

Polarization and Rising Wage Inequality Comparing the U.S. and Germany

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Workshop: Increasing Labor Market Flexibility - Boon or Bane?

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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; UK: Gosling et al., 2000; Germany: Dustmann et al., 2009, and others)
- One (most?) 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
- Moreover, as SBTC may have a bias in the age/cohort dimension, our framework allows for potential cohort effects

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)

Preview of Main Results

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

Data

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.

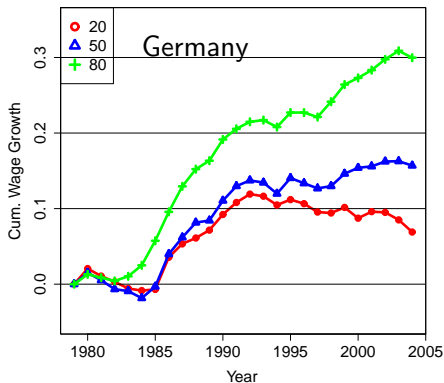
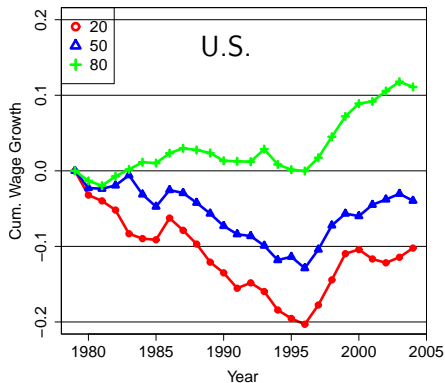
- Low-skilled: 12 years or less
- Medium-skilled: 13 to 15 years
- High-skilled: 16 years or more

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.



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

$$g(c, \alpha) = \underbrace{G + K(c)}_{\text{cohort specific constant of integration}} + A(\alpha) + B(c + \alpha)$$

cohort specific constant of integration

Estimated Model

$$\begin{aligned}
 g(c, \alpha) = & G + a_1\alpha + a_2\alpha^2 + a_3\alpha^3 \\
 & + b_1t + b_2t^2 + b_3t^3 + b_4t^4 + b_5t^5 \\
 & + \gamma b_2 c_{b(orth)}^2 + \gamma b_3 c_{b(orth)}^3 + \gamma a_2 c_{a(orth)}^2 + \gamma a_3 c_{a(orth)}^3 \\
 & + \sum_{i=1979}^{2004-N_b-1} \kappa_i YD_i
 \end{aligned}$$

- $c_{b(orth)}^n$ 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, MaCurdy/Mroz 1995)

- Life-cycle index

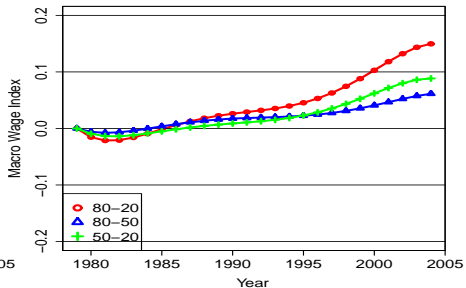
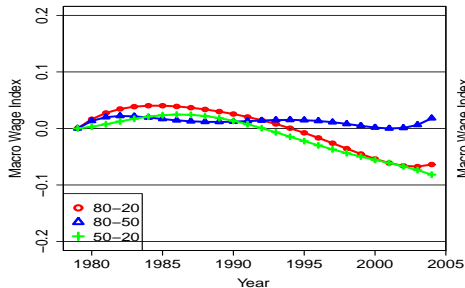
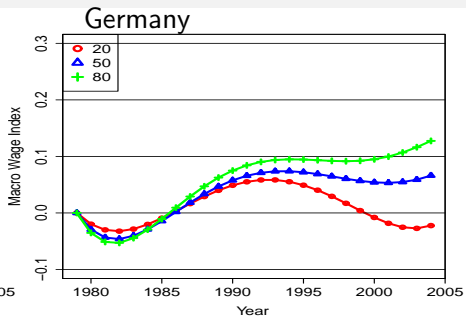
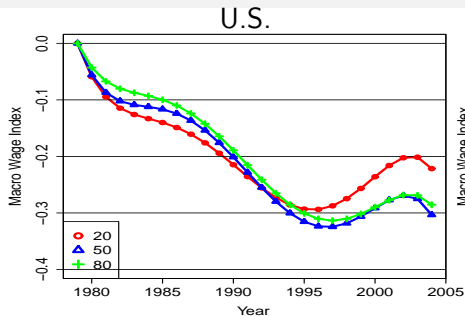
$$\ln[w_L(\alpha)] = (A_1 - K_1)\alpha + A_{(2)}(\alpha) = (A_1 - K_1)\alpha + a_2\alpha^2 + a_3\alpha^3$$

- Time trend

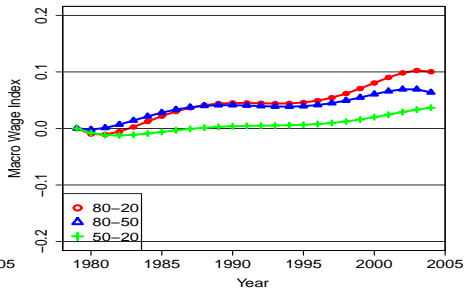
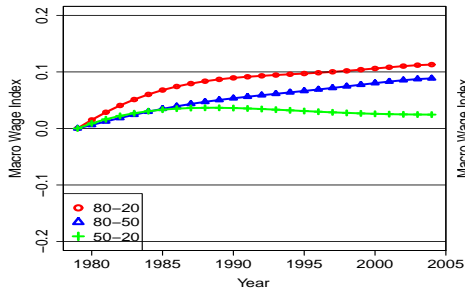
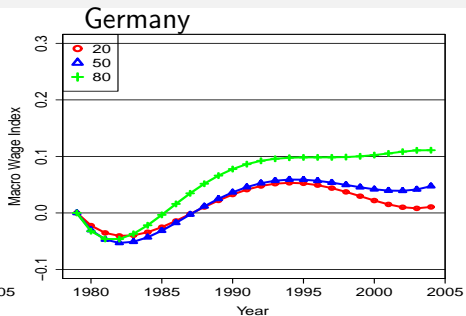
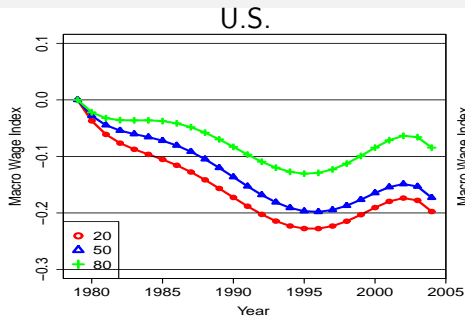
$$\ln[w_m(\alpha)] = (B_1 + K_1)t + B_{(2)}(t) = (B_1 + K_1)t + b_2t^2 + b_3t^3 + b_4t^4 + b_5t^5$$

K_1 : coefficient of linear cohort term

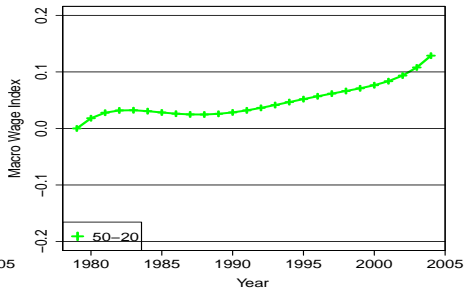
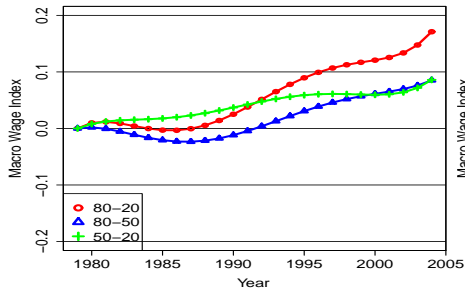
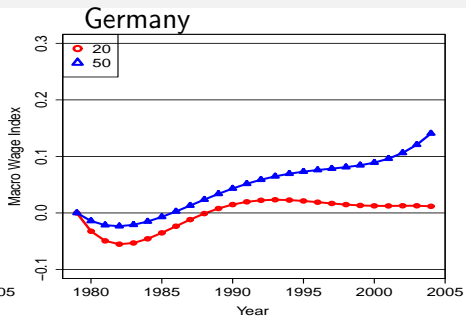
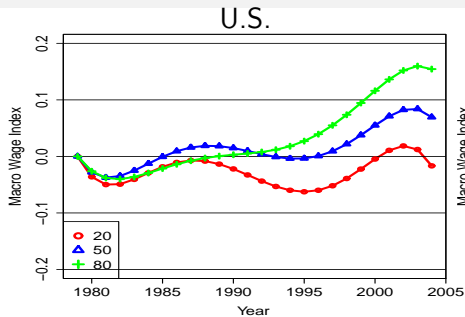
Time Trends and Wage Dispersion, 79–04, Low-skilled



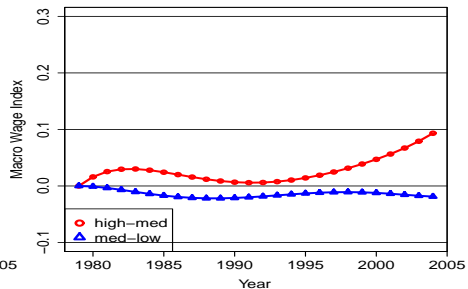
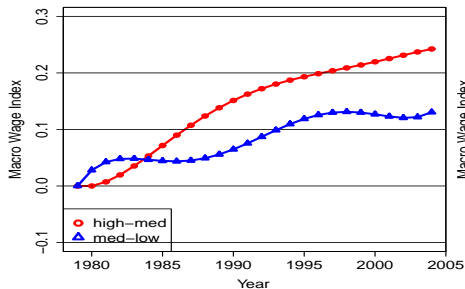
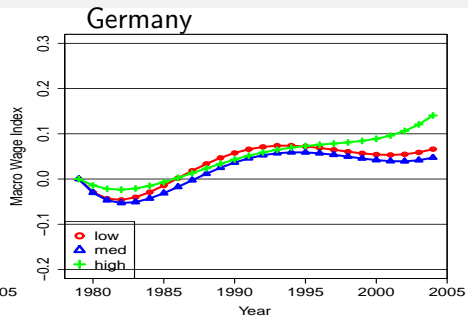
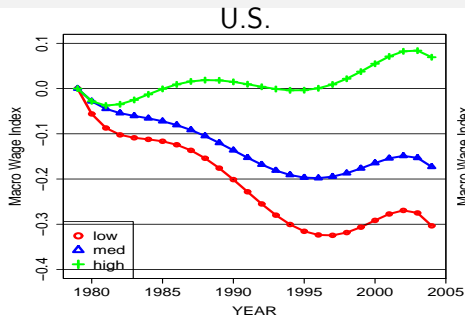
Time Trends and Wage Dispersion, 79–04, Medium-skilled



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



Wage Trends across Skill Groups and Skill Premia



Wage Dispersion

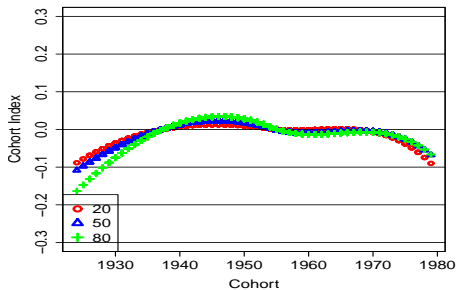
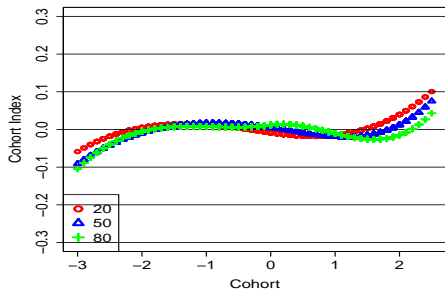
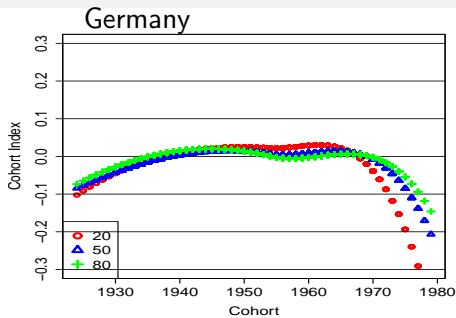
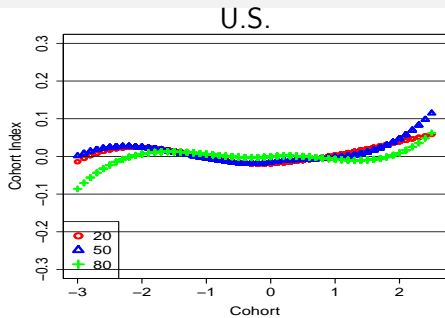
Within Skill Groups

- 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
→ institutional factors?

Between Skill Groups

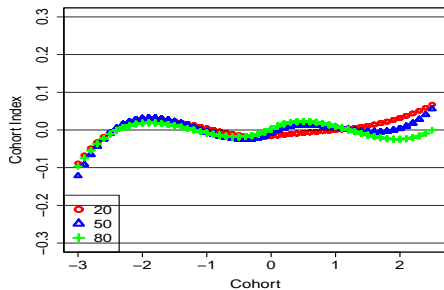
- U.S.: rising high-medium premium, medium-low premium ceases to increase during the 1990s
- Germany: Stable until mid-1990s, then increasing high-medium premium
- Differences between conditional and unconditional skill premia due to compositional effects

Cohort Effects, Low- and Medium-skilled workers

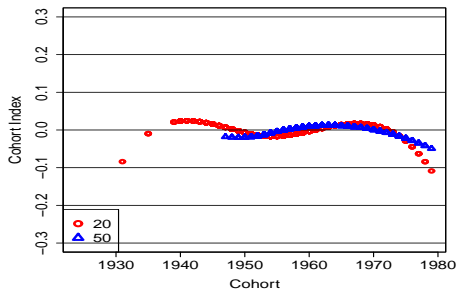


Cohort Effects, High-skilled workers

U.S.



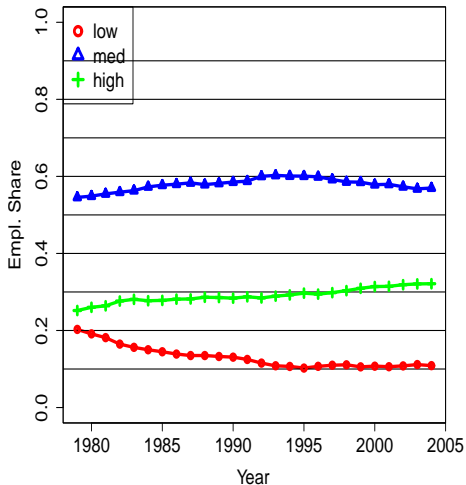
Germany



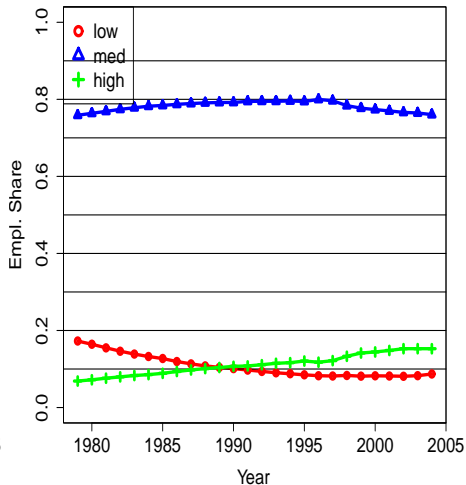
Employment Shares of Different Skill Groups, 79–04

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

U.S.



Germany

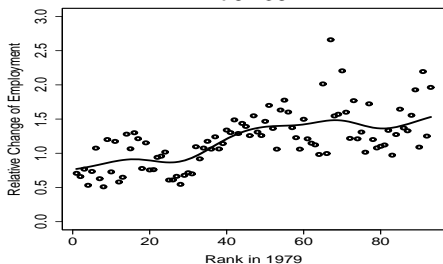


Employment

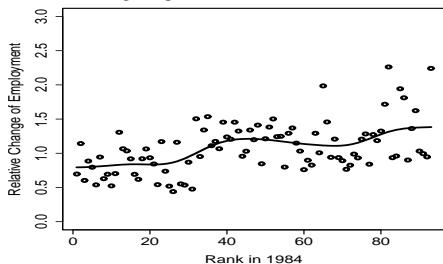
- Describe employment growth along wage distribution
- Rank age-education cells across skill groups for base year 0 by cell median wage
- Age variable is discrete (25-55), 3 educational levels, yielding 93 cells
- "Skill groups" j comprising education and age:
Wage in base year $\ln(w_{j0})$ as proxy 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.

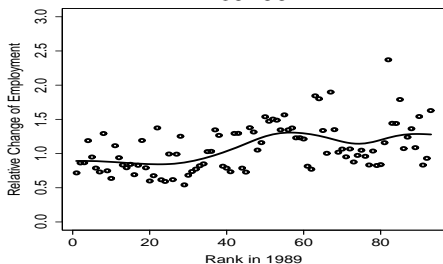
79-89



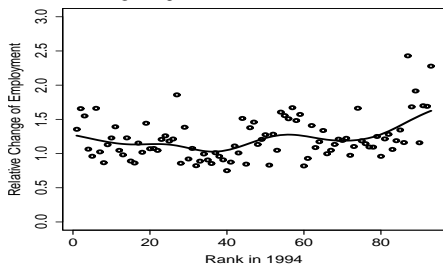
84-94



89-99

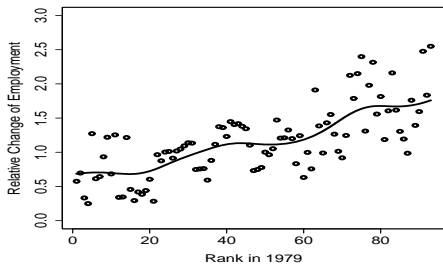


94-04

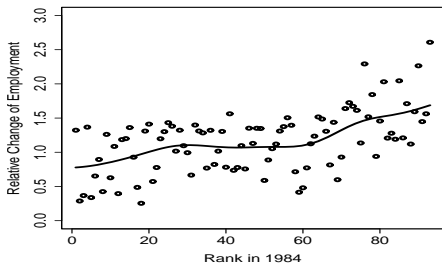


Employment Germany

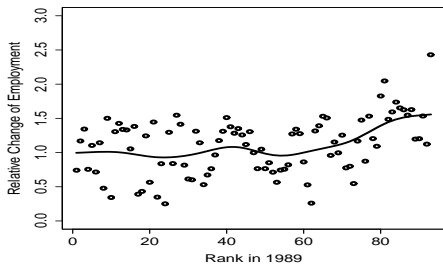
79-89



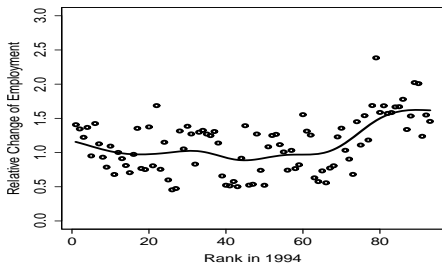
84-94



89-99



94-04



Main Results

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

Conclusions

- 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
 - unlikely that technological change alone can explain the empirical findings
- SBTC may interact with institutional factors
 - differences in institutions across economies maybe the reason why we observe different trends in inequality across the U.S. and Germany

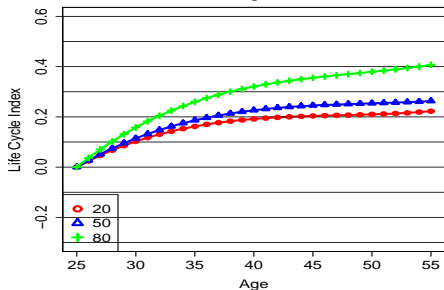
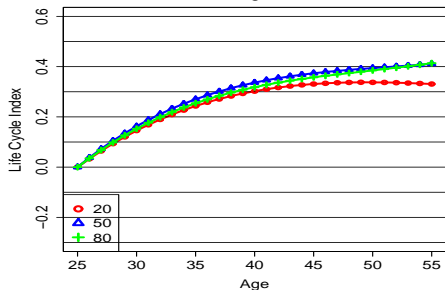
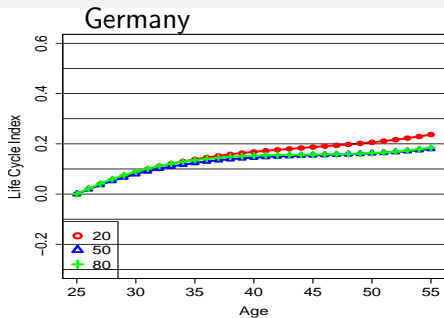
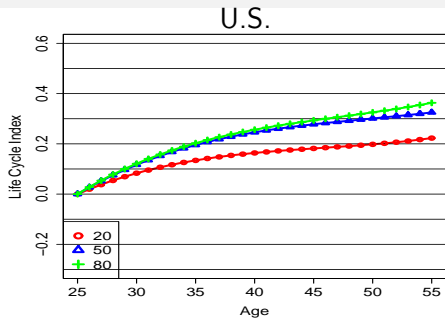
Empirical Implementation

- $A(\alpha) = A_1\alpha + A_{(2)}(\alpha) = a_1\alpha + a_2\alpha^2 + a_3\alpha^3$
- $B(t) = B_1t + B_{(2)}(t) = b_1t + b_2t^2 + b_3t^3 + b_4t^4 + b_5t^5$
- $K(c) = K_1c + (1 - \delta)K_b(c) + \delta K_a(c)$

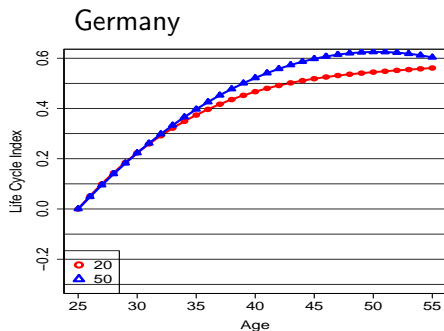
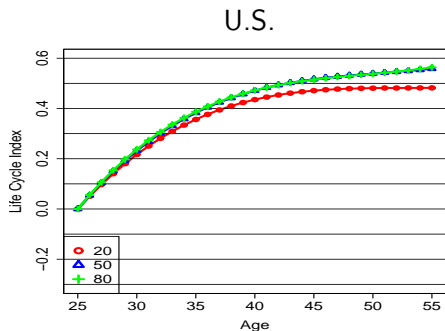
$$\begin{aligned}
 g(c, \alpha) + \bar{u}_t &= G + (A_1 - K_1)\alpha + (B_1 + K_1)t + A_{(2)}(\alpha) \\
 &\quad + B_{(2)}(t) + (1 - \delta)K_b(c) + \delta K_a(c) \\
 &\quad + \sum_{i=1}^4 \gamma_i R_i + \sum_{i=1979}^{2004 - N_b - 1} \kappa_i YD_i
 \end{aligned}$$

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

Life Cycle, Low- and Medium-skilled Workers



Lifecycle, High-skilled workers

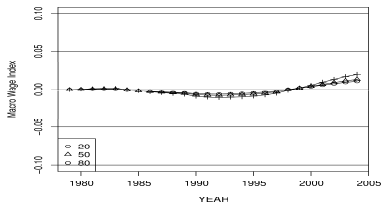
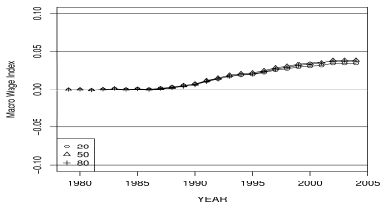
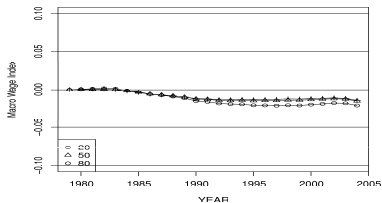
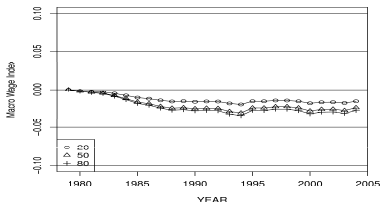


- Wage growth over the life-cycle at the median wage, positively correlated with educational level

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

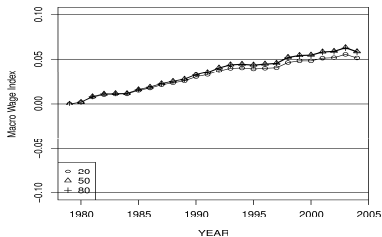
U.S.

Germany



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

U.S.



Germany

