# Long-run Macro-Finance

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# Macro-Finance in the Long-Run

- Typical macro-finance questions relate to boom/bust business cycle frequency issues

- Long-Run Macro-Finance: How do small but persistent low frequency forces shape the relationship between macro and finance?
  … Long-Run determines the “state variable” for short-run / business cycle freq

- Today:
  … the role of changes in distribution (inequality) on supply and demand for credit via consumption-saving decisions

  … implications for secular trends in credit, interest rate and asset prices
  … implications for monetary policy
  … implications for fiscal policy
  … empirically estimating long-run expectations of “natural rate”

# Indebted Demand model

- Non-homothetic preferences
  … people derive greater utility from accumulating wealth (*a*) as they get richer

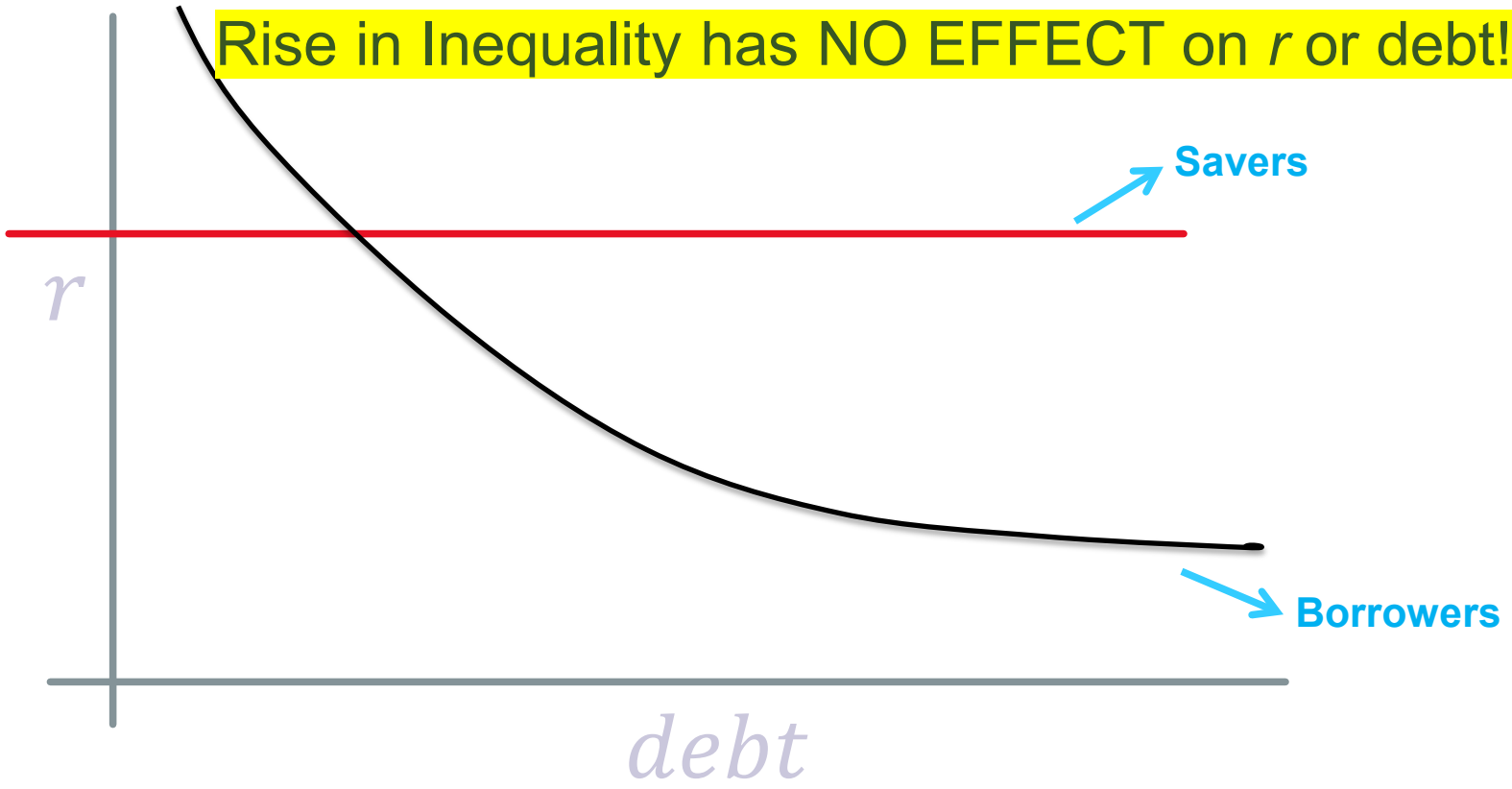
$$\int_0^{\infty} e^{-(\rho+\delta)t} \left\{ \log c_t^i + \frac{\delta}{\rho} . v(a_t^i) \right\} dt$$

- Euler equation in steady-state for the rich
  … determines the long-run saving supply schedule

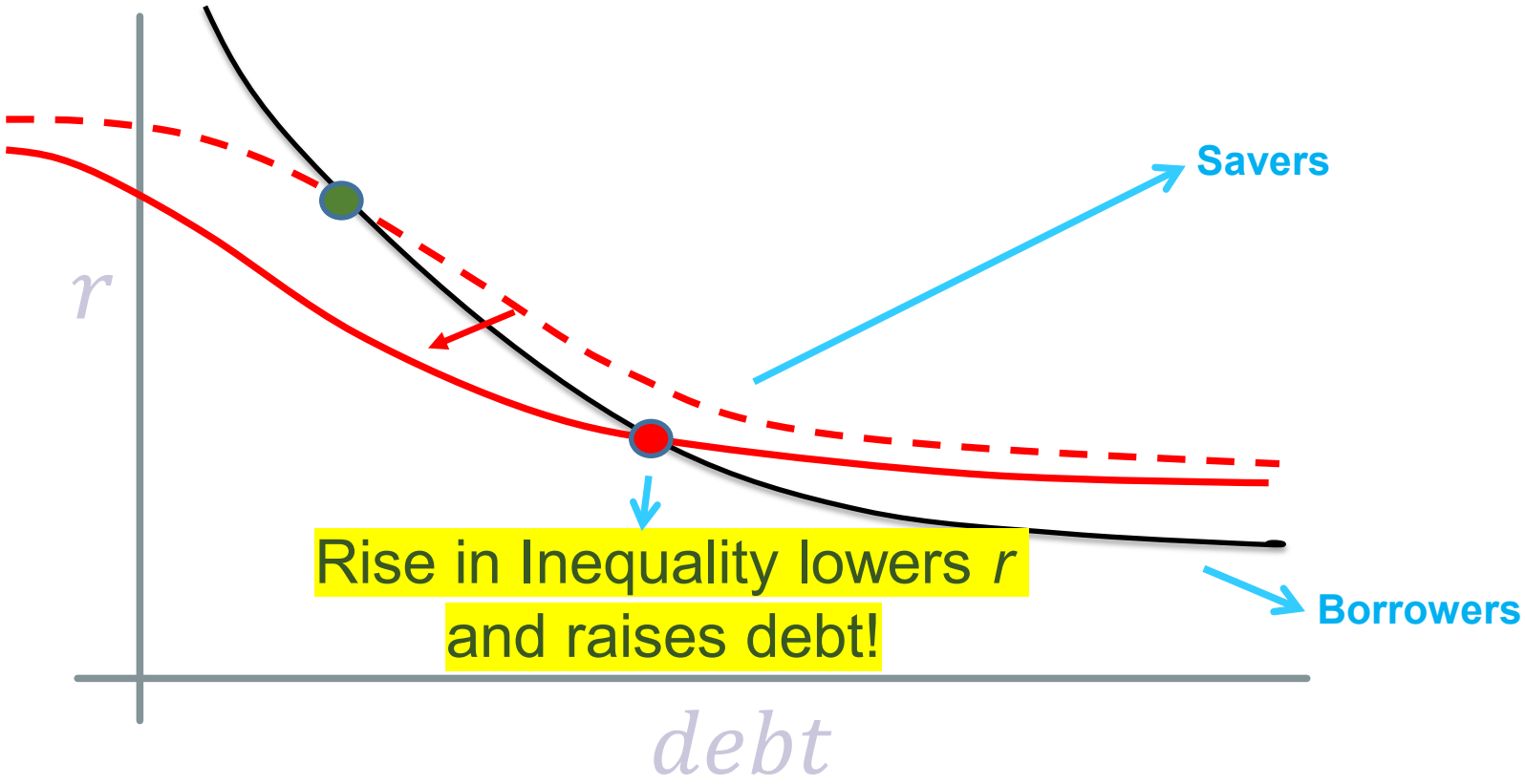
$$r = \rho . \frac{1 + \rho/\delta}{1 + \frac{\rho}{\delta} . av'(a)}$$

See Mian, Sufi and Straub (QJE 2021) for formal details

# Standard homothetic models



# Indebted Demand model



# Indebted Demand

- When rich save more out of lifetime income, and extreme inequality rises

  … need to stimulate demand today through debt creation: rich save/lend, non-rich borrow

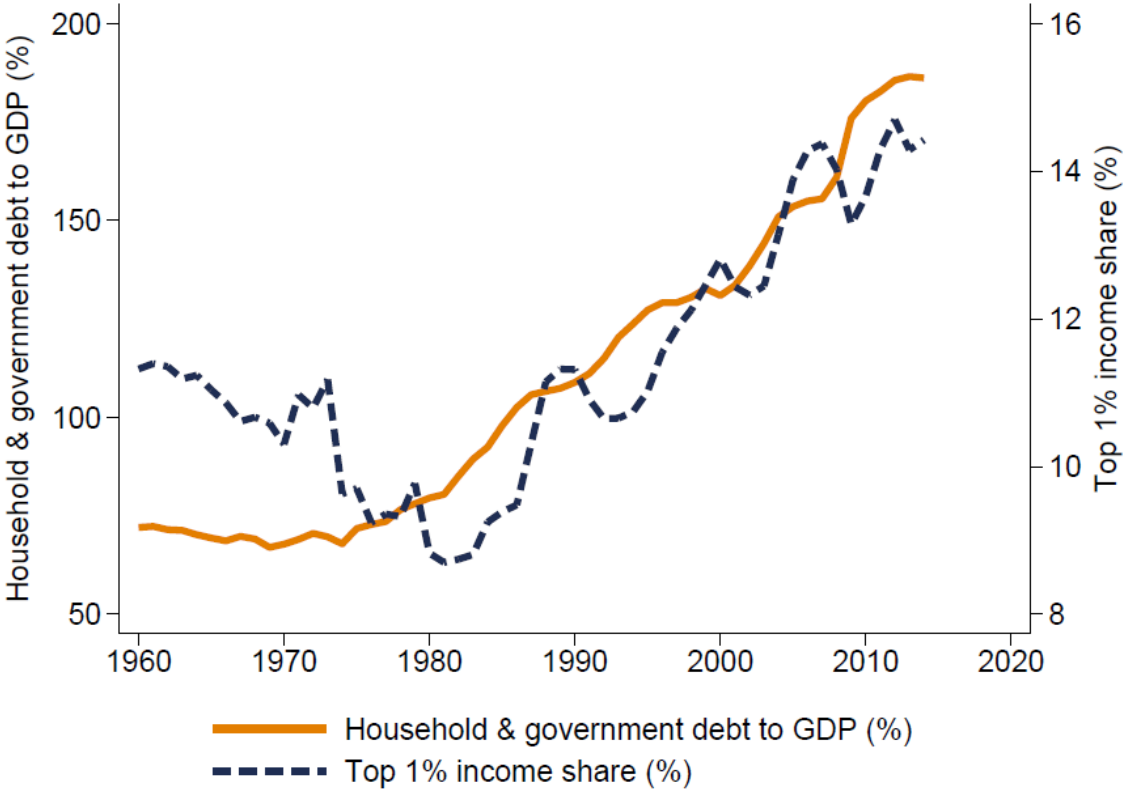
  … but that reduces demand in the future when borrowers have to repay the debt

  … only solution is for interest rate to fall, so non-rich could borrow even more!

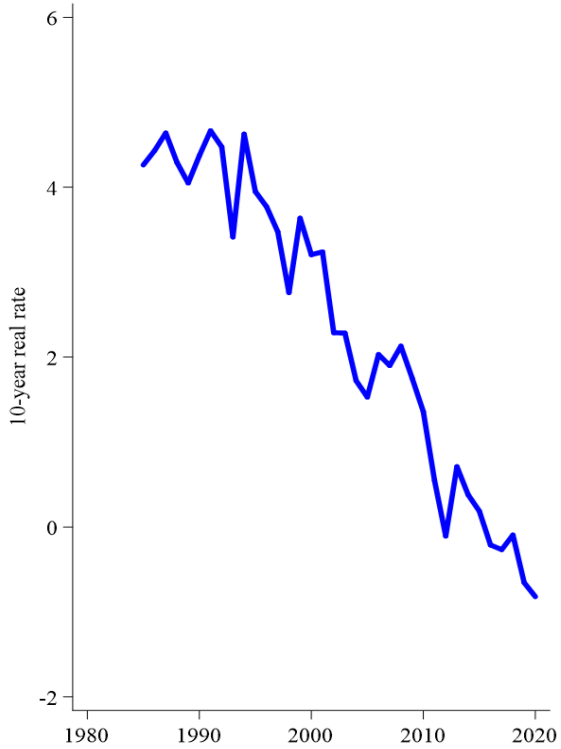
  … this **indebted demand** cycle continues, until interest rate hits zero lower bound (ZLB)

  … if extreme inequality persists, remain stuck in perpetual **debt trap**

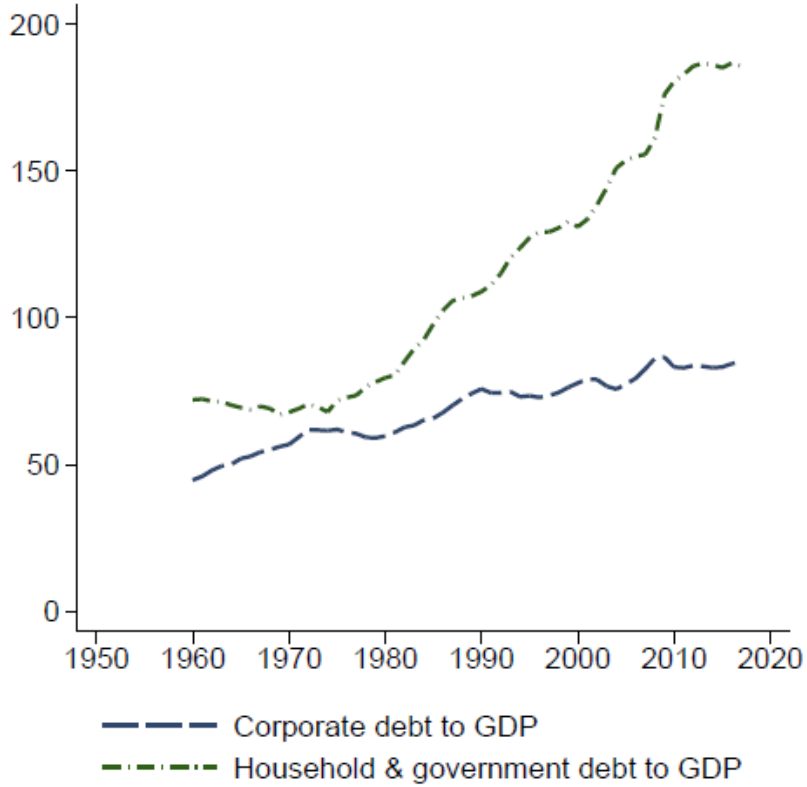
# Rising inequality is associated with rising debt



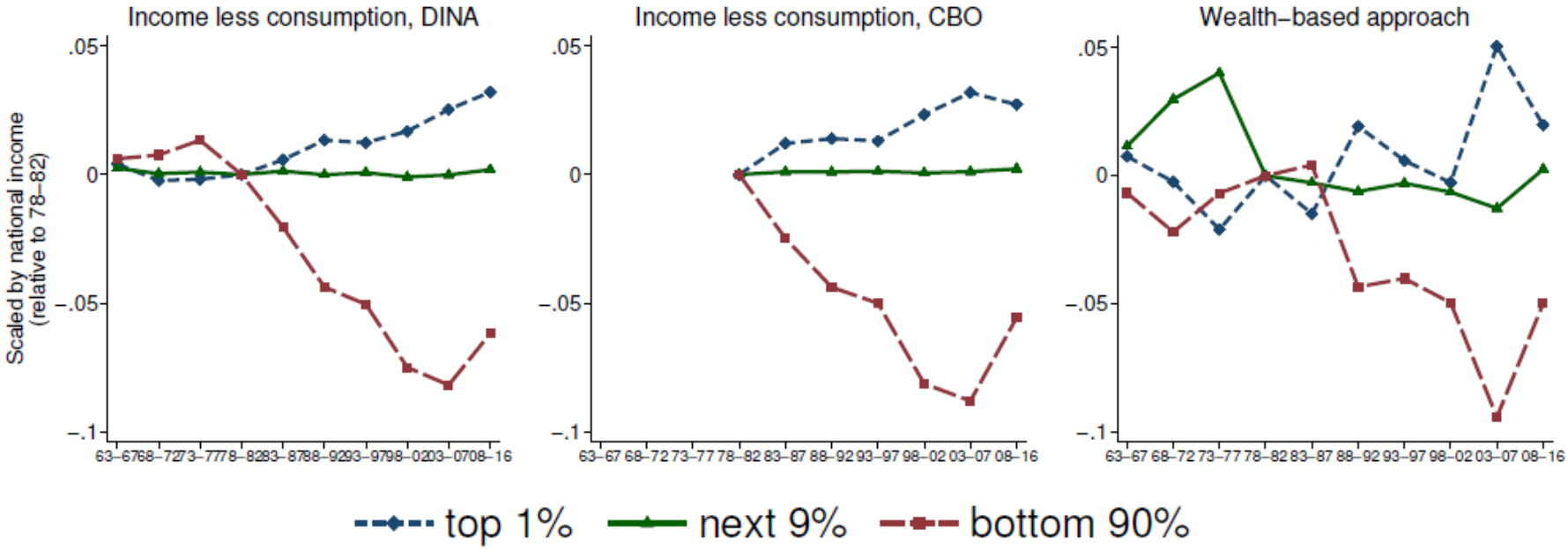

# …. and falling rates



- Is credit financing the demand-side of the economy?



# Where does the saving glut of the rich go?




See Mian, Sufi and Straub ("Saving Glut of the Rich") for formal details

# Implications for monetary policy

- Rising inequality forces the hand of monetary policy by lowering r*

  … reduces space for monetary policy to operate

- Easy monetary policy often raises demand through debt creation

  … but that creates indebted demand, putting downward pressure on future rates: monetary policy has limited ammunition.

  "the sustainability of debt burdens depends on interest rates remaining low" – Mark Carney

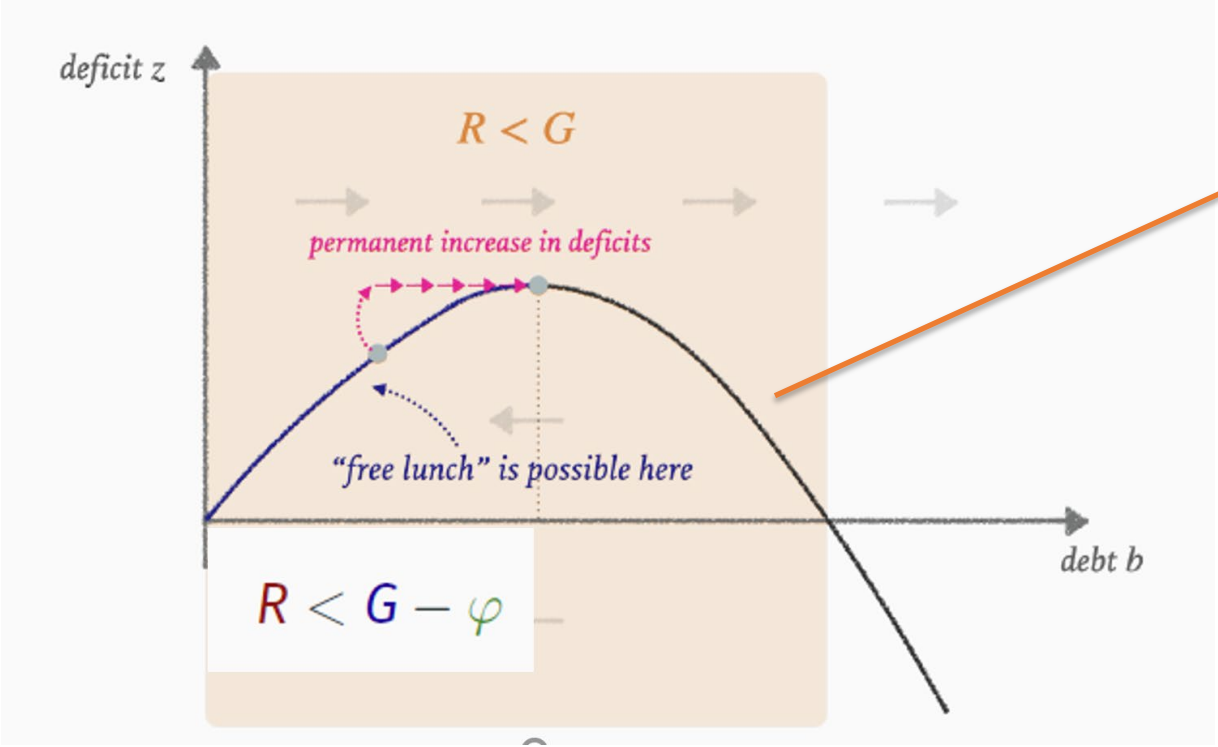
- Persistent extreme inequality pushes monetary policy against ZLB, and economy stagnates inside a debt trap

# Implications for fiscal policy

- With “specialness”, such as “convenience yield”, of government debt, $R < G$ for government borrowing when aggregate demand is weak … fiscal policy is like a wealth tax!
- Rising inequality expands fiscal space
- There is an MMTesque “free lunch” when $R < G - \psi$, i.e. government can increase primary deficit permanently without ever having to raise taxes
- The design of tax policy is really important for moving and staying away from the ZLB

See Mian, Sufi and Straub “A Goldilocks Theory of Fiscal Policy”

# Implications for fiscal policy




Rise in inequality expands fiscal space!

# What should policy makers do?

- Revise macroeconomic models to incorporate the key role that inequality plays in determining macroeconomic dynamics and fundamentals

  … possibly explains persistent over-forecasting of interest rates

- Monetary policy is ill-equipped to deal with weak aggregate demand resulting from extreme inequality. Emphasis should be on,

  … policies that deliver equitable and inclusive growth

  … progressive taxation, consider wealth taxes

  ... Increase public investment, especially in areas that promote equality of opportunity

  … promote competitive markets

# Where is the natural rate heading?

- Wicksell: natural rate that clears market for saving and investment
- Natural rate of interest, r*, and LW and HLW estimates by New York Fed
  … but estimates are very imprecise
  … subject to serious misspecification concerns (e.g. broke down during pandemic)
- BHM estimate natural rate of return on capital, $r_k^*$, using a natural experiment approach: lease extension experiments in UK
  … precise, no structural assumption, real-time, public data

See Backer-Peral, Hazell and Mian “Measuring The Natural Rate With Natural Experiments”

# What is the natural rate of return on capital, $r_K^*$?

- Price $P_t$ of capital with dividend $R_t$:

$$P_t = R_t \int_0^\infty e^{-\int_0^S r(u)+\zeta(u)-g(u)du} dS$$

  where $r$ is safe return, $\zeta$ is risk premium and $g$ is dividend growth

- The natural rate of return on capital is the long-run expectation of the dividend-price ratio

$$\frac{R_{t+\infty}}{P_{t+\infty}} \equiv \lim_{u\to\infty} r(u) + \zeta(u) - g(u) \equiv r_K^* = r^* + \zeta^* - g^*$$

- Equivalently $r_K^*$ is the Hall-Jorgensen user cost of capital, normalized by its price

# Empirical Methodology

Price change after lease extension difference-in-difference:

$$\Delta_{it} = \log\left(1 - e^{-r^*_{Kt}(T_{it}+90)}\right) - \log\left(1 - e^{-r^*_{Kt}T_{it}}\right)$$

Control: non-extenders within $\{0.1, 0.5, 1, 5, 10, 20\}$ km and $\pm 10\%$ of extender duration $T_{it}$

- Robustness: residualize prices by hedonic characteristics

Validating control group + parallel trends:

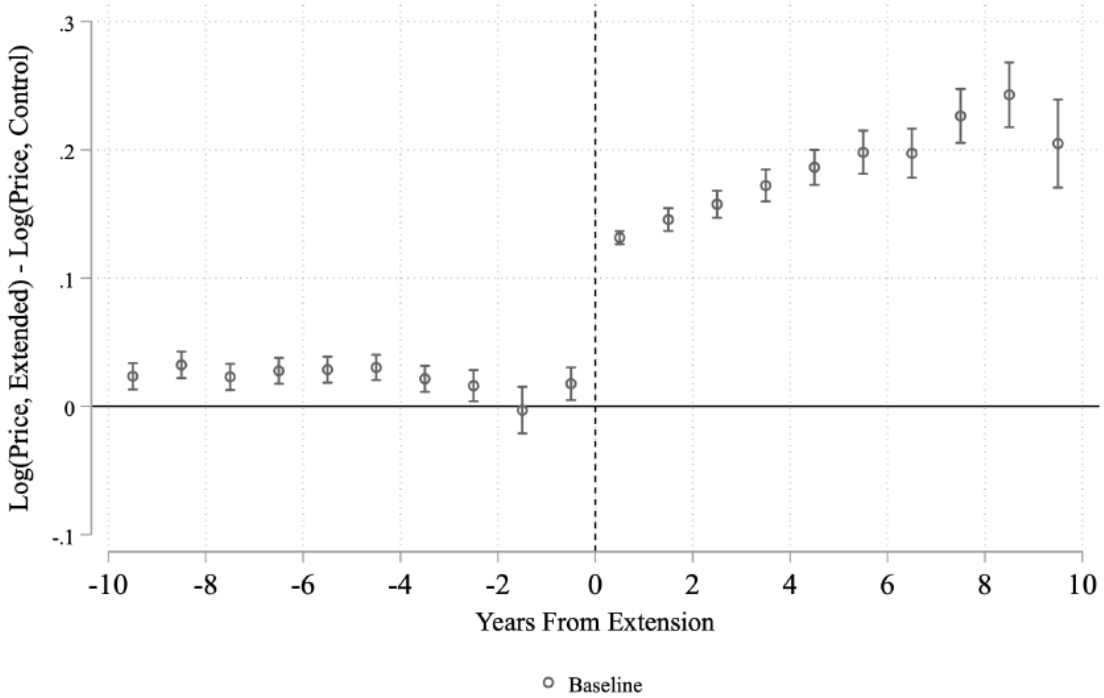
- ✓ Balance test: hedonics vs. treatment Balance Test
- ✓ Placebo: growth in (market) rents + hedonics vs. treatment Hedonics
- ✓ Lack of pre-trends: growth in prices before extension vs. treatment No-Pre Trends
- ✓ Stable coefficients w/ controls

**Nonlinear least squares:** estimate $r^*_{Kt}$ given $(\Delta_{it}, T_{it})$ from lease extensions

- Time varying estimator of $r^*_{Kt}$ is feasible

# Event Study

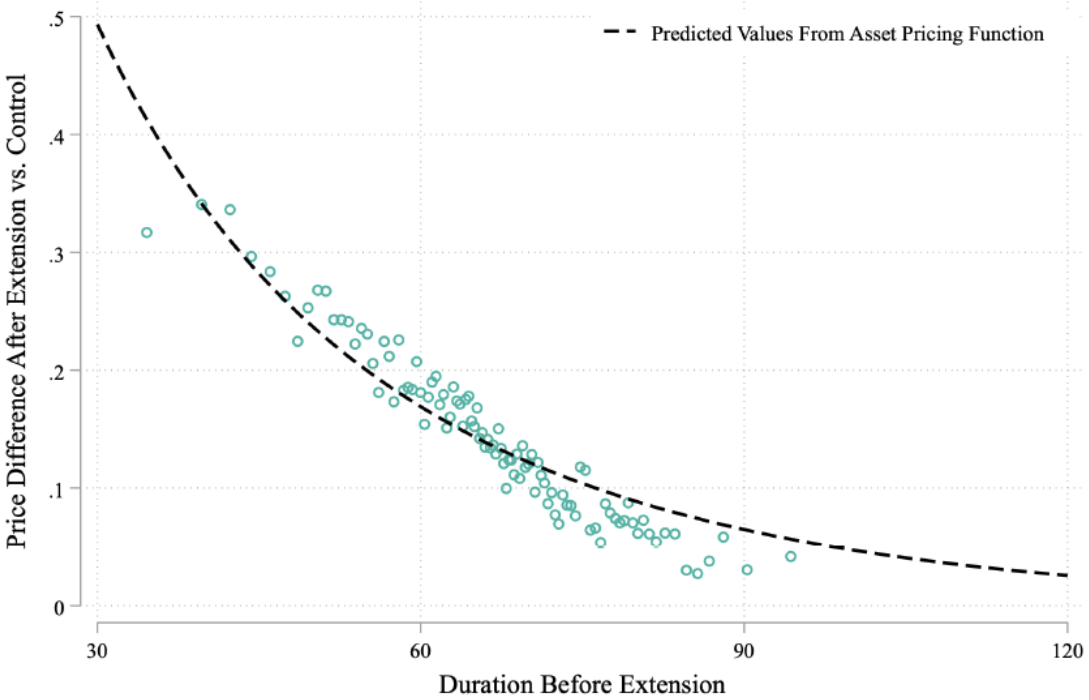
Event Study Plot Over Time & Duration | Lease Term Distribution




90 year extensions

**Price change from lease extension helps to identify $r^*_{Kt}$**

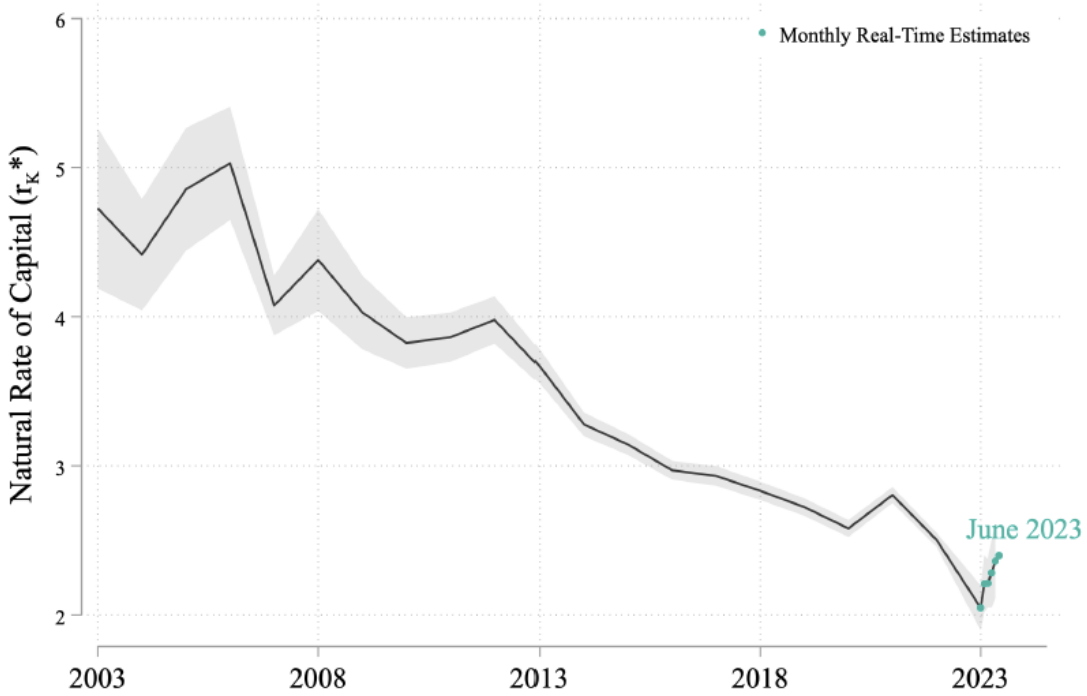
# Duration Before Extension Predicts Price Change After Extension




Binscatter with 100 bins, 90 year extensions

**Model prediction:** price gain from extension decreasing in duration before extension (helps to identify $r_K^*$)

# Main Result

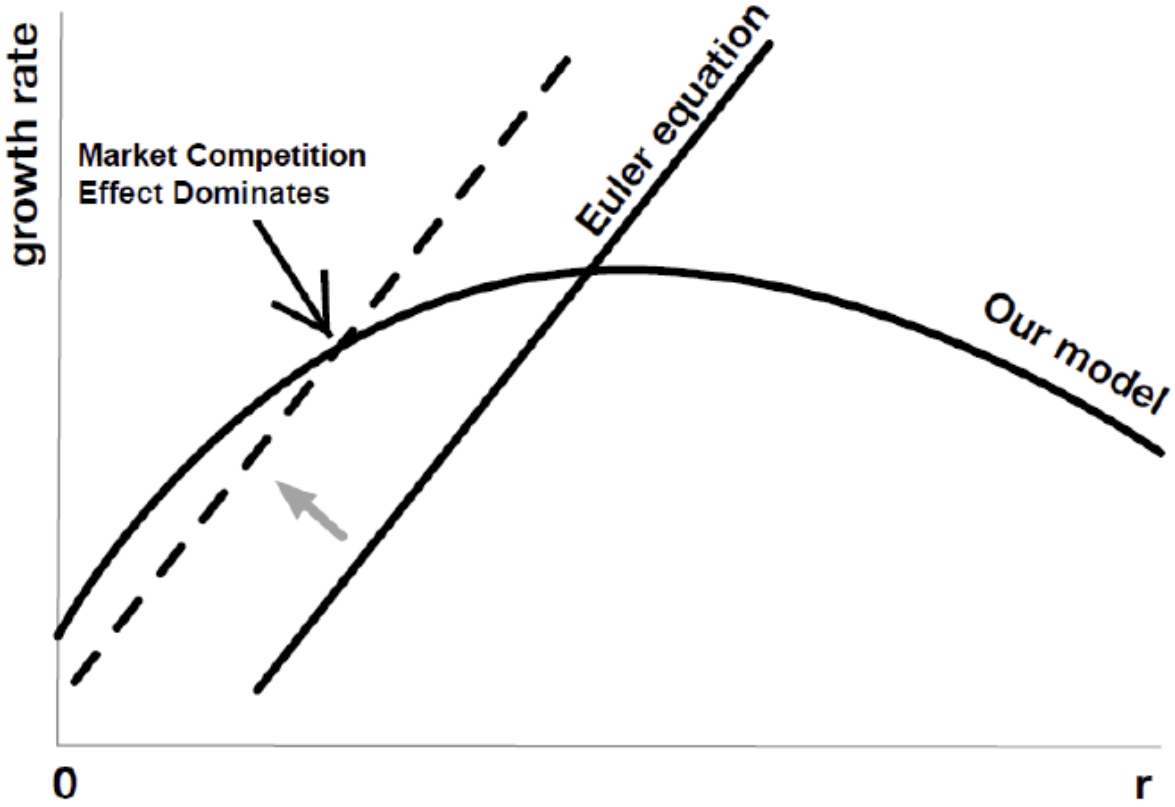



**Fall of $r_K^*$ from 4.8% to 2.3%, more than doubling of natural price-rent ratio**

# Long-run Macro-Finance

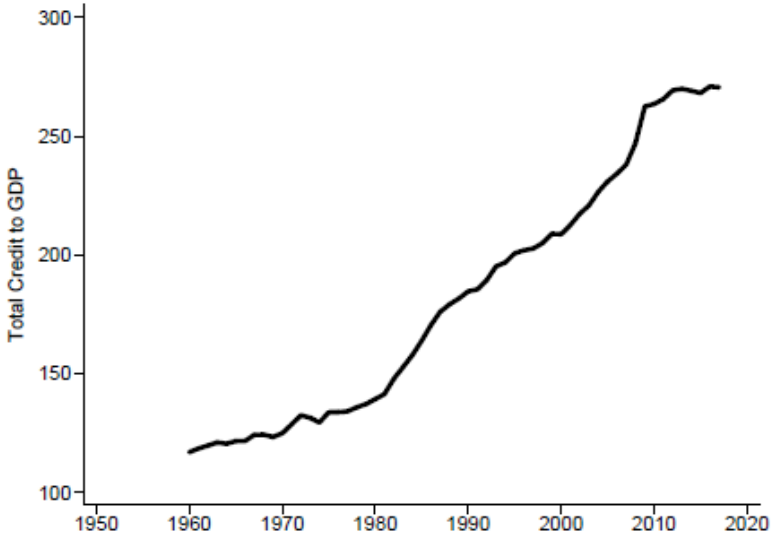
- Today we focused on the “demand side” – how inequality, via consumption-saving decisions, impacts determination of long-run interest rate and debt to GDP, shapes (and constrains) monetary and fiscal policies
- We took the “supply side” as given – but falling rates should be expansive, why has investment not exploded (e.g. see Liu, Mian and Sufi Ectma 2022)? What is the impact on asset prices, and the Q theory of investment?
- What about feedback effects of long-run debt and interest rate to inequality and mobility?

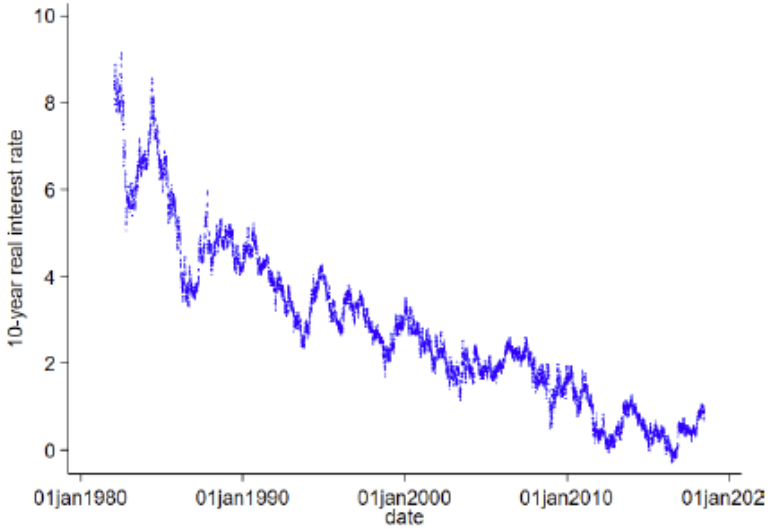
- What are the consequences of long-run credit expansion?



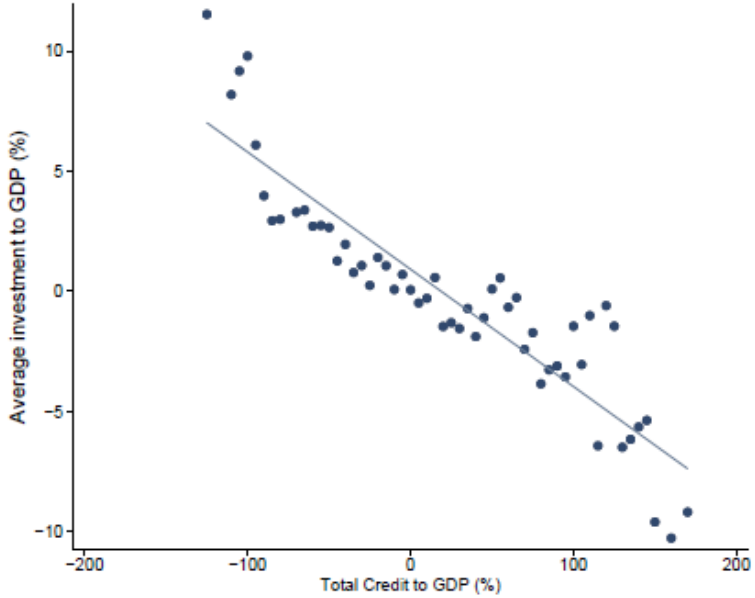
# Macro-Finance and the long-run

- Huge rise in quantity and large fall in price of credit since about 1980. Why did this happen? What are its consequences?



- Is credit financing the supply-side of the economy?

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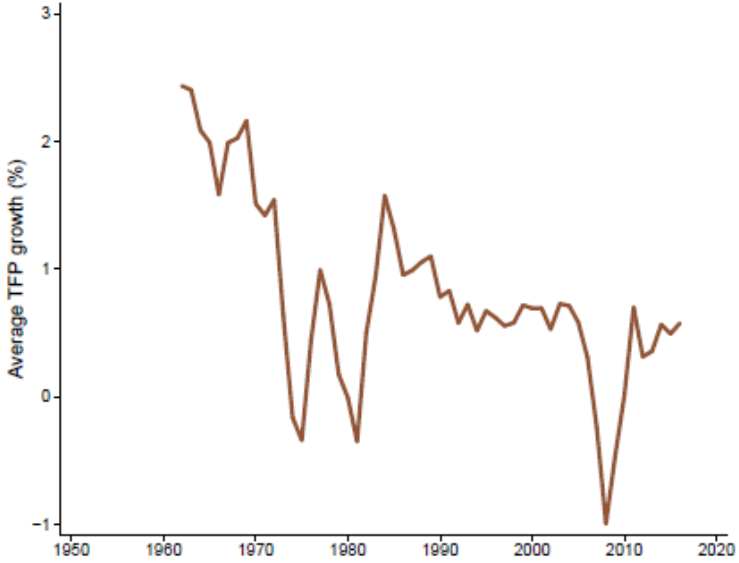
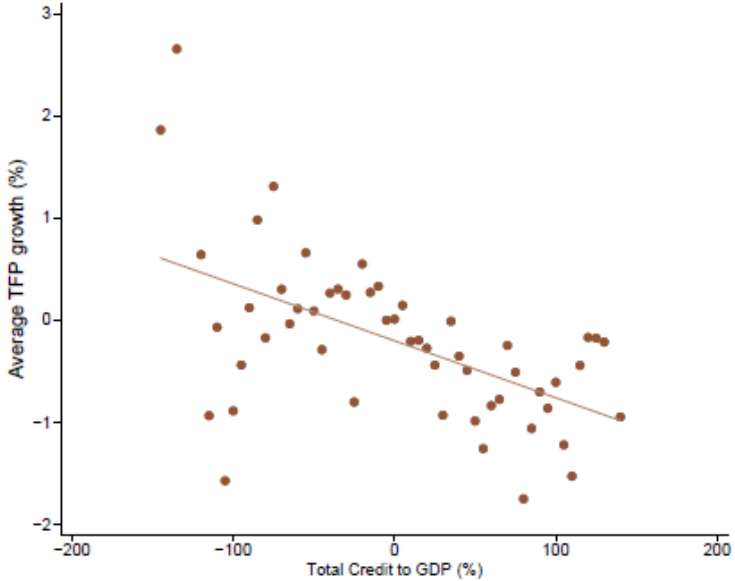
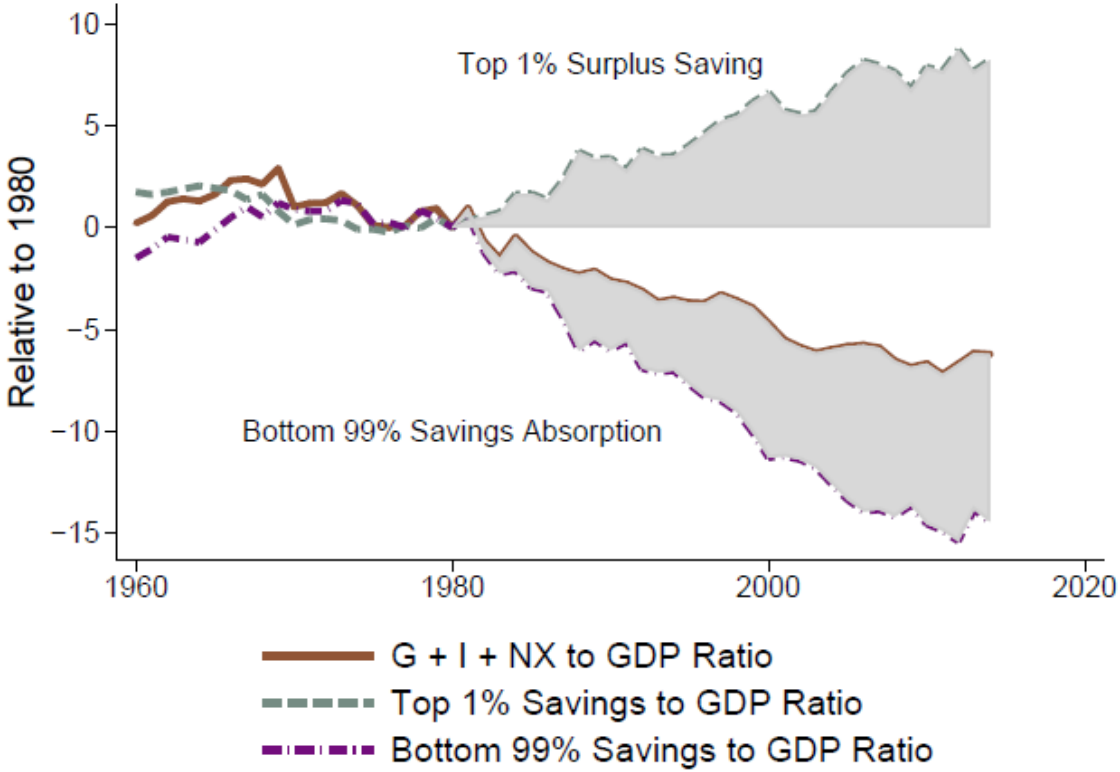
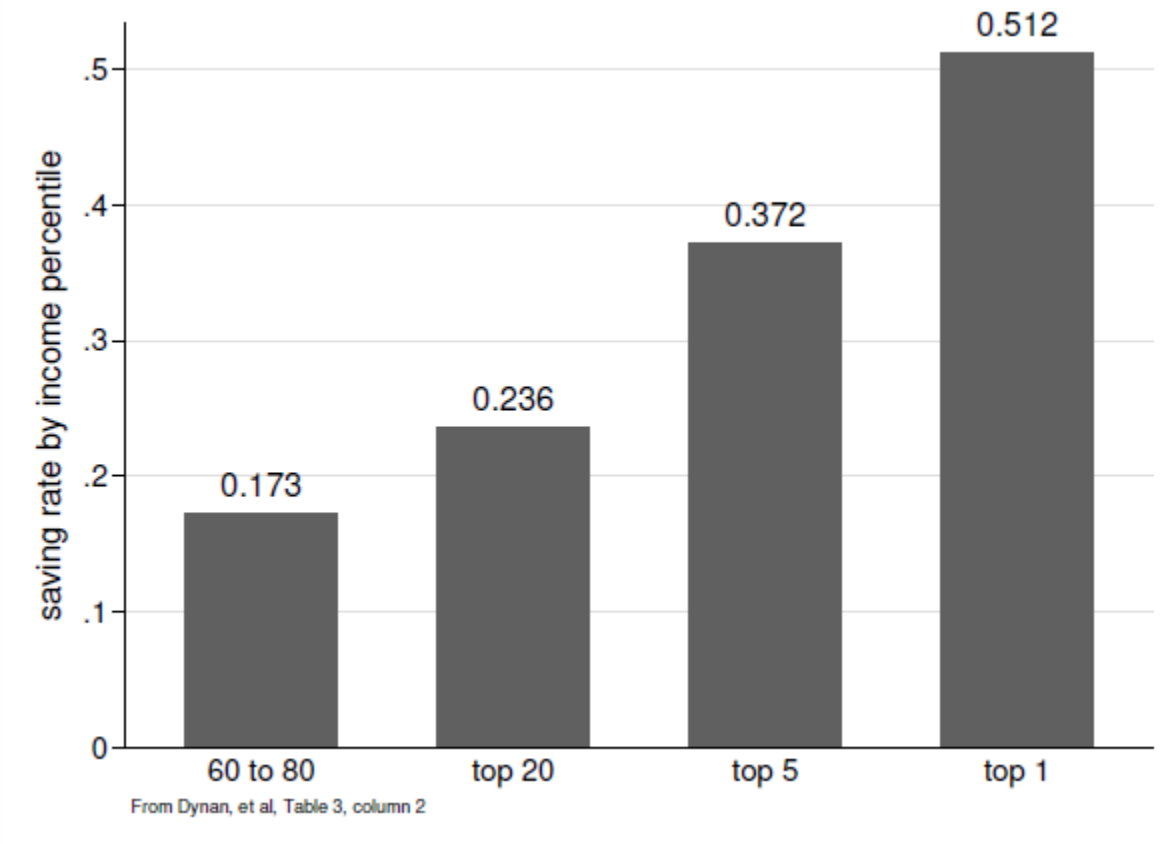


- Where is long-run credit expansion coming from?



# Fact: The rich save more out of *lifetime* income



# Household problem

- Fraction $1-\mu$ savers solve (de-trended) problem

$$\max_{\{c_t, b_t\}} \int_0^\infty e^{-\rho t} \{\log c_t + v(b_t)\} dt$$

$$c_t + \dot{b}_t \leq (R_t - G_t) b_t + (1-\mu) y_t - \tau_t$$

- $b_t =$ government debt to potential GDP
- $v(b_t)$ captures convenience benefits of government bonds

  [Krishnamurthy Vissing-Jorgensen 2012, Greenwood Hansen Stein 2015]

  - increasing and concave
- Spenders consume constant share of income $\mu y_t$
- $y_t =$ labor endowment, sold to repr. firm. If rationed, $y_t < 1$

## Government

- Fiscal policy consists of $\{x, b_t, \tau_t\}$ that satisfy

$$x + (R_t - G_t)\, b_t \leq \dot{b}_t + \tau_t$$

$$\text{primary deficit:} \qquad z_t \equiv x - \tau_t$$

- Monetary dominance, natural rate implemented whenever possible

$$R_t = \max\{R_t^*, 0\}$$

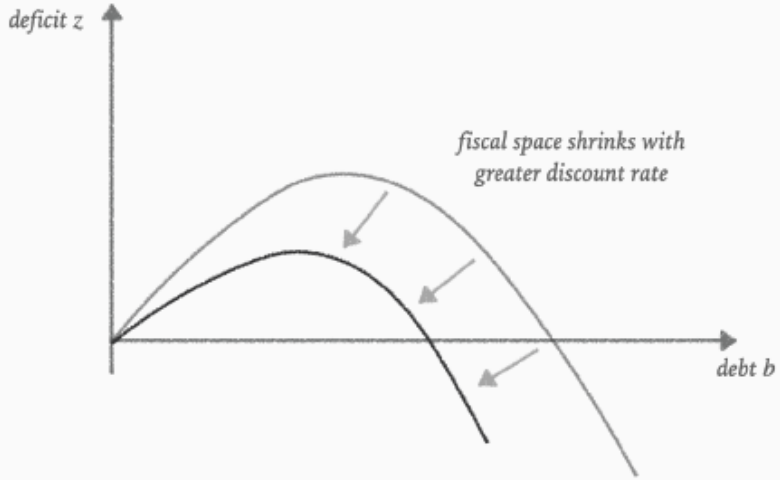
- Simple downward nominal wage rigidity [easily generalized]

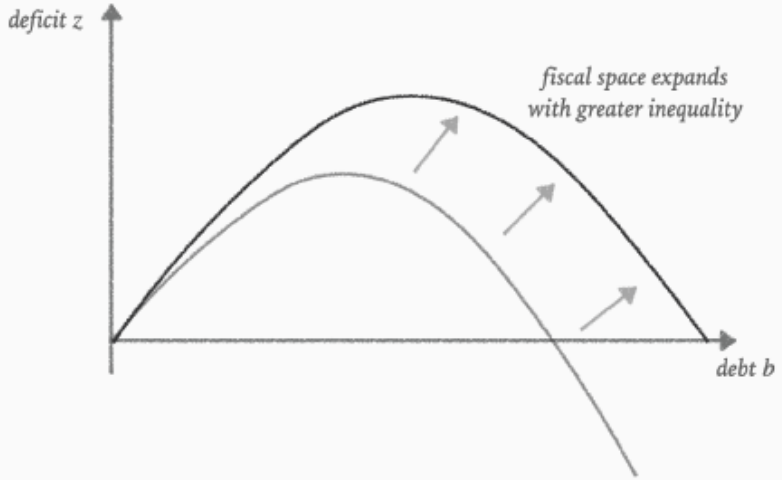
$$\pi_t = \dot{W}_t / W_t \geq \pi^* - \kappa(1 - y_t)$$

When demand is low, $y_t < 1$ and $\pi_t < \pi^*$

[$\kappa < v'(0)$ avoids Benhabib Schmitt-Grohe Uribe (2001) issues, as in Michaillat Saez (2019)]

# What determines fiscal space?




- Fiscal space shrinks with greater discount rate $\rho$
  - more “aggregate demand” shrinks fiscal space
- Fiscal space rises with greater inequality $1 - \mu$
  - conflict between large deficit-financed programs and reducing inequality?