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Lecture 1

Directed Reading Course

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Motivation

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- Rise of wage inequality
- Several inequality debates: discrimination by sex, labor-market institutions, technology change, education, ...

Trends in wage inequality

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Three reasons to focus in college premiums (Goldin & Katz, 2007)

- Big share of wage inequality due to college premiums

Trends in wage inequality

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Three reasons to focus in college premiums (Goldin & Katz, 2007)

- Big share of wage inequality due to college premiums
- As result of long-term demand shifts favoring high-skill workers coupled with a slowdown in the relative growth of the supply of college-educated workers Katz and Murphy, 1992

Trends in wage inequality

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Three reasons to focus in college premiums (Goldin & Katz, 2007)

- Big share of wage inequality due to college premiums
- As result of long-term demand shifts favoring high-skill workers coupled with a slowdown in the relative growth of the supply of college-educated workers Katz and Murphy, 1992
- Possibility to study the general equilibrium response due to educational or labor policies Bowlus et al., 2017

Three tendencies in wage structure Goldin and Katz, 2007

1. **Narrowing (1910-1960)**: rapid growth in the relative demand for more educated workers and increases in the supply of skills (rising educational attainment)
2. **Widening (1970-1980):** Inequality rose **monotonically** during this decade (Autor et al., 2008). Katz and Autor (1999) shows the log 90-10 workers rose 20 log points to men and 25 for women.
3. **Polarizing (1980-now):** growth employment polarized in 90s and was in the highest-skill jobs, declines in employment shares occurred for middle-skill jobs, and rising employment shares in lowest-skill occupations (Autor et al., 2008)

Polarization

Explanation by Autor et al., 2008

1. Central role for relative supply growth fluctuations and trend demand growth in explaining the evolution of the college wage premium
2. Secular increase in the relative demand for college workers combined with fluctuations in relative skill supplies
3. Goldin and Katz, 2007 indicates that from 1980 to 2005 returns of schooling increased and **convexified**, playing an important role in the divergence of the upper and lower tail

Wage setting models

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Researchers have advanced in possible causes for the changes in wage inequality

1. Educational attainment
2. Skill-biased technological change (SBTC)
3. Deunionization
4. Decline real minimum wage
5. Growing monopsony power in the labor market

Which one is the best candidate?

Canonical model - Katz and Murphy, 1992

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- Rising return to "skill"
  - Observed determinants: education, experience
  - Unobserved determinants: talent, ability
- Tinbergen (1974): race between education and technology
  - Skill-biased technical change raises the return to skill
  - Rising educational attainment depresses the return to skill

1. Changes in relative demand

- Aggregate function $F(X_t)$ is a function of K labor inputs
- **Conditional** factor demands

$$X_t = D(W_t, Z_t)$$

where W_t are factor prices and Z_t demand shifters

- Hypothesis : If relative demand is stable $dZ_t = 0 \Longrightarrow dW_t' dX_t \geq 0$

Reject stable demand

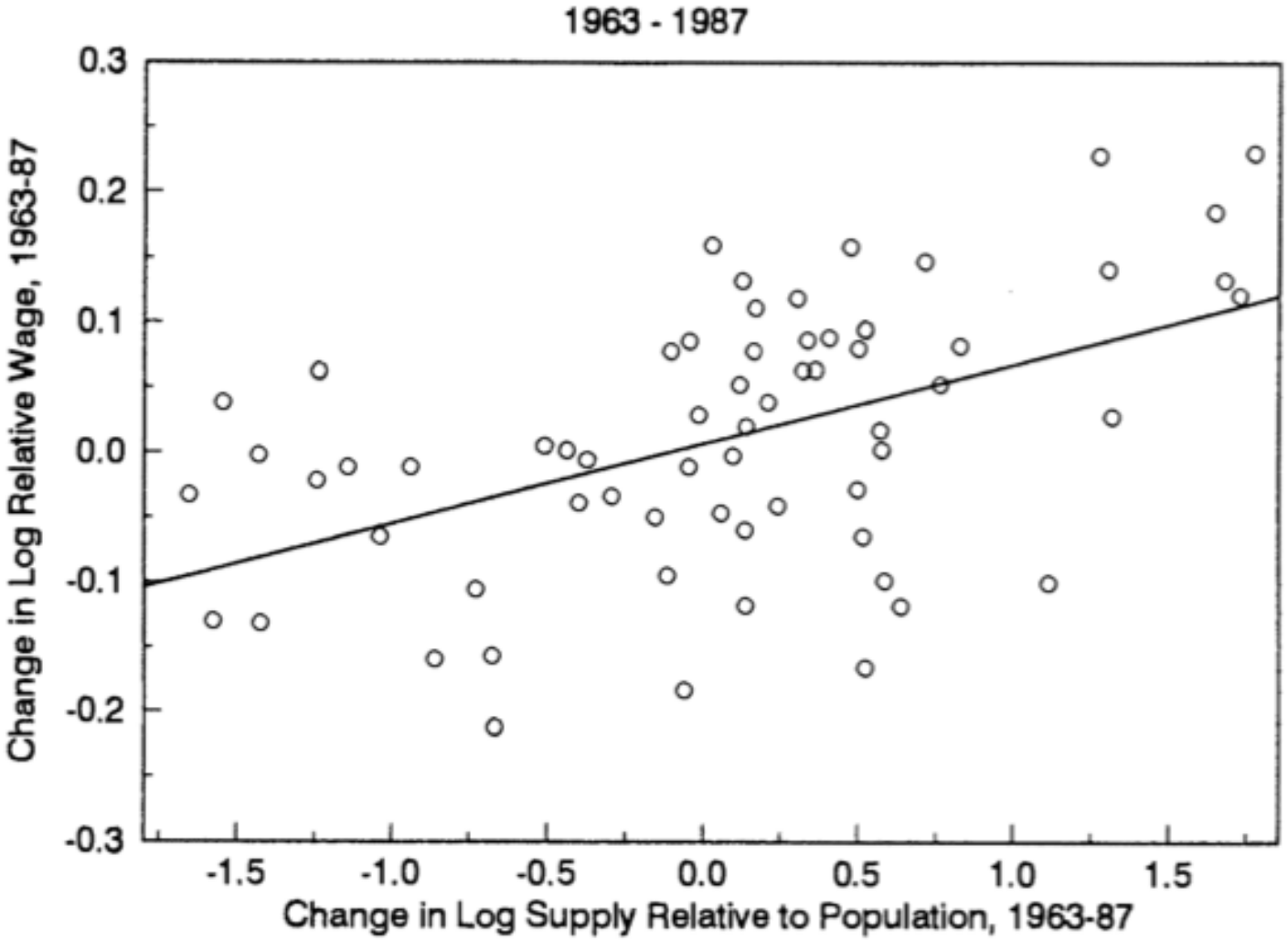

Figure: Katz and Murphy, 1992 , Figure 3

2. Changes in relative supply

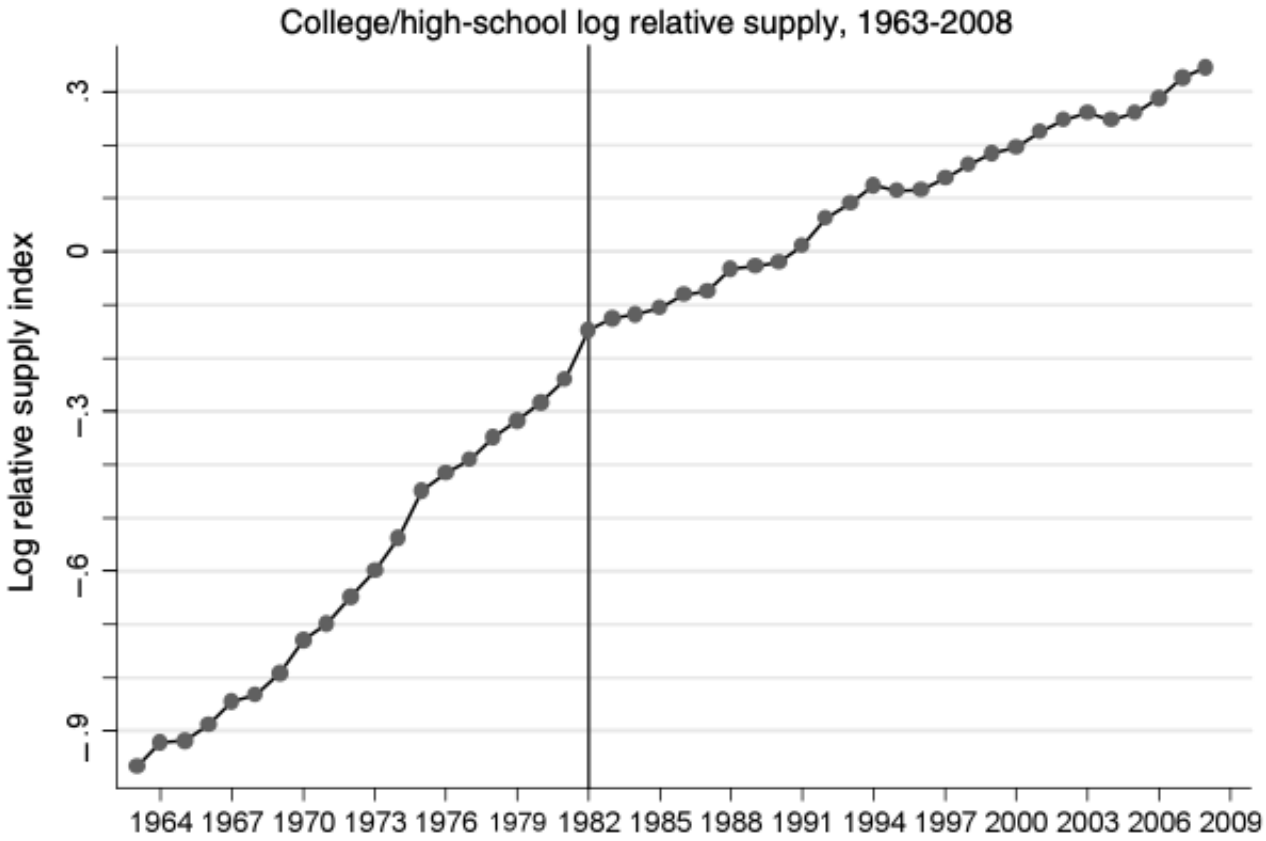

Figure: Acemoglu and Autor, 2011 , Figure 2

Basic idea: do sectoral shifts favor certain groups?

Canonical model combine these elements

- CES aggregate production function

$$F(L_t, H_t) = [(A_{Lt} L_t)^{\rho} + (A_{Ht} H_t)^{\rho}]^{\frac{1}{\rho}}$$

- Letting $e_{it} \equiv$ efficiency and $h_{it} \equiv$ hours worked,

$$L_t = \sum_{i \in \mathcal{L}} e_{it} h_{it}, \quad H_t = \sum_{i \in \mathcal{H}} e_{it} h_{it}$$

- Multiple interpretation
  - Low-skill and high-skill tasks within each firm
  - Low-skill and high-skill sectors
- Strong assumptions
  - Exogenous technology
  - Exogenous skill supplies
  - Ignore capital-skill complementarity

Skill premium

- Cost minimization: $w = MPL$

$$w_{Ht} = A_{Ht}^{\rho} H_t^{\rho-1} \left[(A_{Lt} L_t)^{\rho} + (A_{Ht} H_t)^{\rho} \right]^{\frac{1-\rho}{\rho}}$$

- Factor price ratio $= MRTS$

$$\frac{w_{Ht}}{w_{Lt}} = \left(\frac{A_{Ht}}{A_{Lt}} \right)^{\rho} \left(\frac{H_t}{L_t} \right)^{\rho-1}$$

- Take logs, define $\sigma \equiv \frac{1}{1-\rho}$

$$\log \left(\frac{w_{Ht}}{w_{Lt}} \right) = \underbrace{\frac{\sigma - 1}{\sigma} \log \left(\frac{A_{Ht}}{A_{Lt}} \right)}_{\text{relative demand effect}} - \underbrace{\frac{1}{\sigma} \log \left(\frac{H_t}{L_t} \right)}_{\text{relative supply effect}}$$

Estimate effects

- Recall our skill-premium equation:

$$\log\left(\frac{w_{Ht}}{w_{Lt}}\right) = D_t - \frac{1}{\sigma}\log\left(\frac{H_t}{L_t}\right)$$

- Assume D_t is a linear trend plus noise:

$$\log\left(\frac{w_{Ht}}{w_{Lt}}\right) = \alpha_0 + \alpha t + \beta\log\left(\frac{H_t}{L_t}\right) + \varepsilon_t$$

- Results $\log\left(\frac{w_{Ht}}{w_{Lt}}\right) =$ constant $+ 0.033t - 0.709\log\left(\frac{H_t}{L_t}\right)$
  - Implies that $\hat{\sigma} = \frac{1}{\hat{\beta}} = 1.41 \Longrightarrow \hat{\sigma} > 1$
  - Secular demand shift of ~ 3.3 percent per year

Extensions

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- Card and Lemieux, 2001
- Bowlus et al., 2017

Card and Lemieux, 2001

College wage premium among younger/older US workers

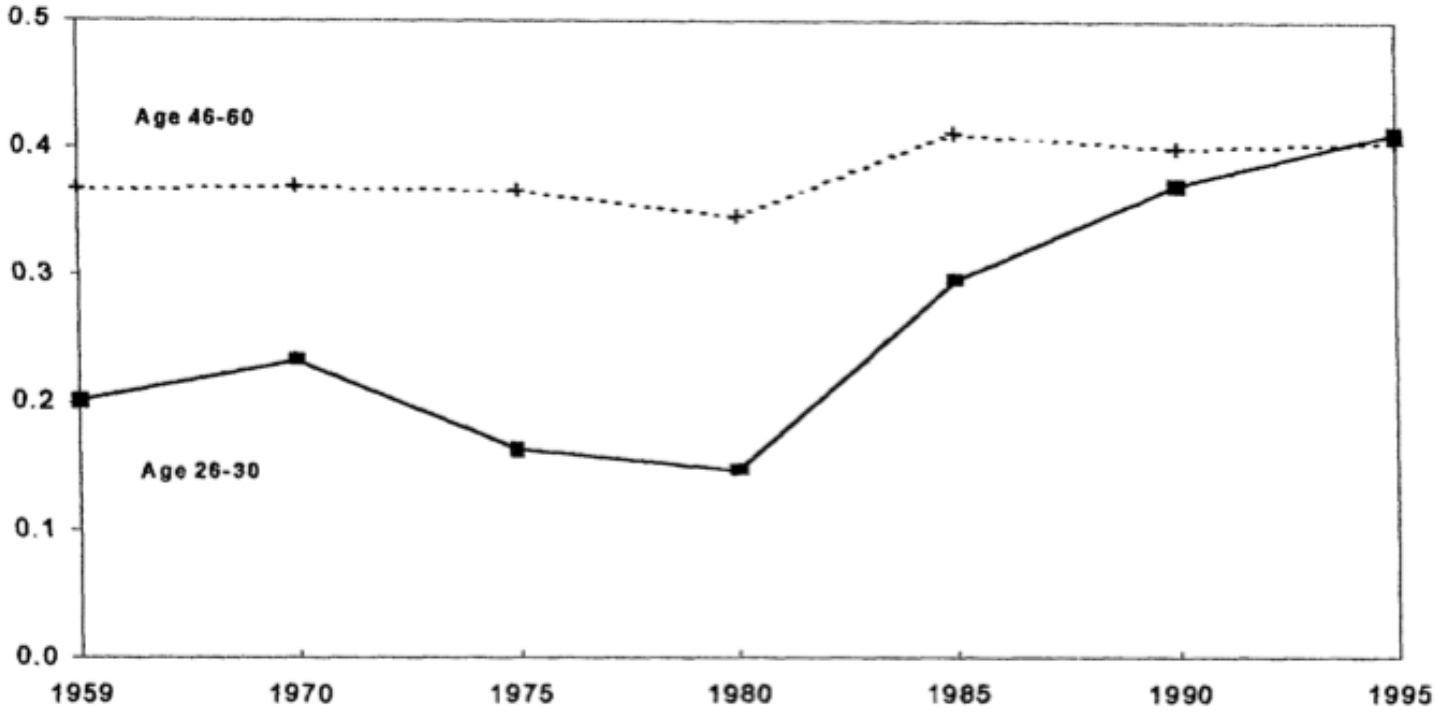

Figure: Katz and Murphy, 1992 , Figure 3

Younger and older workers are close but not perfect substitutes

Bowlus et al., 2017

As Carneiro and Lee, 2011 did, include "quality" of recent college graduation cohorts.

$$\ln \omega_{ct} = \ln \omega_t + \ln (B_{Ht}/B_{Lt}) = [\underbrace{\frac{\sigma - 1}{\sigma} \ln (A_{Ht}/A_{Lt})}_{\text{Demand } (SBTC)} - \underbrace{\frac{1}{\sigma} \ln (H_t/L_t)}_{\text{Supply}}] + \underbrace{\ln (B_{Ht}/B_{L}}_{\text{Cohort qualit}} \quad (1)$$

Results

- Better fit out-of-sample prediction even with perfect substitutability across groups
- **Higher elasticity of substitution** between high and low-skill labor than has been found in the standard literature
  1. The higher estimated elasticity results in a much smaller role for SBTC in explaining the path of the college wage premium
  2. Elasticity of substitution is an important parameter for assessing general equilibrium responses to government policies: weaker general equilibrium relative price changes and stronger enrolment effects

Contributions to project

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- Notion of inequality
- Measuring wage inequality
- Ideas of general equilibrium

Notions of inequality

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- **Wage inequality** w_i: individual receive different wages *for an hour of work*. In economics, this measure is used to reflect different levels of productivity or the price paid (the law of the one price for a productivity unit of labor). Empirically, this law doesn't always hold: CCK(2016) and others show there is substantial cross-firm dispersion in wage setting (high-wage firms and low-wage firms)
- **Earning inequality** $w_i h_i$: hourly wage and hourly worked (earned income by work).

Hourly wages are the best indicator: in a competitive equilibrium, the wage tells us the market price placed on a worker's time.

Grow together, grow apart

"Rising education returns explain 62 percent of the growth of hourly wage variance for men and 37 percent for women. (Goldin & Katz, 2007)"

Measuring wage inequality

1. Variance of log wages: If we use a linear model for the conditional expectation function, $w = X'\beta + \varepsilon$ we can obtain the variance by using the **total variance law**

$$Var(w_i) = Var[E(w|X)] + E[Var(w|X)]$$

This lets us decompose wage variation into "between-group" and "within-group" components (variance of residual). For this reason, "within-group" inequality is often referred to as *"residual inequality"*

2. Quantiles: Let us characterize changes in inequality **at different points in the wage distribution**. One measure used in Autor et al., 2008 and Goldin and Katz, 2007 is "log 90-10" (log ratio of the 90th percentile to 10th)

$$log(\frac{w_{90}}{w_{10}}) = log(\frac{w_{90}}{w_{50}}) + log(\frac{w_{50}}{w_{10}})$$

This lets us decompose total wage inequality into "lower tail" and "upper tail" components. Sometimes, the lower and upper tails don't move "together". For example, minimum wage may influence the 50-10 but is unlikely to affect 90-50 (Autor et al., 2008)

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Thanks!

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