The historical evolution of the wealth distribution: A quantitative-theoretic investigation

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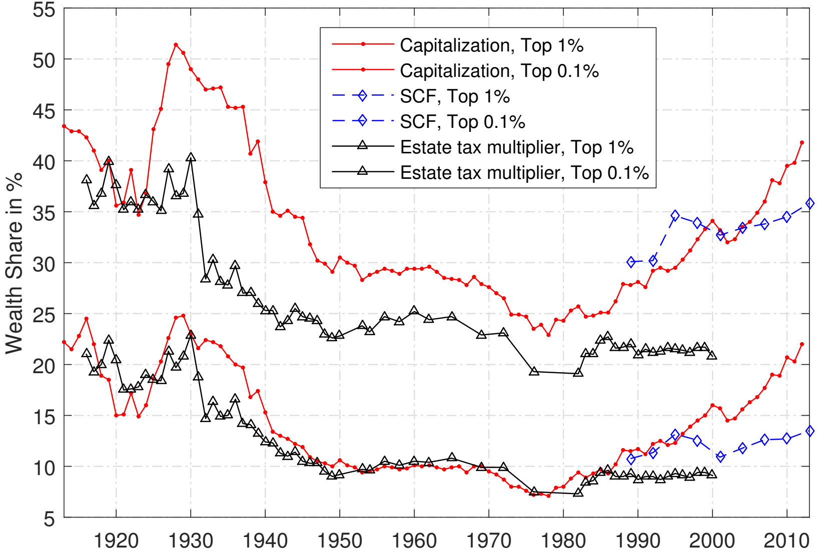
Evolution of top wealth inequality (Kopczuk 2015)



Overview: objective

- calibrate a quantitative macro model that accounts for the full US wealth distribution, including the Pareto tail
- study the transition path: starting in the 1960s, feeding in observed changes in earnings inequality and tax rates
- can the standard macro-inequality framework explain movements in the wealth distribution?

Overview: findings

- model is partially successful in explaining the evolution of the wealth distribution
  - magnitude of increase in inequality explained for bulk of distribution
  - misses speed of changes at the very top and short-run dynamics
- active channels:
  - decreasing tax progressivity has a dramatic effect on the wealth distribution
  - increase in idiosyncratic labor income risk has in general a dampening effect on wealth inequality via the precautionary savings channel (vanishes at the top)
  - changes in $r - g$ not important, partly working in the opposite direction
- cautious prediction for 21st century: long-term effects of decreasing tax progressivity on wealth inequality

Trends in wealth inequality: recent literature

- Data: Saez and Zucman (2015); Kopczuk; Bricker, Henriques, Krimmel, and Sabelhaus (2016).
- Models of Pareto tails: Piketty and Zucman (2015); Benhabib, Bisin, and Luo (2015); Nirei and Aoki (2015).
- Models of transitions: Kaymak and Poschke (2016); Gabaix, Lasry, Lions, and Moll (2016).

Quantitative model

- Aiyagari '94 framework:
  - log labor income as sum of persistent and transitory component; adjusted at the top to match the observed Pareto tail in labor income
  - transitory component incorporates zero earnings state
  - stochastic discount factor follows AR1 process (Krusell-Smith '98 extended)
  - stochastic i.i.d. return on capital
  - progressive taxation: use data on federal effective tax rates for 11 income brackets (Piketty & Saez 2007)
  - parsimonious modeling of social safety net: 60% of tax revenues rebated as lump-sum transfers
- time-varying tax system and labor income process

The consumer's problem

$$V_t(x_t, p_t, \beta_t) = \max_{a_{t+1} \geq \underline{a}} \{u(x_t - a_{t+1}) + \beta_t \mathbb{E}[V_{t+1}(x_{t+1}, p_{t+1}, \beta_{t+1}) | p_t, \beta_t]\} \tag{1}$$

$$\text{subject to } x_{t+1} = a_{t+1} + y_{t+1} - \tau_{t+1}(y_{t+1}) + T_{t+1} \tag{2}$$

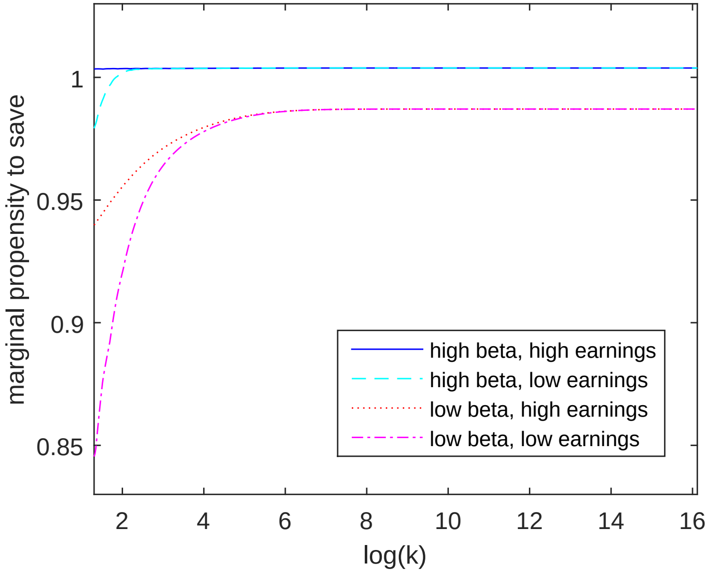
$$y_{t+1} = r_{t+1}\eta_{t+1}a_{t+1} + w_{t+1}l_{t+1}(p_{t+1}, \nu_{t+1}) \tag{3}$$

x_t cash on hand
p_t persistent component of earnings process
$l_{t+1}(\cdot, \cdot)$ efficiency units of labor, moves over time
ν_{t+1} transitory earnings shock
η_{t+1} return to capital shock
$\tau_t(y_t)$ tax function based on gross income, moves over time
T_t lump-sum transfer

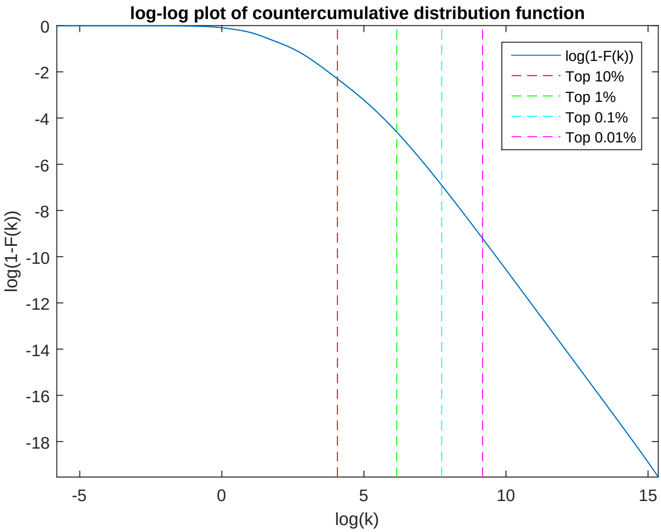
Main qualitative mechanism

- stochastic-β alone generates a Pareto tail in the wealth distribution
  - add stochastic return to capital and Pareto tail in labor income to improve quantitative properties of the model
  - Pareto tail in labor income alone would be inherited by wealth distribution, but tail coefficient would be too high (top inequality inequality too low)
- follows from random growth theory (Kesten 1973, see also Gabaix 2009)
  - mechanism has been employed by Benhabib, Bisin and Zhu (2011), Nirei & Aoki (2015), Piketty & Zucman (2015)
- main alternative calibration (Castañeda, Días-Giménez, Ríos-Rull 2003) cannot deliver this Pareto tail

Stochastic-β yields stochastic, linear savings decisions



Gives rise to a Pareto tail in the wealth distribution



Calibration strategy

- earnings process, tax rates, social safety net calibrated to observables
- randomness in discount factor and return to capital calibrated to replicate the wealth distribution in the initial steady state (1960s)
- focus on tail coefficient alone misleading: even if say the richest 10% can be described exactly by a Pareto distribution, the shape parameter only tells us how wealth is distributed *within* these 10%, not how much wealth the top 10% control as a fraction of total wealth

Calibration: stochastic-β and r

Stochastic-β:

- follows AR(1) process
- $\mu = 0.92$, $\rho = 0.992$, $\sigma = 0.0019$
- i.e in cross-section, standard deviation $= 0.0148$
- i.e. over 50 years, mean reversion is $1/3$

Stochastic Return to Capital:

- pre-tax return $(1 + r_t \eta_t)$
- $\eta_t \sim^{i.i.d} N(1, 0.725)$
- i.e. in steady state, standard deviation of 0.048 or 90% have return $(1 + r^\star \eta_t) \in [0.9874, 1.1437]$
- Fagereng, Guiso, Malacrino & Pistaferri (2016) find a standard deviation of 0.04 in Norwegian data

Matching the wealth distribution

US Wealth distribution in 1967:

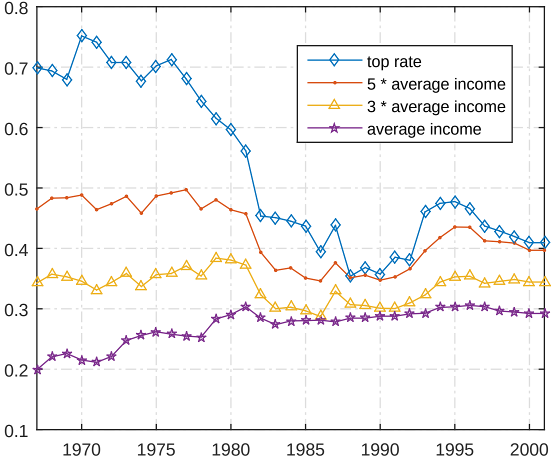
	Top 10% Share	Top 1%	Top 0.1%	Top 0.01%
Data*	70.8%	27.8%	9.4%	3.1%
Model	70.6%	28.1%	9.5%	2.9%
	fraction w negative wealth	Bottom 50% share		
Data*	8.0%	4.0 %		
Model	7.0%	3.1 %		

(* Top wealth shares (capitalization): Saez & Zucman, 2014; bottom 50% share (SCF): Kennickell, 2012)

- model matches wealth distribution well on its entire domain

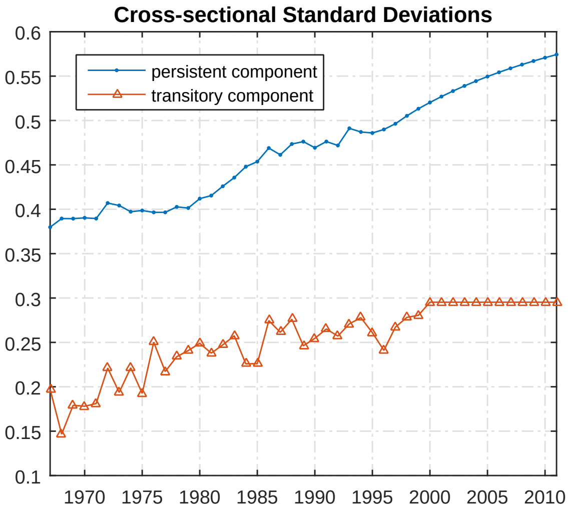
Observed change 1: decrease in tax progressivity

- federal effective tax rates (Piketty & Saez 2007): income, payroll, corporate and estate taxes



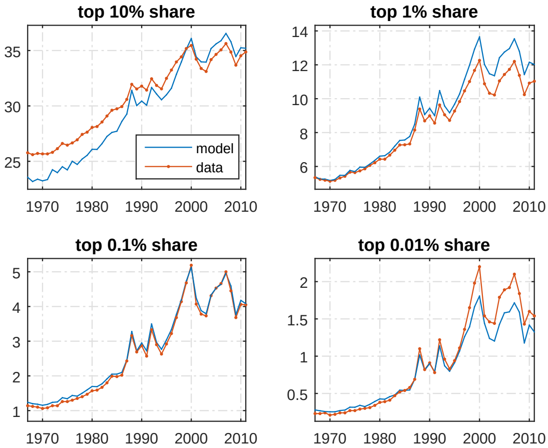
Observed change 2: increase in labor income risk

- estimates for variance of persistent and temporary components 1967-2000 (Heathcote, Storesletten & Violante 2010)

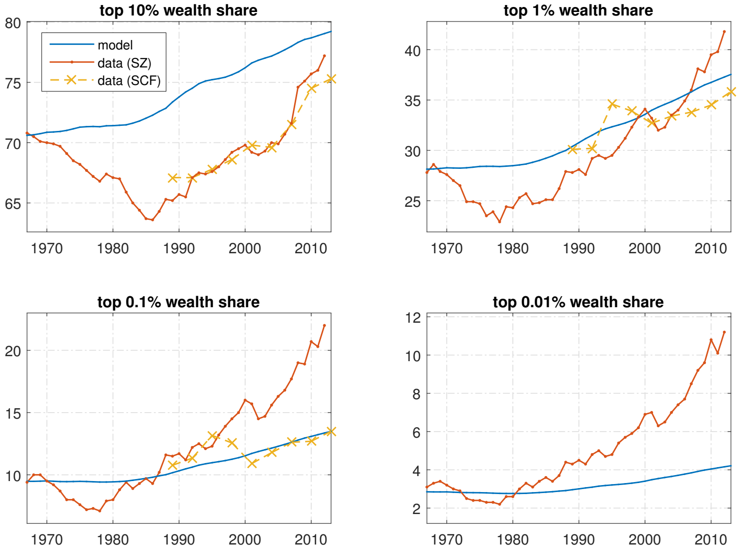


Observed change 3: increase in top labor income shares

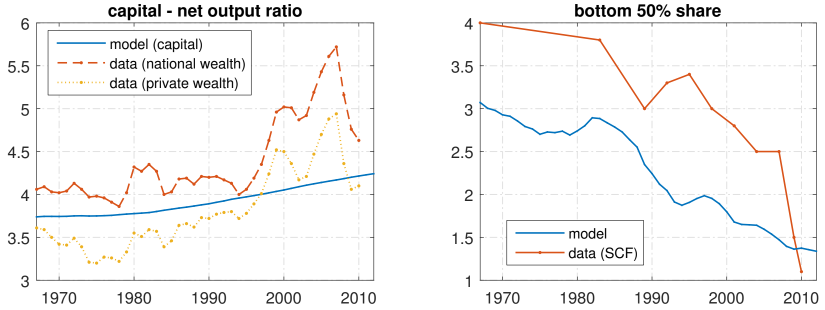
- adjust standard AR1 in idiosyncratic productivity by imposing a Pareto tail for the top 10 % earners: calibrated tail coefficient decreases from 2.8 to 1.9 (Piketty & Saez, 2003 [updated series -2011])



Main result: evolution of top wealth shares



Other statistics



- captures dynamics of capital stock (but capital $\neq$ wealth) and share of wealth held by asset-poor

Summary of transitional dynamics

- model captures the salient features of the evolution of the US wealth distribution
- perfect foresight assumption does not seem to be critical (myopic transition)
- robust to CES production function with elasticity > 1 (CES)
- shortcomings:
  - miss on short-run dynamics (heterogeneous portfolios and valuation effects?)
  - explosion of wealth concentration at the very top (0.1% and above) as measured by Saez & Zucman (2014) not explained well

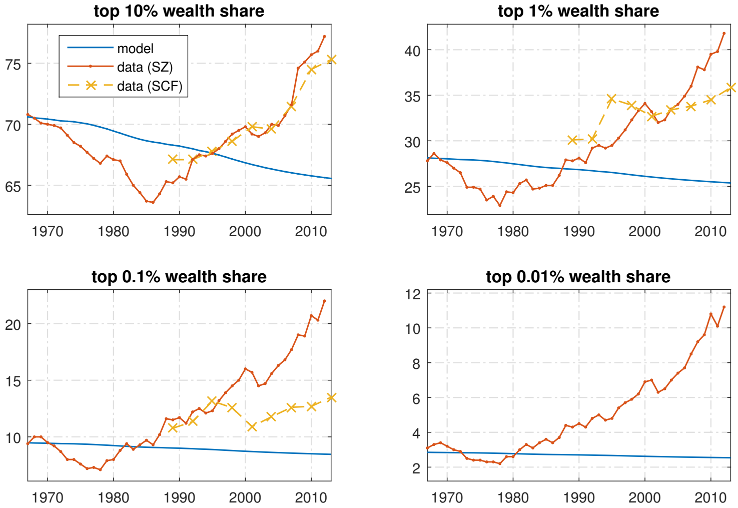
Main channels

- what fraction of the increase in the top wealth shares do the three channels account for?

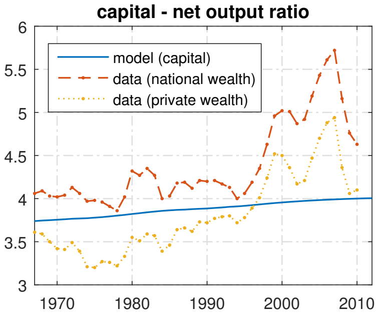
	Earnings Risk	Top Earnings	Taxes	Combined
Top 10 %	−0.78	0.22	1.89	1.32
Top 1 %	−0.19	0.05	0.82	0.65

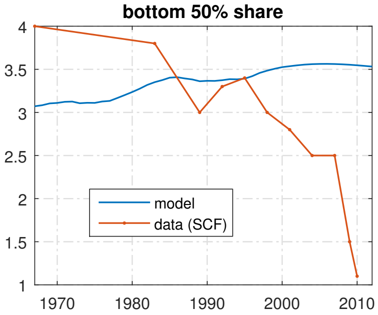
- larger earnings risk induces higher precautionary savings (vanishes for the rich), depressing the interest rate and thus increasing the Pareto tail coefficient (i.e. decreasing top wealth inequality)
- in general equilibrium, the average tax level does not matter much for wealth inequality, but changing progressivity has a large effect

Only Changes in Earnings Risk I

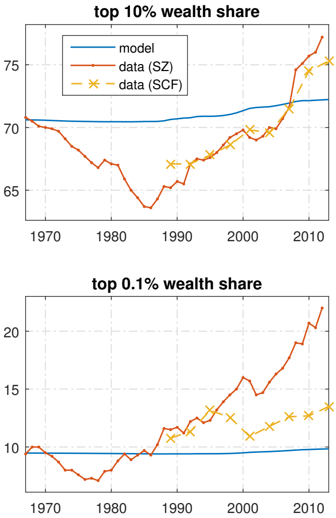


Only Changes in Earnings Risk II





Only Changes in Top Earnings Shares I



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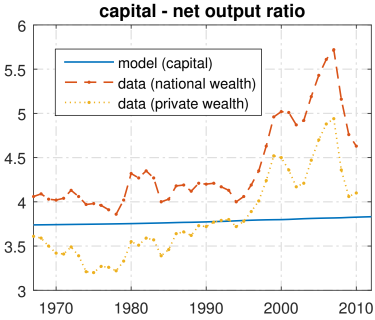
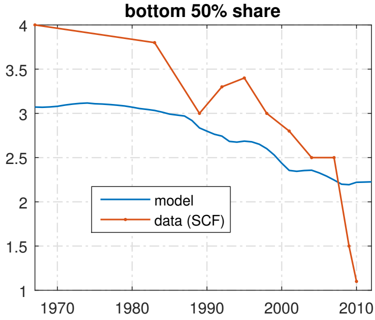
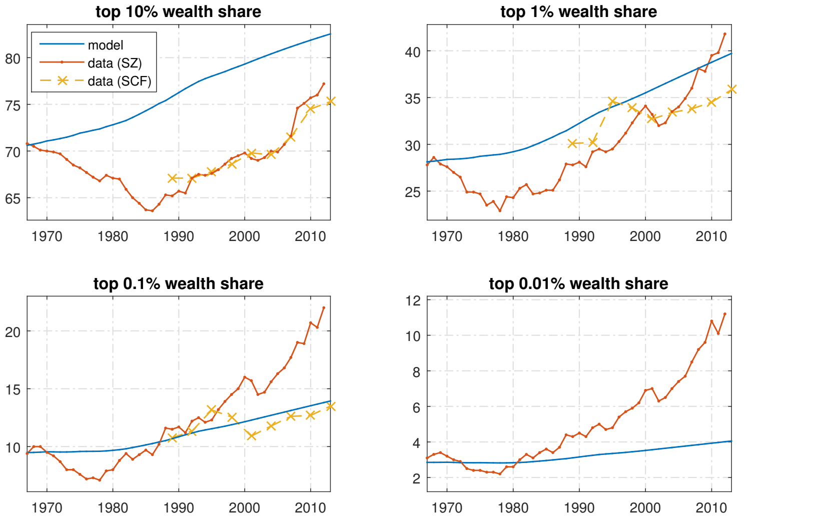
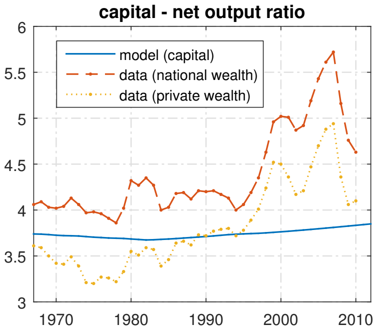


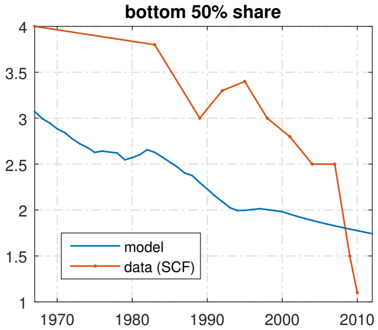


Only Changes in Taxes I

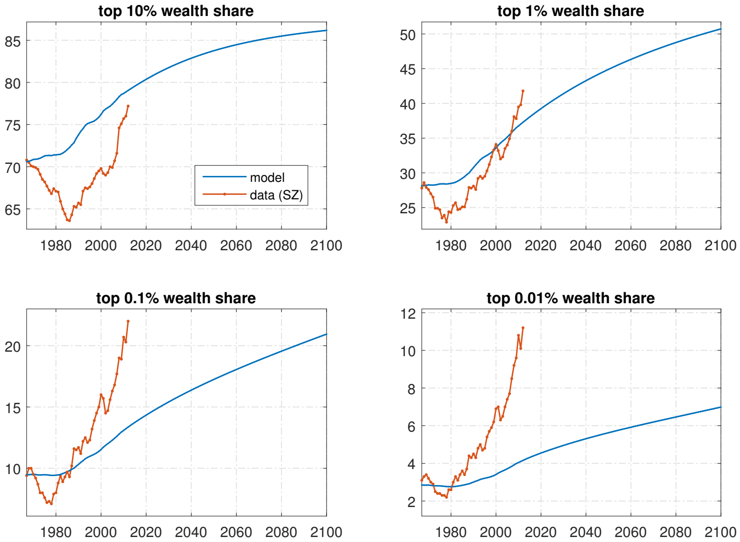


Only Changes in Taxes II





Capital in the 21st century?



- long-run effects of decrease in tax progressivity

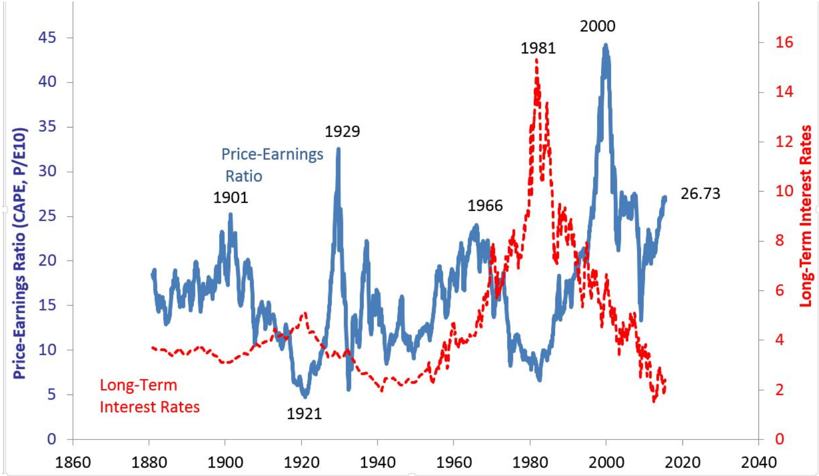
Other channels: what about $r - g$?

- increase in $r - g$ *decreases* wealth inequality in the medium run (a few decades)
- Pareto tail coefficient decreases (i.e., top wealth inequality increases), but very slowly ▸ r-g graphs
- more important in short-run: low-asset agents' savings decisions more elastic w.r.t. the interest rate
- random growth models generally feature slow transitions, it takes long to fill a thick long tail (see Gabaix, Lasry, Lions, and Moll [2015])

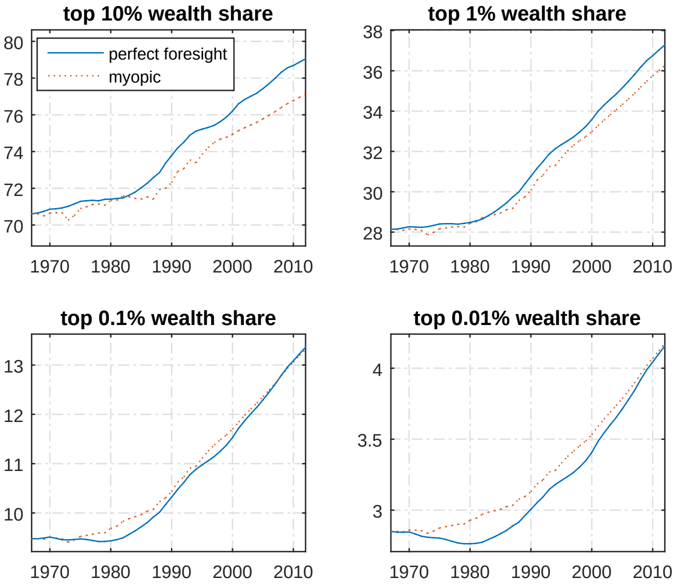
Conclusion: where next?

- speed of changes at the very top hard to match
- asset price movements and portfolio choice?
  - why are portfolios heterogeneous?
  - why are asset prices moving that much? (outside the scope of our model - ▸ What would Shiller say?)

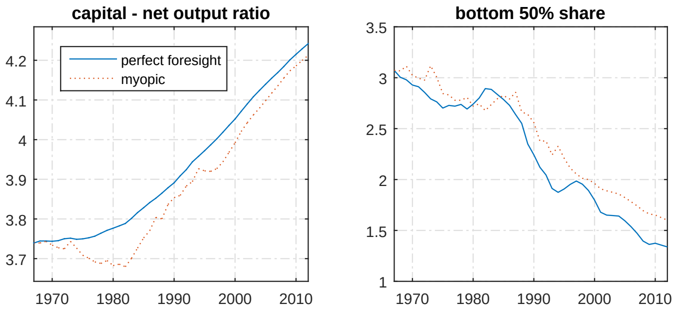
Price-earnings ratio (Shiller) ‣ return



Perfect foresight vs myopic transition I [return]

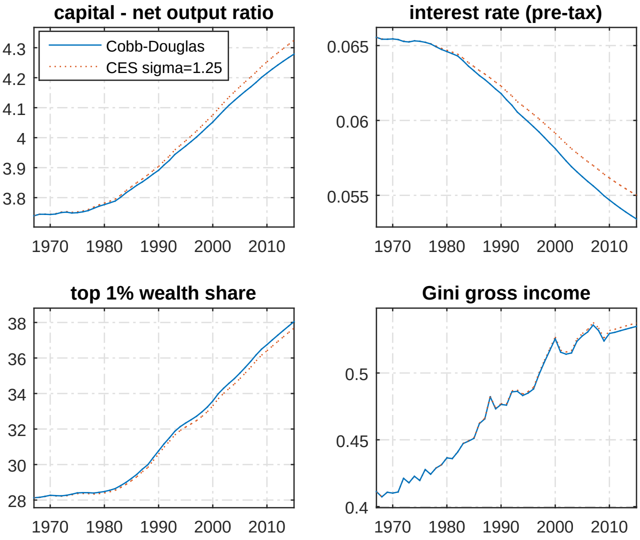


Perfect foresight vs myopic transition II ▸ return



CES with elasticity of substitution > 1 ▸ return

- $\sigma = 1.25$ (Karabarbounis and Neiman, 2014)



$r - g$? ▸ return

- model increase in $r - g$ as temporary 50% - increase in interest rate
- partial equilibrium, holding wage and transfers constant

$r - g$ experiment

return