Summary of: 'Polarization and Rising Wage Inequality Comparing the U.S. and Germany' and 'Rising Wage Inequality, the Decline of Collective Bargaining, and the Gender Wage Gap'

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Based on joint work with D. Antonczyk, T. DeLeire, K. Sommerfeld

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Introduction

- Wage inequality has been increasing in many industrialized countries since the late 1970s (US: Autor et al., 2006, 2008, Lemieux, 2008; Germany: Dustmann et al., 2009, and others)
- Prominent explanation: Skill-biased technological change (SBTC)
- For SBTC to be "compelling explanation": Labor market trends across economies having access to the same technologies should be similar
- Therefore, we look at two such countries, which are arguably on the same technological level, using comparable data and a unified statistical approach
- SBTC may have a bias in the age/cohort dimension
- Institutional explanation of rising wage inequality in Germany: Strong decline in coverage by collective bargaining

Literature Review

Debate SBTC, Task-Based Approach, Polarization

- Katz/Autor (1999, Handbook LE)
- Autor/Levy/Murnane (2003, QJE)
- Goos/Manning (2007, REStat)
- Autor/Katz/Kearney (2006, AER, 2008, REStat)

...versus institutions and supply-side

- DiNardo/Fortin/Lemieux (1996, Econometrica)
- Card/DiNardo (2002, JOLE)
- Lemieux (2006, AER, 2008, JPop)

Some studies on Germany

- Fitzenberger (1999), Fitzenberger/Hujer/MaCurdy/Schnabel (2001)
- Spitz-Oener (2006, JOLE)
- Dustmann/Ludst./Schönb. (2009, QJE), Gernandt/Pfeiffer (2007)

Paper 1 'Polarization'

U.S.

- Polarization of employment
- And polarization of wages both across and within skill groups
- Small cohort effects

Germany

- Polarization of employment
- But polarization of wages only between skill groups
- Sizeable cohort effects: Recent cohorts hit most strongly

Paper 2 'Collective Bargaining'

- Sharp decline of collective bargaining coverage
- Contributed to the increase in wage dispersion
- Increase in wage dispersion and stronger real wage loss in the lower part of the wage distribution
- Driven to a major part by changes in firm coefficients which are driven by sector coefficients

  Smaller contributions from firm characteristics and from personal coefficients

  Counteracted by personal characteristics

Data: Paper 1 'Polarization'

U.S.

- Current Population Survey (CPS)
- Outgoing Rotation Group

West Germany

- IAB Regional File (IABS)
- Top coding

Choices

- Large sample sizes, reliable information on wages
- Full-time working males, 25 to 55 years, only national citizens (Germany)
- 1979–2004
- Real log wage
- Construct cohort–year–skill cells

Skill Groups

U.S.

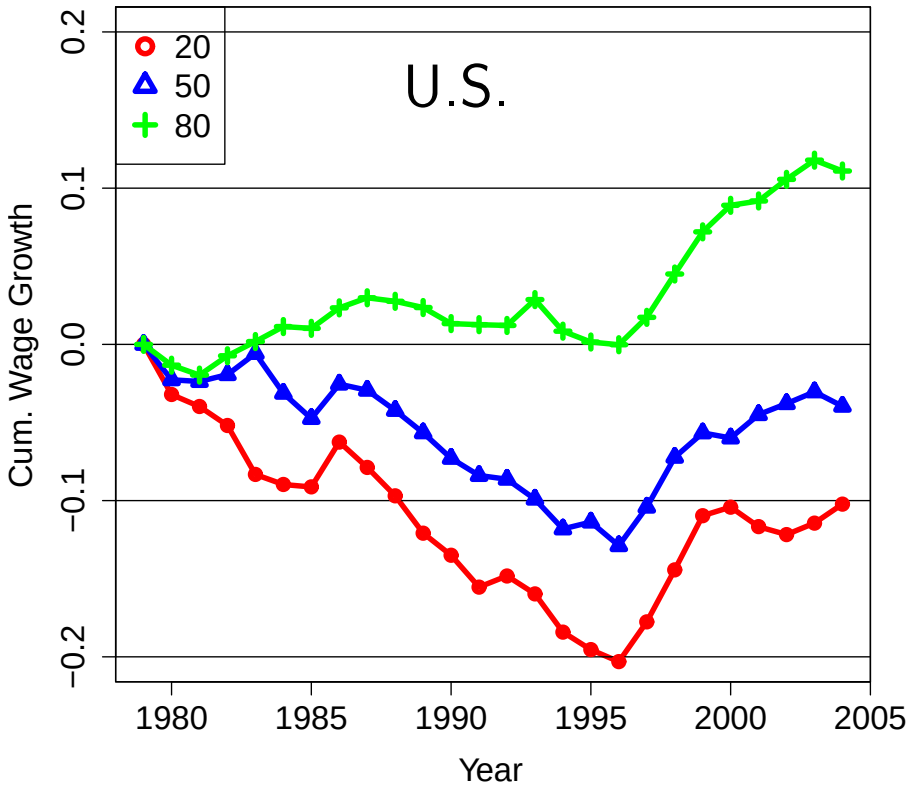
- Low-skilled: 12 years or less
- Medium-skilled: 13 to 15 years
- High-skilled: 16 years or more

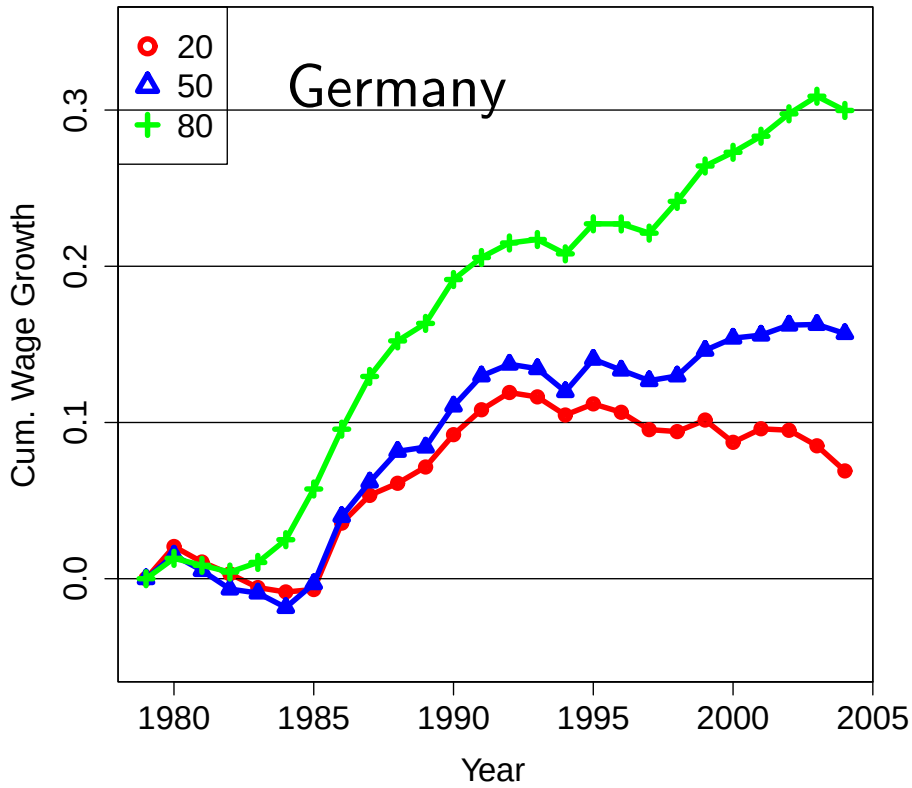
Germany

- Low-skilled: without a vocational training degree
- Medium-skilled: vocational training degree
- High-skilled: technical college/university degree

Basic Facts

Unconditional cumulated wage growth at different quantiles 79–04:
Rising wage inequality in both countries, polarization restricted to the U.S.

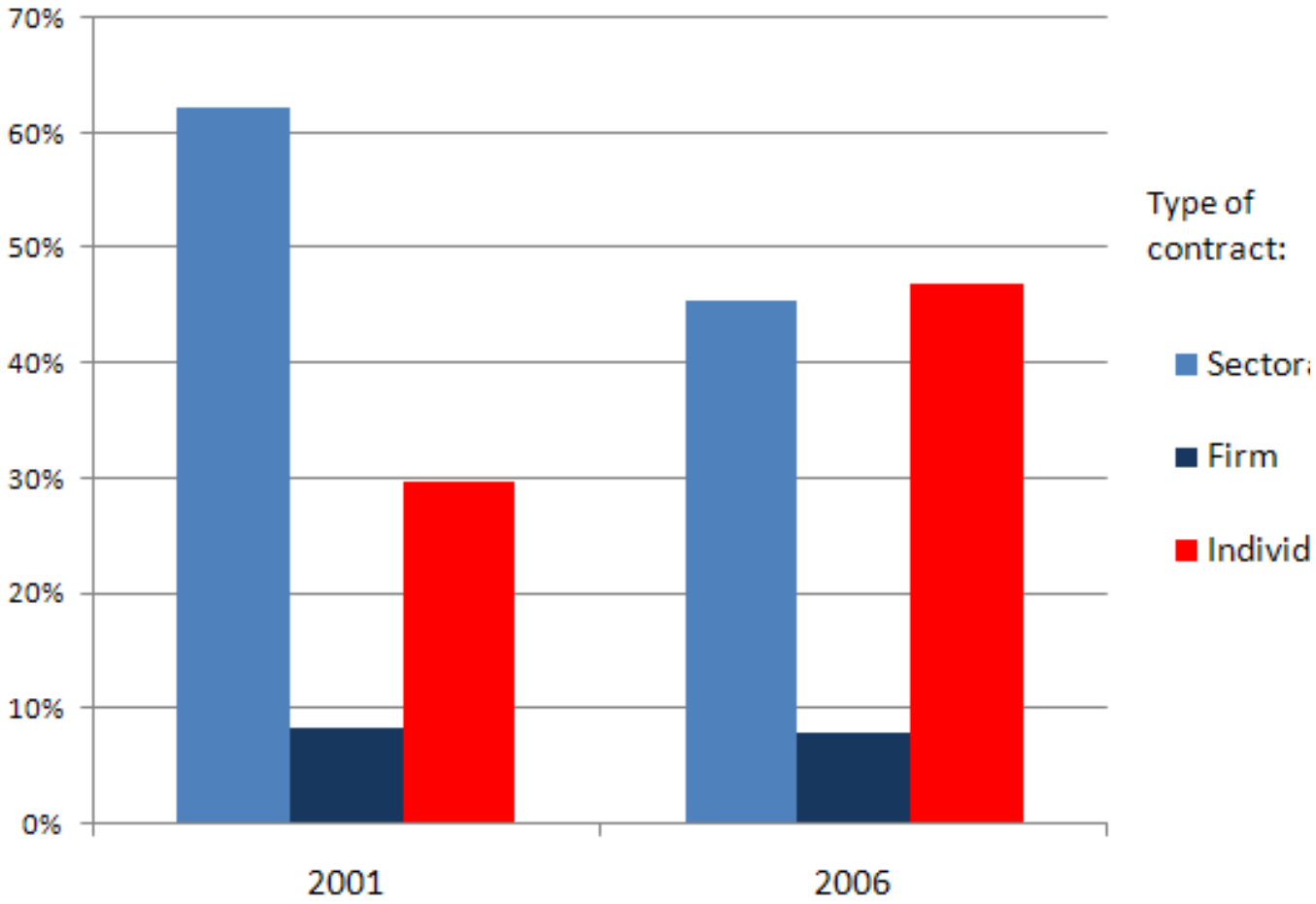




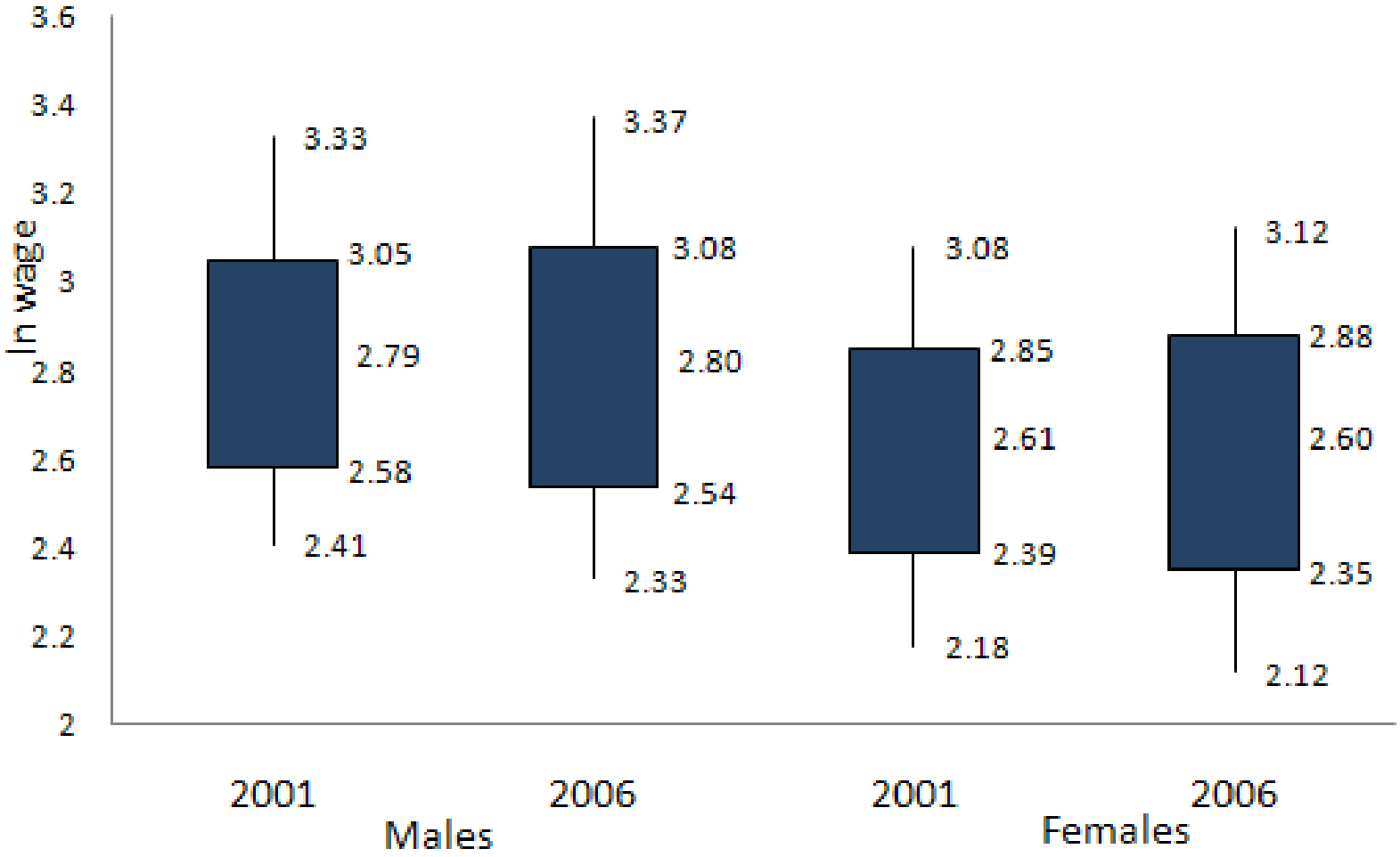
Data: Paper 2 'Collective Bargaining'

- German Structure of Earnings Survey, 2001 and 2006 (GSES; "Verdienststrukturerhebung")
- Random sample of all German firms with at least ten employees, mainly in private sector
- Linked employer-employee data set
- Information on bargaining regime on individual level
- Use full-time employees in West Germany, aged 25–55
- 2001: 420,000 employees, 17,000 firms
  2006: 830,000 employees, 22,600 firms
- Log gross real hourly wage
- Access to raw data and estimation in research data center of Statistical Office in Wiesbaden ('Forschungsdatenzentrum des StaBu/der StaLa')
  $\longrightarrow$ Use own computer there

Collective Wage Bargaining Coverage



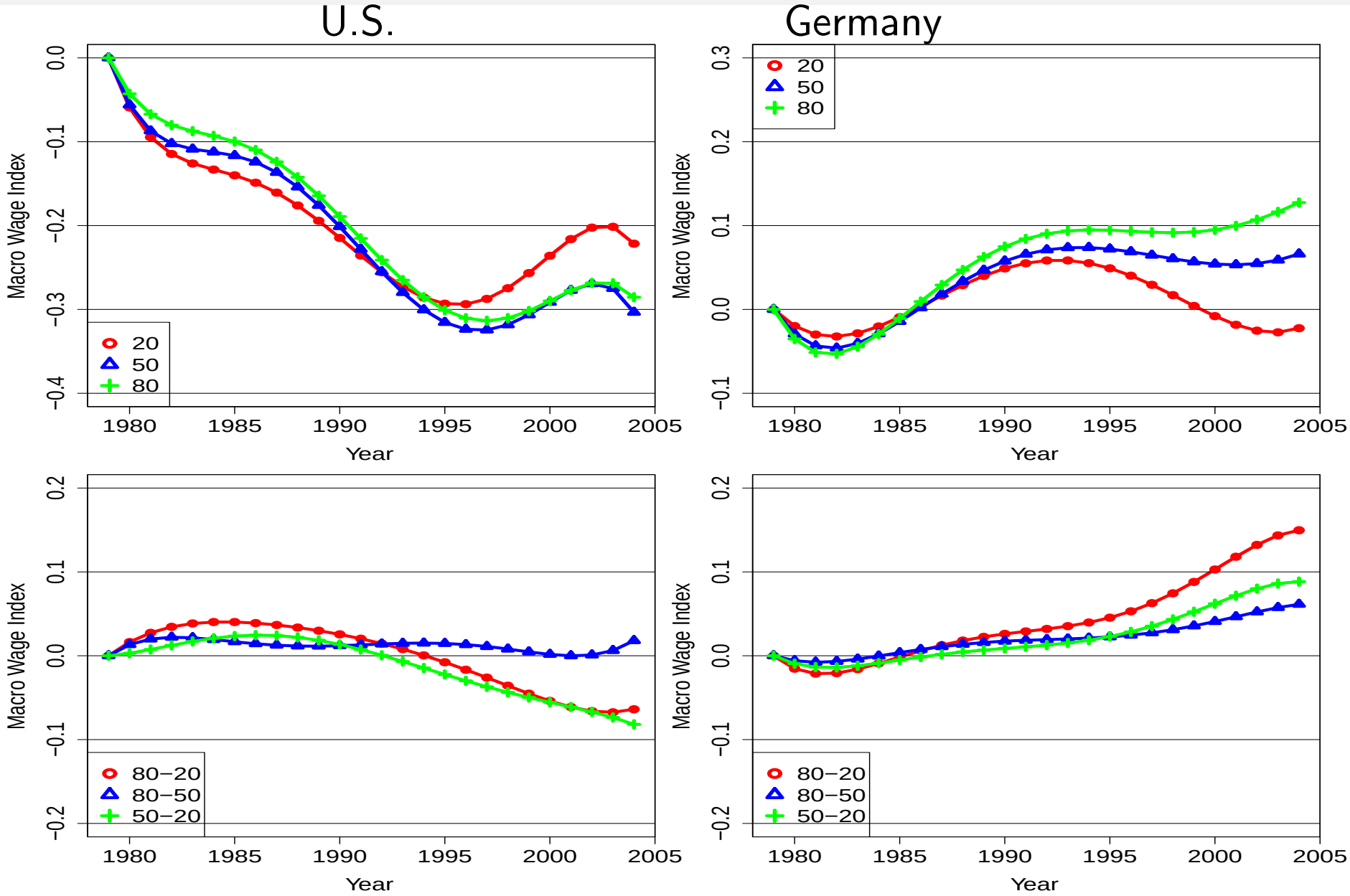
Wage Inequality



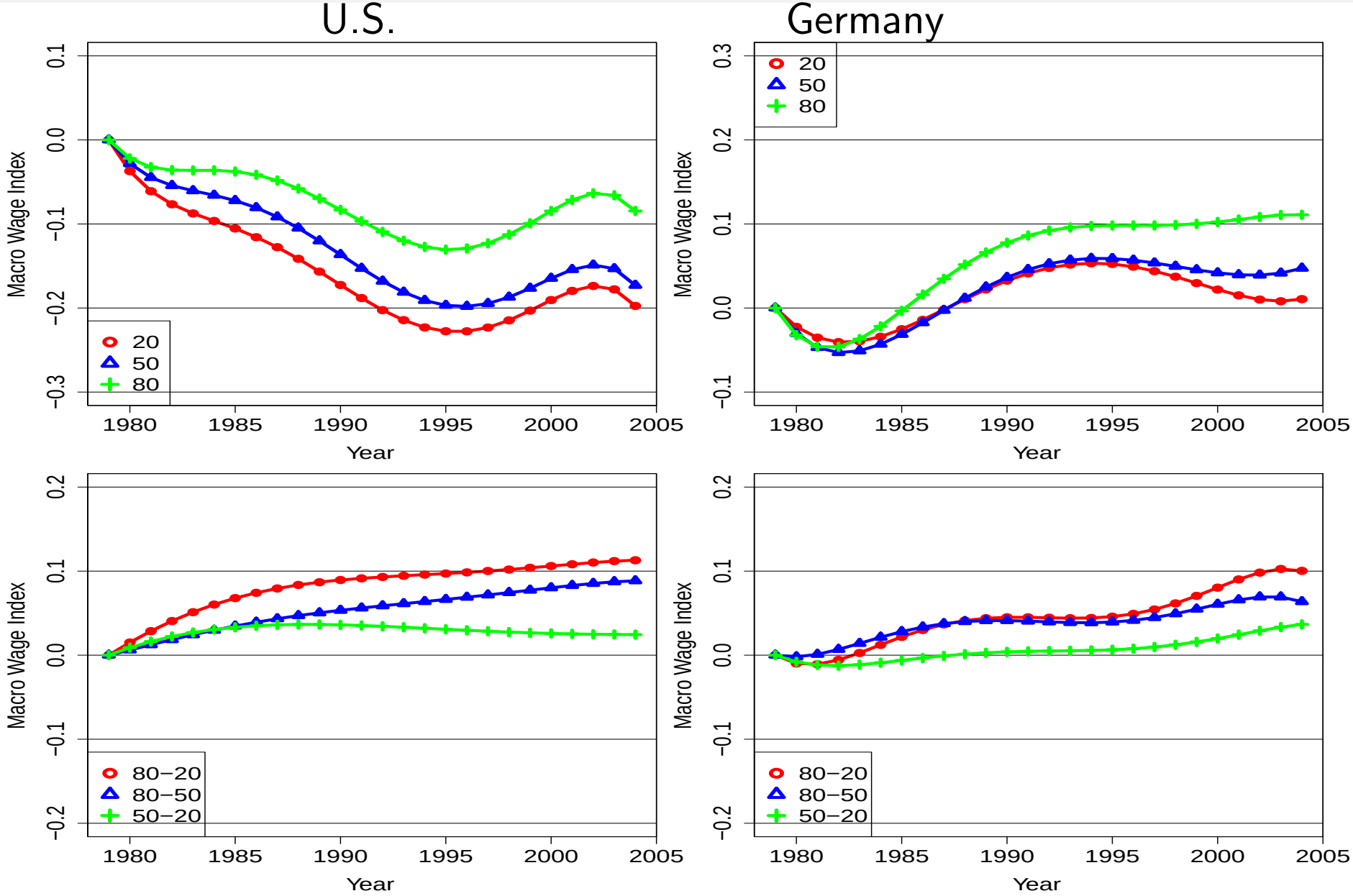
Econometric Approach / MaCurdy and Mroz (1995)

- Three effects: t: time, α: age, c: year of birth
- Identification problem: $t - \alpha = c$
- "Age-earning profiles" are statistically indistinguishable from "cohort-earning profiles"
- Cohort-earning profile $ln[w(c, \alpha)] = g(c, \alpha) + u$
- $\frac{\partial g}{\partial t}|_c = \frac{\partial g}{\partial \alpha}|_c \equiv g_\alpha(c, \alpha) \equiv g_\alpha$
  Simultaneous change of t and α
- H_{UI}: Uniform insider wage growth hypothesis (*testable*)
  $g_\alpha = a(\alpha) + b(t) = a(\alpha) + b(c + \alpha)$
- Integrating back wrt α
  $g(c, \alpha) = \underbrace{G + K(c)}_{\text{cohort spec. constant}} + A(\alpha) + B(c + \alpha)$
- H_{UI} never rejected

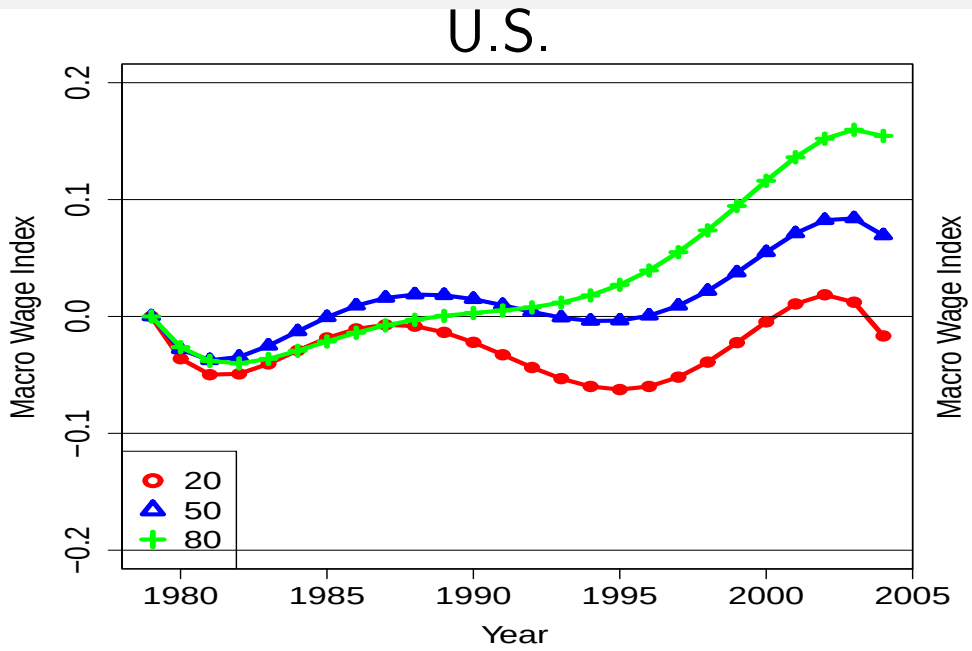
Time Trends and Wage Dispersion, 79–04, Low-skilled

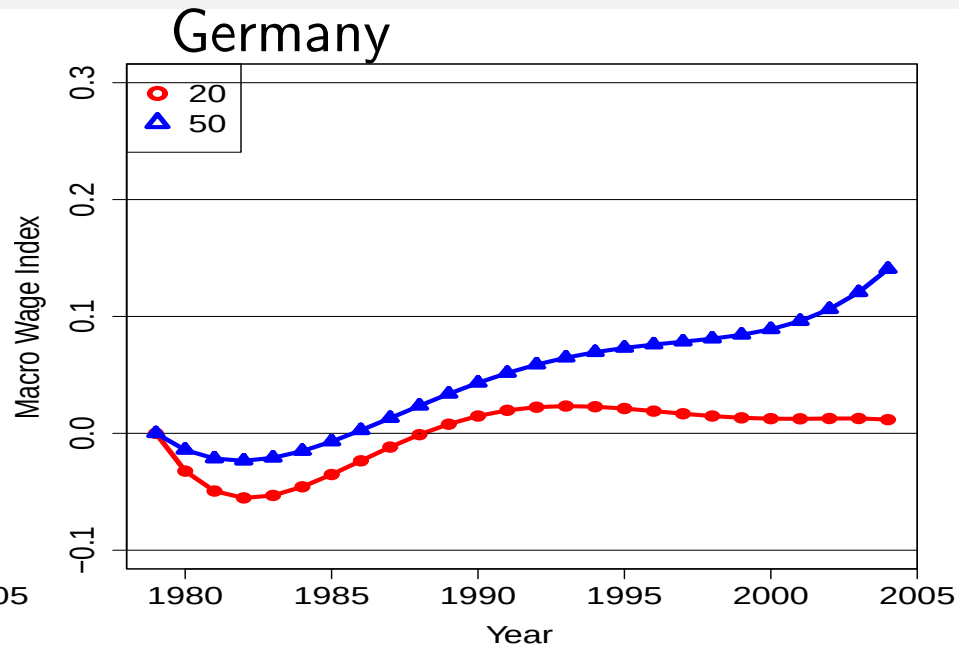


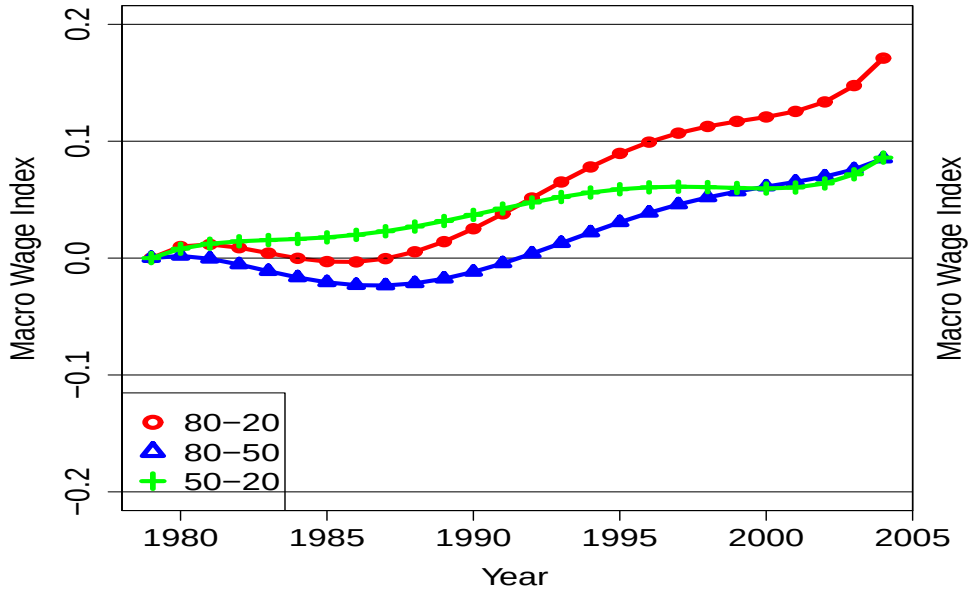
Time Trends and Wage Dispersion, 79–04, Medium-skilled

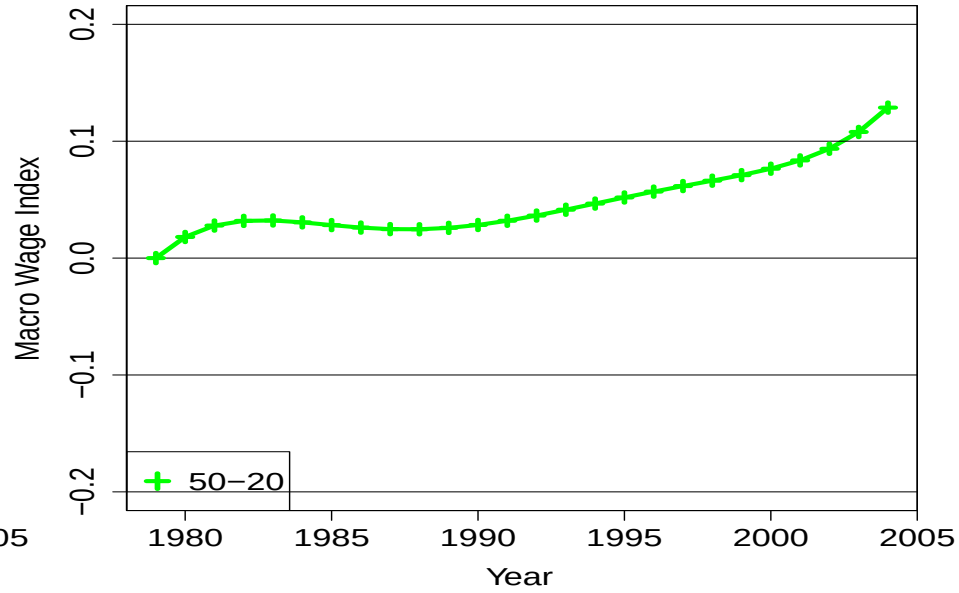


Time Trends and Wage Dispersion, 79–04, High-skilled

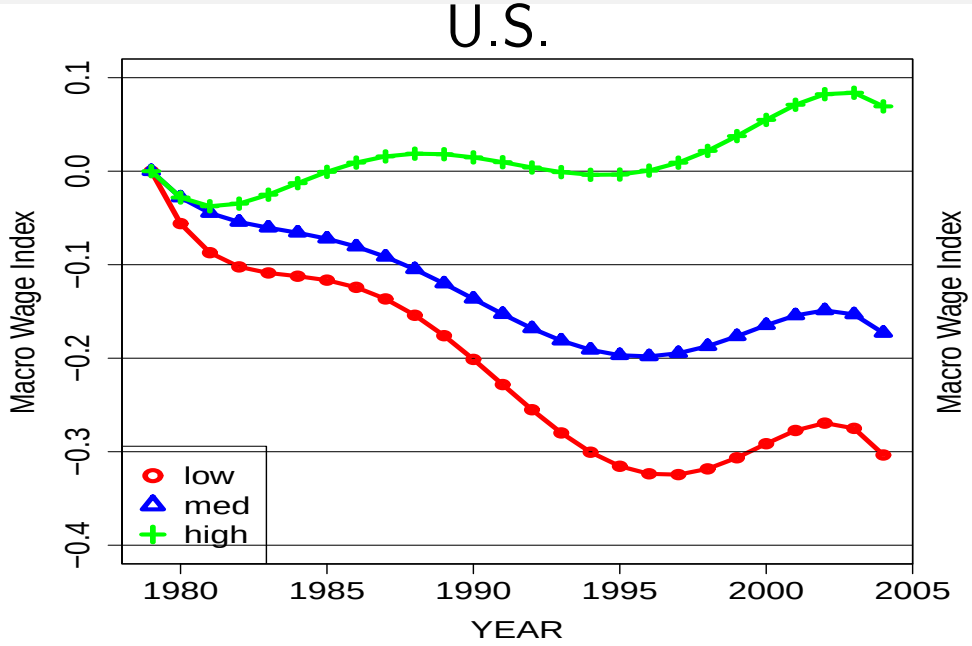


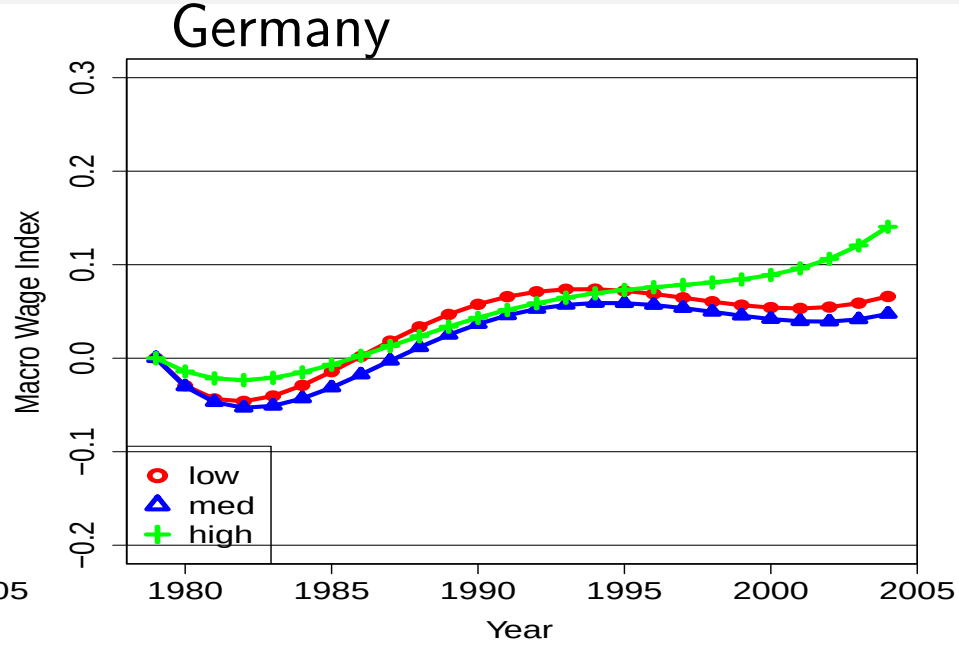


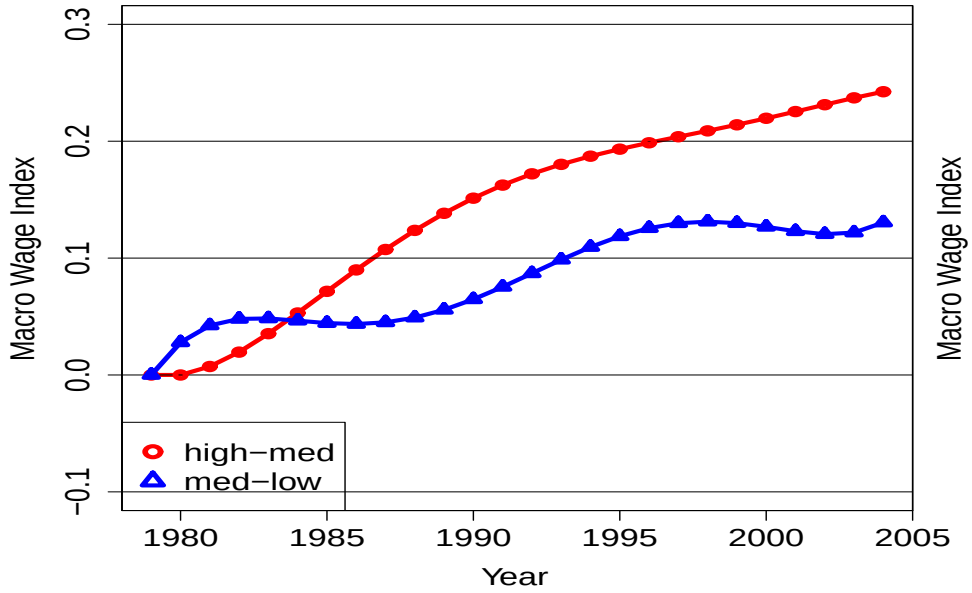


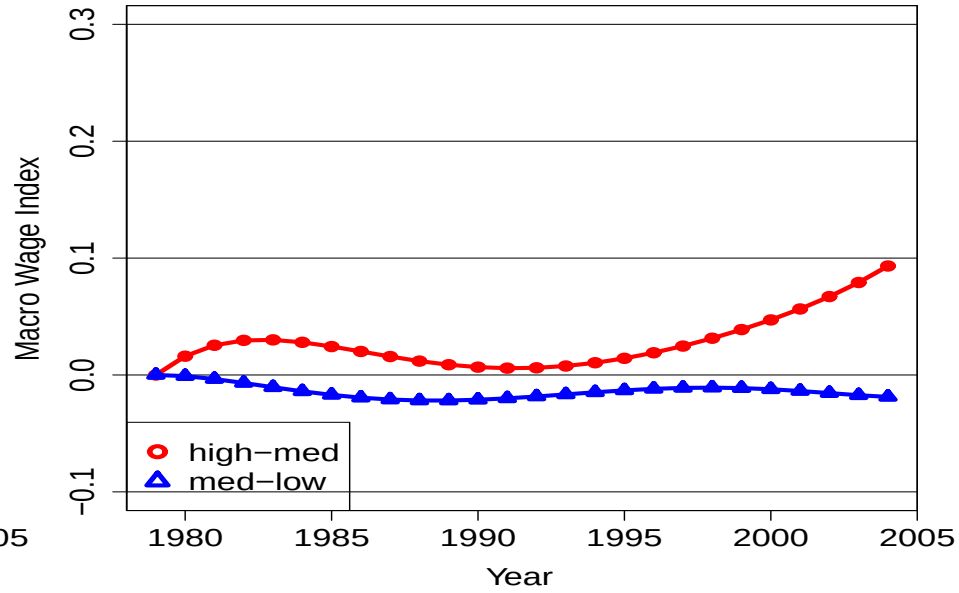


Wage Trends across Skill Groups and Skill Premia









Wage Dispersion

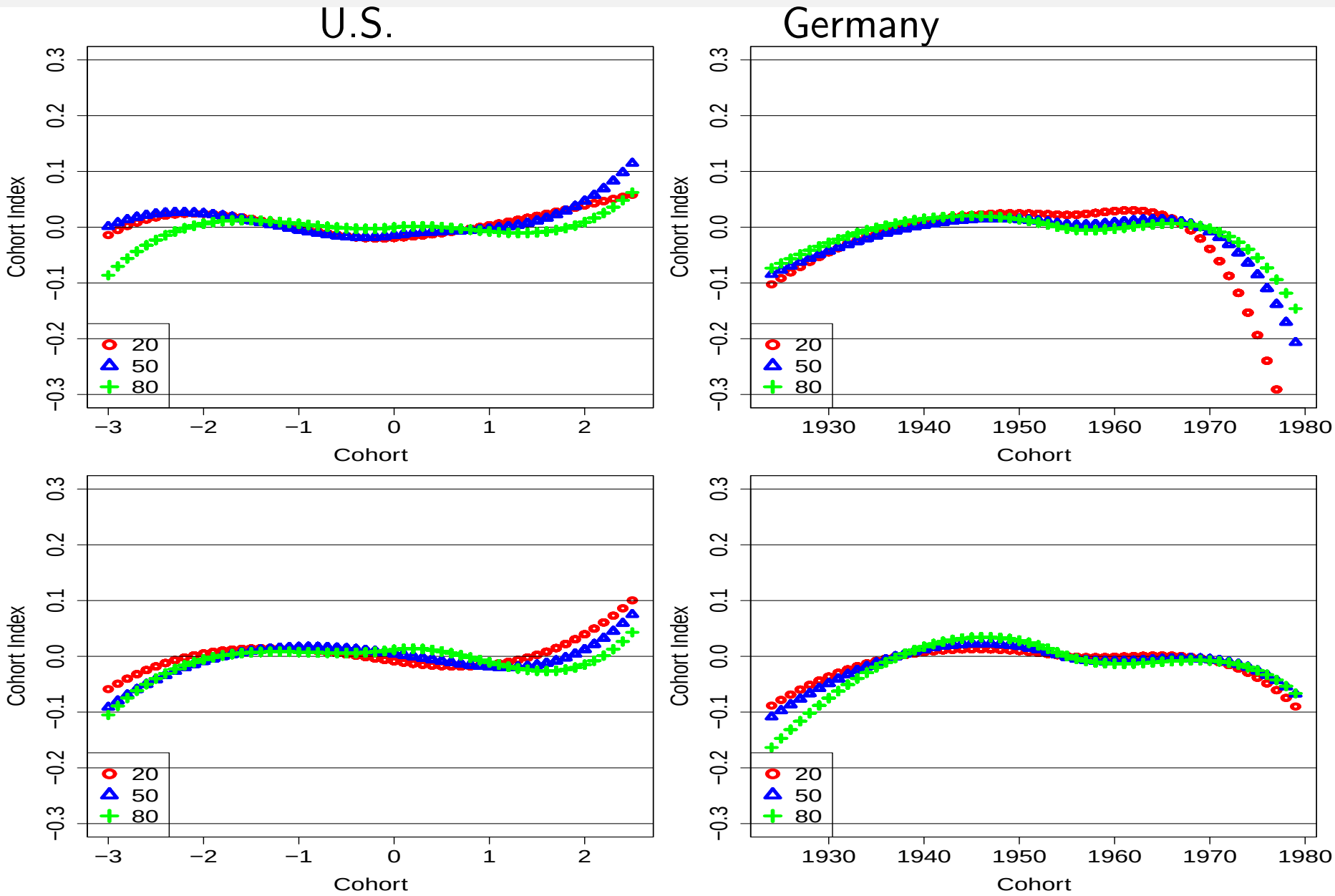
Within Skill Groups

- Polarization of wages (among low- and medium-skilled) in the U.S. since 1990 – Before recovery of wages!
- Negative trend for lower skilled workers after German Reunification and uniformly rising wage dispersion in Germany since mid 1990s
- Rise in inequality in Germany delayed by one decade
  $\longrightarrow$ institutional factors?

Between Skill Groups

- U.S.: rising high-medium premium, medium-low premium ceases to increase during the 1990s
- Germany: Stable until mid-1990s, then increasing high-medium premium
- Differences between conditional and unconditional skill premia due to compositional effects

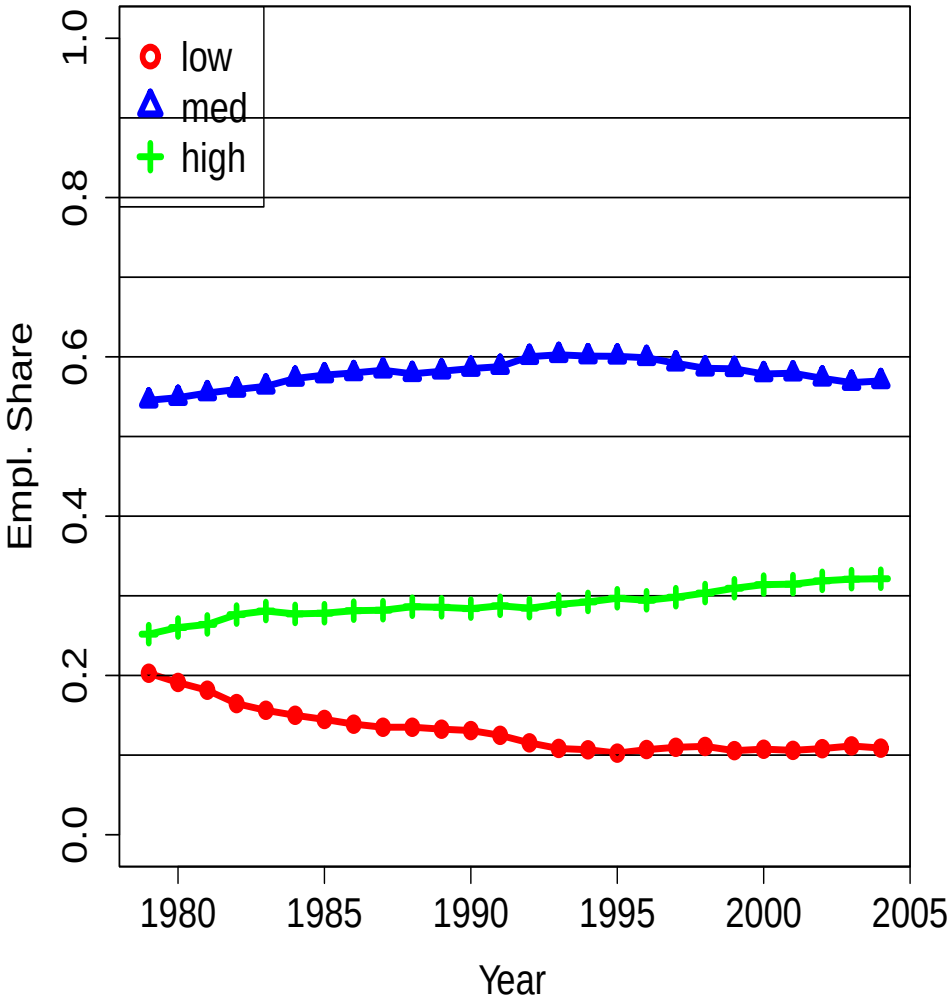
Cohort Effects, Low- and Medium-skilled workers



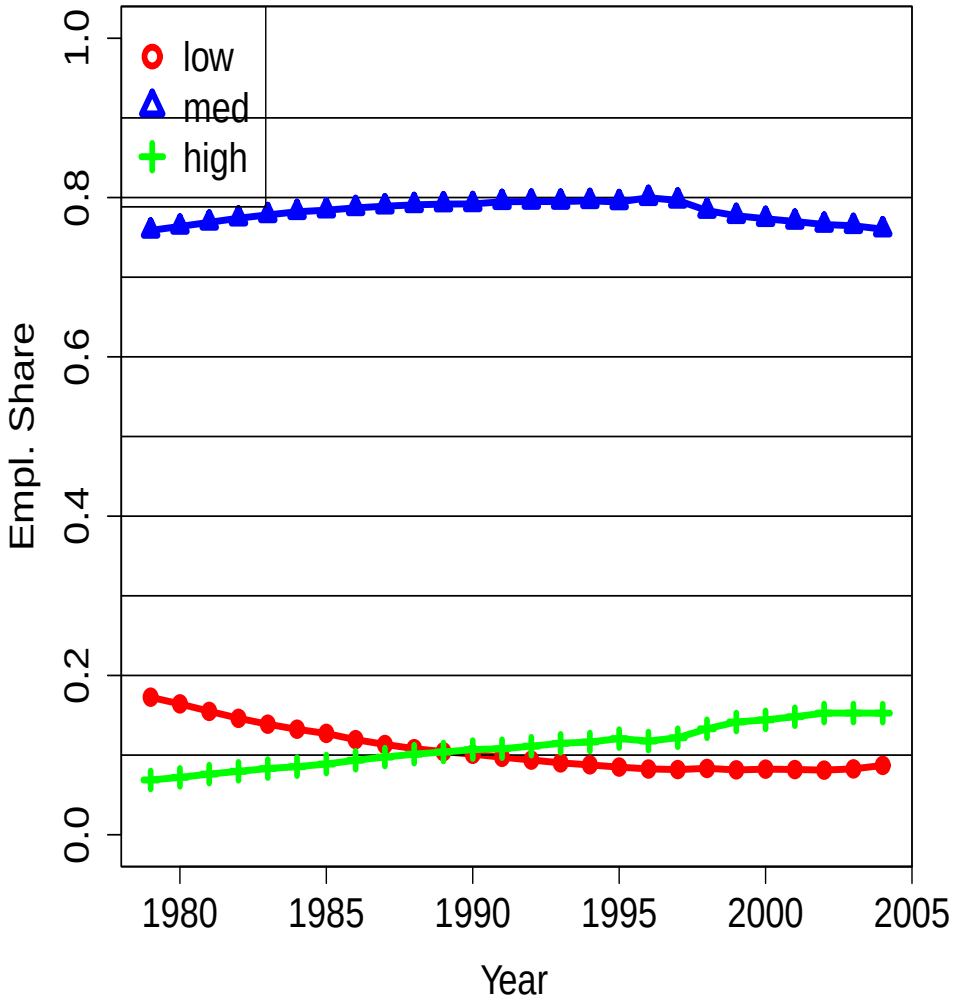
Employment Shares of Different Skill Groups, 79–04

- Slowdown in skill-upgrading in both countries since beginning of 1990s

U.S.



Germany



Sequential Decomposition

P = Personal, i.e. individual-specific characteristics

F = Firm, i.e. establishment-specific characteristics

B = Bargaining regime, i.e. sectoral, firm or no collective bargaining

$$\Delta_\tau^{06/01} = q_\tau^{06}(\alpha_P^{06}, \alpha_F^{06}, \alpha_B^{06}, \bar{\alpha}_0^{06}, B^{06}, F^{06}, P^{06}) - q_\tau^{01}(\alpha_P^{01}, \alpha_F^{01}, \alpha_B^{01}, \bar{\alpha}_0^{01}, B^{01}, F^{01}, P^{01})$$

$$= \underbrace{\underbrace{\underbrace{\Delta_\tau^1}_{Personal} + \underbrace{\Delta_\tau^2}_{Firm} + \underbrace{\Delta_\tau^3}_{Coverage}}_{Coefficients} + \underbrace{\Delta_\tau^4}_{Time-trend} + \underbrace{\underbrace{\Delta_\tau^5}_{Coverage} + \underbrace{\Delta_\tau^6}_{Firm} + \underbrace{\Delta_\tau^7}_{Personal}}_{Characteristics}}$$

Sequential Decomposition of 90-10/90-50/50-10 Differences

	Males		
	90-10	**90-50**	**50-10**
Overall 2006–2001	**0.131**	**0.034**	**0.098**
Personal Coefficients	0.018	0.007	0.011
Firm Coefficients	0.057	0.010	0.048
Bargaining Coefficients	0.020	0.015	0.005
Residual	0.026	0.013	0.013
Bargaining Regime	0.021	0.015	0.006
Firm Characteristics	0.019	0.000	0.019
Personal Characteristics	-0.029	-0.026	-0.003

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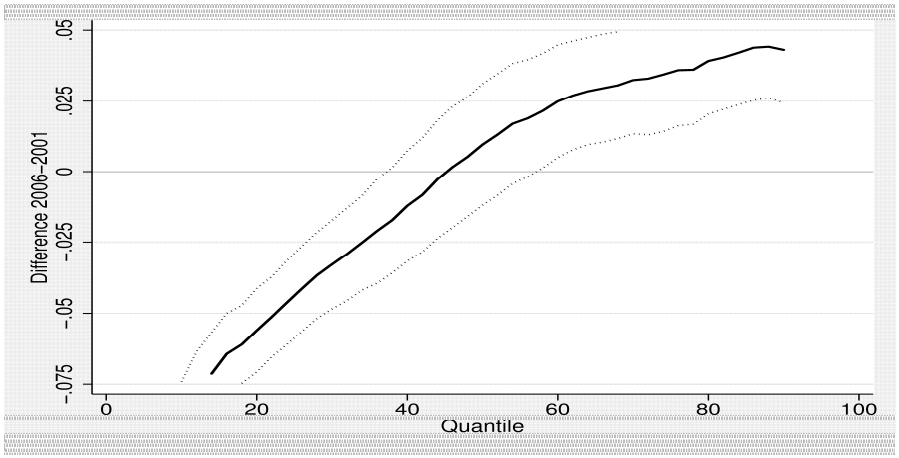
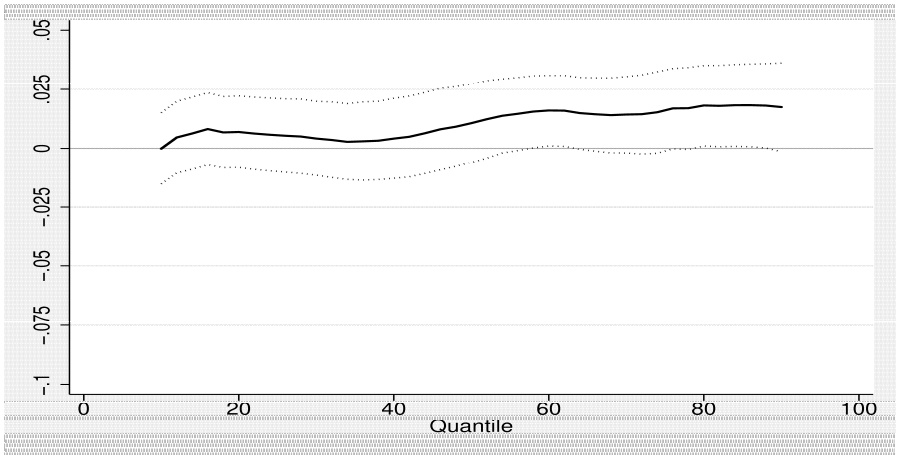
Sequential Decomposition of Δ Male Wage Distribution

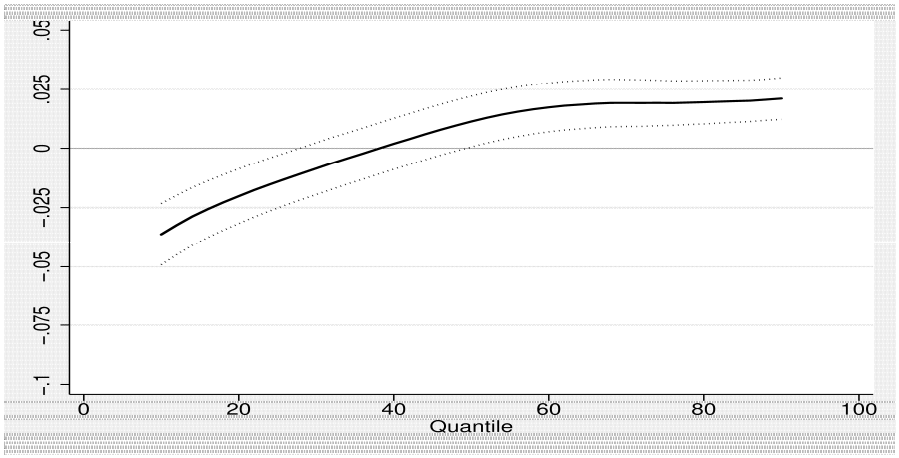
Unconditional Differences



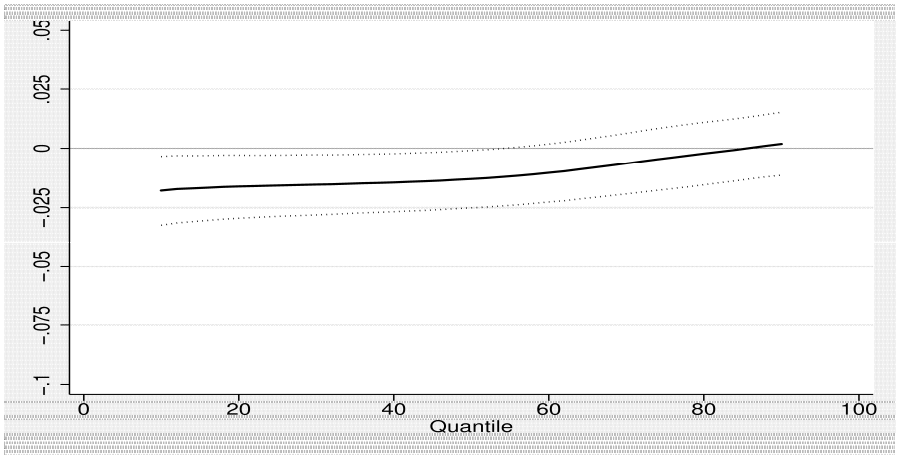
Personal Coefficients



Firm Coefficients

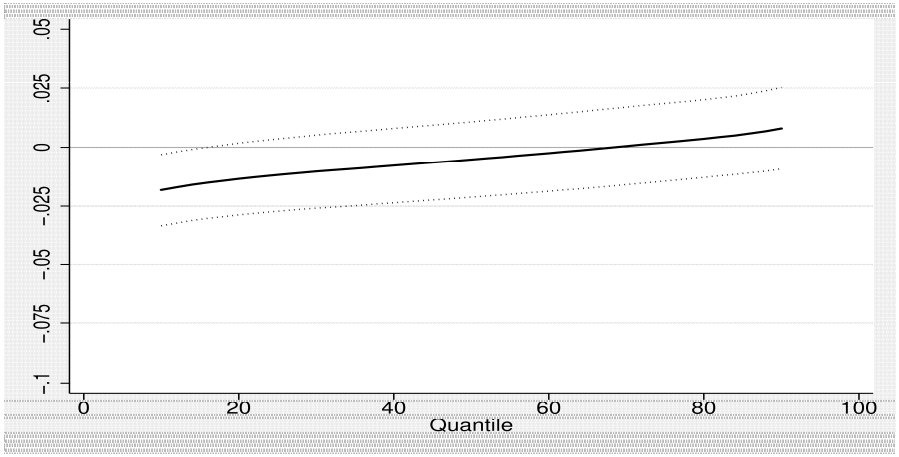


Bargaining Coefficients

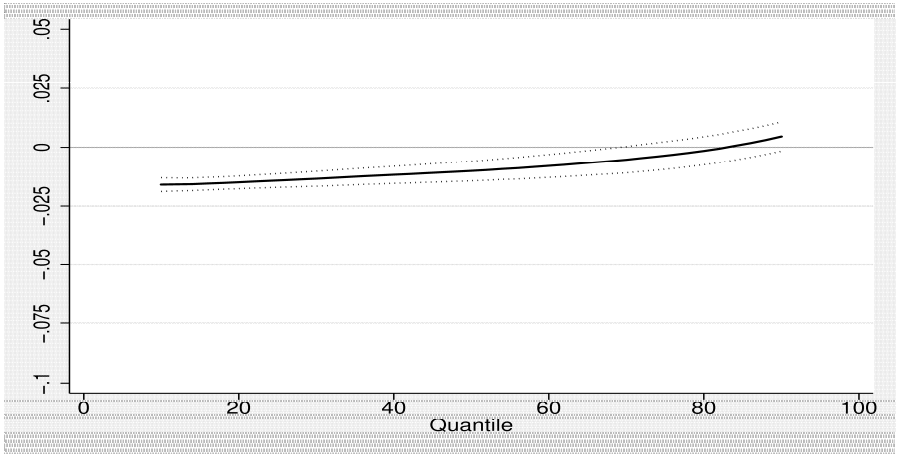


Sequential Decomposition of Δ Male Wage Distribution

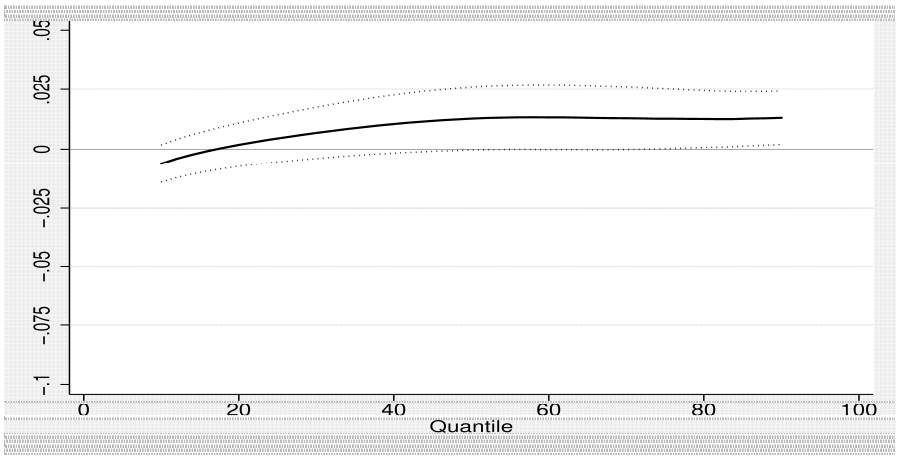
Residual



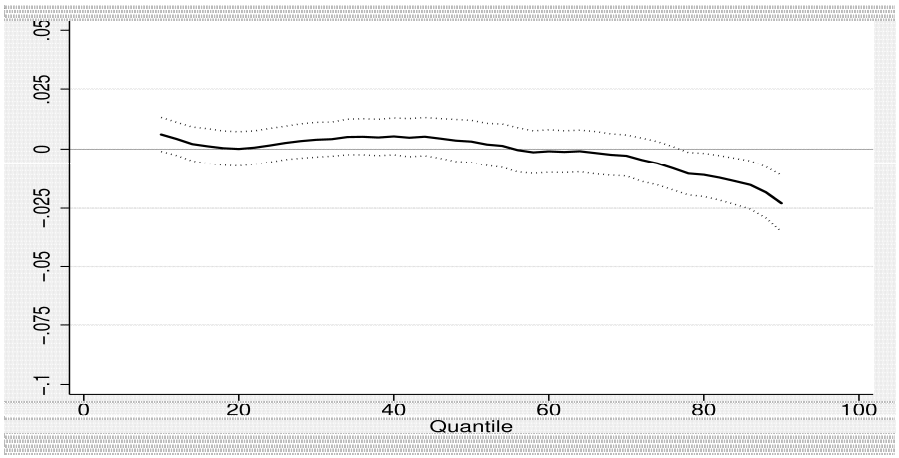
Bargaining Regime



Firm Characteristics



Personal Characteristics



Conclusions: Paper 1 'Polarization'

- Trends in employment and some of the trends in wages are consistent with technology driven polarization of labor market
- Patterns in wage inequality between the U.S. and Germany differ strongly
  $\longrightarrow$ unlikely that technological change alone can explain the empirical findings
- SBTC may interact with institutional factors
  $\longrightarrow$ differences in institutions across economies maybe the reason why we observe different trends in inequality across the U.S. and Germany

Conclusions: Paper 2 'Collective Bargaining'

- Sharp decline of collective bargaining coverage
- Contributed to the increase in wage dispersion
- Increase in wage dispersion and stronger real wage loss in the lower part of the wage distribution
- Driven to a major part by changes in firm coefficients which are driven by sector coefficients

  Smaller contributions from firm characteristics and from personal coefficients

  Counteracted by personal characteristics

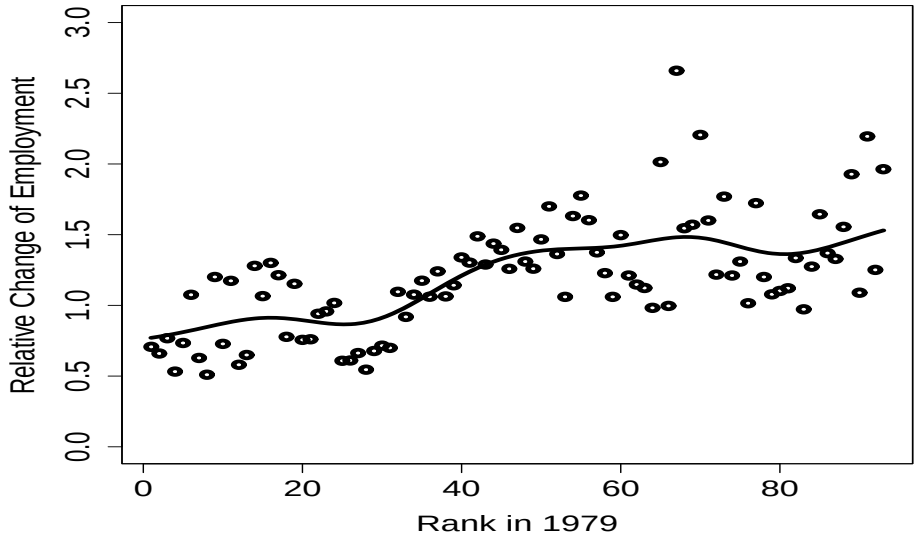
Thank you for your attention!

Empirical Results on Employment

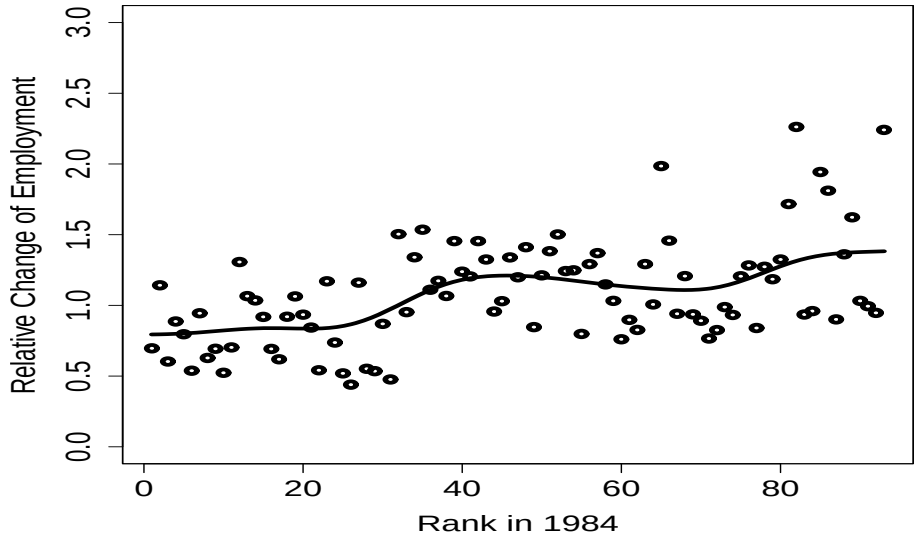
- Describe employment growth along wage distribution
- Rank age-education cells across skill groups for base year 0 by cell median wage
- Age variable is discrete (25-55), 3 educational levels, yielding 93 cells
- "Skill groups" j comprising education and age:
  Wage in base year $ln(w_{j0})$ as proxy for relative demand shock faced by cell j in subsequent years (Card et al., 1999)
- Calculate cumulated relative employment growth of each cell over next 10 years
- Find: Polarization in employment since mid-1990s

Employment U.S.

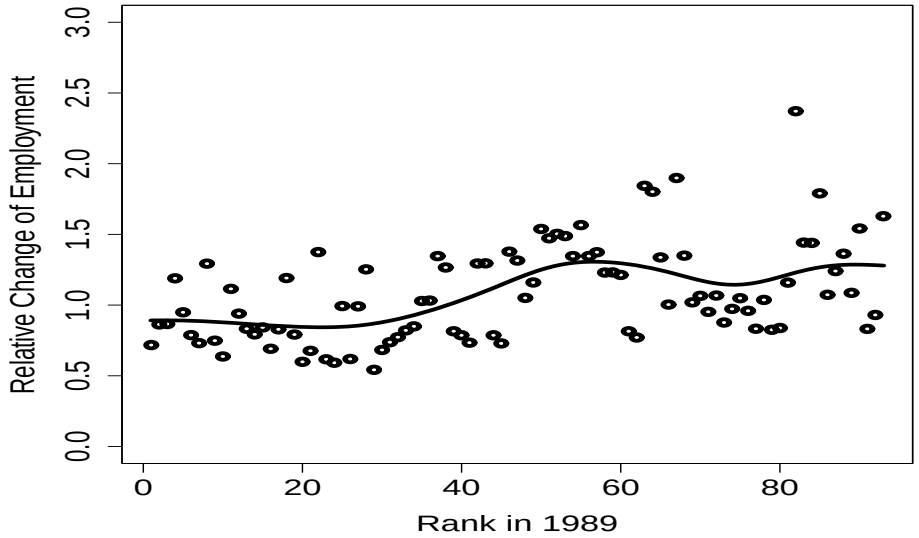
79–89



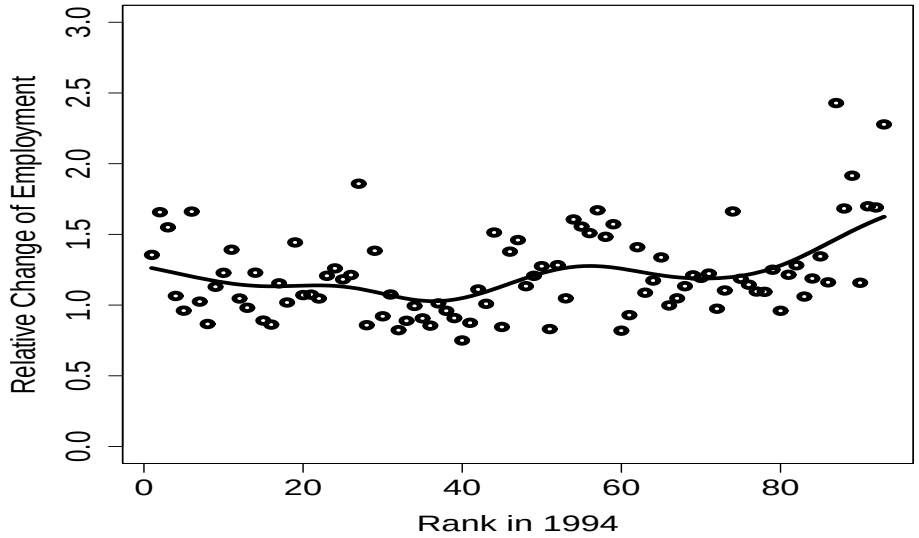
84–94



89–99

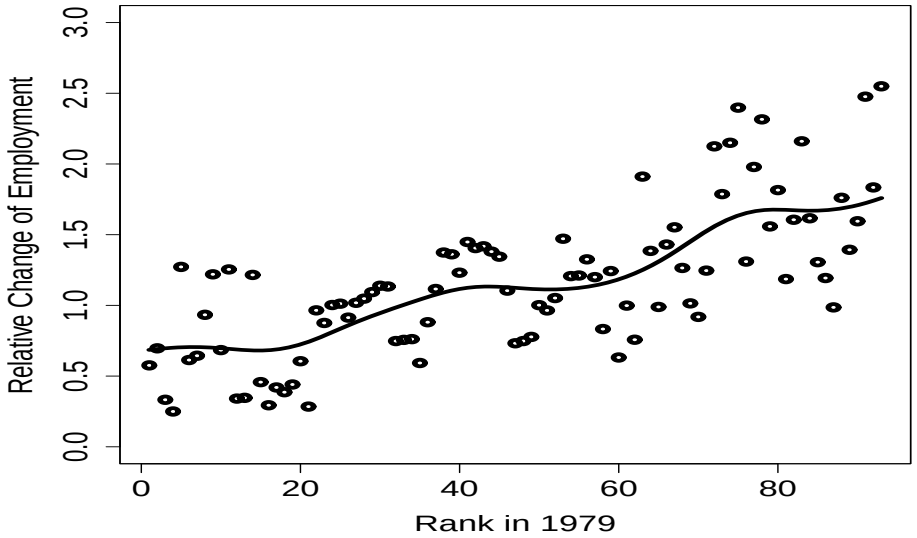


94–04



Employment Germany

79–89



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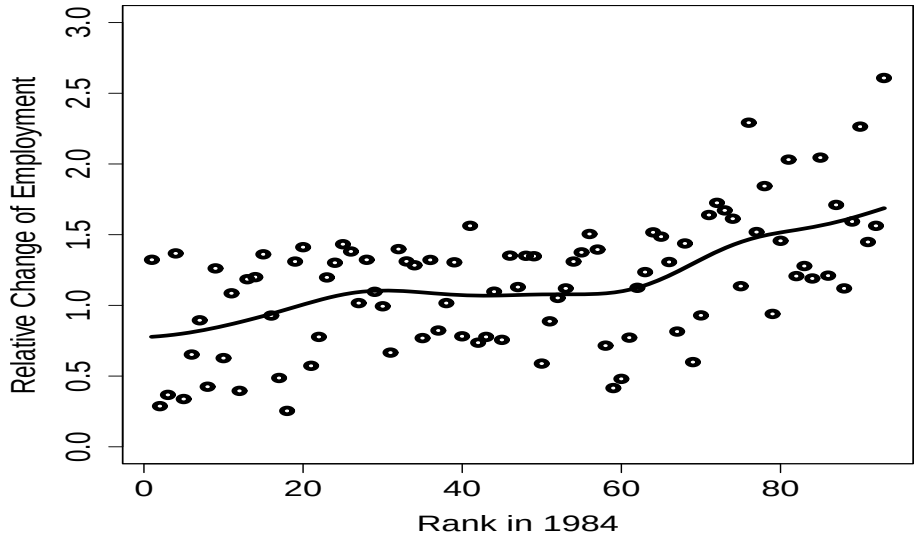

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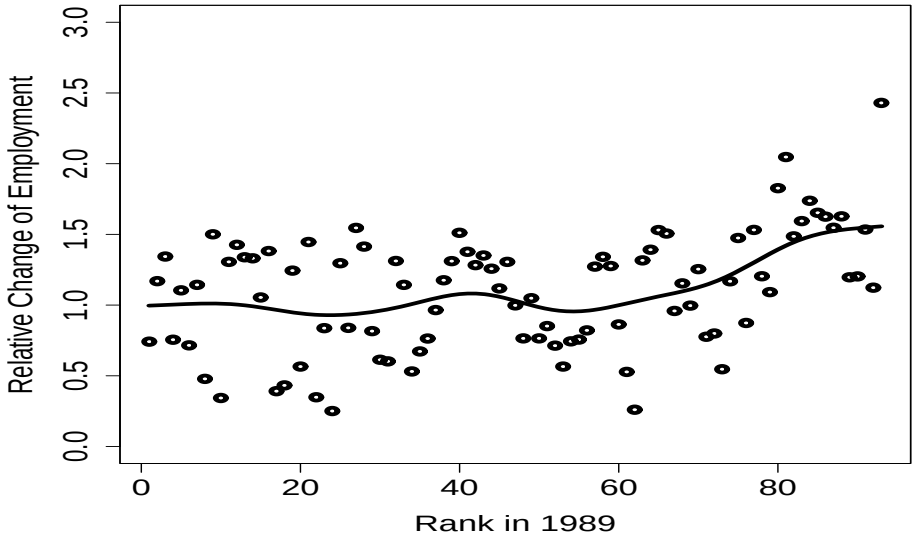
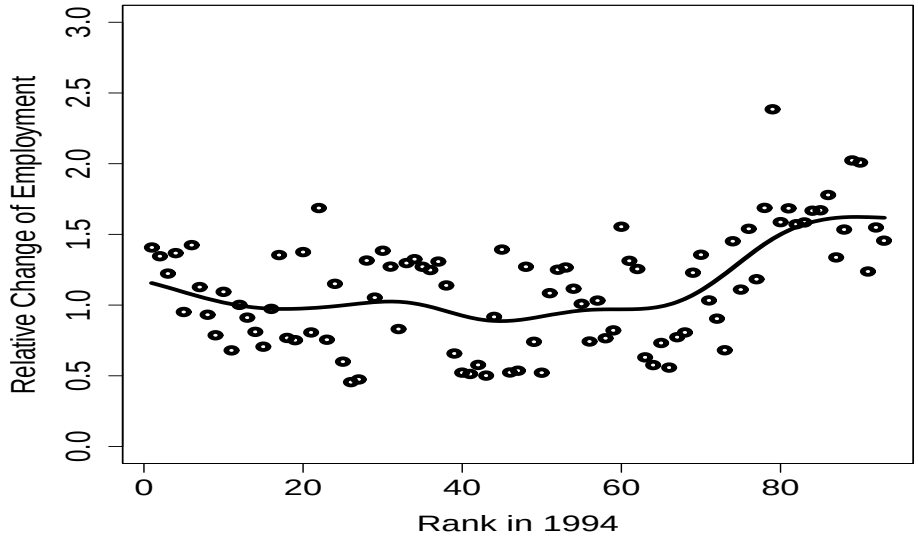


94–04



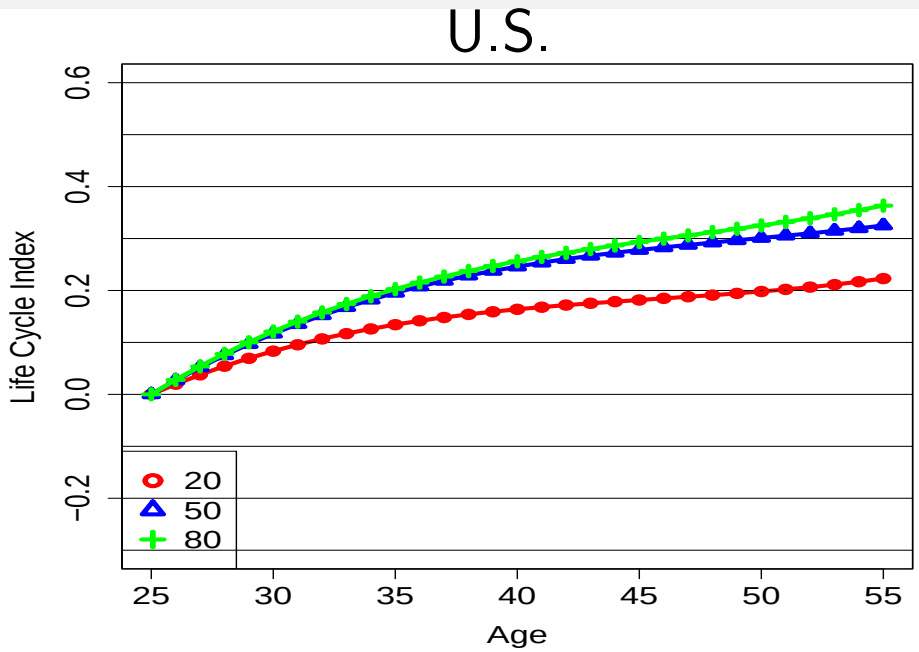
Empirical Implementation

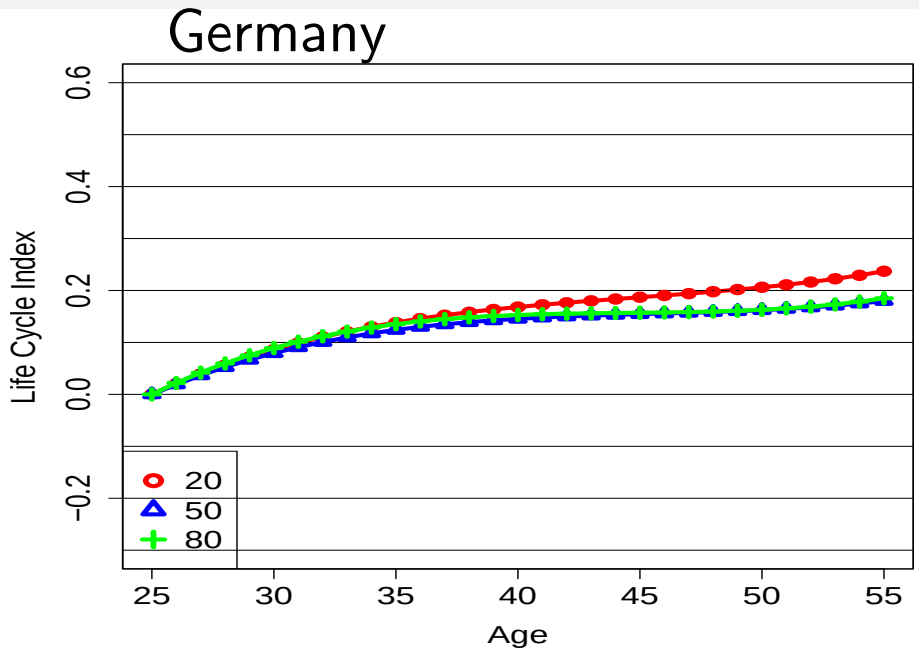
- $A(\alpha) = A_1\alpha + A_{(2)}(\alpha) = a_1\alpha + a_2\alpha^2 + a_3\alpha^3$
- $B(t) = B_1 t + B_{(2)}(t) = b_1 t + b_2 t^2 + b_3 t^3 + b_4 t^4 + b_5 t^5$
- $K(c) = K_1 c + (1-\delta)K_b(c) + \delta K_a(c)$

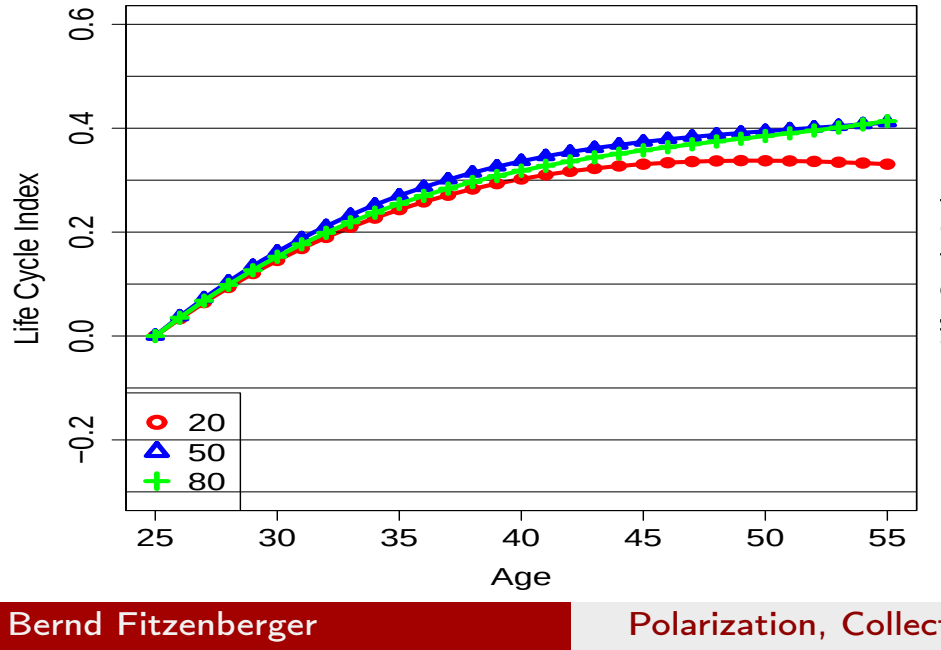
$$g(c,\alpha) + \bar{u}_t = G + (A_1 - K_1)\alpha + (B_1 + K_1)t + A_{(2)}(\alpha) + B_{(2)}(t) + (1-\delta)K_b(c) + \delta K_a(c) + \sum_{i=1}^{4} \gamma_i R_i + \sum_{i=1979}^{2004-N_b-1} \kappa_i YD_i$$

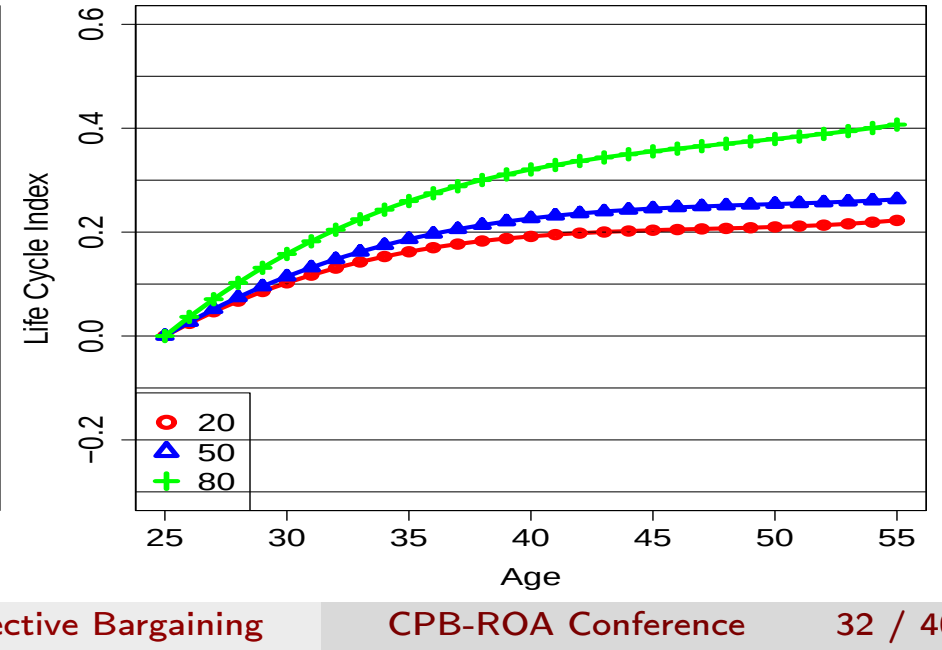
- YD_i: Orthogonalized year dummies
- R_j: Integrated mixed terms

Life Cycle, Low- and Medium-skilled Workers

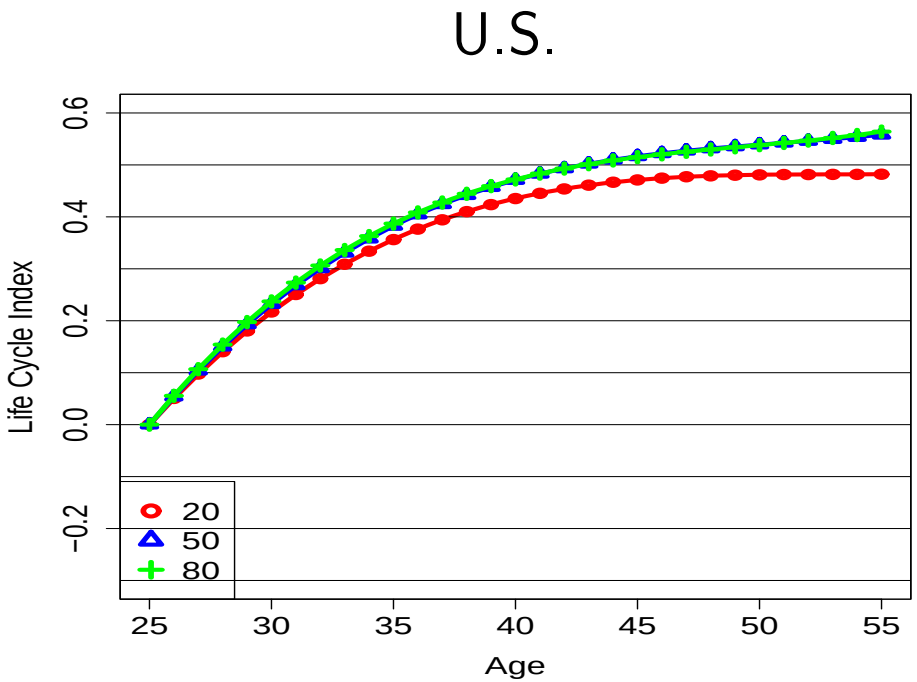


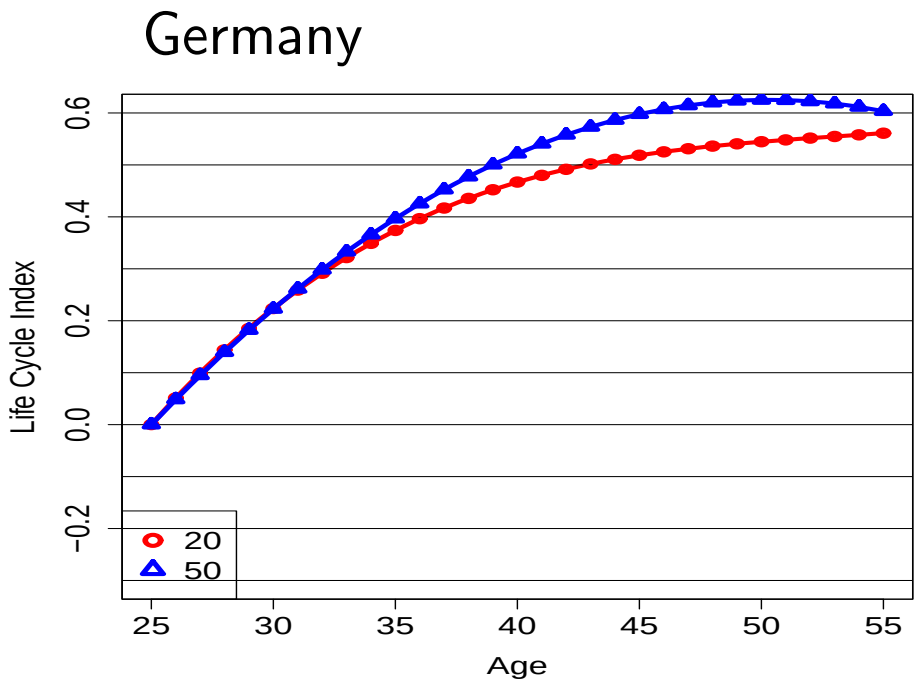






Lifecycle, High-skilled workers

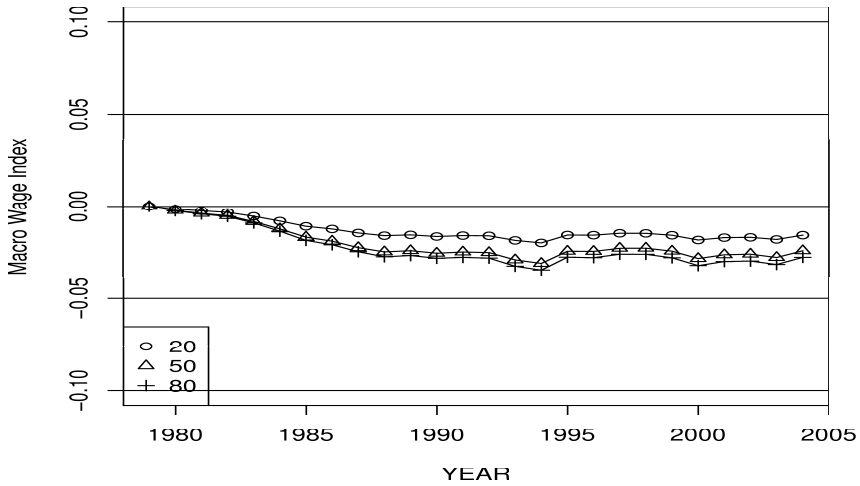


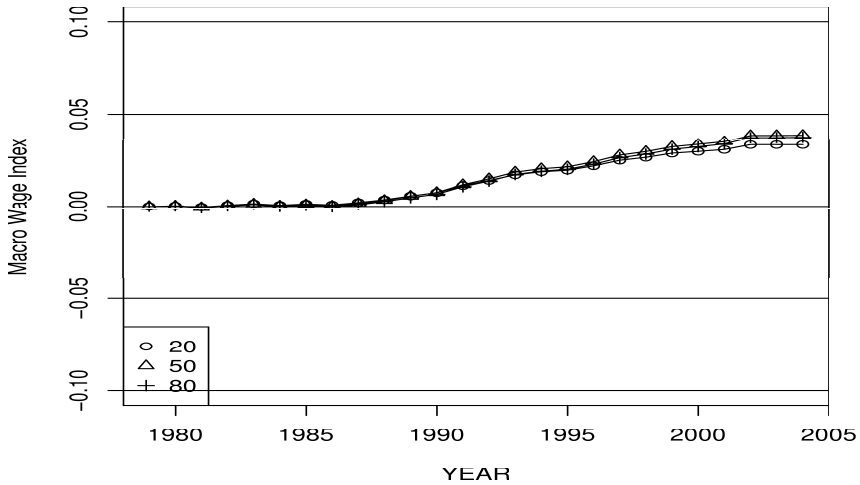


- Wage growth over the life-cycle at the median wage, positively correlated with educational level

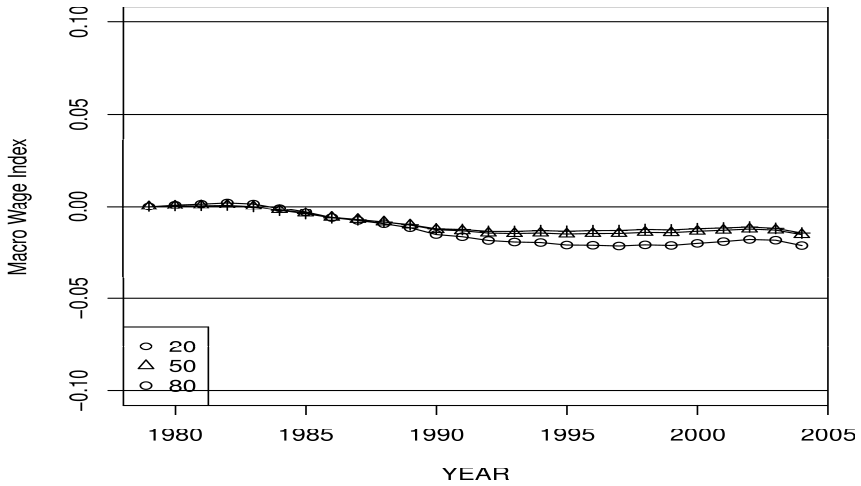
Effect of changes in the age structure on wage growth: 79-04, Low- and Medium-skilled Workers

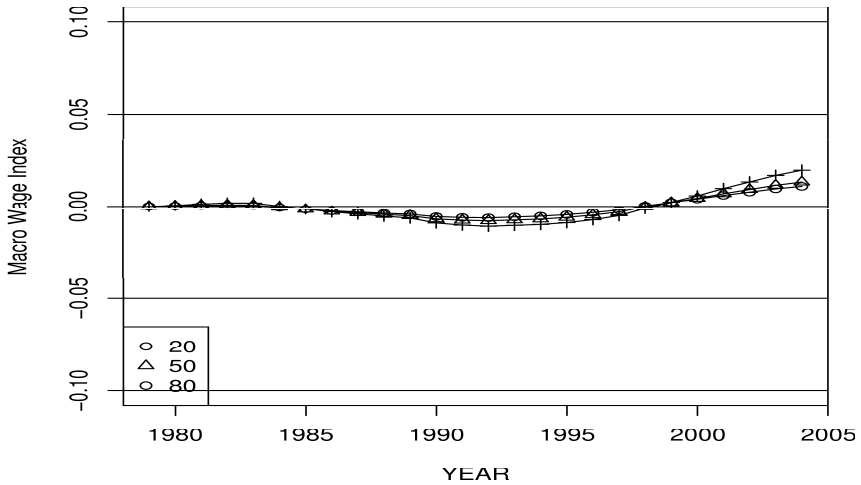
U.S.





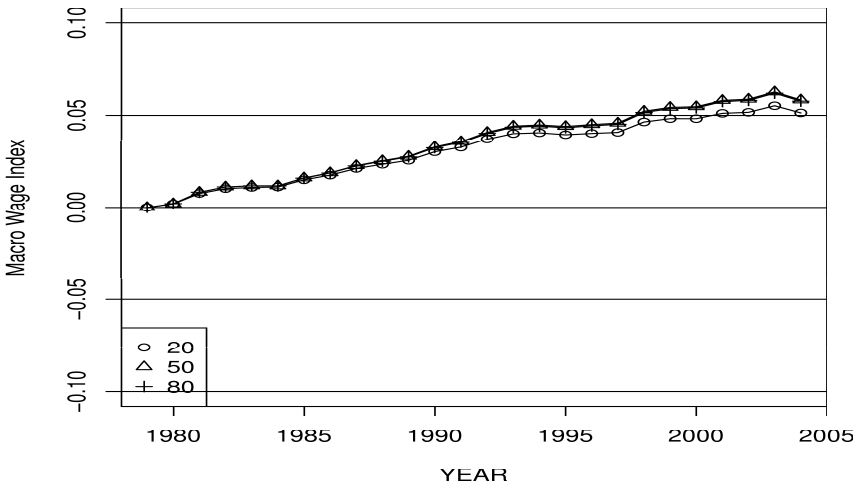
Germany



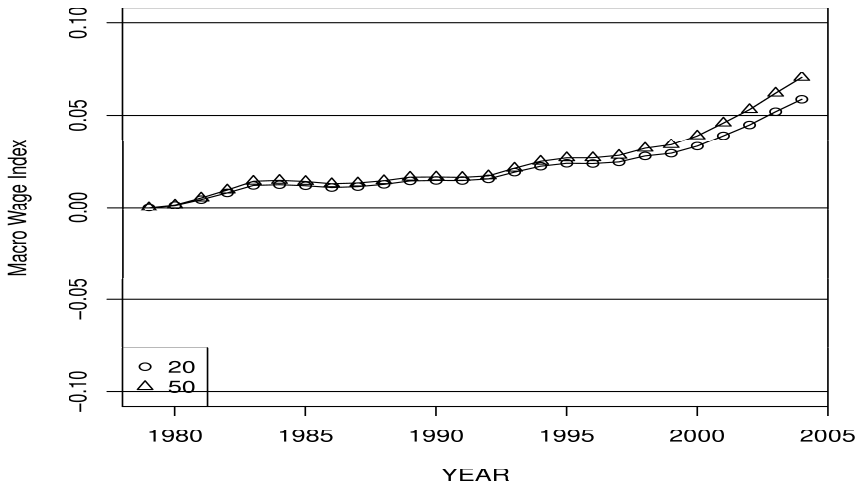


Effect of changes in the age structure on wage growth: 79-04, High-skilled workers

U.S.



Germany



Estimated Model

$$
\begin{aligned}
g(c,\alpha) = {} & G + a_1\alpha + a_2\alpha^2 + a_3\alpha^3 \\
& + b_1 t + b_2 t^2 + b_3 t^3 + b_4 t^4 + b_5 t^5 \\
& + \gamma_{b2} c^2_{b(orth)} + \gamma_{b3} c^3_{b(orth)} + \gamma_{a2} c^2_{a(orth)} + \gamma_{a3} c^3_{a(orth)} \\
& + \sum_{i=1979}^{2004-N_b-1} \kappa_i YD_i
\end{aligned}
$$

- $c^n_{b(orth)}$ are the quadratic and cubic cohort terms orthogonalized wrt c
- Identifying assumption: Linear cohort term equals zero
- H_{UI} never rejected

Quantile Regression, Life-cycle Index and Time Trend

- Construct age-education cells for each year
- Calculate the quantiles in each cell, then regress using weighted OLS, where the weight is the employment size of a cell (Chamberlain, 1994)
- Life-cycle index
  $ln[w_L(\alpha)] = (a_1 - \gamma_1)\alpha + A_{(2)}(\alpha) = (a_1 - \gamma_1)\alpha + a_2\alpha^2 + a_3\alpha^3$
- Time trend
  $ln[w_m(\alpha)] = (b_1+\gamma_1)t+B_{(2)}(t) = (b_1+\gamma_1)t+b_2t^2+b_3t^3+b_4t^4+b_5t^5$

Econometric Approach / MaCurdy and Mroz (1995)

- Three effects: t: time, α: age, c: year of birth
- Identification problem: $t - \alpha = c$
- "Age-earning profiles" are statistically indistinguishable from "cohort-earning profiles"
- Additive form of wage profile (testable against a more general formulation)

$$
\begin{aligned}
ln[w(c,\alpha)] = {} & G + a_1\alpha + a_2\alpha^2 + a_3\alpha^3 \\
& + b_1 t + b_2 t^2 + b_3 t^3 + b_4 t^4 + b_5 t^5 \\
& + \gamma_{b2} c^2_{b(orth)} + \gamma_{b3} c^3_{b(orth)} + \gamma_{a2} c^2_{a(orth)} + \gamma_{a3} c^3_{a(orth)} \\
& + \sum_{i=1979}^{2004-N_b-1} \kappa_i YD_i + u
\end{aligned}
$$

Sequential Decomposition

$$\Delta^1_\tau = q^6_\tau(\alpha^6_P, \alpha^6_F, \alpha^6_B, \bar{\alpha}^6_0, B^6, F^6, P^6) - q^6_\tau(\alpha^1_P, \alpha^6_F, \alpha^6_B, \bar{\alpha}^6_0, B^6, F^6, P^6)$$

$$\Delta^2_\tau = q^6_\tau(\alpha^1_P, \alpha^6_F, \alpha^6_B, \bar{\alpha}^6_0, B^6, F^6, P^6) - q^6_\tau(\alpha^1_P, \alpha^1_F, \alpha^6_B, \bar{\alpha}^6_0, B^6, F^6, P^6)$$

$$\Delta^3_\tau = q^6_\tau(\alpha^1_P, \alpha^1_F, \alpha^6_B, \bar{\alpha}^6_0, B^6, F^6, P^6) - q^6_\tau(\alpha^1_P, \alpha^1_F, \alpha^1_B, \bar{\alpha}^6_0, B^6, F^6, P^6)$$

$$\Delta^4_\tau = q^6_\tau(\alpha^1_P, \alpha^1_F, \alpha^1_B, \bar{\alpha}^6_0, B^6, F^6, P^6) - q^6_\tau(\alpha^1_P, \alpha^1_F, \alpha^1_B, \bar{\alpha}^1_0, B^6, F^6, P^6)$$

$$\Delta^5_\tau = q^6_\tau(\alpha^1_P, \alpha^1_F, \alpha^1_B, \bar{\alpha}^1_0, B^6, F^6, P^6) - q^6_\tau(\alpha^1_P, \alpha^1_F, \alpha^1_B, \bar{\alpha}^1_0, B^1, F^6, P^6$$

$$\Delta^6_\tau = q^6_\tau(\alpha^1_P, \alpha^1_F, \alpha^1_B, \bar{\alpha}^1_0, B^1, F^6, P^6) - q^6_\tau(\alpha^1_P, \alpha^1_F, \alpha^1_B, \bar{\alpha}^1_0, B^1, F^1, P^6)$$

$$\Delta^7_\tau = q^6_\tau(\alpha^1_P, \alpha^1_F, \alpha^1_B, \bar{\alpha}^1_0, B^1, F^1, P^6) - q^1_\tau(\alpha^1_P, \alpha^1_F, \alpha^1_B, \bar{\alpha}^1_0, B^1, F^1, P^1)$$

Helicopter Counterfactuals