

“Wealth Distribution and Monetary Policy”

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Introduction

How does wealth inequality shape the transmission of monetary policy to household consumption?

- Existing literature emphasize the role of low-liquidity households.
- In advanced economies wealth is highly concentrated at the top.
- Macroeconomic impact of top wealth groups?
- Evidence on the responses to monetary policy from Denmark and Norway.
- Implications for the response of aggregate consumption to monetary policy.

Contribution

To quantify the macroeconomic impact of different wealth groups I combine:

- The joint distribution of consumption, income, and wealth in the US.
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 - Income composition and consumption shares.

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- Validate the model with US micro data (SCF and PSID).
 - Income composition and consumption shares.
- Leverage the model to analyze the impact of different wealth groups on
 - Transmission mechanism of monetary policy to aggregate consumption.

Main findings

1. Heterogeneous income and consumption responses across wealth groups:

- Households at the tails of the wealth distribution show the largest responses.

2. Top wealth groups substantially shape aggregate consumption response.

- Top 10% explains more than one-third of the aggregate response.
- Wealthy households benefit from higher equity prices and capital gains.
- Have low MPCs but sizable consumption shares.

3. Wealth distribution matter in the propagation of monetary policy (MP):

- In HANK framework changes in the wealth distribution amplify MP effects.

Literature

- Quantitative work on monetary policy and household heterogeneity: Kaplan, Moll, and Violante (2018), Gornemann, Kuester, and Nakajima (2021), Lee (2021), Wolf (2021).
- Literature on wealth inequality: Castañeda, Díaz-Giménez, and Ríos-Rull (2003), Poschke, Kaymak, and Leung (2021).
- Empirical evidence on heterogeneous effects of monetary policy: Amberg, Jansson, Klein, and Rogantini Picco (2022), Andersen, Johannesen, Jorgensen, and Peydró (2021), Chang and Schorfheide (2022), Slacaleky, Tristani, and Violante (2020), Holm, Paul, and Tischbirek (2021)).

Literature

- Interactions between inequality and monetary policy: Bilbiie, Kanzig, and Surico (2019), Auclert (2019), Melcangi and Sterk (2020), Luetticke (2021), Kekre and Lenel (2022), Bayer, Luetticke, Pham-Dao, and Tjaden (2019).
- Heterogeneous Agents and the macroeconomy: Alves, Kaplan, Moll, and Violante (2020), Debortoli and Galì (2022), Bilbiie (2021).

Model

Households

- Let ψ_t be the cross-sectional distribution over the state space X .
- Markets are incomplete, given states $x = (a, e)$ households solve

$$\begin{aligned} \max_{(c_t)} \quad & \mathbb{E}_0 \int_0^\infty e^{-\rho t} u(c_t, n_t) dt, \\ \text{s.t.} \quad & da_t = (w_t e_t n_t + r_t a_t + d_t - c_t) dt, \\ & a_t \geq -\phi. \end{aligned}$$

- Households trade bonds and accumulate capital.
- Firms' profits D_t are distributed according to $d_t = (e_t / \int_X e_t d\psi_t) D_t$.
- High-income households receive a larger share of profits.

Wage and price rigidities

- Households supply a continuum of labor services (imperfect substitutes).
- Unions set nominal wages by maximizing the average welfare.

$$\pi_{w,t} \left(r_t - \frac{\dot{N}_t}{N_t} \right) = \dot{\pi}_{w,t} + \frac{\epsilon_w}{\Psi_w} \left(\frac{v'(N_t)}{u'(C_t)} - w_t \mu_w^{-1} \right).$$

- Intermediate input producers operate under monopolistic competition.
- Intermediate producers set prices to maximize profits.

$$\pi_t \left(r_t - \frac{\dot{Y}_t}{Y_t} \right) = \dot{\pi}_t + \frac{\epsilon_p}{\Psi_p} (mc_t - \mu_p^{-1}).$$

Financial sector and monetary policy

- The investment fund owns the economy capital stock K_t .
- The fund rents capital to the input producers and invests in new capital.
- Let $\iota_t = I_t/K_t$, the investment problem is

$$V_0 := \max_{\iota_t} \int_0^\infty \left[\exp\left(-\int_0^t r_s ds\right) \left((r_t^k - \iota_t)K_t - \chi_t(\iota_t) \right) \right] dt$$

s.t. $\dot{K}_t = (\iota_t - \delta)K_t$.

- The market value of capital is given by $V_t = q_t K_t$.
- Taylor rule $i_t = r + \phi_\pi \pi_t + v_t$ with an interest rate policy $\{v_t\}$.

Equilibrium

Definition 1. The equilibrium is $(c_t, n_t), (K_t, N_t, Y_t, I_t, C_t, D_t), (r_t, q_t, w_t, \pi_t, \pi_{w,t}) :$

1. Households and unions maximize utility.
2. Firms maximize profits and minimize costs.
3. Markets clear

$$V_t = \int_X a_t d\psi_t,$$
$$N_t = \int_X e_t n_t d\psi_t.$$

4. Monetary policy follows a Taylor rule.
5. The sequence of distributions satisfies aggregate consistency conditions.

Nonlinear system of PDEs solved numerically with global methods.

Parametrization

Calibration

- Two challenges:
 - Match wealth distribution including its Pareto tail.
 - Jointly match aggregate wealth holdings and average MPC.
- To relax this trade-off:
 - Extraordinary earning states as in [Castañeda, Díaz-Giménez, and Ríos-Rull \(2003\)](#), [Poschke, Kaymak, and Leung \(2021\)](#).
 - Calibrate to financial wealth. Alternatives: heterogeneous discount rates, heterogeneous asset returns, two-assets.
- Functional forms: CRRA utility function, Cobb-Douglas production function, quadratic investment, price, and wage adjustment costs.

Calibration

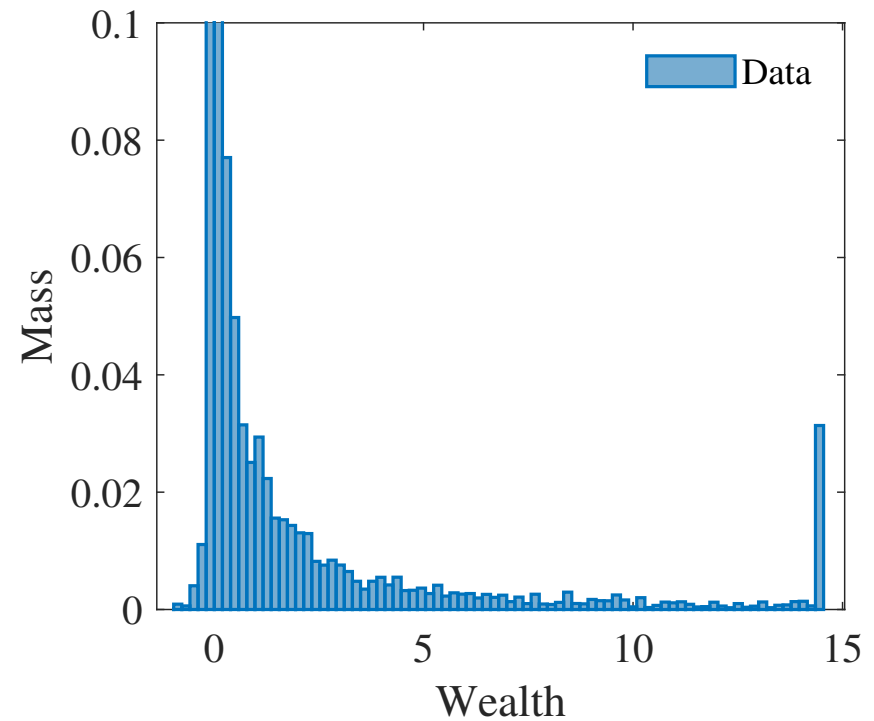
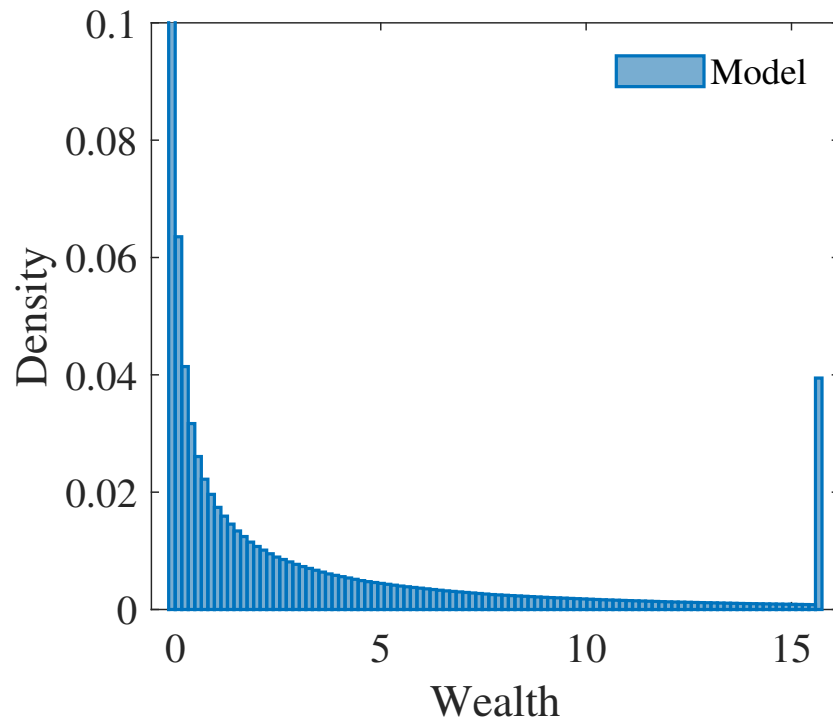
- Externally calibrated: Preferences, production and New Keynesian block.
- Internally calibrated parameters: $\rho, e_1, e_2, \lambda_1, \lambda_2, \theta_1, \kappa$.
- Targeted moments:
 - Wealth-output ratio, aggregate return to wealth.
 - Gini coefficients of earnings and wealth.
 - Top 0,1%,1% earning shares.
 - Overall fraction of low-liquidity households.
 - Peak of real interest rate response.

Model fit

Table 1: Targeted statistics

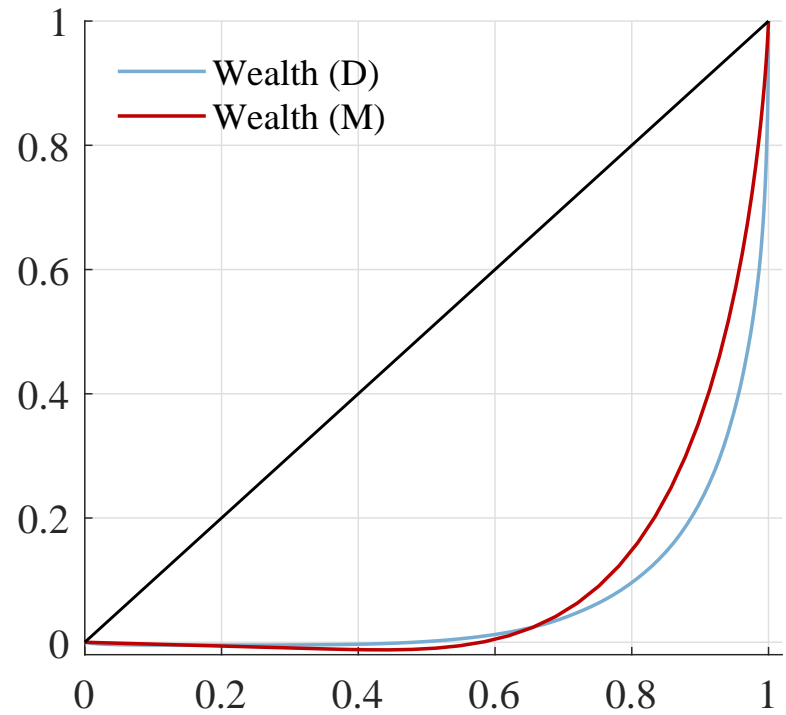
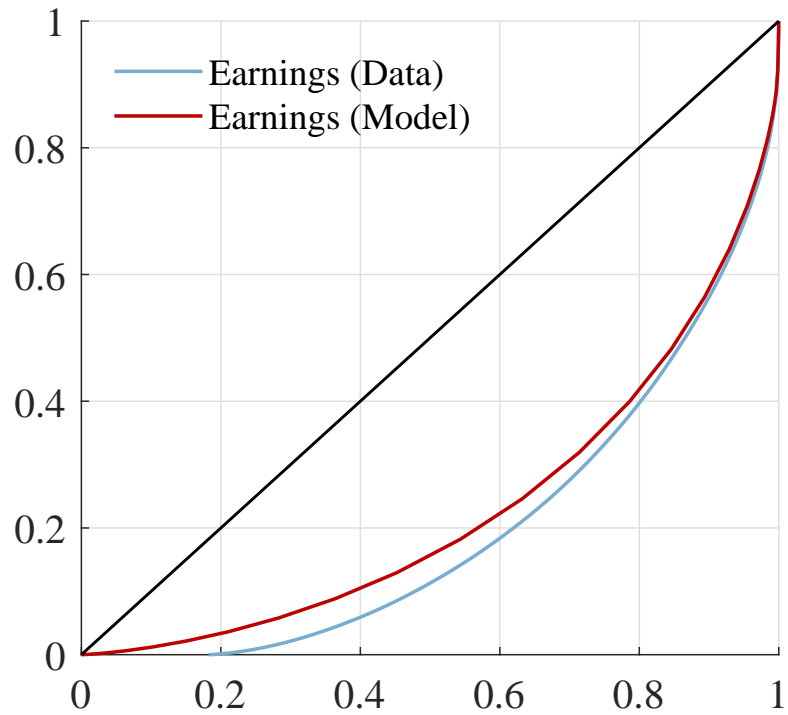
Targeted Statistics	Data	Model
Financial wealth-output ratio	1.42	1.6
Aggregate return on wealth	.065	0.74
Fraction with $a = \phi$	0.3	0.32
Gini wealth	0.87	0.81
Gini earnings	0.59	0.54
Top 0.1% earnings share	6	6
Top 1% earnings share	16	15.5

Wealth Distribution

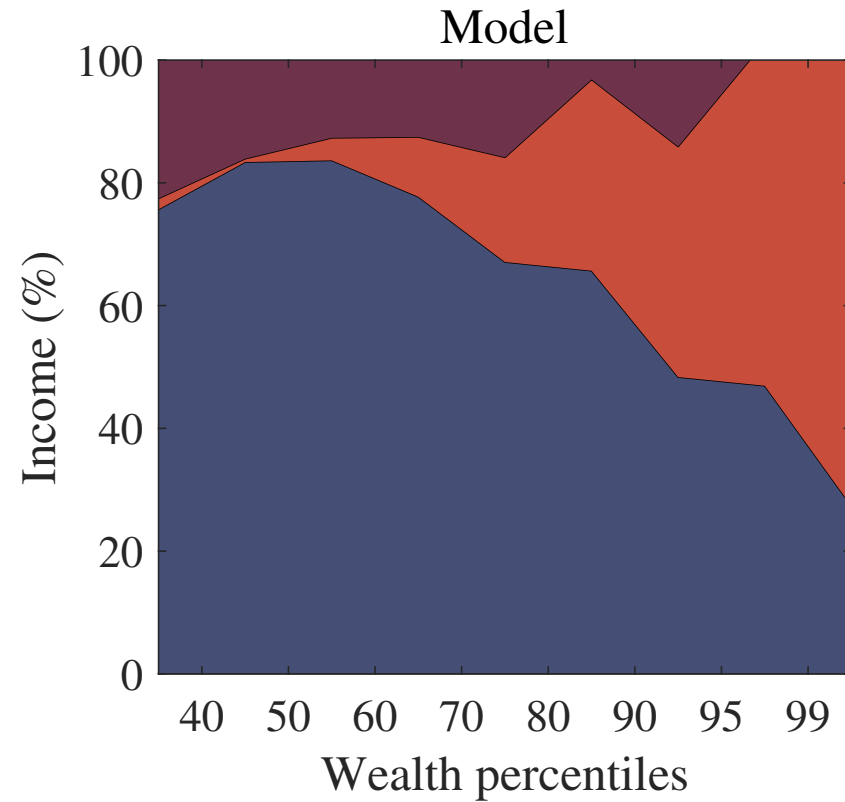
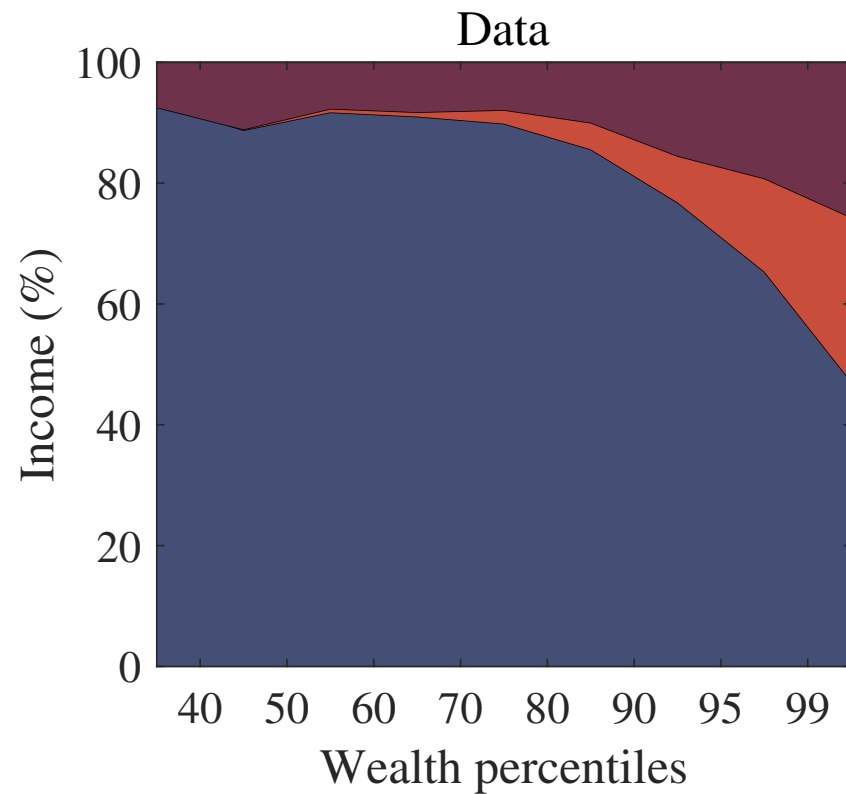


- Mean wealth 2.5 (data) and 2.7 (model), median wealth 0.17 and 0.12.
- 90th percentile 5 and 8, 95th pct 10 and 13, 99th pct 34 and 28.

Marginal distributions

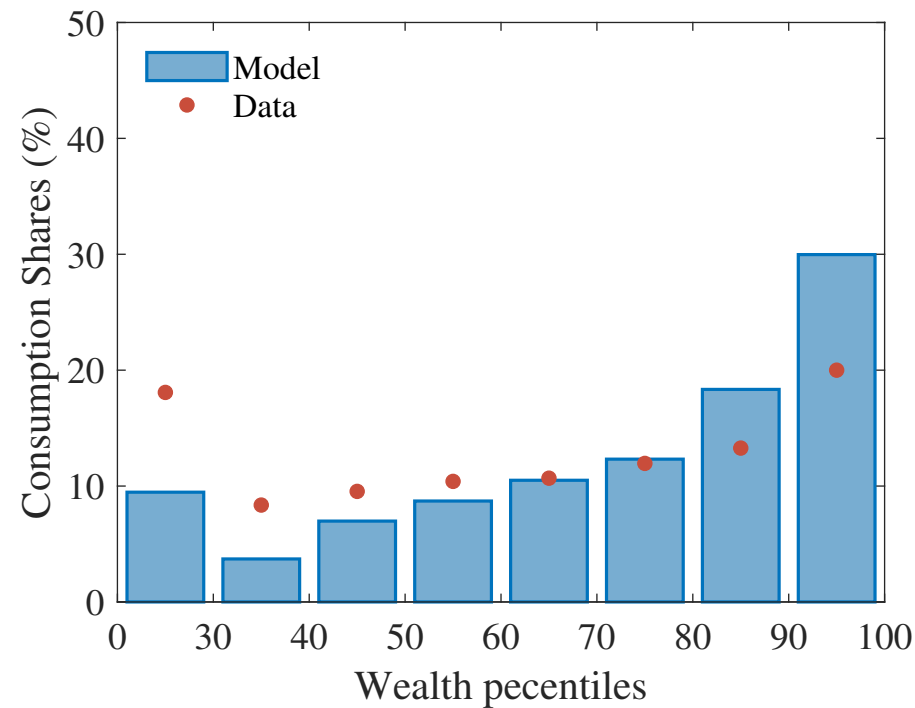


Income composition



■ Labor Income ■ Financial Income ■ Business Income

Consumption shares



- Nondurable consumption and financial wealth from PSID in 2004.
- The model generates increasing shares but overstate consumption at the top.

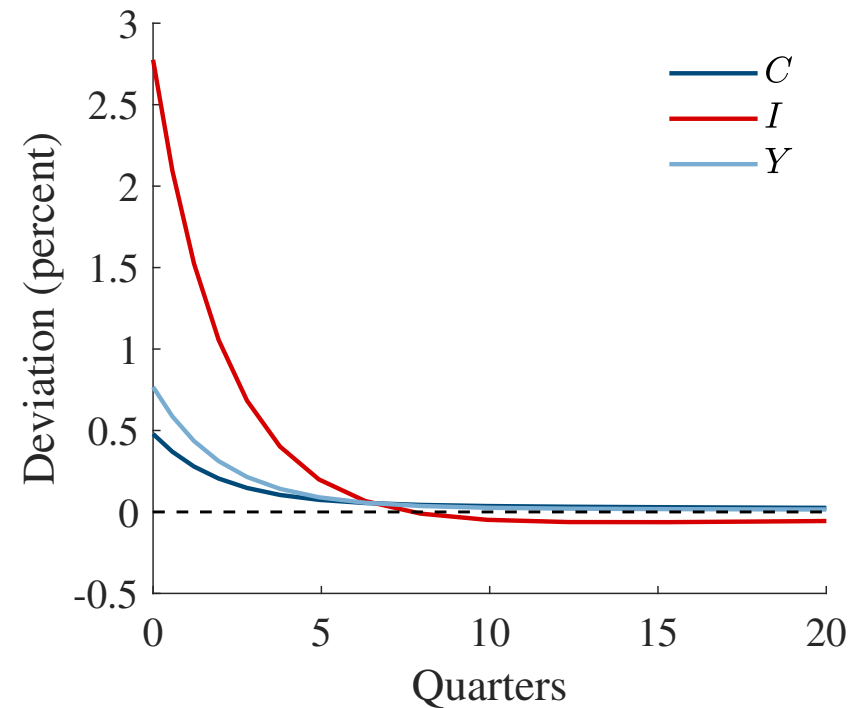
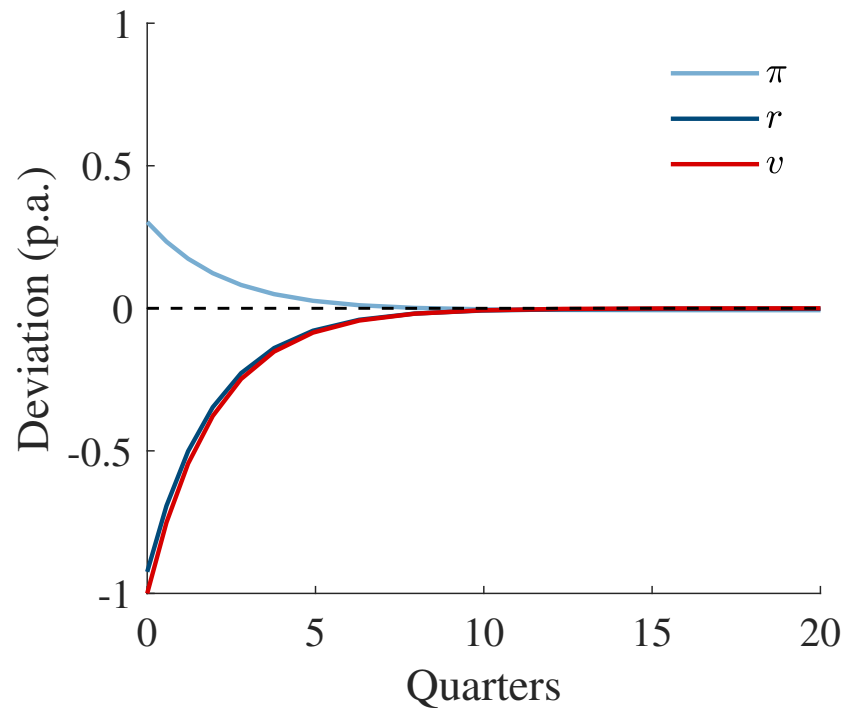
Marginal propensities to consume

- Average fraction of a transfer consumed in a quarter or in a year
 - Empirical benchmark of 15-25% over one quarter out of a \$500 transfer.
 - In the model MPC of 20% over one quarter out of a \$500 transfer.
 - Quantitative HANK models at lower bound of empirical estimates.¹
 - MPC at the top 10% of the wealth distribution is 3%.

¹Respectively Gornemann, Kuester, and Nakajima (2021), Hagedorn, Manovskii, and Mitman (2019), Kaplan, Moll, and Violante (2018) find 15% (Q), 33% (Y), 12% (Q), 40% (Y), and 16% (Q) 33% (Y). These studies typically set a quarterly empirical benchmark 15%-25% out of transfers between \$500 and \$1000 (Parker, Souleles, Johnson, and McClelland (2013), Broda and Parker (2014), Fagereng, Holm, and Natvik (2021)).

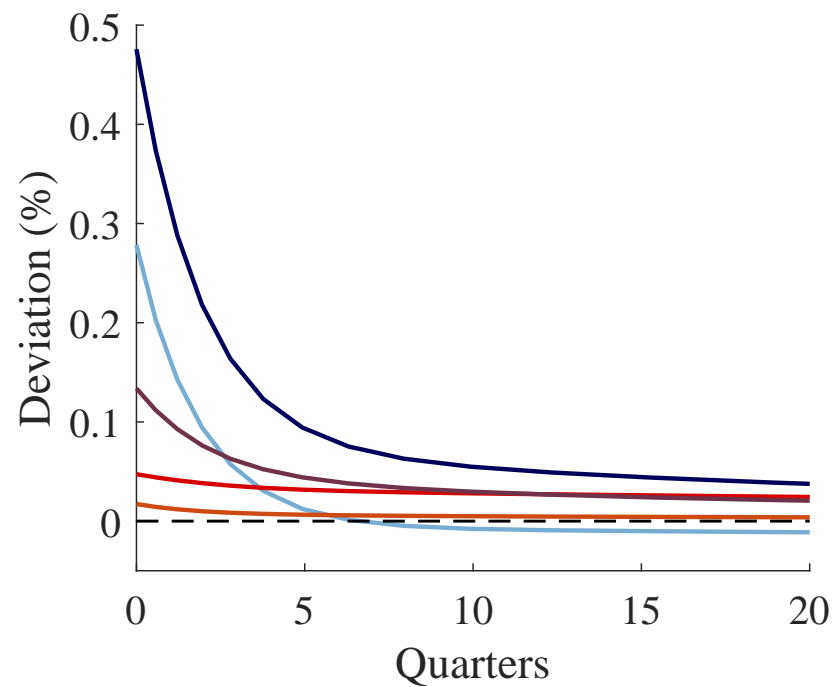
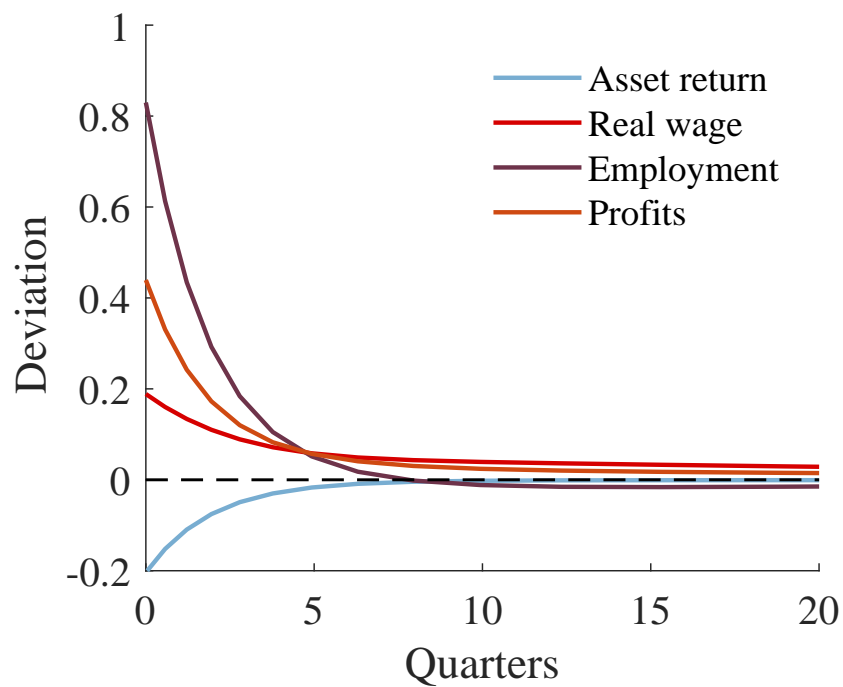
Quantitative Analysis

Macro responses to monetary policy



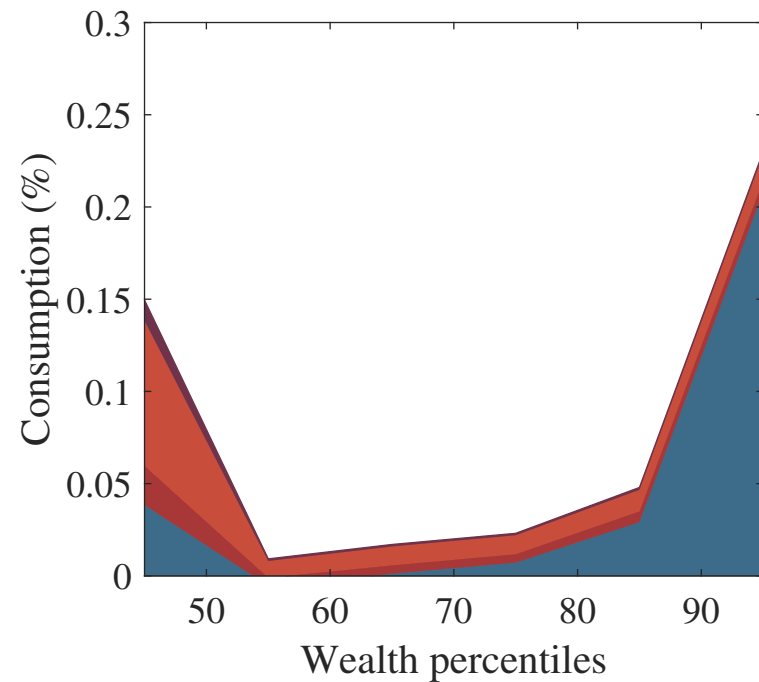
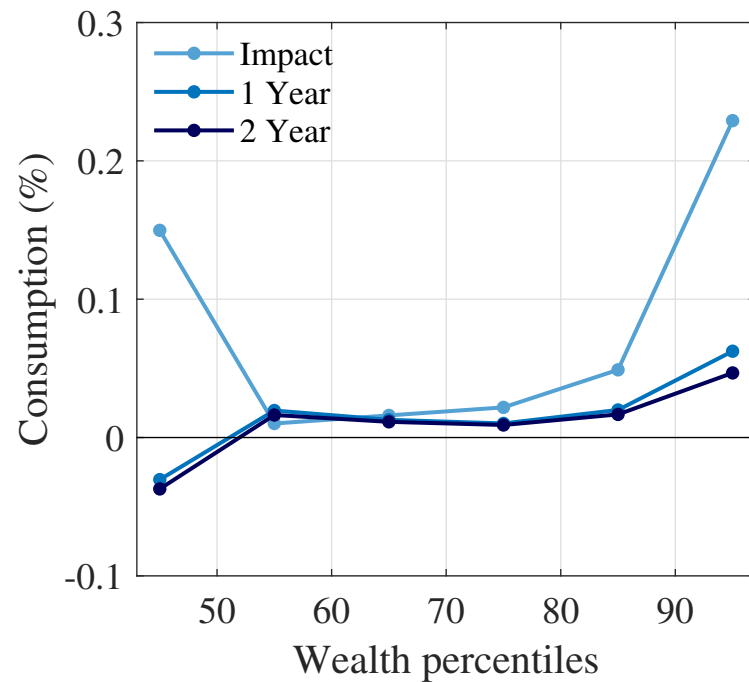
- IRFs to a 25 basis point or 1% annualized interest rate cut.
- Match volatility but overstate magnitudes.

Transmission mechanism



$$dC_t = \int_0^\infty \frac{\partial C_t}{\partial r_s} dr_s ds + \int_0^\infty \left(\frac{\partial C_t}{\partial w_s} dw_s + \frac{\partial C_t}{\partial n_s} dn_s + \frac{\partial C_t}{\partial d_s} dd_s \right) ds.$$

Consumption responses



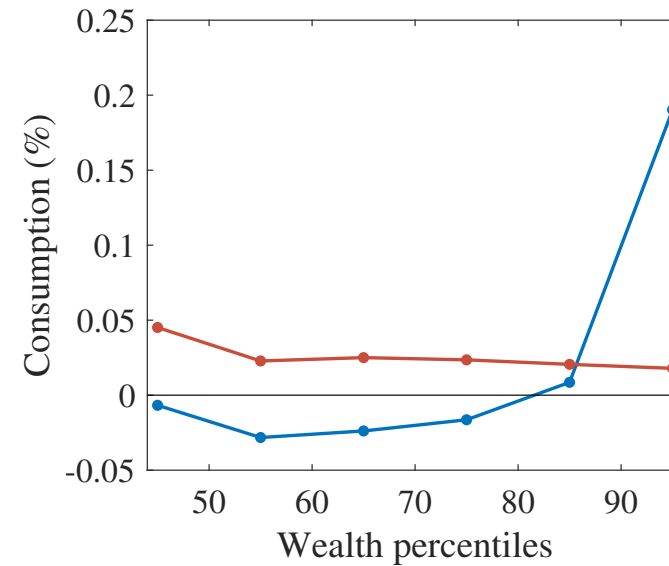
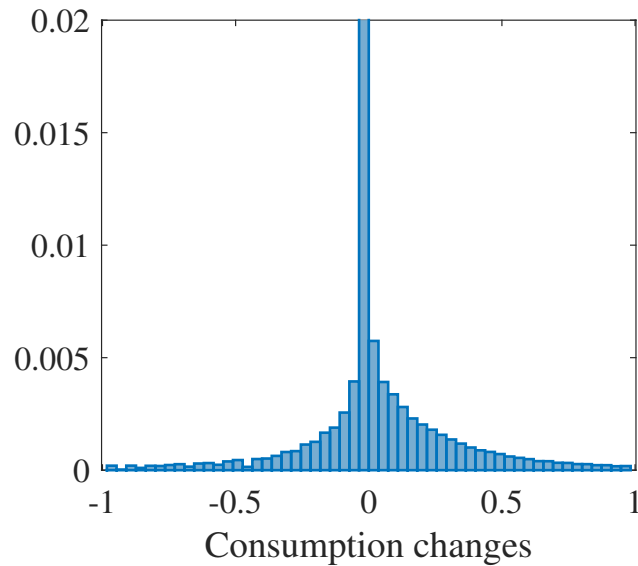
- Households at the top have a strong impact on aggregate consumption.
- The response at the top is 0.16% without the top 1%.

Wealth dynamics

- Consider the consumption response to asset returns $\{r_t\}$.
- On impact higher equity prices leads to capital gains $\uparrow a_t := q_t k_t$.
- Shift the wealth distribution \Rightarrow income and wealth gains.

Consumption response	Total	No capital gains	Amplification
Aggregate consumption	0.27	0.15	0.12
Top 10% consumption	0.21	0.02	0.19

Wealth dynamics



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Inflationary shocks

Inflationary shocks

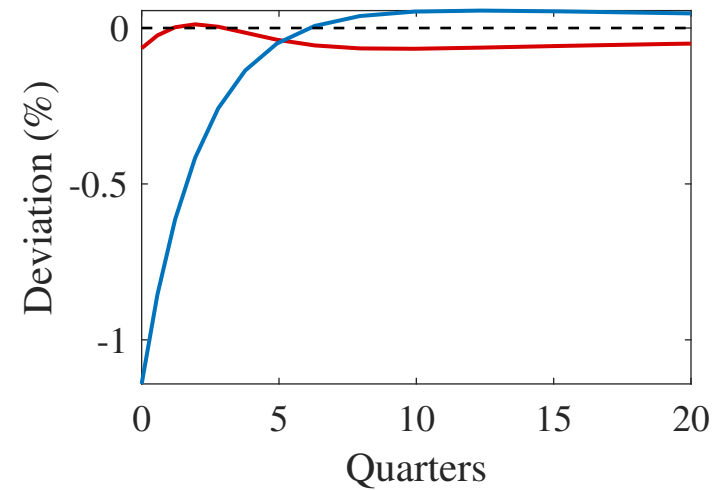
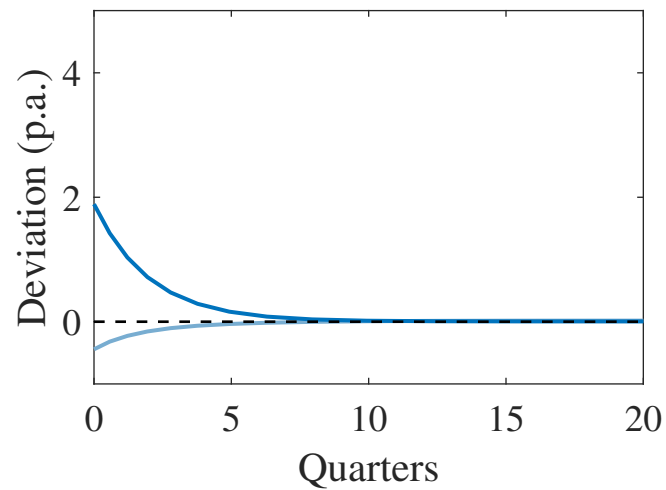
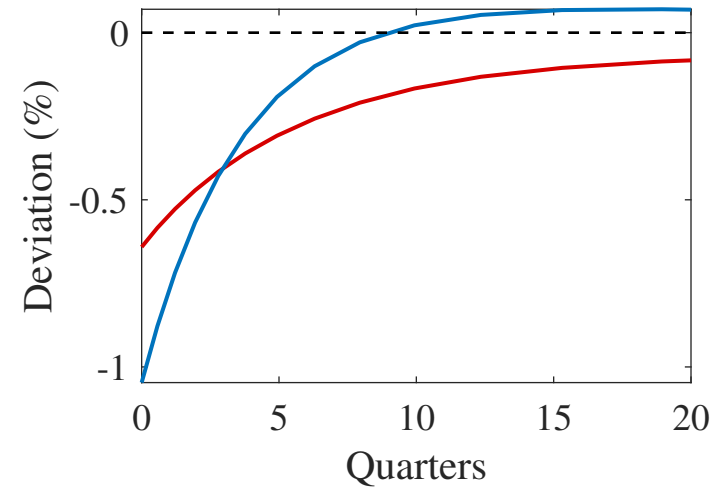
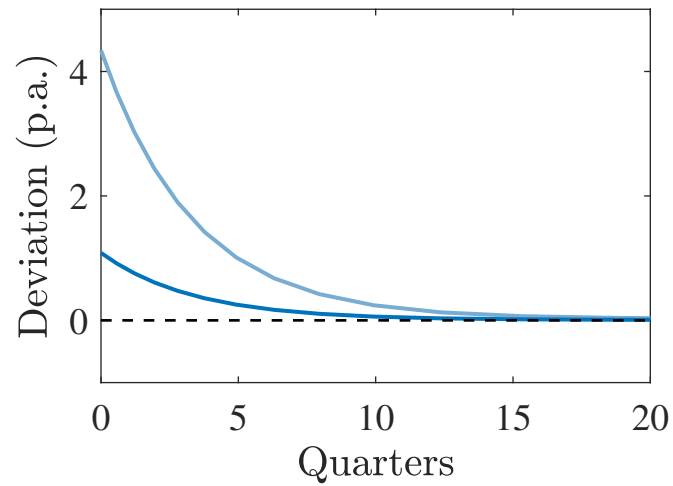
At least part of the return of inflation is attributed to supply shocks

- Supply chain bottlenecks and global trade crisis.
- Shortages of labor, materials, and energy.
- [Amiti, Heise, Karahan, and Şahin \(2022\)](#).

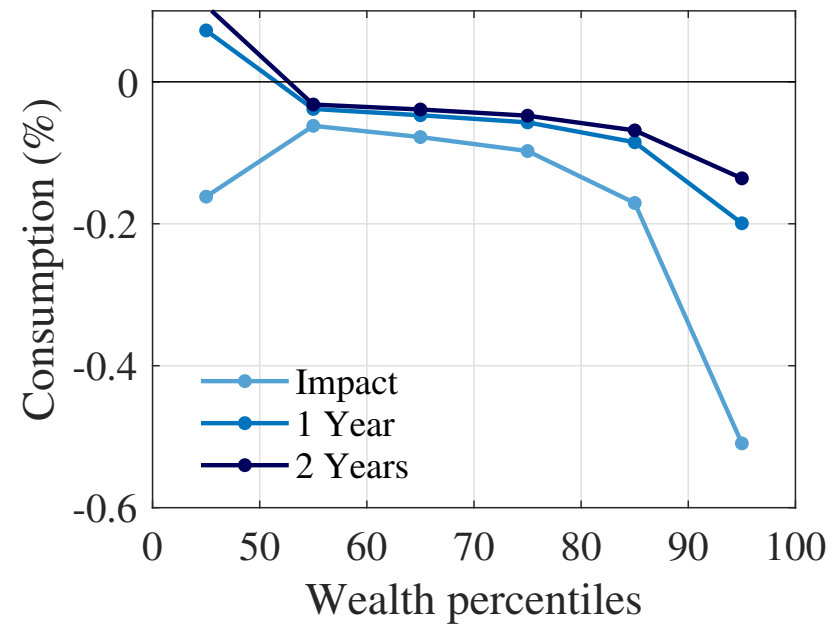
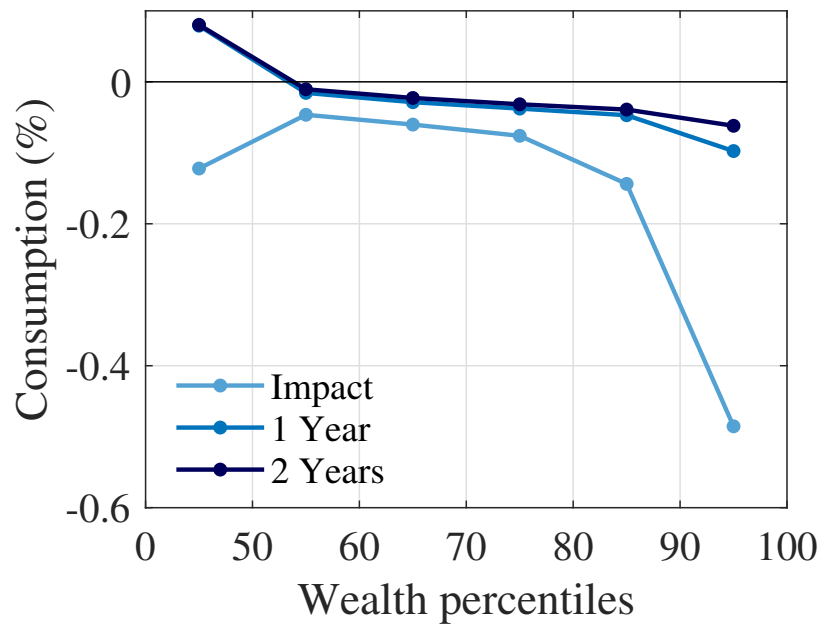
Two important consequences from the 2021 inflation I can study in the model:

- Reduction in real wages in the presence of rigid nominal incomes.
- Reduction in equity prices.

Inflationary shocks



Inflationary shocks



- Macroeconomic shocks with an impact on labor and financial markets.

Conclusion

Main messages:

- Wealth concentration at the top matter for aggregate dynamics:
- Top wealth groups have higher exposure and consumption shares.
- Wealth dynamics amplify the aggregate consumption response.

Extensions:

- Unequal incidence of capital gains.
- Heterogeneous asset returns.

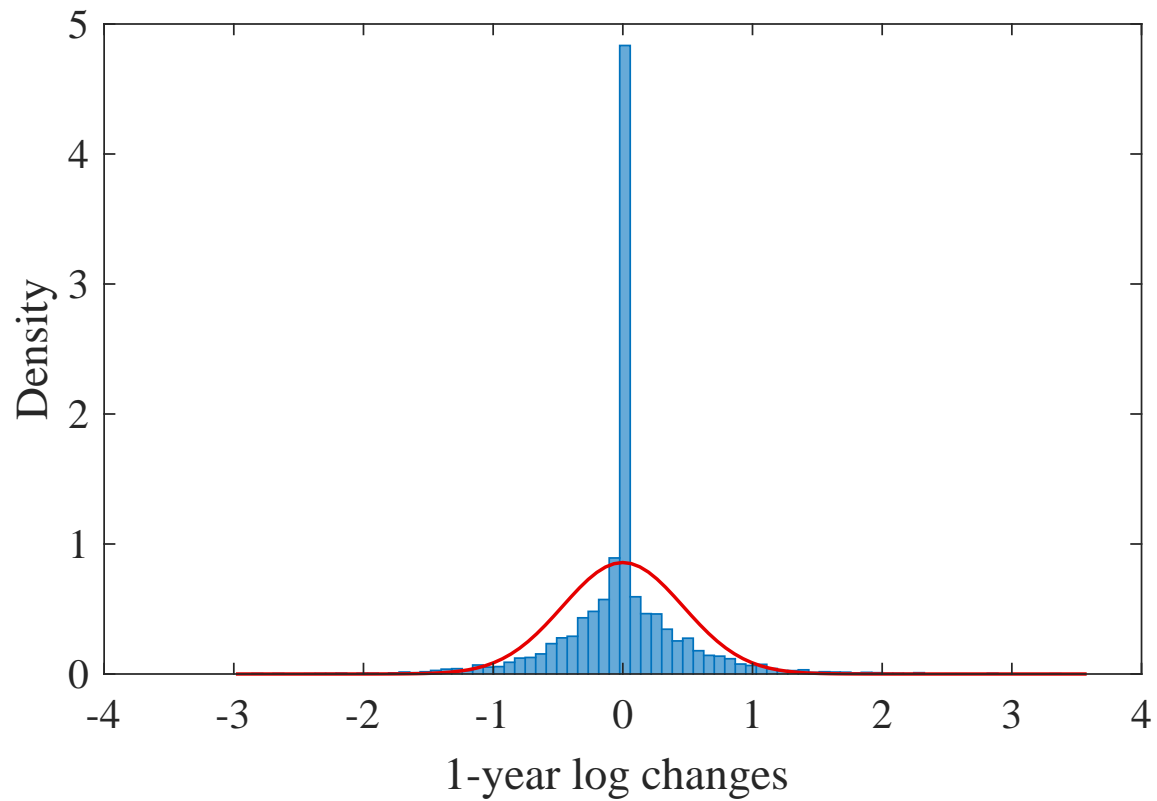
Thank you!

Appendix

Parameter	Description	Value	Source
<i>Households</i>			
γ	CRRA/Inverse IES	1	External
ν	Inverse Frisch elasticity	1	External
ϕ	Borrowing limit	0.5	External
λ_e	Arrival rate normal states	1	External
ν_e	Mean reversion coeff.	0.0263	External
σ_e	S. d. of innovations	0.2	External
<i>Firms and policy</i>			
θ	Capital elasticity	0.33	External
δ	Depreciation rate (p.a.)	5%	External
Ψ_p, Ψ_w	Adjustment cost	100	External
ϵ_p, ϵ_w	Elasticities of substitution	10	External
ϕ_π	Taylor coeff.	1.25	External

Parameter	Description	Value	Source
<i>Households</i>			
ρ	Individual discount rate (p.a.)	12%	Internally calibrated
A_{illiq}	Illiquid asset	7	Internally calibrated
λ_d	Profit disribution parameter	0.7	Internally calibrated
θ_1	Transition probability to e_1	0.6	Internally calibrated
λ_1	Arrival rate top states	0.0028	Internally calibrated
λ_2	Arrival rate leave top states	0.8	Internally calibrated
e_1, e_2	Top earnings states	20, 70	Internally calibrated
<i>Firms and policy</i>			
κ	Investment adjustment cost	16	Internally calibrated

Income dynamics

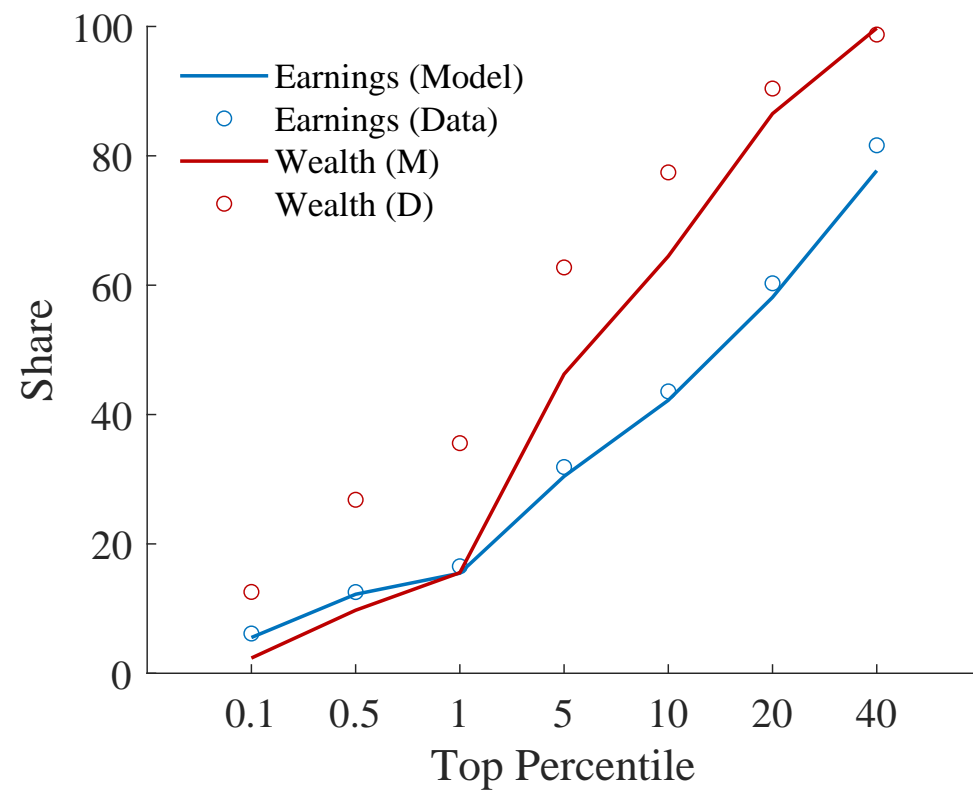


- The estimated kurtosis is around 9 in the model and 17.8 in the data.

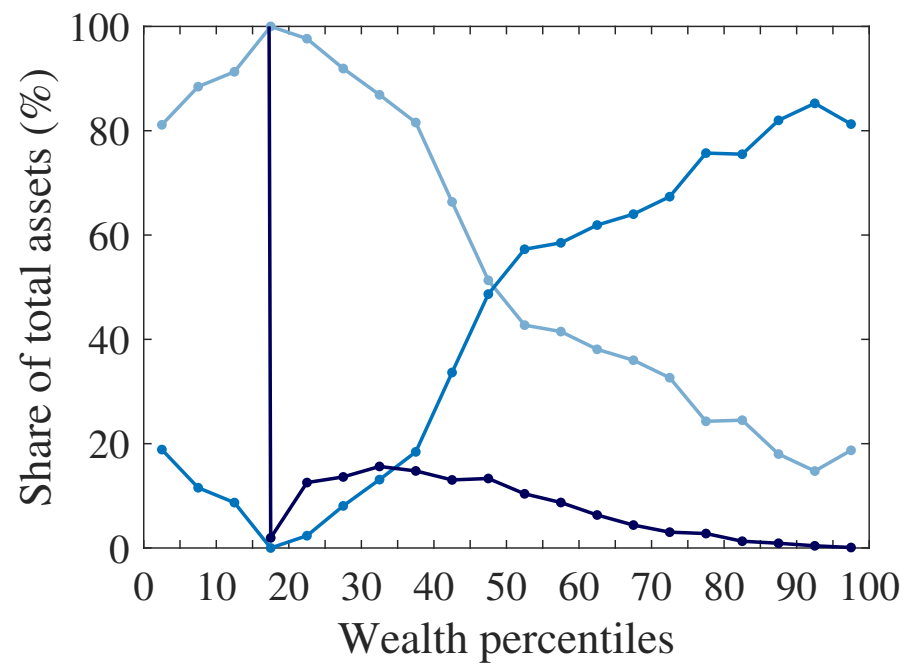
Wealth percentiles

Wealth statistics	Data	Model	Wealth statistics	Data	Model
Mean wealth	2.5	2.7	90th percentile	5	8
Median wealth	0.17	0.12	95th percentile	10	13
75th percentile	1.3	2.3	99th percentile	34	28

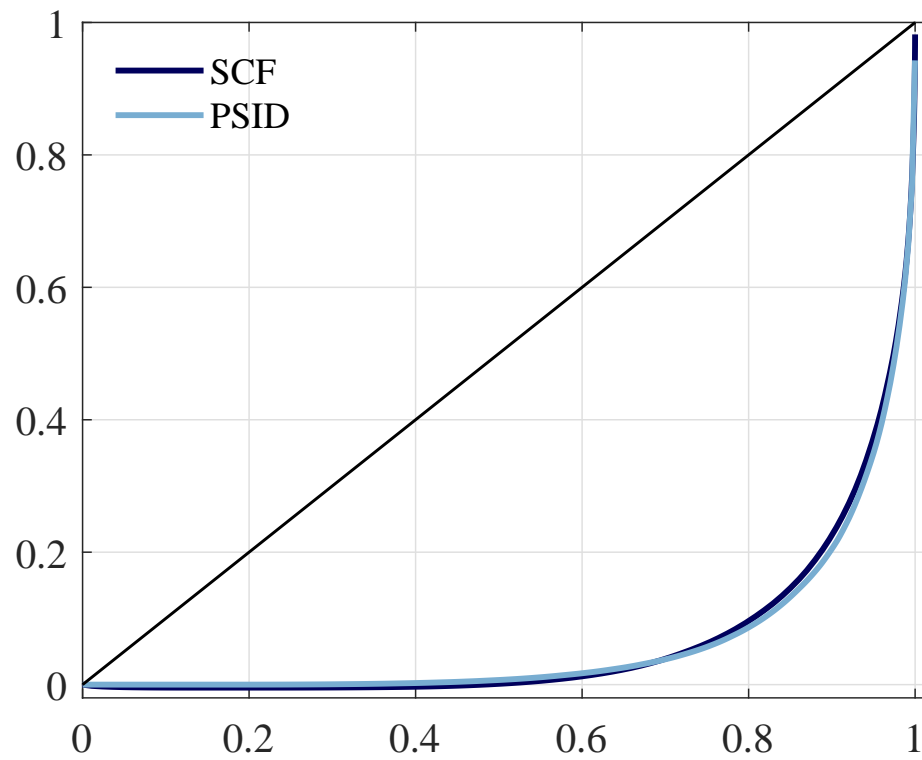
Top shares

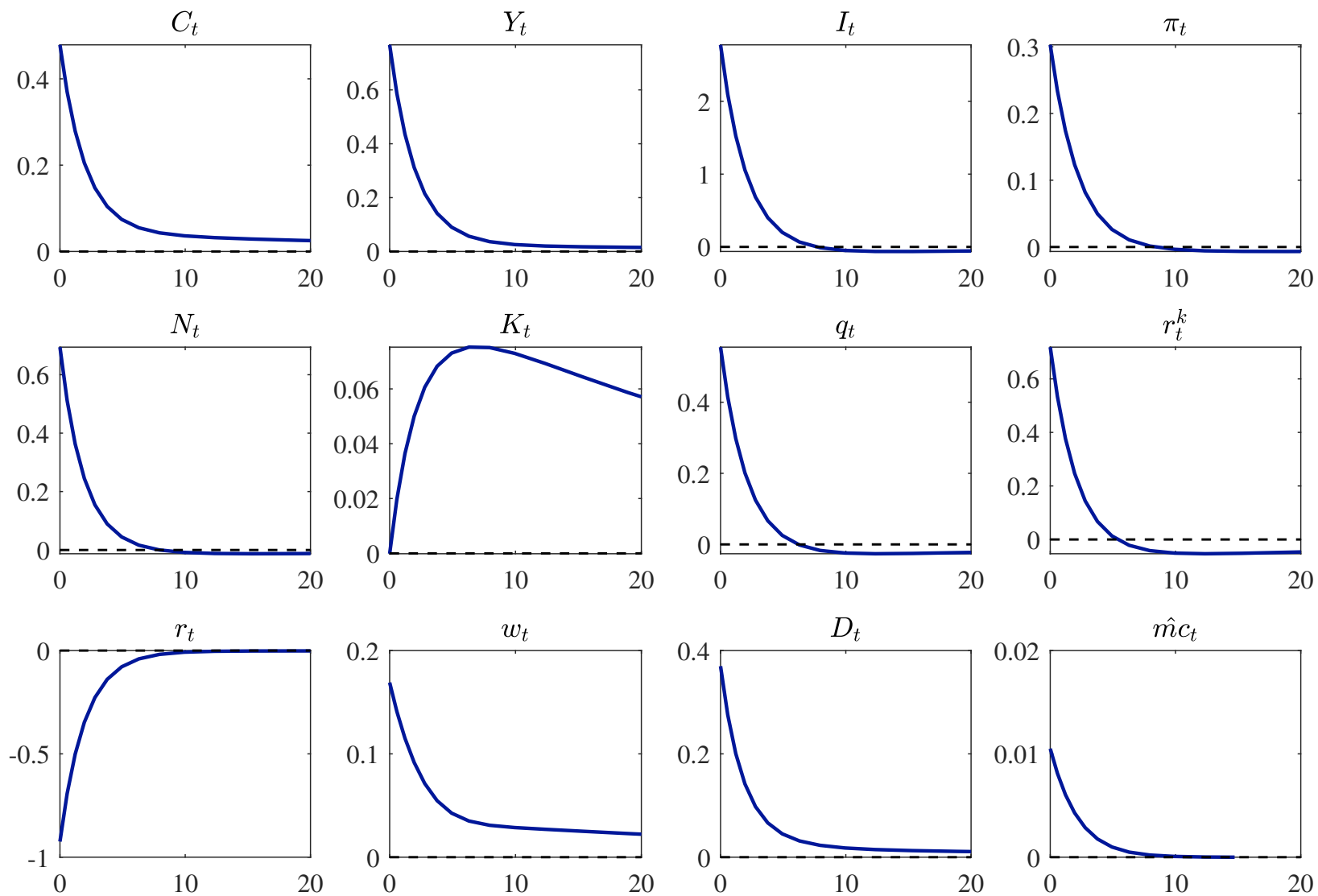


Wealth composition



Wealth in the SCF and PSID





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