Lecture 6. Inequality and Growth

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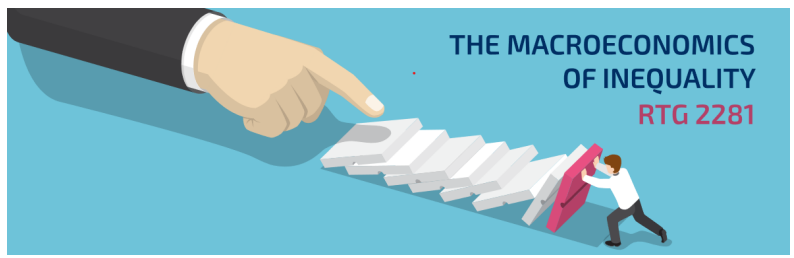

Bonn Summer School: The Macroeconomics of Inequality
June 2020

Overview

- Objective: understand the impact of the increase in inequality on aggregate growth
- Context: a statistical model of labor income process

Introduction

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- Changes in income inequality driven by changes in income dynamics, which naturally can have a growth impact
- Building block: changes in income dynamics that are unequal across income levels (unequal growth), affect, at the same time, aggregate growth, income inequality and welfare

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- Changes in income inequality driven by changes in income dynamics, which naturally can have a growth impact
- Building block: changes in income dynamics that are unequal across income levels (unequal growth), affect, at the same time, aggregate growth, income inequality and welfare
- Contribution: Use micro data and minimal theory to connect growth and inequality, estimate these changes and assess their impact on growth and welfare

Outline

- A micro decomposition of aggregate growth
- Empirical analysis on micro decomposition
- Simple model to measure the changes driving the data, and assess impact

A micro decomposition of aggregate growth

- Let y_{it} real income of household i at time t
- Aggregate growth in period t over horizon T, $\Gamma_{t,T}$ can be written as

$$\Gamma_{t,T} = \frac{E_i(y_{i,t+T})}{E_i(y_{i,t})} = E_i\left(\frac{y_{i,t+T}}{y_{i,t}}\frac{y_{i,t}}{E(y_{i,t})}\right)$$

- Define $g_{i,T} = \frac{y_{i,t+T}}{y_{i,t}}$, $s_{i,t} = \frac{y_{i,t}}{E(y_{i,t})}$ so that $\Gamma_{t,T} = E_i(g_{i,T} \cdot s_{i,t})$

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- Similar decomposition widely used in IO (Olley and Pakes, 1996)

Insights from decomposition

$$\begin{aligned}\Gamma_T &= cov(g_{i,T}, s_i) + E(g_{i,T}) \\ &= corr(g_{i,T}, s_i)\sigma(g_{i,T})\sigma(s_i) + E(g_{i,T})\end{aligned}$$

- Simple way to sum micro moments to evaluate a given Γ_T:
- Growth can be:
  - Equal ($\sigma(g_i) = 0$, $E(g_i = \bar{g}$)
  - Unequal ($\sigma(g_i) > 0$). In this case inequality $\sigma(s_i)$ and mobility $corr(g_i, s_i)$) matter for Γ_T
- Whether growth is equal or unequal has welfare consequences

Warning: $Cov(g_i, s_i), E(g_i)$ .. not independent primitives: structural changes in income dynamics change (at same time) all terms: need a theory!

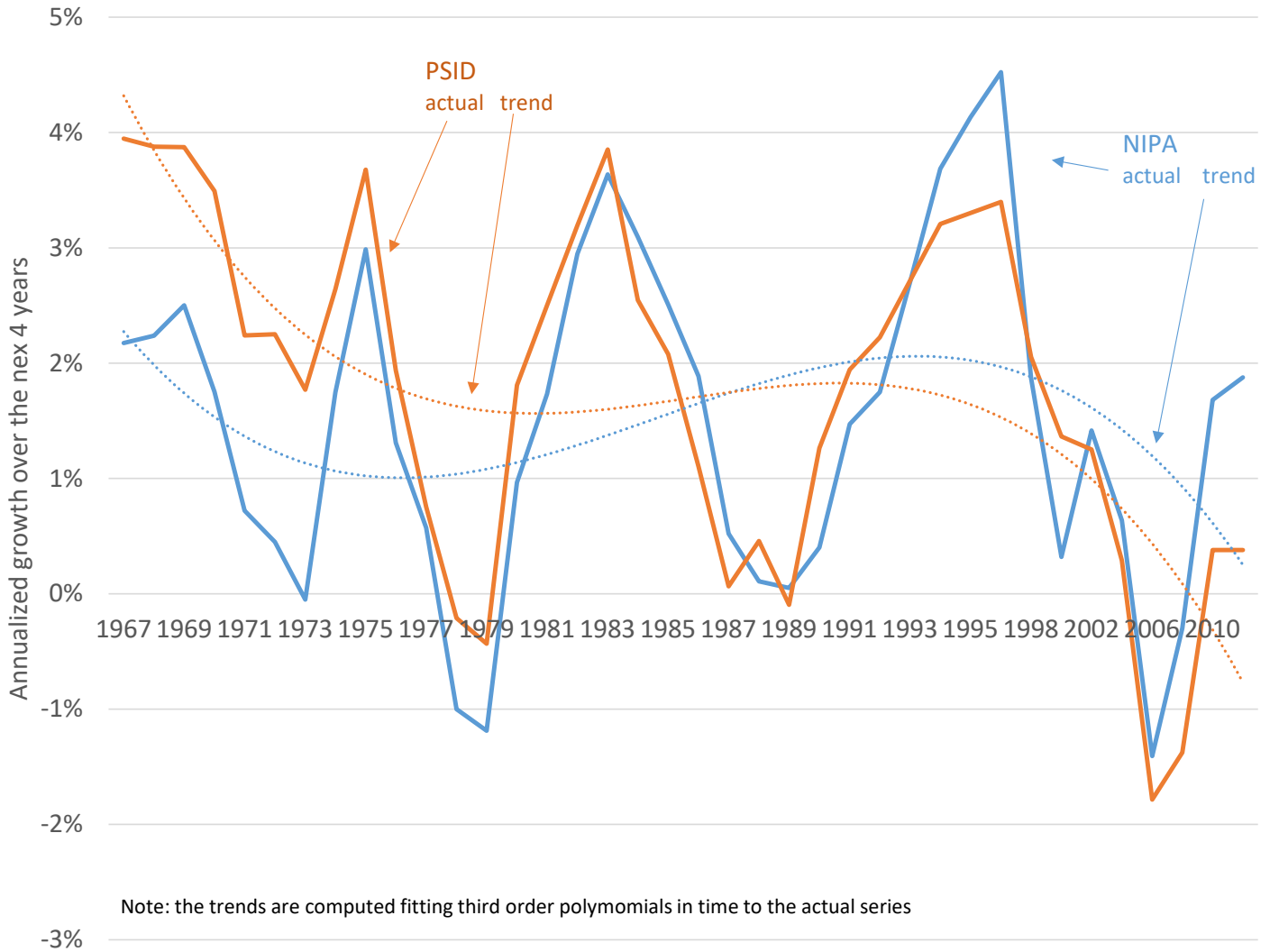
Plan

- Measure Γ, $corr(g_i, s_i)$, $\sigma(g_i)$, $\sigma(s_i)$ and $E(g_i)$ 1967-2016, using PSID
- Simple model to identify driving force of changes

Panel Study of Income Dynamics (PSID)

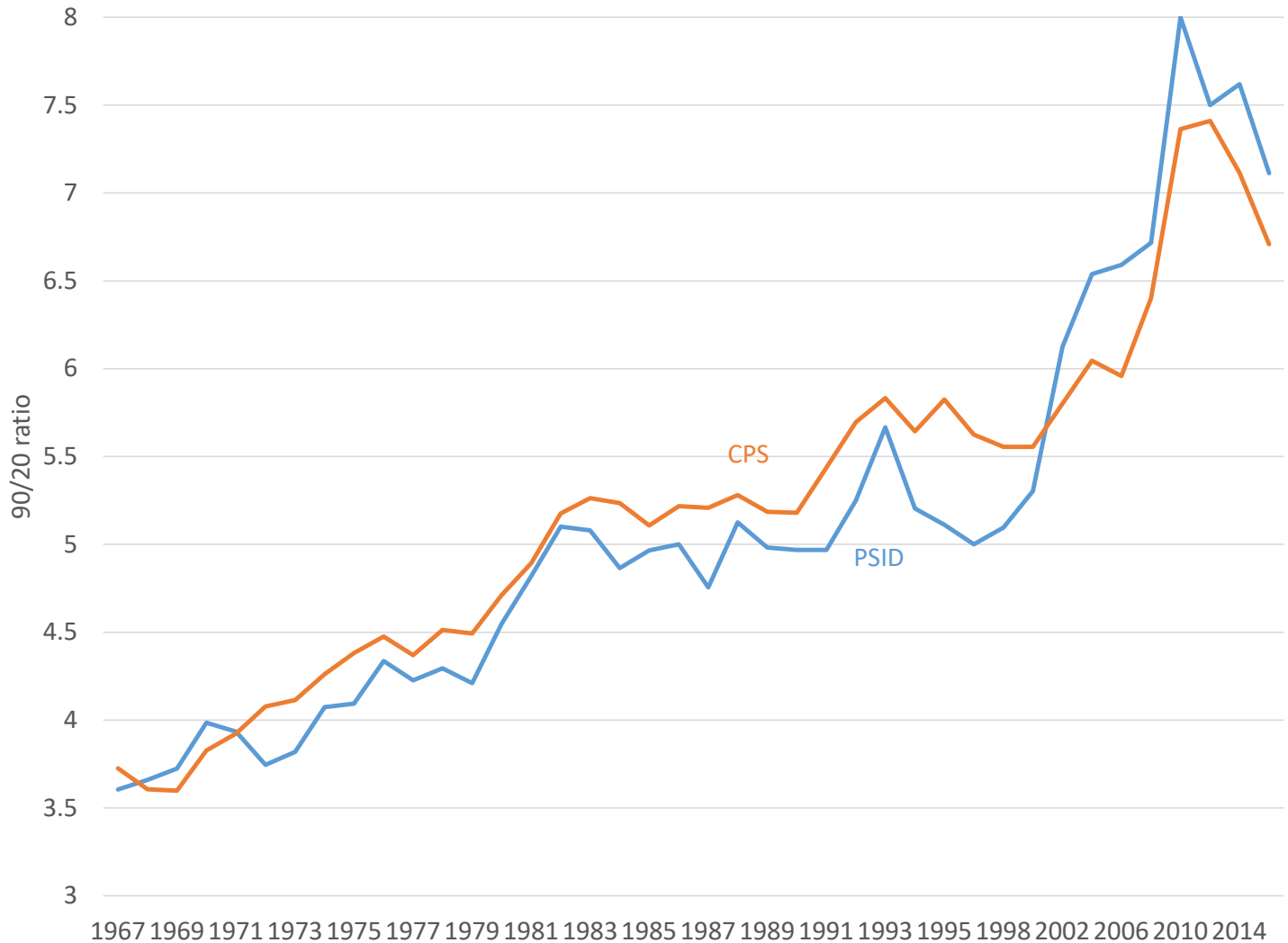
- Long panel of about 5,000 HH, representative of U.S. population
- Panel essential to identify change of individual dynamics (vs composition)
- 1967-2016 (Annual until 1996, bi-annual after)
- Publicly available
- Panel data must aggregate up to macro outcomes

PSID v/s NIPA: Γ_t (4y real earnings pc)



- Aggregate PSID matches NIPA Dynamics

PSID v/s CPS: Cross sectional inequality



- PSID matches well cross sectional inequality in labor income from much larger sample (CPS)

Mapping decomposition to panel data

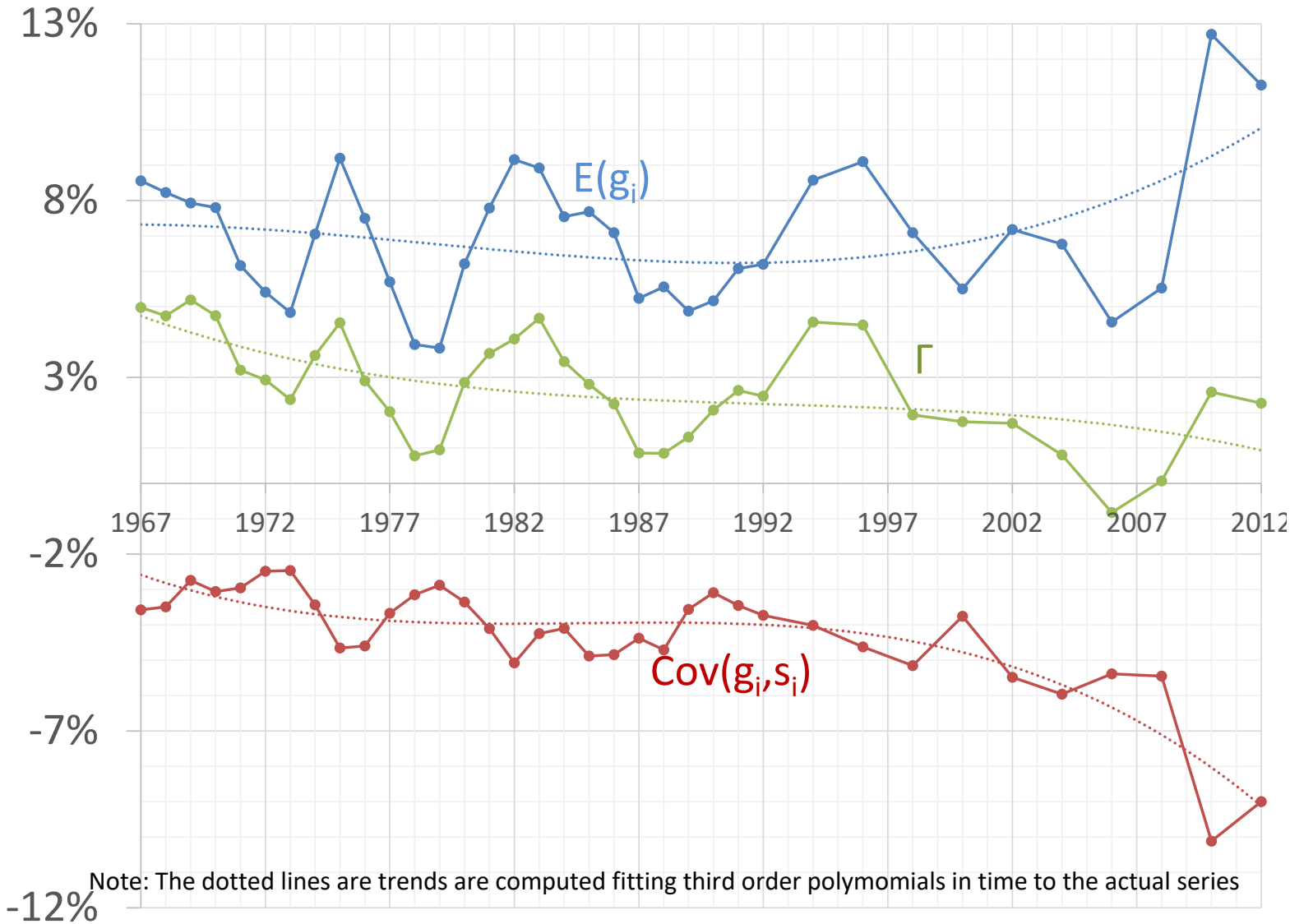
Let $T = 4$ years, $y_{j,i,t}$ be real (PCE deflated) income of HH j, in decile i in year t and P_t total population in sample in year t

$$\text{then} \qquad g_{i,t+T} = \frac{\sum_j y_{j,i,t+T}}{\sum_j y_{j,i,t}} \frac{P_t}{P_{t+T}} \qquad \text{and} \qquad s_{i,t} = \frac{\sum_j y_{j,i,t}}{\sum_i \sum_j y_{j,i,t}}$$

Aggregating by income deciles (quintiles) useful with measurement error

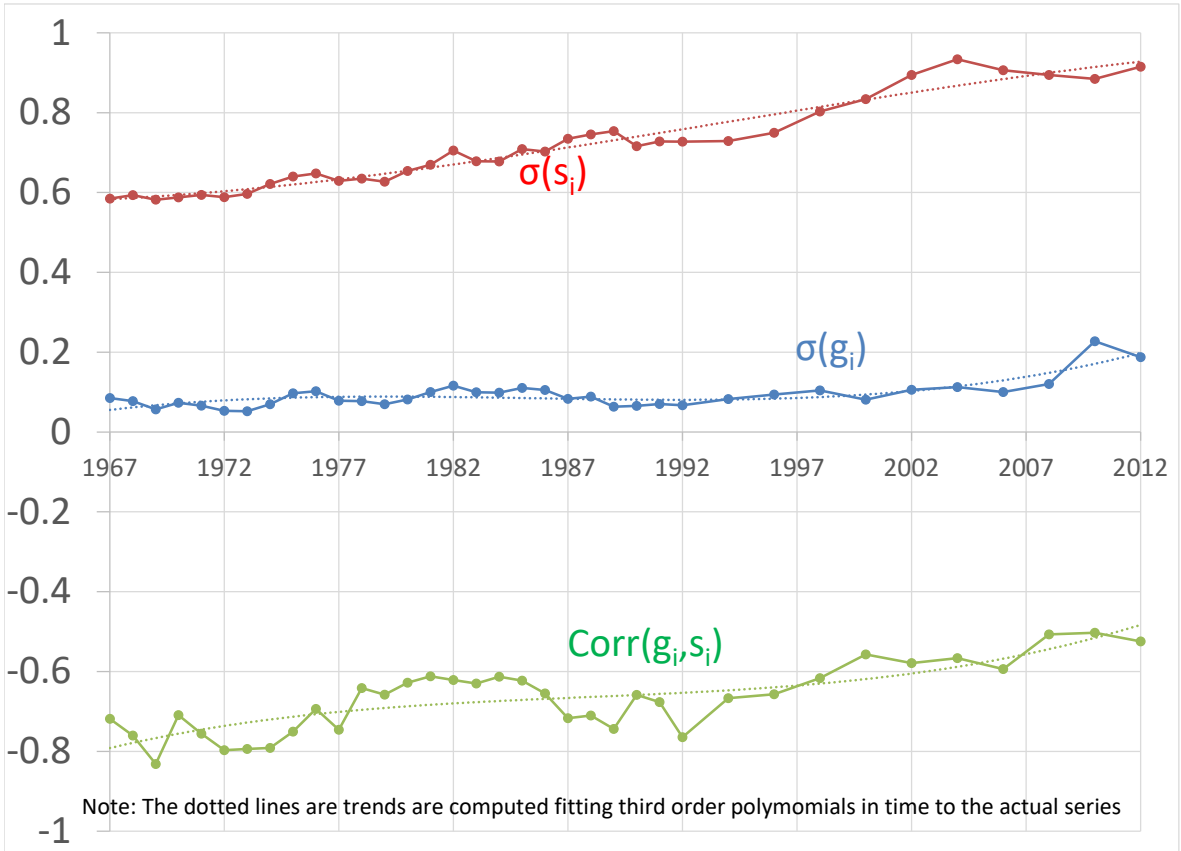
- Income measure: Labor Earnings of all household members
- Sample restrictions: Households with head 25-60, with income above 20% of the pvty line, no imputed labor income, which are in sample in year t and $t + 4$ (avg. sample per year $\simeq$ 3500)
- Similar patterns for hholds with 25-40 head (age composition)

Γ decomposition (by decile, age 25-60)



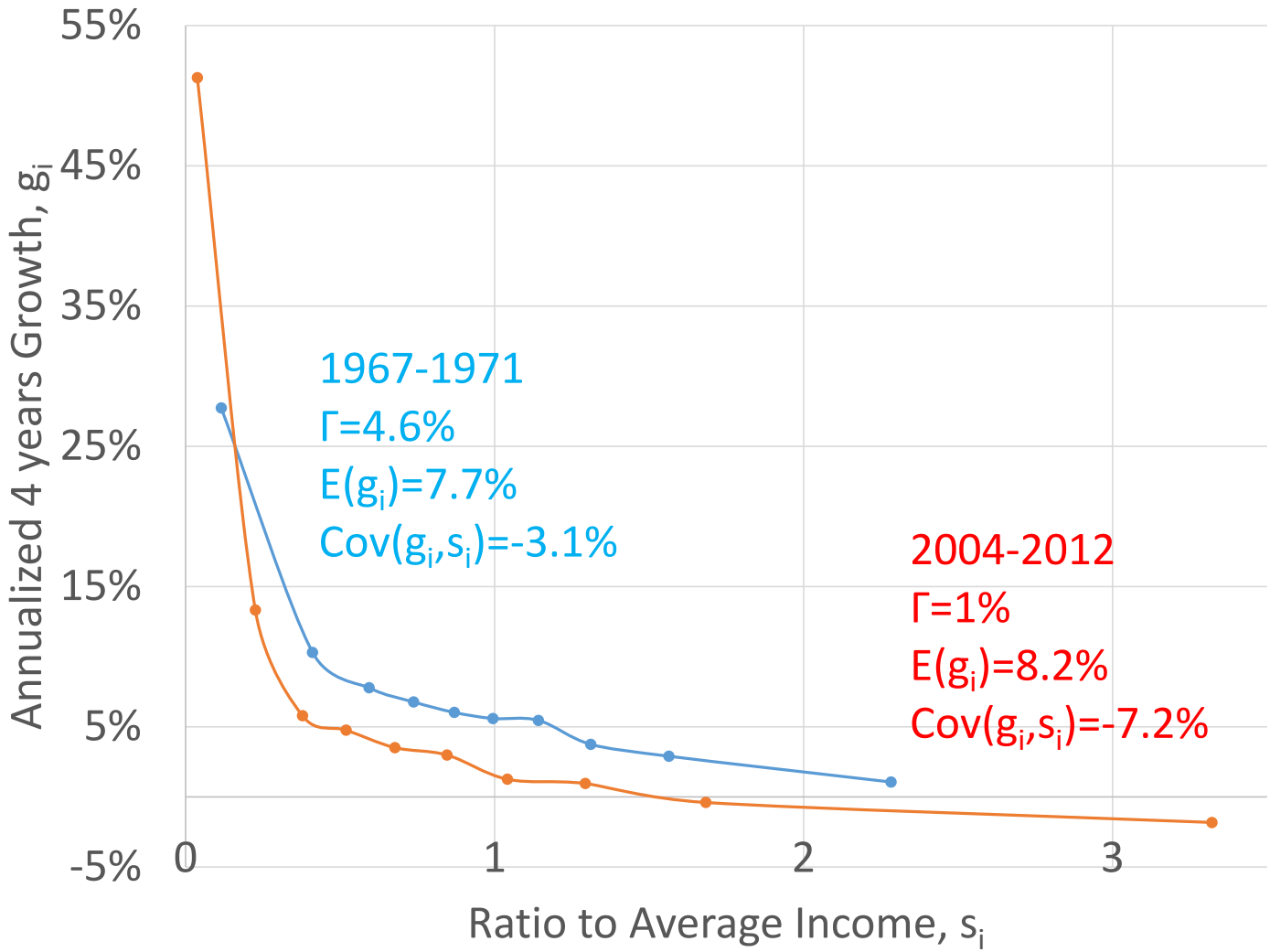
Note: The dotted lines are trends are computed fitting third order polymomials in time to the actual series

Covariance decomposition



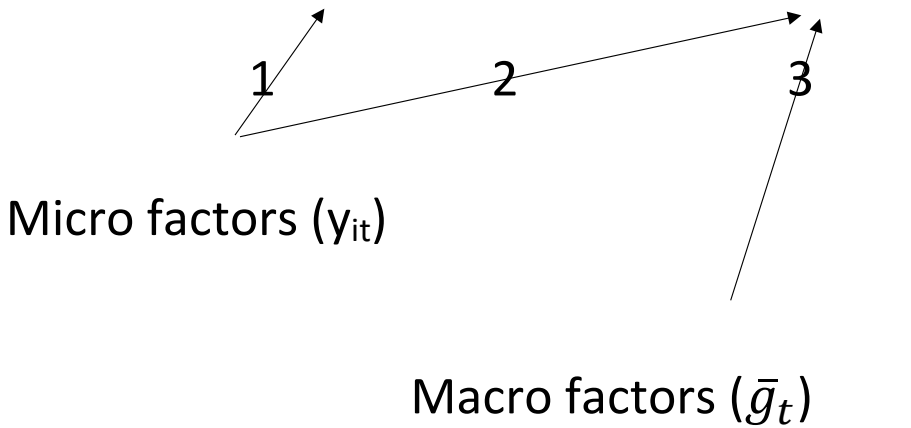
- Increasing $\sigma(s_i)$ measure of increasing income inequality
- $Corr(g_i, s_i)$ increasing (toward 0): over time high level growing more

Changes in the microstructure of aggregate growth



From data to drivers

$$\Gamma_T = corr(g_{i,T}, s_i)\sigma(g_{i,T})\sigma(s_i) + E(g_{i,T})$$



- Use data on $corr(g, s), \sigma(g), \sigma(s)$, (1) plus model to identify micro factors
- Use (1) and (2) to identify effect of micro factors on Γ
- Identify changes in macro factor $\bar{g}_t$ residually

An Ayiagari-Bewley-Huggett Model

- Continuum of infinitely lived households
- Log of household i earning potential is

$$\begin{aligned} y_{it} &= e_{it} + \alpha_i + f_{it} \\ e_{it} &= \rho e_{it-1} + \varepsilon_{it}, \varepsilon_{it} \sim N(\mu(s_{it}), \sigma^2_{\varepsilon t} g(s_{it})) \\ \alpha_i &\sim N(0, \sigma_\alpha) \\ f_{it} &= h(s_{it}) + f_{it-1} \qquad h(s_{it}) = \bar{g}_t + \delta_t \frac{s_{it} - 1}{1 + s_{it}} \end{aligned}$$

- e_{it} standard AR part. Variance of shocks $\sigma^2_{\varepsilon t} g(s_{it})$ declining in income s_{it} (Meghir and Pistaferri, 2004)
- α_i is household fixed effect
- f_{it} is growth factor, $\bar{g}_t =$ equal growth, $\delta_t =$ unequal growth

Extensive margin

- Household works iff

$$Y_{it}(1-\tau) \quad > \quad exp(\phi_t)$$

- ϕ_t is transfer income
- If household works: earnings $= Y_{it}$, if not earnings $= 0$
- Earning potential evolves when household does not work
- ϕ_t chosen to match increase of non participant household in data (in our PSID sample from 5.3% to 8.7%)
- τ balances the gov. budget

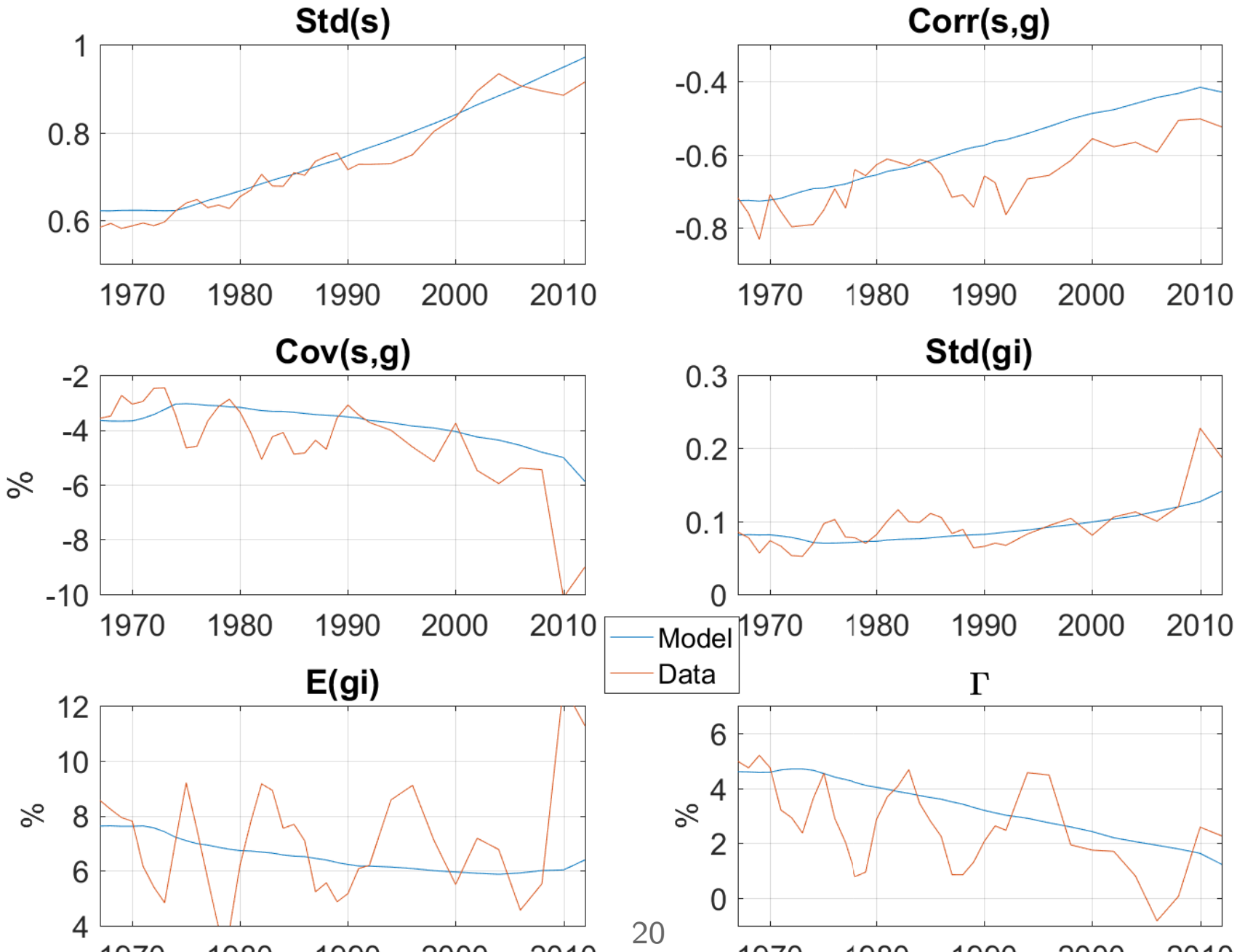
Exercise

- Set $\delta = 0$ (no unequal growth), set parameters from micro studies and to match initial steady state (1967-1972)
- 1 change in micro factors (increase in unequal growth δ_t)
- 1 change in macro factors (decline in common growth $\bar{g}_t$)
- Identify changes from micro and macro data

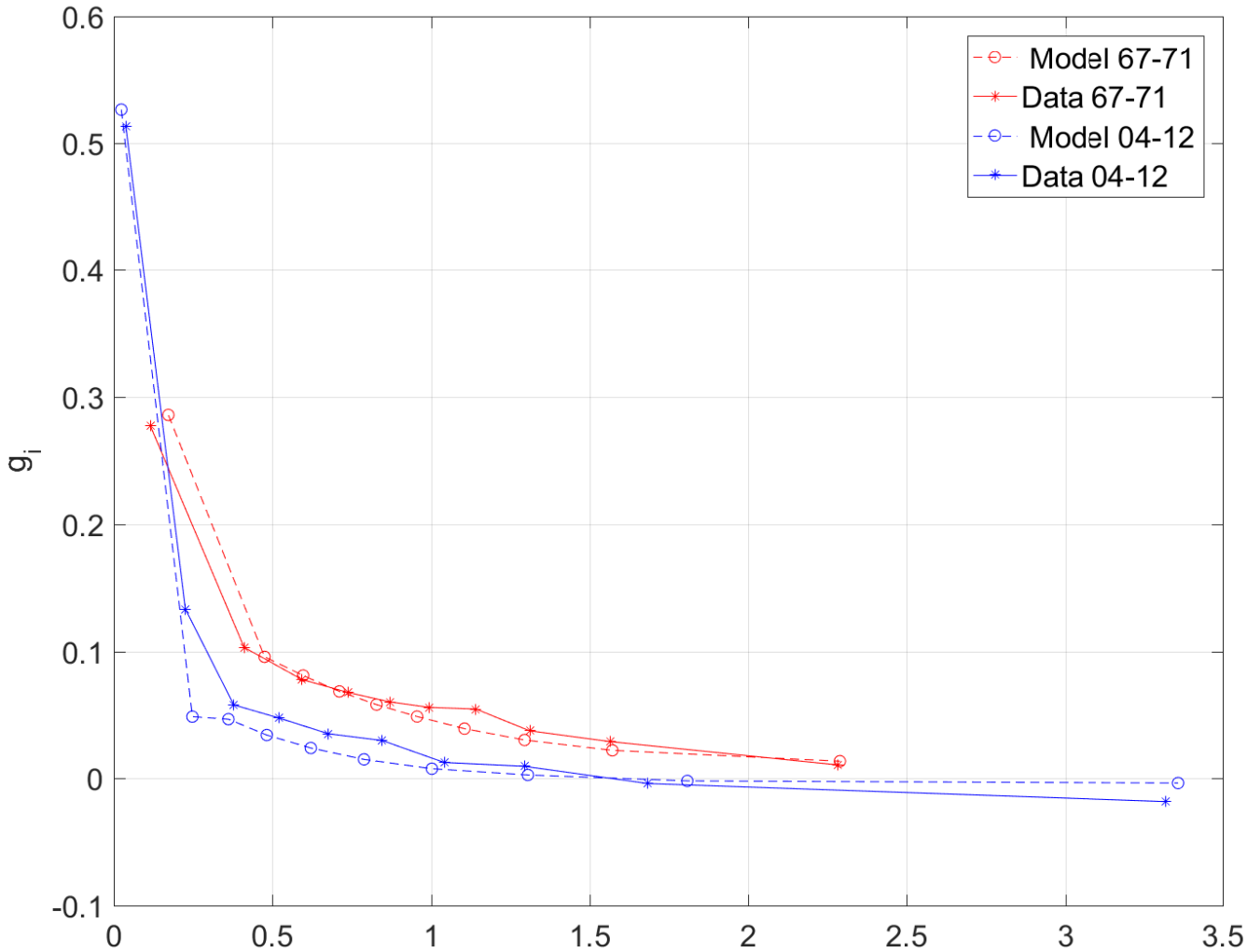
Parameter values

Income Process Parameters		
Name	Symbol	Value
Variance of fixed effects	σ_α	0.45
Persistence of shocks	ρ	0.6
Baseline sd of shocks	σ_ε	0.21
Standard deviation gradient	χ	$0.75\sigma_\varepsilon$
Common growth	$\bar{g}$	4.5%
Transfer income (% of average Y)	ϕ	0.3
Tax rate	τ	1.5%
Unequal growth	δ	0
Preference Parameters		
Discount Factor	β	0.97
Risk Aversion	θ	2
Other Parameters		
Borrowing Constraint	$\bar{b}$	0
Risk free rate	r	2.5%

Time paths: data and model

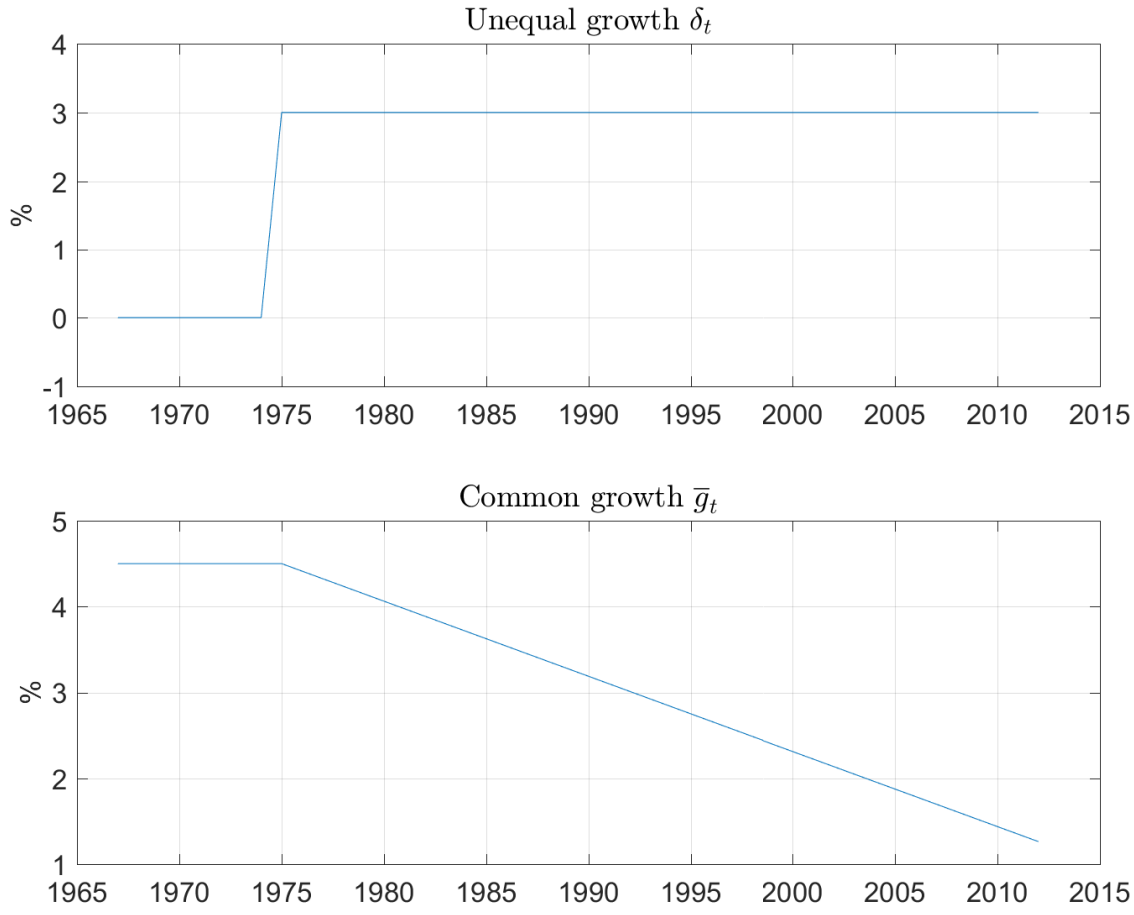


Initial ss and 40 years later: data and model



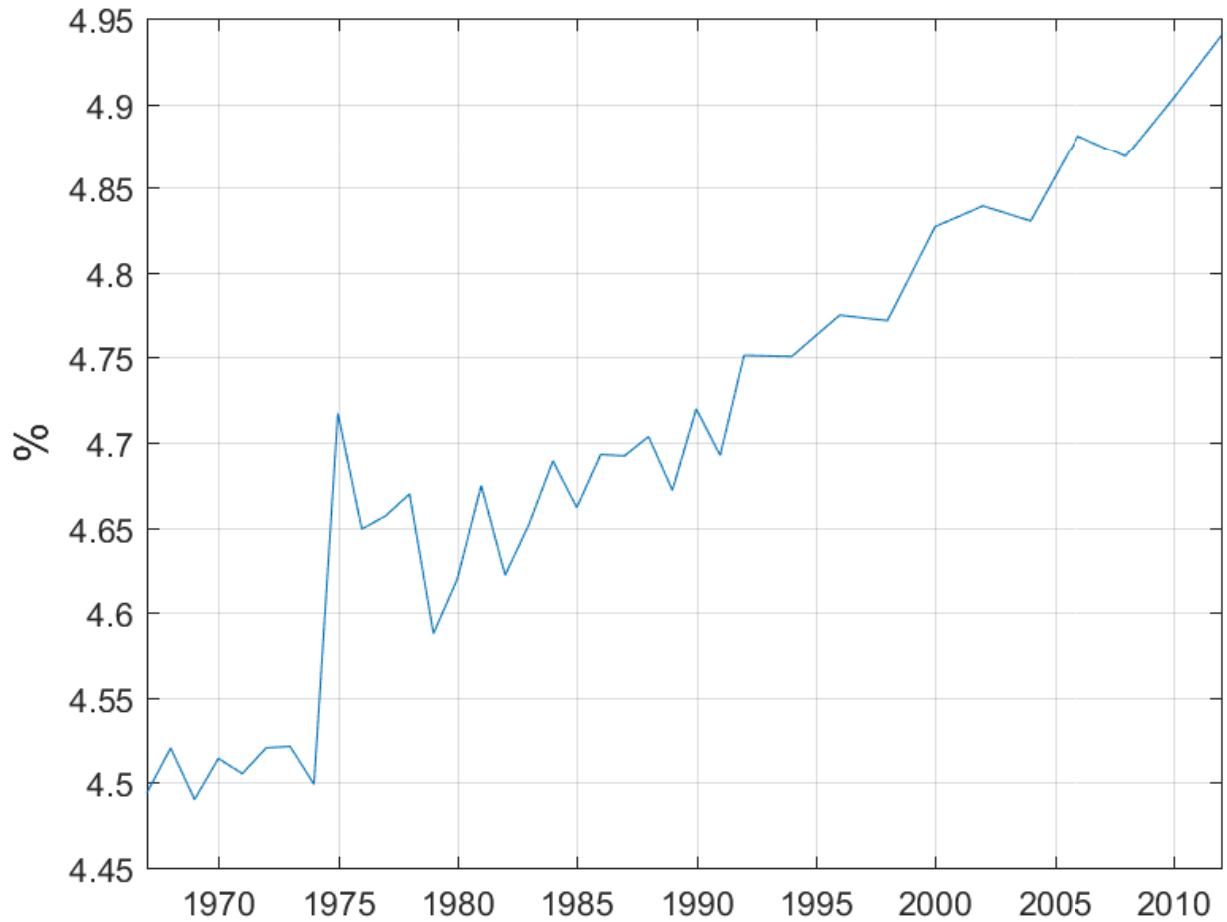
- Mean reversion accounts for negative slope
- Unequal growth accounts for right and left tail changes
- Common growth accounts for downward shift

Identified micro and macro changes



- $\delta = 3\%$: $s_i = 2$ grows 1% per year faster than $s_i = 1$ (mean earnings)
- Large decline in common growth (from 4.5% to 1.25%)

Aggregate growth impact of increase in unequal growth



- Average growth contribution over 40 years is less than 0.5% per year
- Agg. growth increases because high earnings grow faster and contribute more to aggregate

Welfare costs of increase in unequal growth

- Compute equilibria and values in B,CM and A
- Compare values in initial SS, and transition with unequal growth (keeping g_t constant)

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	Market Structure		
Risk aversion (θ)	CM	BE	A
$\theta = 2$	-6.1%	+2%	+10.3%
$\theta = 4$	-3.2%	+28.5%	+50.6%

With IM, unequal growth costly because:

- Increase permanent income inequality (Bowlus Robin, 2004, Abbott and Gallipoli, 2019, Straub, 2019), hard to insure with bond
- Increase in risk at the bottom of the distribution, where it is more costly

Conclusions

- Highlight a statistical connection between inequality and growth
- Use it to identify changes in earnings formation:
  - Increase in unequal growth can account for patterns of inequality and has effects on growth (+0.5%) and welfare (-2%,-50%)
  - Large decline in common growth (-3%)

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Open issues

- What has driven the increase in unequal growth? SBTC, reduced access to opportunities (Fogli and Guerrieri, 2019)?
- What has driven the large decline in common growth?
- How to share the unequal growth?