The Effects of Technical Change on Labor Market Inequalities

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3. We, briefly, speculate on the macroeconomic, welfare and policy implications of technology-induced changes in the wage structure
Methodological Issues

• Distinctive feature of this literature: *huge variety of approaches*

  ◦ Neoclassical growth/Schumpeterian growth, McCall search/Lucas-Prescott islands, Mortensen-Pissarides random matching/directed search, Bewley incomplete markets/Arrow-Debreu with limited commitment
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  1. Young field of research
  2. Many possible departures from competitive model
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• Challenge for the exposition... we gave priority to presenting a wide range of ideas, at the cost of often simplifying models
College-High School Wage Premium

Dynamics of Relative Prices and Quantity of Skills in the U.S. (1963–2002)

Wage Premium: 1.47
Relative Supply: 0.88

Hornstein-Krusell-Violante, "The Effects of Technical Change on Labor Market Inequalities" – p. 4/19
Rise in the Educational Premium I

KATZ-MURPHY (1992)

• From CES production function in skilled and unskilled labor:

\[
\log \left( \frac{w_{st}}{w_{ut}} \right) = \sigma \log \left( \frac{A_{st}}{A_{ut}} \right) + (1 - \sigma) \log \left( \frac{l_{ut}}{l_{st}} \right)
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- relative supply of skills rose at 3\% per year
- skill-biased technical change (SBTC) grew at 10\% per year
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• Limits of the pure SBTC hypothesis:
  ◦ it’s based on an unobservable residual
  ◦ growth in relative productivity of skilled labor huge, plausible?
  ◦ SBTC exogenous
Rise in the Educational Premium II


- **Capital-skill complementarity** hypothesis:
  - Capital equipment and skilled labor are *complements in production*
  - Rapid fall of relative price of equipment, due to fast productivity improvements in ICT, increased the demand for capital in production

- It successfully accounts for the rise in the skill premium, essentially *without the help of growth in the unobserved relative productivity of skilled labor.*
Further Evidence on K-S Complementarity


• Large effect of equipment investments on relative wages in a cross-section of countries

• The theory works also when applied to the evolution of skill premia in Sweden, where institutions play a big role in the labor market

• It helps explaining cyclical behavior of the skill premium at business-cycle frequencies

• Suggestive historical evidence...
Historical Role of K-S Complementarity

Dynamics of Relative Prices of Capital and Returns to Education in the U.S. (1929−1995)

- Relative Price of Capital
- Return to College
- Return to High-School
Endogenous Skill-Bias


• If R-D can be directed towards productivity improvements of different inputs, it will be biased towards the one with the highest return for the innovators
Endogenous Skill-Bias


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- Sources of SBTC:
  1. **market size effect:**
     - Exogenous rise in the supply of skilled labor in 1970s
     - Technology policy: U.S. government shifted expenditures towards IT goods
  2. **relative price effect:**
     - Openness to trade
Rise in the Returns to Ability


• *Nelson-Phelps (1966) Hypothesis*: workers endowed with more innate skills cope better with technological transformations

• Various versions: more able workers...
  ◦ ... are more productive with the new technology
  ◦ ... acquire skills specific to the new technology more cheaply
  ◦ ... are less subject to obsolescence of human capital due to the introduction of new technologies
Returns to Experience by Educational Group

Male high school graduates

Male college graduates

Rise in the Experience Premium


• General Purpose Technology: transferability of knowledge improves with GPT, which increases the value of experience and the returns to experience
Rise in the Experience Premium


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- *Experience facilitates adoption for the low-educated*: experience plays the role of education/ability for the unskilled workers
Age-Profiles of PC Adoption

Adoption Rate of Computers by High–School Graduates

Adoption Rate of Computers by College Graduates
Deunionization and the Rise in Inequality

UNITED STATES: 65-92

union density

90-10 wage differential

unionization
inequality

Deunionization


- **Traditional view**: deunionization is an alternative explanation

- **Alternative view**: deunionization is caused by technology
  
  - Model the union as a coalition of workers heterogeneous in their skill level, with endogenous participation decision:
  
  - *Benefit*: rent extraction
  
  - *Costs*: wage compression for skilled workers, operating cost
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- SBTC increases the relative productivity of skilled workers and the value of opting out of the union to work at the competitive wage

- SBTC $\Rightarrow$ *deunionization* which amplifies the direct effect of SBTC on inequality, by eliminating wage compression
Rise in the Returns to “Luck”


- Models with frictional labor markets, random matching, vintage capital, and Nash bargaining
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- An acceleration in the rate of capital-embodied technical change has two effects:

  1. can increase the dispersion of productivities of technologies in operation ⇒ higher wage inequality, since wages depend on productivity of machines
Rise in the Returns to “Luck”


• Models with frictional labor markets, random matching, vintage capital, and Nash bargaining

• An acceleration in the rate of capital-embodied technical change has two effects:
  1. can increase the dispersion of productivities of technologies in operation ⇒ higher wage inequality, since wages depend on productivity of machines
  2. with vintage human capital, it can increase the dispersion of skills ⇒ higher wage inequality, since wages depend on individual outside option
Europe vs US: Unemployment and Labor Share

"Standardized" Unemployment Rate

Year

Percentage


United States
Europe (Average)

Labor Share

Year

Percentage


United States
Europe (Average)
Europe vs United States


- **Krugman’s (1994) hypothesis**: similar macroeconomic shocks, interacted with different institutions lead to different outcomes
Europe vs United States


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Europe vs United States

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  - **Sectoral-transformation view**: if one focuses on $e$ (rather than on $u$), the US-EU trends start diverging in the 1960s $\Rightarrow$ differential expansion of service sector.
Policy Implications


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• **Technology-skill complementarity**
  
  ◦ important to rebuild (obsolete) skills through training policies

• **Technology-ability complementarity**
  
  ◦ interventions should occur early in the life-cycle
  
  ◦ adult training is ineffective, better subsidizing wages for the low-skilled