

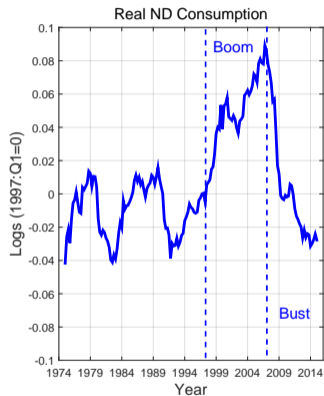
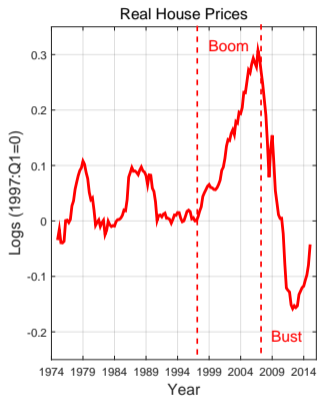
Consumption and House Prices in the Great Recession:

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Kurt Mitman
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Housing: Microdata, macro problems

4 May 2016
Bank of England

p_h and C around the Great Recession



- Boom and bust in **house prices**
- Boom and bust in **non-durable consumption**

Three questions

1. What shock(s) drove the boom-bust in p_h ?

- **Disagreement** on the source of boom-bust
 1. Fundamentals: productivity, taste for housing
 2. Credit conditions/financial deregulation
 3. Beliefs about future growth in p_h

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 1. Income and substitution effects
 2. Wealth effects
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3. Would a Principal Reduction program have cushioned the bust?

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- Simulate: boom-bust, compare against **aggregate time-series**
 - House prices
 - Consumption
 - Rent-price ratio
 - Home ownership
 - Leverage/Refinancing
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- **Counterfactuals:** to address our three questions

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2. House price channel for consumption
 - Wealth effects important, but negative for young households
 - Collateral effects relevant for boom but not for bust
3. Mortgage modification programs
 - Very limited impact on p_h and C dynamics
 - Big impact on foreclosure

Model

Demographics and preferences

- Households work, retire, and live until age J
- **Lifetime utility** of household i :

$$\mathbb{E}_0 \left[\sum_{j=1}^J \beta^{j-1} u_j(c_{ij}, s_{ij}) + \beta^J v(b_i) \right]$$

c : ND consumption, s : housing services, b : bequest

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$$u_j(c, s) = \varphi_j \frac{[(1 - \phi)c^{1-\gamma} + \phi s^{1-\gamma}]^{\frac{1-\sigma}{1-\gamma}} - 1}{1 - \sigma}, \quad \gamma, \sigma \in [0, \infty)$$

- ϕ : relative taste for housing
- $1/\gamma$: elasticity of substitution between (c, s)

Endowments

- **Working households** receive **idiosyncratic income endowment**:

$$\log y_{ij} = w + \chi_j + z_{ij}$$

where z_{ij} follows a discrete Markov process

- **Retired households** receive **social security benefits** from govt
- **Newborn households** endowed with draw from pool of bequeathed assets, correlated with initial draw of earnings

Housing

- Finite number of house sizes $h \in \mathcal{H}$
- Households can **buy** at price p_h , or **rent** at rate ρ , per unit

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- Households can **buy** at price p_h , or **rent** at rate ρ , per unit
- **Advantages** of owning vs renting:
 - Yields higher consumption flow per unit of h
 - Tax advantage: mortgage-interest deduction
 - Rental houses $\in \tilde{\mathcal{H}} \subset \mathcal{H}$
- **Disadvantages** of owning vs renting:
 - Owning requires a minimum downpayment
 - Linear **transaction cost** $\kappa_h \cdot (p_h h)$ for selling

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- **Mortgages** (m): long-term, fixed rate
 - Origination / **(cash-out)** refinancing cost $\kappa_m \times m$
 - Max loan-to-value **at origination only** $m \leq \lambda^m p_h h$
 - Competitively determined **price schedule** $q(h, m, b, y)$
 - Amortized over remaining lifetime at rate $r_m = r_b (1 + \iota_m)$

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- **HELOCs** ($b < 0$)
 - One-period borrowing collateralized by housing, $b \geq -\lambda^b p_h h$
 - At rate $r_b (1 + \iota_b)$, non-defaultable

Household decisions

- All households choose **consumption** and **liquid savings**

- **Non-home owner**

Rent choose: $h \in \tilde{\mathcal{H}} \subset \mathcal{H}$

Buy choose: $h \in \mathcal{H}$

mortgage = { down payment, min repayment }

- **Home owner**

Pay mortgage payment > min repayment
 HELOC borrowing

Refinance pay old and get new mortgage (w/ **Cash-Out**)

Sell rent or buy

Default rent $h = \min \tilde{\mathcal{H}}$

Production of goods and housing

- Final good sector: $Y = ZN \rightarrow w = Z$

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- **Final good sector:** $Y = ZN \rightarrow w = Z$
- **Construction sector:** goods + housing permits \rightarrow new houses
- Competition among builders: aggr. housing investment function

$$I_h = (p_h)^{\frac{\alpha_k}{1-\alpha_k}} (\alpha_k)^{\frac{\alpha_k}{1-\alpha_k}} \bar{L},$$

where \bar{L} are new housing permits issued by government and sold at market price

- Local **housing supply elasticity** given by $\frac{\alpha_k}{1-\alpha_k} \in [0, \infty)$

Rental sector and government

- **Rental sector** owns rental stock
- Buys housing from sellers, transform to rentals, or vice-versa, sells rental units to home buyers
- **Zero-profit condition** yields **equilibrium rental rate ρ**

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- Buys housing from sellers, transform to rentals, or vice-versa, sells rental units to home buyers
- **Zero-profit condition** yields **equilibrium rental rate ρ**
- **Government**: spends, pays social security to the retirees, taxes workers (with mortgage interest deduction) and properties, collects revenues from selling new land permits

Model: summary

Households

- OLG lifecycle economy with uninsurable individual earnings risk
- Preferences for nondurable c and housing services h

Financial Instruments

- One-period bond (exogenous r_b)
- Rent or own houses: long-term mortgages and HELOCs
- Mortgages priced competitively with options to refinance, default

Equilibrium

- Construction sector: endogenous house prices
- Rental sector: endogenous rents
- Aggregate shocks move equilibrium house prices

Aggregate shocks

Underlying shocks cause equilibrium house price to fluctuate:

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1. Aggregate productivity: Z
2. Credit conditions: (i) collateral parameters λ^m, λ^b
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1. Aggregate productivity: Z
2. Credit conditions: (i) collateral parameters λ^m, λ^b
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3. Beliefs / News about future housing demand:

Three regimes for ϕ (share of housing services in u):

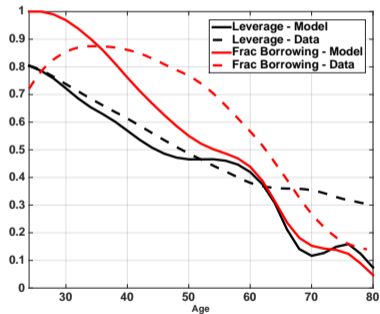
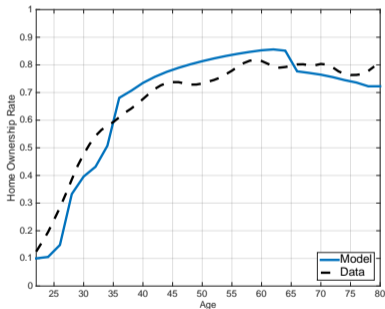
- (a) ϕ_L : low housing share and unlikely transition to ϕ_H
- (b) ϕ_L^* : low housing share and likely transition to ϕ_H
- (c) ϕ_H : high housing share

Boom-Bust: shift from (a) to (b), and back to (a)

Parameterization

Parameterization strategy

Parameter values disciplined by facts from household-level micro-data



- Life-cycle profiles of ownership and leverage

Parameterization strategy

Parameter values disciplined by facts from household-level micro-data

- Distributional stats: mortgages, housing wealth, renters, and consumption

Moment	Empirical value	Model Value
Fraction homeowners w/ mortgage	0.66	0.57
Aggr. mortgage debt / housing value	0.42	0.36
P10 LTV ratio for mortgagors	0.15	0.28
P90 LTV ratio for mortgagors	0.92	0.76
Aggr. home-ownership rate	0.66	0.65
P10 Housing NW / total NW for owners	0.11	0.12
P90 Housing NW / total NW for owners	0.95	0.98
Avg.-size owned house / rented	1.5	1.4
Avg. earnings owners / renters	2.05	2.02
BPP consumption insurance coef	0.36	0.43

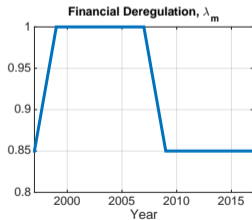
Shock Processes

1. **Productivity**: aggregate earnings data
2. **Credit conditions**: max LTV: 85% - 100%, HELOC limit: 20% - 30%, origination costs: \$2,000 - \$1,200
3. **Beliefs**: expected house price growth from Case-Shiller survey

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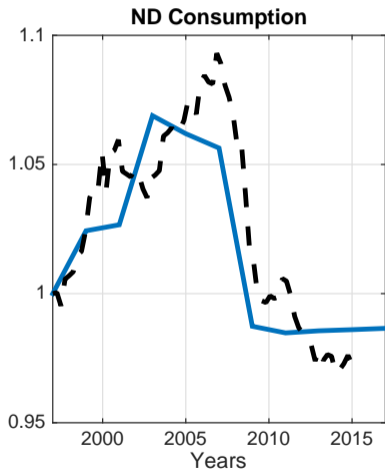
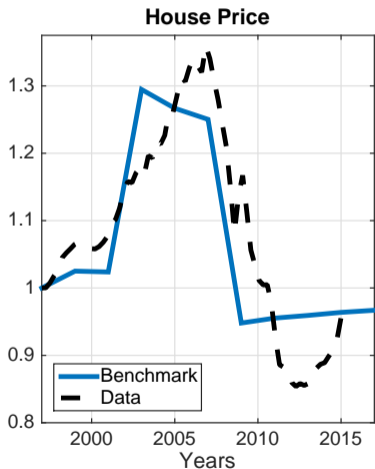
Realized path for shocks



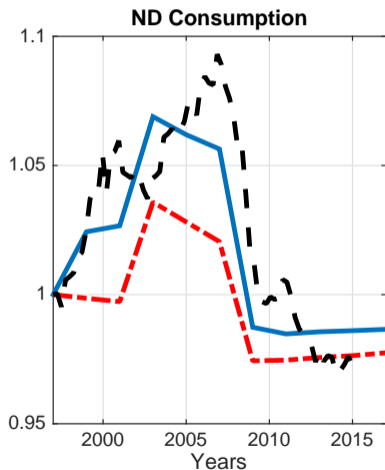
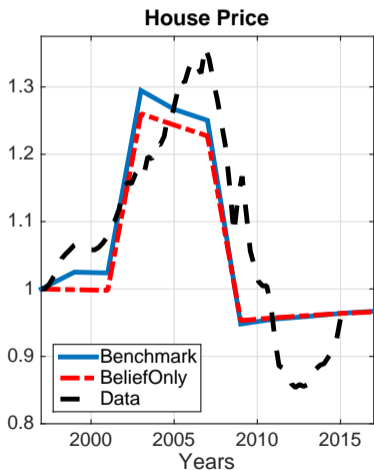
- The **shift in beliefs** hits in 2001 and reverts back in 2007

Simulation

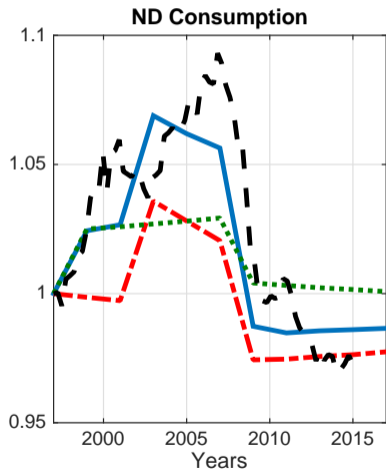
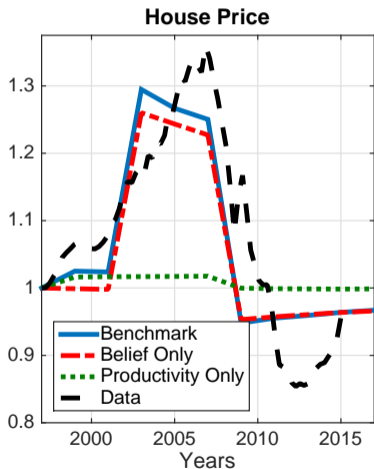
Consumption and house price dynamics



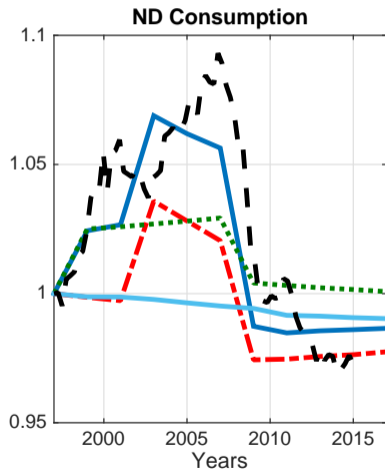
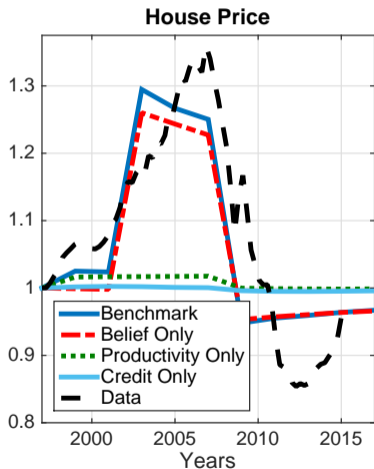
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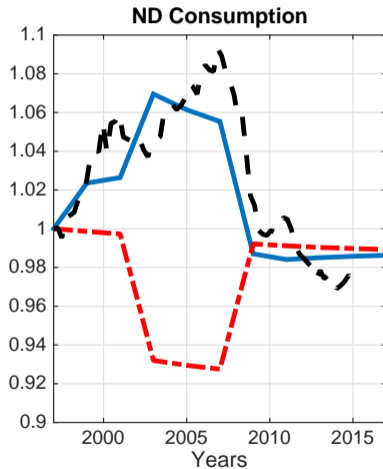
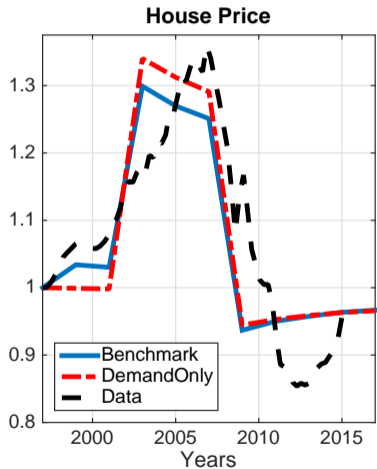
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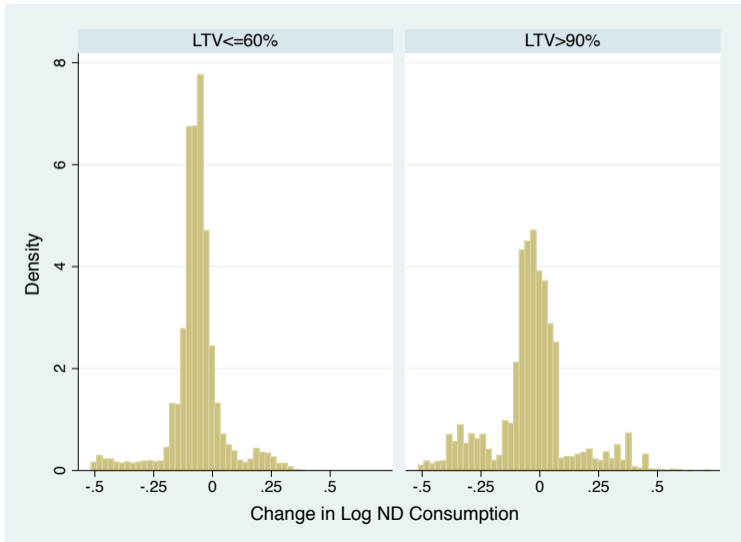
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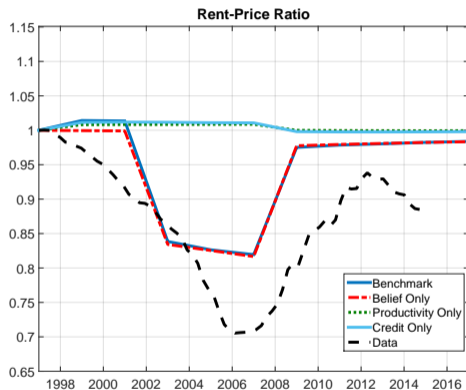
Beliefs vs preferences



Consumption response by LTV during bust

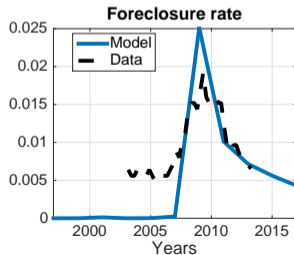
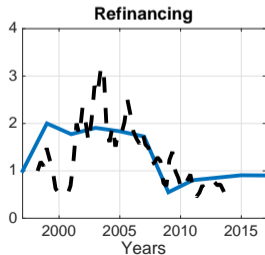
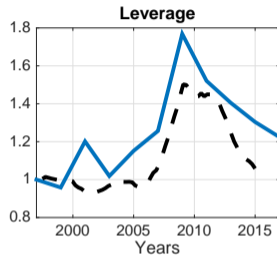


Dynamics of rent-price ratio

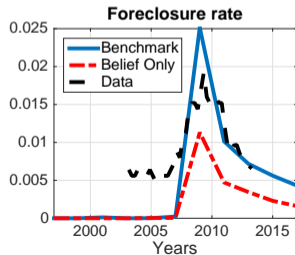
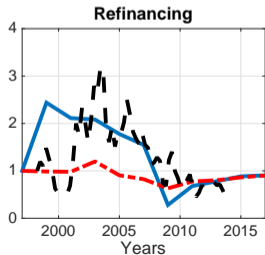
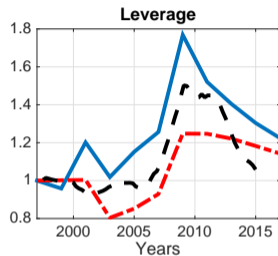
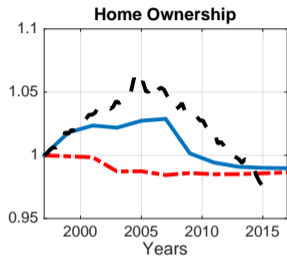


$$\rho = \psi \left(\frac{r_b + \delta_h}{1 + r^b} \right) + p_h - \left(\frac{1 - \delta_h - \tau_h}{1 + r^b} \right) \mathbb{E}_{p_h} [p'_h]$$

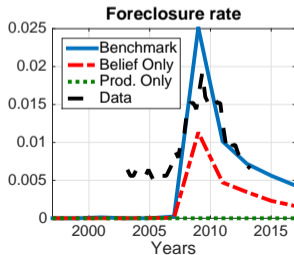
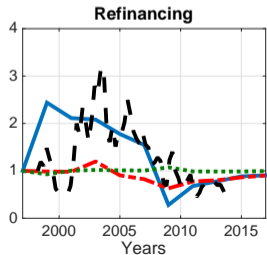
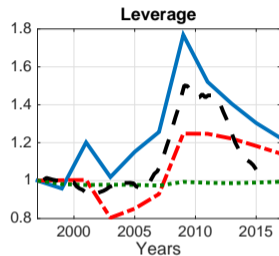
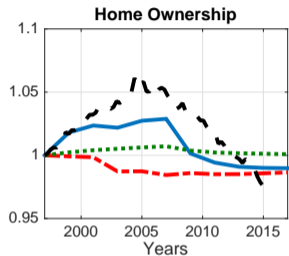
Housing finance dynamics



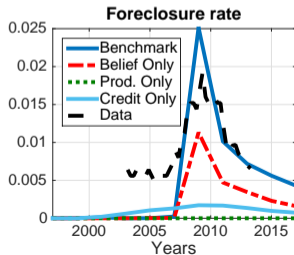
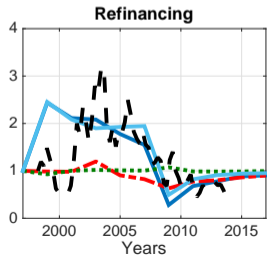
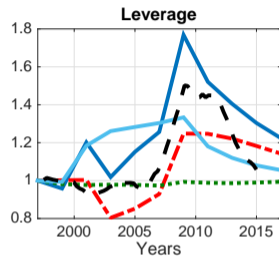
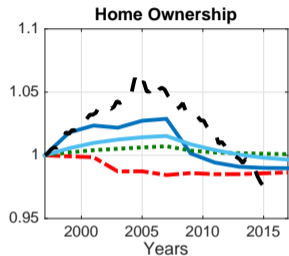
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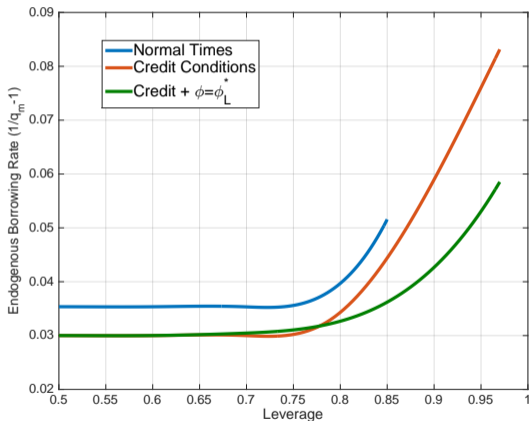
Why credit conditions do not affect p_h ?

- Max LTV and mortgage origination costs affect housing demand if renters (**extensive margin**) or home-owners (**intensive margin**) are constrained in housing choice
 1. Rental market relaxes these constraints

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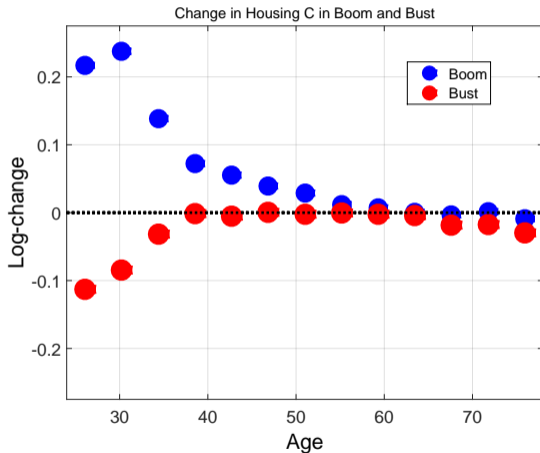
- Max LTV and mortgage origination costs affect housing demand if renters (**extensive margin**) or home-owners (**intensive margin**) are constrained in housing choice
 1. Rental market relaxes these constraints
- Prior research: **2 observations** suggest importance of credit
 1. Cheaper credit for 'low-quality' borrowers
 2. Increase in home ownership mostly among young households
- Both observations consistent with model: **endogenous relaxation in lending standards** in response to belief-driven Δp_h

Cheaper credit for 'low-quality' borrowers



- Expected house appreciation reduces probability of default

Housing demand response by age



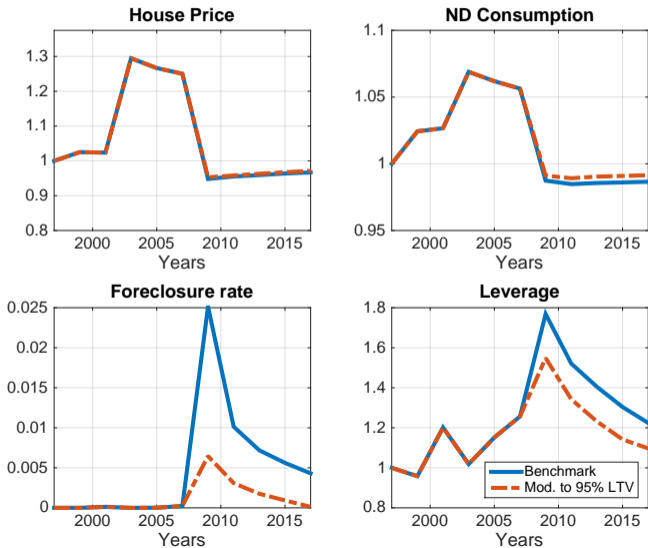
- The young go in-out of housing market during boom-bust

Policy Experiment

Mortgage modification programs

- **HAMP: Home Affordable Modification Program**
 - Delinquent homeowners
 - Incentivize lenders to lower payments / avoid foreclosure
- **HARP: Home Affordable Refinance Program**
 - Homeowners current on mortgage backed by GSE
 - Waive LTV limits for refinancing into lower rates
- **NEW! Principal Reduction Modification Program**
- **Model experiment:** generous version implemented in 2009
 - **All** homeowners with LTV >95%: forgive excess debt

Counterfactual 'debt forgiveness' program



Summary

- Equilibrium model broadly consistent with [cross-sectional](#), [life-cycle](#), [cross-regional](#), and [time-series](#) dimensions of the data
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 2. Exogenous and endogenous relaxation of credit conditions crucial for **homeownership, leverage and foreclosure**
 3. **Boom-bust in p_h explains 2/3 of observed dynamics of C** , primarily through wealth effects
 4. Principal reduction programs successful at **reducing foreclosure**, but very limited scope to boost p_h or C

Thanks!