Technological Change and Unions

An Intergenerational Conflict with Aggregate Impact

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In a Nutshell

- Automation boosts productivity, but entails large labor adjustment
- Labor market institutions generate adjustment costs

Research Question

How do unions shape the evolution of employment and wages of workers exposed to labor replacement during technological transitions?

What I do

Empirics: Document effect of unions in automating occupations
- **Distributional:** More adjustment through young, incoming workers
- **Aggregate:** Accelerate overall employment decline

Mechanism: Union-imposed firing cost + gradual technology adoption
- Firing cost ⇒ Reduce hiring instead of costly layoffs
- **Firing cost + gradual adoption over time** ⇒ Shrink workforce preemptively to avoid future firing costs

Quantification: Embed mechanism in dynamic equilibrium model
- Endogenous adoption + OLG with occupational choice + union
- Quantitatively accounts for documented union effects

Welfare analysis: Unions transfer automation impact from old to young
- WC of automation for incumbent cohorts **4% of consumption lower**
- WC of automation for young **2% of consumption higher**

Empirics: Union Effect at MSA Level

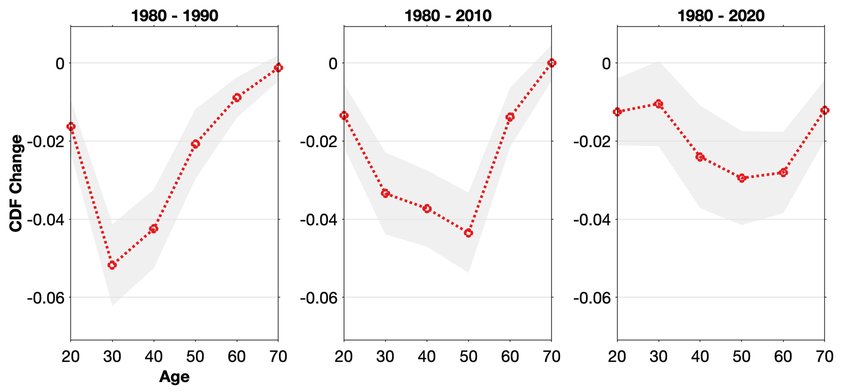


Figure 1: Union effect on routine-manual age composition. **Unionization shifts the fall in employment to young** workers (same for wages). Greater initial fall in the share of young moves up the age ladder over time.

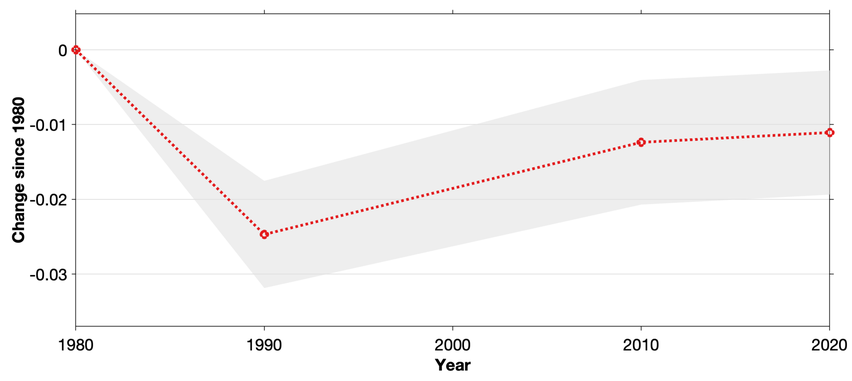


Figure 2: Union effect on routine-manual employment share. **Unions accelerate employment decline:** Greater decline early in the transition, and a subsequent catch-up in less unionized labor markets after 2000.

Model Overview

- Firing costs create wedge between incoming and incumbent workers
- Firms reduce hiring in expectation of future adoption

Dynamics through job levels
- Technology uses labor at different job levels
- Workers progress in job levels and bargain collectively
- The union sets job level wage schedule

Technological Transitions in the Model

1. Initial Steady State: Calibrate to 1980 US local labor markets (MSAs)
2. Shock: **Unexpected fall in path of automation price**

Two-sector OLG model with endogenous automation

- **Firms:** Combine non-routine and routine occupations to produce final good
  - Non-routine occupations: Homogeneous workers: $y_t^N = N_t$
  - Routine occupations: Automation α_t, and different job levels

$$y_t^R = F_t(l_{t,1}, ..., l_{t,J}, \alpha_t)$$

  ⇒ Routine workers of different age are imperfect substitutes
- **Households:** Live 50 years; make consumption-savings and **occupational choice**
- **Monopoly union:** Sets routine wage schedule taking labor demand into account
  - Level of **firing costs parameterize unionization** rate
  - Maximizes current wage bill of incumbent workers: $\sum_{j=2}^{J} w_{t,j}^R \cdot l_{t,j}$

Model Validation and Mechanism

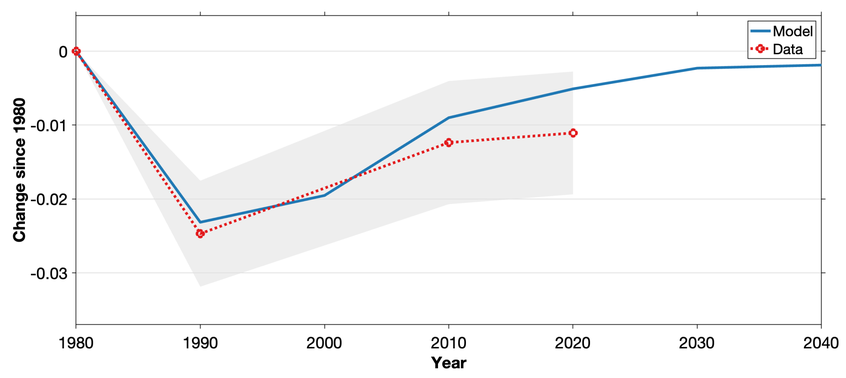


Figure 3: Untargeted union effect on routine employment share. 1990 value is calibrated.

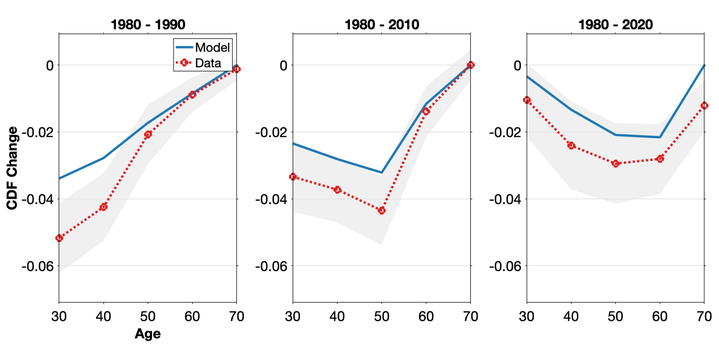


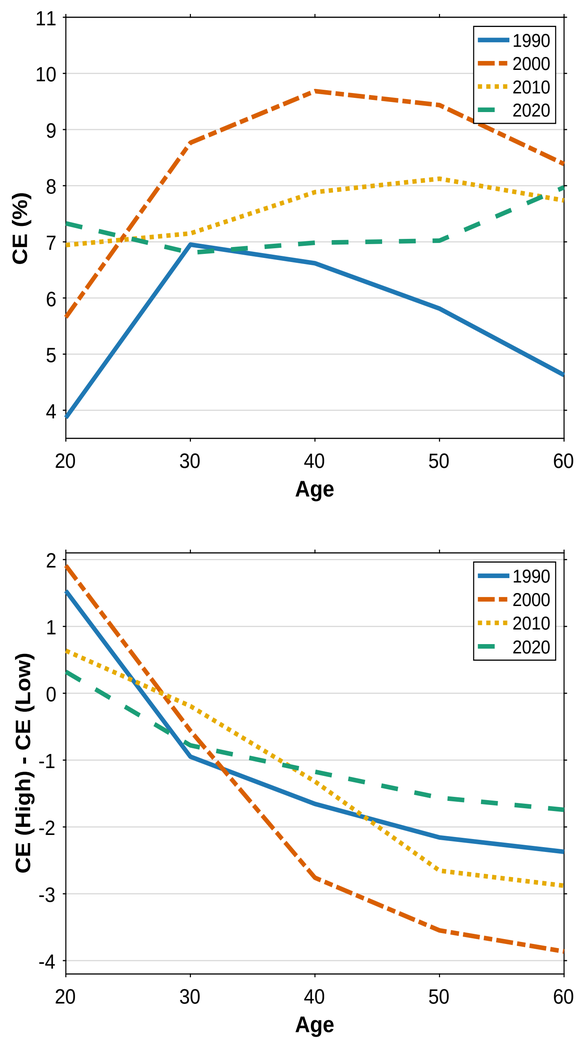
Figure 4: Untargeted union effect on routine age composition.

Conclusion

Unionization, and adjustment frictions more broadly, are important to understanding the distributional impact of technology and the evolution of aggregate employment during transitions.

Quantifying the Intergenerational Transfer

Welfare cost of automation: Consumption decrease to avoid automation (back to 1980)



WC of automation for routine workers

- Most costly for incumbents: Occupational choice prior to transition
  ⇒ Full life-cycle impact for 1980 cohort
  ⇒ Welfare cost reach 10% in 2000
- Incoming cohorts endogenously adjust occupational choice
  ⇒ Limits impact but still costly

Union transfer of automation cost

- Union protects incumbent cohorts
  ⇒ limits wage decline and layoff risk
  ⇒ WC of automation up to 4% lower
- Impact shifted to incoming cohorts
  ⇒ WC up to 2% higher
  ⇒ Limited due to occ choice

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