared	0.01	0.03	0.02	0.02	0.01	0.10
Controls	No	No	No	No	No	No
Subset	Full	Full	Rich	Rich	Single	Single

- Results stand up
- Very small sample for Rich Drop
- Still nothing for singles

Extension: Add annuities

Different Paper: "Housing, Health, and Annuities"

- Annuities: great idea if bequest motive not strong
- Except they're illiquid and badly priced
- Emerging literature: fix both problems with LTCI combo
- What about housing?
  - Annuities: \$ today $\rightarrow$ \$ future(when old, likely sick)
  - LTCI: likewise
  - Home Equity: likewise
- Simulations:
  - No illiquid housing
    - Annuities better with LTCI
    - and vice-versa
  - Illiquid housing
    - Annuities subtract value only if combined with LTCI
    - Full LTCI bad, worse with annuities

Simulation setup

- Caplin et al (Brown Finkelstein, . . .) 4 health states
  - Healthy (hate moving)
  - Slightly ill (moving ok)
  - LTCI (moving ok)
  - Dead (NA)
- Expected utility

$$\sum_{t=62}^{101} \sum_{s=1}^{3} [1+\delta]^{62-t} \, q_{st} \left[\frac{\alpha h_{st}^{1-\gamma} + [1-\alpha] \, c_{st}^{1-\gamma}}{1-\gamma} - L(s) \times M_{st} \right].$$

- Maximize w/ or w/out RM, fair LTCI, fair annuity

Simulation Calibration

Symbol	Meaning	Value(s)
α	housing share	.25
δ	discount rate	.03
r	interest rate	.03
γ	Curvature	2, 4
q_{st}	Health and survival prob.	per Robinson . . .

Numerical Results

Disutility of Bankrupt	Disutility of Move	Liquid Assets	Price Growth	Risk Aversion	Mtg ($)	Annuitized ($)	LTCI (%)	Value
-99	-99	100	0	2	200	0	0	0
-99	-99	100	0	2	200	0	100	94
-99	-99	100	0	2	200	50	0	6
-99	-99	100	0	2	200	50	100	160
-99	-99	100	0	2	0	0	0	0
-99	-99	100	0	2	0	0	50	4
-99	-99	100	0	2	0	0	100	-5
-99	-99	100	0	2	0	10	0	2
-99	-99	100	0	2	0	10	50	5
-99	-99	100	0	2	0	10	100	-6
-99	-99	100	0	2	0	50	0	11
-99	-99	100	0	2	0	50	50	4
-99	-99	100	0	2	0	50	100	-17
-99	-9	100	0	2	0	0	0	0
-99	-9	100	0	2	0	0	100	128
-99	-9	100	0	2	0	50	0	6
-99	-9	100	0	2	0	50	100	120
-99	-99	200	0	2	0	0	0	0
-99	-99	200	0	2	0	0	100	98
-99	-99	200	0	2	0	50	0	9
-99	-99	200	0	2	0	50	100	145
-99	-99	100	0	4	0	0	0	0
-99	-99	100	0	4	0	0	100	-5
-99	-99	100	0	4	0	50	0	11
-99	-99	100	0	4	0	50	100	-17

Conclusions

- Home Equity is crucial at T
  - Reverse mortgage an important market
- Optimal retirement product extremely complicated
  - Bundling Annuities and LTCI may not work well
- C-S/S-S "consumption commitments" a big deal
- Optimal life cycle behavior hard to characterize
  - For economists, too