Falling Behind: Has Rising Inequality Fueled the American Debt Boom?

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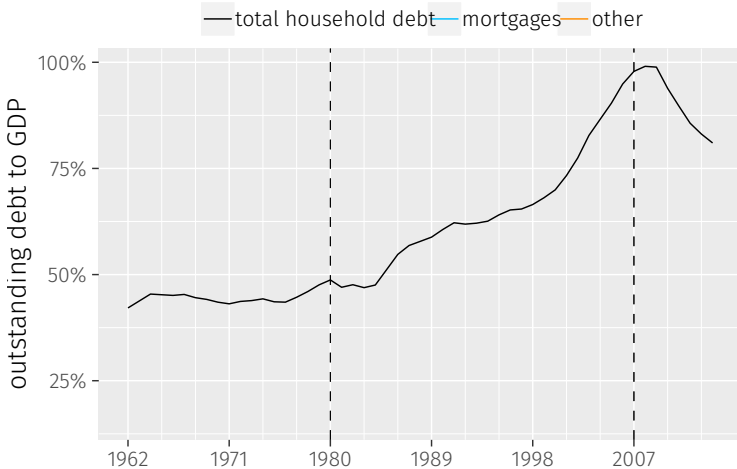
Outline

Fact I: US Household Debt Boom



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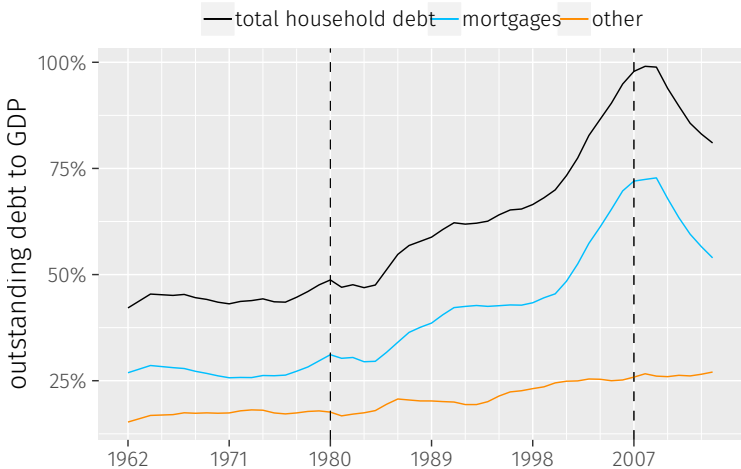

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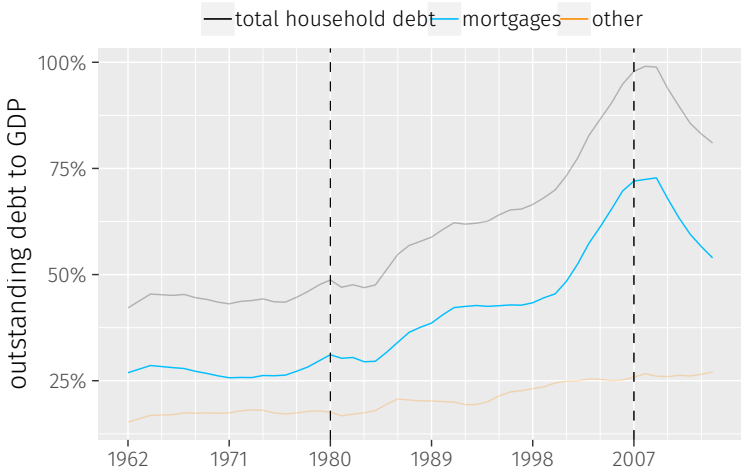

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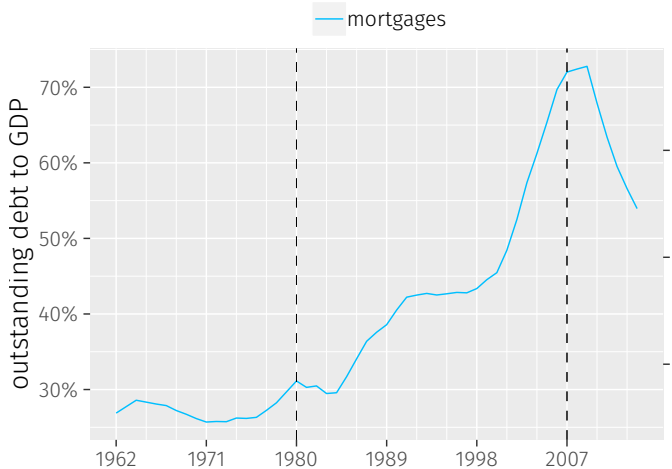

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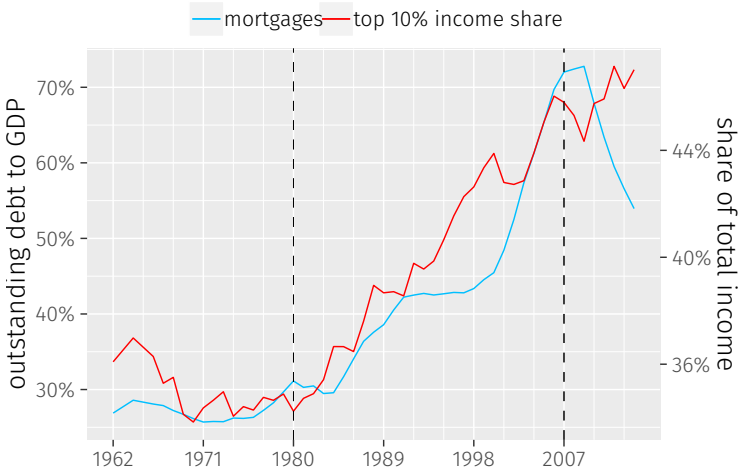
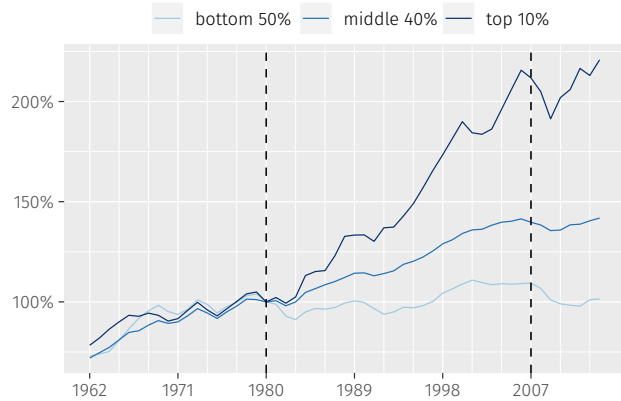
Fact I: US Household Debt Boom and Income Inequality



Source: US Flow of funds and World Inequality Database (Piketty et al.) ▸ alternative inequality measure

Fact II: Top Incomes Drive Inequality



Pre-tax incomes in the US. Base year: 1980. Based on Piketty et al. (2018).

Fact III: Mortgages of Non-Rich and Top Incomes Across US States

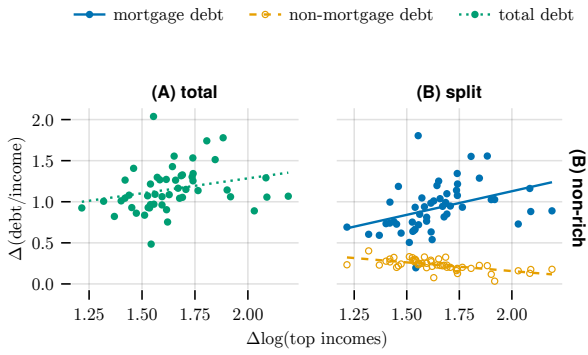


Figure shows changes between 1980 and 2007 for mortgages of the bottom 90% and incomes of the top 10%. Data: Distributional National Accounts.

In the paper: various specifications that confirm this result.

Research Question

Can rising income inequality account for (part of) the mortgage debt boom?

Research Question and Method

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Macroeconomic Model

- heterogeneous agents (income and wealth)
- durable housing and non-durable consumption, mortgages
- social preferences (Keeping up with the Joneses)

Data

- US State-Level Distributional National Accounts (Piketty et al., 2018; Mian et al., 2020)

Findings

Analytical Results

1. individual debt is increasing in the incomes of the reference group
2. aggregate debt-to-income is increasing in top incomes when somebody cares about the rich

Empirical Results

1. top incomes drive mortgages of the non-rich
2. top housing wealth drives housing wealth of the non-rich

Quantitative Result

1. Rising inequality and social comparisons generate about 50% of observed mortgage and house price booms

How Rising Income Inequality Leads to a Mortgage Boom

rising top inequality $\overset{\text{Keeping up with the Joneses}}{\Longrightarrow}$ mortgage boom

1. rich become richer (exogenously)
2. rich improve their houses, raise reference point
3. non-rich want to keep up with the richer Joneses
4. non-rich improve their houses using a mortage
5. higher debt-to-income ratios across the distribution

Note: non-rich $\approx$ bottom 90 % (almost everyone!)

Outline

Households' problem

- risky post-tax earnings $\tilde{y}$
- non-durable consumption c, durable housing h
- asset a (savings device and mortgage)
- social comparisons
  - housing status $s(h, \bar{h})$
  - reference measure $\bar{h}$
- house price p, interest rate r

Preferences

$$\mathbb{E}_0 \int_0^\infty e^{-\rho t} u(c_t, s(h_t, \bar{h}_t))$$

Endogenous States

$$\dot{a}_t = \tilde{y}_t + r_t a_t - c_t - p_t x_t$$
$$\dot{h}_t = -\delta h_t + x_t$$

Collateral constraint

$$-a_t \leq \omega p_t h_t$$

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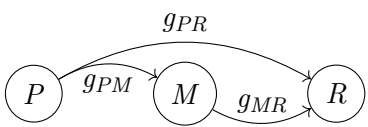

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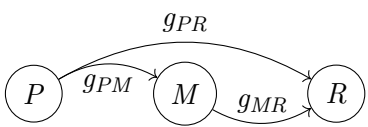

- $u(c, s(h, \bar{h})) = u(c, h - \phi\bar{h})$
- house price p, interest rate $r = \rho$ fixed
- life-time budget constraint
- for convenience: $a_0 = \delta = 0$

General Result

Lemma
Equilibrium debt (given p, r) is

$$-\begin{pmatrix} a_1 \\ \vdots \\ a_N \end{pmatrix} = \kappa_1 \begin{pmatrix} y_1 \\ \vdots \\ y_N \end{pmatrix} + \kappa_2 \phi \underbrace{\left(\sum_{i=1}^{\infty} \kappa_3^i G^i \right)}_{\approx \text{Leontief inverse of } G} \begin{pmatrix} y_1 \\ \vdots \\ y_N \end{pmatrix},$$

where $\kappa_1, \kappa_2 > 0$, $\kappa_3 \in (0, 1)$.

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Proposition
Total debt-to-income is increasing in type k's income as long as some other type cares about k. The total effect depends on the in-centrality of k.

Result: Example with three income types

Let $\begin{pmatrix} \bar{h}_P \\ \bar{h}_M \\ \bar{h}_R \end{pmatrix} = \underbrace{\begin{pmatrix} 0 & g_{PM} & g_{PR} \\ 0 & 0 & g_{MR} \\ 0 & 0 & 0 \end{pmatrix}}_{G} \begin{pmatrix} h_P \\ h_M \\ h_R \end{pmatrix}$

then equilibrium debt (given p, r) is

$$-\begin{pmatrix} a_P \\ a_M \\ a_R \end{pmatrix} = \kappa_1 \begin{pmatrix} y_P \\ y_M \\ y_R \end{pmatrix} + \kappa_2 \phi \begin{pmatrix} 0 & \tilde{\phi} \cdot g_{PM} & \tilde{\phi} \cdot g_{PR} + \tilde{\phi}^2 \cdot g_{PM} \cdot g_{MR} \\ 0 & 0 & \tilde{\phi} \cdot g_{MR} \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} y_P \\ y_M \\ y_R \end{pmatrix}$$

where $\tilde{\phi} = \kappa_3 \phi$, $\kappa_1, \kappa_2 > 0$, $\kappa_3 \in (0, 1)$.

$\rightsquigarrow$ Households need not be directly linked! (effects trickle-down)

Why Is Debt Increasing in Others' Incomes?

1. others' houses (and $\bar{h}$)
   increase in others' incomes

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1. others' houses (and $\bar{h}$) increase in others' incomes
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$$h = c\left(\frac{\xi}{(1-\xi)rp}\right)^{\frac{1}{1-\varepsilon}} + \phi\bar{h}$$

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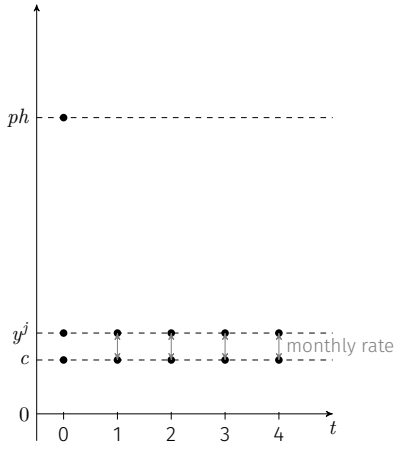
1. others' houses (and $\bar{h}$) increase in others' incomes
2. own house increases with others' houses
3. bigger house means more debt
   - use debt to smooth payments



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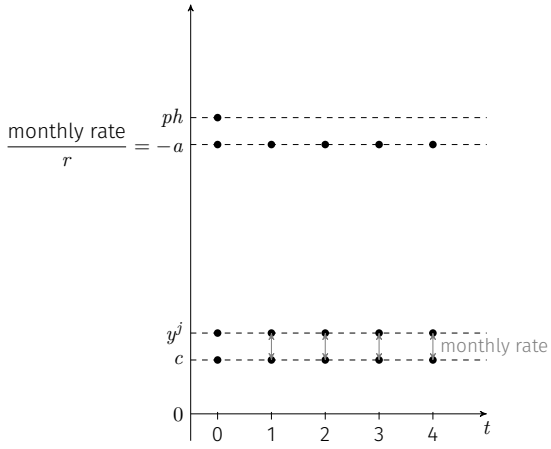

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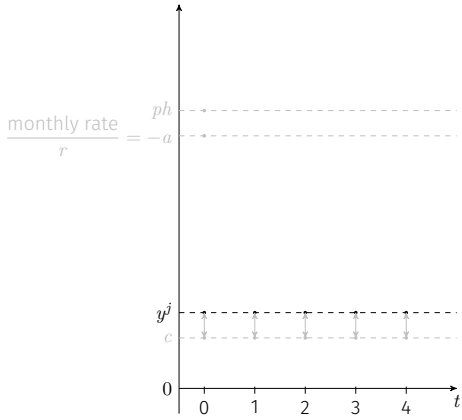

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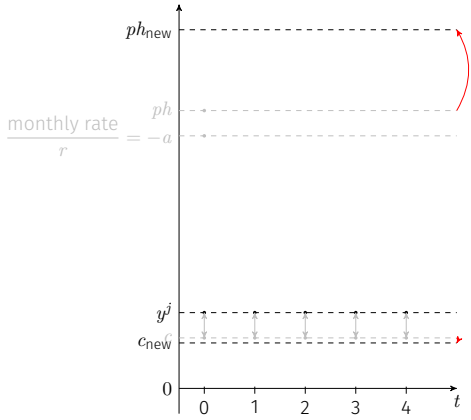

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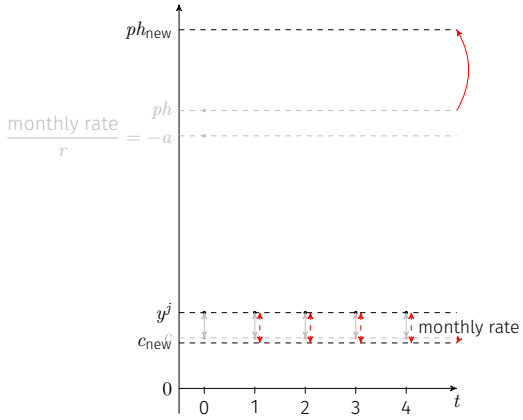

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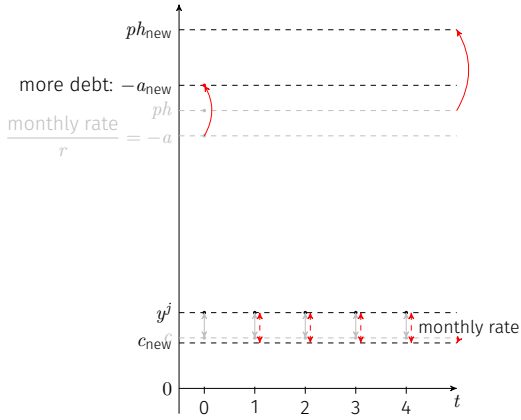

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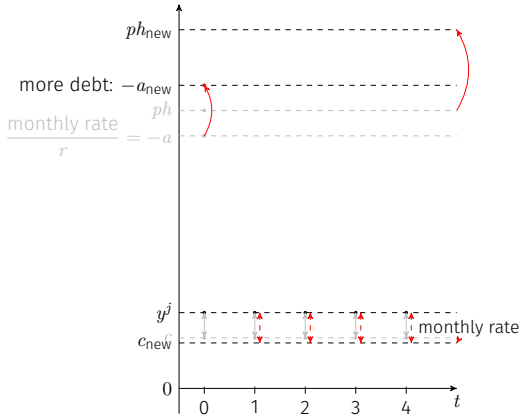


$\rightsquigarrow$ Own credit demand is increasing in others' income!

Outline

Data

Distributional National Accounts (DINA; Piketty et al., 2018)

- aggregated to US state-year panel 1978–2008
- constructed from admin and survey data
- contains income, assets, debt
- state-level identifiers for top incomes imputed from IRS data (Mian et al., 2020)

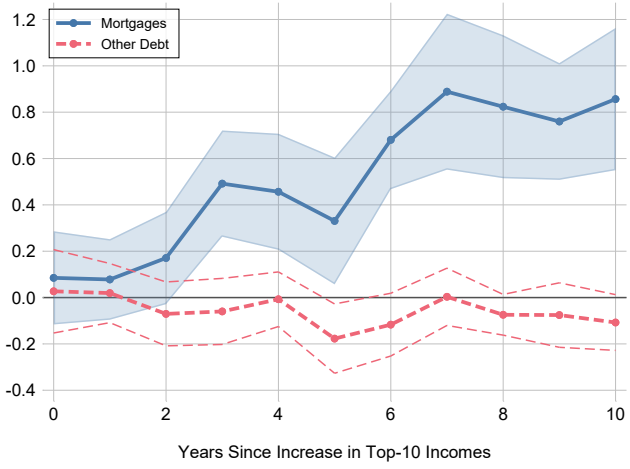
House prices

- annual, US state level
- repeat-sales index
- provided by US Federal Housing Finance Agency (FHFA)

Social Connectedness (Bailey et al., 2016)

- US state level, single cross-section
- constructed from Facebook data
- measure number of Facebook friendships between two states

Dynamic Effects on Debt of Bottom 90% — Local Projections



Baseline regression

	log(non-rich mortgage debt$_{s,t}$)
	(1)
log(top incomes$_{s,t-3}$)	0.343***
	(0.084)
Demographic Controls	Yes
Income bin FE	Yes
state	Yes
year	Yes
Estimator	OLS
N	1,530
Within-R^2	0.101

Is this all driven by house prices? I

	log(house prices$_{s,t}$)	
	(1)	(2)
log(top incomes$_{s,t-3}$)	0.337***	
	(0.091)	
log(saiz elasticity$_s$)) ·log(house prices$_{USA,t}$)		-0.346***
		(0.043)
Year FE	Yes	Yes
State FE	Yes	Yes
Estimator	OLS	OLS
N	1,527	1,440
Within-R^2	0.069	0.271

Is this all driven by house prices? II

- sample split pre/post house price boom
- instrument: housing supply elasticity
- sample split high/low housing supply elasticity

House prices I: Controlling for house prices

	log(non-rich mortgage debt$_{s,t}$)		
	(1)	(2)	(3)
log(top incomes$_{s,t-3}$)	0.343***	0.193***	0.163**
	(0.084)	(0.061)	(0.078)
log(house prices$_{s,t}$)		0.389***	0.415*
		(0.039)	(0.219)
Demographic Controls	Yes	Yes	Yes
Income bin FE	Yes	Yes	Yes
state	Yes	Yes	Yes
year	Yes	Yes	Yes
Estimator	OLS	OLS	IV
N	1,530	1,530	1,440
Within-R^2	0.101	0.235	0.242

House prices II: Split sample pre/post house price boom

	log(non-rich mortgage debt$_{s,t}$)	
	(1)	(2)
log(top incomes$_{s,t-3}$)	0.343***	
	(0.084)	
before1996: log(top incomes$_{s,t-3}$)		0.370***
		(0.093)
after1996: log(top incomes$_{s,t-3}$)		0.318***
		(0.095)
Demographic Controls	Yes	Yes
Income bin FE	Yes	Yes
State FE	Yes	Yes
Year FE	Yes	Yes
Estimator	OLS	OLS
N	1,530	1,530
Within-R^2	0.101	0.102

House prices III: Split sample high/low housing supply elasticity

Do top incomes drive lagged bottom incomes?

	log(own income$_{s,t+3}$)
	(1)
log(top income$_{s,t}$)	0.030
	(0.043)
Demographic Controls	Yes
Income bin FE	Yes
state	Yes
year	Yes
Estimator	OLS
N	1,530
Within-R^2	0.004

Alternative approach: Top incomes in connected states I

- construct new variable: *exposure to top income*
- for state s:

$$\frac{1}{\sum_{s' \neq s} \#\text{links}_{s,s'}} \cdot \sum_{s' \neq s} \#\text{links}_{s,s'} \text{top incomes}_{s'} \tag{1}$$

- can be computed using Facebook Social Connectedness Index Bailey et al. (2018)

Alternative approach: Top incomes in connected states II

	log(non-rich mortgage debt$_{s,t}$)		
	(1)	(2)	(3)
log(top income$_{s,t-3}$)	0.343***		
	(0.084)		
log(top income$_{\text{friends},t-3}$)		0.508***	0.504**
		(0.139)	(0.214)
Demographic Controls	Yes	Yes	Yes
Income bin FE	Yes	Yes	Yes
state	Yes	Yes	Yes
year	Yes	Yes	Yes
Estimator	OLS	OLS	IV
N	1,530	1,500	1,500
Within-R^2	0.101	0.097	0.097

Regressions II: Evidence for Social Comparisons

	$\log(NonRichMortgages_t)$		$\log(NonRichHousing_t)$	
	(1)	(2)	(3)	(4)
$\log(TopHousing_{t-2})$	0.9934***	0.7651**	0.4713***	0.3498*
	(0.3417)	(0.2410)	(0.1720)	(0.2025)
$HousePrice_t$		0.0005		0.0003
		(0.0004)		(0.0004)
Non-Rich Income FE	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes
State & Year FE	Yes	Yes	Yes	Yes
Method	IV	IV	IV	IV
F-test (first stage)	26.31	20.63	25.79	17.47

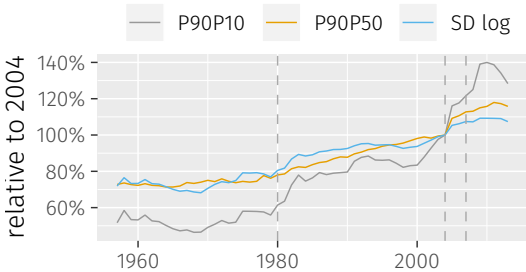
Summary of Empirical Findings

- lagged top incomes are correlated with mortgages of non-rich
- can use top incomes in connected states instead
- the effect is not driven by house prices alone
- bottom incomes are not following top incomes

Outline

Rising inequality, mortgages and house prices 1980–2007 (1)

- inequality rises



Source: Guvenen et al. (2018)

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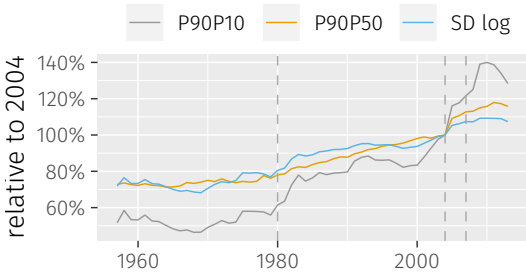
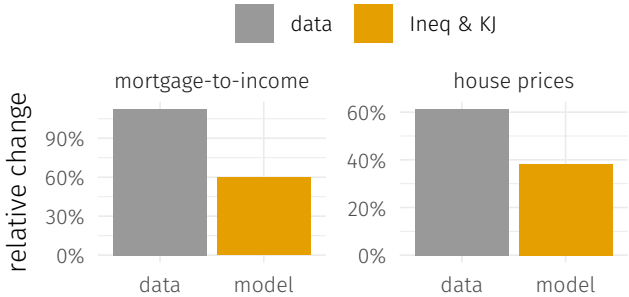


Source: Guvenen et al. (2018)

- adjust permanent component of incomes (σ_α^2) to match difference in P90/P50 ratio between 1980 and 2007
- all other parameters are kept constant

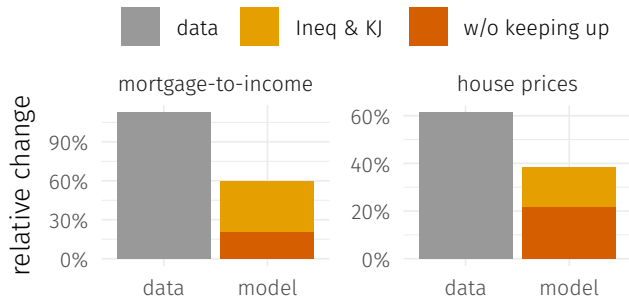
Rising inequality, mortgages and house prices 1980–2007 (2)



Take-away: Inequality & keeping up with the Joneses generate

- 40% of the observed mortgage boom
- 55% of the observed house price boom

Social Comparisons are an Important Amplifier — Rising Inequality is not Enough



Note: Keeping reference measure $\bar{h}$ constant at $\bar{h}_{1980}$.

Take-away: Keeping up with the Joneses contributes 61% of the mortgage debt increase and 30% of the house price increase

Outline

Conclusion

- We formalize a causal link between rising top incomes and the debt boom based on “keeping up with the richer Joneses”
- We show analytically that aggregate debt-to-income ratio is increasing in top incomes when somebody cares about the rich
- We show empirically that top incomes drive mortgage debt across states and time
- We show that rising income inequality “keeping up with the Joneses” are a quantitatively important driver of mortgage debt

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