Homeownership and Portfolio Choice over the Generations

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Younger generations are less likely to own homes

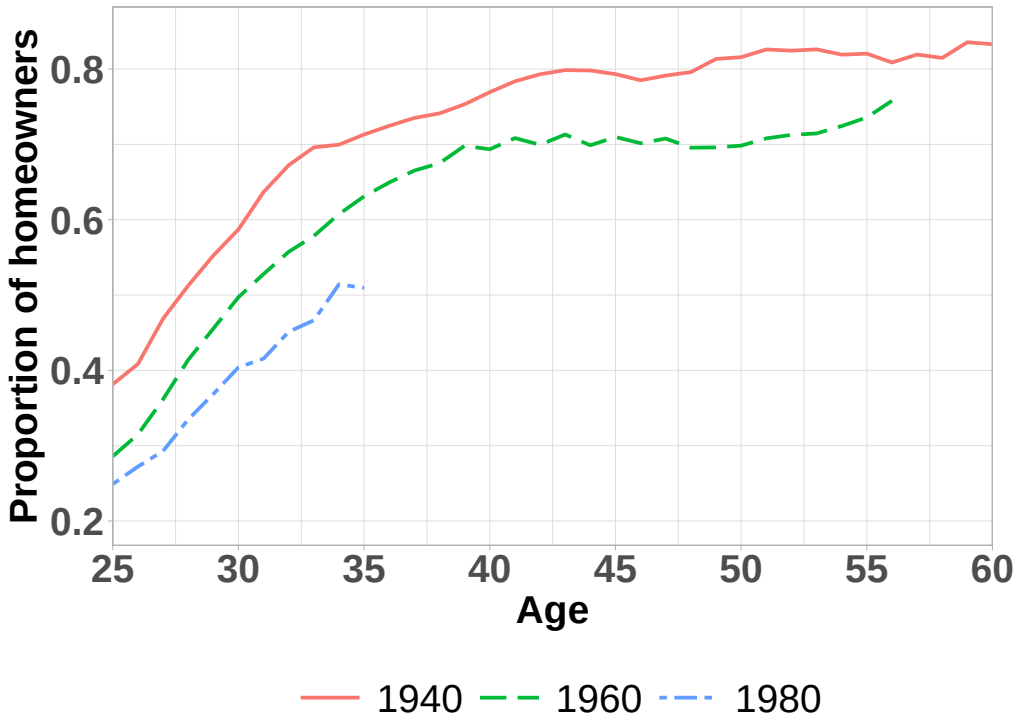


Figure: Homeownership by age and cohort, PSID data

- But more likely to participate in the stock market

Census Sample Stock market M C R P Agg

Question

1. Which factors might lie behind these changes?
    - Transformations in the labor market
    - Changes in returns and substitution towards financial assets
    - Changes in financial conditions
    - Different histories of aggregate shocks

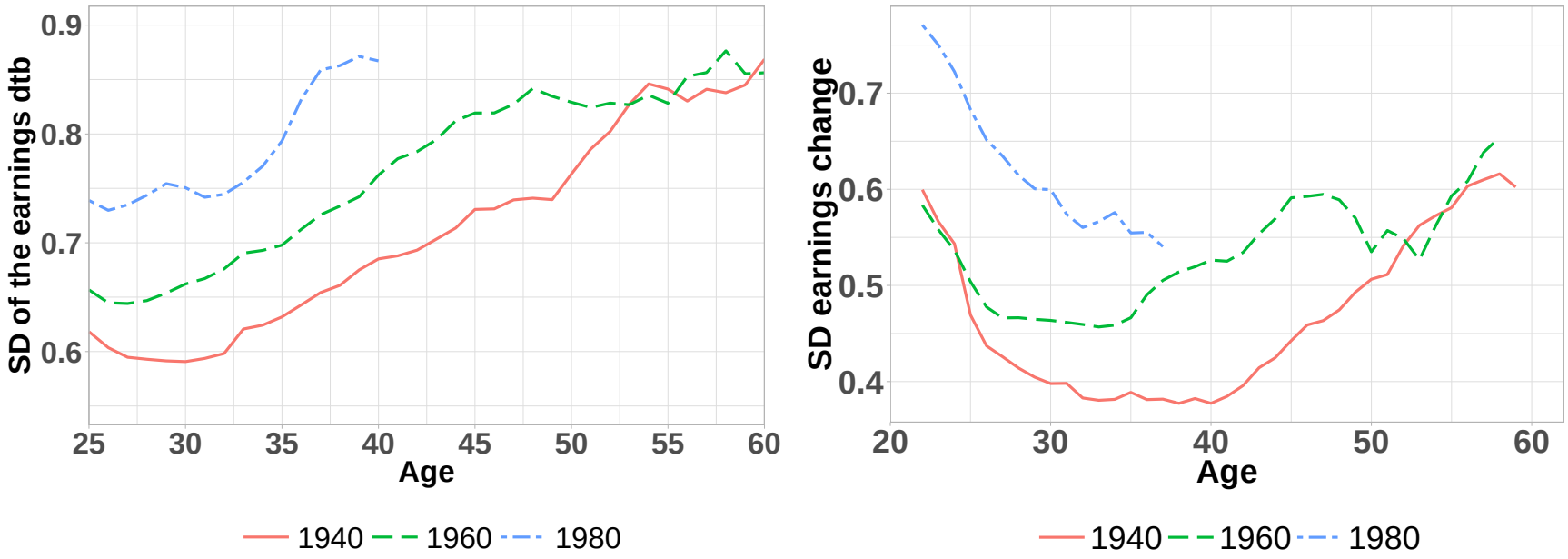
Question

1. Which factors might lie behind these changes?
   - Transformations in the labor market
   - Changes in returns and substitution towards financial assets
   - Changes in financial conditions
   - Different histories of aggregate shocks
2. Why does it matter?
   - Will the 1980s generation accumulate less wealth than earlier cohorts?
   - Impact on inequality?

Approach

- Quantify intergenerational changes in US data (PSID, SCF)
  - Estimate a flexible model of earnings risk
  - Histories of asset prices
  - Cyclical histories
  - Financial conditions
  - Homeownership and stock market participation
- Life-cycle model with rich household portfolio structure
- Take aggregate and idiosyncratic differences across cohorts seriously
  - Calibrate for 1940s generation
  - Simulate three cohorts (1940s, 1960s, 1980s)
    - Same preferences
    - Different earnings risk, asset prices, and histories
  - Can the model generate the observed changes? If so, which are the main factors?

Earnings have become more unequal and riskier



- Capture with flexible earnings process that accounts for age-dependence, non-normality, non-linearity, and variation over the business cycle More

PSID data

Robustness 1 | Average | 25-35 | 25-35, M | Mobility | Dtb

The model: households

- Life-cycle: 20-86, focus on 20-60
- Preferences
  - Households value consumption and housing services
  - Epstein and Zin (1989)
- Exogenous stochastic labor earnings, vary over business cycle
- Assets and liabilities
  - Safe, liquid assets a_t with fixed interest rate r^a
  - Stocks f_t with risky returns $r^f(\Omega_t)$, and entry participation cost κ^f.
  - Lumpy houses with average price $p^h(\Omega_t)$, transaction costs κ^h
  - Non-homeowners pay rent $r^s(p^h(\Omega_t))$
  - Mortgages m_t
    - LTV and LTI constraints at origination
    - Households decide repayment schedule
    - Must pay interest r^b every period and be eventually repaid
    - Either a_t or f_t can be held jointly with a mortgage

More

The model: rich aggregate state

$$\Omega = \{\Omega^f, \Omega^h, \Omega^y\}$$

- The combination of three exogenous elements:
  - Stock market returns
  - House prices and house price growth state (increasing/decreasing)
  - State of the labor market (expansion/recession)
- Persistence in house prices, their growth, and state of the labor market
- Correlated labor market state and stock market returns
- In the simulations, actual realizations from historical data

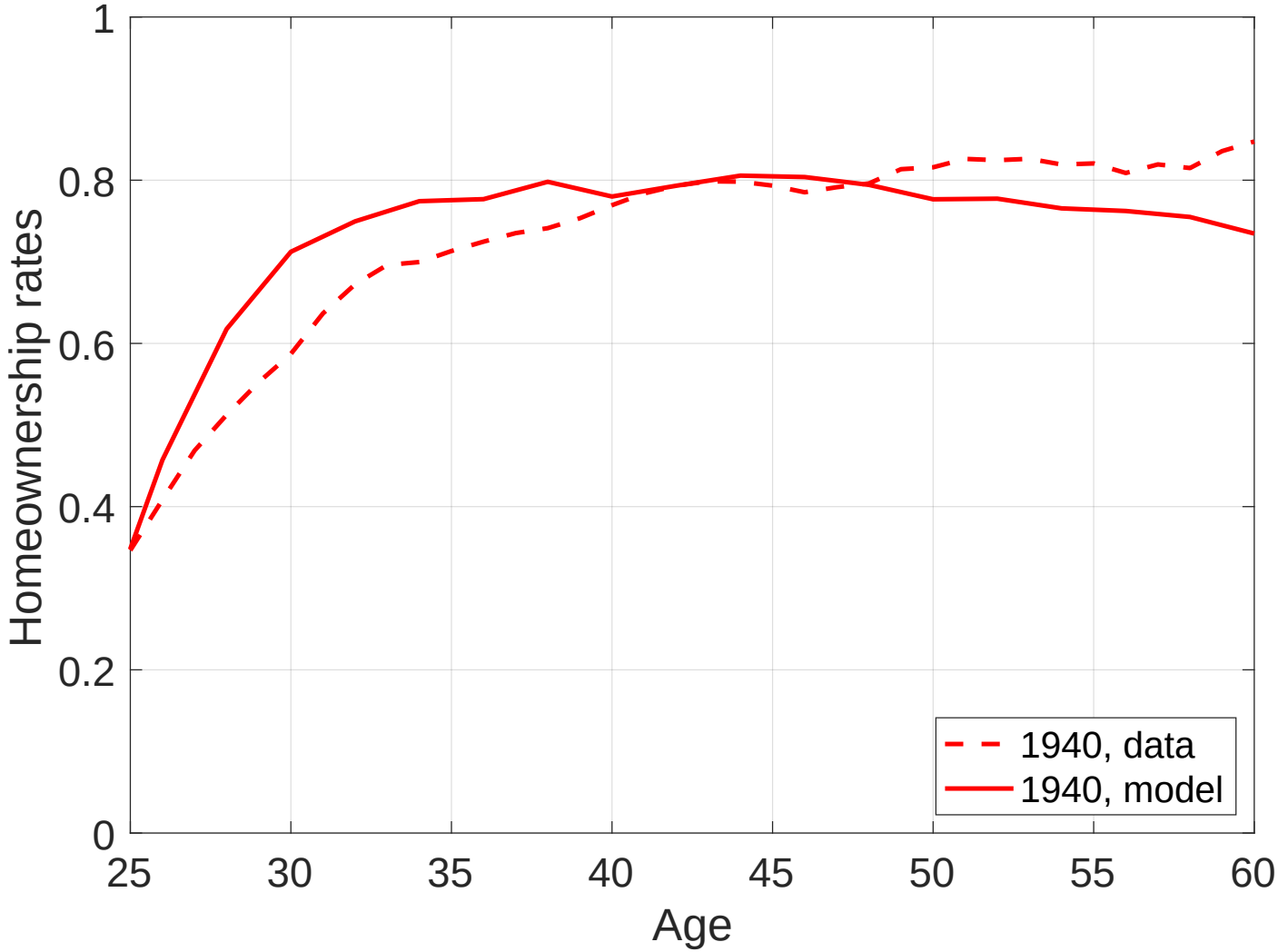
More | Government and default

Households' problem

Calibration and experiment

- Estimate the model for 1940s generation
- Some parameters calibrated externally More
- MSM: 7 parameters for 7 targets More
  - Moments: homeownership rate at 40, stock market participation at 40, wealth to income ratios...
  - Parameters: discount rates, taste for homeownership, participation cost in stock market...
- Verify overidentifying restrictions: life-cycle profiles More
- Then, keep preferences constant, change exogenous inputs, look at implications for different generations

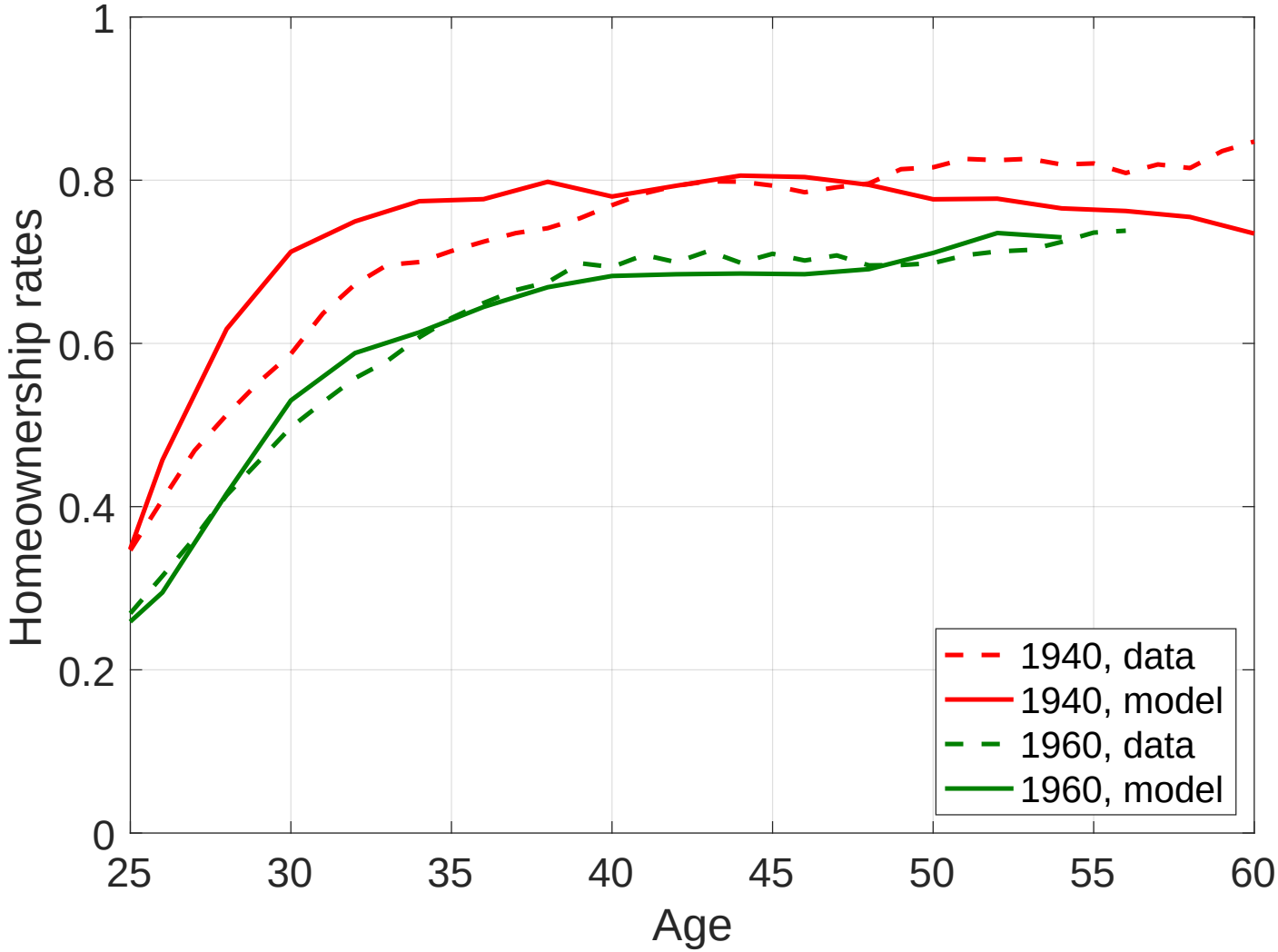
Model fit: homeownership across generations



Data: PSID

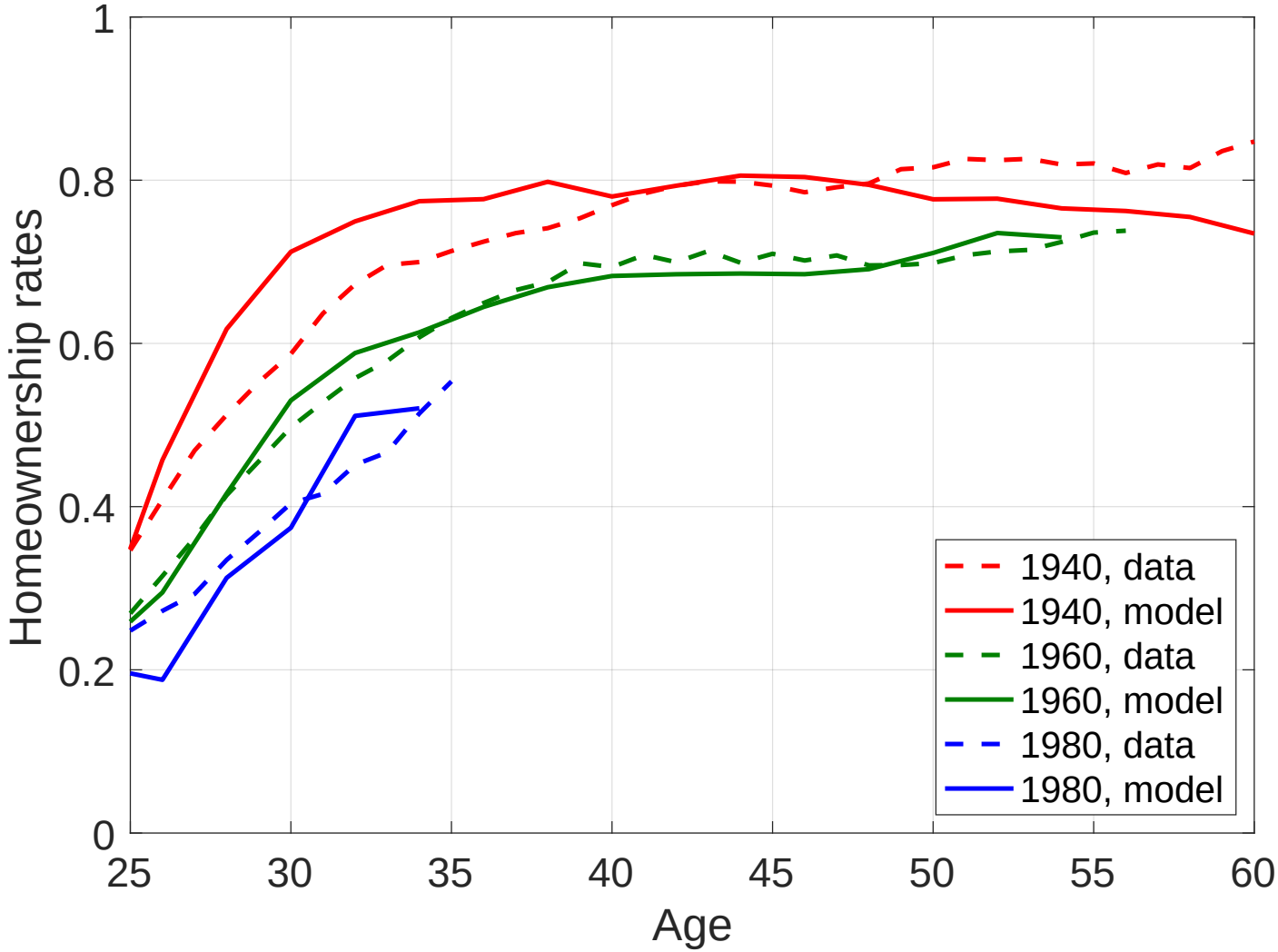
Gen. changes

Model fit: homeownership across generations



Data: PSID Gen. changes

Model fit: homeownership across generations



Data: PSID

Gen. changes IW Zero initial wealth

Understanding the decrease in homeownership, 1960s

Age	30	40	50
Total	-9	-8	-9
Earnings			
Asset prices			
Financial conditions			
Demographics			

Understanding the decrease in homeownership, 1960s

Age	30	40	50
Total	-9	-8	-9
Earnings	-6.1	-3.8	-1.4
Asset prices	-3.0	-3.6	-8.1
Financial conditions	-0.1	+0.1	+0.2
Demographics	+0.2	-0.7	+0.3

Table: Contributions (pp) to decrease in homeownership wrt 1940s

θ

Understanding the decrease in homeownership, 1960s

Age	30	40	50
Total	-9	-8	-9
Earnings	-6.1	-3.8	-1.4
initial inequality	-5.5	-2.0	+1.5
risk	-0.6	-1.8	-2.9
Asset prices	-3.0	-3.6	-8.1
house price trend	-5.7	-6.3	-4.1
histories	+2.7	+2.7	-4.0
Financial conditions	-0.1	+0.1	+0.2
stock participation costs	-0.1	+0.1	+0.2
borrowing conditions	0.0	0.0	0.0
Demographics	+0.2	-0.7	+0.3

Table: Contributions (pp) to decrease in homeownership wrt 1940s

θ

Understanding the decrease in homeownership, 1980s

Age	30	35
Total	-14	-22
Earnings	-10.2	-8.4
initial inequality	-5.7	-3.1
risk	-4.5	-5.3
Asset prices	-12.6	-16.3
house price trend	-6.3	-10.3
histories	-6.3	-6.0
Financial conditions	+8.8	+3.3
stock participation costs	-0.7	0.0
borrowing conditions	+9.5	+3.3
Demographics	0.0	-0.6

Table: Contributions (pp) to decrease in homeownership wrt 1940s

Figures Histories

Risk vs inequality

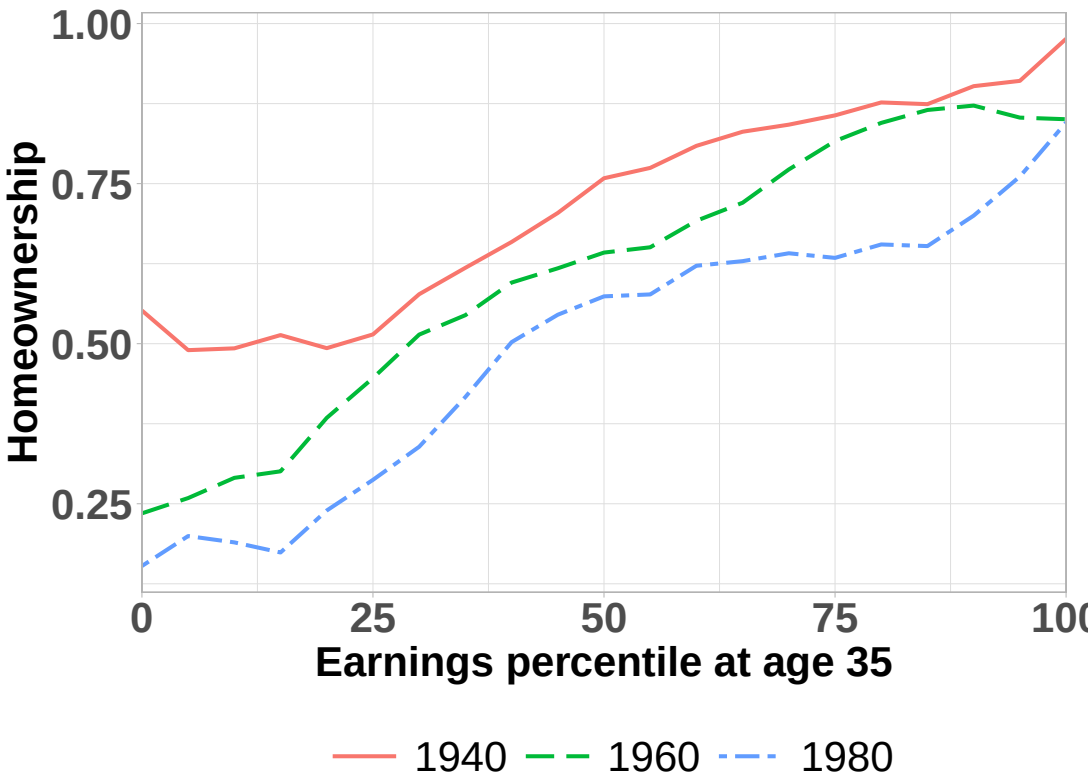
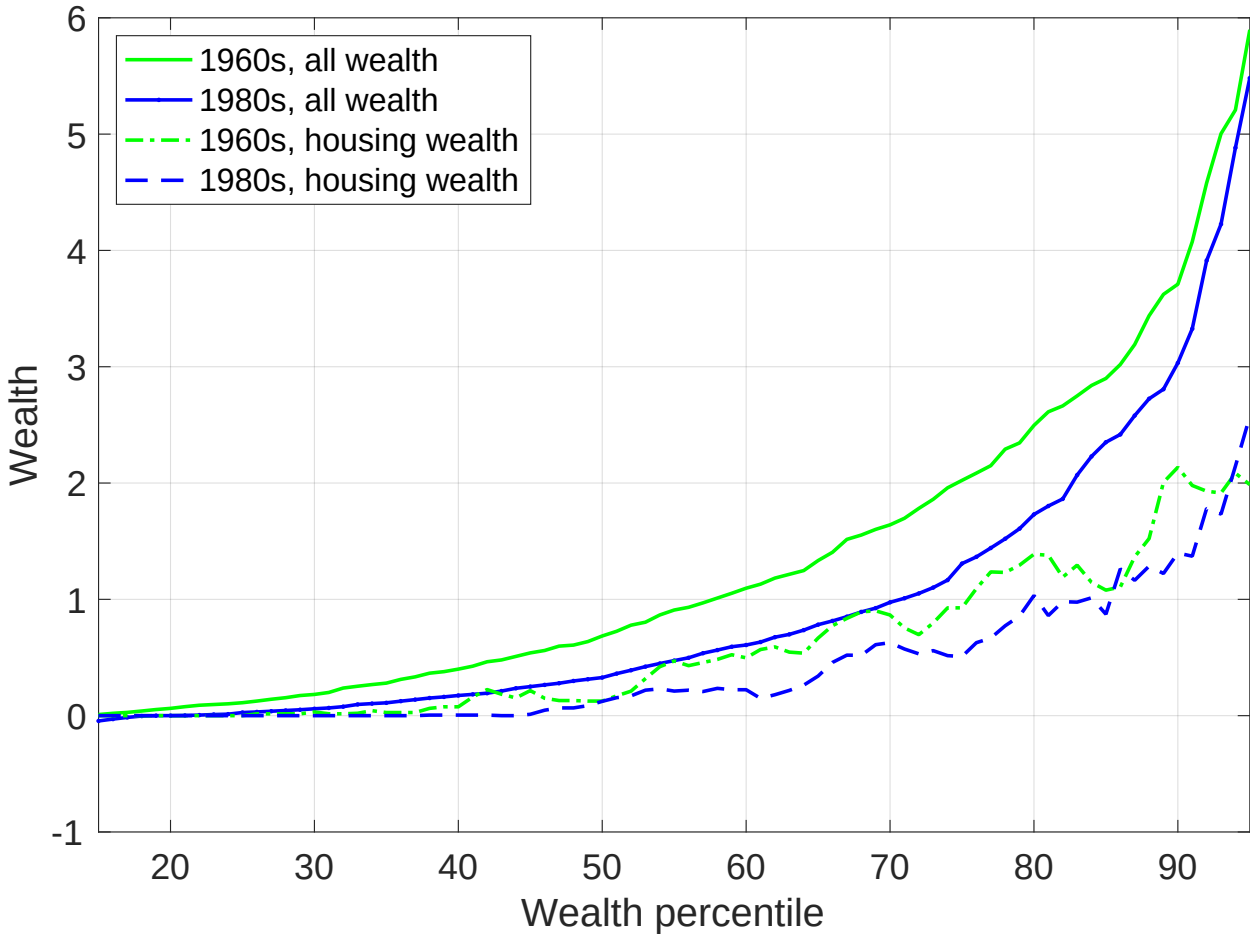


Figure: Homeownership by cohorts, by percentile of the earnings distribution at age 35. PSID data.

Model Stock mkt participation

Younger generations are accumulating less wealth



Data: SCF, ages 30-35 Model Simulations Robustness

Conclusion

- Secular changes for younger generations in the US:
  - More earnings inequality + earnings risk
  - Lower homeownership
  - More (indirect) stock market participation
- Can explain intergenerational changes with a model with:
  - Rich, business-cycle varying, generation-dependent earnings risk
  - Flexible asset structure
- Earnings inequality and risk key for lower homeownership of 1960s and 1980s generations
- Lower wealth accumulation for many younger households
- Financial wealth is becoming more relevant with respect to housing wealth

Appendix

SD earnings distribution, robustness

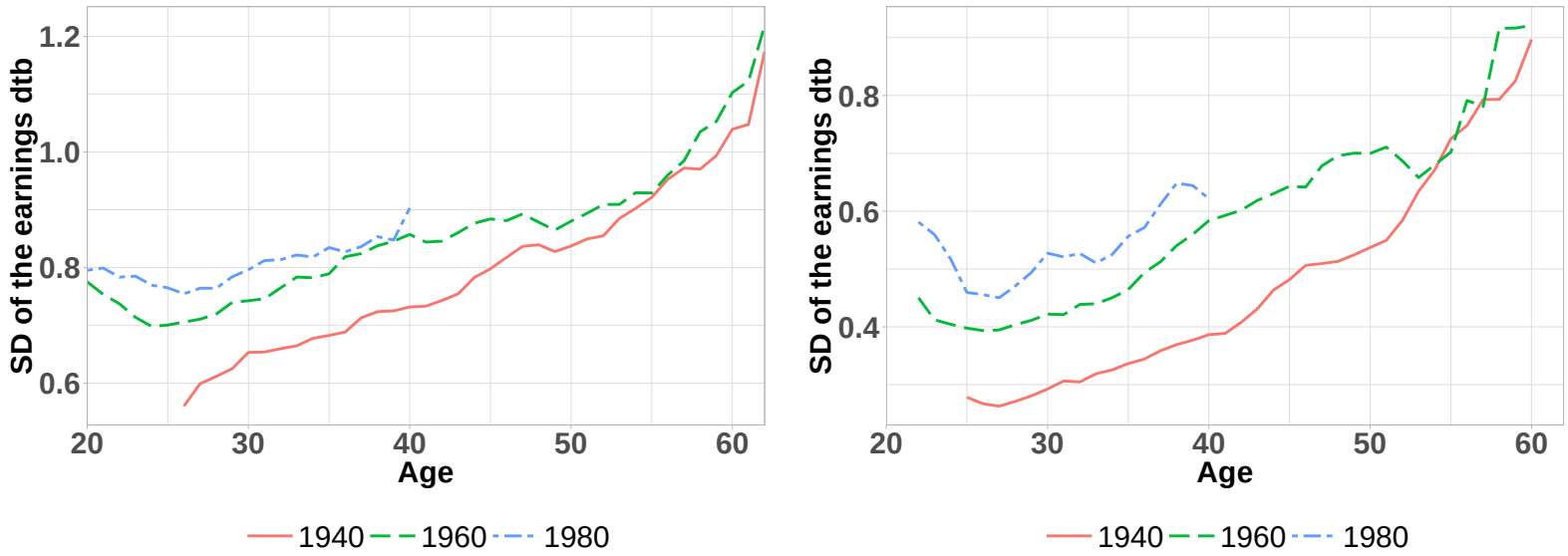


Figure: Left: male earnings; right: only married couples

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SD earnings distribution, by percentile

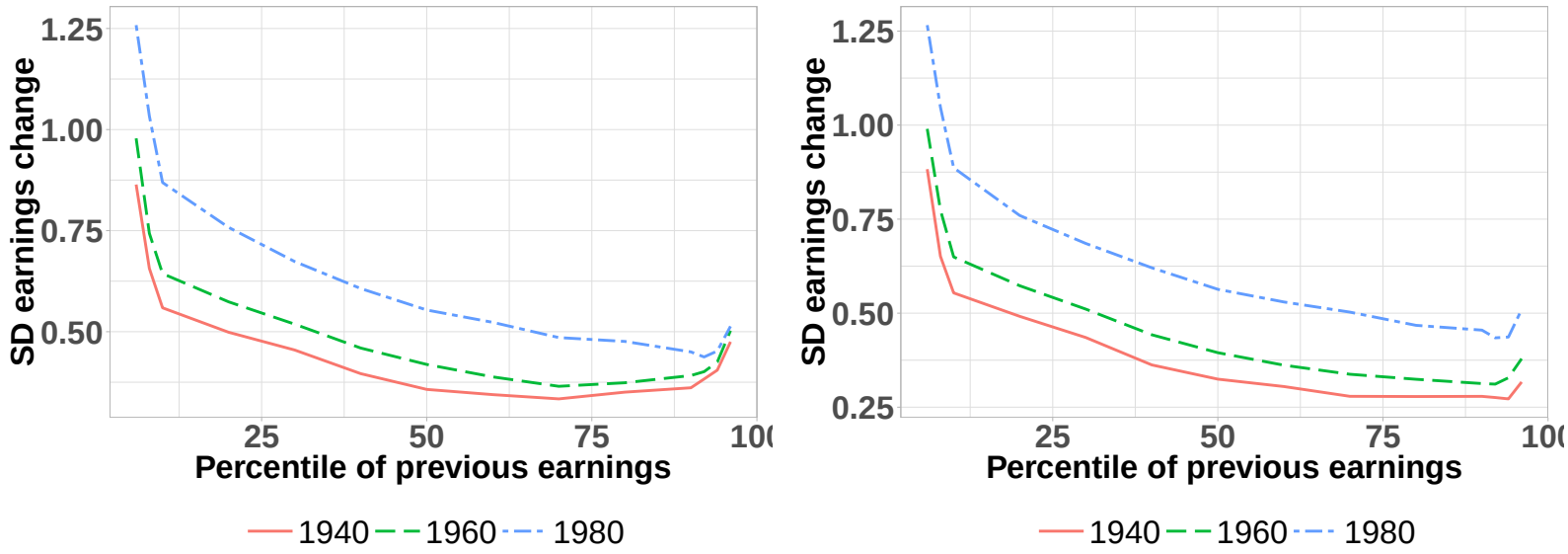

Figure: Left: all households; right: 35 and below

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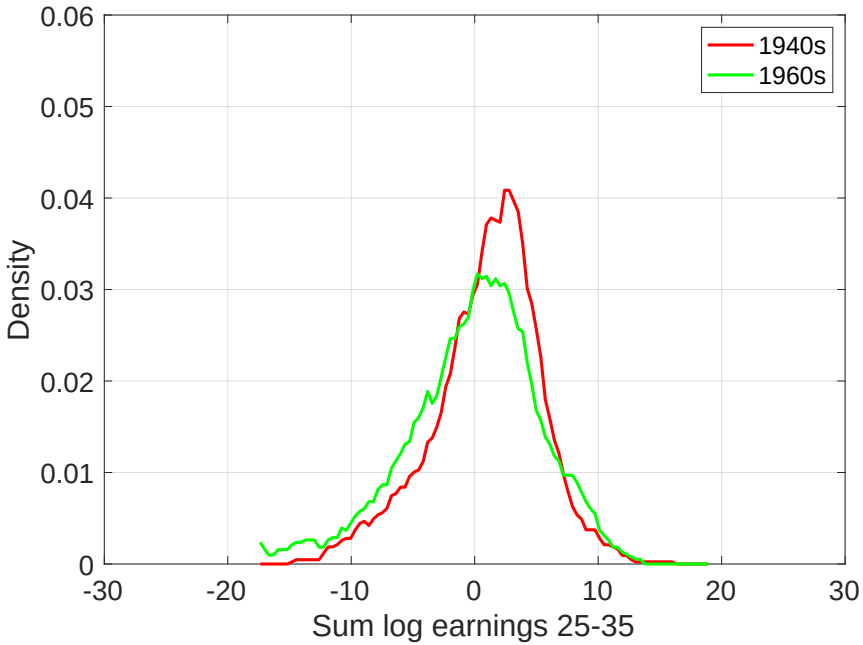
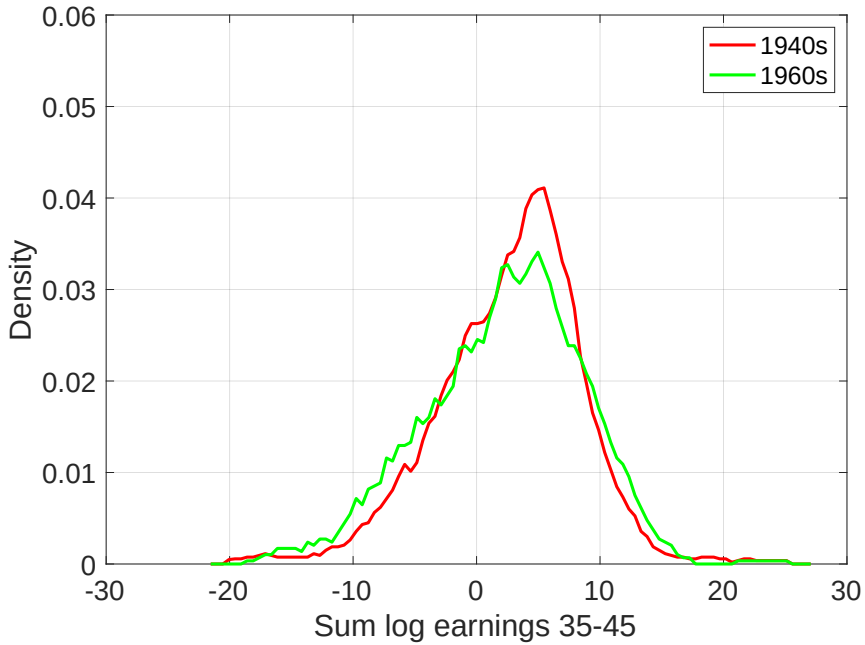
SD earnings distribution, longer horizon





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SD earnings distribution, longer horizon, data vs model

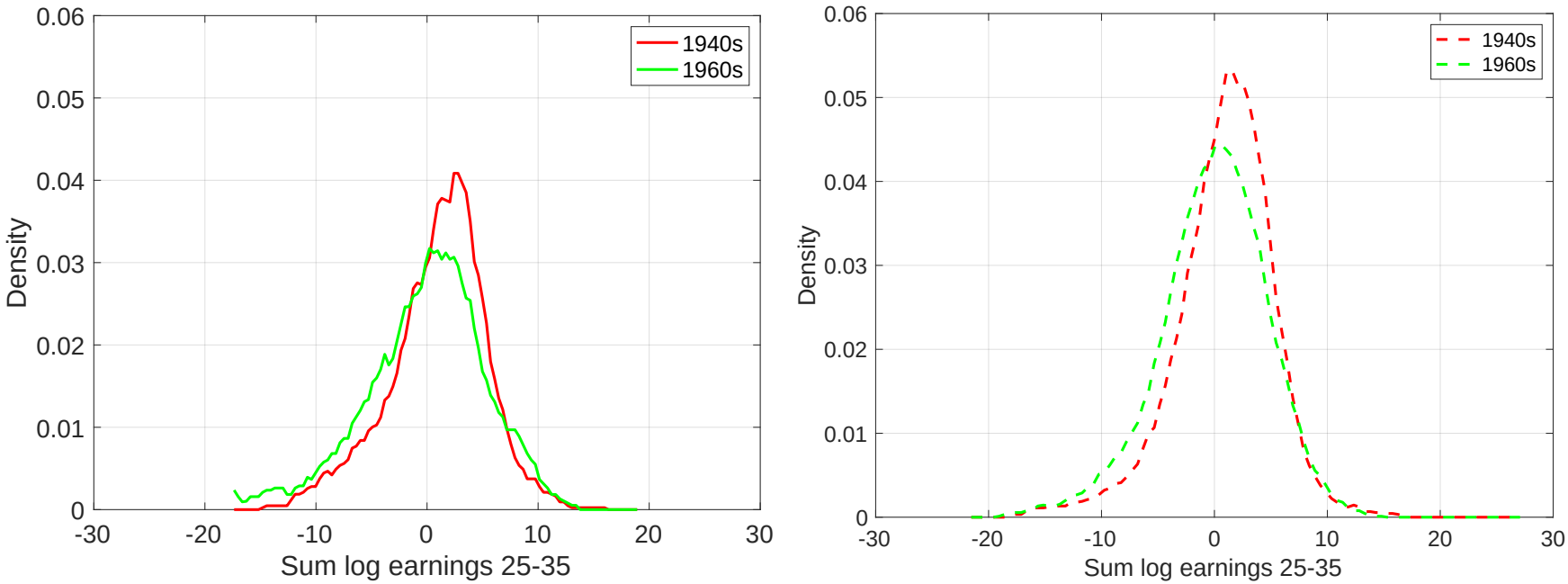

Figure: Left: PSID data; right: model implication

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Average and median earnings

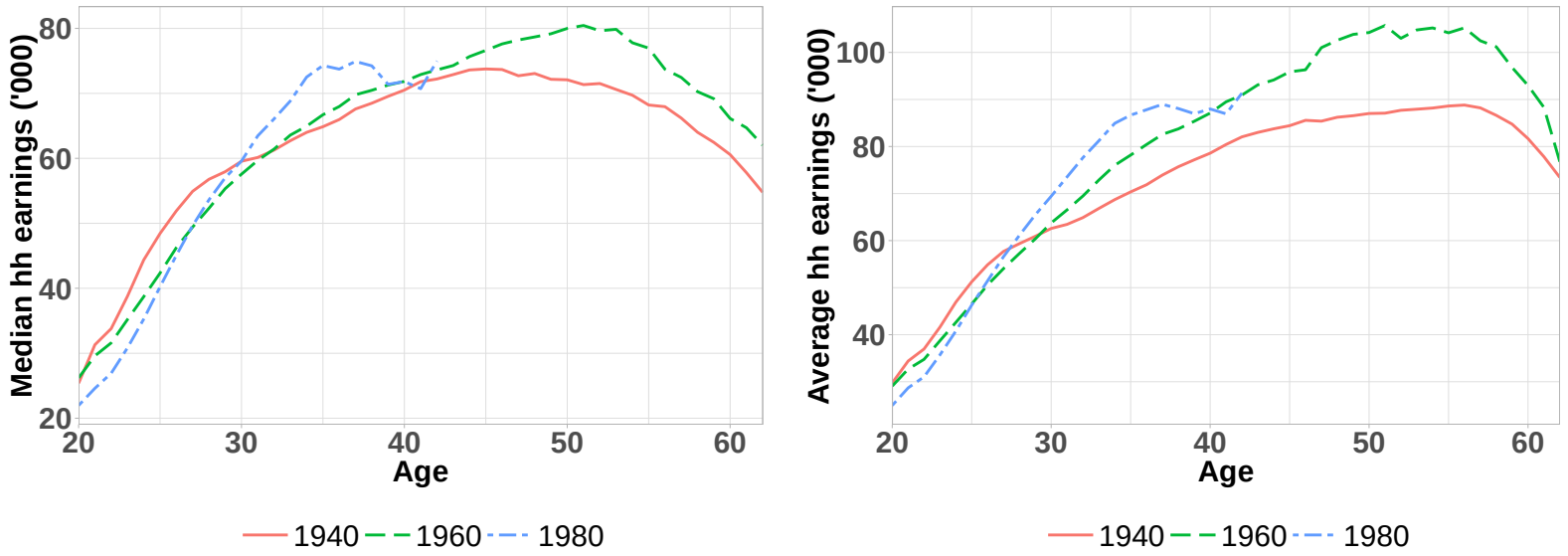

Figure: Left: median earnings; right: average earnings

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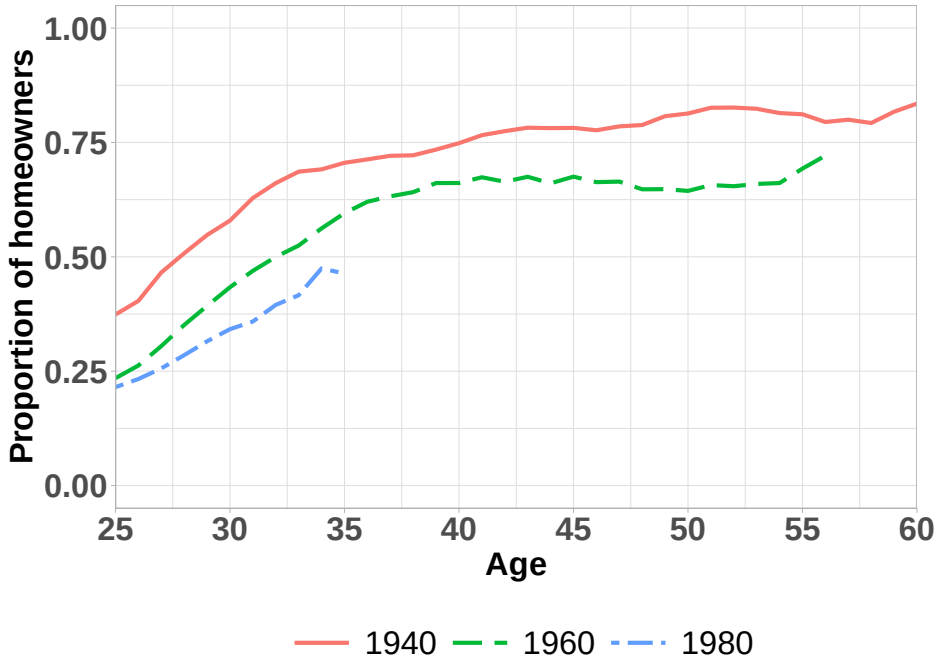
Homeownership, weighted full PSID



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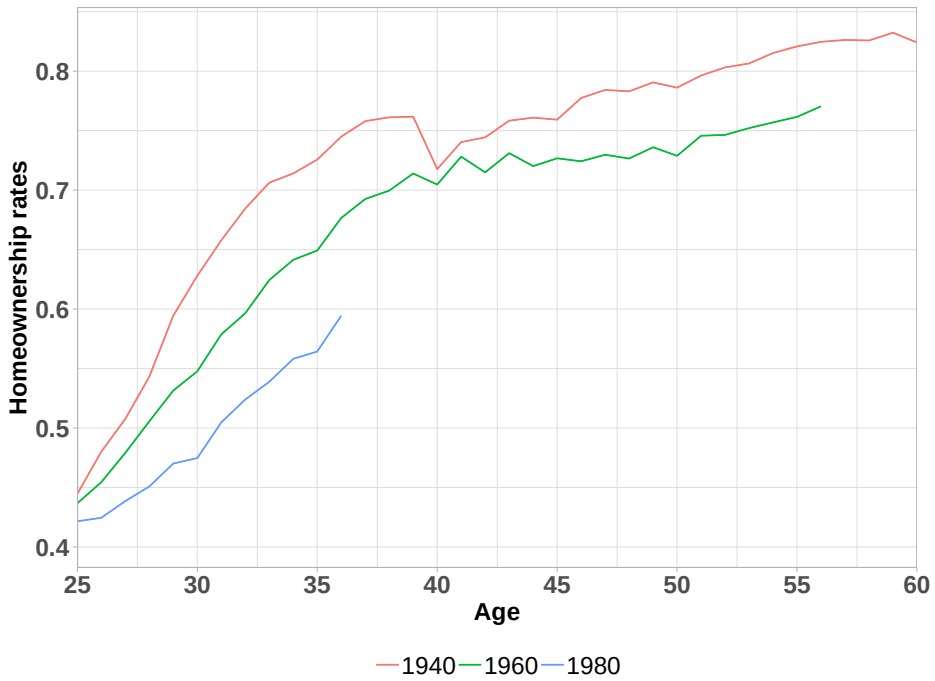
Homeownership, IPUMS (census) data



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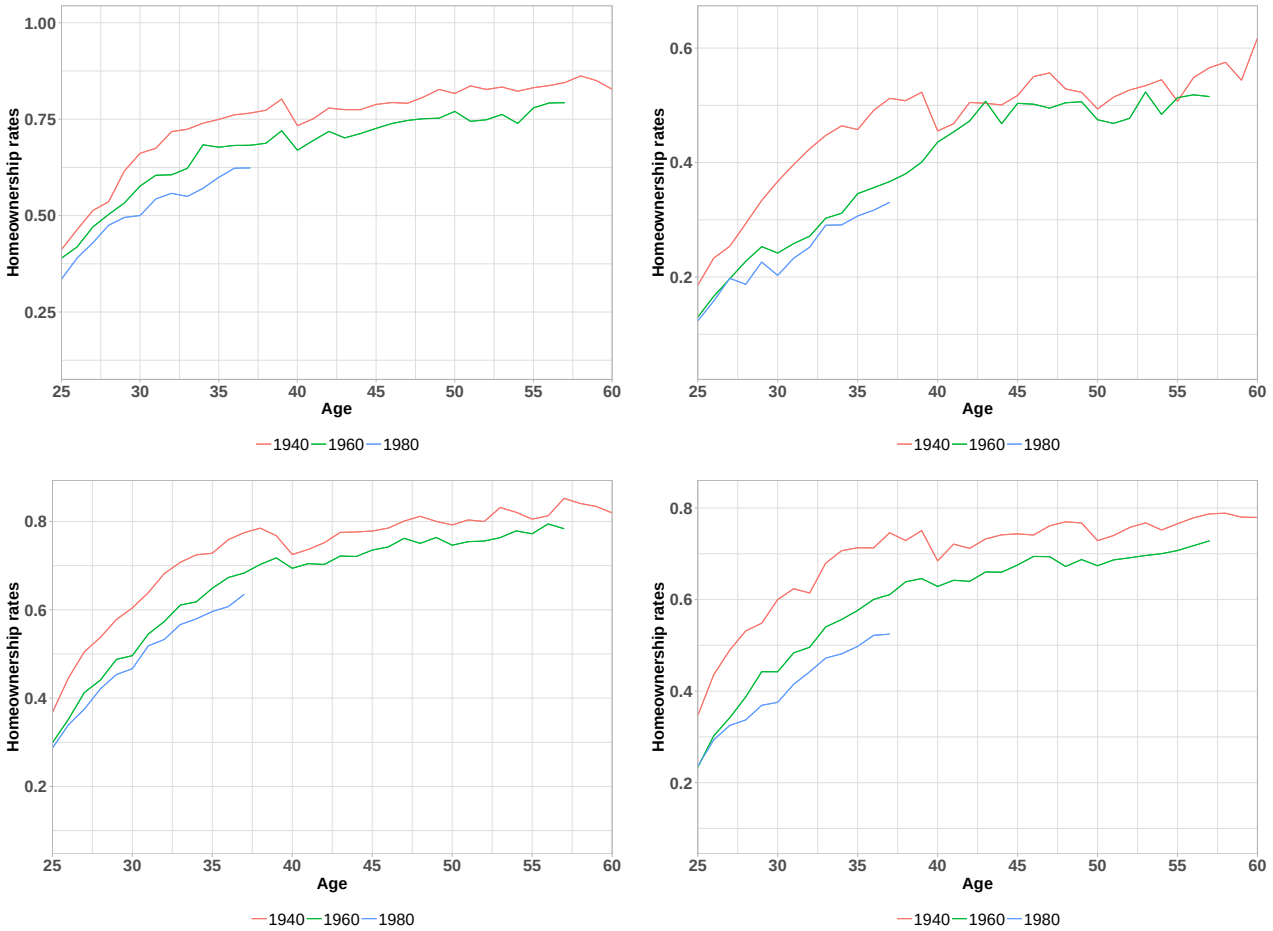
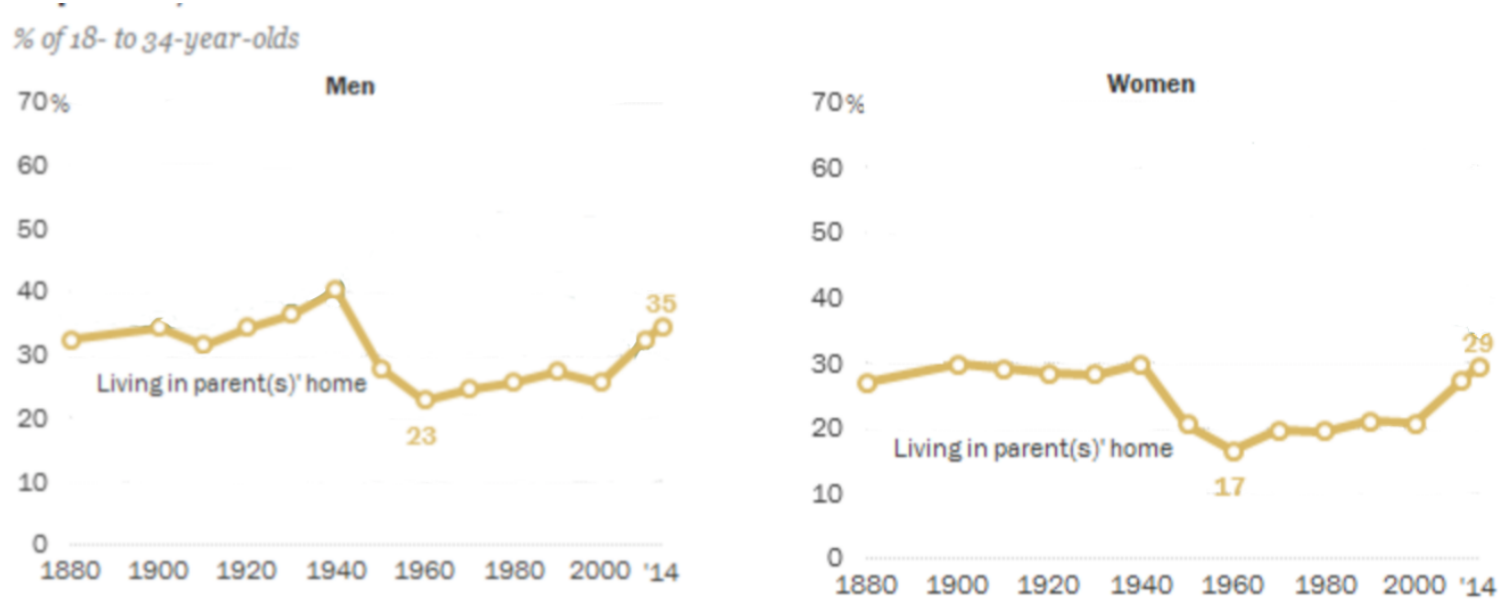
Homeownership, IPUMS (census) data



Not in metropolitan area, in central/principal city, not in central/principal city, intermediate status. Back

Young people are also staying longer with their parents



Source: Pew Research Center, with Census data Back

... despite apparent stability in aggregate homeownership rates

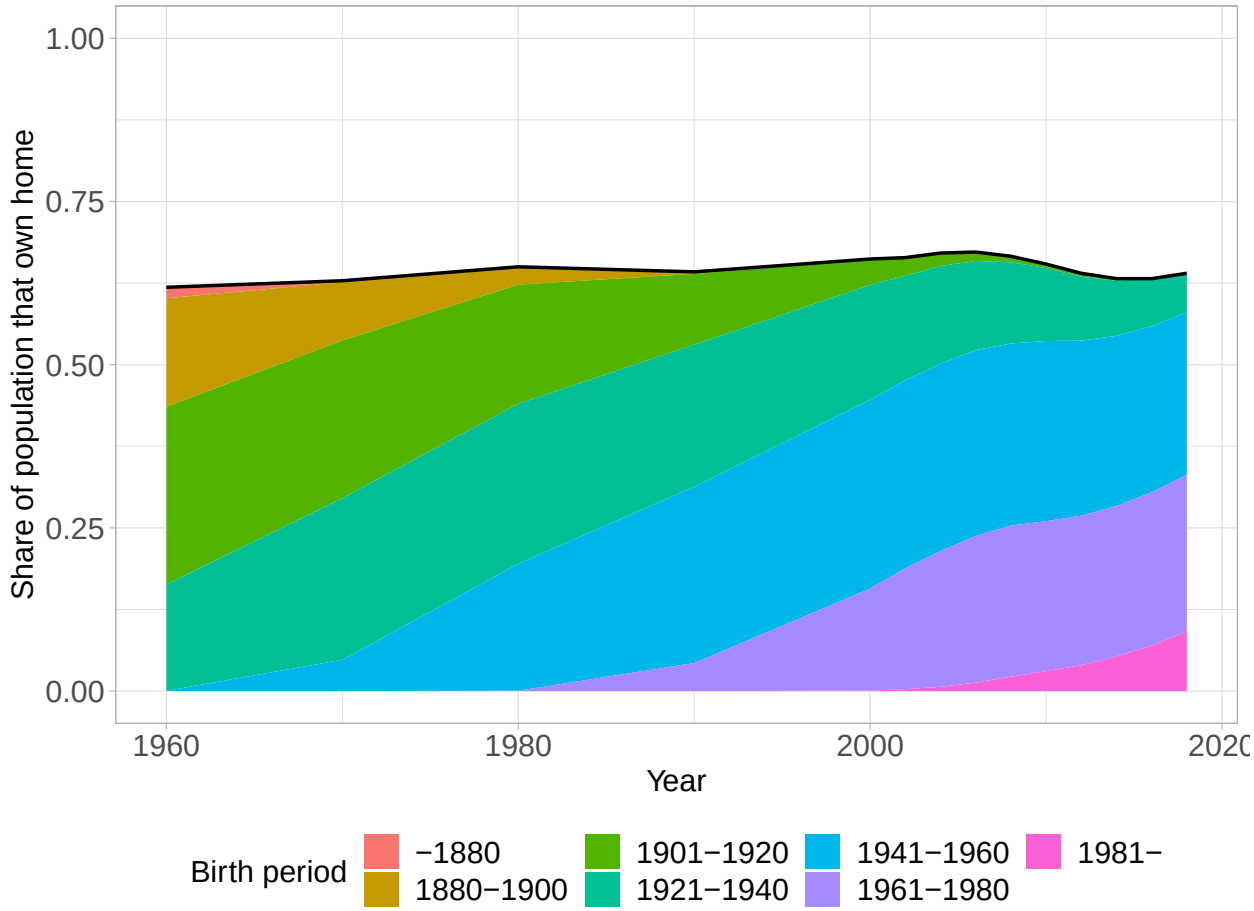
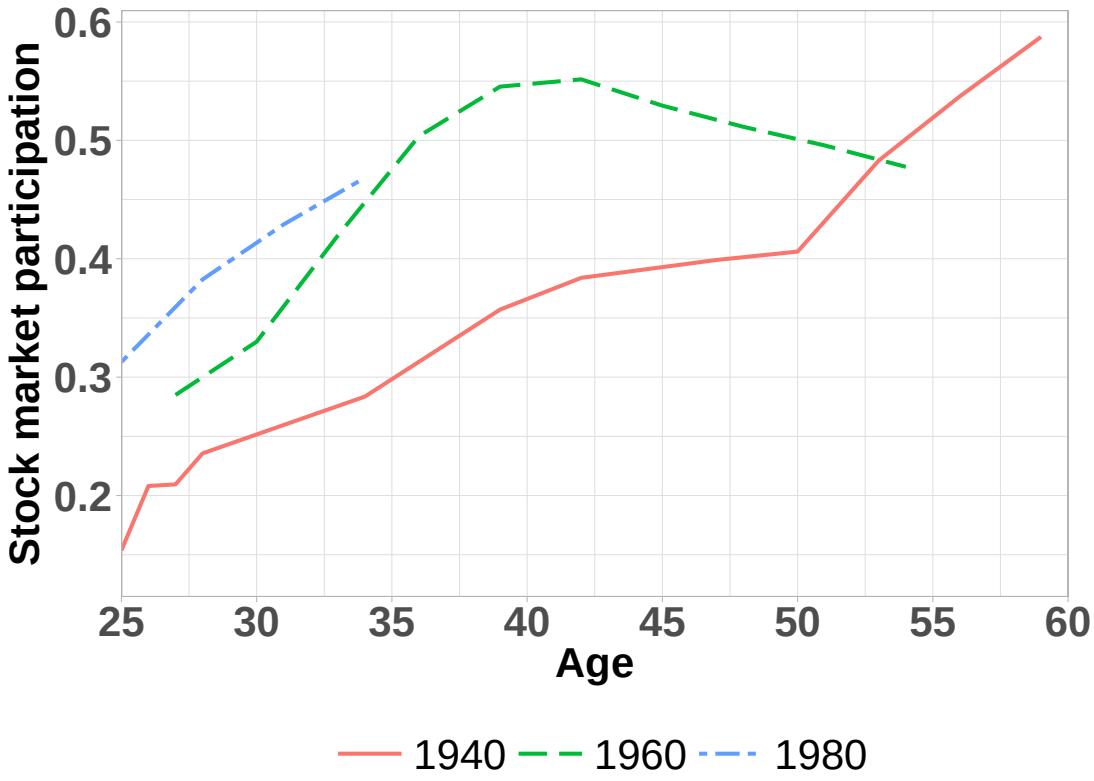


Figure: Homeownership by age and cohort, IPUMS census data (census and ACS data)

Stock market participation, indirect holdings



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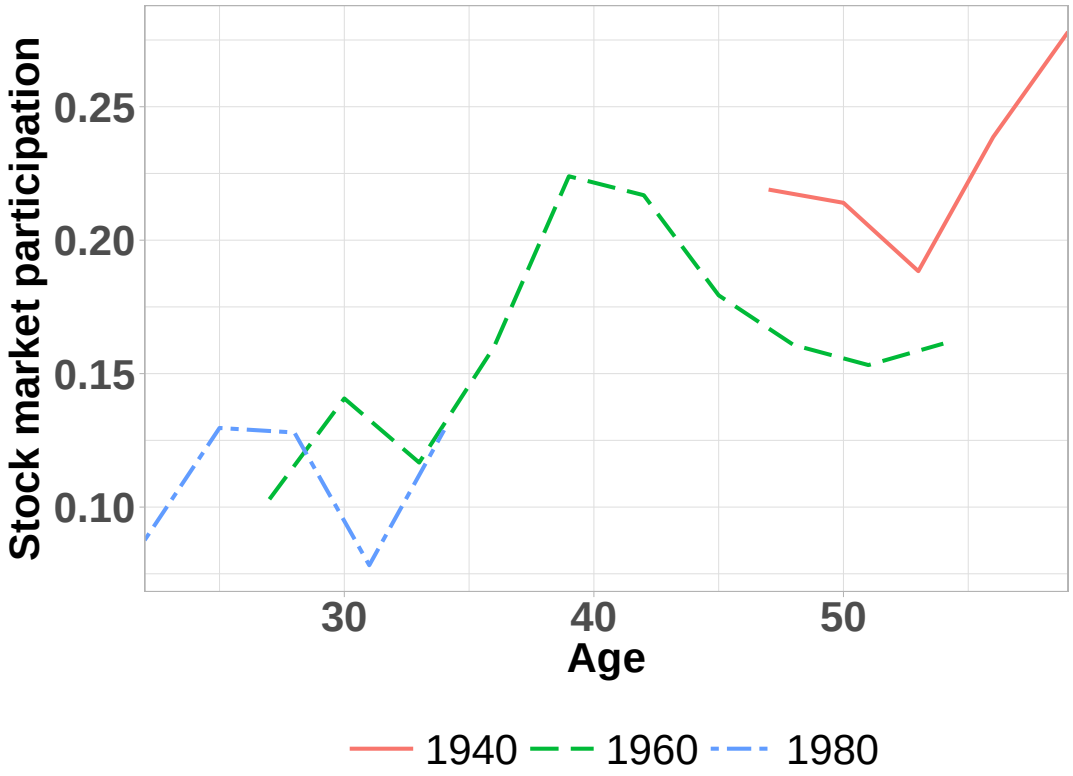
Stock market participation, direct holdings



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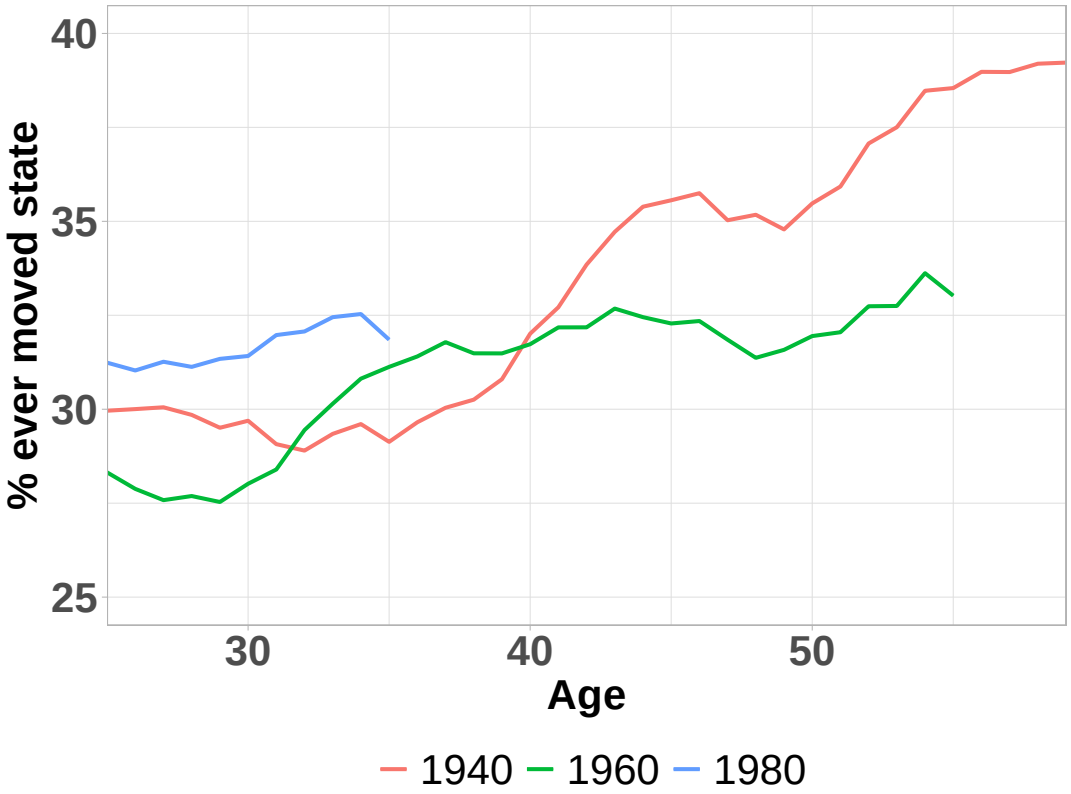
Share that has ever moved state



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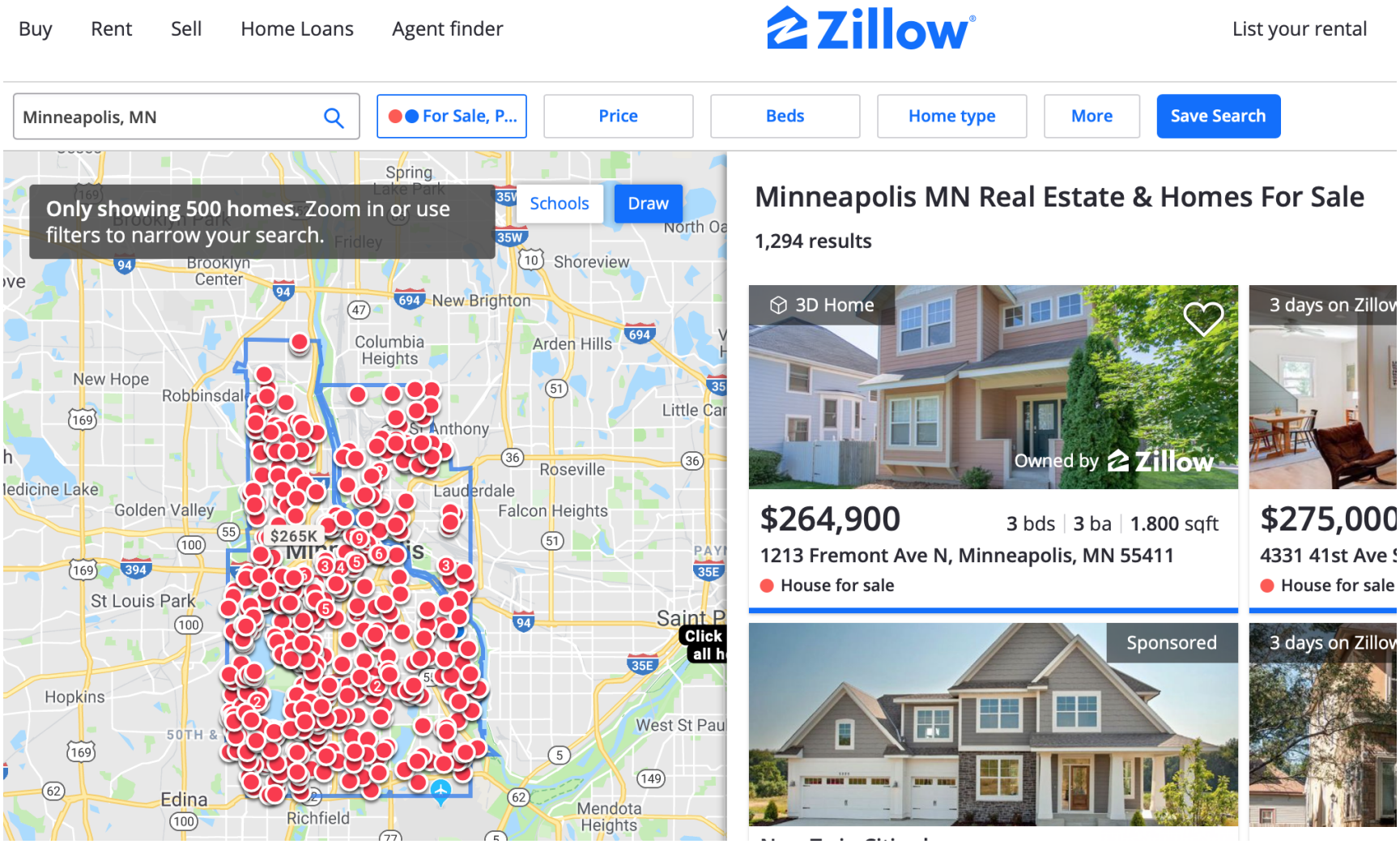
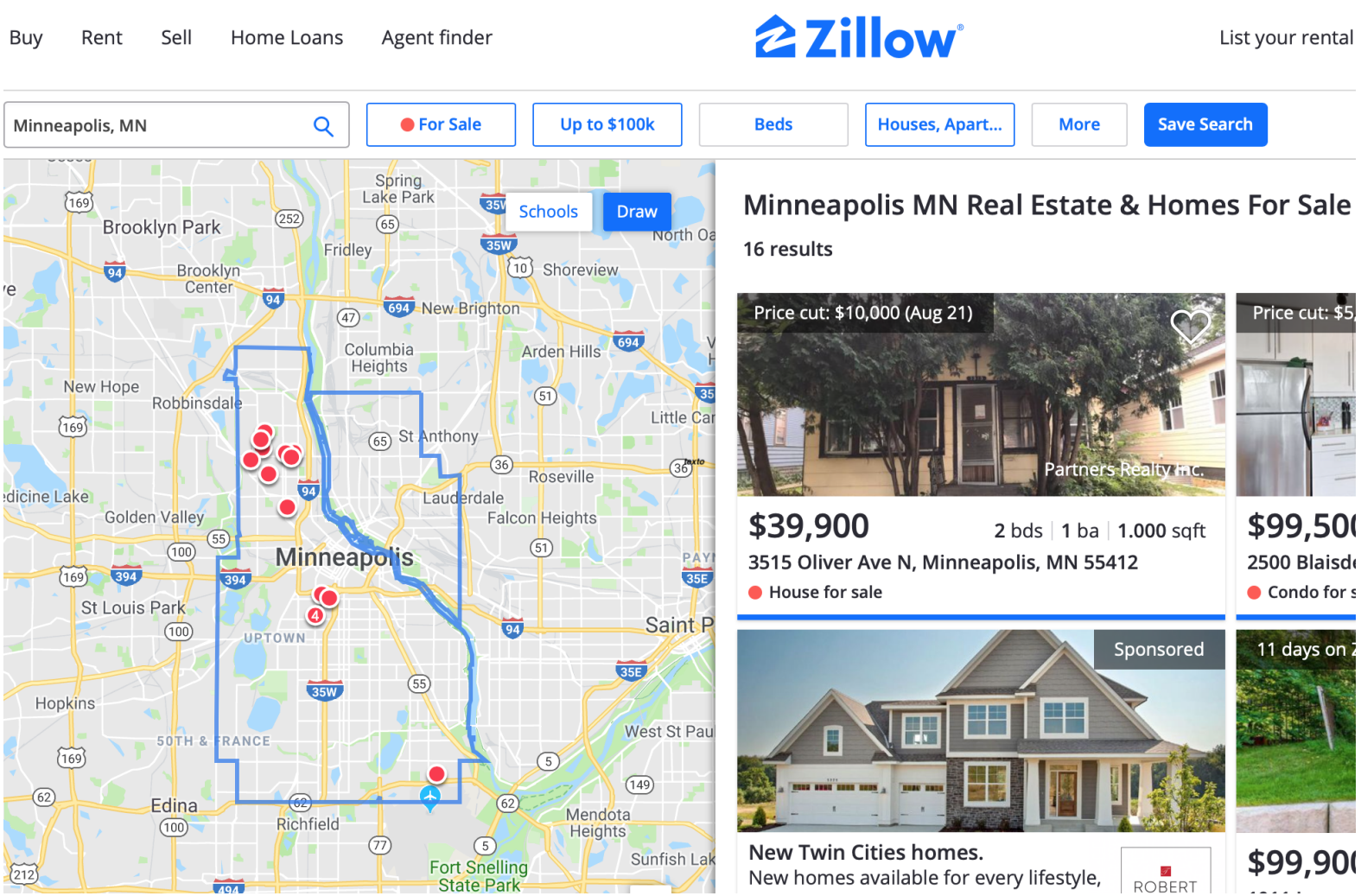
Minimum house sizes



Minimum house sizes



Back to mechanisms Back to model

Flexible earnings process

- Captures (Guvenen, Karahan, Ozkan, and Song (2018)):
  - Age dependence of conditional 2nd and higher moments
  - Non-normality of shocks Non-normality
  - Non-linearity in previous earnings and their innovation Non- linearity
- Based on the econometric framework proposed in Arellano, Blundell and Bonhomme (2017)
- Enriched with:
  - Aggregate uncertainty
  - Intergenerational differences Variance by cohort
- PSID data (1968-2017)

Specification Back

Why is business cycle variation important?

Countercyclical skewness (as in Guvenen, Ozkan and Song (2014)).

- Earnings expected to decrease during recessions
- Large negative earnings realizations particularly likely during recessions
- Correlation with asset returns
- Sluggish recovery from recessions More

Back

ABB (2017) with business cycle risk

Let $\tilde{y}_t$ be an observation of log earnings in the data, and $Q_z(q|\cdot)$ denote the conditional quantile function for z. I assume:

$$\begin{aligned}
\tilde{y}_{it} &= \eta_{it} + \varepsilon_{it} \\
\eta_{it} &= Q_\eta(v_{it}|\eta_{i,t-1}, t, \Omega_t) \\
\varepsilon_{it} &= Q_\varepsilon(u_{it}|t) \\
\eta_{i1} &= Q_{\eta_1}(v_{i1}|\Omega_1) \\
u_{it}, v_{i1}, (v_{it}|\eta_{i,t-1}, \eta_{i,t-2}, \ldots) &\sim U(0,1)
\end{aligned}$$

Implementation

Let $\psi^k, \quad k = 0, 1, \ldots$ denote a family of bivariate, polynomial fns.

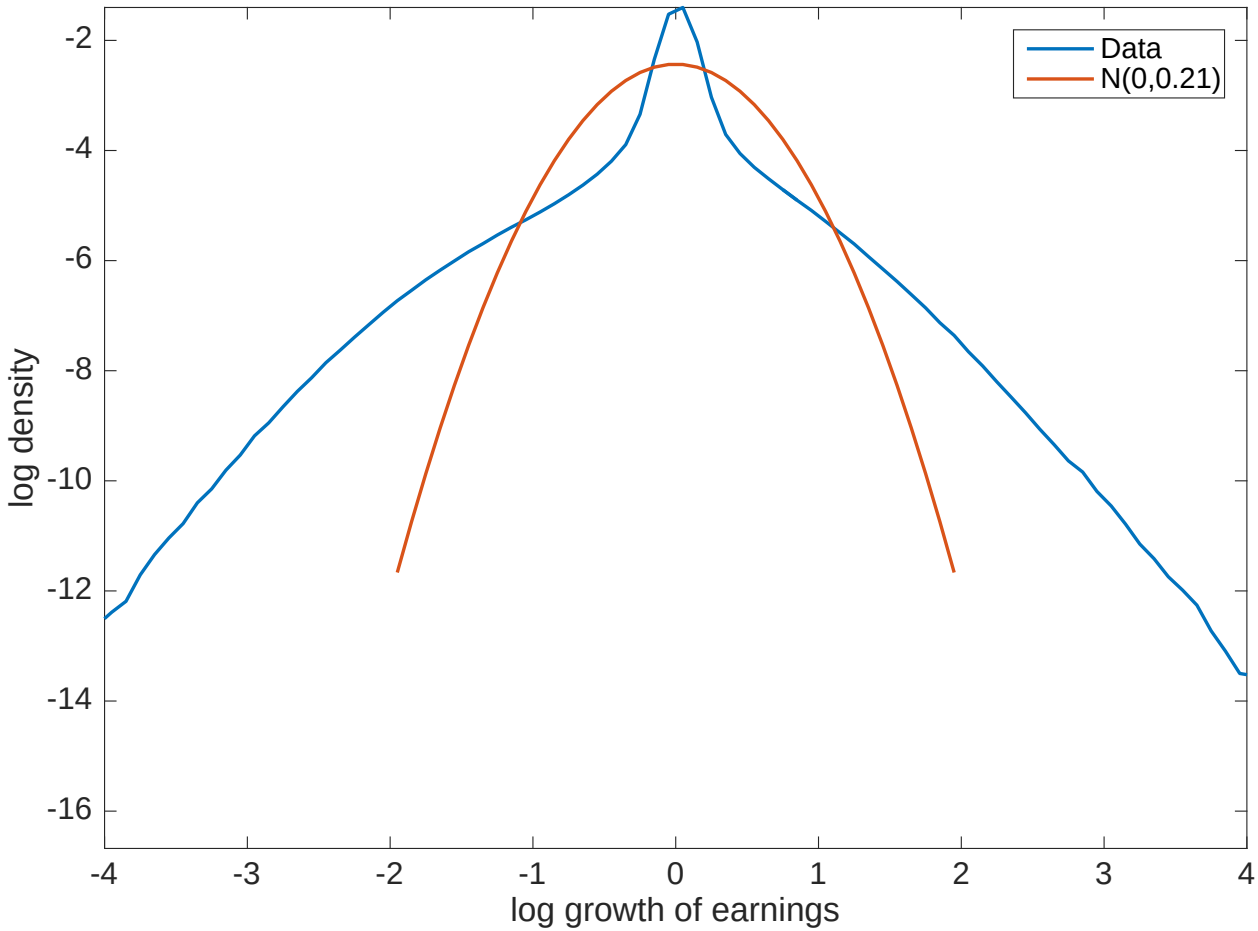
$$Q_\eta(q|\eta_{i,t-1}, age_{it}, \Omega_t) = \sum_{k=0}^{K} \alpha_k^\eta(q)\psi^k(\eta_{i,t-1}, age_{it}, \Omega_t)$$

$$Q_\varepsilon(q|age_{it}) = \sum_{k=0}^{K} \alpha_k^\varepsilon(q)\psi^k(age_{it})$$

$$Q_{\eta_1}(q|age_{i1}, \Omega_1) = \sum_{k=0}^{K} \alpha_k^{\eta_1}(q)\psi^k(age_{i1}, \Omega_1)$$

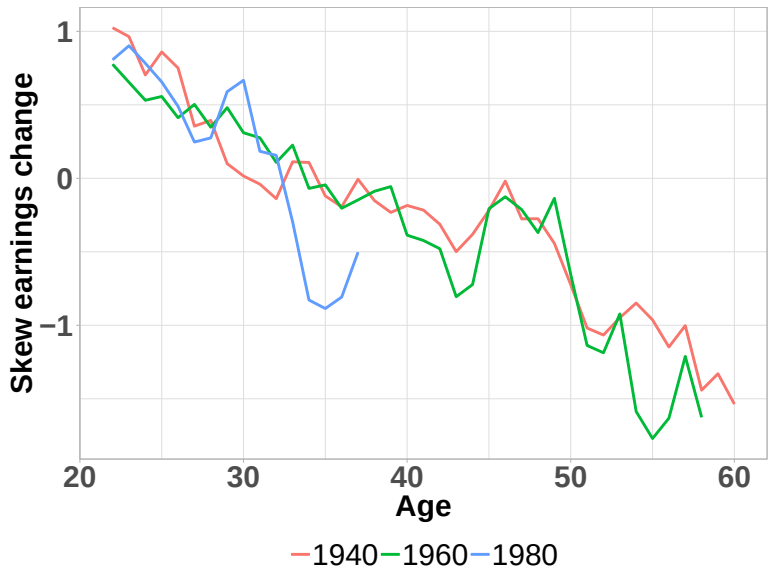
Back

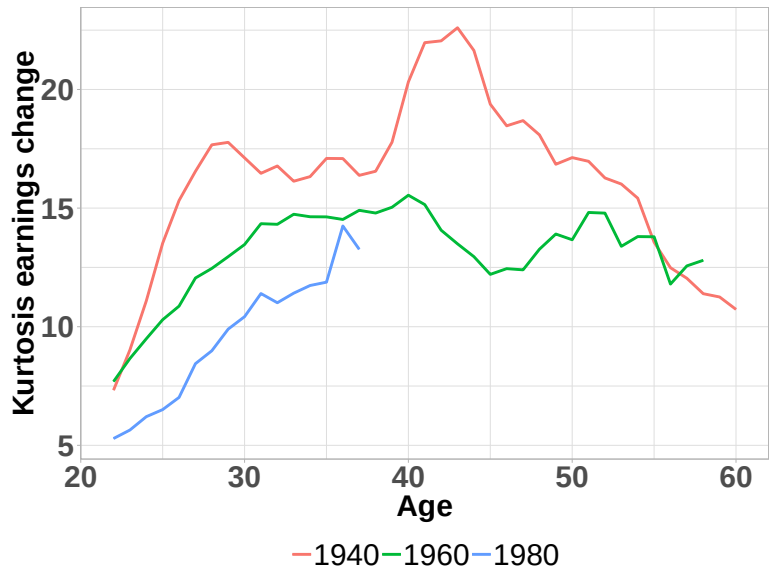
Non-normality



Source: earlier work from De Nardi, Fella, and Paz-Pardo (2019)

Non-normality over the generations





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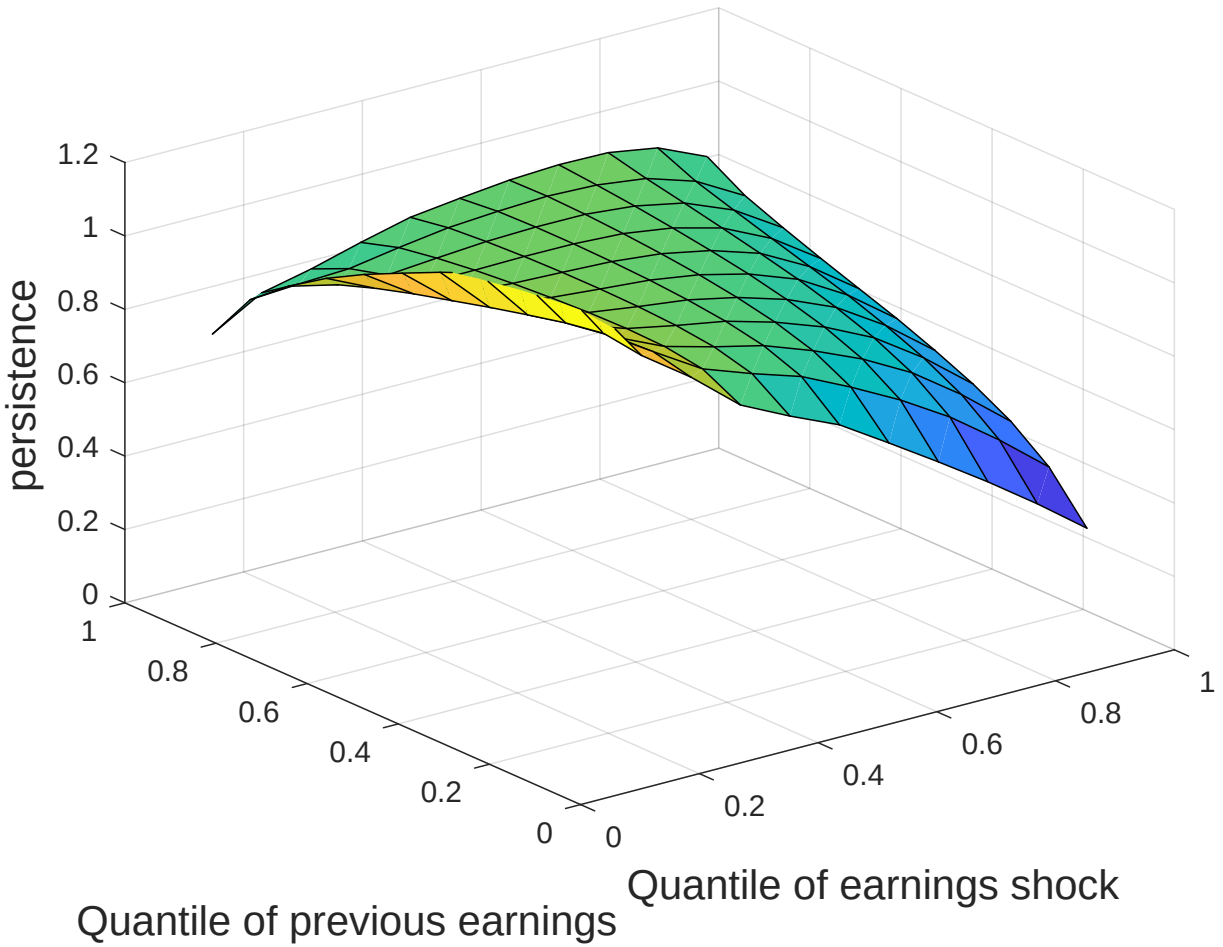
Nonlinearity



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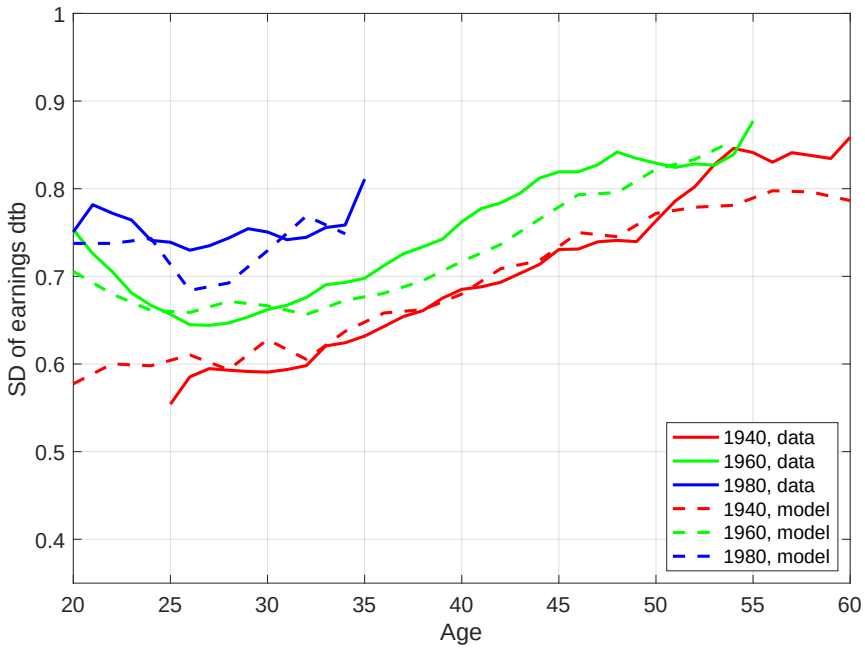
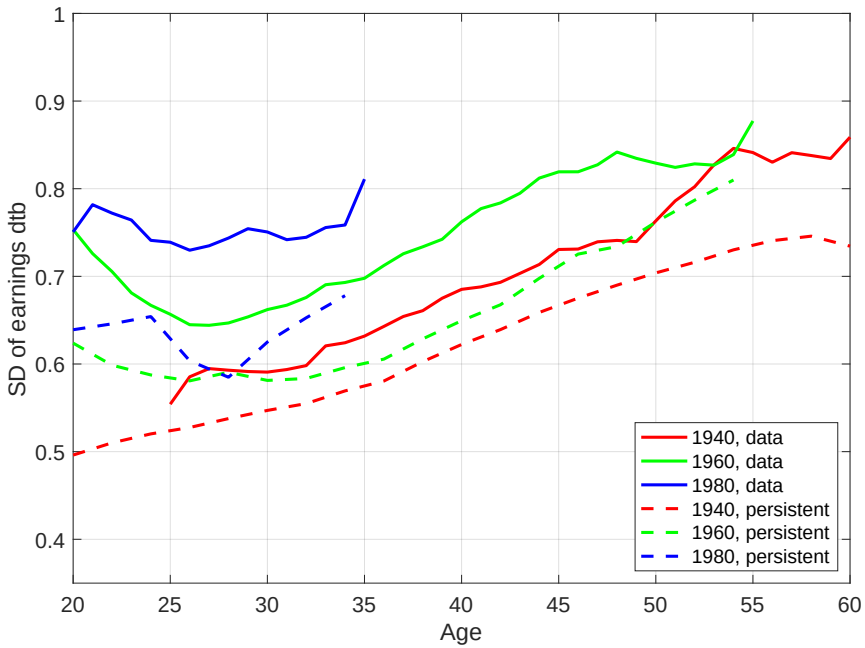
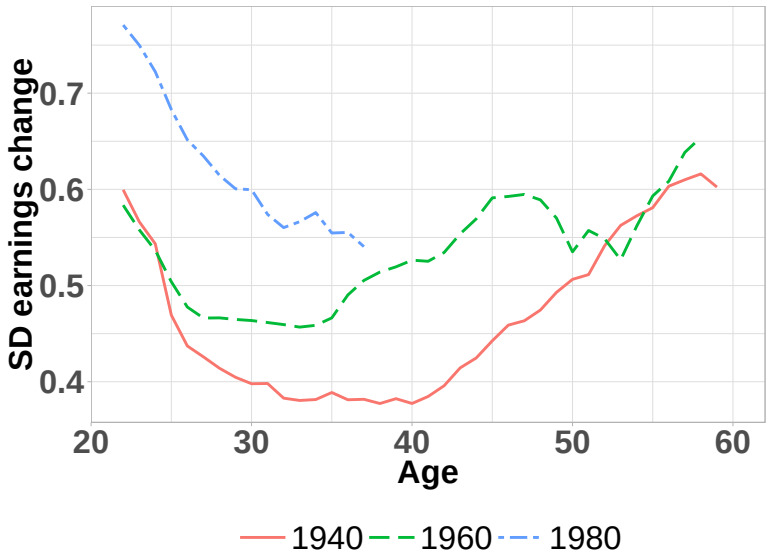
Earnings inequality over time: data vs model

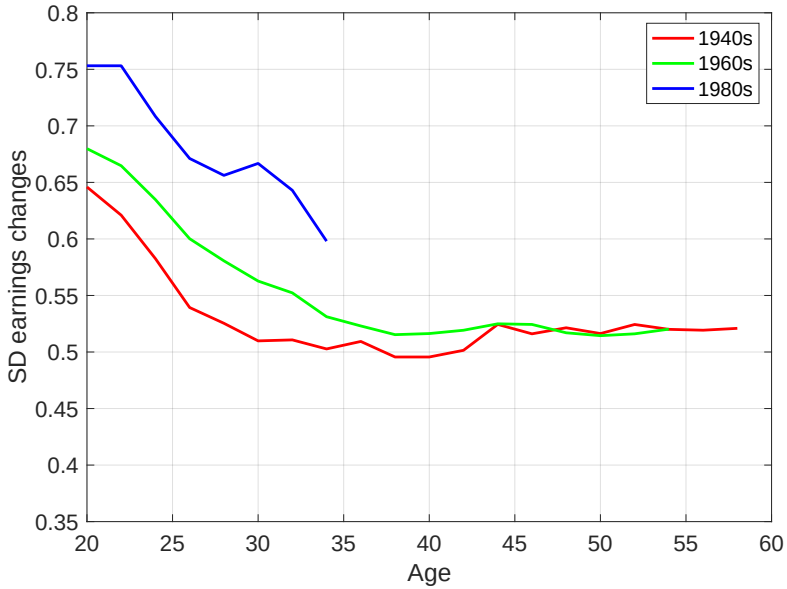




Back

Earnings risk over time: data vs model





- Model includes only persistent component

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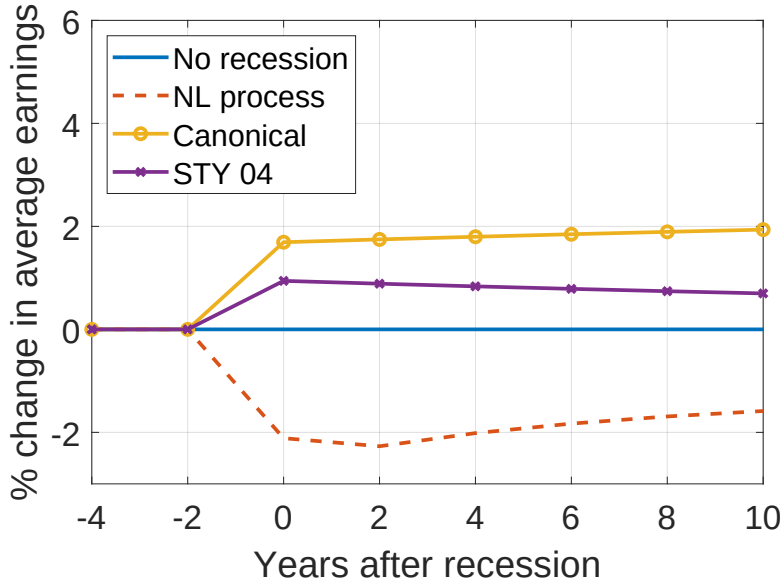
Business-cycle variation in earnings risk

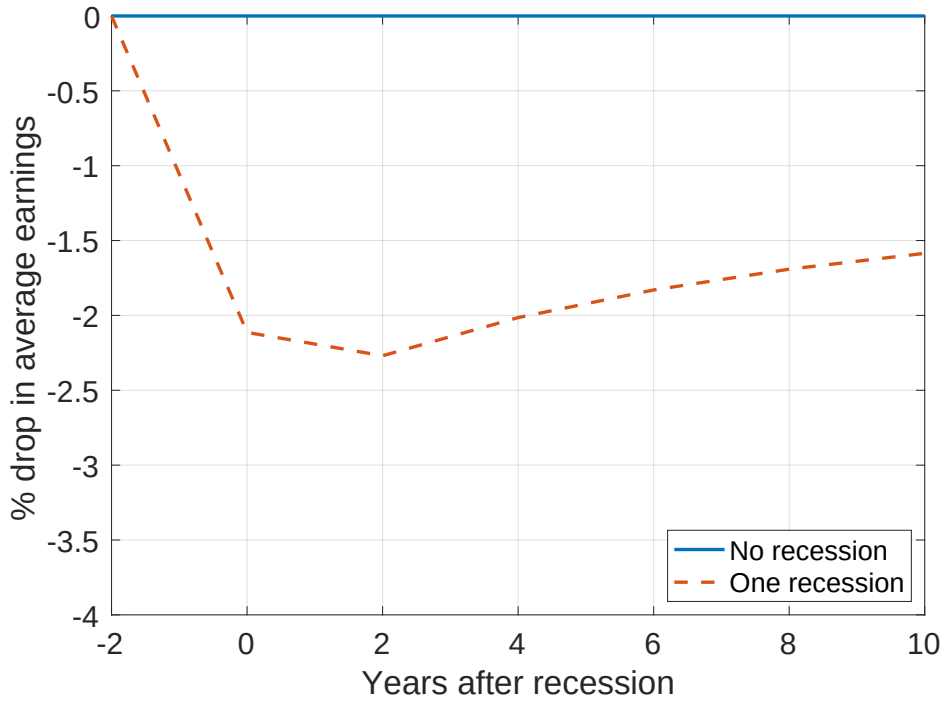
Recovery from recessions is sluggish



By previous earnings | By age | Back to earnings process

Business-cycle variation in earnings risk

Recovery from recessions is sluggish



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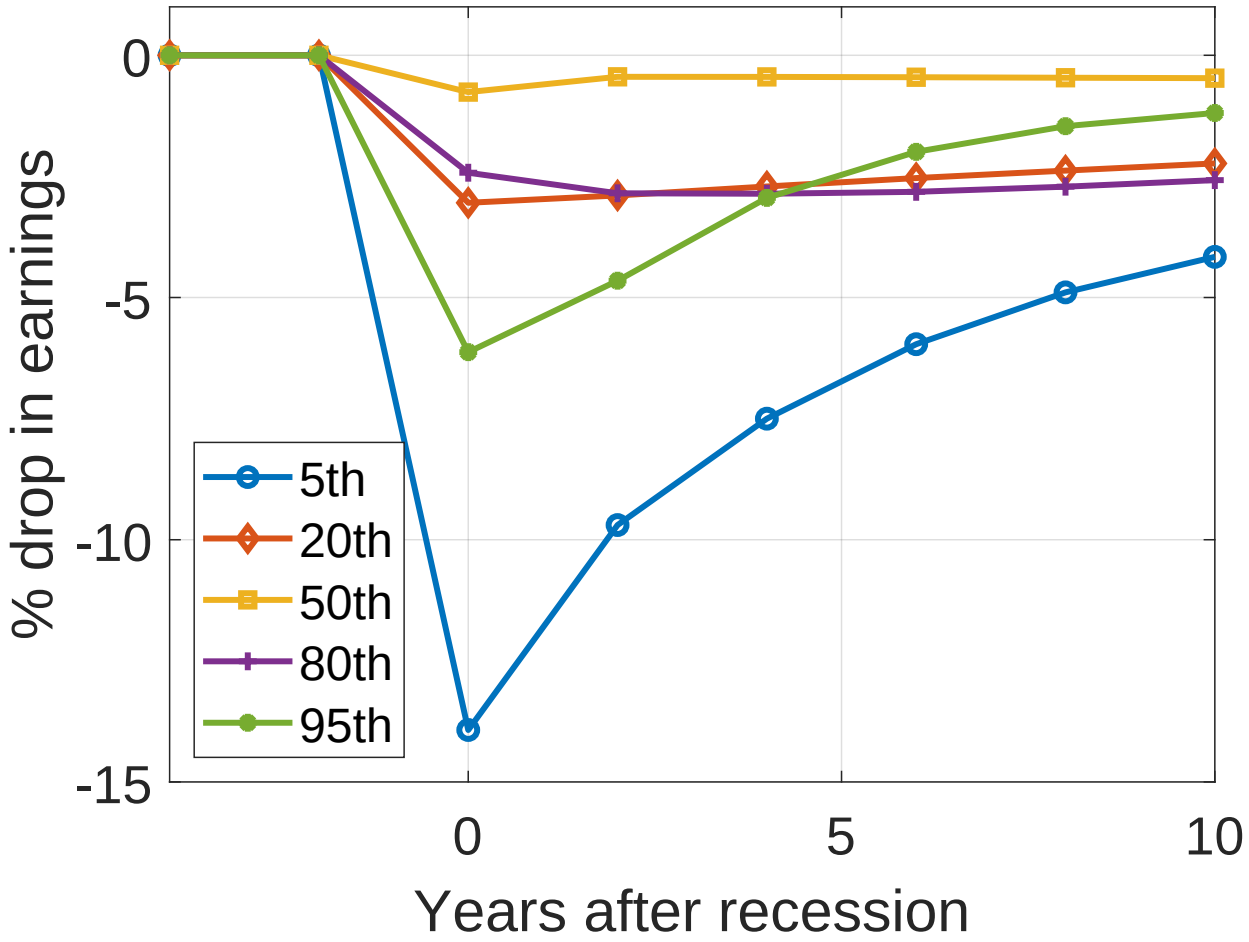
Different effects over the earnings distribution



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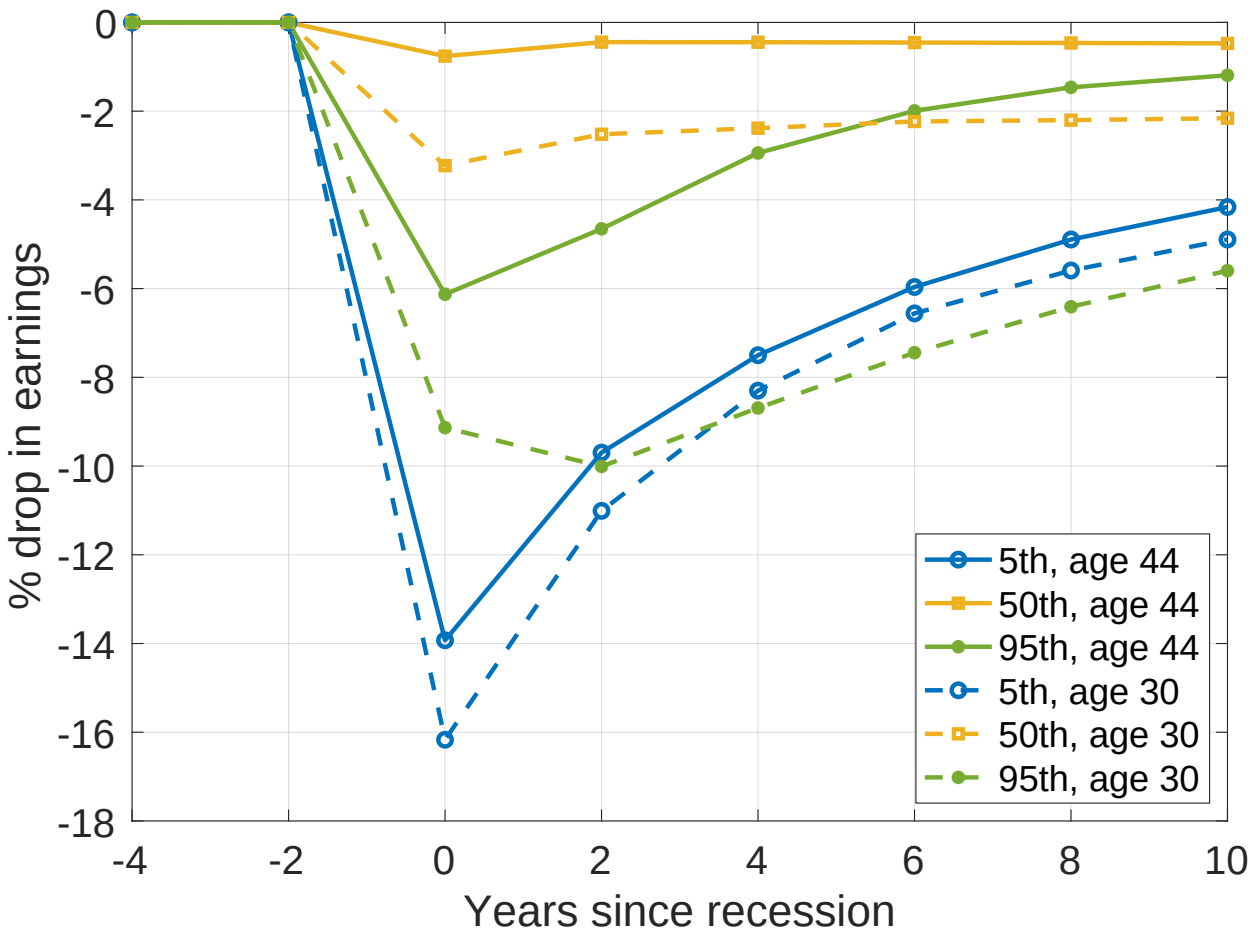
Different effects for different ages



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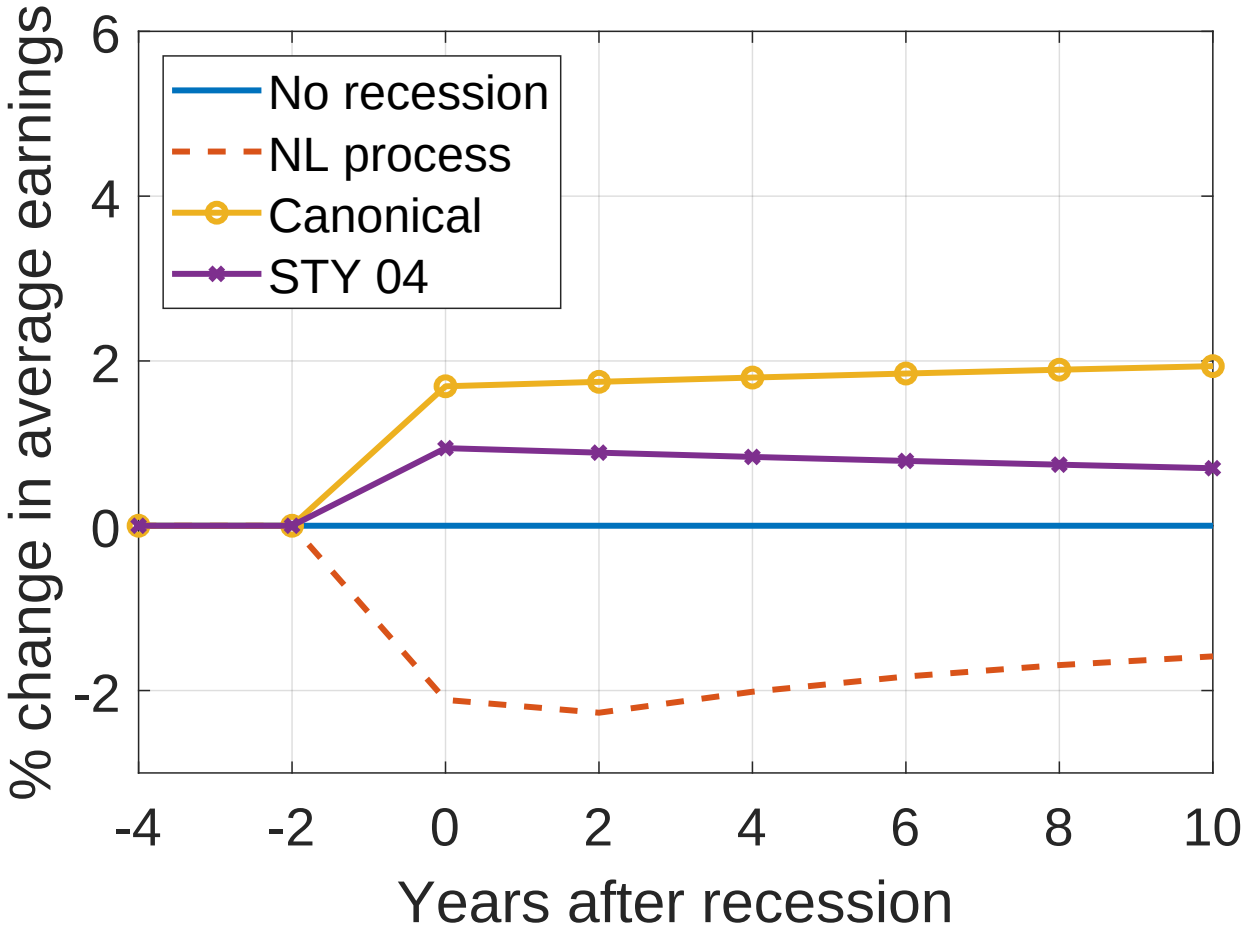
Counterfactual implications of canonical process



Back

The model: financial assets

- Liquid holdings a_t
  - Risk free
  - Exogenous fixed return r^a
- Stocks f_t
  - Risky return $r_t^f(\Omega)$
  - Fixed entry cost κ^f
- No uncollateralized borrowing:

$$a_{t+1} \geq 0, f_{t+1} \geq 0$$

The model: housing

- Discrete housing choice

$$h_{i,t} = \{0, h^1, h^2\}$$

- Illiquid (proportional transaction costs κ^h when buying and selling)
- House prices $p_t^h(\Omega)$:
  - Grow on average
  - Risky
  - Ratio h_2 to h_1 fixed
- Non-homeowners pay rent $r_t^s(\Omega)$.
- During working age, "moving shocks" with probability π

Z Mobility

The model: mortgages

- Collateralized borrowing, subject to downpayment (LTV) and income test (LTI) restrictions at origination

$$m_{t+1} \geq -\lambda_h p_t^{h^j}$$

$$m_{t+1} \geq -\lambda_y y_t$$

where $\lambda_h < 1$.

- Minimum interest payment each period

$$m_{t+1} \geq \frac{m_t}{1 + r^b} \text{ if } h_{t+1} = h_t$$

- Cannot reach terminal period of life with gross debt
- Mortgagors can hold either liquidity or stocks

$$a_{t+1} f_{t+1} m_{t+1} = 0$$

Back to model

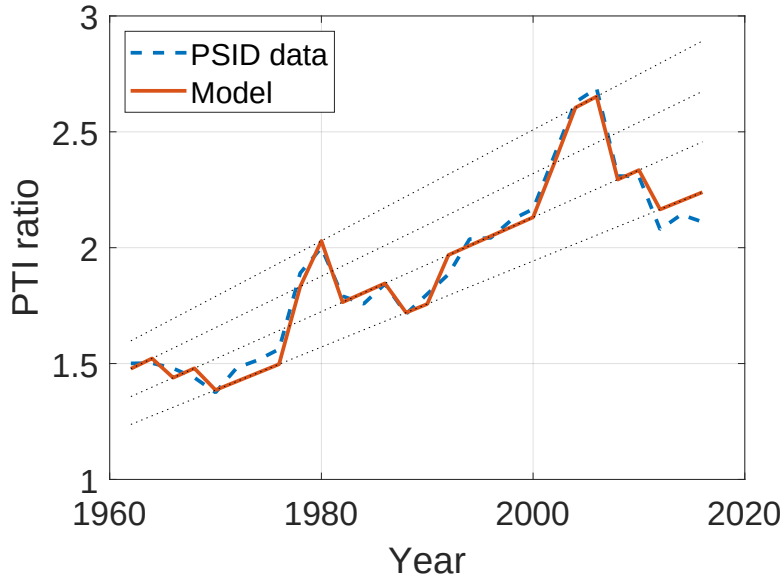
The model: additional elements

- The government
  - Progressive earnings taxation
  - Flat-rate asset income taxation
  - Deductible mortgage interest
  - Provides public pensions
- Bankruptcy
  - Happens when
    - Net worth is negative
    - All financial assets + income not enough to pay interest
  - All debts are canceled.
  - Large utility penalty for one period.

Back

Aggregate state Ω

- Ω^y, state of the labor market (expansion/recession)
- Ω^f, state of the stock market (4 states)
- Ω^{hp}, house prices (4 states)
- Ω^{hg}, house price growth regime (+/-)



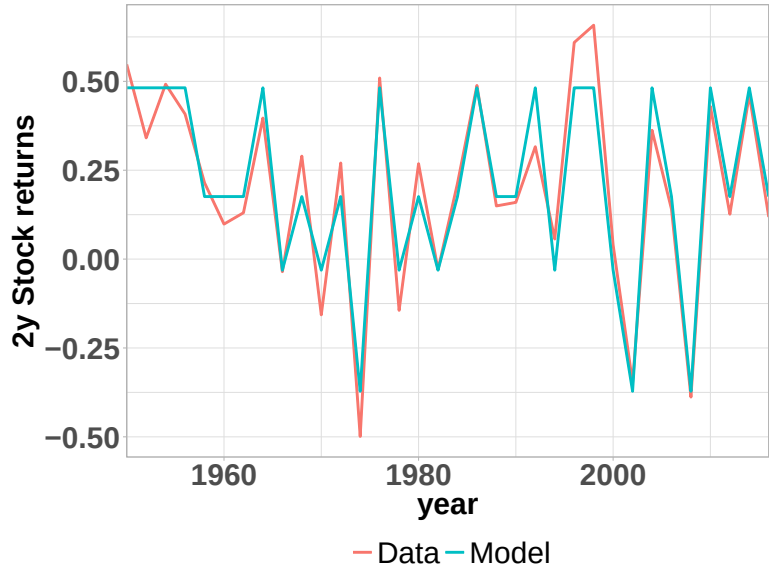


Figure: Housing Price-To-Income ratio, stock market returns

Restrictions on transition matrix | Back to aggregate state | Back to calibration

Aggregate state

- Ω_t is Markov 1
- 64 possible states in each period $(\Omega^h, \Omega^{hg}, \Omega^y, \Omega^f)$
- Agents know the process for Ω
- Transition matrix P_Ω from historical data.
- I assume:

$$Pr(\Omega^h_{t+1}, \Omega^{hg}_{t+1}, \Omega^y_{t+1}, \Omega^f_{t+1} | \Omega^h_t, \Omega^{hg}_t, \Omega^y_t, \Omega^f_t) =$$
$$Pr(\Omega^f_{t+1} | \Omega^y_{t+1}) Pr(\Omega^h_{t+1} | \Omega^{hg}_{t+1}, \Omega^h_t) Pr(\Omega^{hg}_{t+1}, \Omega^y_{t+1} | \Omega^{hg}_t, \Omega^y_t)$$

Back to aggregate state

Canonical business-cycle dependent earnings process

- Let y_{it} be an observation of earnings for household i of age t in a given cohort:

$$\log y_{it} = f(t) + \eta_{it} + \varepsilon_{it}$$

- Traditional way of modelling these:

$$\begin{aligned} \eta_{it} &= \rho\eta_{it-1} + \nu_{it} \\ \nu_{it} &\sim N(0, \sigma_\nu^2) \\ \epsilon_{it} &\sim N(0, \sigma_\epsilon^2) \end{aligned}$$

with potentially countercyclical variance $\sigma_\nu^2(\Omega_t^y)$

Flexible, business-cycle dependent earnings process

- Let y_{it} be an observation of earnings for household i of age t in a given cohort:

$$\log y_{it} = f(t) + \eta_{it} + \varepsilon_{it}$$

- More general formulation:

$$\eta_{it} = Q_t^{\eta}(\nu_{it}, \eta_{it-1}, \Omega_t^y)$$

$$\epsilon_{it} = Q_t^{\epsilon}(\nu_{it}^{\epsilon})$$

where Q is a conditional quantile function

- Dependence of η_{it} on η_{it-1} and distribution of ν_{it} vary with Ω_t^y (expansion, recession) in a flexible way

Back to earnings process

Households' problem

$$U_t(y,a,h,f,m,\Omega) = \max_{c,a',h',f',m'} \Big\{ [(\theta_t c_t^{\nu} s_t(h_t)^{1-\nu})^{\frac{(\psi-1)}{\psi}} + \beta(\mathbb{E}_t U_{t+1}(y',a',h',f',m',\Omega')^{1-\gamma})^{\frac{1}{1-\gamma}\frac{\psi-1}{\psi}}]^{\frac{\psi}{\psi-1}} \Big\}$$

subject to

$$p_t^h(\Omega_t^h)h_{t+1} + \kappa^h p_t^h(\Omega_t^h)h_{t+1}\mathbb{I}(h_{t+1} \neq h_t) + r_t^s(\Omega_t^h)\mathbb{I}(h_t = 0) + f_{t+1} + \kappa^f \mathbb{I}(f_{t+1} > 0, f_t = 0) + a_{t+1} + m_{t+1} + c_t = p_t^h(\Omega_t^h)h_t + f_t + a_t + m_t + T(y_t(\Omega_t^y), r_t^f(\Omega_t^f)f_t, r^a a_t, r^b m_t, p_t^h h_t)$$

and no-shorting a_t and f_t, LTV and LTI constraints at origination, mortgage interest payments, $a_{t+1}f_{t+1}m_{t+1} = 0$, bankruptcy condition Back

Externally calibrated parameters

$$U_{it} = [(\theta_t c_{it}^{\nu} s_{it}^{1-\nu})^{\frac{(\psi-1)}{\psi}} + \beta(\mathbb{E}_t U_{it+1}^{1-\gamma})^{\frac{1}{1-\gamma}\frac{\psi-1}{\psi}}]^{\frac{\psi}{\psi-1}}$$

$$y^{disp} = \lambda y^{1-\tau}$$

Risk aversion	γ	4
EIS	ψ	1.5
Housing utility share	ν	0.2
Risk-free interest rate	r^a	2%
Mortgage interest rate	r^b	4%
LTV restriction	λ_h	0.8
LTI restriction	λ_y	9
Tax level	λ	0.63
Progressivity	τ	0.08
Soc. sec. replacement rate	$p(\cdot)$	55%
Housing adjustment cost	k^f	5%
Rental rate	r_t^s/p_t^h	3.5%
Bankruptcy penalty	b_k	15%

More on aggregate state Back

Targeted moments (1940s generation)

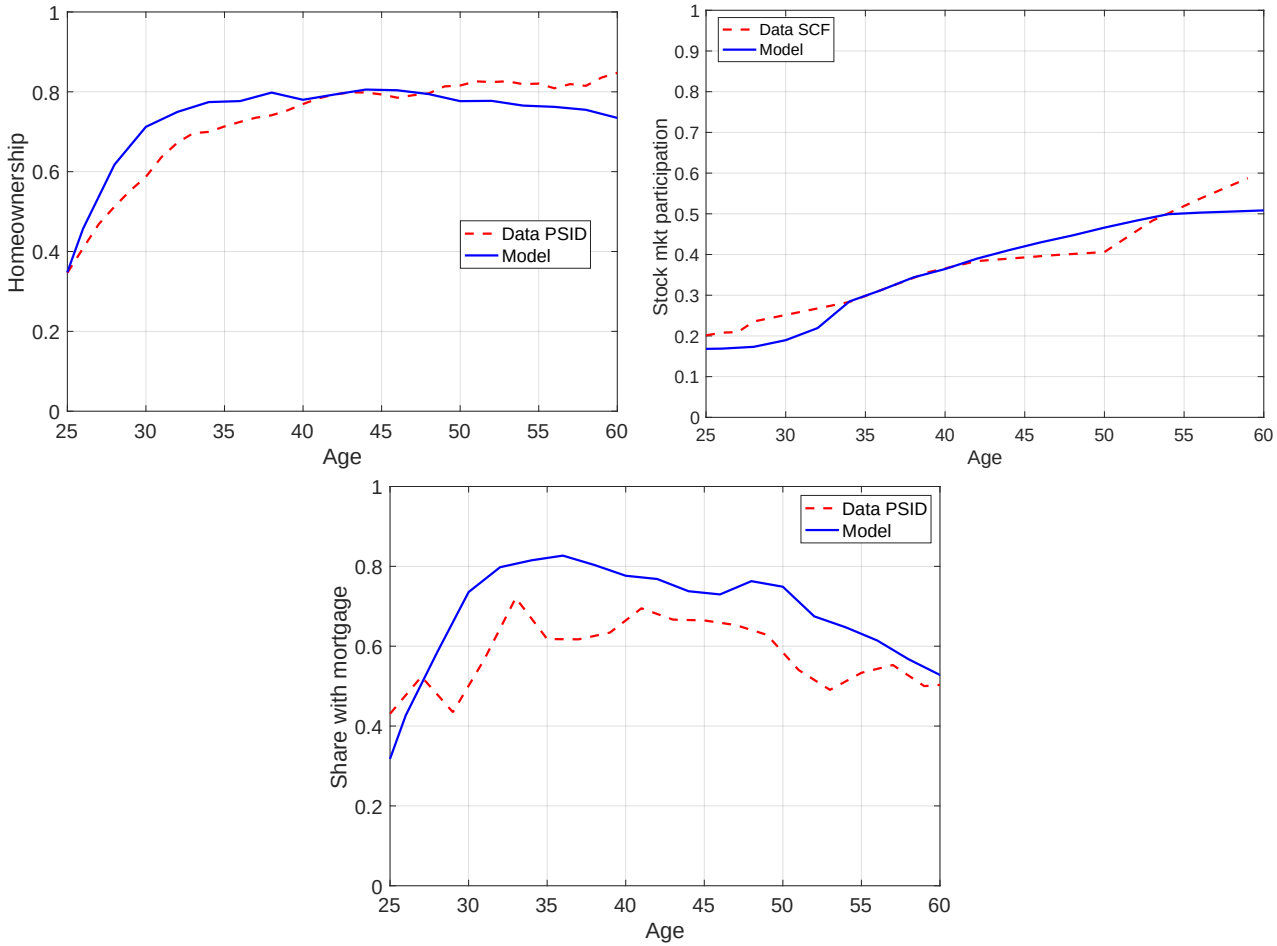
- Some parameters calibrated externally More
- 7 parameters for 7 targets for 1940s generation:

Moment	Data	Model	Key parameter	Value
House ownership at age 40	77%	75%		
... of large houses	68%	67%	Large house taste $\frac{s_2}{s_1}$	4.3
... of small houses	9%	8%	Homeowning taste $\frac{s_1}{s_0}$	2.1
Stock market participation, age 40	30 %	30%	Participation cost k^f	0.30
Percentage buying houses at age 40	4.5%	4.4%	Moving shock π_{hm}	0.051
W/Y ratio	3.1	3.1	Discount factor β	0.930
Average bequest (/average income)	2.0	2.0	Bequest taste ϕ_1	3.0
Fraction leaving no bequests	20%	22%	Bequest taste ϕ_2	1.0

- Initial wealth to replicate observed homeownership and stock market participation at 25.

back

Untargeted moments (1940s generation)



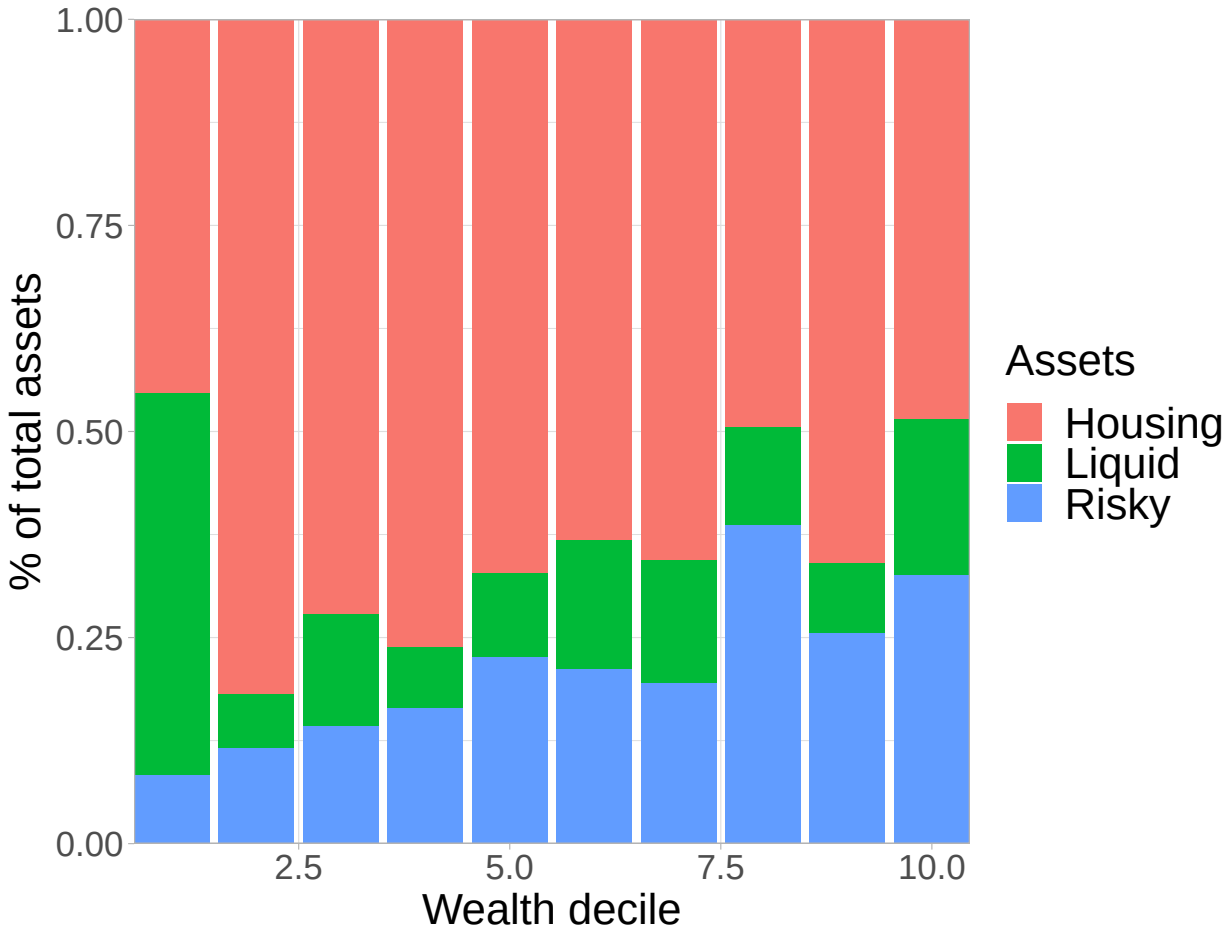
By wealth levels Back

Portfolio composition at retirement, by wealth

Figure: Portfolio shares by wealth decile: left, PSID data; right, model

Back

Stricter definition, portfolio shares



Data: PSID, 1940-1945 cohort, around retirement age. "Liquid" includes cash and bonds, "housing" includes the principal residence and other real estate, and "risky" includes stocks only. Vehicles and business holdings are dropped.

Model: changes across generations

1. Earnings process
   - Initial earnings inequality
   - Earnings risk
2. Aggregate conditions
   - Average house prices
   - Histories of aggregate shocks
3. Financial conditions
   - Costs of access to stock market
   - Borrowing constraints
4. Average family size by age

▶ All data-driven except costs of access to the stock market

Back

Changes in earnings dynamics reduce homeownership

- Initial and lifetime earnings of lowest earners have been decreasing $\rightarrow$ lower housing demand
- Important role of earnings risk

Changes in earnings dynamics reduce homeownership

- Initial and lifetime earnings of lowest earners have been decreasing $\rightarrow$ lower housing demand
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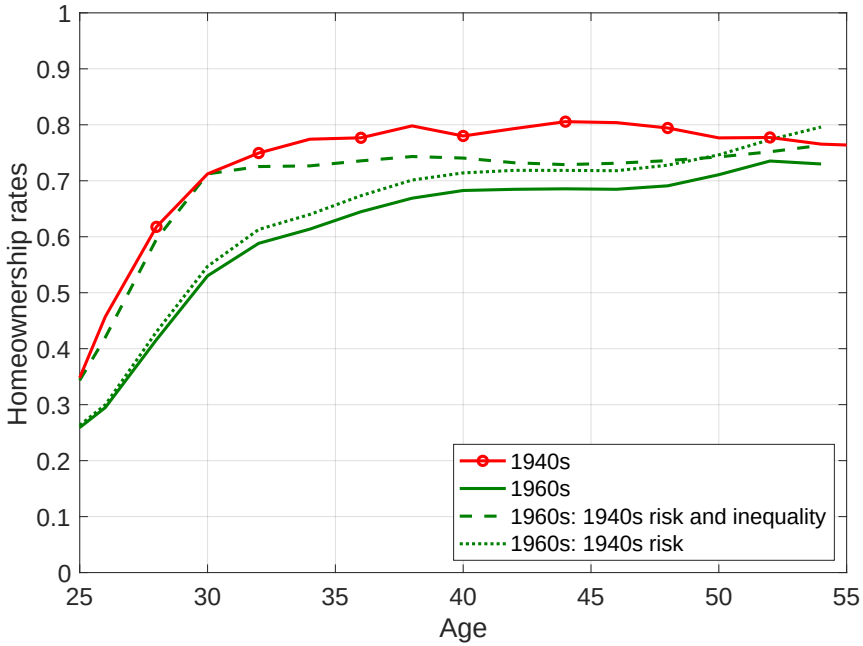
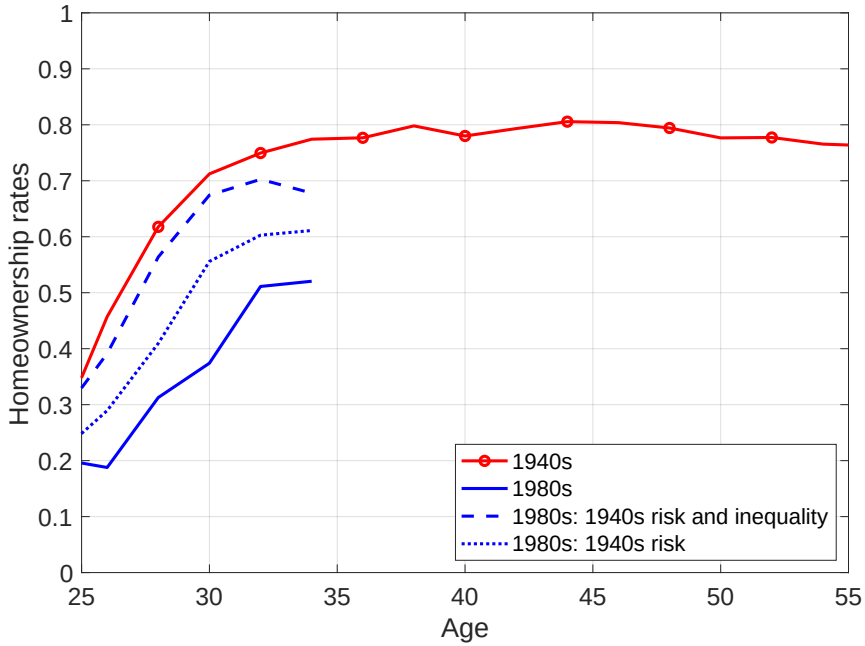
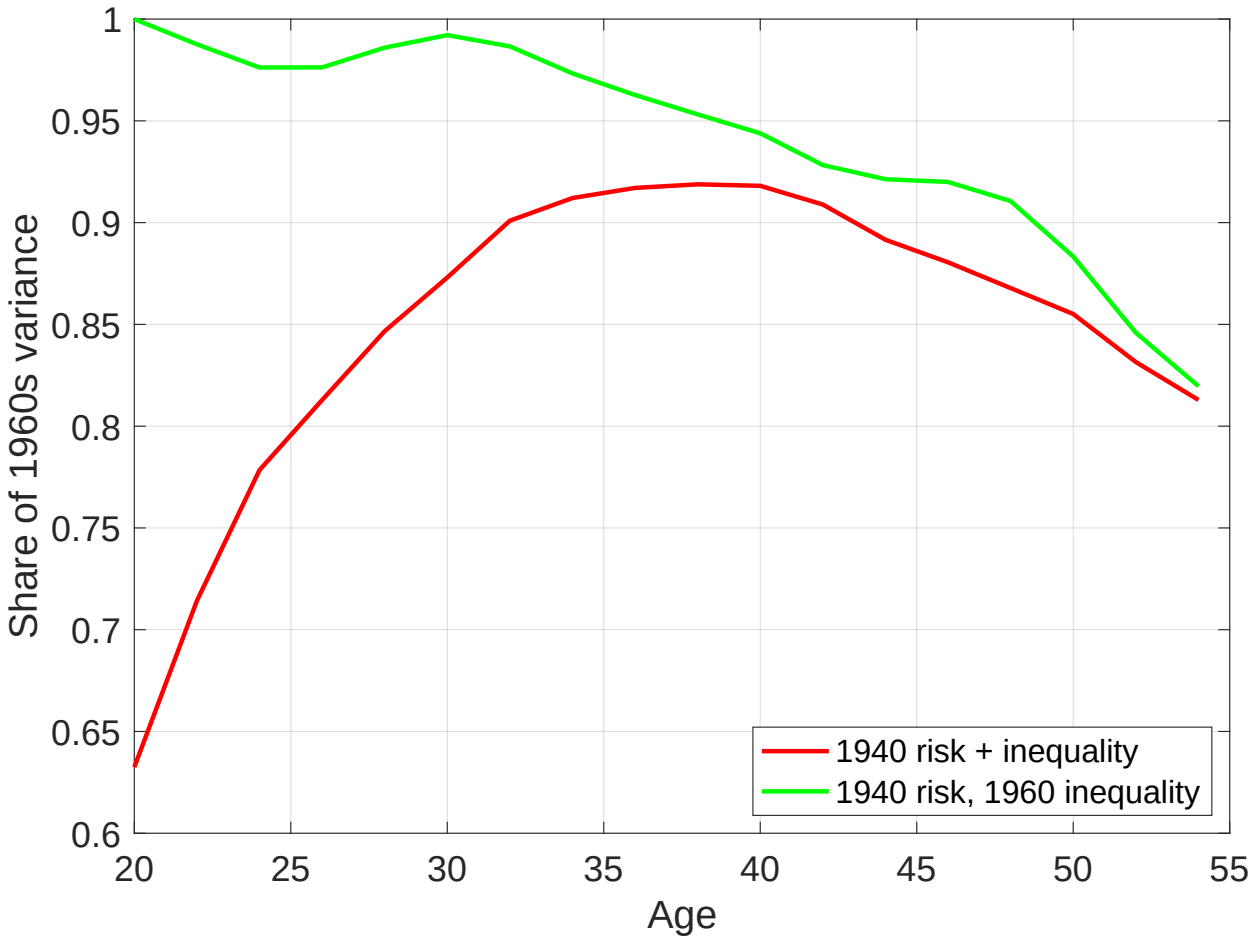




- Robust to letting house prices adjust

Var earnings | Alternative | Married | House prices | Back to table

Variance over the life-cycle in risk counterfactual



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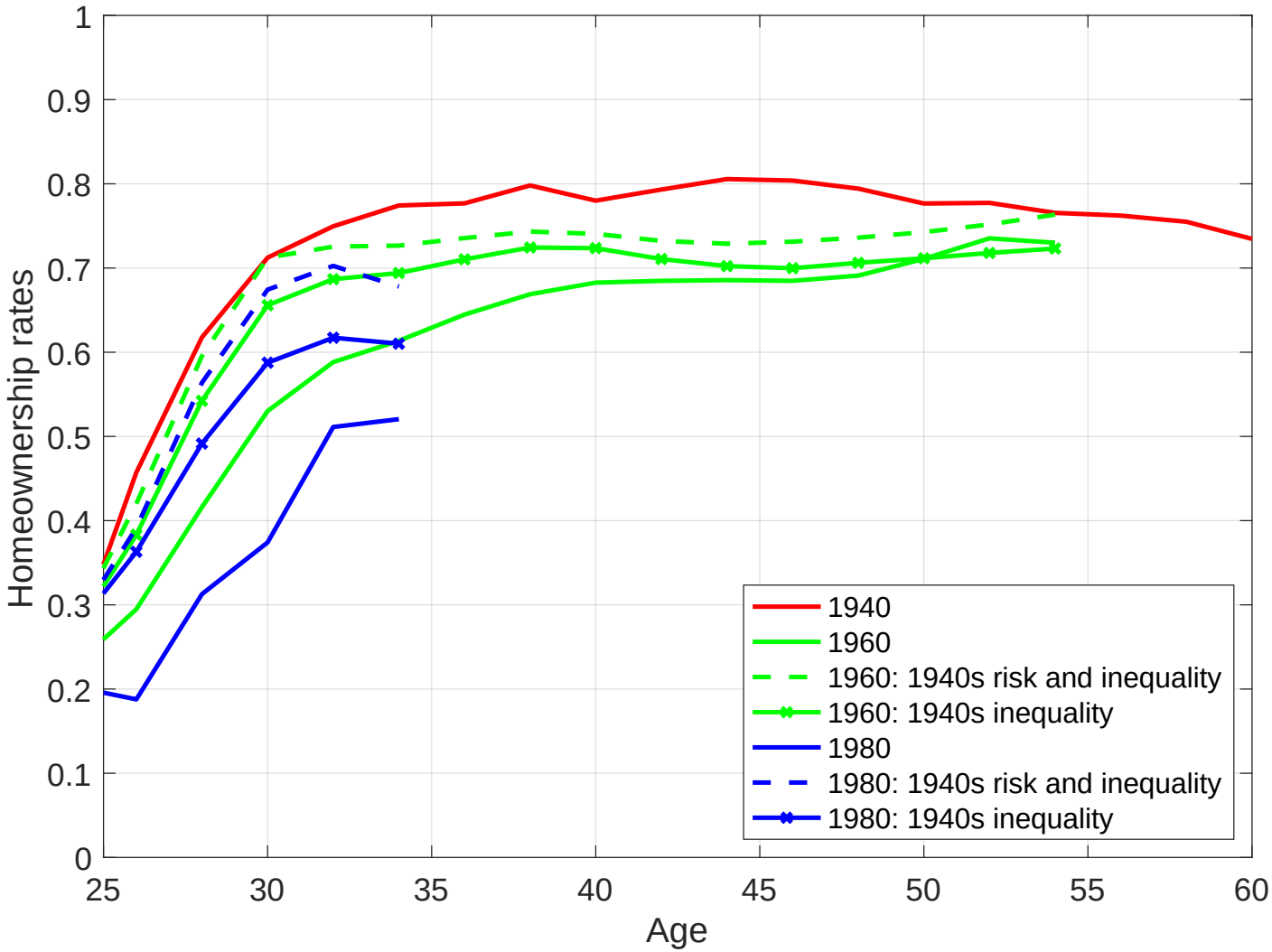
Risk vs inequality



Back

Risk vs inequality

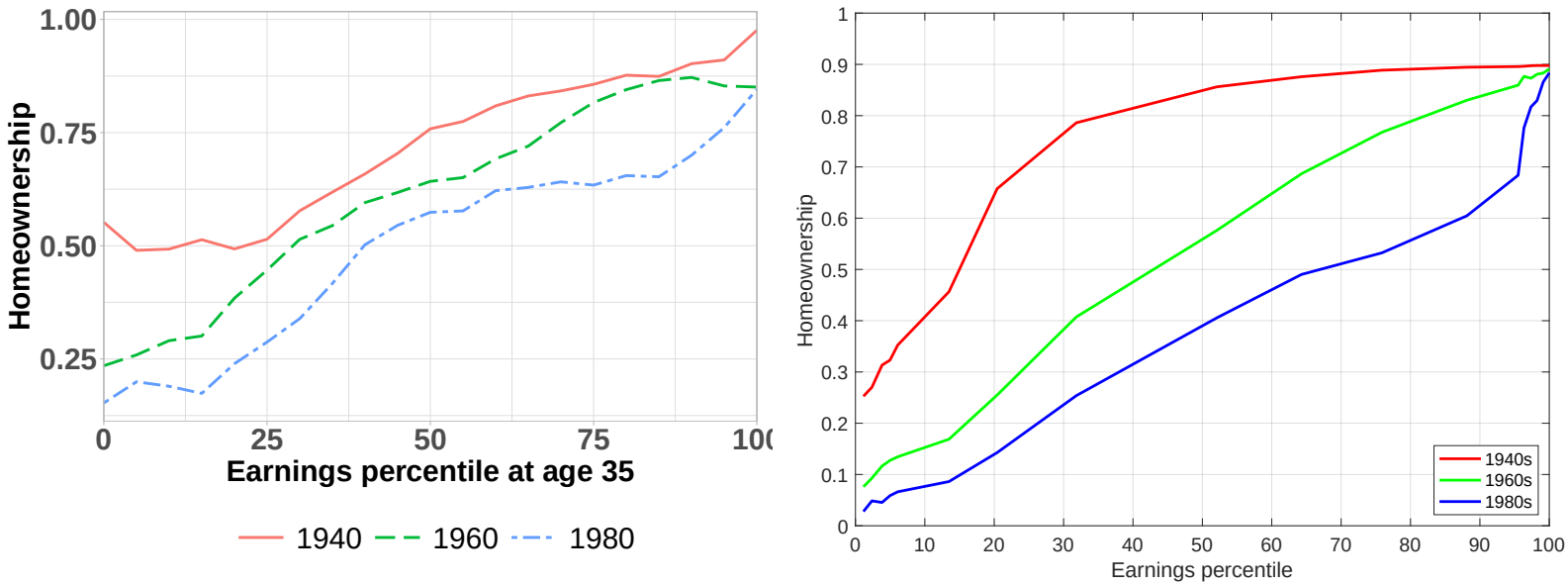


Figure: Homeownership by cohorts, by percentile of the earnings distribution at age 35. PSID data.

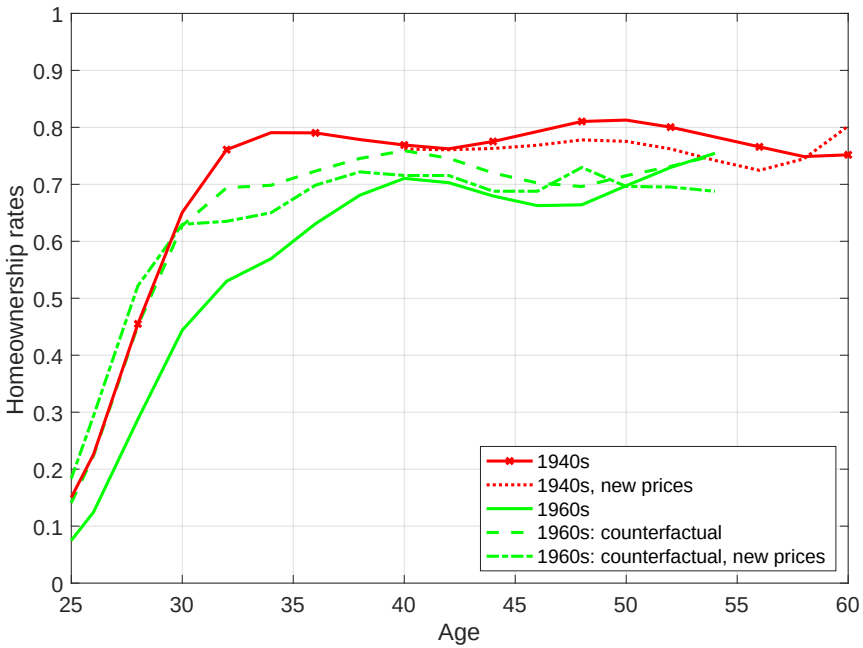
Back

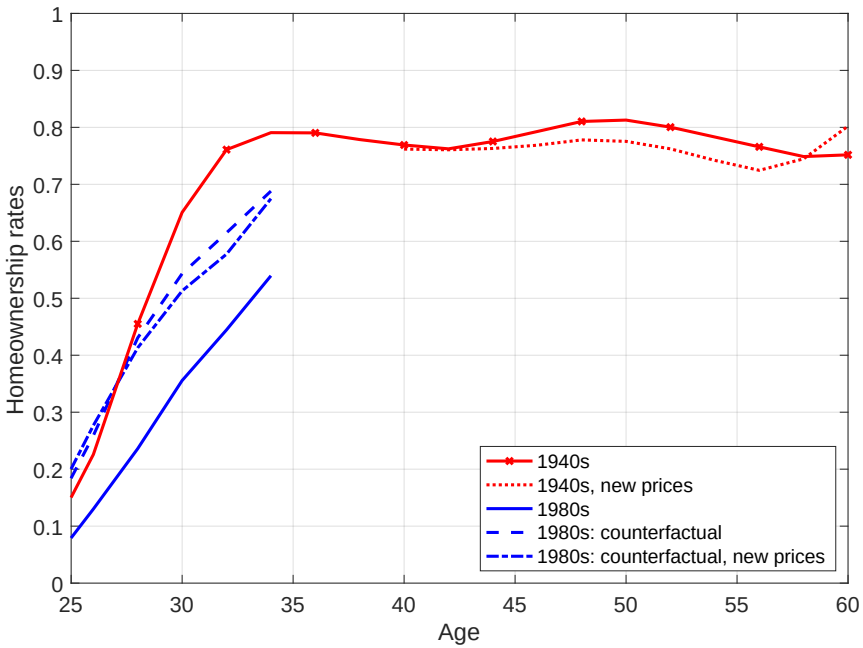
Robust to letting house prices adjust

- So far, constant house prices
- But they can change in counterfactuals
- Use model-implied housing demand and empirical housing supply elasticity (1.75 (Saiz, 2010)).
- Results robust to this assumption
- Intergenerational reallocation even under fully inelastic housing supply

1.75 Inelastic Back

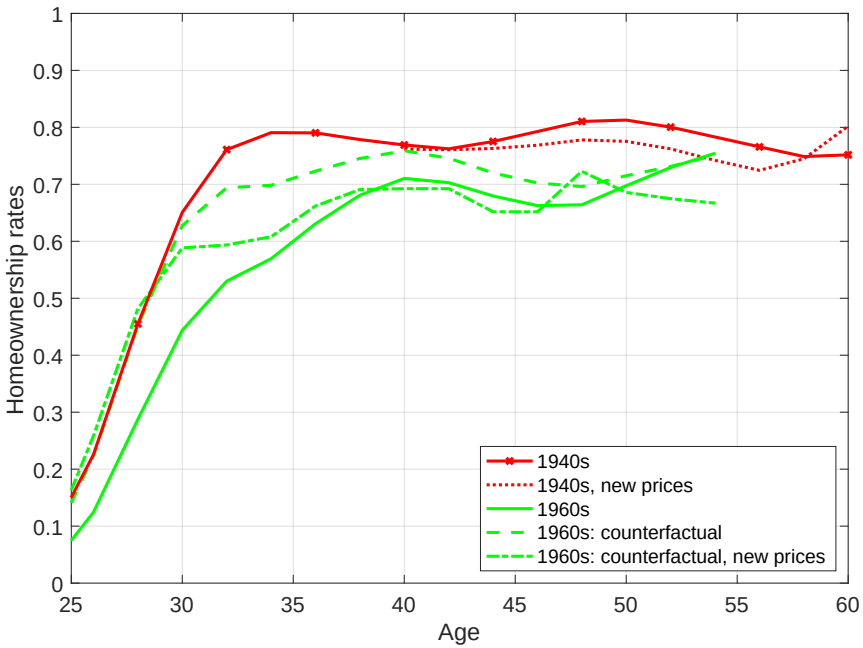
Elasticity of housing supply = 1.75

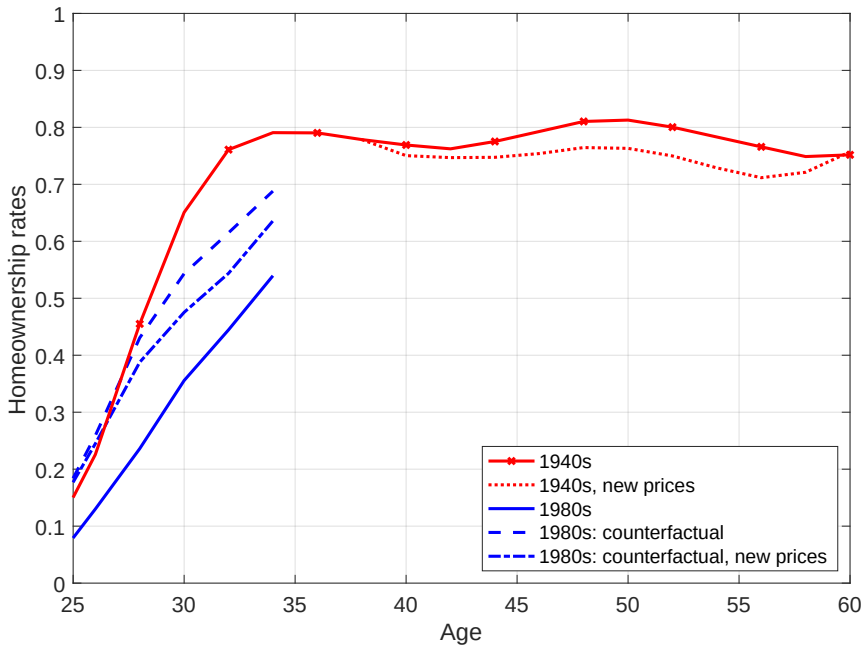




Back

Elasticity of housing supply = 0





Back

Histories matter

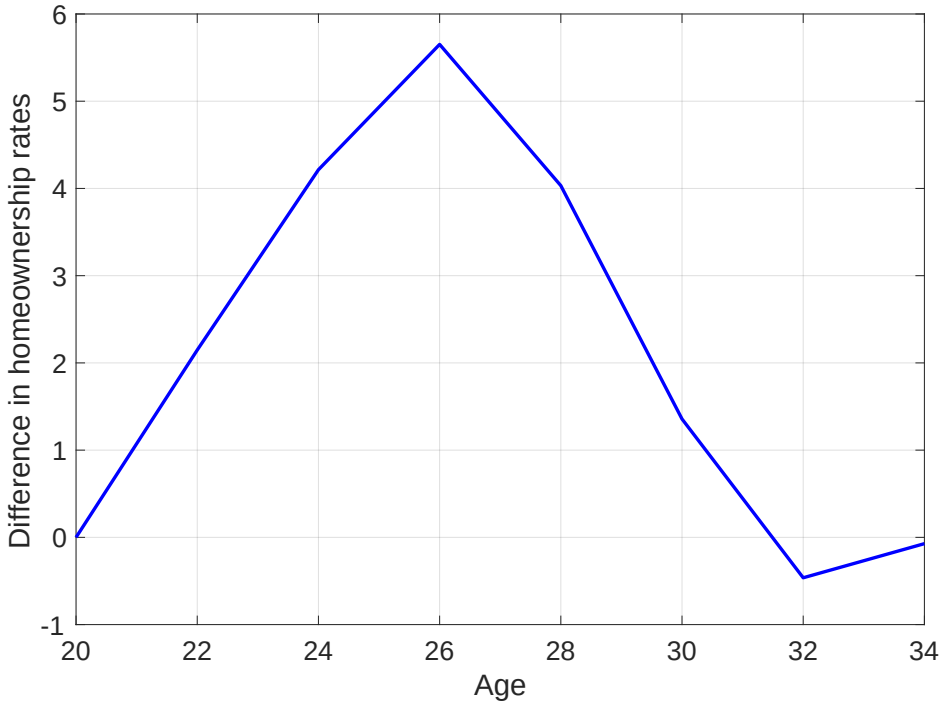
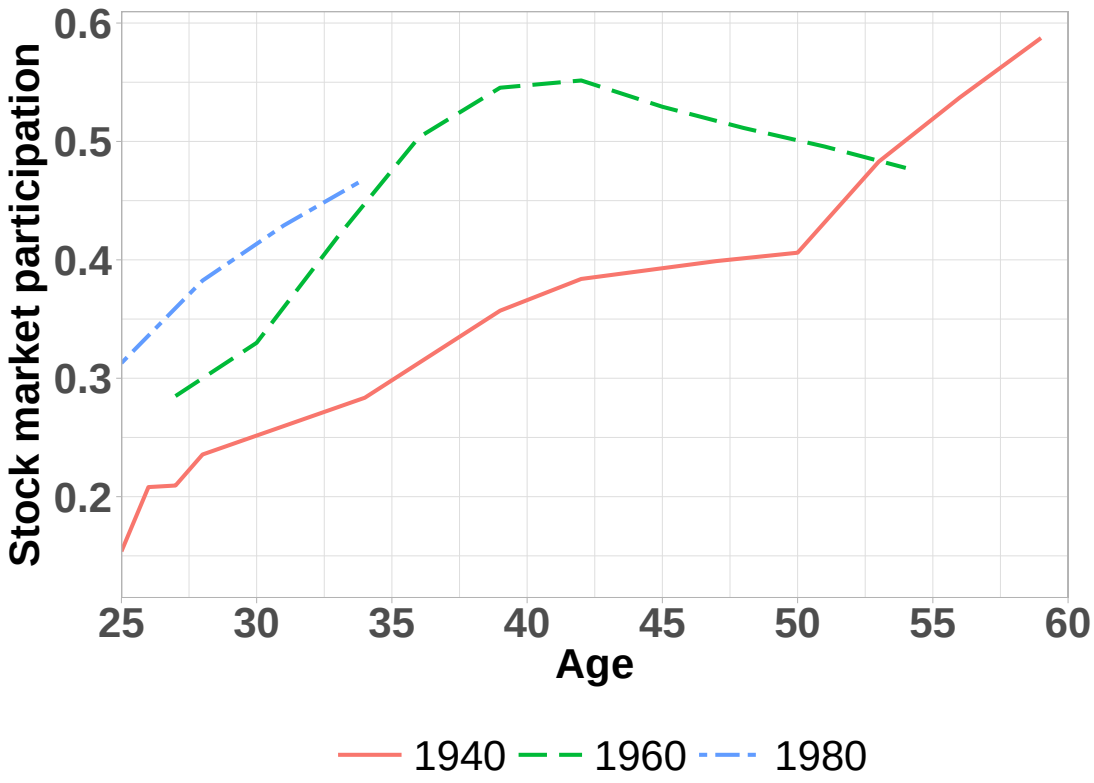


Figure: Difference in homeownership rates, 1980s generation, benchmark model, vs 1980s generation, no boom-bust cycle for house prices and no Great Recession

- Many in the 1980s generation postponed homeownership decisions.

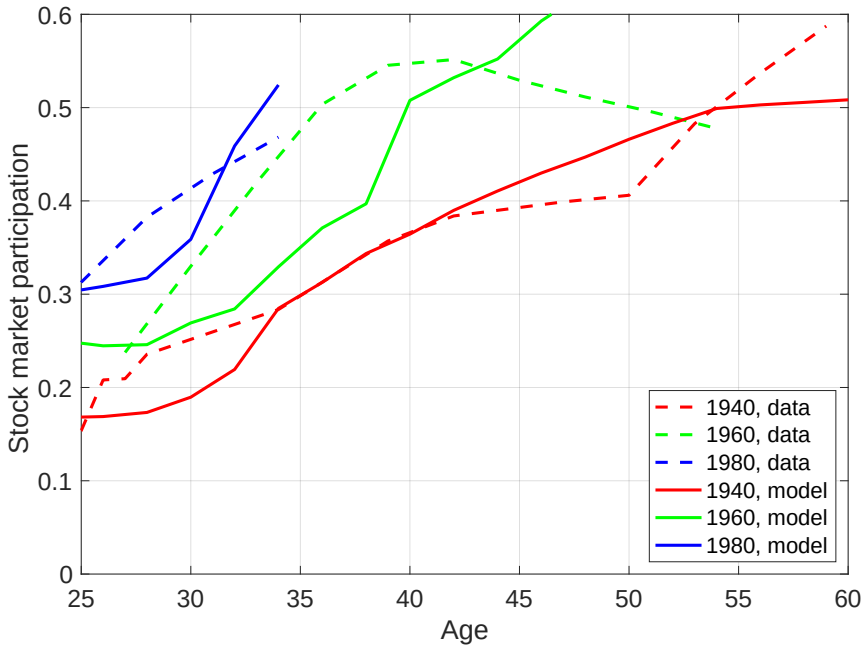
Back

Stock market participation has been increasing...



More Data: SCF

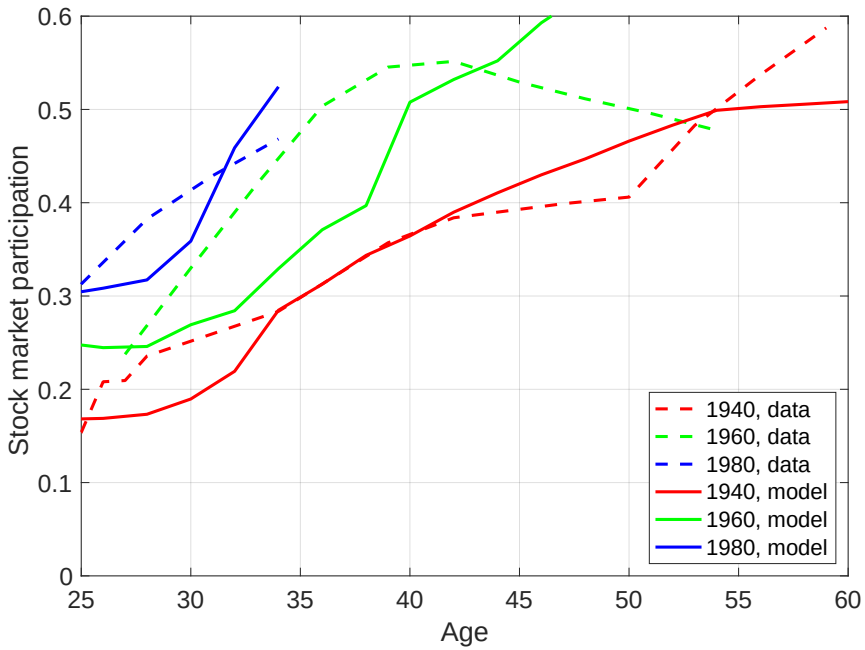
Lower participation costs on the stock market

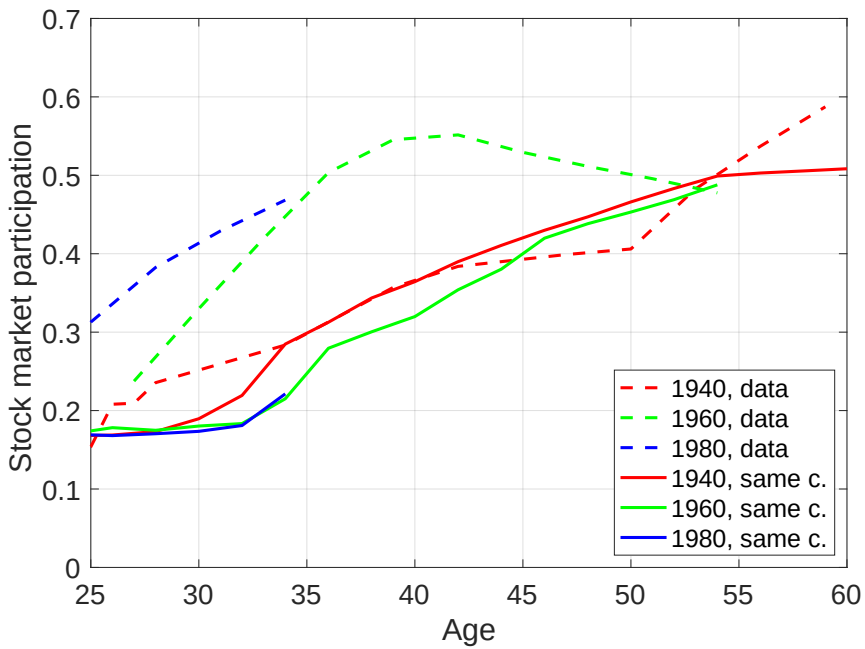


- Large effect of automatic enrolment and reduction of participation costs
- Quantitatively: 30% reduction (1960s), 70% reduction (1980s)

401(k) Per period Back Data: SCF

Lower participation costs on the stock market



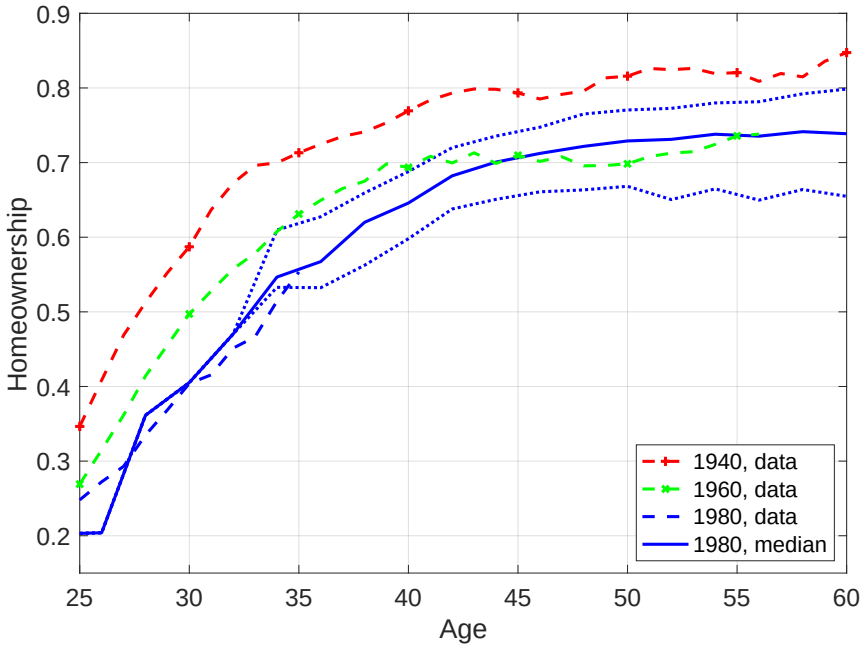


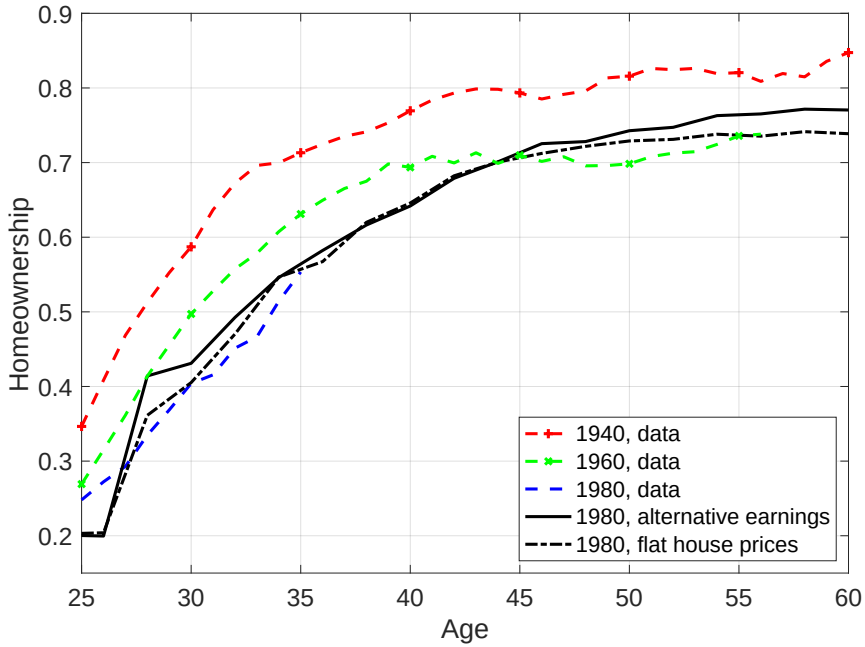
- Without changes in participation costs, model cannot reconcile patterns

401(k) Per period Back Data: SCF

Future of the 1980s generation

- Simulations predict, at retirement age:
  - Lower homeownership
  - Similar housing wealth, but more financial wealth, even under constant participation costs
  - Effect on wealth inequality depends on stock market participation costs





Details BPP and MPCs Back

Future of the 1980s cohort: wealth accumulation and inequality

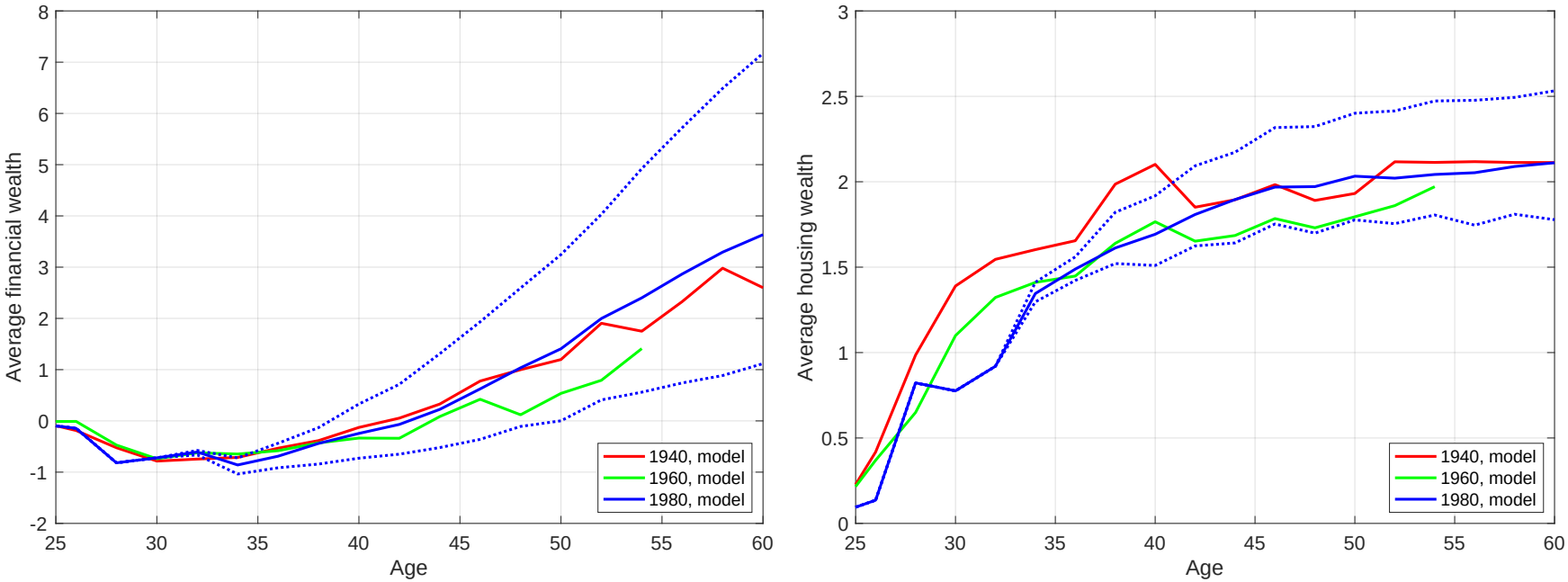


Figure: With constant stock market participation costs

Future of the 1980s cohort: wealth accumulation and inequality

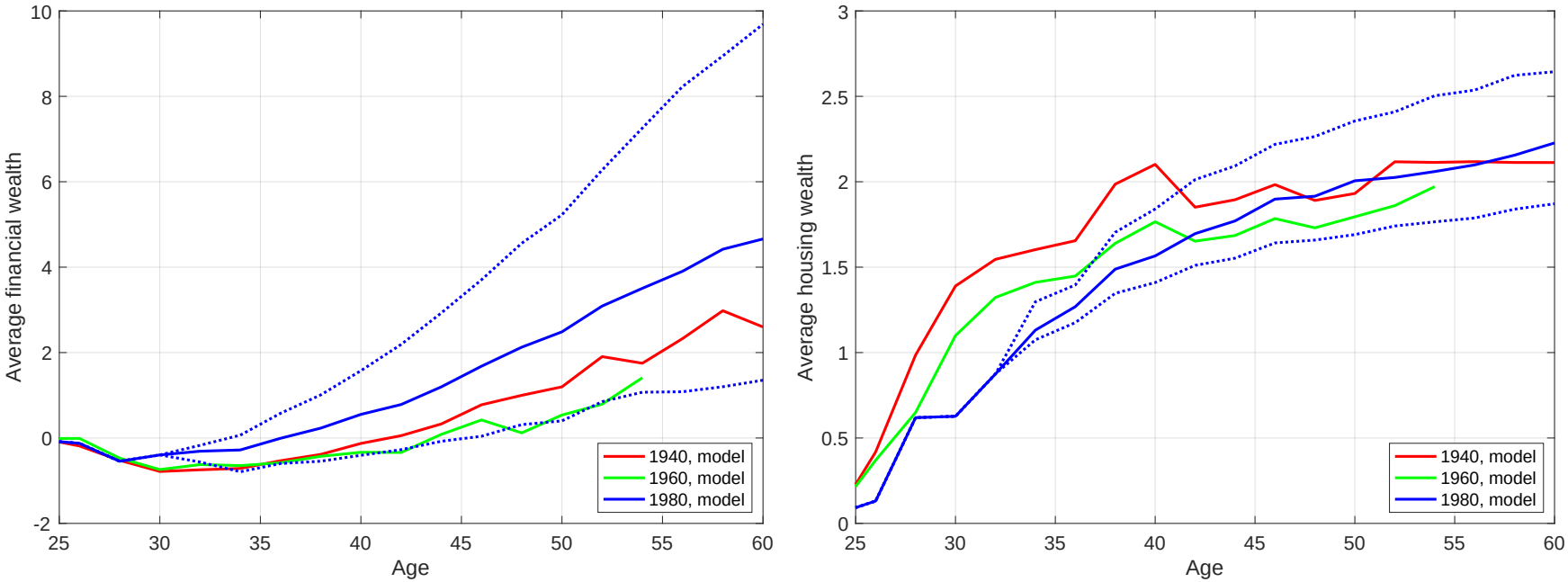


Figure: With reduced stock market participation costs

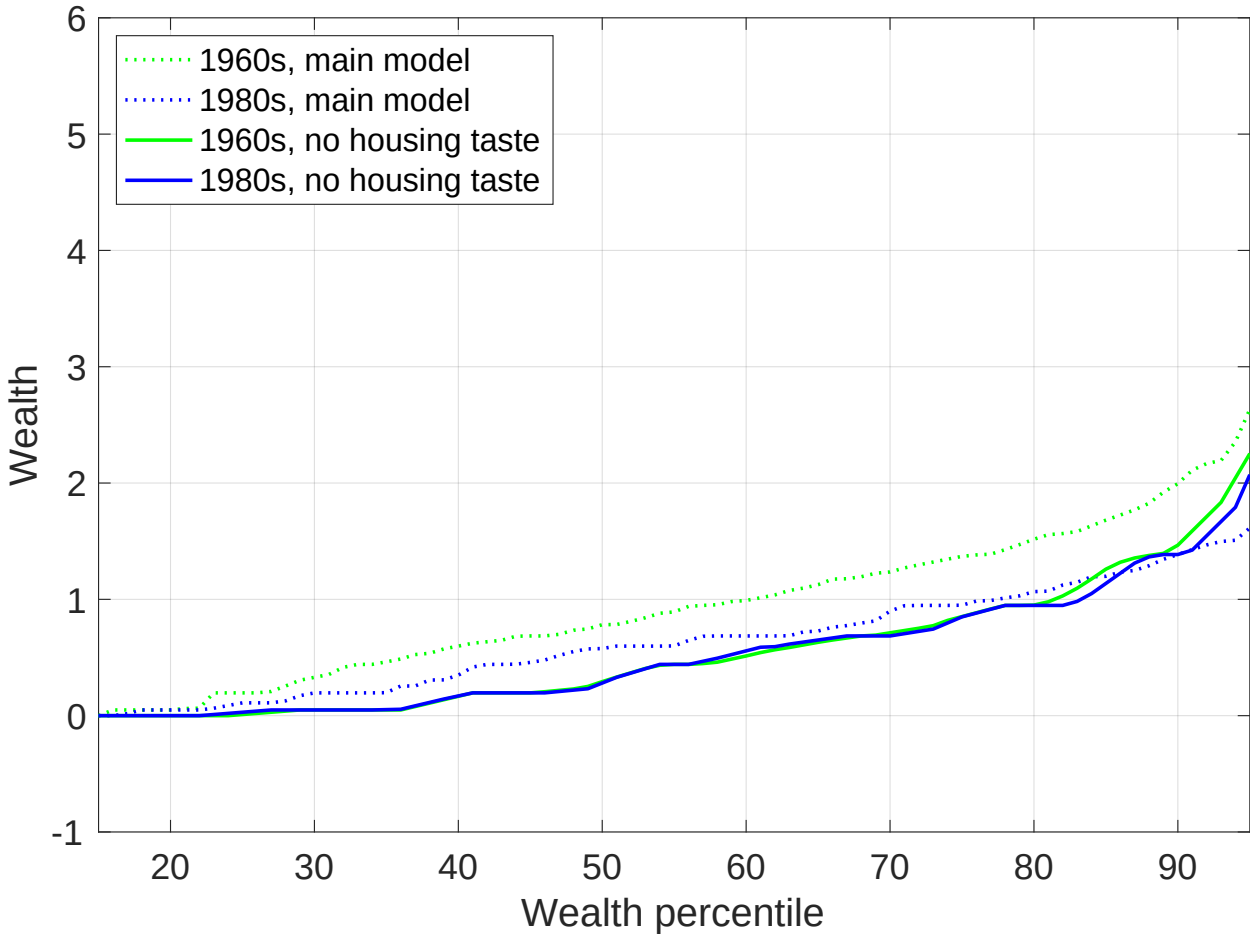
Future of the 1980s cohort: wealth accumulation and inequality

Generation	1940	1960	1980, fixed k^f	1980, lower k^f
Wealth Gini	0.50	0.53	0.57	0.52
			(0.026)	(0.017)

Table: Wealth Gini at retirement, model (standard errors for simulation in parentheses)

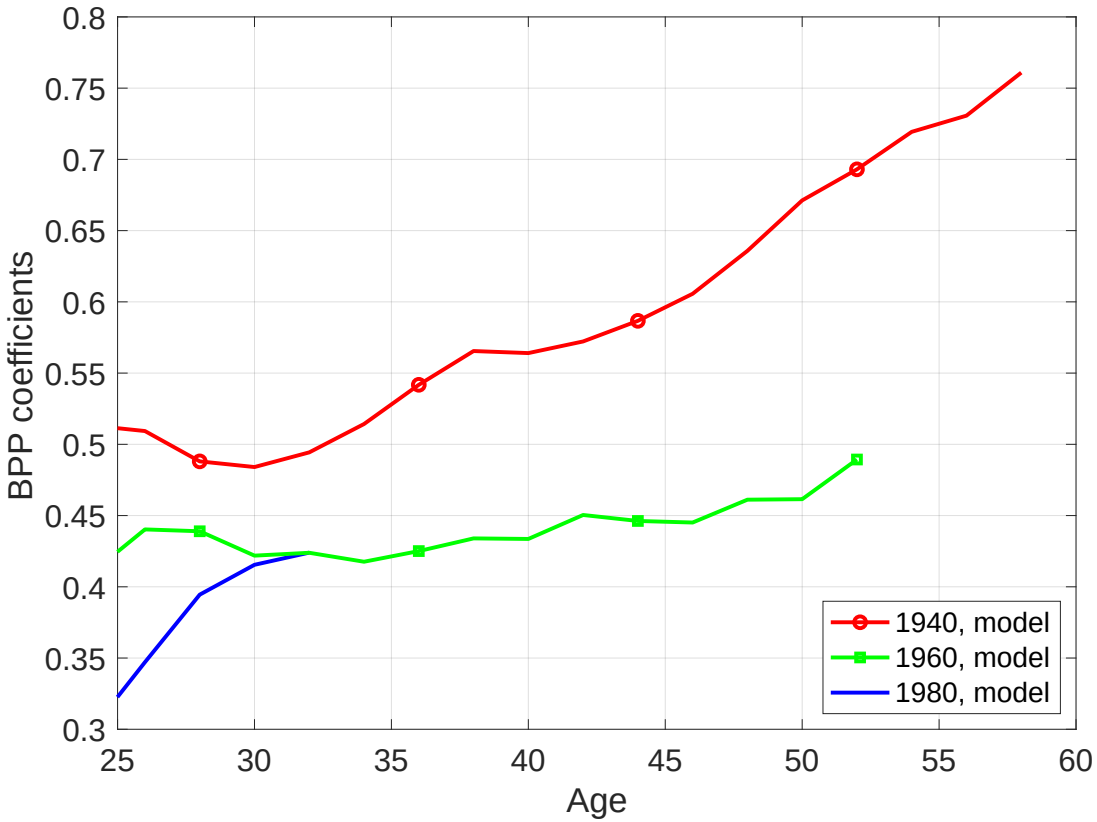
Back

Lower wealth accumulation: data vs model



Data: SCF, ages 30-35 Back

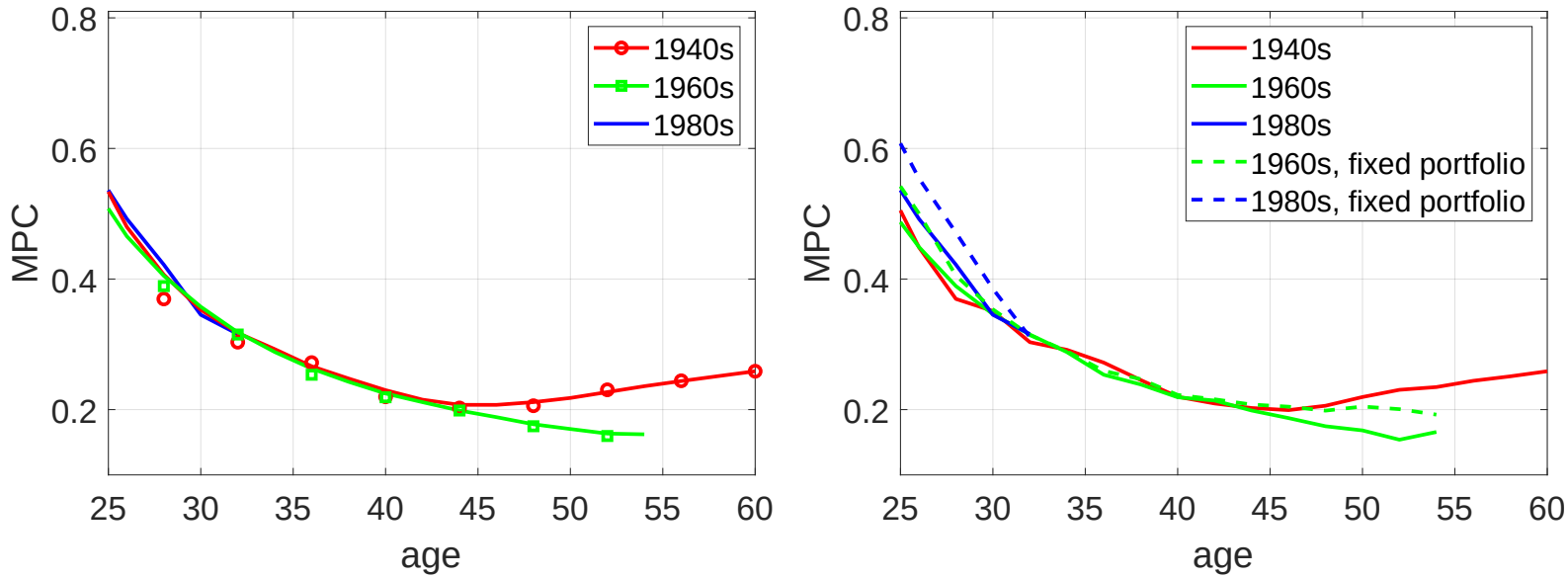
Consumption responses: BPP coefficients



$$\Delta c_{i,t} = (1 - \phi^{BPP})\zeta_{i,t} + \xi_{i,t} \tag{1}$$

- Lower insurance against persistent income shocks $\zeta_{i,t}$

Consumption responses: MPCs



- Small changes in MPCs to a positive wealth shock.
- More liquid wealth for younger generations counteracts less wealth accumulation on average.

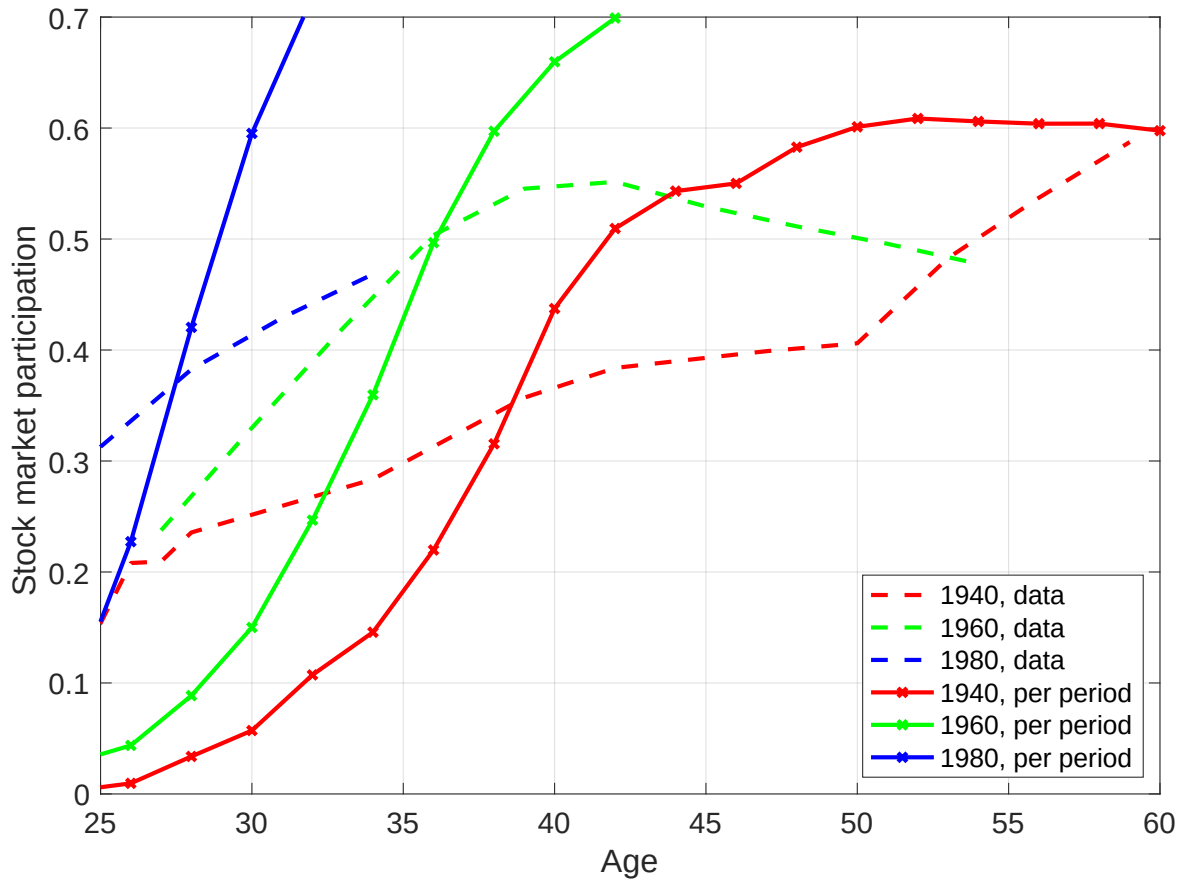
Back

Robustness

- Per-period participation costs More
- Canonical earnings process More
- (Local) correlation of income shocks and housing prices More
- Initial wealth More Zero IW
- Marital dynamics More
- Timing of labor market entry More
- House size specification Small $H = 3$

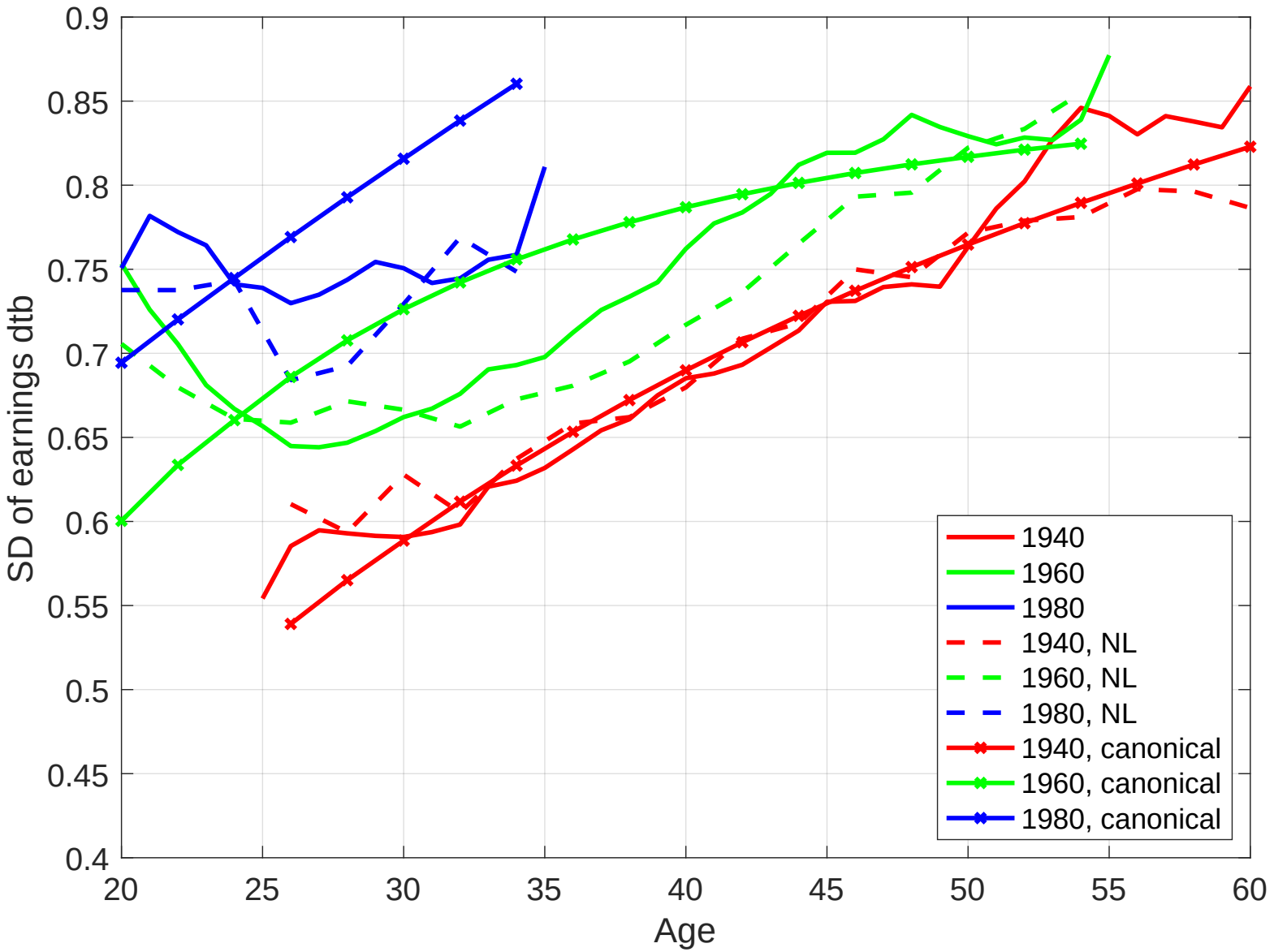
Back

Per-period participation costs in stock market

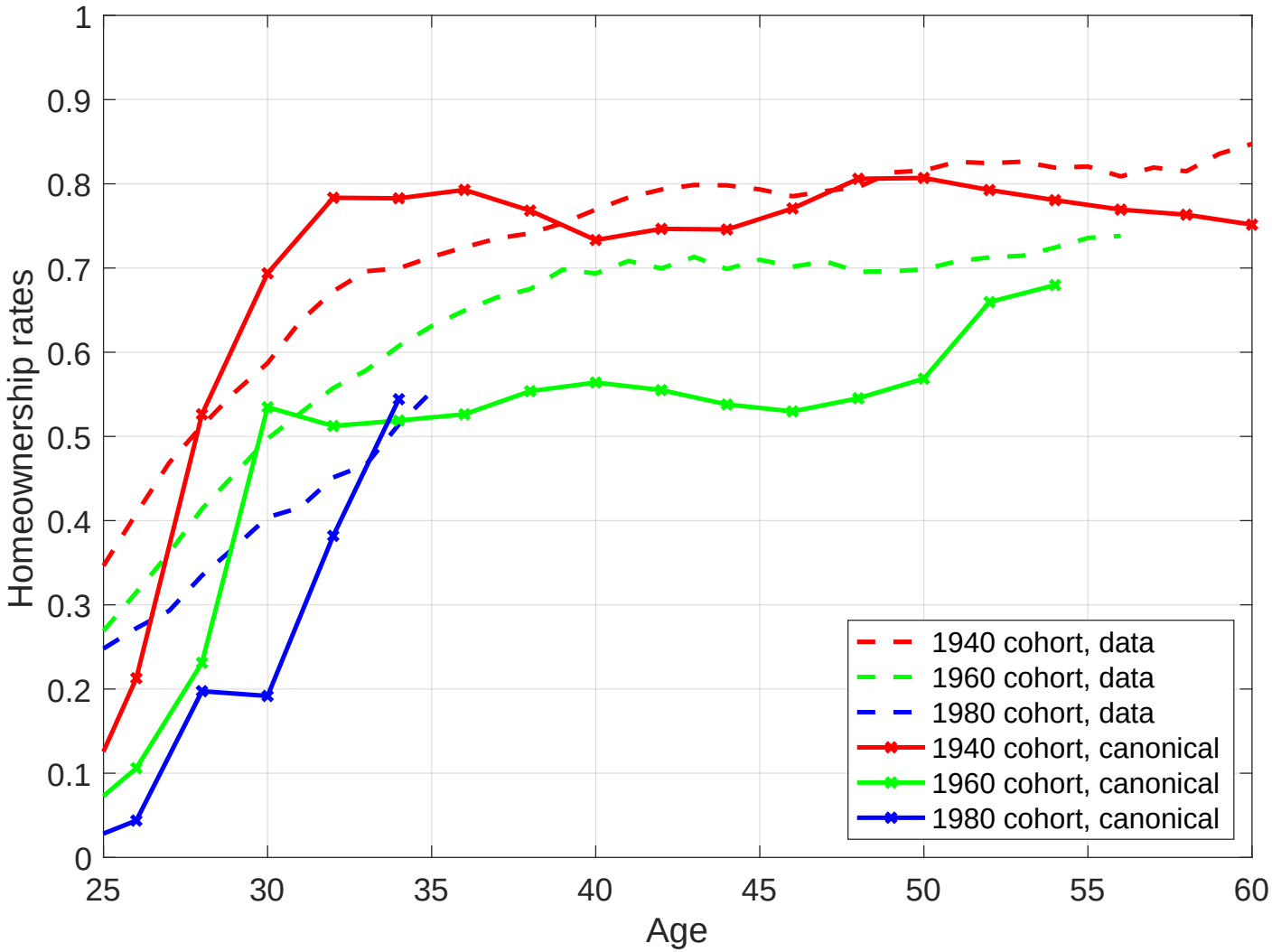


Back to stocks Back to robustness

Canonical earnings process

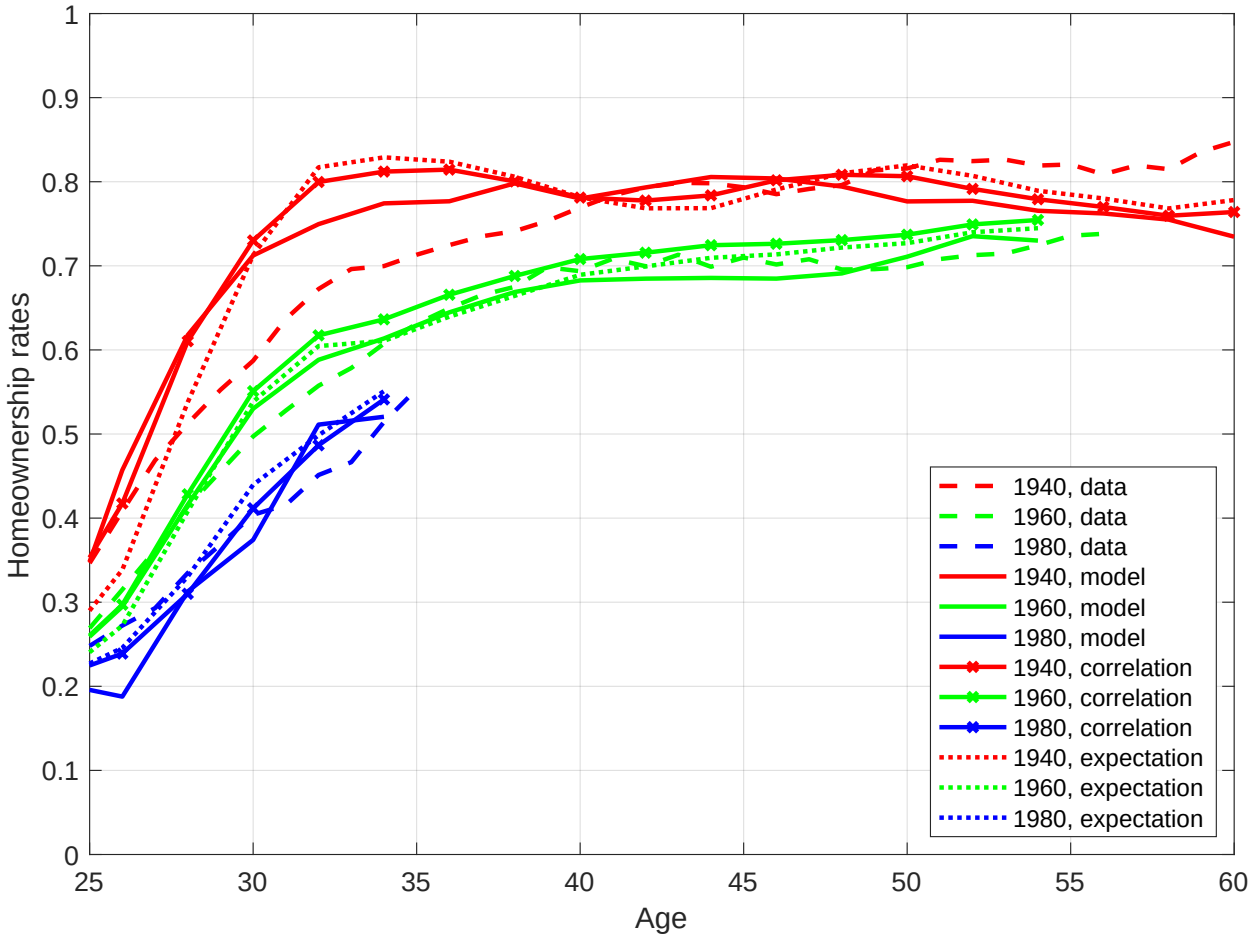


Canonical earnings process



Back

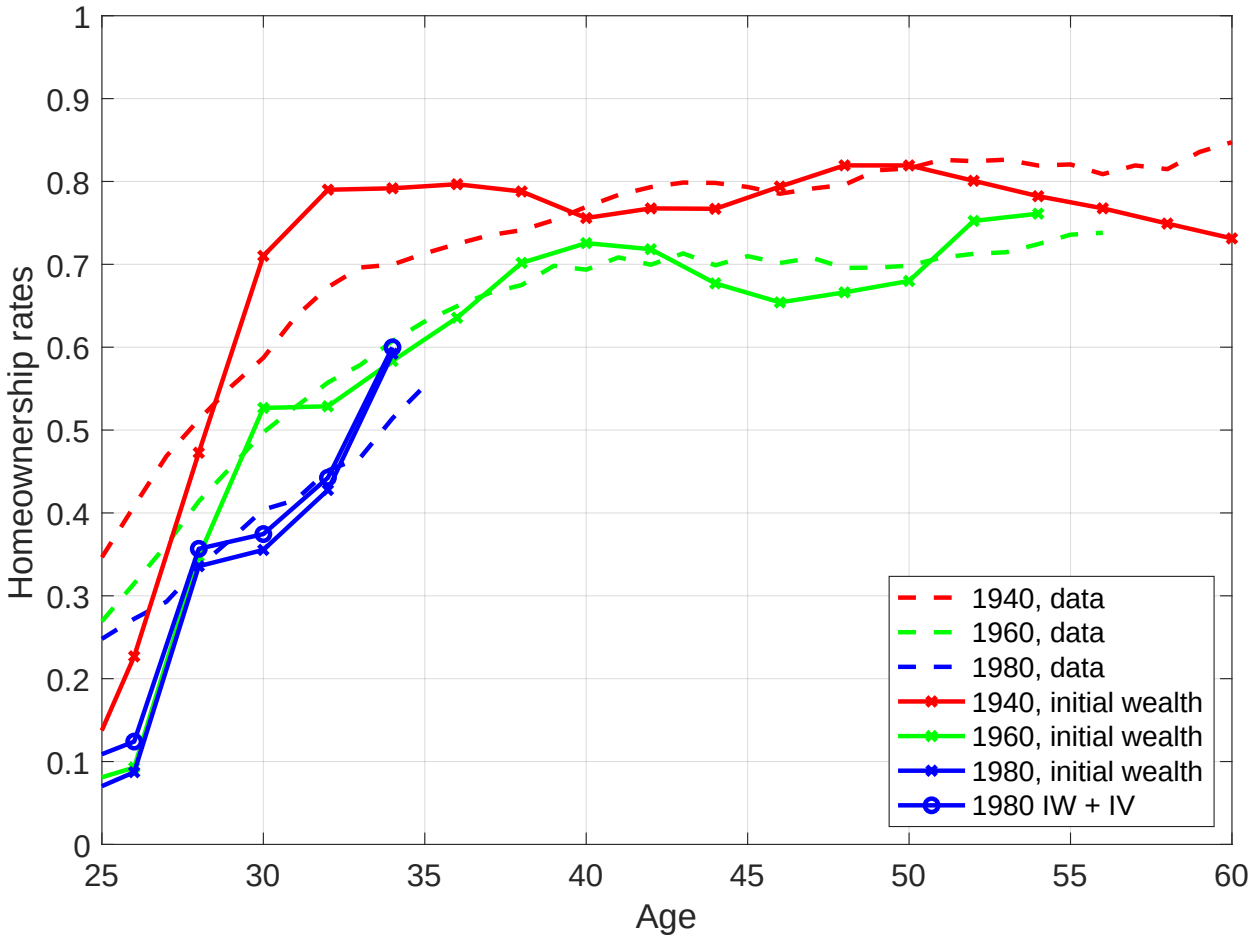
Local correlation between income shocks and house prices



- Empirical value 0.29 (Davidoff, 2006).

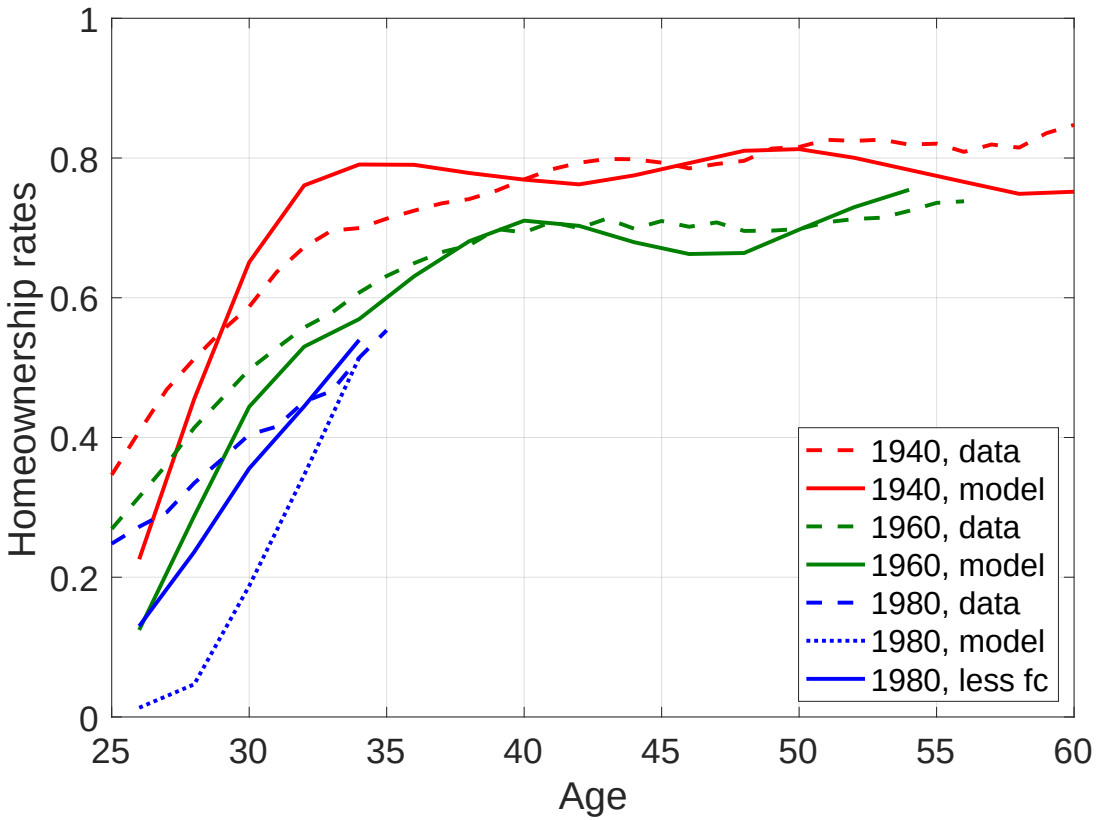
Back

Initial wealth and inter-vivos transfers: data



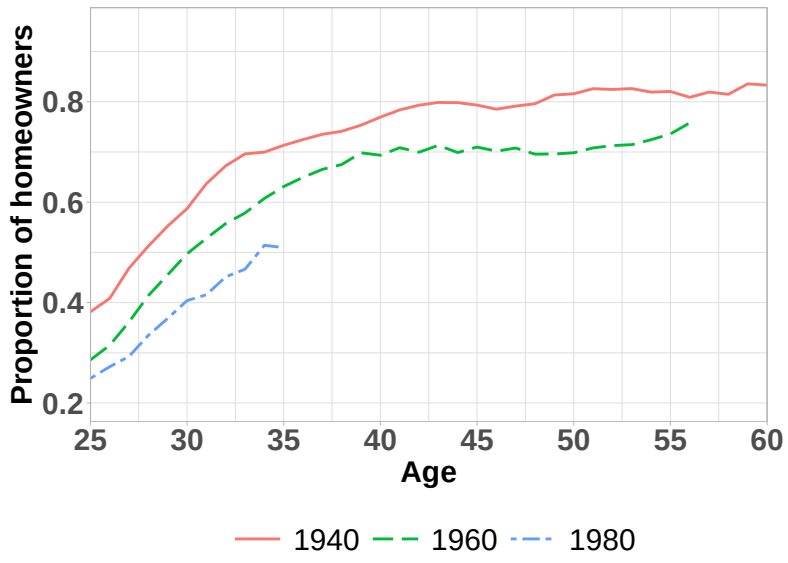
Back to results Back to robustness

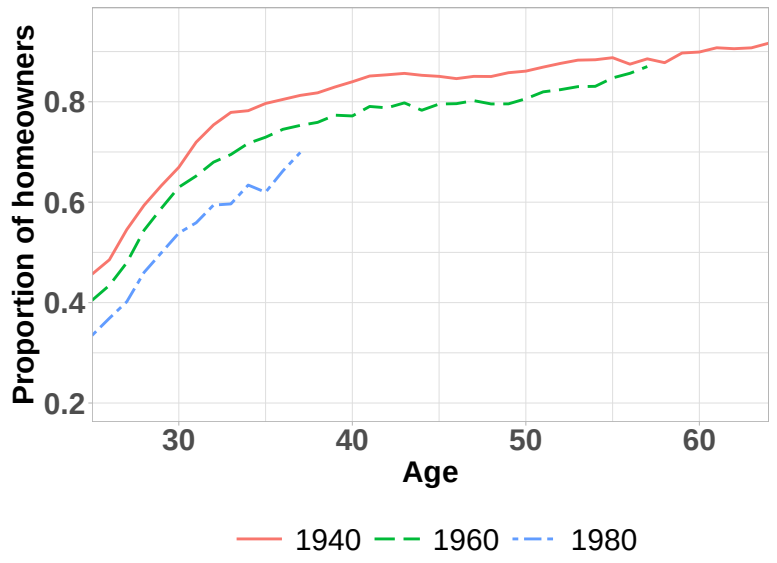
Zero initial wealth



Back to results Back to robustness

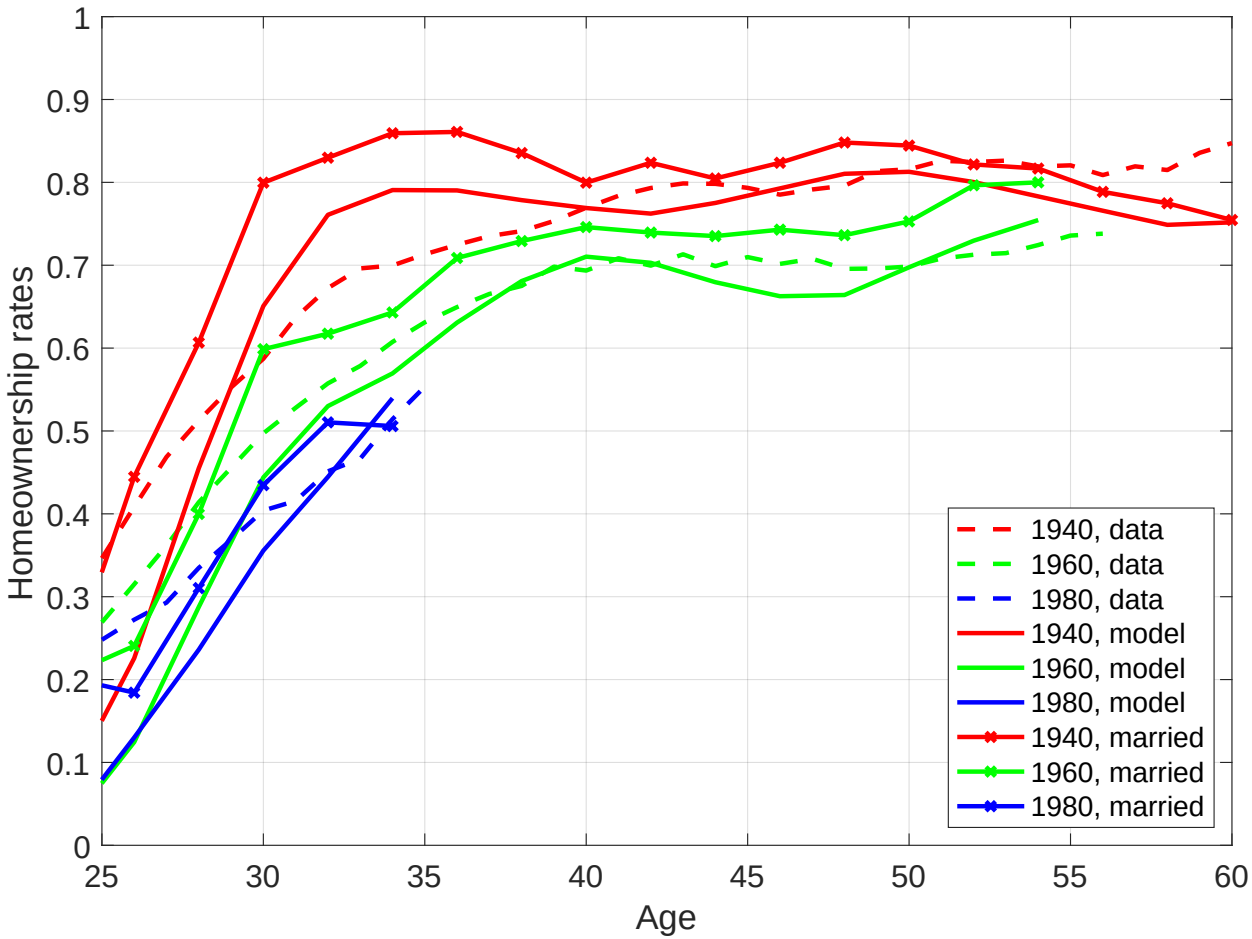
Marital dynamics: PSID data, only married households (right)



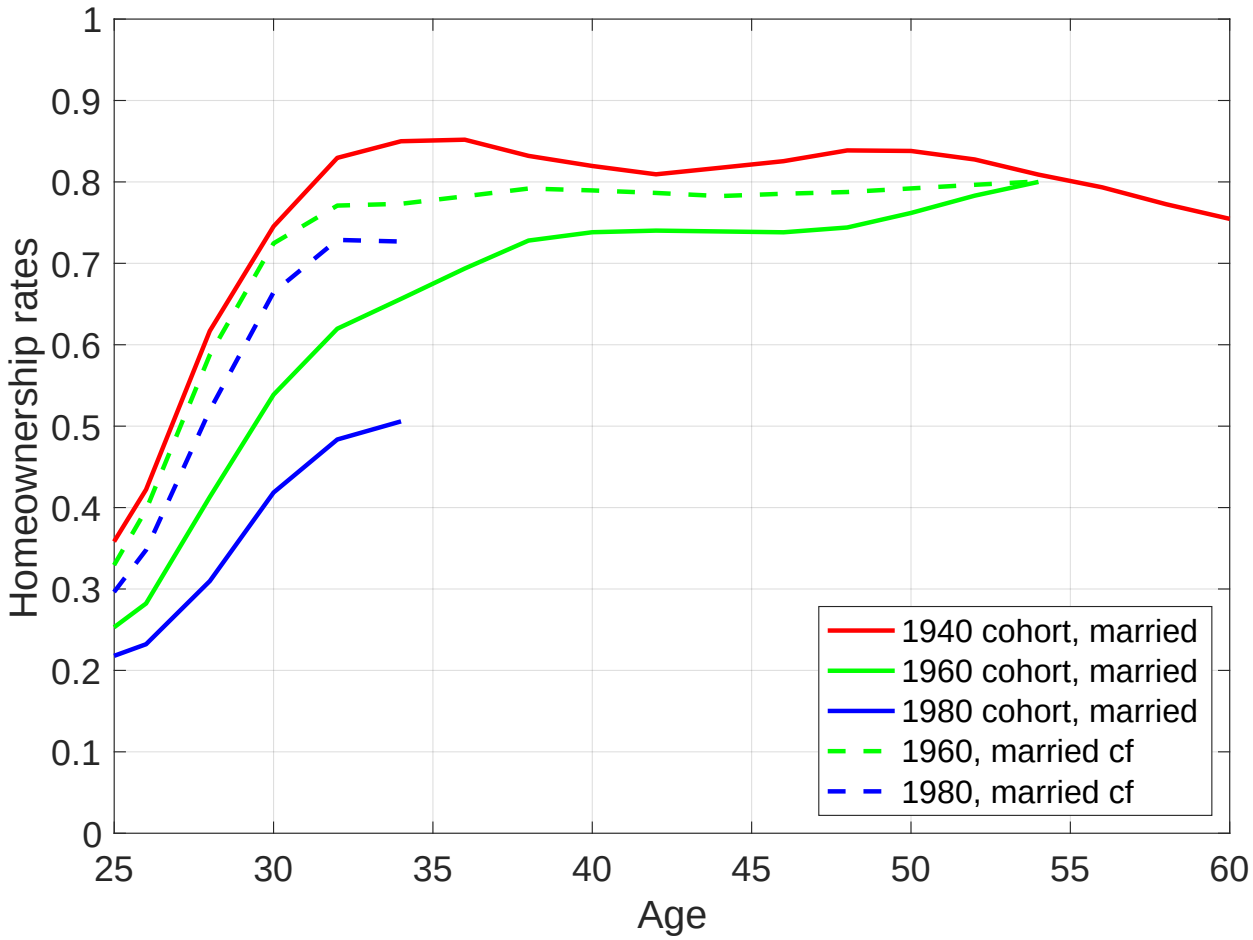


Back to introduction

Marital dynamics

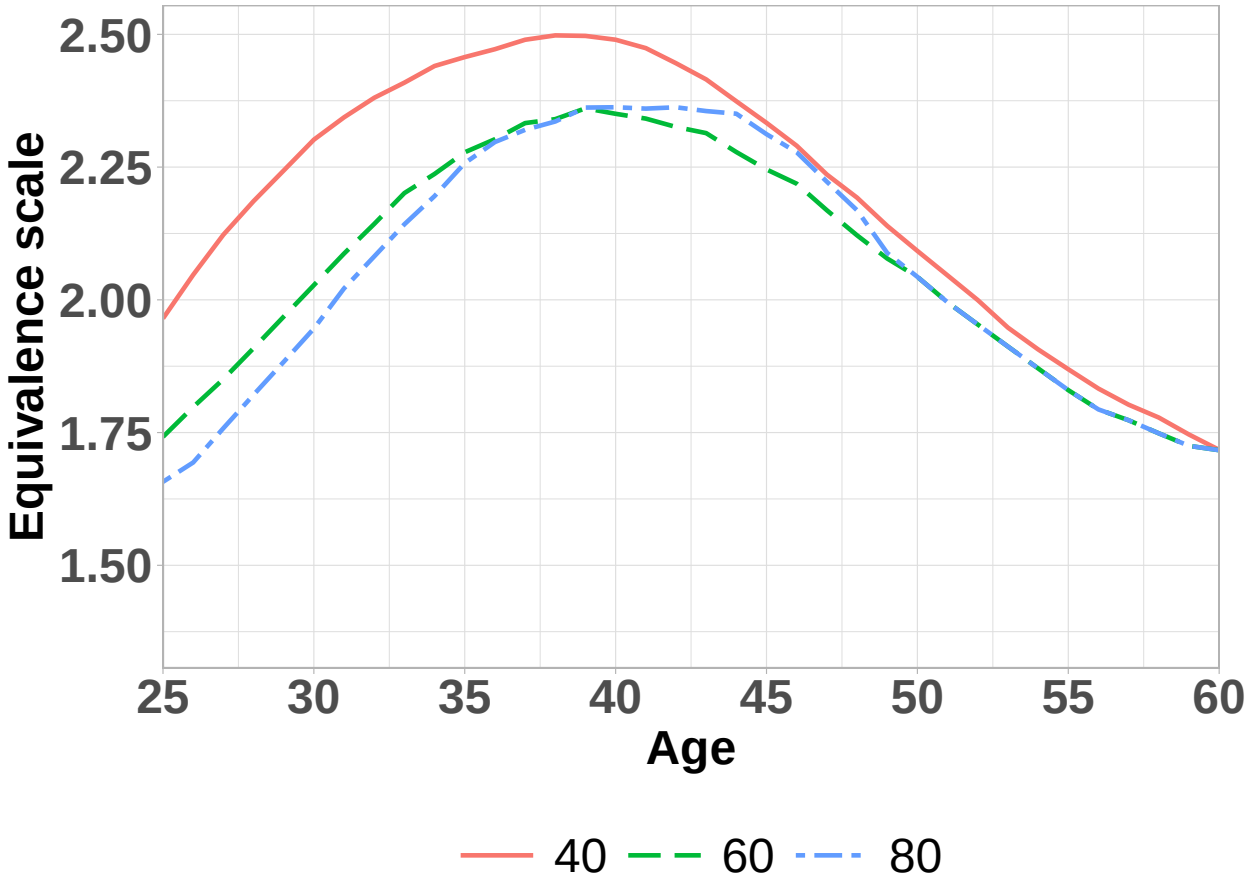


Marital dynamics



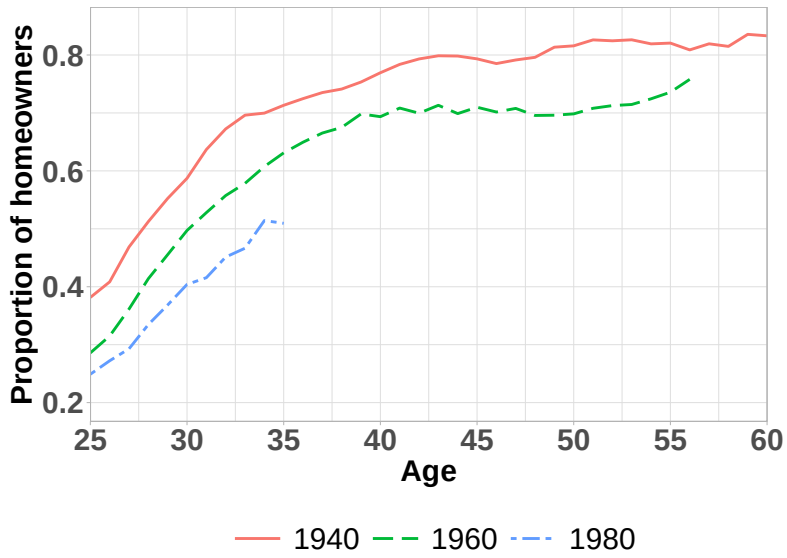
Back to risk/inequality Back to robustness

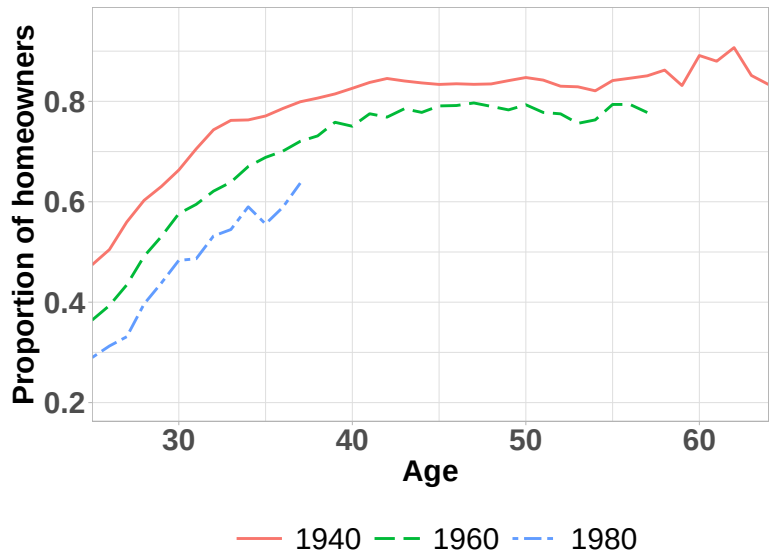
Family sizes: PSID data, equivalence scales



Back to decomposition

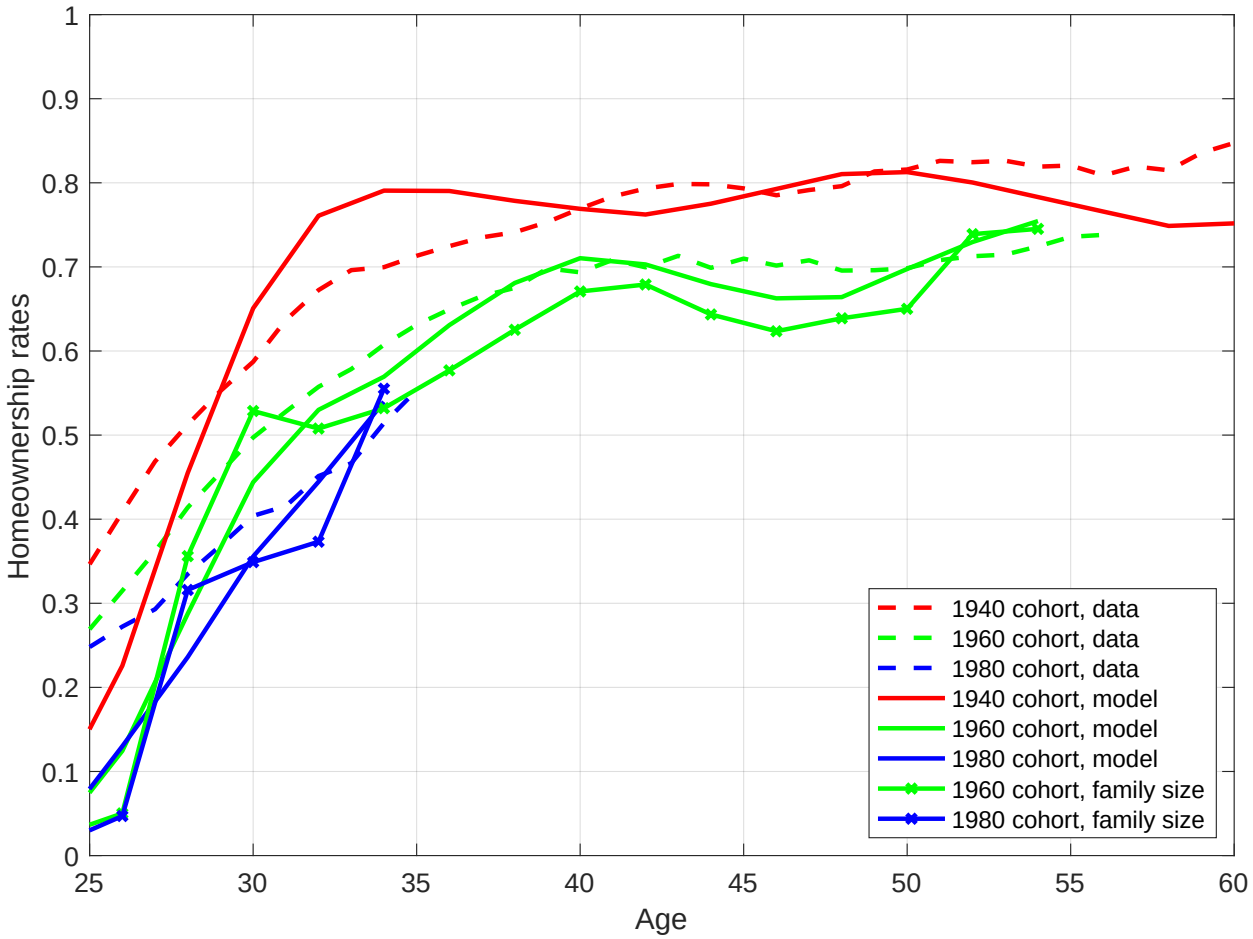
Family sizes: PSID data, only families with children (right)





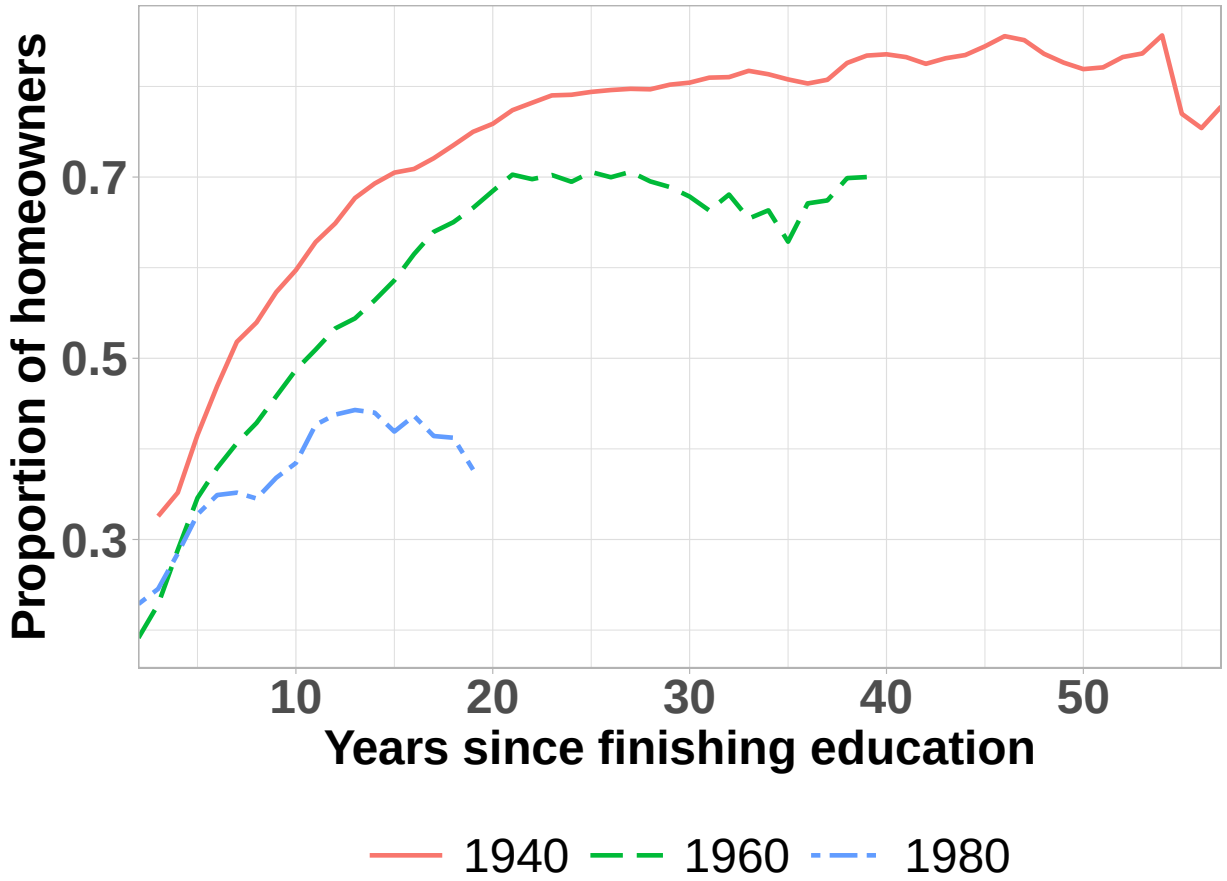
Back to introduction

Family sizes



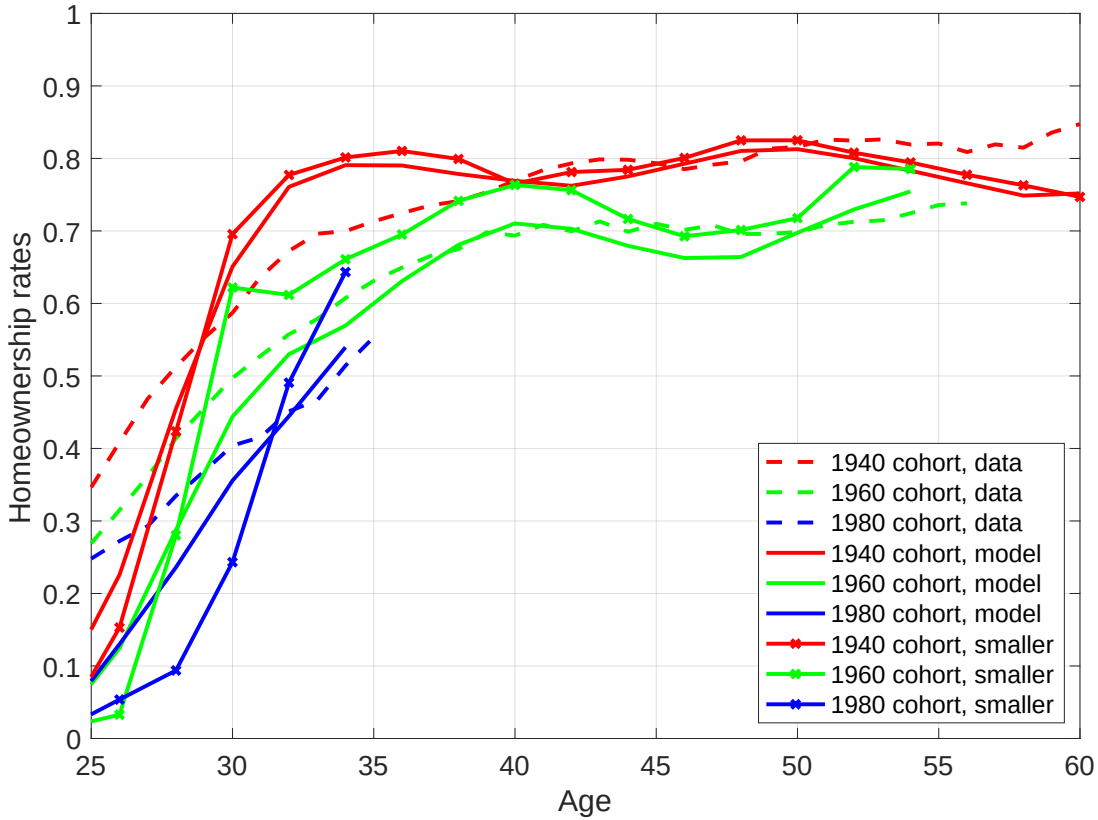
Back

Years since finishing education



Back

House sizes, small house



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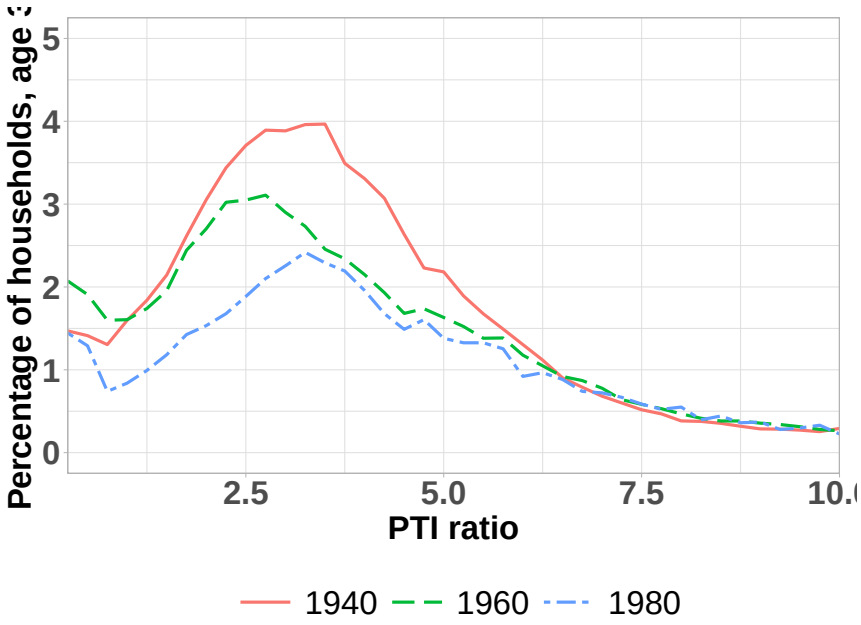
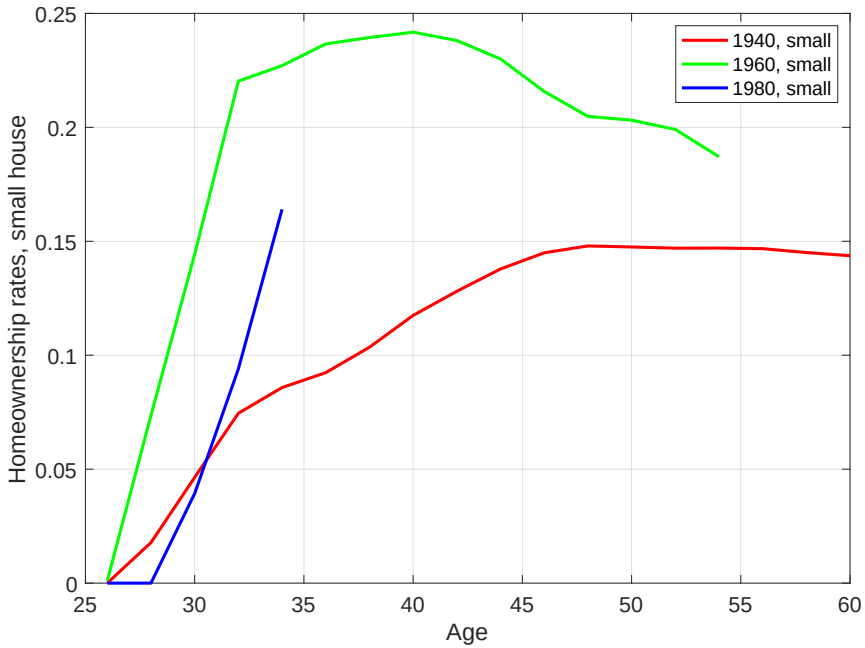
House sizes, small house





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House sizes, $H = 3$

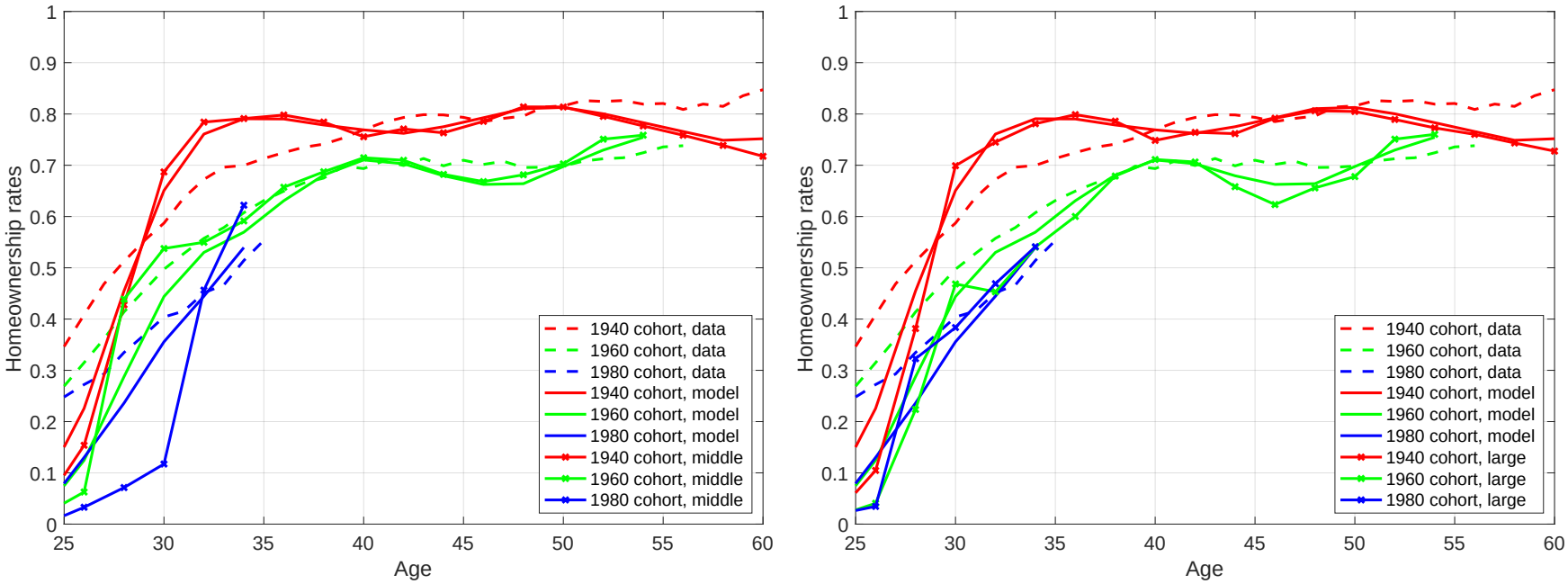

Figure: Left: third house in the middle; right: third house bigger

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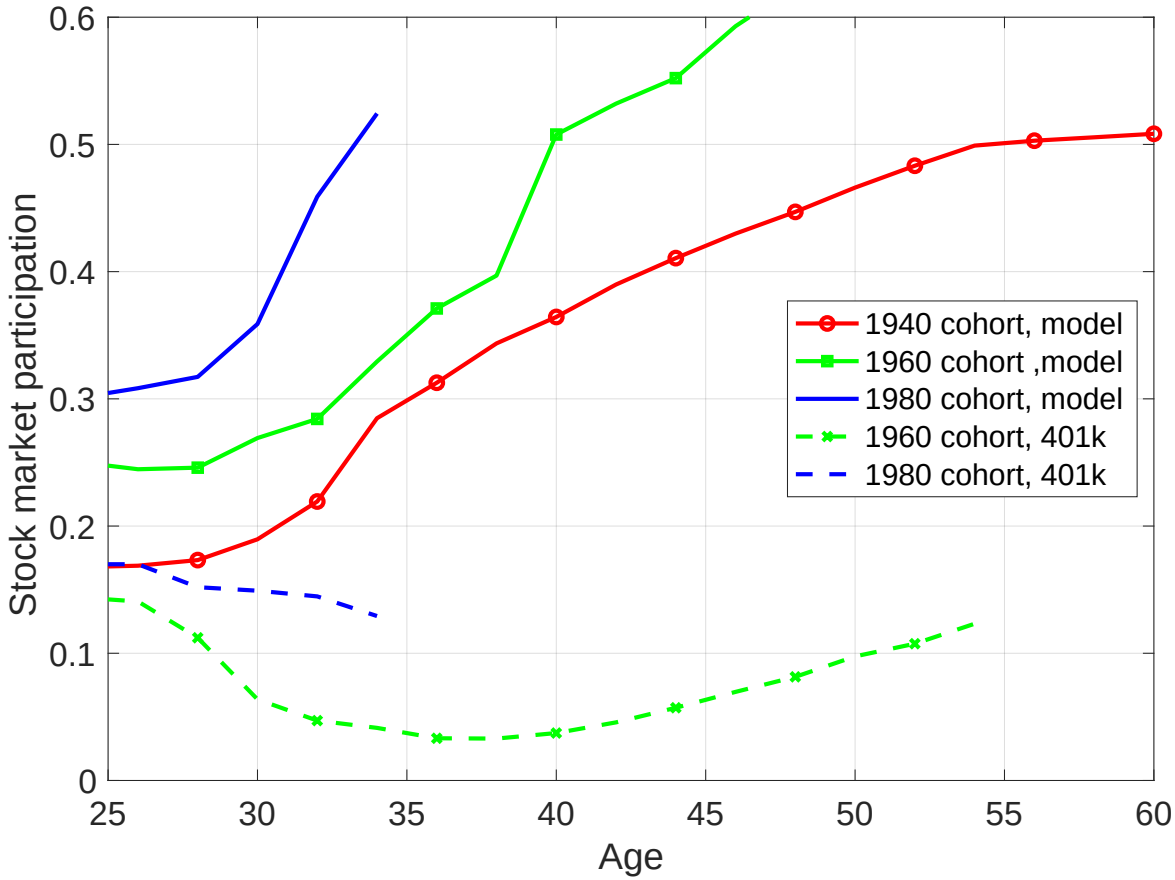
401(k) tax properties



Back to stocks

No GR, no house price boom-bust

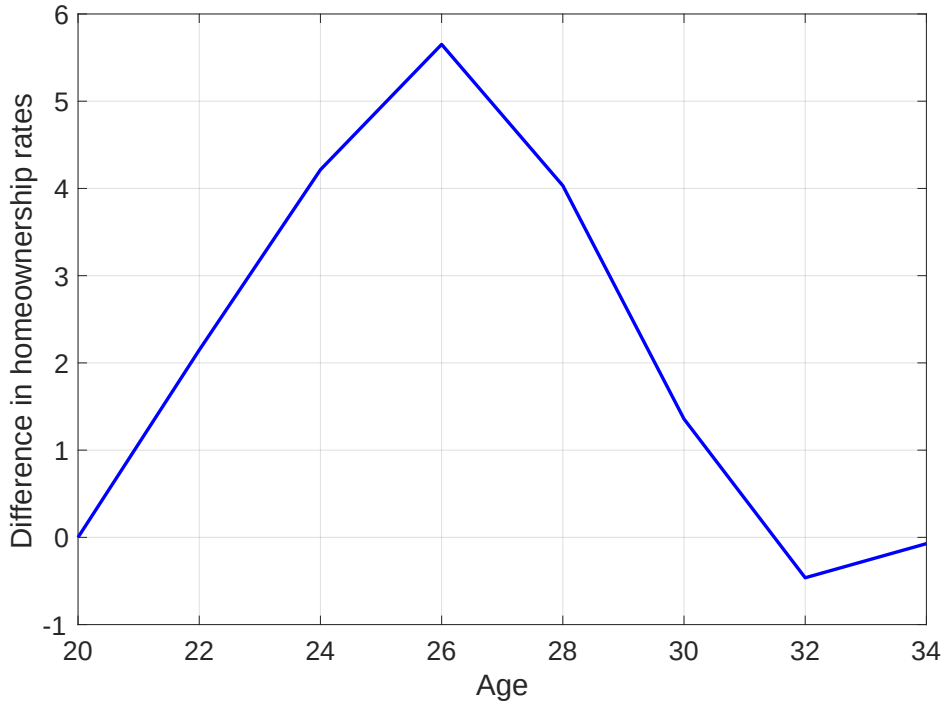


Figure: Difference in homeownership rates, 1980s generation, benchmark model, vs 1980s generation, no boom-bust cycle for house prices and no Great Recession

- Many in the 1980s postponed homeownership decisions.

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