Unequal Growth

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Carnegie-Rochester-NYU Conference on Public Policy

April 2022

Introduction

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- Many studies on its causes, less work on its direct growth impact
- Idea: 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, identify these changes and assess their impact on growth and welfare

Outline

- A micro decomposition of aggregate growth
- Empirical analysis on micro decomposition
- Simple model plus empirical analysis: identify changes driving income inequality (unequal growth)
- Assess impact of unequal growth on growth and welfare

Some Related literature

- Empirical: “Earnings, Inequality and Mobility in the United States”, Kopczuk, Saez and Song 2010, “The Nature of Countercyclical Income Risk” Guvenen, Ozkan, and Song. 2014
- Models of Income Inequality: “Uninsured Idiosyncratic Risk and Aggregate Saving", Ayiagari 1994,“Uneven Growth: automation’s impact on Income and Wealth Inequality", Moll, Rachel and Restrepo 2019
- From Micro to Macro: “The Granular Origins of Aggregate Fluctuations”, Gabaix 2011, “Misallocation and growth”, Jovanovic 2014, “Skill Heterogeneity and Aggregate Labor Market Dynamics", Grigsby 2020

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, Γ_t can be written as

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

- 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 $\Gamma_t = E_i(g_{i,t} \cdot s_{i,t})$

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- Similar decomposition widely used for firms (Olley and Pakes, 1996), more interesting tradeoff when applying it to households!

Insights from decomposition

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- Simple way to sum micro moments to evaluate a given Γ
  How growth happens (cov v/s g) matters for inequality
- When growth unequal ($\sigma(g_i) > 0$) Inequality $\sigma(s_i)$ and mobility $corr(g_i, s_i)$ matter for Γ
  Who grows (cov) matters for aggregate growth

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!

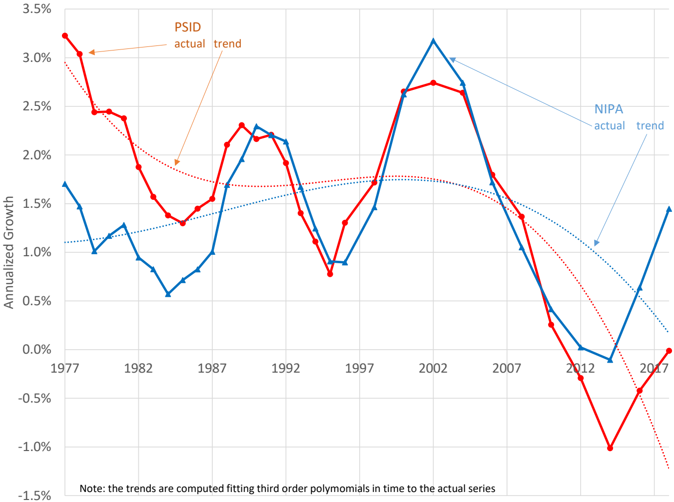
Next

- Measure Γ, $corr(g_i, s_i)$, $\sigma(g_i)$, $\sigma(s_i)$ and $E(g_i)$ 1967-2018, using PSID
- Simple model to identify driving force of changes

Panel Study of Income Dynamics (PSID)

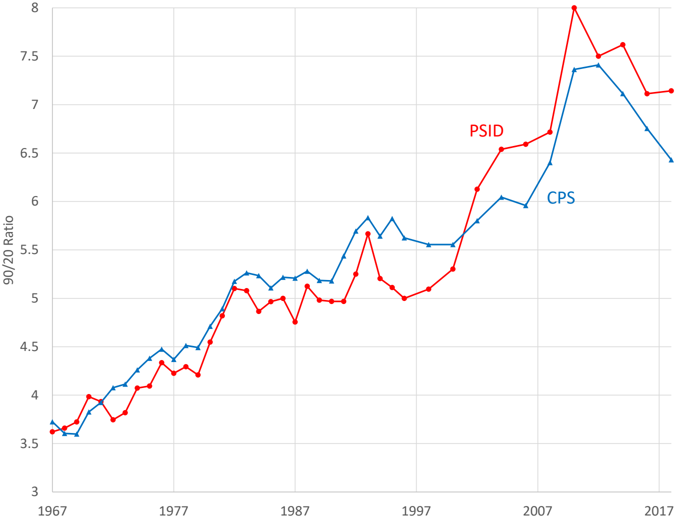
- Long panel of an average 6,000 HH, representative of U.S. population
- Panel essential to identify change of individual income dynamics
- 1967-2018 (Annual until 1996, bi-annual after)
- Publicly available
- Panel data must aggregate up to macro outcomes

PSID v/s NIPA: Γ_t (5y real earnings pc)



- Growth in 2018 is $Avg(2018-16-14)/Avg(2012-10-08)$
- Aggregate PSID matches NIPA Dynamics

PSID v/s CPS: Cross sectional earnings inequality



- PSID matches earnings inequality from larger sample (ASEC CPS)

Mapping decomposition to panel data

$$\bar{y}_{j,t} = \frac{y_{jt} + y_{jt-2} + y_{jt-4}}{3}$$

is real (PCE deflated) average 5-years income of HH j. Let I_t be ith decile of $\bar{y}_{j,t}$ in year t and $\bar{P}_t$ average sample population

then $$g_{i,t} = \frac{\sum_{j \in I_t} \bar{y}_{j,t+6}}{\sum_{j \in I_t} \bar{y}_{j,t}} \frac{\bar{P}_t}{\bar{P}_{t+6}}$$ and $$s_{i,t} = \frac{\sum_{j \in I_t} \bar{y}_{j,t}}{\sum_{I_t} \sum_{j \in I_t} \bar{y}_{j,t}}$$

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- Averaging by years/deciles useful with measurement error
- Growth of decile I in t computed using same of group of households

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- Averaging by years/deciles useful with measurement error
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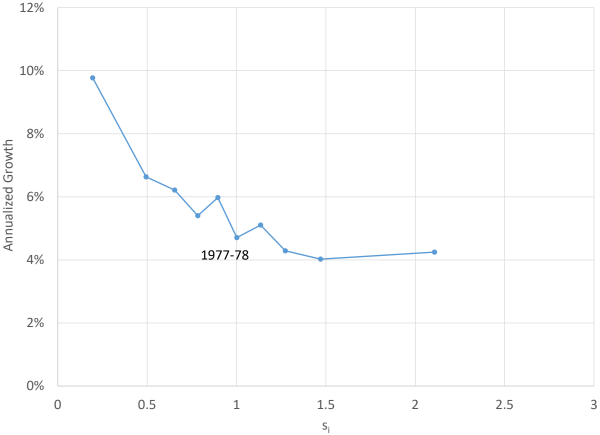
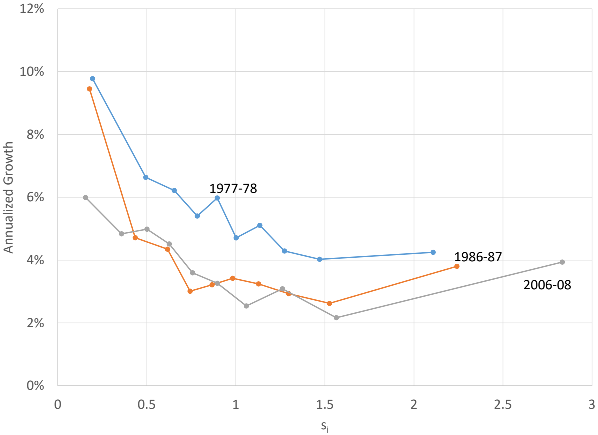
- Income measure: Labor Earnings of all household members
- Sample restrictions: Households with head 25-60, total income $>$ 20% of pvty line, no imputed labor income, in sample in years from $t-4$ to $t+6$ (avg. sample per year $\simeq$ 2000)

Unequal Growth in the 70s (low inequality)



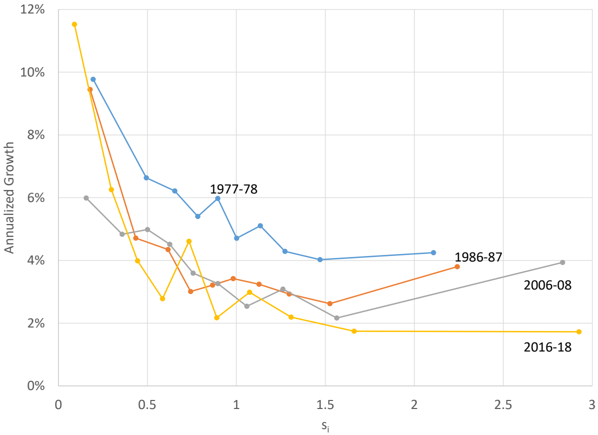
- Unequal growth across earning distribution: $\sigma(g_i) > 0$
- Poor grow faster than rich: $corr(g_i, s_i) < 0$
- L shaped curve

Inequality surges (80s and 00s)



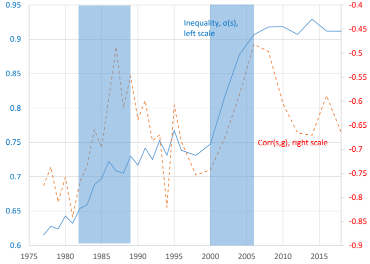
- L turn in U shaped curve, $corr(g_i, s_i) \uparrow$, top grows more than middle
- Inequality increases, $\sigma(s_i) \uparrow$
- Overall growth reduction

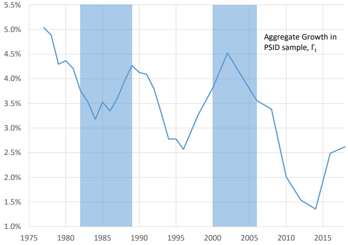
Post Great Recession



- U turns back into L shaped curve, $corr(g_i, s_i) \downarrow$,
- Inequality stabilizes $\sigma(s_i) \simeq$
- Spike at the bottom

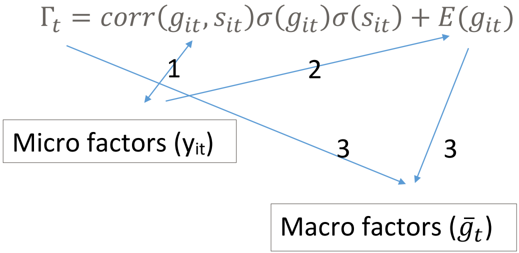
Summarizing





- Data suggests increase in $corr(s, g)$ and inequality happen at the same time and associated with higher growth

From data to drivers



- Data on $corr(g, s), \sigma(g), \sigma(s)$, + model identifies micro factors: (1)
- Model identifies effect of micro factors on $E(g_{it})$, Γ_t: (2)
- Identify changes in macro factor $\bar{g}_t$ residually: (3)

An Ayiagari-Bewley-Huggett Model

- Continuum of infinitely lived households, quarterly
- Small open economy
- Log of household i earning potential is

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

- e_{it} standard AR part, $\tilde{s}_{it} = \frac{e^{\alpha_i + f_{it}}}{E_i(e^{\alpha_i + f_{it}})}$ indicator of income rank

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- α_i is household fixed effect
- f_{it} is growth factor, $\bar{g}_t$ = common growth, δ_t = unequal growth
- When $\delta_t > 0$ rich grows faster than poor

Extensive margin

- Household works iff

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

- 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 constant fraction of non working households in each quarter (abstract from cycle)
- τ balances the gov. budget

Market Structures

- Complete markets, $C_{it} = \bar{Y}_t$
- Bond economy (Ayiagari, 94)

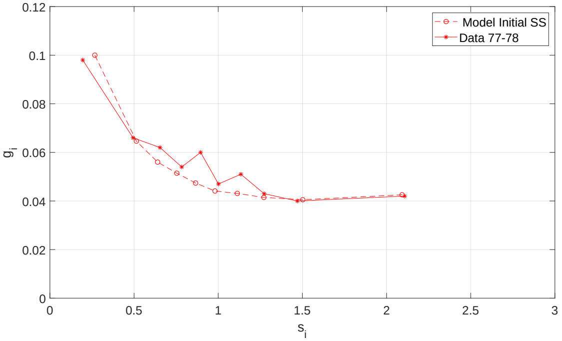
$$\begin{aligned} & \max_{C_{it}, b_{it}} E_t \sum_{t=0}^{\infty} \beta^t u(C_{it}) \\ & s.t. \\ C_{it} &= b_{it-1}(1+r) + max(Y_{it}(1-\tau), \phi_t) - b_{it} \\ & b_t \geq \bar{b} \qquad b_0 \text{ given} \end{aligned}$$

- Autarky (HTM), $C_{it} = max(Y_{it}(1-\tau), \phi_t)$

Exercise

- Set $\delta = 0$ (no unequal growth), set parameters $\rho, \sigma_\varepsilon, \sigma_\alpha, \phi$ to match initial steady state (Ending 1977-78)
- Micro change: one time increase in δ_t
- Macro change: linear decline in common growth $\bar{g}_t$
- $\rho, \sigma_\varepsilon, \sigma_\alpha$ constant throughout, ϕ_t varies to keep fraction of non working constant

Identification of initial parameters



1. Curve is flat for rich, steep for poor

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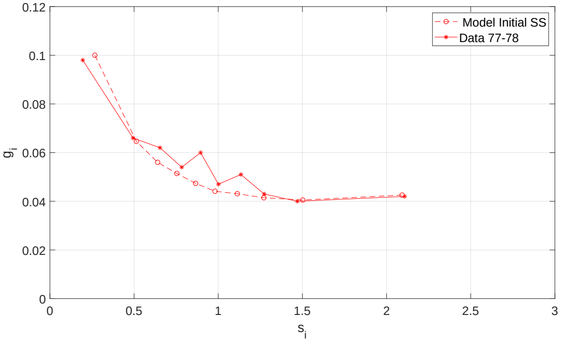

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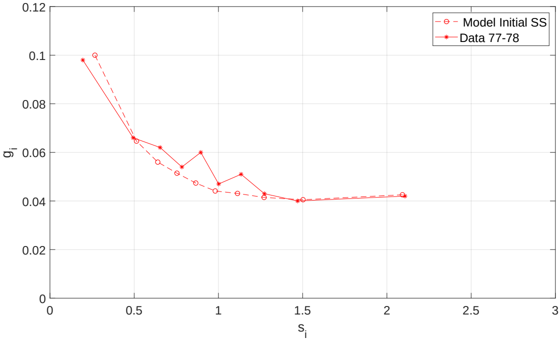
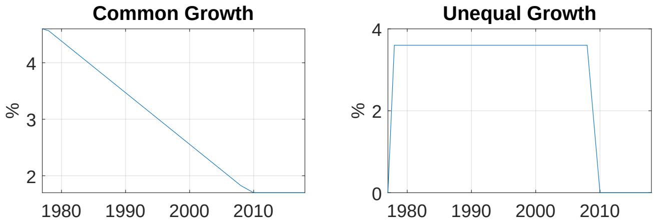


1. Curve is flat for rich, steep for poor

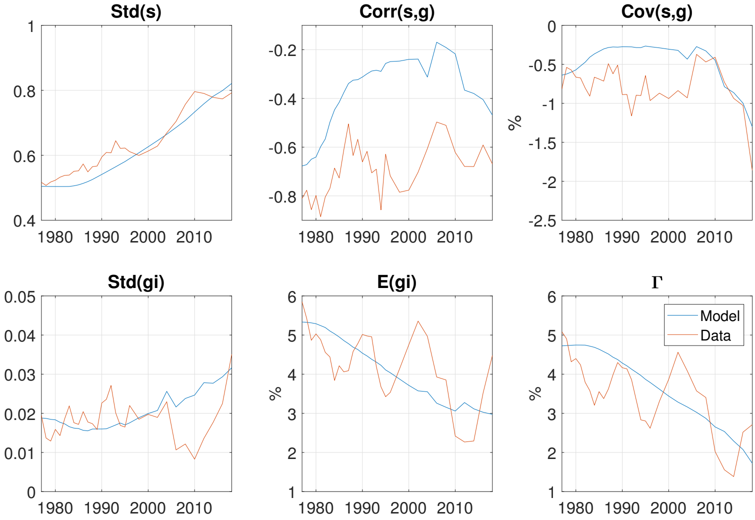
- Fixed effect (initial conditions): flat, Standard AR(1) (luck): steep
- Fixed effect + AR(1): cannot get (1)
- Variance of AR(1) declining with s: fixed effect more important for rich, AR(1) more important for poor $\rightarrow$ Match 1

Parameter driving changes

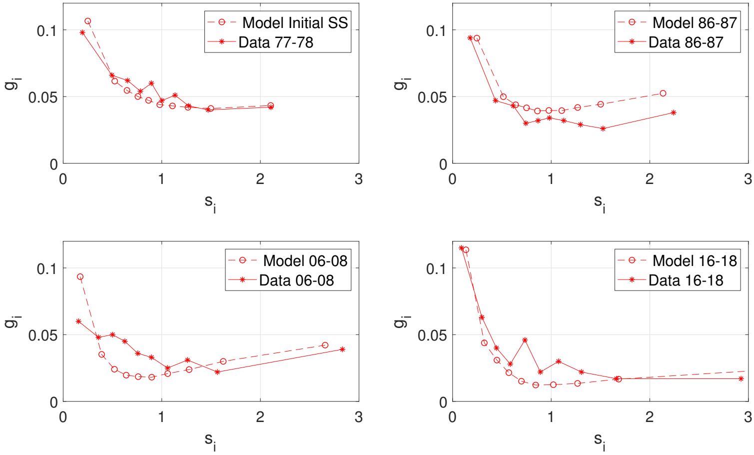


- $\delta \simeq 3.6\%$: $\tilde{s}_i = 2$ grows 1% per year faster than $\tilde{s}_i = 1$ (mean earnings)
- Large decline in common growth (from 4.6% to 1.7%)

Time paths: data and model

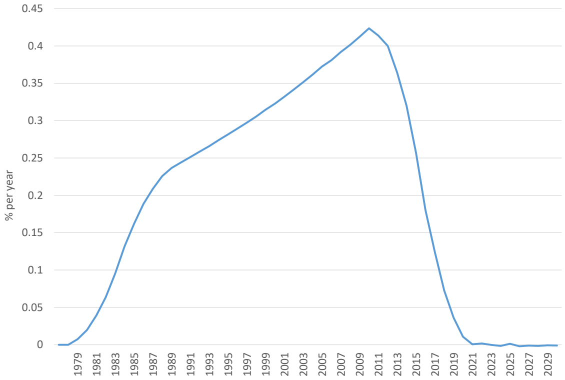


Unequal Growth over time: data and model



- Unequal growth gets change from L to U shape

Aggregate impact of unequal growth



- $\Gamma(\bar{g}_t, \delta_t) - \Gamma(\bar{g}_t, \delta = 0)$: Small but sizeable (average 0.25% per year)
- Possibly larger with a more skewed (and realistic) earning distribution

Unequal growth v/s increasing risk

- Increase persistence and/or volatility of shocks (e.g. Heathcote, Storesletten and Violante, 2010) generate an increase in inequality
- These mechanisms do not generate changes in the growth distribution curve from L to U, i.e. systematic growth differentials between rich and poor
- Growth distribution point to increase in permanent dispersion not increase in risk (Bloom at al., 2017)

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- These mechanisms do not generate changes in the growth distribution curve from L to U, i.e. systematic growth differentials between rich and poor
- Growth distribution point to increase in permanent dispersion not increase in risk (Bloom at al., 2017)
- Alternative mechanisms also have much lower aggregate impact

Welfare costs of increase in unequal growth

- Compute equilibria and values in Complete Markets, Bond Economy and Autarky
- Compare ex-ante values of transition with and without unequal growth (keeping $\bar{g}_t$ constant)

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	Market Structure		
Risk aversion (θ)	CM	BE	A
$\theta = 2$	-3.3%	+4%	+18.3%
$\theta = 4$	-1.6%	+28.5%	+63.6%

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 (+0.25%) 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, globalization, unequal access to education opportunities (Fogli and Guerrieri, 2020)?
- What has driven the large decline in common growth?
- How to share the unequal growth?