Inequality and Macroeconomics: Facts and Theories

Lecture 5. Applications

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Overview

- **Inequality and Growth** (Lippi and Perri, 2023)
- Inequality and Business Cycles (Heathcote, Perri and Violante, 2020)
- Inequality and Segregation (Fogli, Guerrieri, Ponder and Prato 2023)
- Inequality and Trade (Waugh, 2024)

Introduction

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- Over past 50 years in the United States large increase in household income inequality
- 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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$$\begin{aligned}\Gamma_t &= cov(g_{i,t}, s_i) + E(g_{i,t}) \\ &= corr(g_{i,t}, s_{i,t})\sigma(g_{i,t})\sigma(s_{i,t}) + E(g_{i,t})\end{aligned}$$

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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

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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!

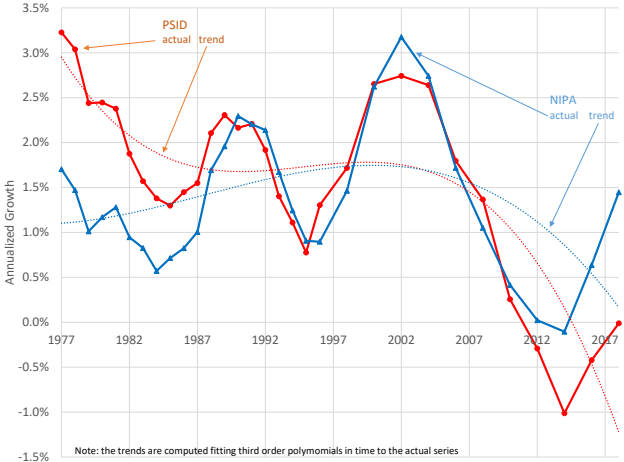
Next

- 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)

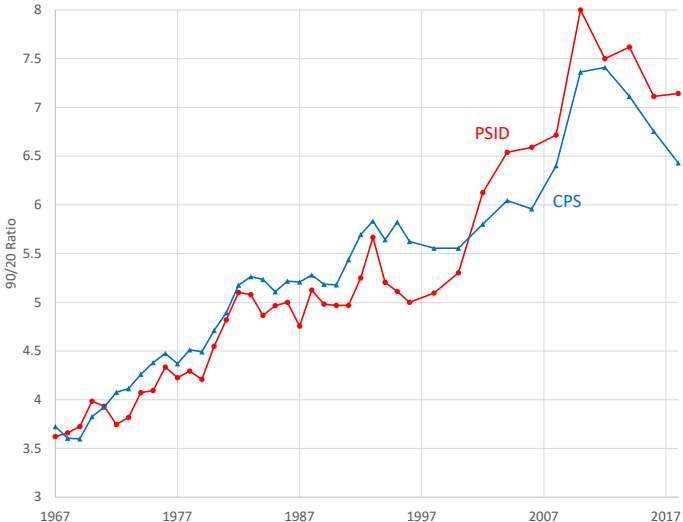
- Long panel of an average 6,000 HH, representative of U.S. population
- Panel essential to identify change of individual income dynamics
- 1967-2018 (Annual until 1996, bi-annual after)
- Publicly available
- Panel data must aggregate up to macro outcomes

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

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

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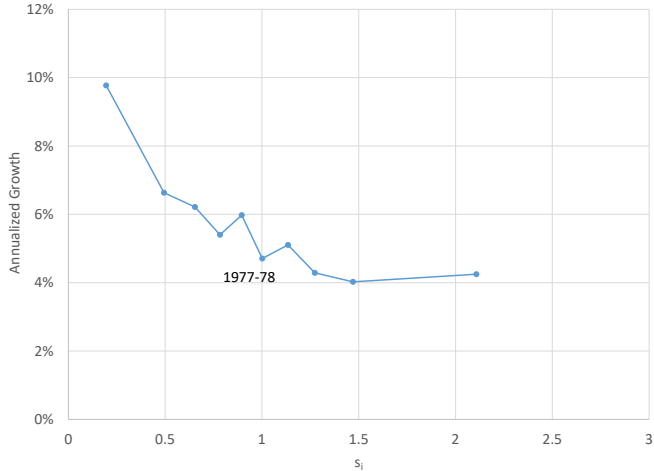
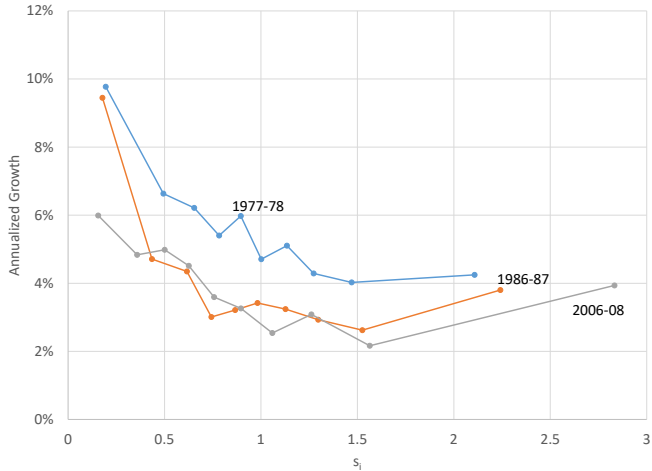
- Averaging by years/deciles useful with measurement error
- Growth of decile I in t computed using same of group of households
- Income measure: Labor Earnings of all household members
- Sample restrictions: Households with head 25-60, total income above 20% of pvty line, no imputed labor income, in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

Unequal Growth in the 70s (low inequality)



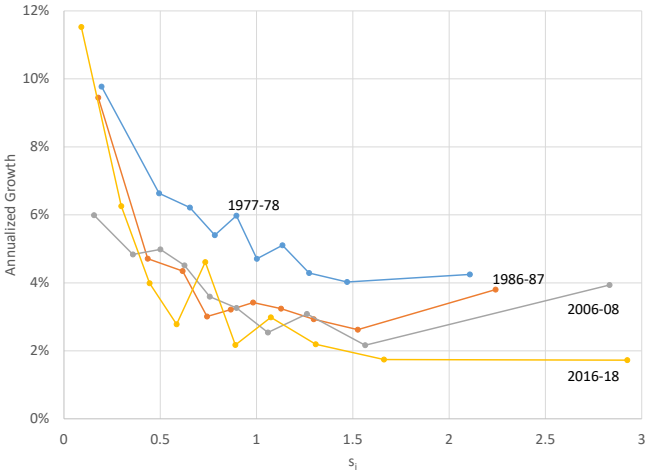
- Unequal growth across earning distribution: $\sigma(g_i) > 0$
- Poor grow faster than rich: $corr(g_i, s_i) < 0$
- L shaped curve

Inequality surges (80s and 00s)



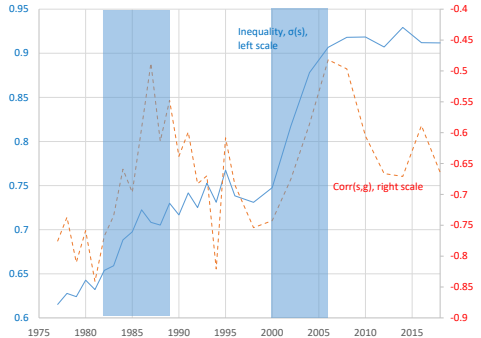
- L turn in U shaped curve, $corr(g_i, s_i) \uparrow$, top grows more than middle
- Inequality increases, $\sigma(s_i) \uparrow$
- Overall growth reduction

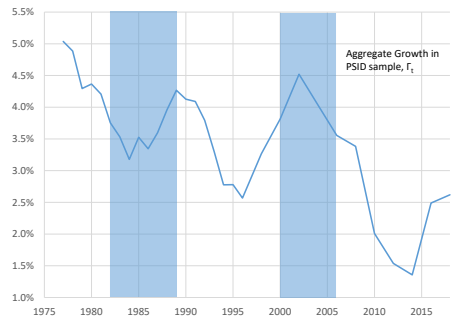
Post Great Recession



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

Summarizing

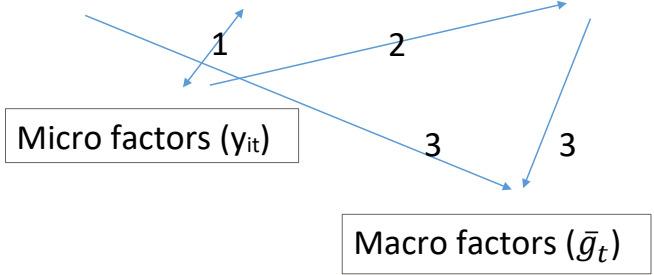




- Data suggests increase in $corr(s, g)$ and inequality happen at the same time and associated with higher growth

From data to drivers

$$\Gamma_t = corr(g_{it}, s_{it})\sigma(g_{it})\sigma(s_{it}) + E(g_{it})$$



- 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 (1 $\rightarrow$ income = mean)

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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)

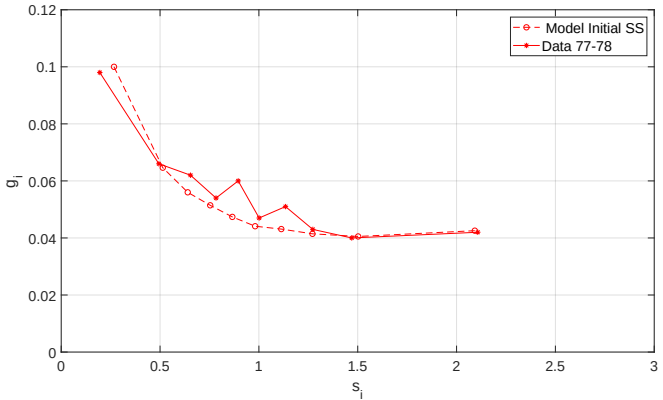
$$\begin{aligned} & \max_{C_{it}, b_{it}} E_t \sum_{t=0}^{\infty} \beta^t u(C_{it}) \\ & s.t. \\ C_{it} \quad = \quad & b_{it-1}(1+r) + max(Y_{it}(1-\tau), \phi_t) - b_{it} \\ & b_t \geq \bar{b} \qquad b_0 \text{ given} \end{aligned}$$

- 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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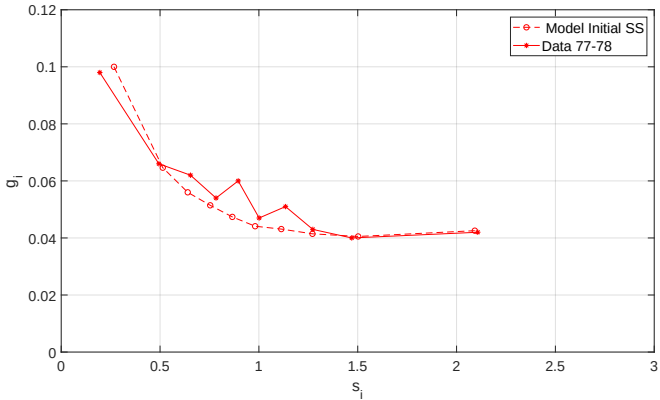

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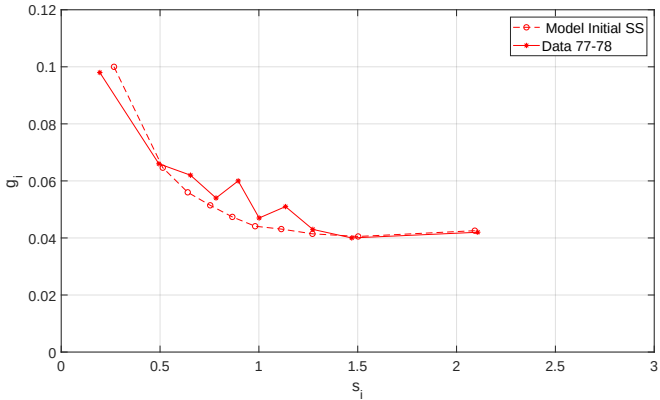
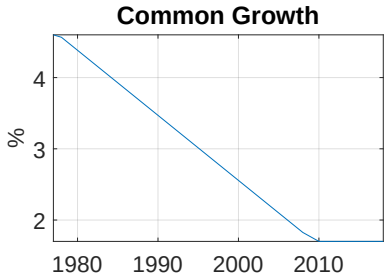
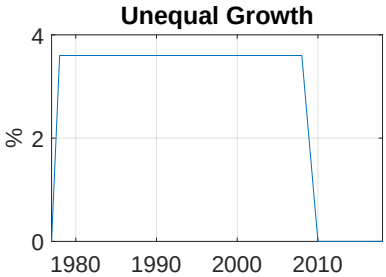


1. Curve is flat for rich, steep for poor
   - Fixed effect (initial conditions): flat, Standard AR(1) (luck): steep
   - Fixed effect + AR(1): cannot get (1)
   - Variance of AR(1) declining with s: fixed effect more important for rich, AR(1) more important for poor $\rightarrow$ Match 1

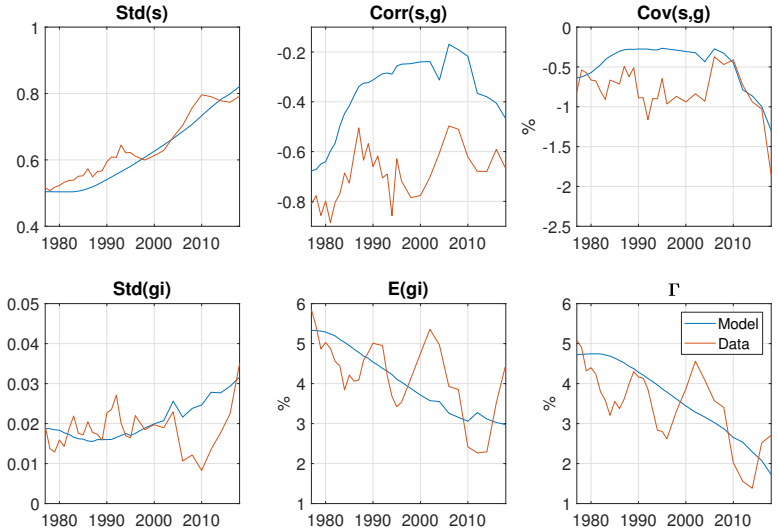
Parameter driving changes



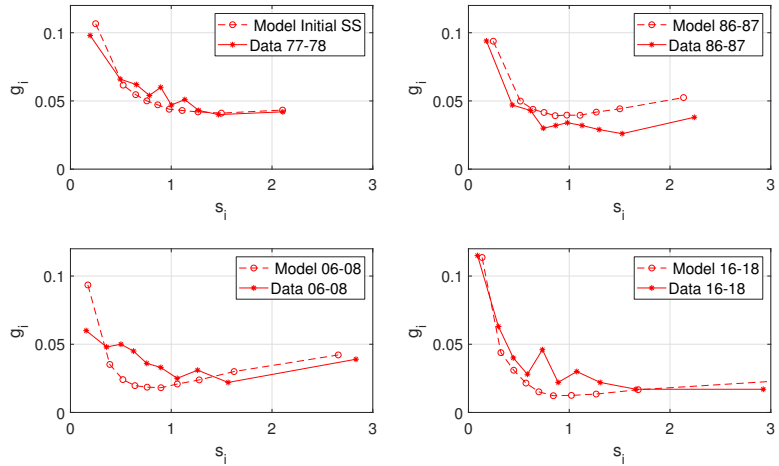


- $\delta \simeq 3.6\%$: $\tilde{s}_i = 2$ grows 1% per year faster than $\tilde{s}_i = 1$ (mean earnings)
- Large decline in common growth (from 4.6% to 1.7%)

Time paths: data and model

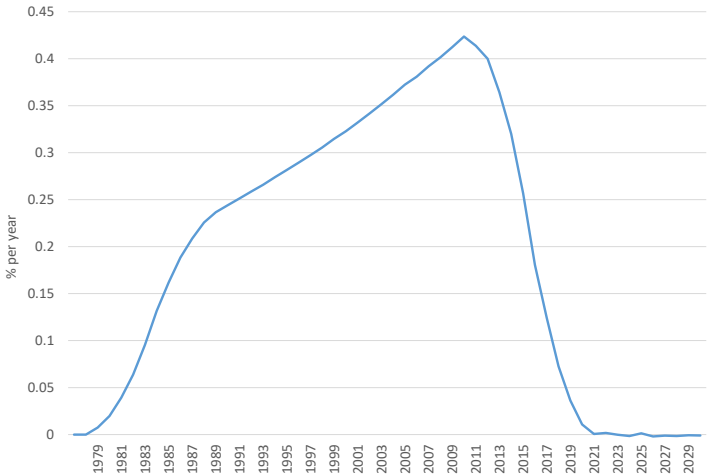


Unequal Growth over time: data and model



- Unequal growth gets change from L to U shape, spike in final years

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., 2023)

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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., 2023)
- 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?
- What has driven the large decline in common growth?
- How to share the unequal growth?

Overview

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- **Inequality and Business Cycles** (Heathcote, Perri and Violante, 2020)
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- Inequality and Trade (Waugh, 2024)

Overview

- Objective: understand the roles of recessions (macro event) on inequality trends in US
- Context: a labor force participation theory

Questions

- How much of the rise in US earnings inequality in the last 50 years is due to recessions?
- Had the US experienced fewer/milder recessions, how different would its earnings distribution be today?

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Outline

- Facts
- Model
- Counterfactuals and answers

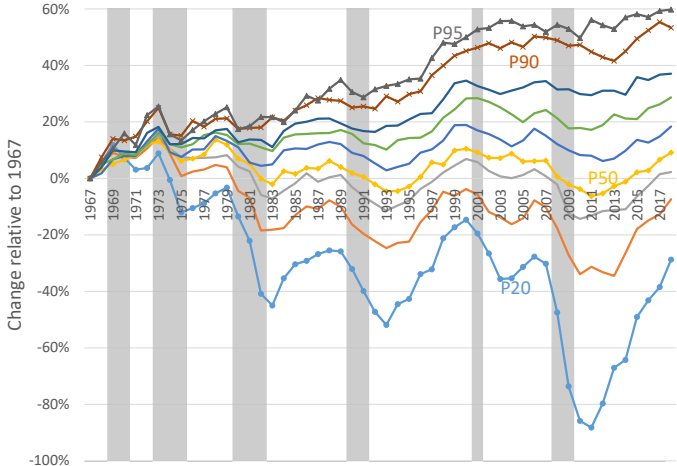
Data

- CPS 1967-2018
- Men, Prime-age (25-54)
- Earnings = wages & salaries + business income + farm income

Data

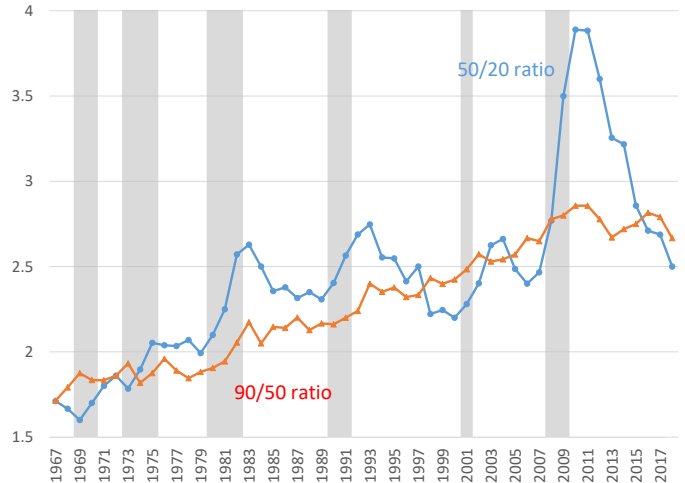
- CPS 1967-2018
- Men, Prime-age (25-54)
- Earnings = wages & salaries + business income + farm income
- Don't drop the zeros! Important part of rise in inequality
  - Most studies focus on full-time full-year workers
  - Standard inequality measures [e.g. $var(\log)$] force dropping zeros
  - Administrative data sets miss non-earners by construction

US Real Earnings Distribution: 1967-2018



Sample: March CPS, All Males, Aged 25-55

Inequality at the top and at bottom: 1967-2018



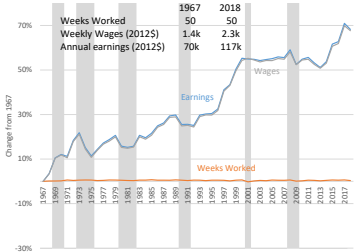
Sample: March CPS, All Males, Aged 25-55

Main Features

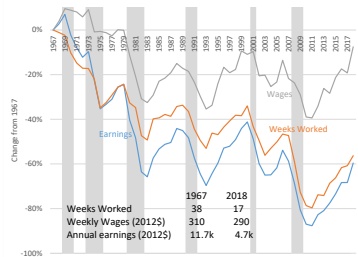
- Widening dispersion, at both the top and the bottom
- Increase at the top: steady rise
- Increase at the bottom: cyclical pattern
  1. increases sharply in recession
  2. only partially recovers in expansions
- Inequality at the bottom: **gap between poor and middle class**

The Tale of the Tails: Wages vs Hours

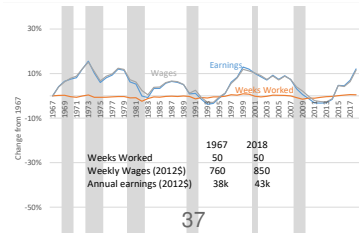
Top 85-95%



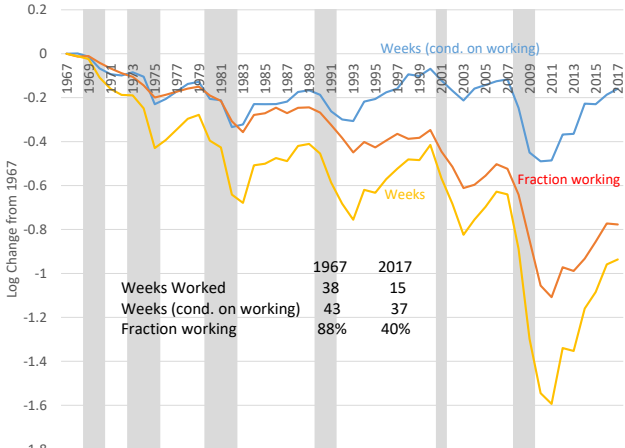
Bottom 0-20%



Mid 45-55%

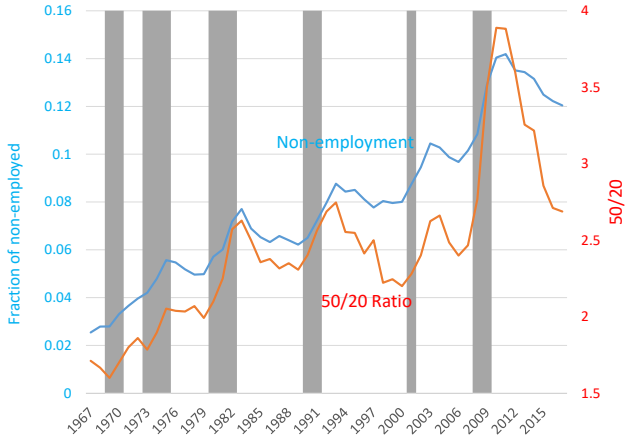


Intensive and Extensive Margins at the Bottom



Sample: March CPS, Males, Aged 25-54

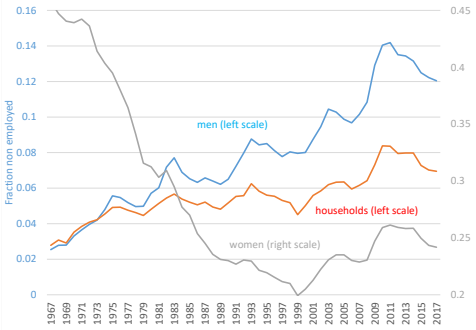
Inequality at the Bottom and Non-Employment



Sample: March CPS, Males, Aged 25-54

Why prime-age men?

- Group with participation least likely affected by additional factors (aging, culture)
- Same forces likely important for women in recent years

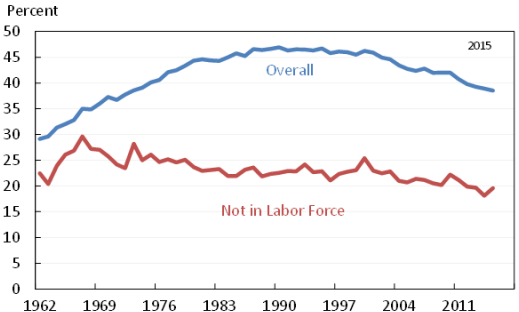


Non-employment for men, women, households

Does the fall in participation for men reflect rising participation for women?

- If women replacing men's earnings within the household, declining men participation might not impact household earnings inequality
- Data are not consistent with this: fewer than 1/4 of non-participating men have a working spouse ...and that share has decline over the past 50 years
- Rising female participation amplifies earnings inequality at the top, does not mitigate earnings inequality at the bottom

Share of prime age men with spouse in the labor force



Source: Bureau of Labor Statistics, Current Population Survey (Annual Social and Economic Supplement); CEA calculations.

Dynamics of Inequality at the Bottom: Trend vs Cycle

	Trend	Recessions
Non-employment	Goes up	Goes up
	⇓	⇓
Earnings of bottom 20%	Goes down	Goes down
	⇓	⇓
Inequality at the bottom (50/20)	Goes up	Goes up

- Two interpretations:
  1. Inequality on a secular upward trend, and business cycles just generate fluctuations around this trend
  2. Recessions increase inequality, and long run increase is cumulative effect of series of recessions
- Data alone not enough: need a model

A Theory of a “Double Whammy”

- Recessions are times when lots of workers lose their jobs
- With their jobs, they lose skills (scarring)
- Job/skill loss disproportionately impacts low-skilled workers, who may already be *marginal* labor market participants
- In recoveries most jobs/skills slowly return, unless...
- Recession happens against backdrop of trend-decline in low skill wages relative to the “value of leisure”
- Then, low-skill workers might never come back to labor market

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Recessions accelerate the trend

Model Ingredients

- Three-state model of the labor market: $x_t \in \{E, U, N\}$
- Skill dynamics depend on state (learning/scarring)
- Dynamic Participation decision
- Cycle: Fluctuations in job finding rate (Shimer, 2012)
  - Job finding and losing rates unequal across skills
- Trend: skill-biased technical change
- Start by describing model with neither cycle nor trend

Demographics & Preferences

- **Demographics:** overlapping generations of individuals of age $a = 0, \ldots, A$. Stationary population size normalized to 1
- **Preferences:** linear in consumption (numeraire) and leisure

$$u(c, \ell) = c + \exp(\phi)\,\ell$$

  - discount at rate β
- **Skills:** each individual has skill s which evolves stochastically
- **Budget Constraint:** no intertemporal borrowing and lending

$$c = w(s)\mathbb{I}_{\{x_t = E\}}$$

Technology

- Aggregate production function linear in effective labor

$$C = Y = \int \exp(\sigma s) \cdot L(s)\, ds$$

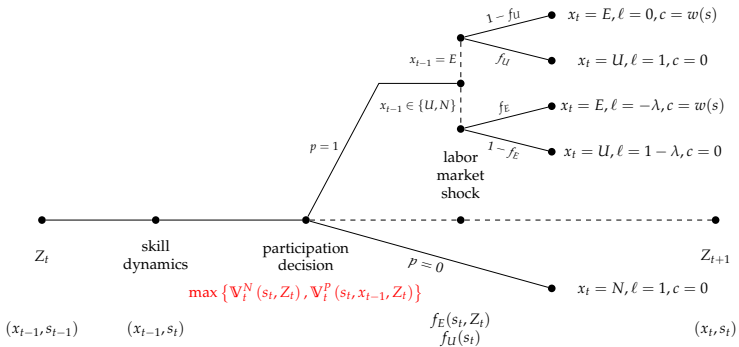
where $L(s)$ is the mass of employed workers with skill s

- Labor market is competitive:

$$\log w(s) = \sigma s \quad \Rightarrow \quad var(\log w) = \sigma^2 \cdot var(s)$$

- σ is a measure of skill bias in technology

Timeline


$1 - f_U$
$x_t = E, \ell = 0, c = w(s)$
$x_{t-1} = E$
f_U
$x_t = U, \ell = 1, c = 0$
$x_{t-1} \in \{U, N\}$
f_E
$x_t = E, \ell = -\lambda, c = w(s)$
$p = 1$
$1 - f_E$
$x_t = U, \ell = 1 - \lambda, c = 0$
labor market shock
Z_t
skill dynamics
participation decision
Z_{t+1}
$p \approx 0$
$x_t = N, \ell = 1, c = 0$
$\max \{\mathbb{V}_t^N(s_t, Z_t), \mathbb{V}_t^p(s_t, x_{t-1}, Z_t)\}$
(x_{t-1}, s_{t-1})
(x_{t-1}, s_t)
$f_E(s_t, Z_t)$
$f_U(s_t)$
(x_t, s_t)

Skill Dynamics

- Skills evolve as

$$s_{t+1} = \rho s_t + \mathbb{I}_{\{x_t = E\}} \cdot \delta^+ - \mathbb{I}_{\{x_t \neq E\}} \cdot \delta^- + \varepsilon_{t+1}, \quad \text{with} \quad \varepsilon_{t+1} \sim \mathbb{N}(0, v_\varepsilon)$$

- δ^+ is pct skill growth during employment (E)

- δ^- is the pct skill loss from not working (U, N)

Cycles and Trends

- **Cycles:** State-dependent job finding probabilities
  - Aggregate state Z (cyclical indicator)
  - $Z \in \{B, X, R, C\}$
    $B = Boom, X = eXpansion, R = Recession, C = Crisis$

$$\Pr\left(x_t = U | x_{t-1} = E, s\right)$$

$$\Pr\left(x_t = E | x_{t-1} = U, s, Z\right)$$

- **Trends:** Time effect in the return to skill:

$$\sigma^2_{t+1} = \sigma^2_t + \gamma_\sigma$$

Other Secular Trends in Cohort Effects

- Cohort effects in mean initial skill level:

$$\bar{s}_{0,t+1} = \bar{s}_{0,t} + \gamma_{\bar{s}_0}$$

- Cohort effects in mean value of leisure (video-games):

$$\bar{\phi}_{t+1} = \bar{\phi}_t + \gamma_{\bar{\phi}}$$

  with $\gamma_{\bar{\phi}} = \gamma_{\bar{s}_0}$ (balanced growth)

- Cohort effects neutral on participation

Changing Returns to Skills and Participation

- SBTC:
  - Creates more wage inequality at labor market entry
  - Weakens wage growth for low-skill workers
- And, as a result:
  - Increases the number of marginal participants
  - Increases the sensitivity of participation to negative skill shocks and unemployment spells
  - Makes participation more sensitive to recessions

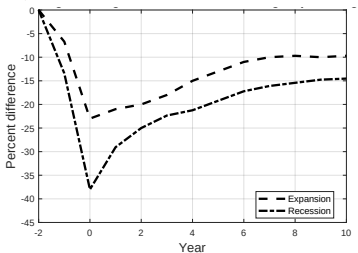
Key Calibration Targets

- Scarring
- Job Transition Probabilities
- Unemployment and Long term Unemployment
- Inequality at the Top

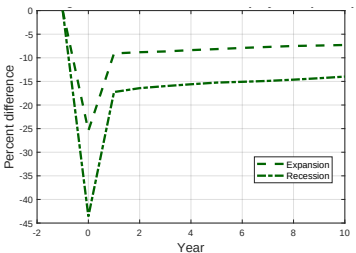
Scarring (δ^-): data vs model

Percentage earning losses after unemployment

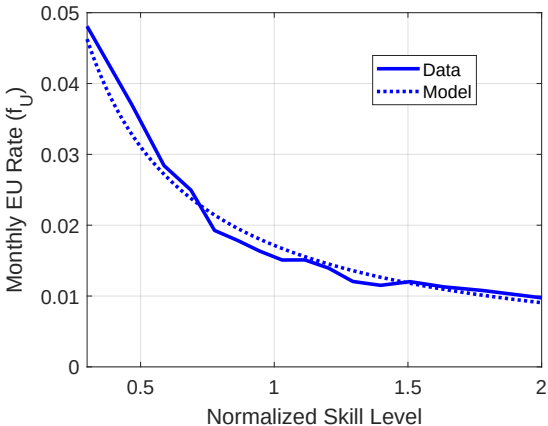
Data (Davis and Von Wachter, 2011)



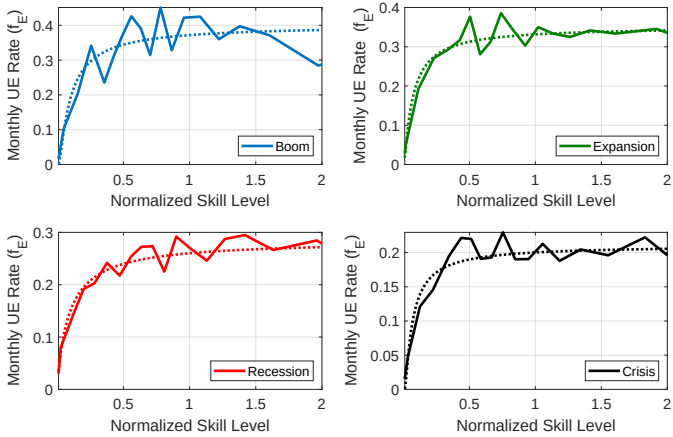
Model



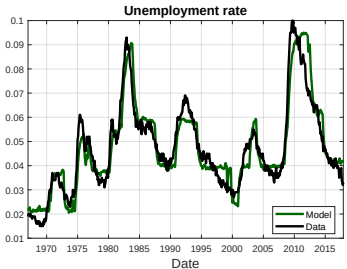
EU transition (constant over time)
CPS 1989-2019

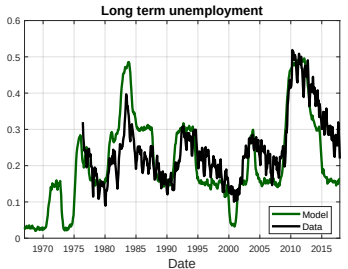


UE transition (changing with aggregate state Z)
CPS 1989-2019



Unemployment and Long term unemployment





Wage Inequality at the top over time and over age

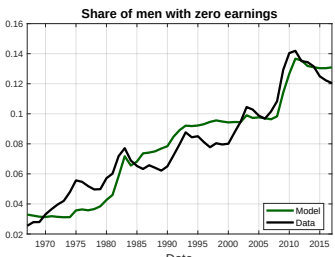
- At median earnings and above: earnings $\simeq$ wages
- Pick:
  - ν_ϵ: dispersion of skill shocks
  - γ_σ: increase in skill bias over time
- To match time/age effects in earnings 90/50 for age/year cells

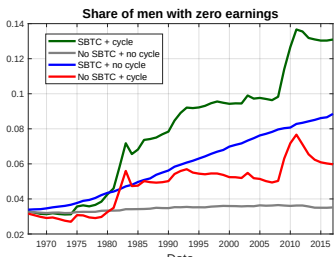
Experiments

Three versions of the model:

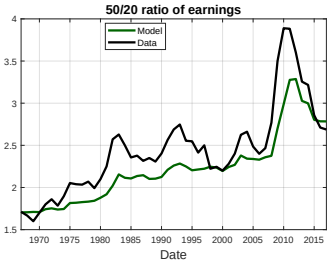
- Baseline
- No trend: baseline without secular increase in inequality ($\sigma_t = \bar{\sigma}$)
- No cycle: baseline without recessions ($u_t = 4\%$, $t = 1967, ..., 2017$)

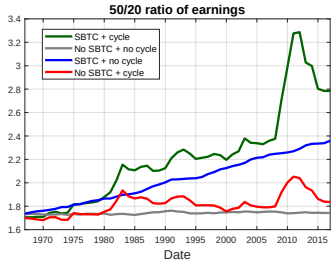
Non Participation





Inequality


50/20 ratio of earnings
Model
Data
4
3.5
3
2.5
2
1.5
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date


50/20 ratio of earnings
SBTC + cycle
No SBTC + no cycle
SBTC + no cycle
No SBTC + cycle
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date

Answers

- Recessions w/o SBTC would have had smaller impact on non-employment and inequality
  - Job and skill losses in recessions largely recouped in expansions
- SBTC w/o recessions would have had smaller impact on non-employment and inequality
  - Skill growth on the job for low wage workers partially offsets declining low skill wages
- Recessions against a backdrop of SBTC $\rightarrow$ "double whammy"
  - Recession pushes many low skill workers into nonemployment
  - Skill losses through scarring amplified by downward trend in low skill wages $\rightarrow$ many job losers never come back to the labor market

Overview

- Inequality and Growth (Lippi and Perri, 2023)
- Inequality and Business Cycles (Heathcote, Perri and Violante, 2020)
- **Inequality and Segregation** (Fogli, Guerrieri, Ponder and Prato, 2023)
- Inequality and Trade (Waugh, 2024)

Question

- over the last 40 years large increase in US income inequality
- simultaneous rise in residential income segregation

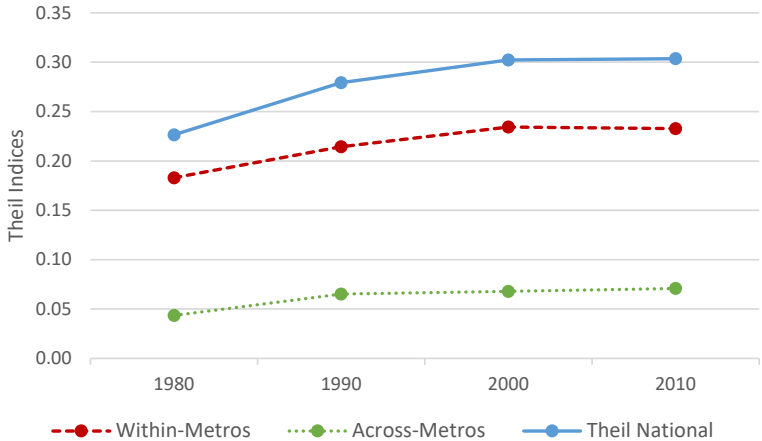
Question:

has residential segregation contributed to amplify inequality response to underlying shocks?

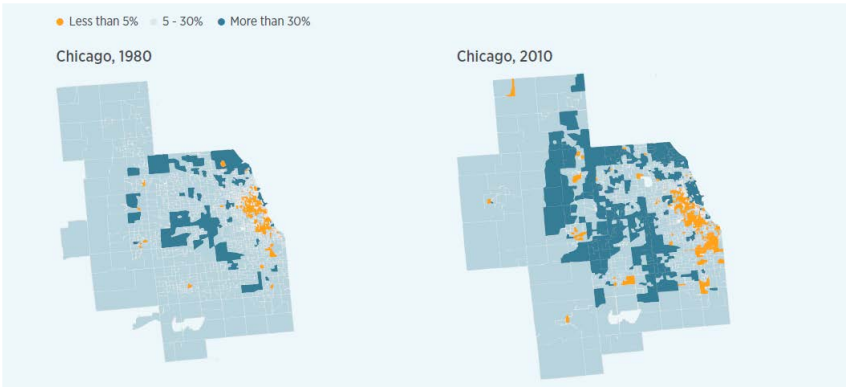
This paper:

model with residential and educational choices in presence of endogenous local spillovers disciplined with micro estimates by Chetty-Hendren (2018)

Inequality Within and Across Metros



An Example: Chicago



The figure plots the share of rich households (top 20th percentile)

Preview

- data: correlation between inequality and segregation
- GE OGM with residential choice with endogenous neighborhood spillover
  - peer effects, public schools, social norms, learning …
  - endogenous house prices $\rightarrow$ feedback between inequality and segregation
- calibrate the model to a representative US MSA, using CH micro estimate
- **main exercise**: MIT shock to skill premium in 1980
  - contribution segregation to increase in inequality

Data and Indexes

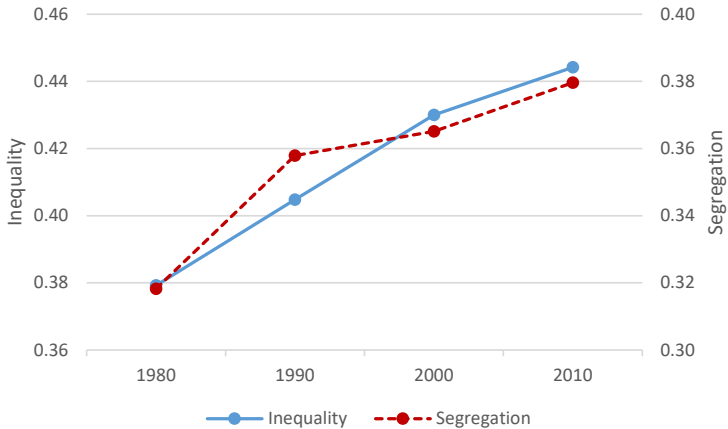
- data sources:
  - Census tract data 1980 - 2010 (long questionnaire only up to 2000)
  - American Community Surveys 2008-2012
- geographic unit and sub-unit: metro and tracts (according to Census 2000)
- inequality measure = Gini coefficient
- segregation measure = dissimilarity index
  - it measures how uneven is the distribution of two mutually exclusive groups across geographic subunits
  - groups: rich and poor as above and below the 80th percentile

More on Dissimilarity Index

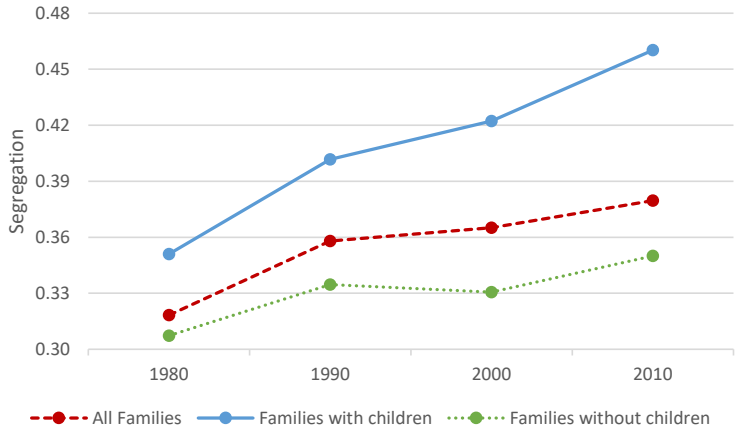
$$D(j) = \frac{1}{2} \sum_i \left| \frac{x_i(j)}{X(j)} - \frac{y_i(j)}{Y(j)} \right| \tag{1}$$

- $x_i(j)$ = poor in census tract i in metro j
- $y_i(j)$ = rich in census tract i in metro j
- $X(j)$ = total poor population in metro j
- $Y(j)$: total rich population in metro j
- extremes:
  1. $D(j) = 0$ each tract same distribution as metro
  2. $D(j) = 1$ each tract has only one group

Inequality and Segregation Across Time



Segregation: Different Samples



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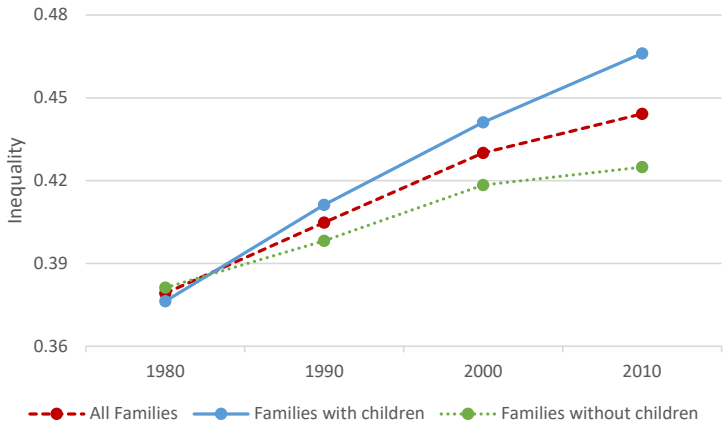
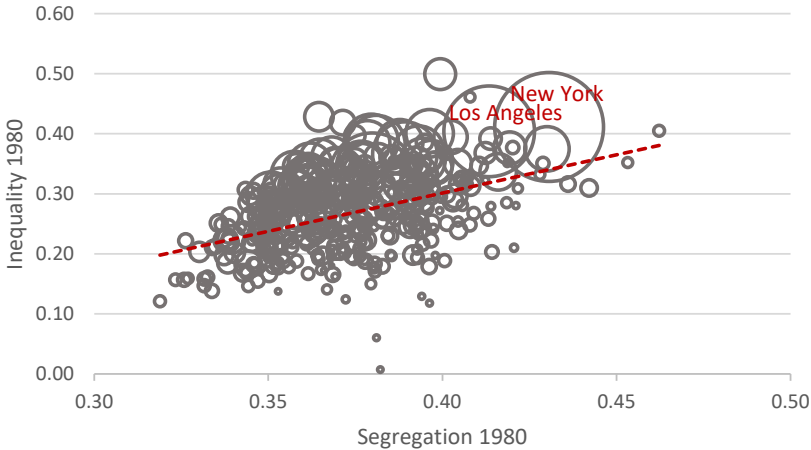
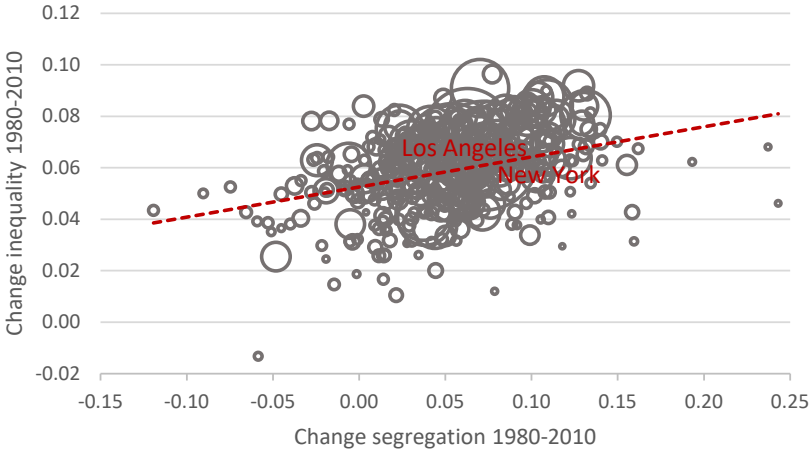


Inequality and Segregation Across Space



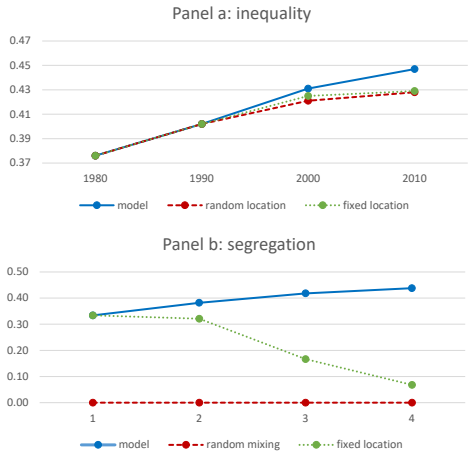
Inequality and Segregation Across Space and Time



Two Main Counterfactuals

- how much does segregation amplify the response of inequality to the skill premium shock?
- main counterfactuals: shut down residential choice after the shock
- two ways of doing it:
  1. after the shock families randomly re-located in the two neighborhoods $\rightarrow$ global spillover
  2. after the shock families cannot move and rental rates are fixed at SS

Counterfactuals



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Heterogenous Price Elasticities and Trade

To trade economists, household heterogeneity is interesting because of the notion that some benefit from trade and others don't.

One mechanism behind this notion is heterogeneity in **elasticities**.

- In the context of the 2015 Swiss appreciation, Auer et al. find that poor households are more price elastic.
- A very intuitive idea. Missing almost entirely from macro and trade, but a foundation of modern demand estimation in IO.

Waugh(2024)

- A model of household heterogeneity that results in heterogenous price elasticities, use it as a laboratory to think about aggregate trade, the gains from trade and how they are distributed.

Heterogenous Price Elasticities and Trade | How it Works

Two ingredients:

- Trade as in Armington, but households have random utility over varieties (Mc Fadden)
- Standard incomplete markets model with households facing incomplete insurance against idiosyncratic productivity and taste shocks (Ayiagari)

The core insight | a household's price elasticity, in essence, is about the marginal gain in utility from a percent change in consumption.

- A price reduction delivers a lot of extra utility for high marginal utility (poor) households and this induces strong substitution by the poor.
- An implication is that the poor value the trade-induced price reduction more than the rich.

Heterogenous Price Elasticities and Trade

Qualitatively characterize:

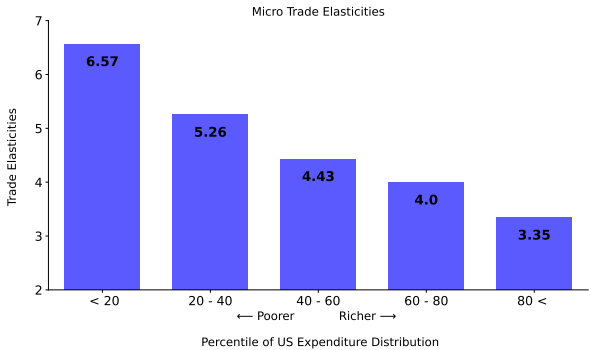
- How price elasticities vary at the micro-level and when micro-heterogeneity shapes aggregates.
- The welfare gains from trade.
- The efficient allocation and, thus, how market incompleteness shapes these outcomes.

Quantitatively:

- Find large gains from trade…

  The poorest households gain 4.5X more than the richest; the average gains from trade are 3X than representative agent benchmarks.

Trade elasticities across the expenditure distribution



Welfare gains across the expenditure distribution

U.S. Welfare: 10% Reduction in $d_{us,j}$