arxiv:1605.05631

Far from equilibrium: Wealth reallocation in the United States

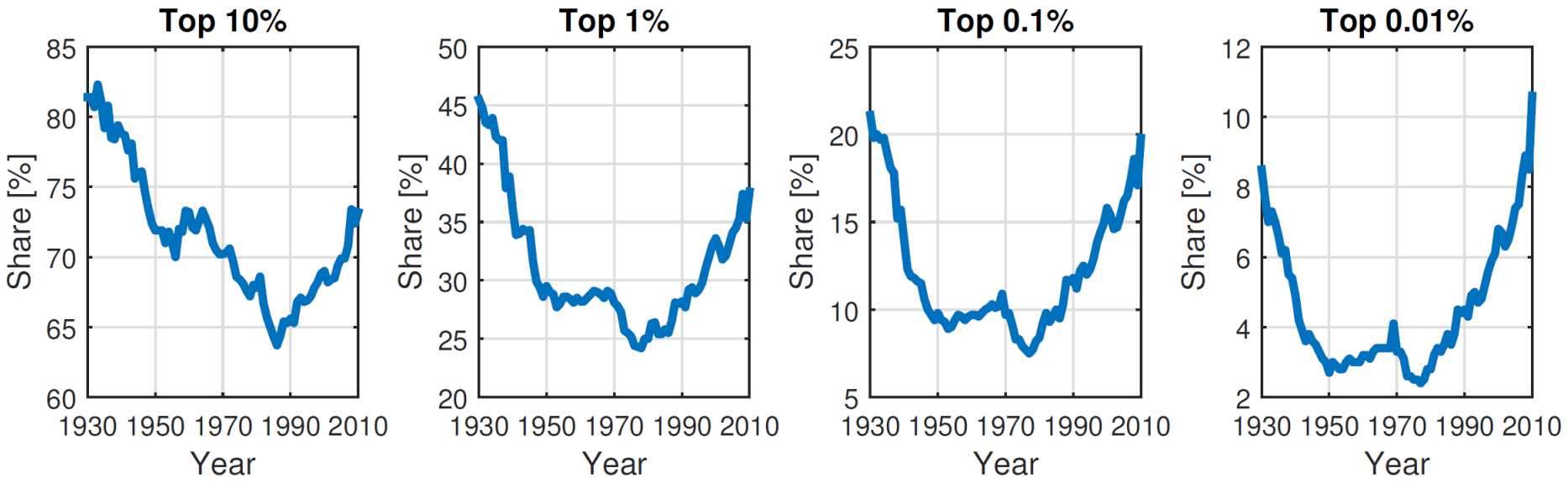
Yonatan Berman, Ole Peters, Alex Adamou

School of Physics and Astronomy, Tel Aviv University

London Mathematical Laboratory

NORDITA, Physics and Social Network Dynamics of the Markets, 2016

Wealth inequality



(Saez & Zucman, 2014)

arxiv:1605.05631

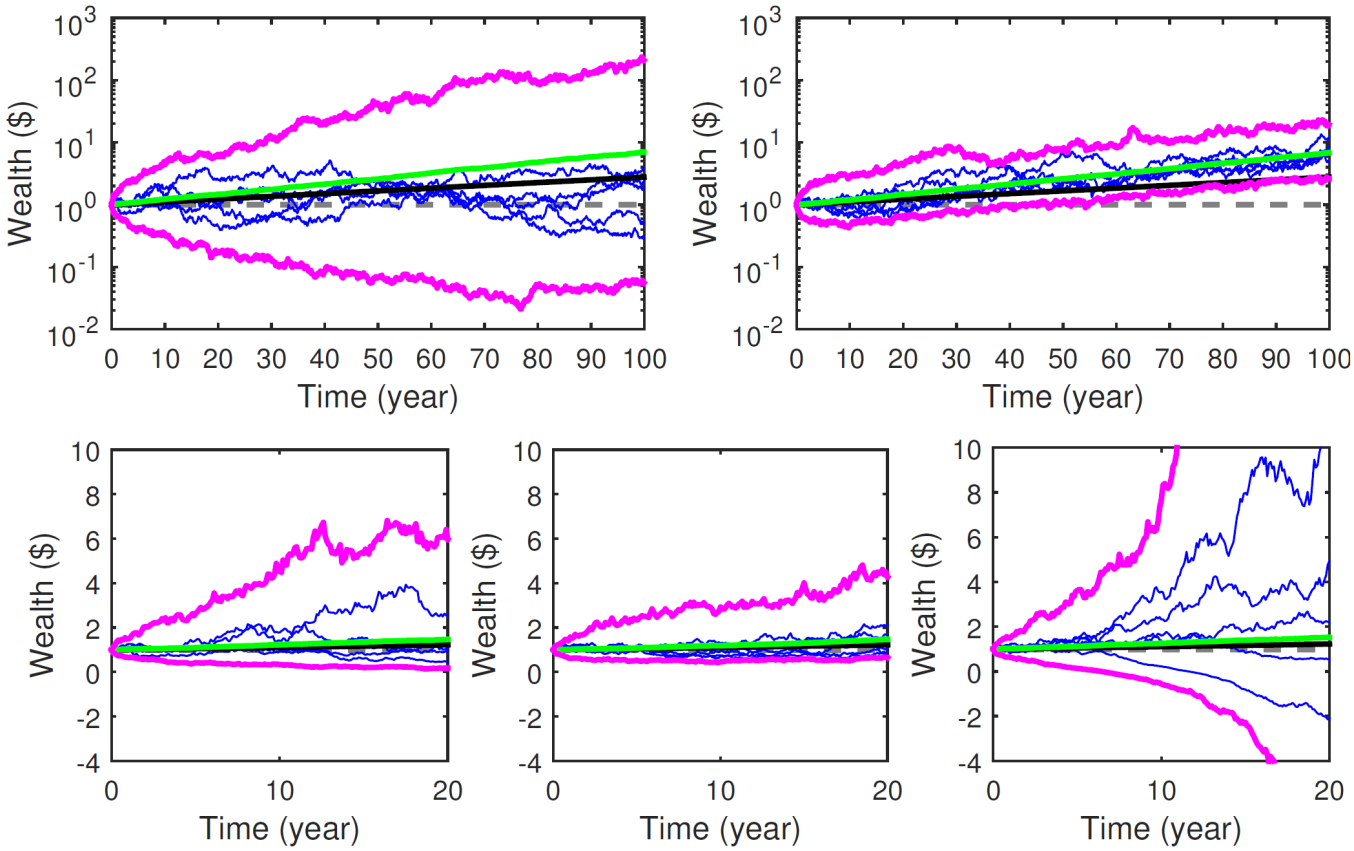
Our model

Our model of personal wealth is geometric Brownian motion (GBM) enhanced with a simple realloaction mechanism

$$dx_i = \underbrace{x_i \left(\mu dt + \sigma dW_i\right)}_{\text{growth}} - \underbrace{x_i \tau dt + \langle x \rangle_N \tau dt}_{\text{reallocation}}$$

arxiv:1605.05631

Our model

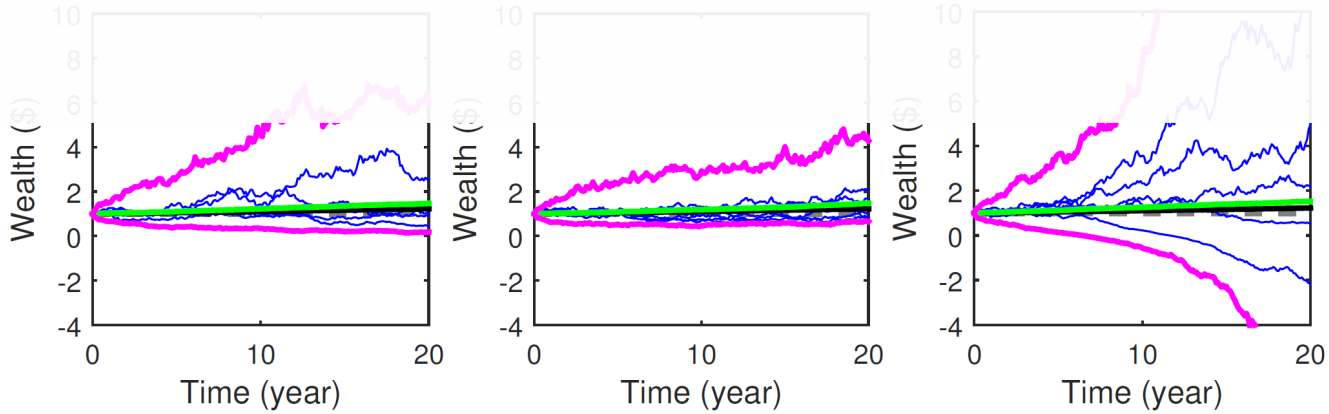


arxiv:1605.05631

Our model

Three main regimes:

1. $\tau = 0$ – *Pure GBM, expanding lognormal distribution*
2. $\tau > 0$ – *Some moments converge, some don't*
3. $\tau < 0$ – *"Poorer" are driven to negative wealth values*



arxiv:1605.05631

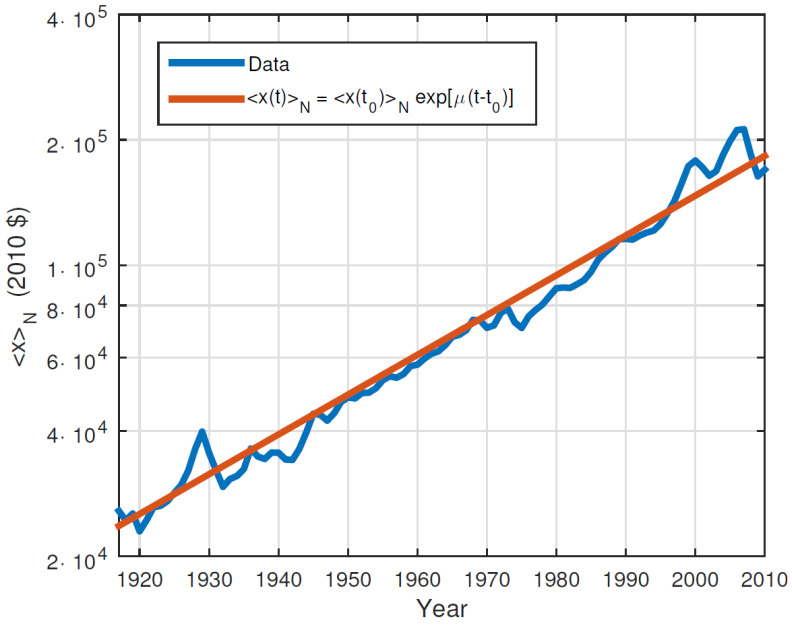
Empirical analysis

1. We estimate the values of μ and σ using the historical dynamics of total private wealth in the US:

   $\mu \approx 0.02 year^{-1}$,

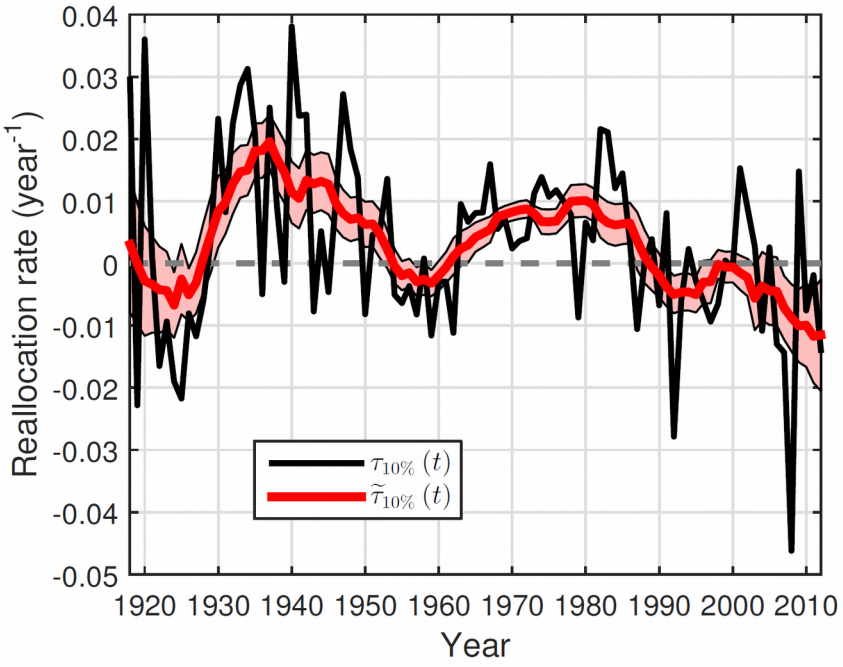
   $\sigma \approx 0.15 year^{-\frac{1}{2}}$

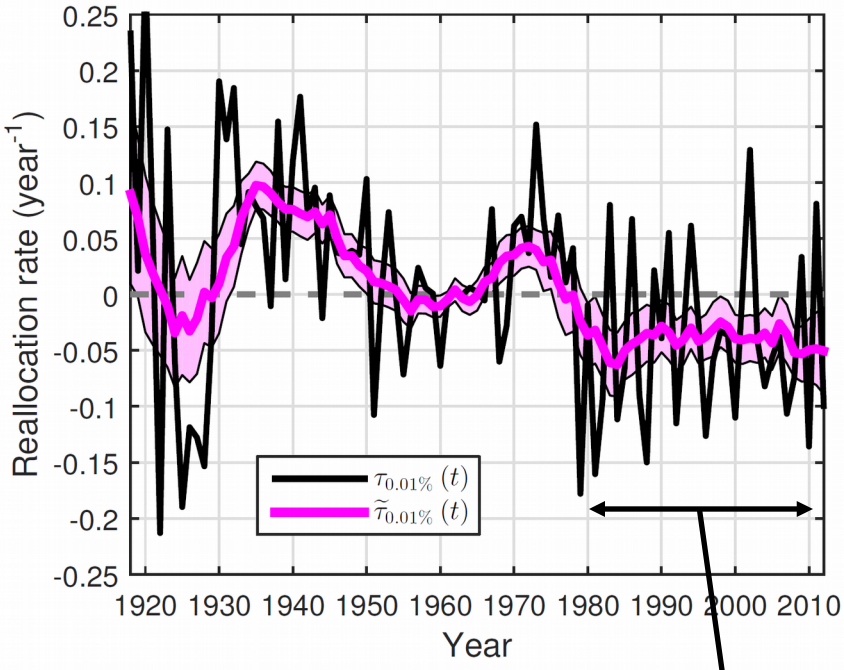
2. Now we fit a time series of values so that different historical measures of inequality are reproduced



arxiv:1605.05631

Empirical analysis

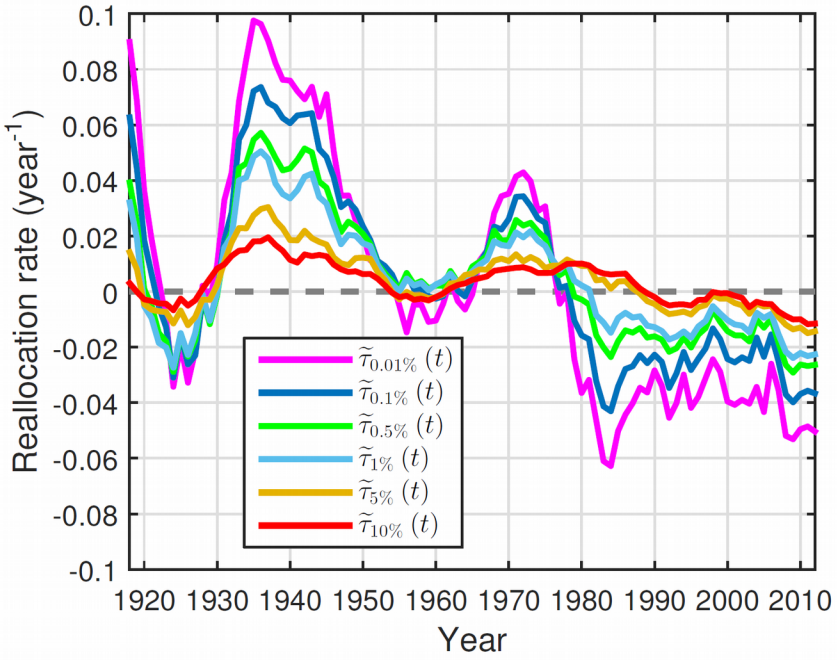


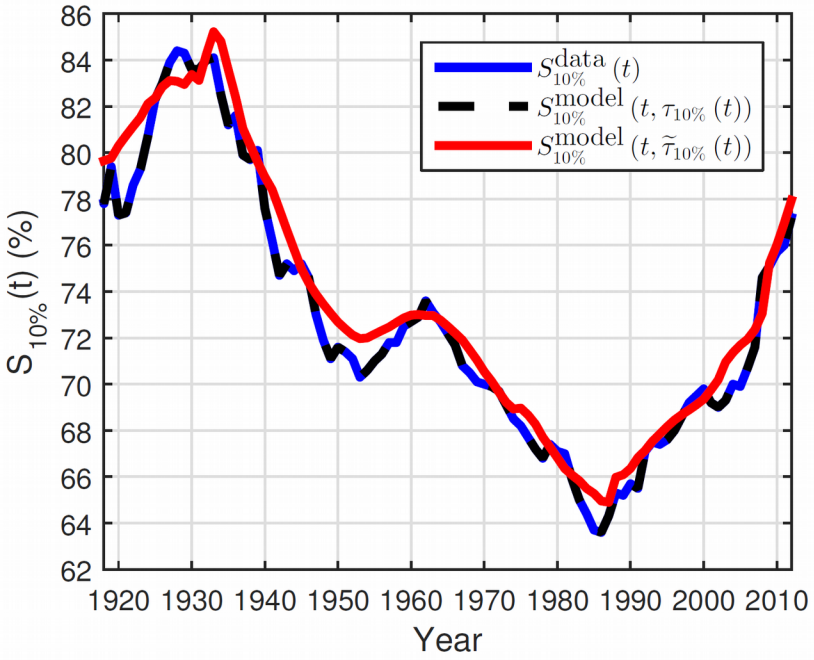


"Trickle up" economy

arxiv:1605.05631

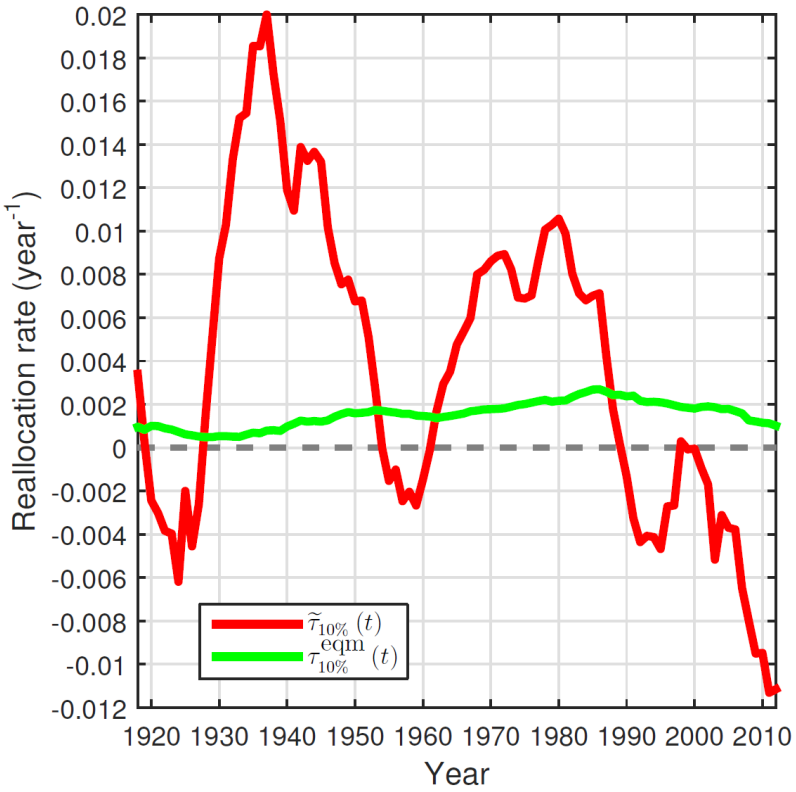
Empirical analysis

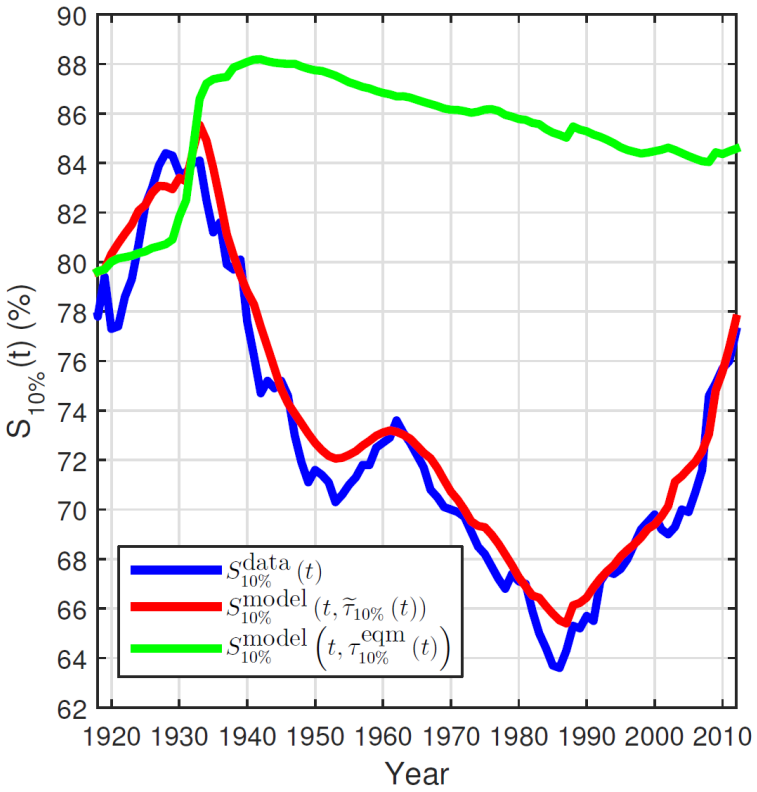




arxiv:1605.05631

Empirical analysis





arxiv:1605.05631

Observations and conclusions

1. Transition to consistent negative reallocation in the ~1980s (not a statistical effect)

2. Far from equilibrium behavior – relaxation time of moments is an order of magnitude larger than observation times

arxiv:1605.05631