House Prices and Consumer Spending

David Berger, Veronica Guerrieri, Guido Lorenzoni, Joe Vavra

Austin, January 2015

Motivation

- Growing empirical evidence of housing wealth effects on non-durable spending
- Simplest theoretical models predict small housing wealth effects
- Broad Questions:
  - Tighter link between theory and data, what do models really predict?
  - How do elasticities depend on joint distribution of assets (housing, non-housing, debt)?
  - Does it matter what shock causes house price movements?
  - Should policy makers pay attention to average debt, distribution of debt, aggregate house prices, local house prices?
  - Are there times when the economy is particularly "fragile" to asset price driven recessions?
  - Should policy makers regulate leverage or engage in debt forgiveness?

More Specific Questions

- Narrow goal:
  - Taking micro estimates at face value:
    - Build consumption model with realistic features to try to rationalize large elasticities
    - Decompose importance of various channels: direct wealth effects, collateral effects, bequest motives, house price bubbles, etc.
  - Use theoretical model to inform micro estimates:
    - Does geographic estimation identify aggregate effects?
    - Aggregate elasticities vs. average elasticities
    - Relative elasticities vs. absolute elasticities

Elasticities

- Wide range of empirical estimates, but most recent estimates during Great Recession pretty large:
- Mian-Sufi: Elasticity of 0.46 to explain differential consumption responses (non-grocery non-durables)
- Case-Quigley-Shiller find a range of elasticities using state-level US data of .07-.18
- Campbell-Cocco find larger elasticities using UK micro data, even as large as 1
    - Lots of heterogeneity by age
- Tough identification issues: Can theory help reconcile differences?
    - Age, geographical aggregation, time-series vs. cross-section
    - Attanasio-Weber claim is mostly income expectations

Simple Theoretical Benchmarks

- Sinai and Souleles 2005: Fully illiquid housing: If never move or die, housing isn't wealth, elasticity of zero
- PIH: Fully liquid housing, will show generates tiny housing wealth effects
- Goal for now: a realistic model is something in between, what does it imply?

Main message of theory for now

- Relationships in more realistic models quickly become complicated:
- Can potentially get very big elasticities when introduce risk, collateral, leverage, etc.
    - But other effects like option to rent work in opposite direction
- Aggregate elasticity depends heavily on initial conditions for housing/debt distribution
- Implies large variation in elasticities in the cross section
- Models need to be taken carefully to data to get reliable predictions

Permanent income

- Benchmark: permanent income model with housing
- Preferences

$$U(C_t, H_t) = \frac{\left(C_t^{\alpha} H_t^{1-\alpha}\right)^{1-\sigma}}{1-\sigma}$$

- Budget constraint

$$C_t + P_t H_t + A_t = Y_t + (1-\delta) P_t H_{t-1} + (1+r) A_{t-1}$$

- No income uncertainty, constant house prices

$$\beta (1+r) = 1$$

- We get

$$C_t = \alpha (1-q) \left[\sum_{j=0} q^j Y_{t+j} + (1-\delta) P H_{t-1} + (1+r) A_{t-1} \right]$$

Permanent income (continued)

- Elasticity

$$\frac{dC}{C} = \frac{dP}{P} \frac{PH_{t-1}}{\sum_{j=0} q^j Y_{t+j} + (1-\delta) PH_{t-1} + (1+r) A_{t-1}}$$

- Set $r = 2.5\%$, then human wealth is $Y/r = 40 \cdot Y$
- Set $PH = 1.5 \cdot Y$ and $A = 1.5 \cdot Y$

$$\text{elasticity} = 0.0349$$

- Suppose household debt goes up by $1 \cdot Y$, so $A = 0.5 \cdot Y$

$$\text{elasticity} = 0.0357$$

Permanent income (continued)

- Implication 1: aggregate elasticity small
- Implication 2: aggregate elasticity minimally affected by household debt
- Implication 3: in cross section older agents have larger elasticity, differences in debt have small role

Precautionary saving model

- Income is stochastic, AR1

$$\log Y_t = \rho \log Y_{t-1} + \varepsilon_t$$

- Impatient households

$$\beta (1 + r) < 1$$

- Value function

$$V(W_t, Y_t) = \max U(C_t, H_t) + \beta E[V(W_{t+1}, Y_{t+1})]$$

subject to

$$C_t + P \cdot H_t + A_t = Y_t + W_t$$

$$W_{t+1} = (1 + r) A_t + (1 - \delta) P \cdot H_t$$

$$-A_t \leq (1 - \theta) \frac{1 - \delta}{1 + r} P \cdot H_t$$

Parameters

- Income process

$$\rho = 0.91, \quad \sigma_\varepsilon = 0.15$$

- Set $r = 2.5\%$
- Set $\theta = 0.2$ and $\sigma = 1$
- Choose $\alpha = 0.897$ to match $PH/Y = 1.5$
- Choose $\beta = 0.969$ to match $A/Y = 1.5$

State-dependent elasticity

- Find change in r that leads to $A/Y = 0.5$ in new steady state
- Compute elasticity to different size shocks in the two regimes

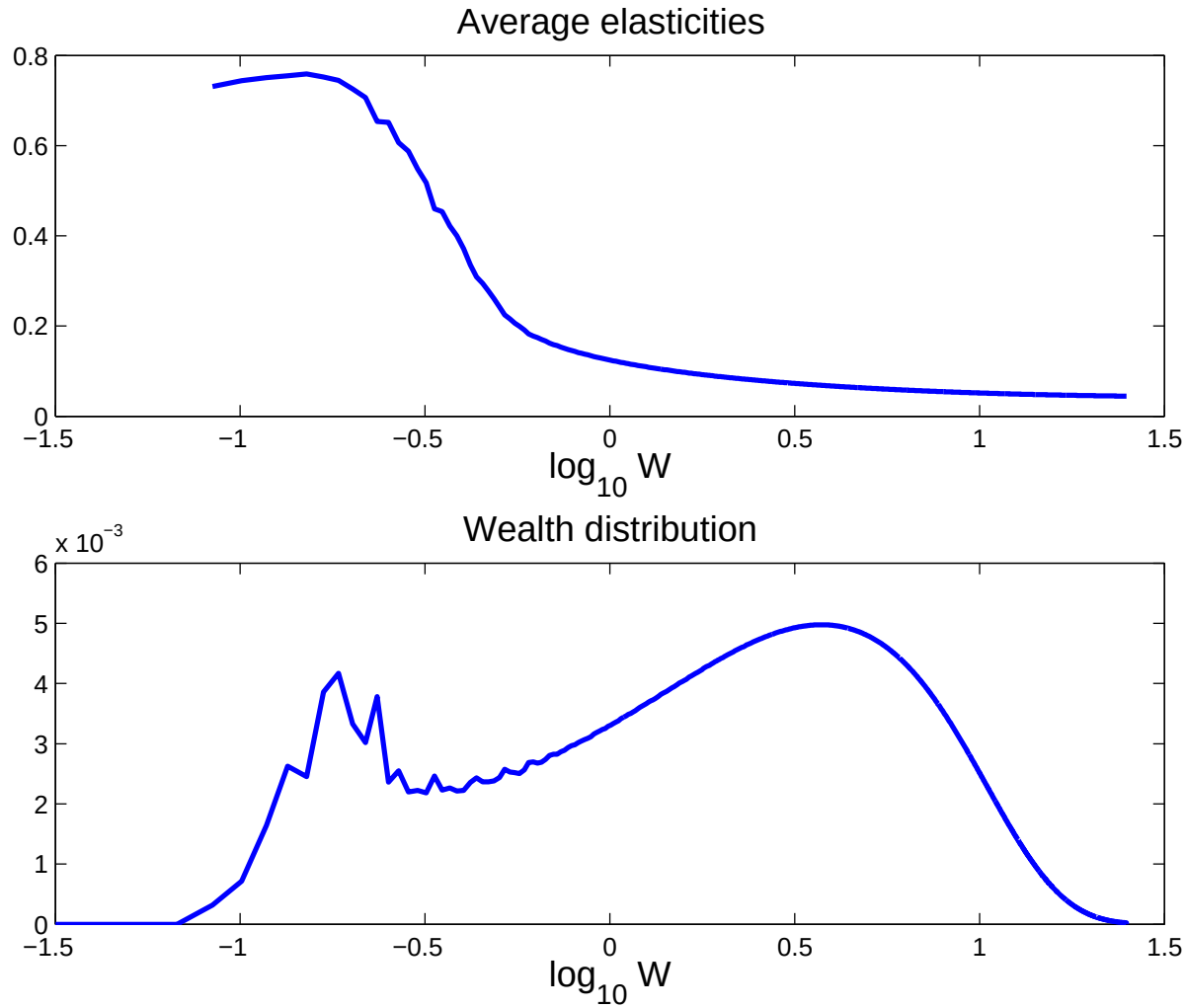
Elasticity of aggregate consumption

			$\Delta P/P$		
r	A/Y	PH/Y	-20%	-10%	$+10\%$
2.50%	1.50	1.50	0.177	0.169	0.112
2.19%	0.50	1.51	0.246	0.230	0.155

Why large effects?

- Heterogeneity + concave consumption functions
- Agents with low net worth who own a house are in the steepest part of the consumption function
- Agents with low net worth who own a house are levered and are hit most by the price change
- House values determine borrowing capacity

Cross section



Two decompositions

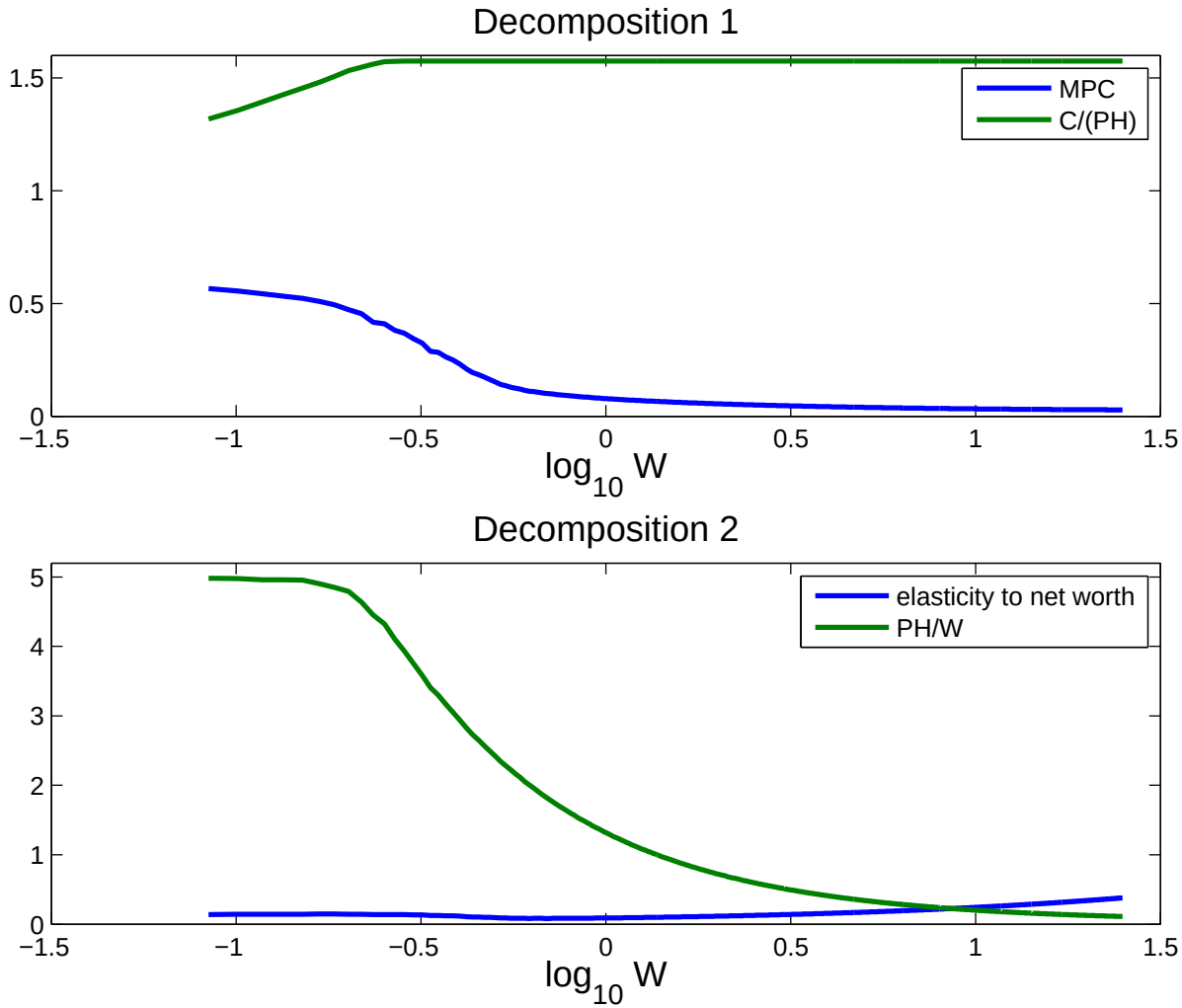
- Marginal propensity to consume and housing to consumption ratio

$$\frac{dC/C}{dP/P} = \frac{dC}{dW}\frac{dP \cdot H}{dP/P} = \frac{dC}{dW}\frac{PH}{C}$$

- Wealth elasticity and leverage

$$\frac{dC/C}{dP/P} = \frac{dC/C}{dW/W}\frac{PH}{W}$$

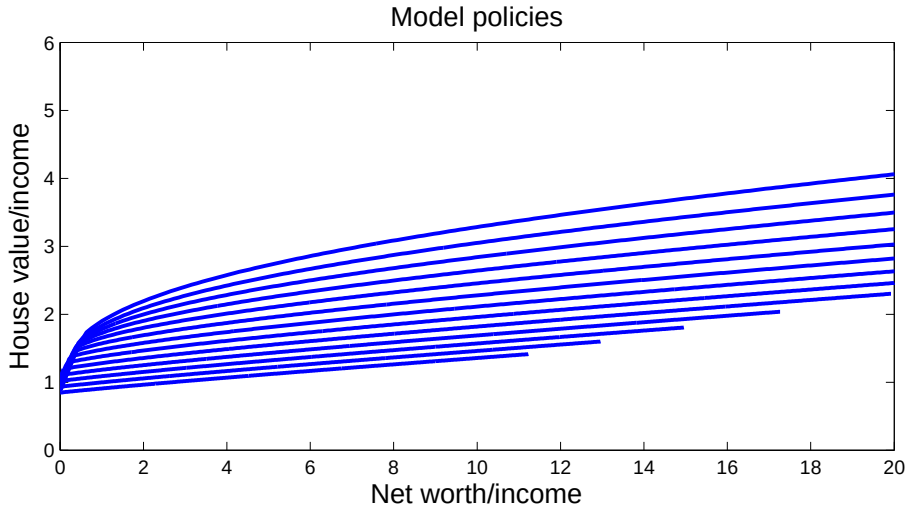
Two decompositions (continued)

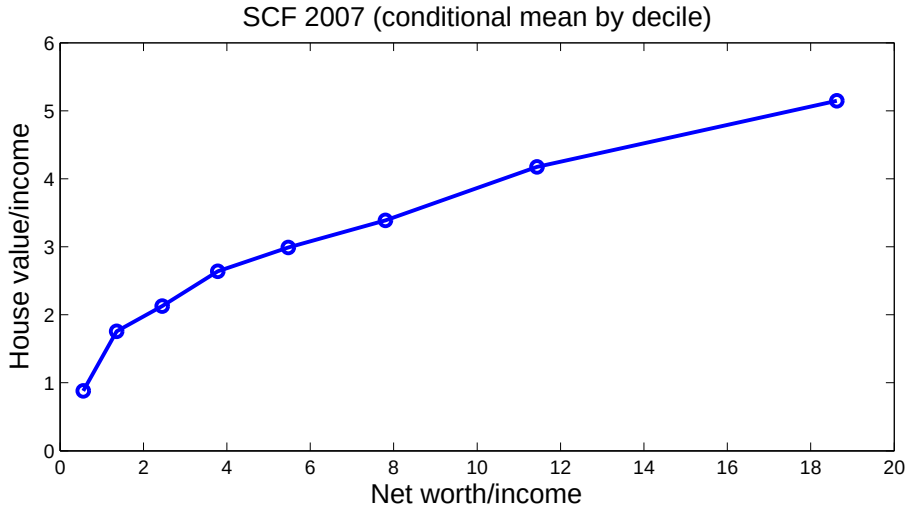


Why low net worth agents so levered?

- Because housing enters the utility function
- Housing holdings are not proportional to net worth (Diaz and Luengo-Prado)
- Look at PH/Y and W/Y in model (data)

Housing and net worth

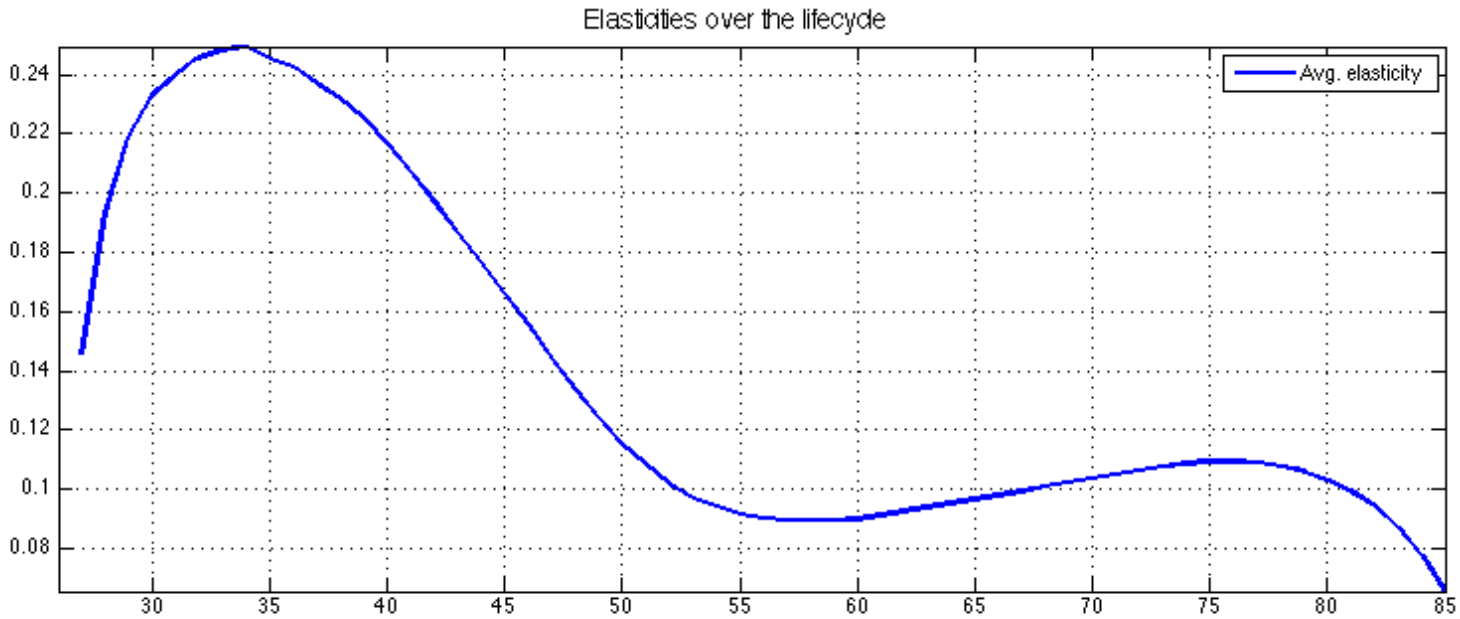




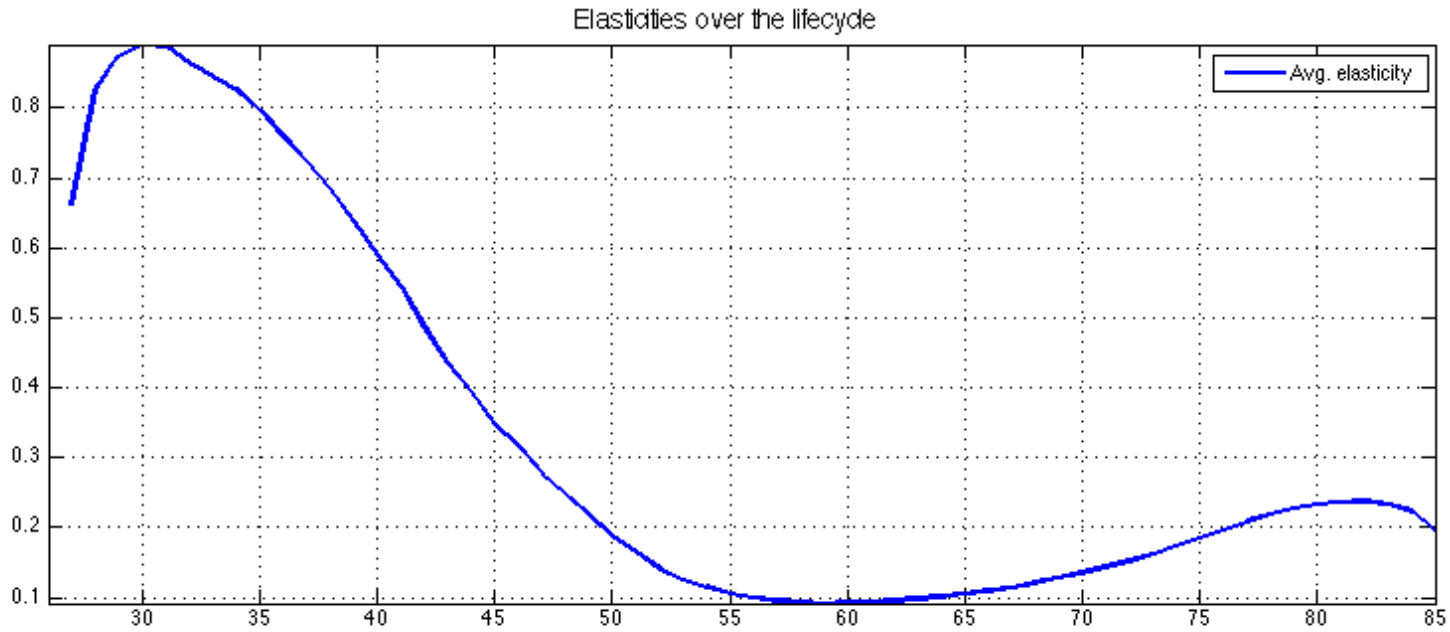
Life-Cycle Considerations

- For now, just worked with infinite horizon model
- Life-cycle might matter
  - Income increases with lifetime, then retire
  - Asset accumulation for retirement
  - Endogenous leverage by age

Bewley $\theta = 1$



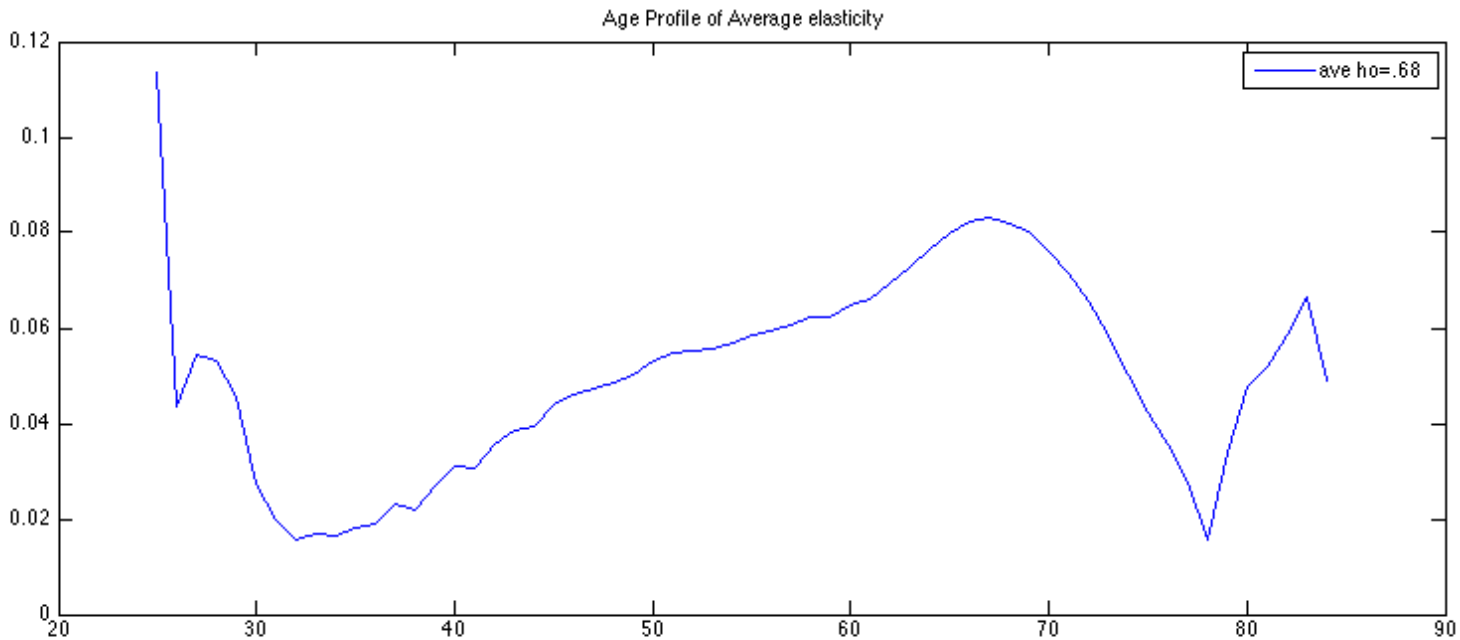
Bewley $\theta = 0.2$



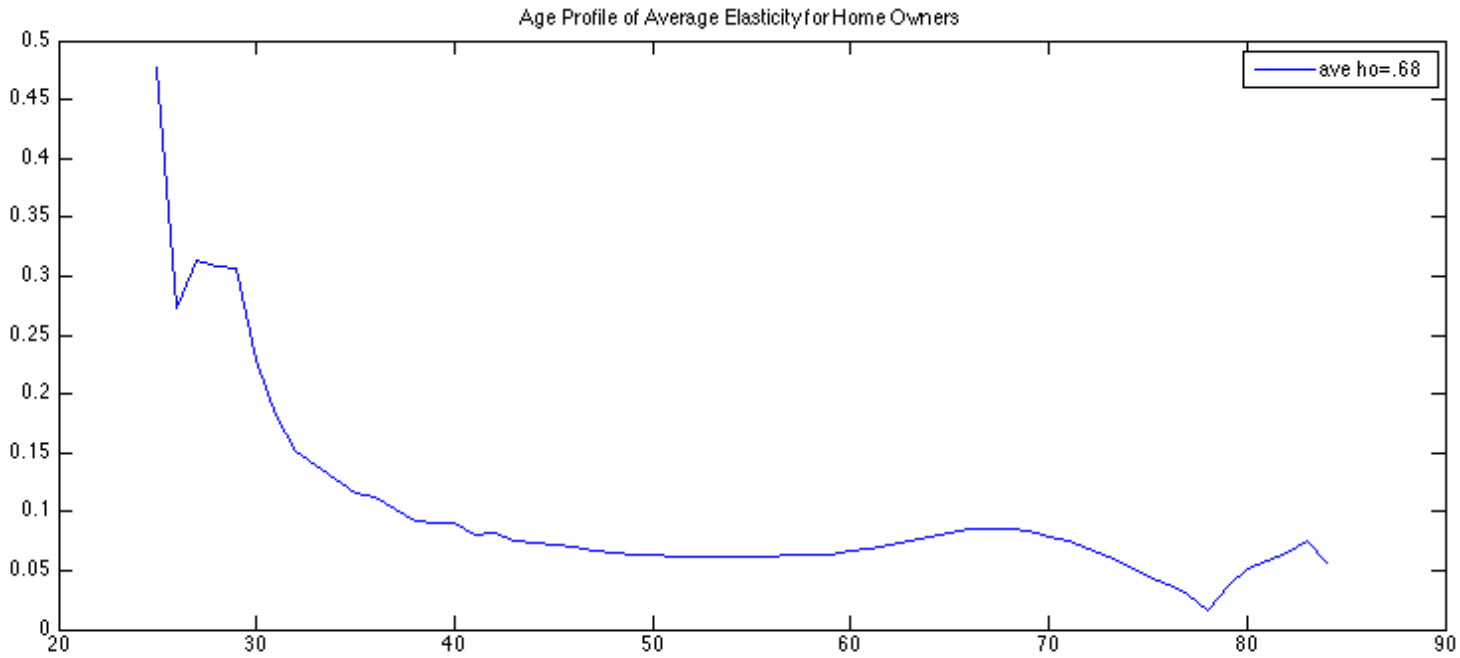
Introducing More Realism

- Model ignores illiquid nature of housing (in limit if housing is just an endowment, no housing wealth effects)
- Model ignores rental margin: poor households forced to lever up and purchase house when would probably rather rent
- Introduce fixed costs of housing adjustment + rental choice
  - Calibrate to match average HO rate in economy
  - Find it makes a big difference!
  - Requires more complicated numerical solutions, but can still do various comparative statics exercises to understand

Baseline results



Baseline: home-owners only

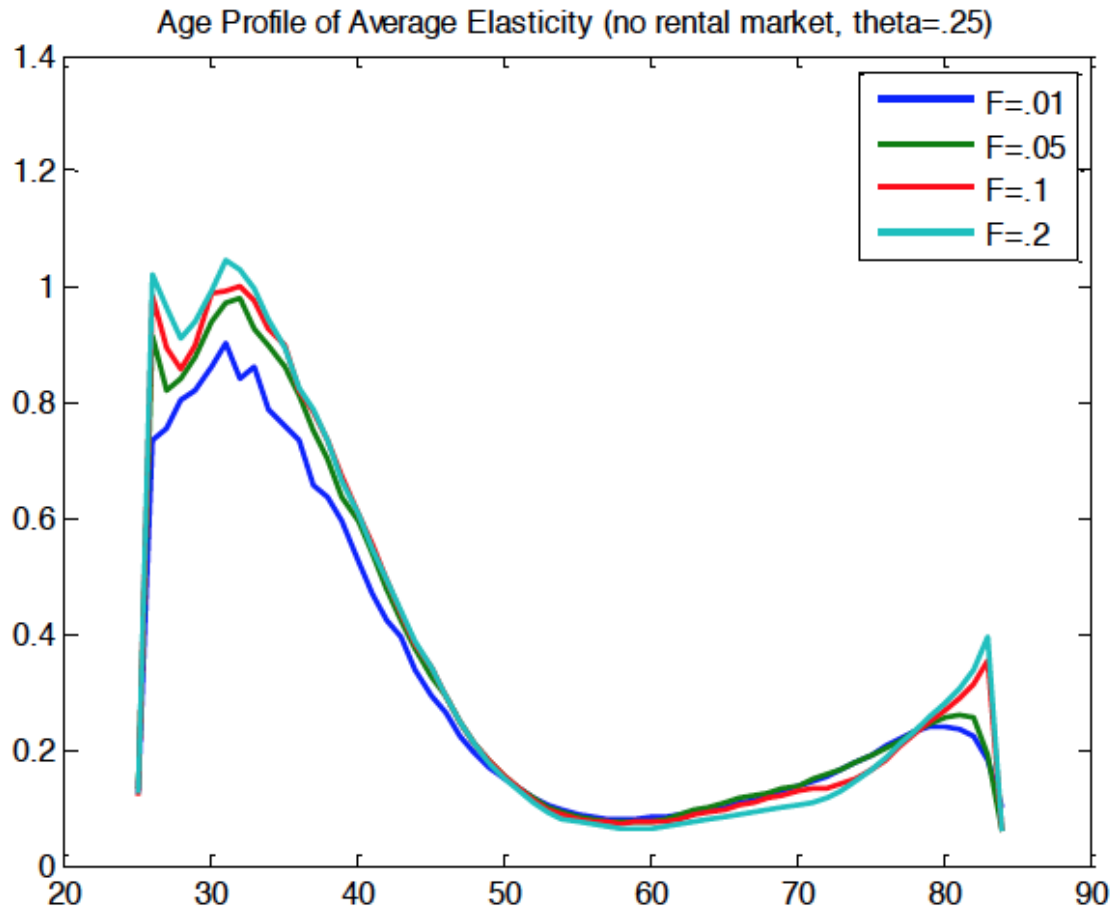


What's Driving the Difference?

- Fixed costs or rental margin?

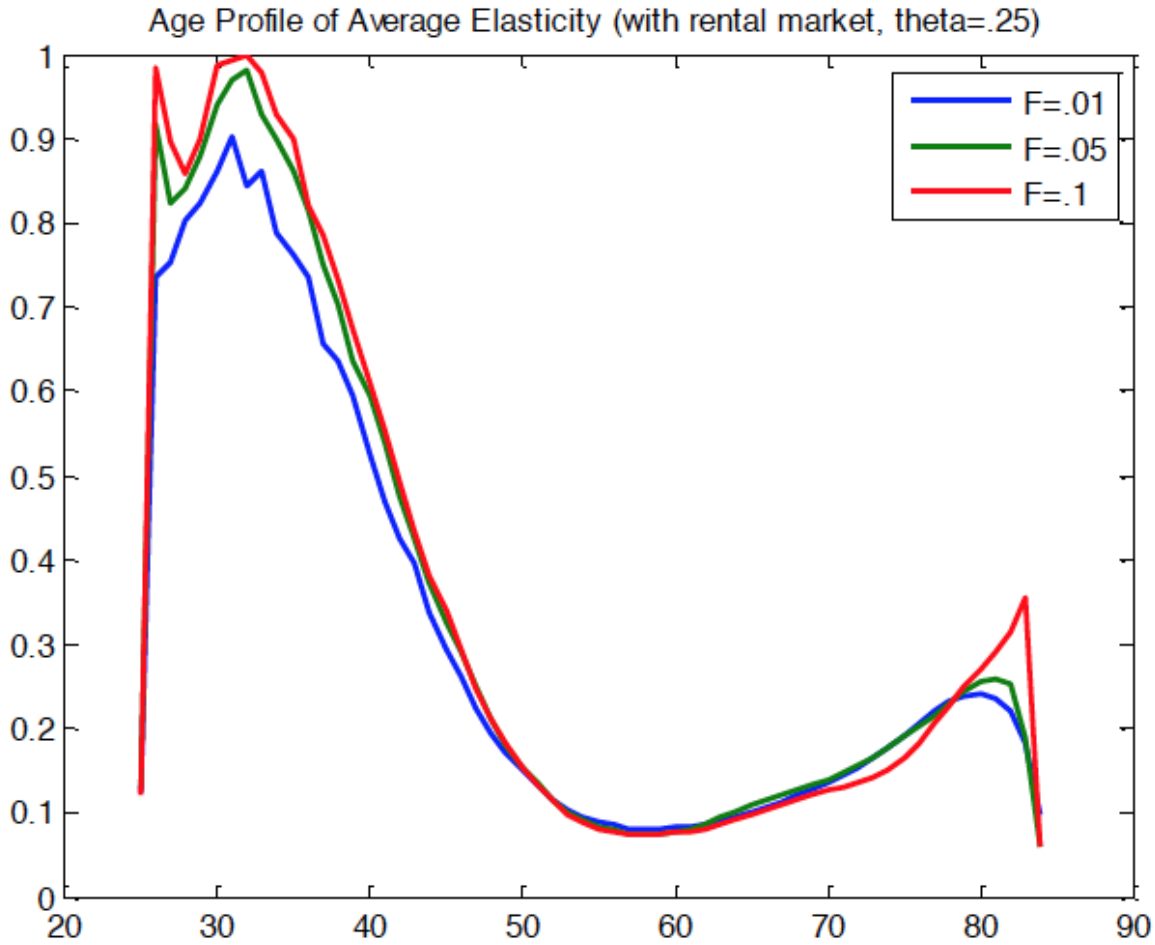
Fixed costs

- Shut down rental market and look at role of fixed costs:

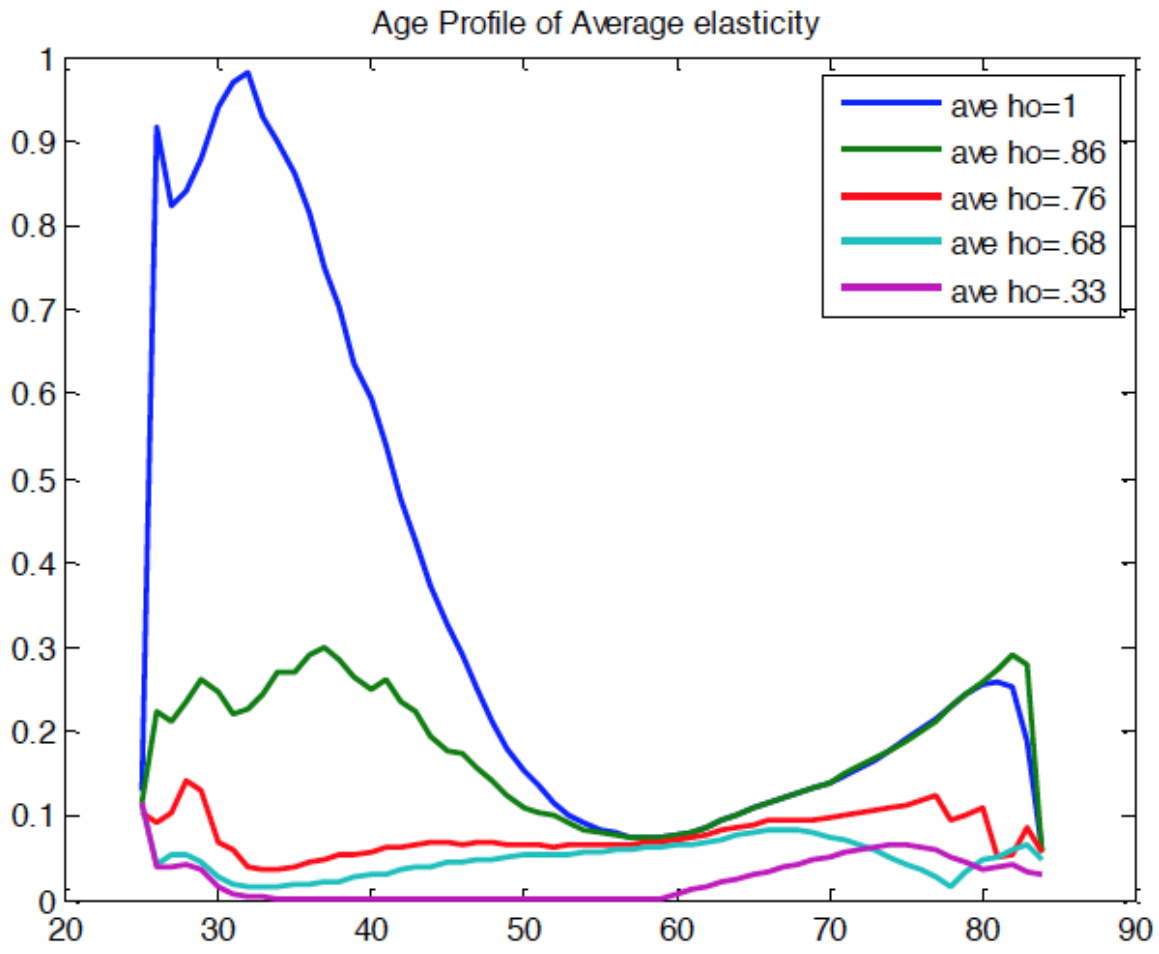


Fixed costs

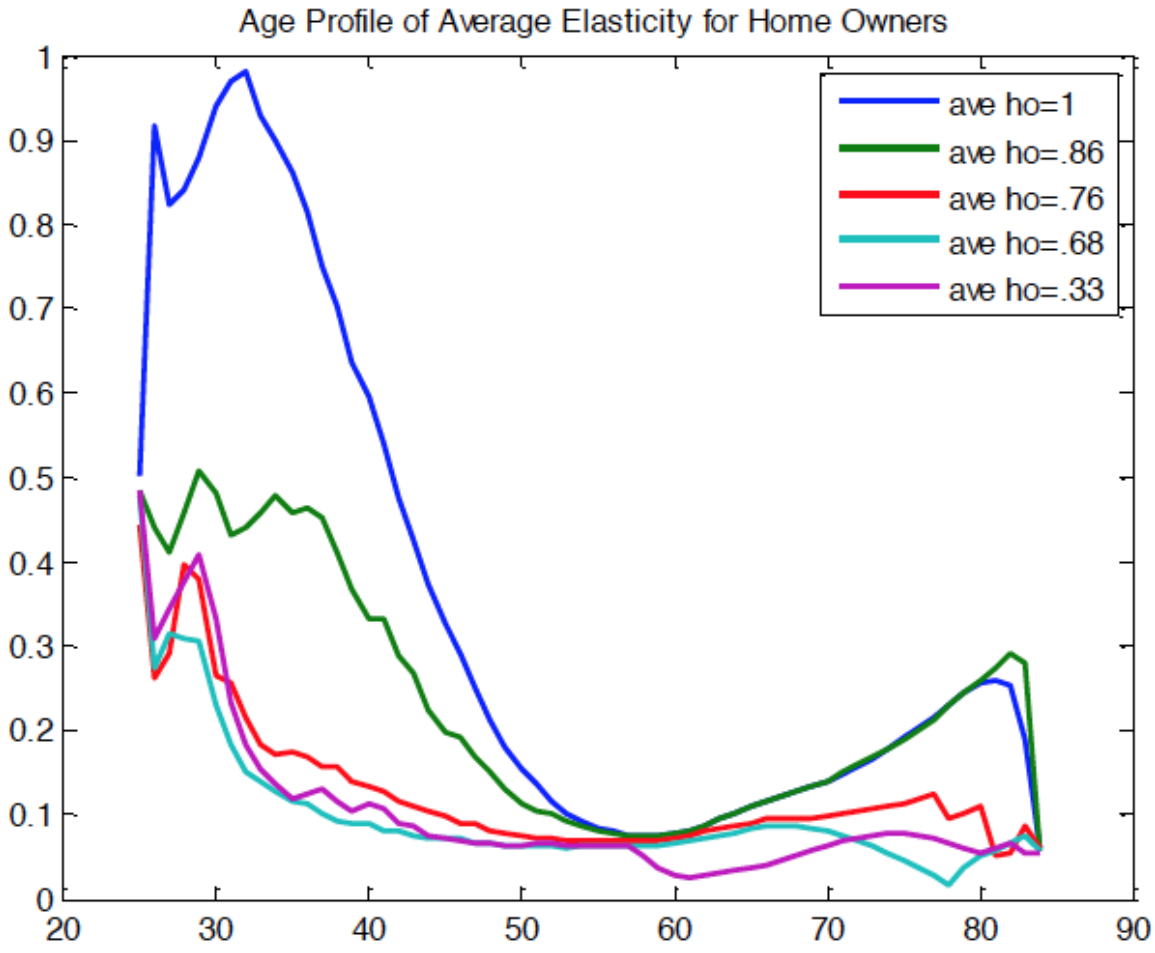
- Turning rental market back on doesn't change importance of fixed costs much



Rental Market Very Important

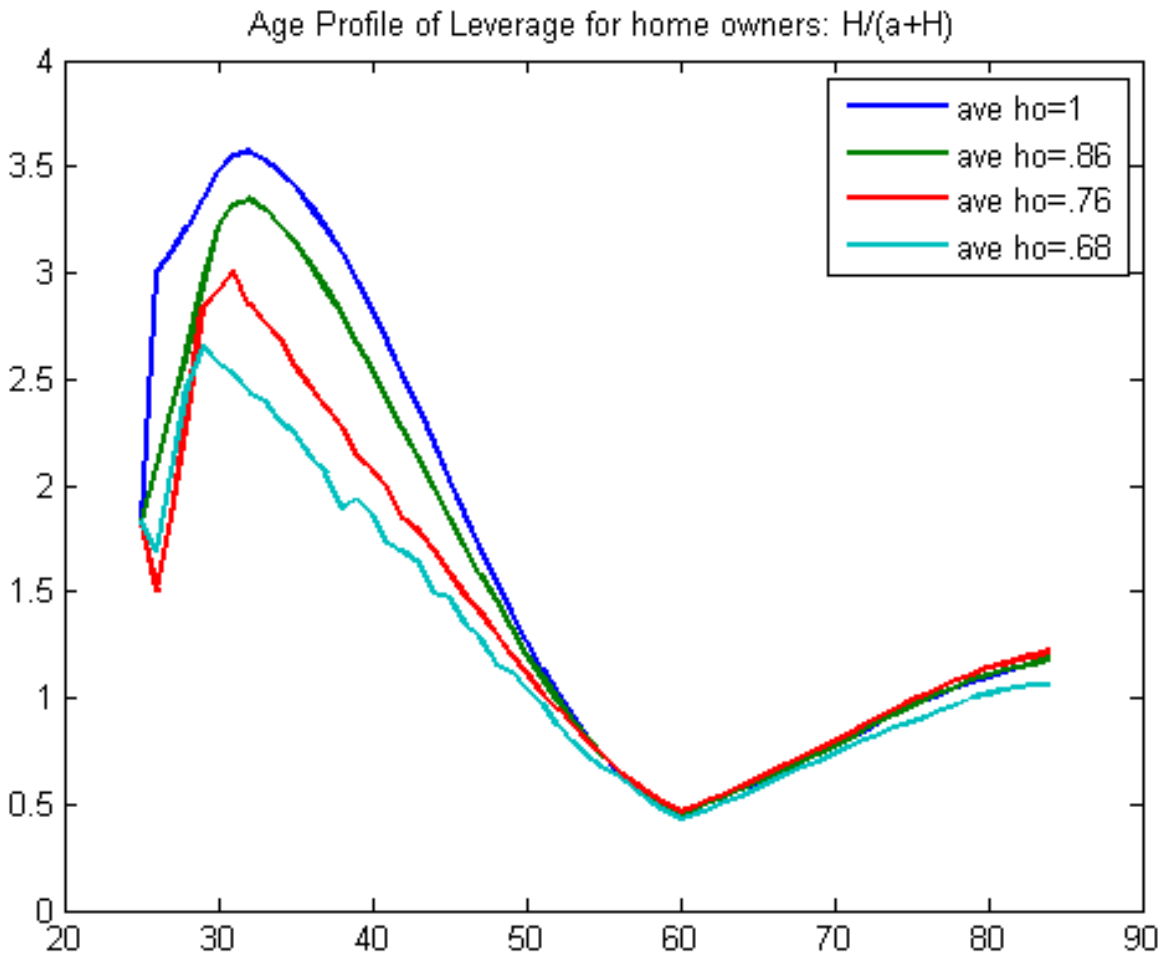


Option to Rent Matters Even For Homeowners' Elasticities

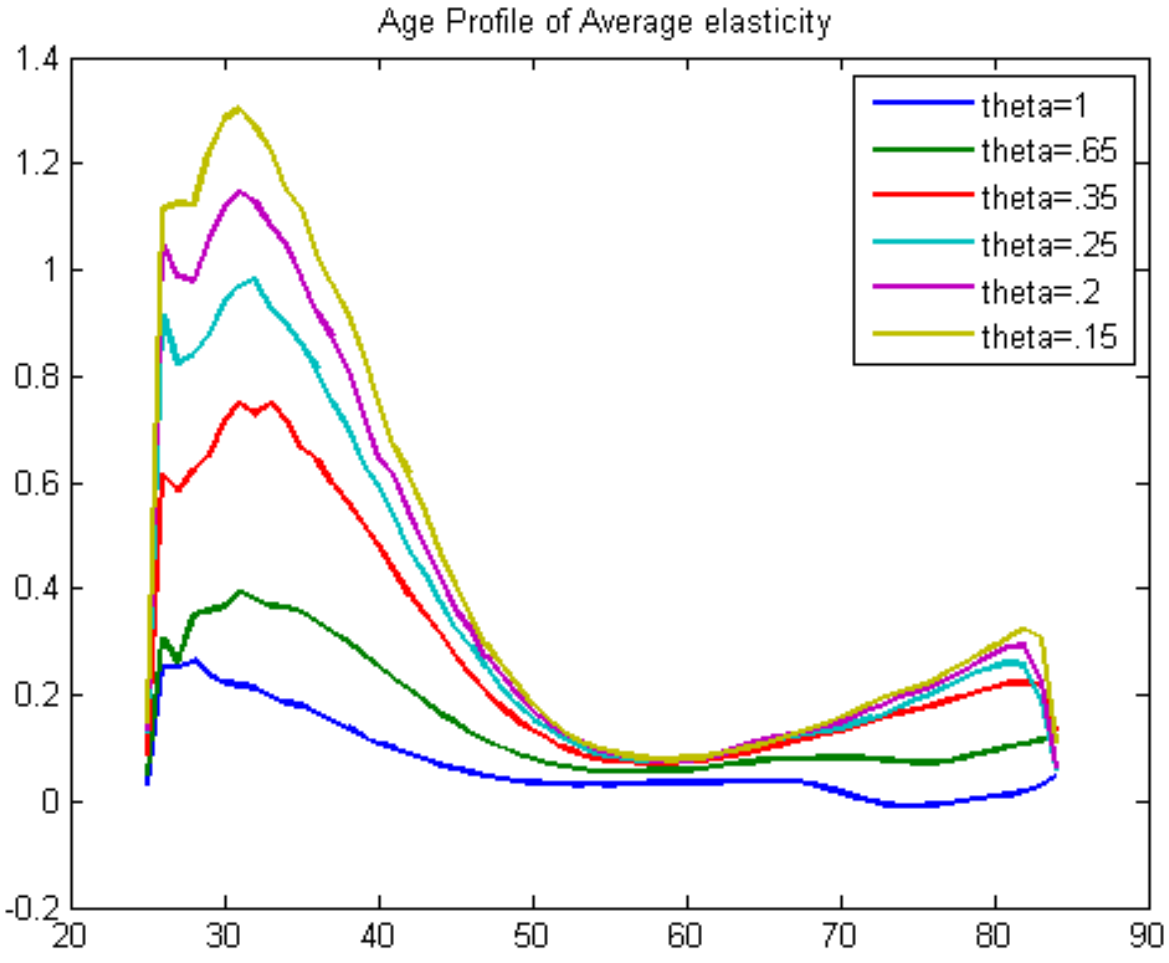


Role of Leverage

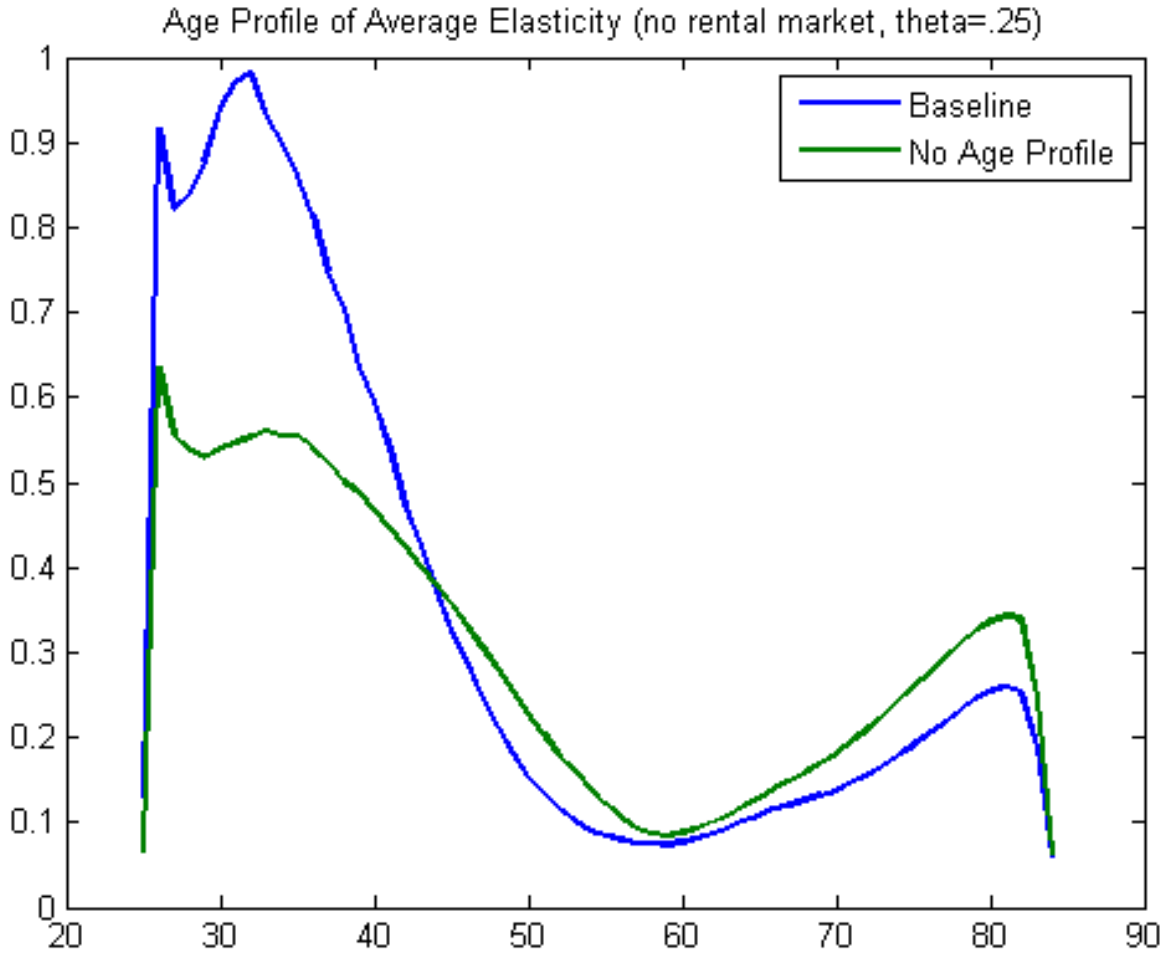
- With no rental option, young households much more levered:



Varying Strength of Collateral Channel



Age-Income Effects Vs. Debt Positions



What causes price dynamics?

- So far we have taken an exogenous shock to house prices
- We have not looked at demand for housing
- (it goes in the wrong direction!)
- How can we generate a boom-bust in house prices, construction, credit and consumption?
- Let's try an irrational bubble episode

Bubble

- Start at steady state with P_t constant
- At date T, unexpected shift in expectations of future appreciation

$$E_T \frac{P_{T+1}}{P_T} = 1 + g = 1 + 2\%$$

  with $E_T P_{T+1} = E_T P_{T+2} = ...$
- Suppose in equilibrium this produces a large appreciation

$$\frac{P_T}{P_{T-1}} = 1 + 20\%$$

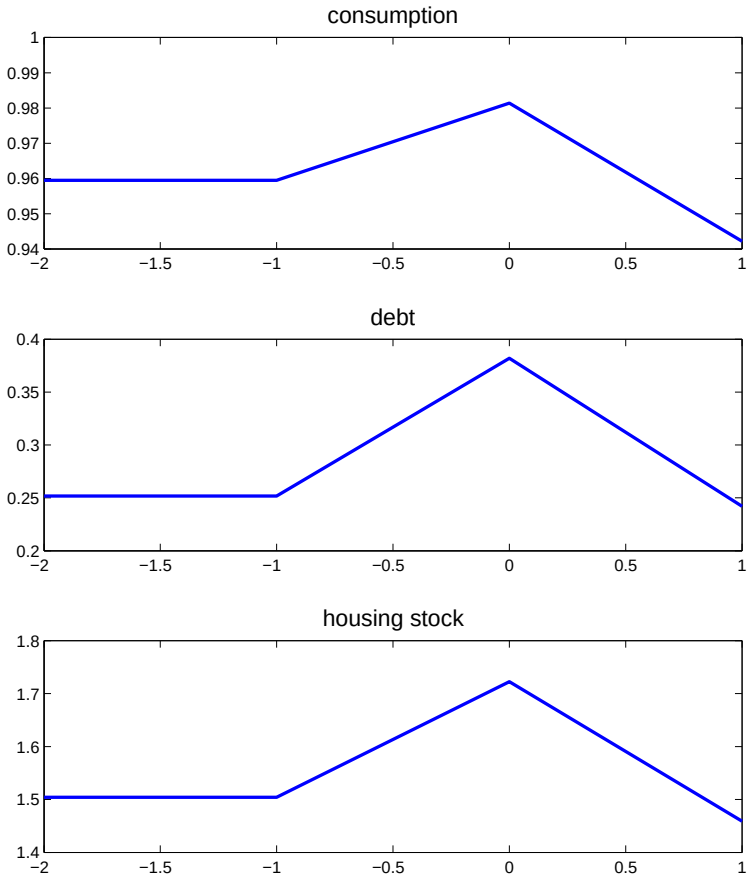
- At $T+1$ expected appreciation goes back to 0

$$E_{T+1} \frac{P_{T+2}}{P_{T+1}} = 1$$

- Suppose in equilibrium this brings prices back to initial level

$$P_{T+1} = P_{T-1}$$

Bubble (continued)



Back to elasticities

- Implied elasticity on the way up is

$$0.114$$

  consistent with initial experiment in the high A regime
- Implied elasticity on the way down is

$$0.240$$

  which is close to the low A regime
- But here A is not going down as much (from 1.5 to 1.2)

Conclusions

- Theoretical implications for elasticity much more complicated than simple benchmarks imply
- More work decomposing effects, taking to data
- Hopefully interesting policy conclusions
- Also want to return to rationalizing disparate micro estimates