COUNTRIES FOR OLD MEN:
AN ANALYSIS OF THE AGE WAGE GAP

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Workforce Aging and the Age Wage Gap

▶ **Average workforce age increased** in high-income countries
  - E.g.: share of O55 workers in US almost doubled in 1985-2020

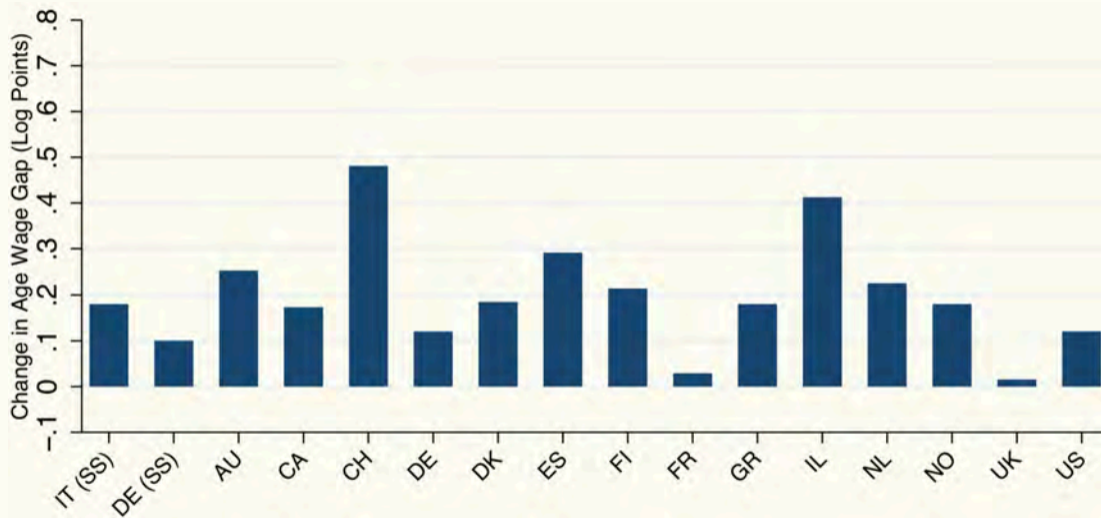# Workforce Aging and the Age Wage Gap

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  - 1960s entry of "baby-boom" cohort, drop in average worker age

▶ Baby-boomers associated with increase in O55-U35 wage gap (Freeman, 1979)
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▶ Has current workforce aging narrowed age wage gap?

Wage Gap Between Older and Younger Workers Increased

Bar chart with y-axis labeled "Change in Age Wage Gap (Log Points)" ranging from -.1 to .8. X-axis categories: IT (SS), DE (SS), AU, CA, CH, DE, DK, ES, FI, FR, GR, IL, NL, NO, UK, US.

▸ Time series   ▸ By Age

This Paper

▶ Data from 19 high-income countries
- Italy: 313 mil obs., 29 mil workers, 3.5 mil firms
- Germany: 35 mil obs., 9 mil workers, 128k firms
- LIS Database: 6.9 mil. workers from 19 countries

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  - **negative career spillovers** in firms: success of older might come at cost for younger
  - spillovers increase if more older workers with lower turnover and/or if slowdown in growth
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  - Look for evidence of deterioration of younger workers' careers
  - Investigate within firm dynamics and crowd out from higer-paying firms
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- ► Complement with additional evidence to rule out several alternative stories

What We Find

1. **Deterioration of younger workers' careers:** pushed to bottom of wage distribution
   - Many O55 workers swapped positions with U35 workers in wage distribution
   - E.g., share of total increase explained by change in rank is 78% in Italy and 98% in US

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6. Complement with additional evidence to rule out alternative stories
   - among others: workforce composition, inequality trend, education and returns to experience

Literature Review

1. **Wage trends**
   - **Relatively small literature on age wage gap** (Rosolia & Torrini (2007); Naticchioni et al. (2014))
     - Administrative and survey data from multiple countries
     - More tests and improved external validity
     - Implications of our results on pay and employment gap for income: Guaitoli and Pancrazi (2022)
     - Worsening in life-time earnings of younger workers (Guvenen et al., 2022)

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- **Bridge gap with other strands of the labor literature**
    - Wage inequality (Autor et al. (2008); Card et al. (2013); Song et al. (2019)), increases in returns to experience (Jones (2009); Azoulay et al. (2020); Jeong et al. (2015)); SBTC (Acemoglu et al. (2011); Autor et al. (2006)); domestic outsourcing (Goldschmidt & Schmieder (2017)); demand for skills (Deming (2021)); selection

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2. Spillovers across workers

- Bertoni & Brunello (2020), Boeri et al. (2021), Bianchi et al. (2022), and Mohnen (2022) find that increase in retirement age worsens labor-market outcomes of younger workers
- Widening of age wage gap compatible with main takeaway of these papers

Outline

Data

Deterioration in Younger Workers Careers, Improvement for Older Workers
    Importance of Changes in Relative Rank in Wage Distribution
    Entry Rank Vs. Rank Growth

The Role of Firms
    Rank Increase Between Vs. Within Firms
    Age Gap Trend Heterogeneity Across Types of Firms

Alternative Stories

Conclusions

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- ▶ Use ITA as main setting, replicate for others when possible

Rank Gap Vs. Distributional Gap

Two Types of Increases in the Age Wage Gap

► Wage distribution at baseline:
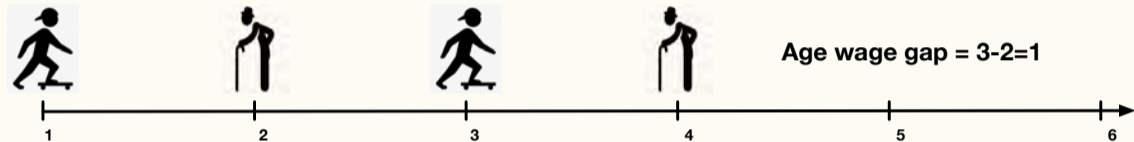
Age wage gap = 3-2=1

► Age wage gap can increase through a change in wage rank:

Age wage gap = 3.5-1.5=2

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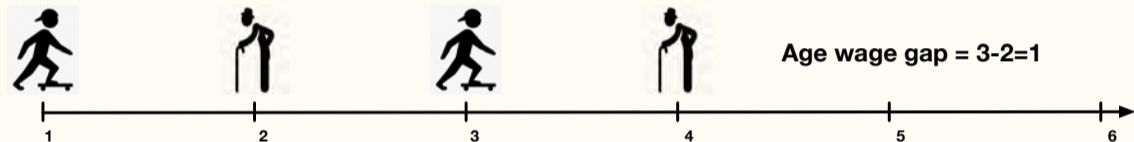
Age wage gap = 3-2=1

► Age wage gap can increase through a change in mean wages at different percentiles:
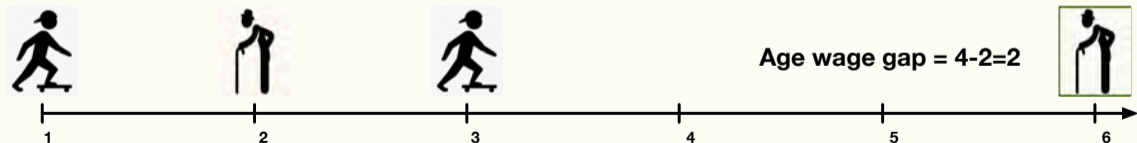
Age wage gap = 4-2=2

Decomposition: Rank Gap and Distributional Gap

The change in mean wages for age group t between periods t and t′ can be written as follows:

$$\Delta w_a^{t,t'} = \underbrace{\sum_v s_{a,v,t} \left(\bar{w}_{v,t'} - \bar{w}_{v,t} \right)}_{\text{Distributional gap}} +$$

▶ $s_{a,v,t}$ = share of workers in age group a $\in \{$U35, O55$\}$, vigintile v of the distribution of wages, and year t

▶ $\bar{w}_{v,t}$ = mean log wage in vigintile v and year t

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▶ Take difference between two age groups $a \in \{U35, O55\}$ to decompose change in age wage gap

Most of the Increase in Age Wage Gap from Larger Rank Gap

O55–U35 gap in log weekly wages, year t – 1985

- Rank gap
- Distributional gap
- Residual

Year

Yearly Earnings   Germany
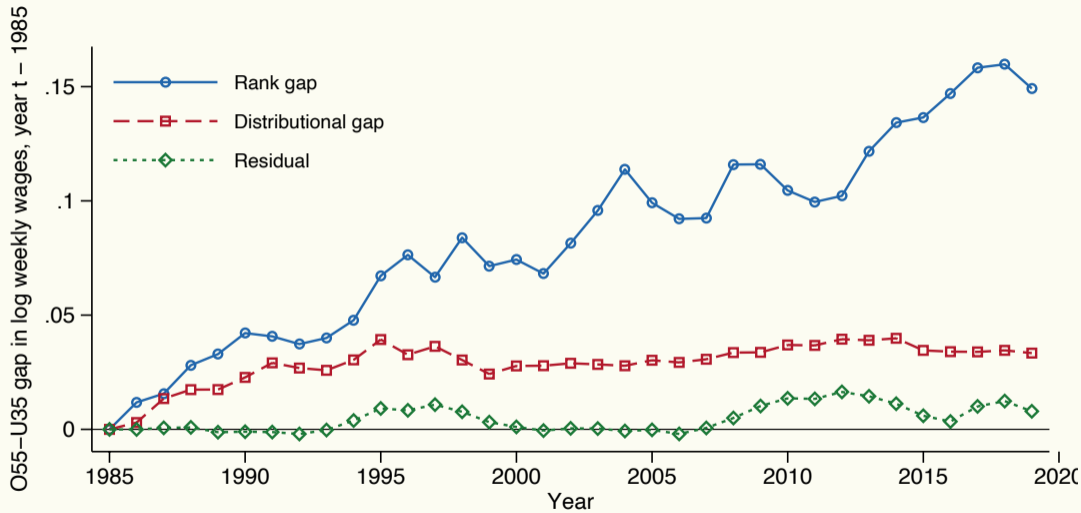
Decomposition by Age Group: U35 lose, while O55 gain
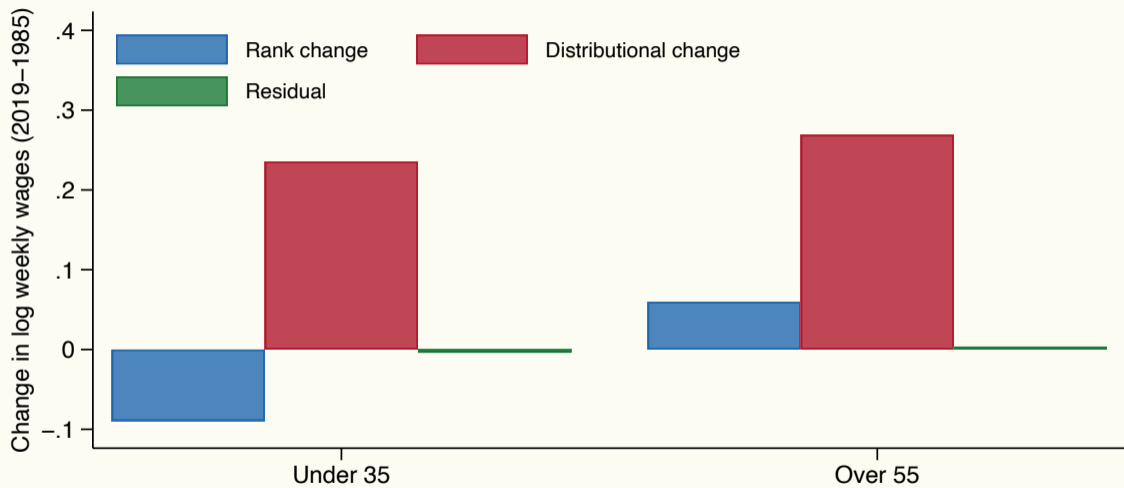
Rank Gap More Important in Most Countries
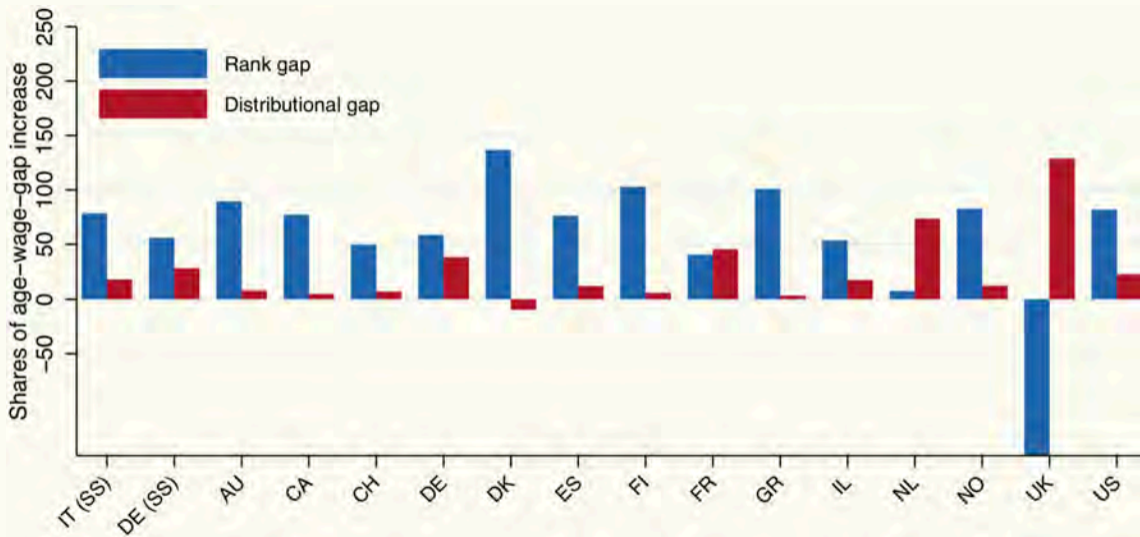
Quartiles U35 ▸ Vigintiles U35 ▸ Quartiles O55 ▸ Vigintiles O55

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Entry Rank Vs. Rank Growth

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▶ Change in rank at labor-market entry between t and t′ (e is years from entry)

$$\underbrace{\sum_{e \in [0,18]} s_{e,t} \cdot \sum_{v} \left[\left(s_{e,t',v}^E - s_{e,t,v}^E \right) \cdot \bar{w}_{v,t} \right]}_{\text{Change in entry rank}}$$

- $s_{e,t,v}^E$ = the share of workers who are e years from entry in year t in vigintile v at the time of entry in the labor market (E)
- $s_{e,t}$ = the share of workers who are e years from entry in year t out of all U-35

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▶ Change in post-entry rank growth between t and t′

$$\underbrace{\sum_{e \in [0,18]} s_{e,t} \cdot \sum_{v} \left[\left(\Delta s_{e,t',v}^{t'-E} - \Delta s_{e,t,v}^{t-E} \right) \cdot \bar{w}_{v,t} \right]}_{\text{Change in rank growth}}$$

- $\Delta s_{e,t',v}^{t'-E} = s_{e,t,v} - s_{e,t,v}^{E}$ = change in share at vingtile v of those who are e years from entry in t

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U35: Loss From Both Entry and Post-Entry Growth
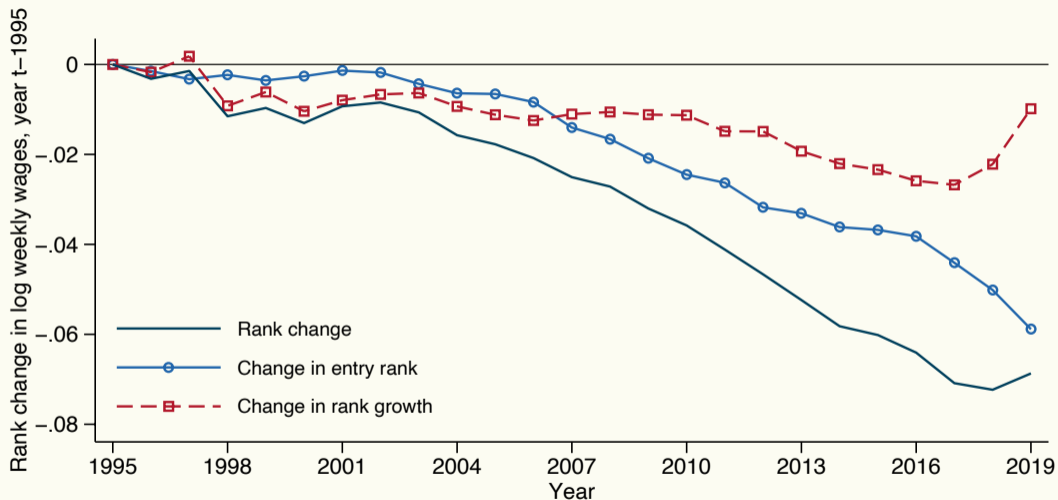
Takeaways From Entry Vs. Post-Entry Growth

► Deterioration of U35 rank from lower entry rank AND lower rank growth over lifecycle

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- ▶ How does lower growth relate to turnover and firm-to-firm moves?
  - we know that most of wage growth comes from turnover
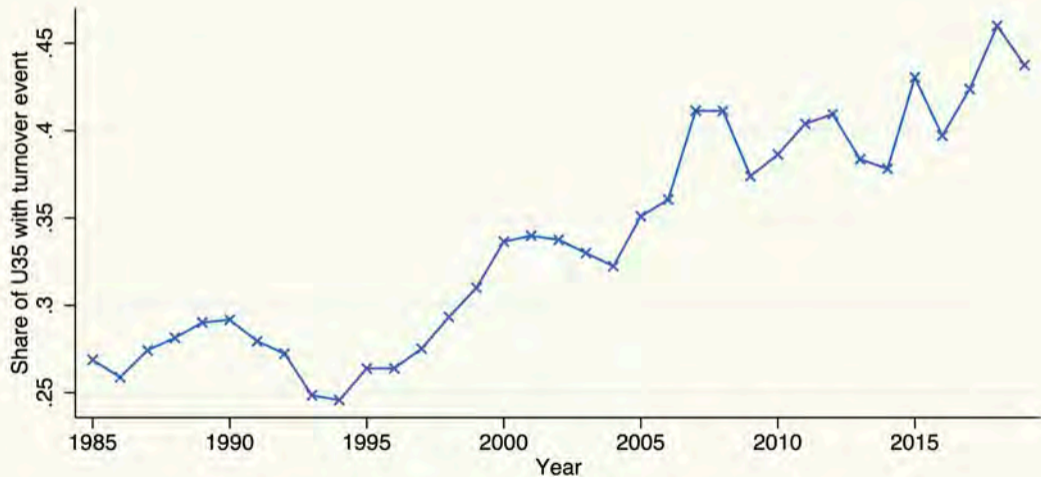
Despite Larger Turnover, Average Rank Growth In Turnover Declines

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Change in share of positive jumps (1985–2019): −.03

(Chart: Share of U35 with turnover event vs. Year, 1985–2015)
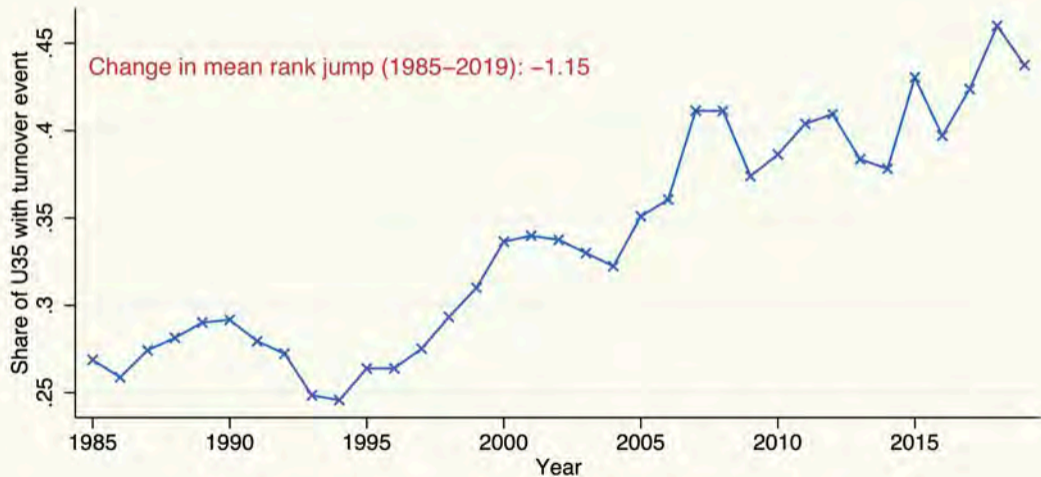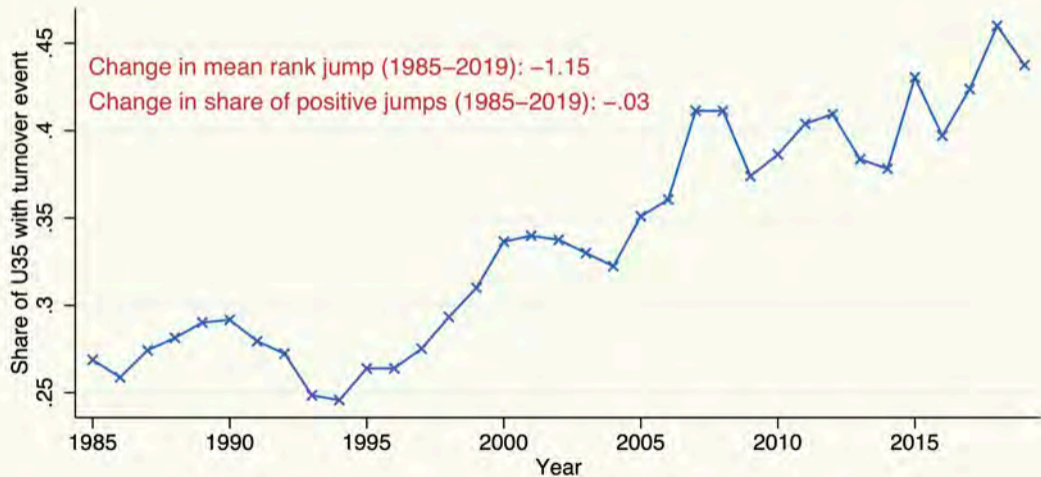
The Importance of Within and Between Firm Dynamics

Sorting of Workers

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▶ Write shares of workers in age group a, firm-worker group (f, e), and year t as follows:

$$s_{a,(f,e),t} = \underbrace{s_{a,f,t}}_{\text{Share of a in f}} \cdot \underbrace{s_{a,(e|f),t}}_{\text{Share of a in e conditional on f}}$$

Rank Gap: Between Vs. Within Firms

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$$+ \underbrace{\sum_{g \in (f,e)} s_{a,f,t} \cdot \left(s_{a,(e|f),t'} - s_{a,(e|f),t} \right) \cdot \bar{w}_{g,t}}_{\text{Within firms}} + \underbrace{\varepsilon_a^{t,t'}}_{\text{Residual}}$$

► You can further differentiate between two age groups $a \in \{U35, O55\}$

Within-Firm Component Accounts for 61% of Rank-Gap Increase

Germany
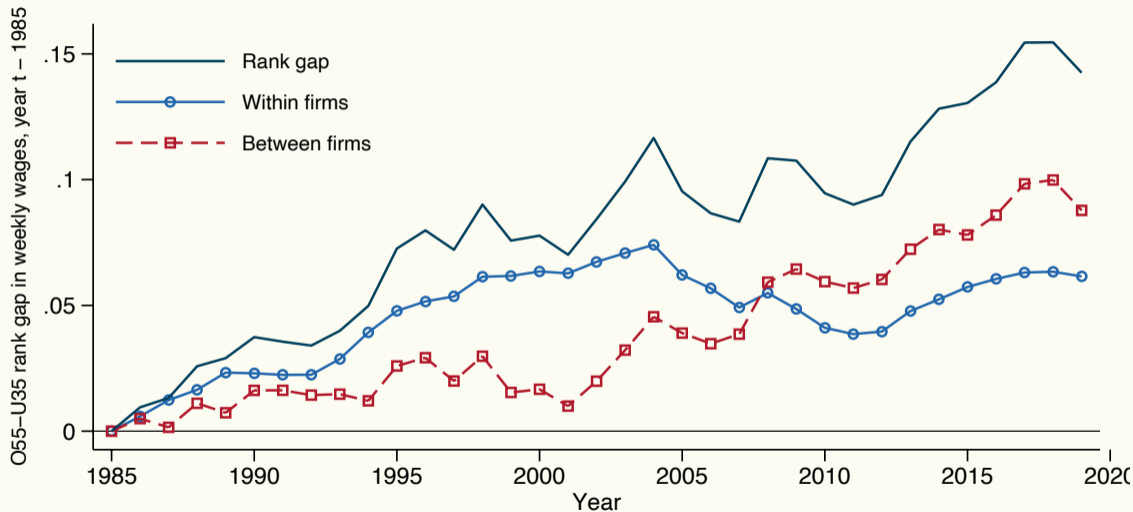
Within Firm Dynamics are Mostly Important for U35
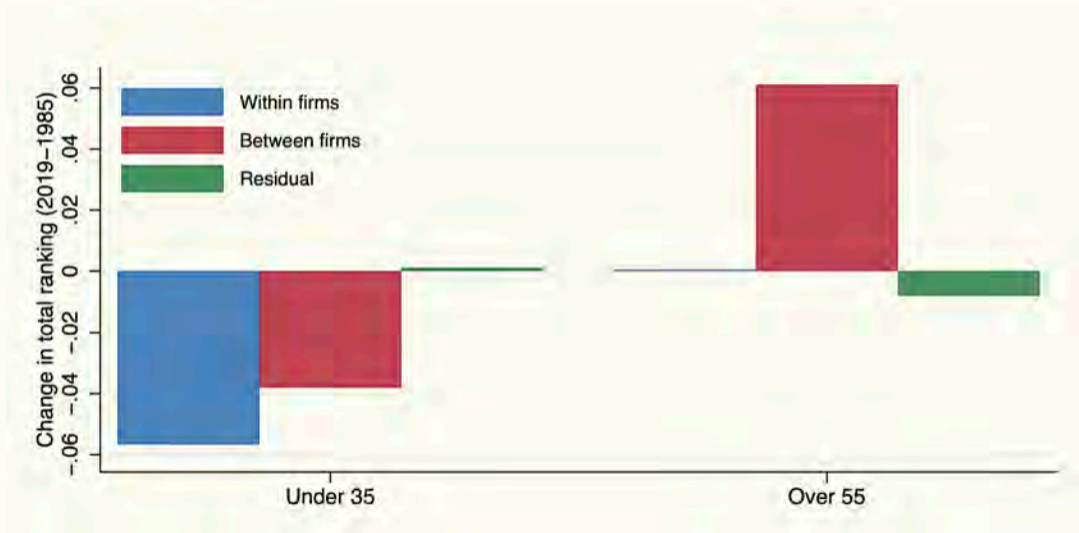
U35 Lose Rank Within Firms At Entry, and for Lower Growth
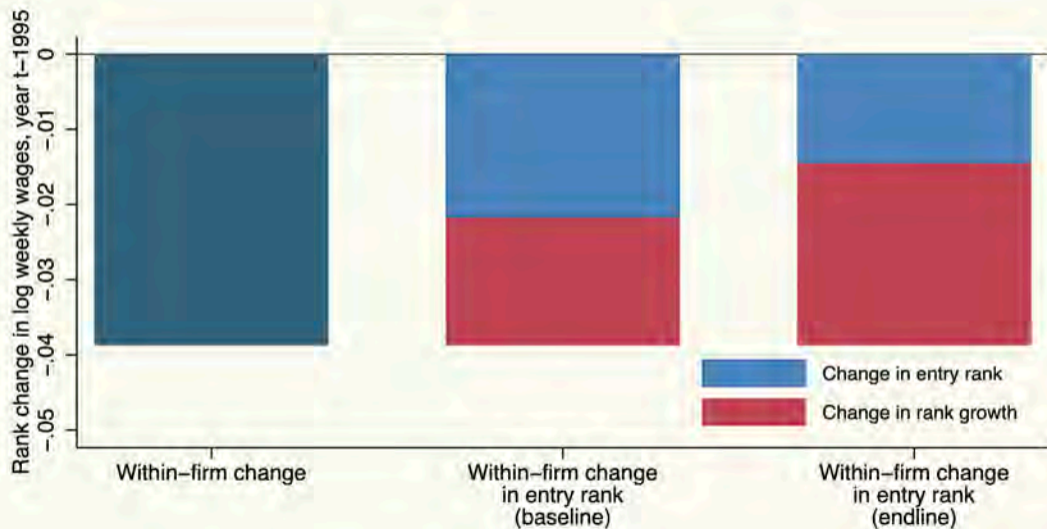
U35 Lose Rank Within Any Level of Firm Pay, O55 Gain
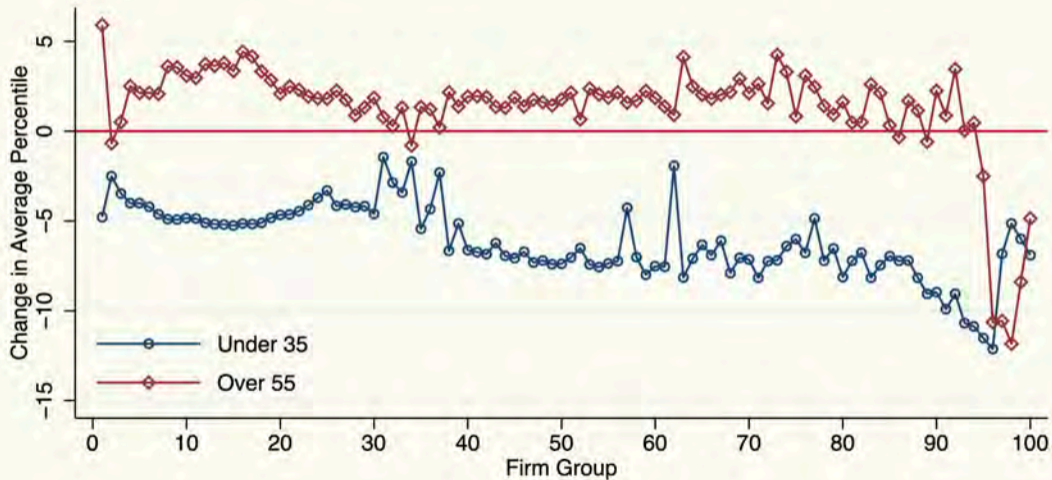
U-35 Move to Apprenticeship, O-55 to Managerial Jobs
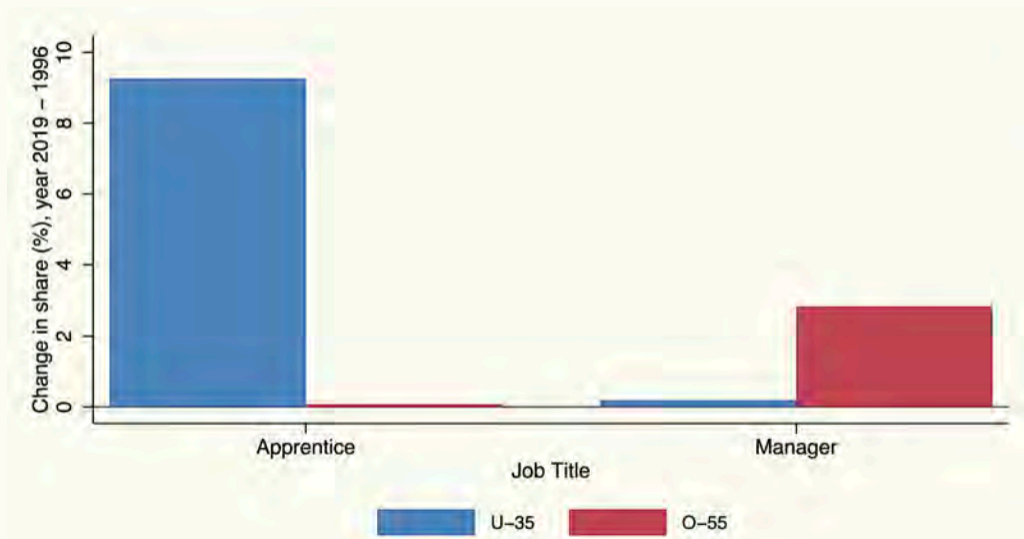
U35 Find it Harder to Grow Within Firms

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- ▶ What about between firm dynamics?

U35 Crowded Out of High-Paying Firms, O55 Concentrate In Those
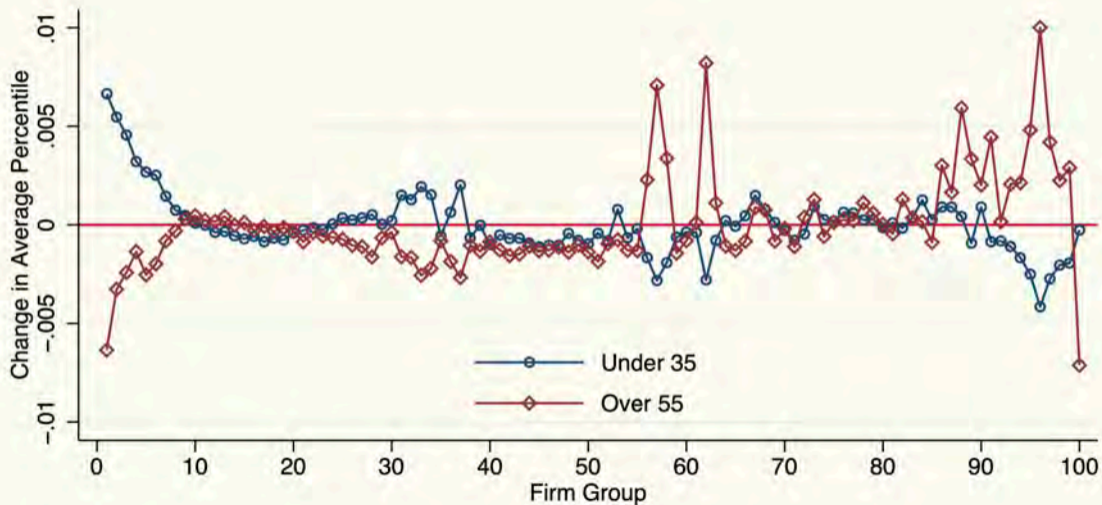
Firm Aging Has Favored Permanence of O55 in High-Paying Firms
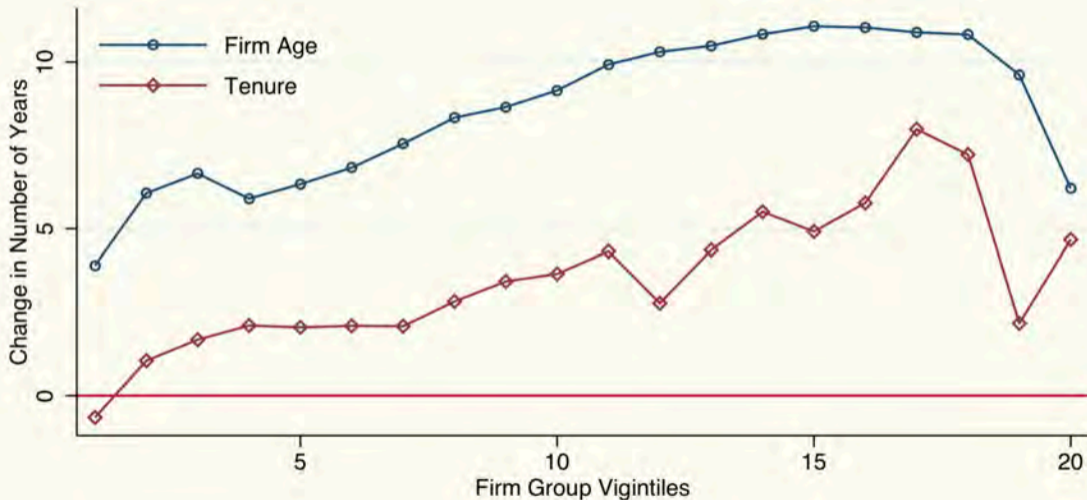
U35 Seem to Have Been Crowded Out of High-Paying Firms

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▶ Opportunities in top firms are taken, U35 forced to move towards the bottom
  - consistent with career spillovers playing out labor-maket-wise

Firm Heterogeneity

Larger Effects Within Older, Larger, Slow-Growing Firms
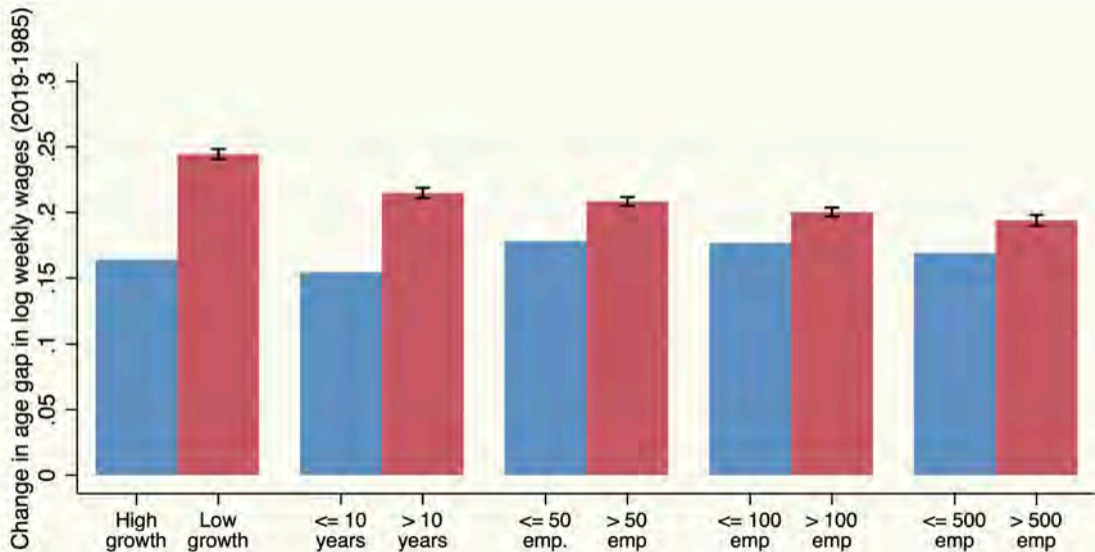
Takeaways From Firm Heterogeneities

▶ Career spillovers are compatible with firm heterogeneities

- Key: some firms need to face constraints in adding higher-ranked jobs
- These firms are more likely to be in mature stage of their life cycle
- Consistent with prior empirical and theoretical findings (Bennett & Levinthal (2017); Bianchi et al. (2022)
- These firms are becoming more common ▸ Firm Age + Lower GDP growth in most high-income countries ▸ GDP

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▶ **Introduction of temporary contracts, duality of labor market**
  - gap increases just the same if focus on U35 with permanent contracts

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▶ These results point to the importance of negative career spillovers

THANK YOU

Appendix

ITA: Increase of Age Wage Gap at Mean and Median
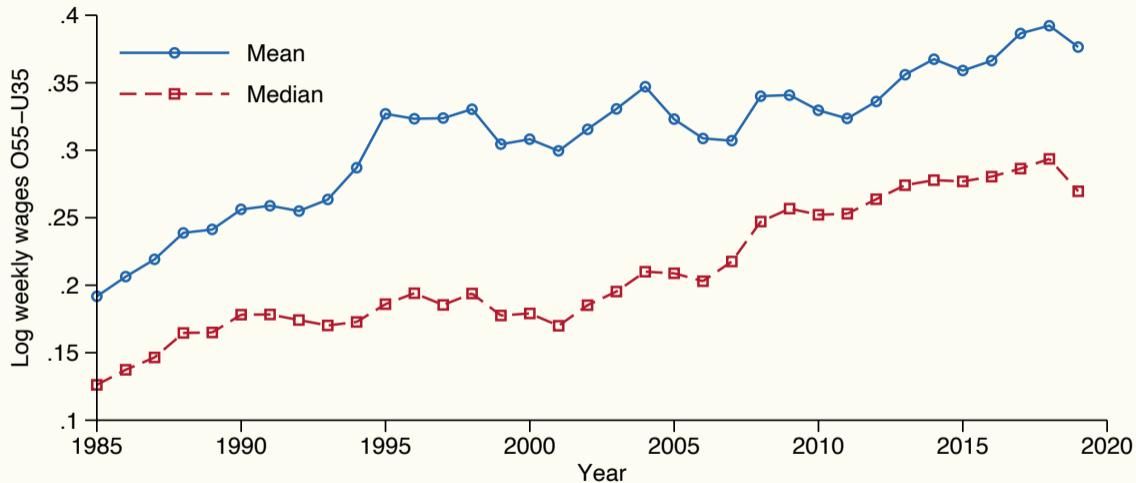
Steeper Wage Curve Over Life Cycle
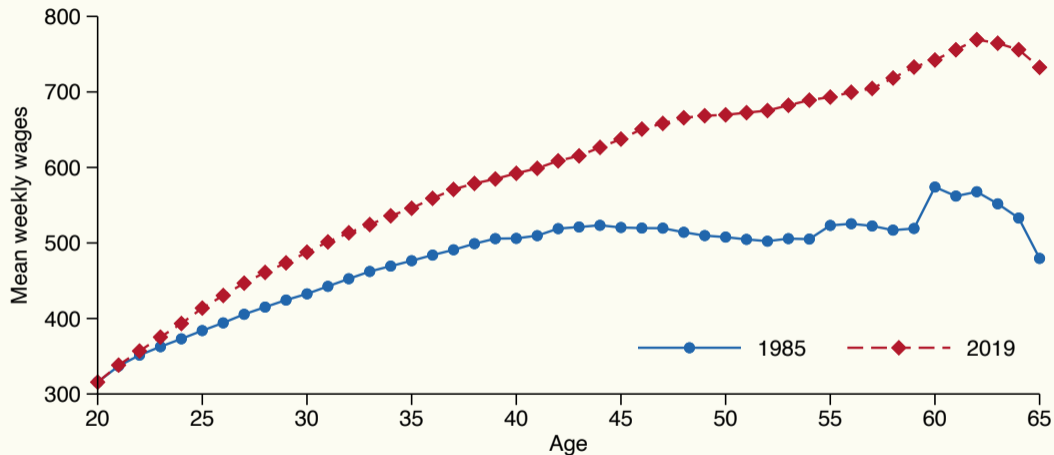
Rank Gap with Yearly Labor Earnings

▸ Back
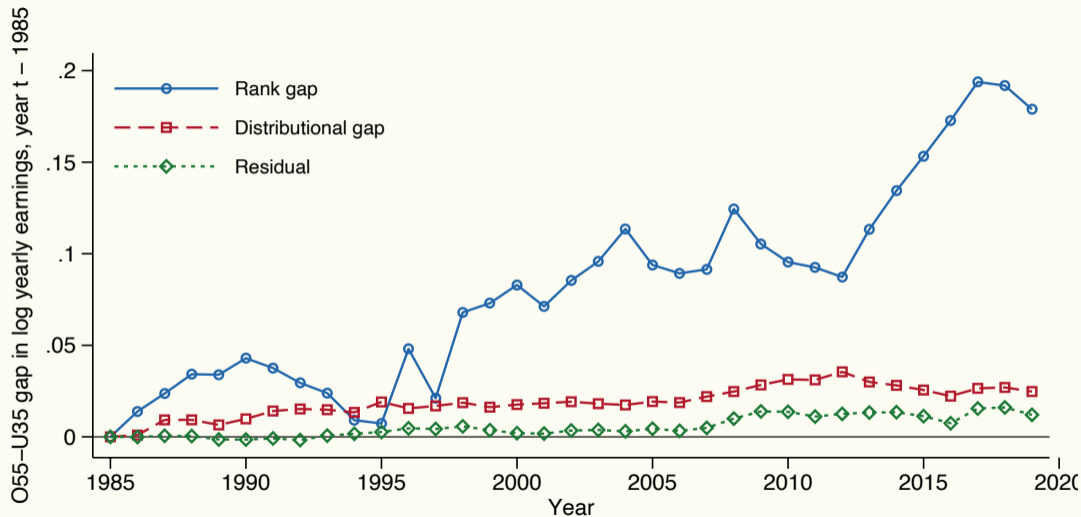
Rank Gap in Germany - Daily Wages
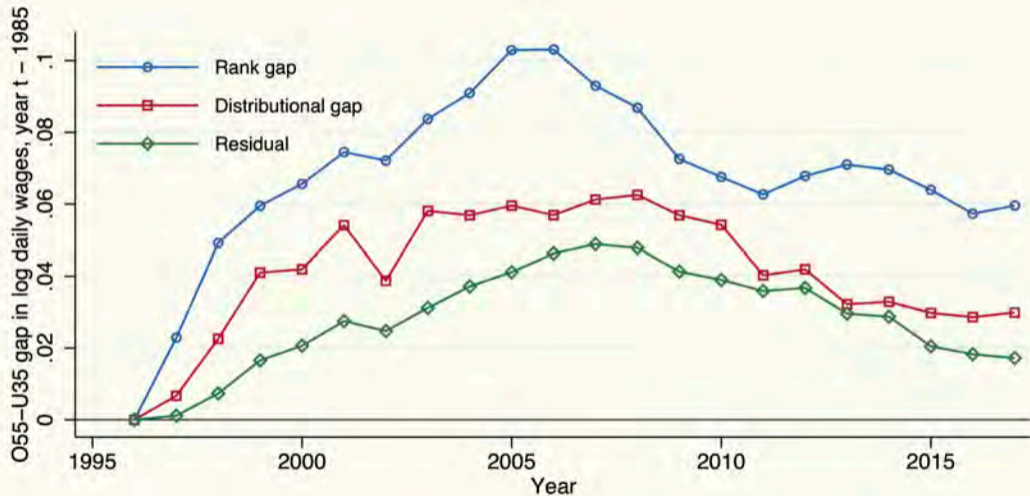
U35 Workers From Top to Bottom Quartile
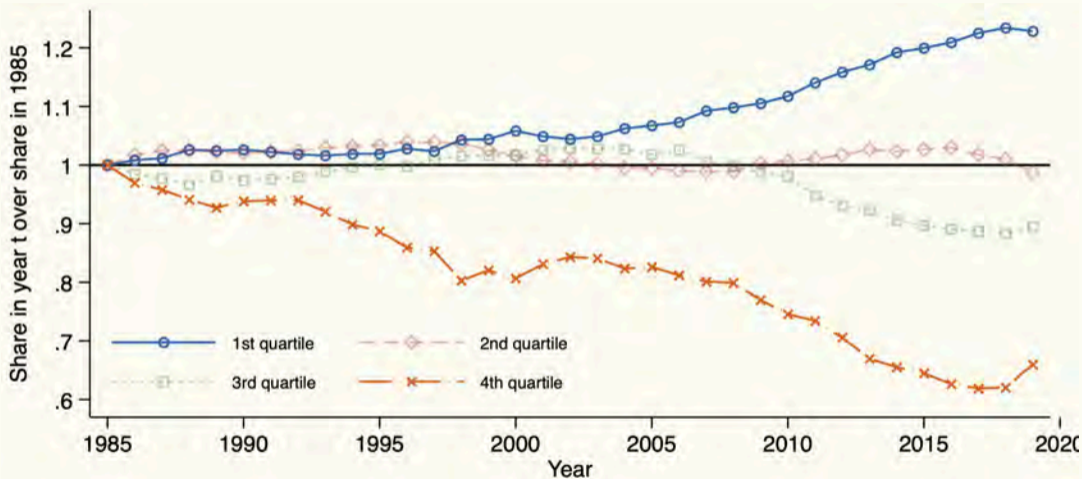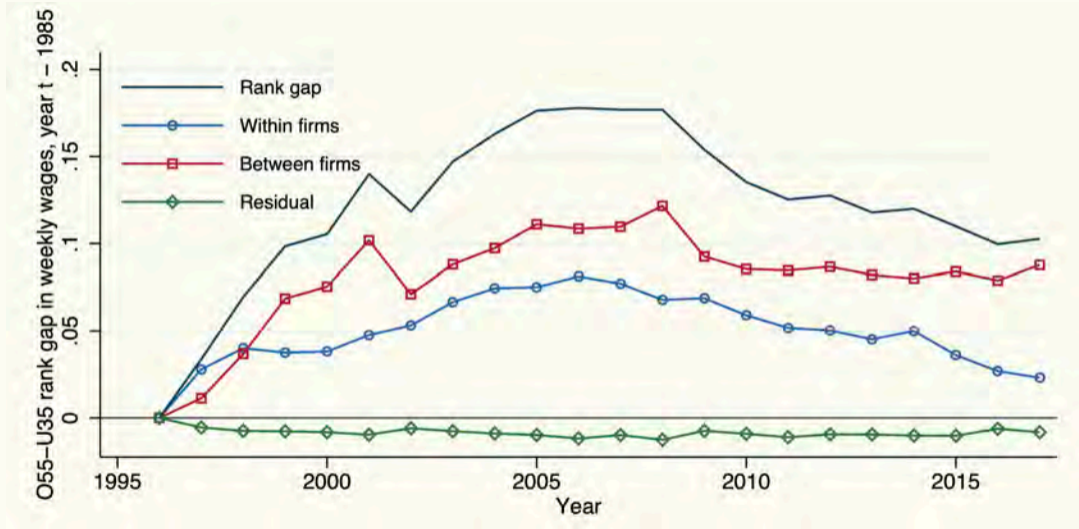
Vigintiles for U35 Workers
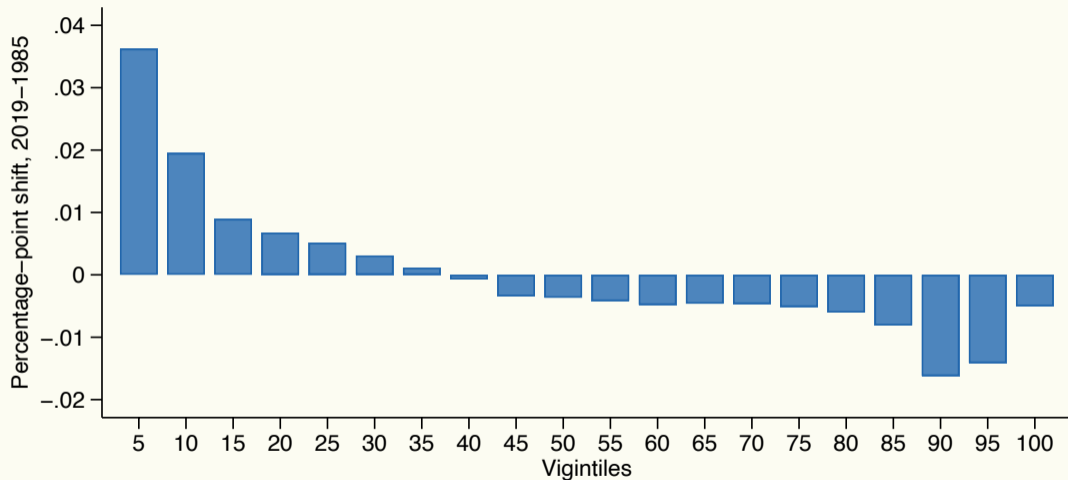
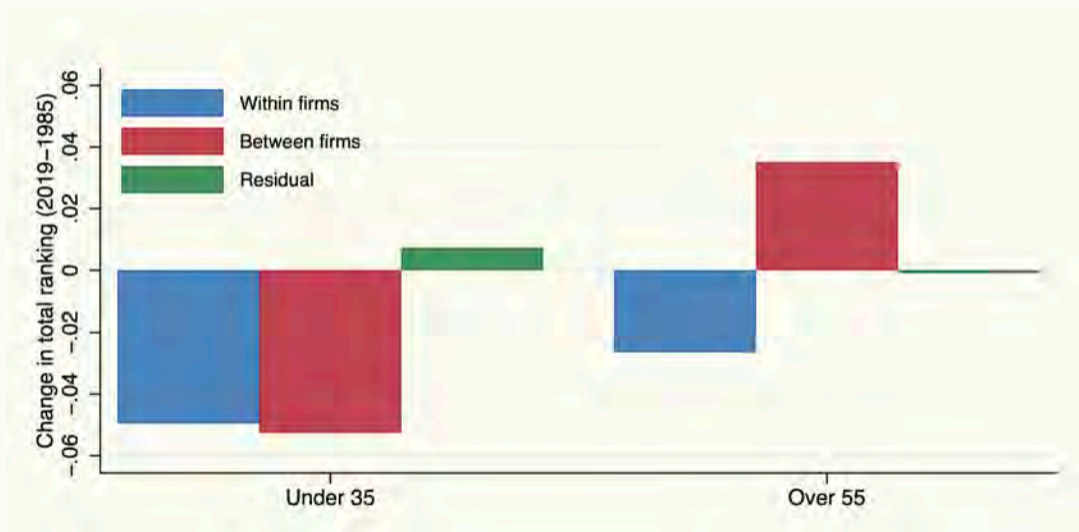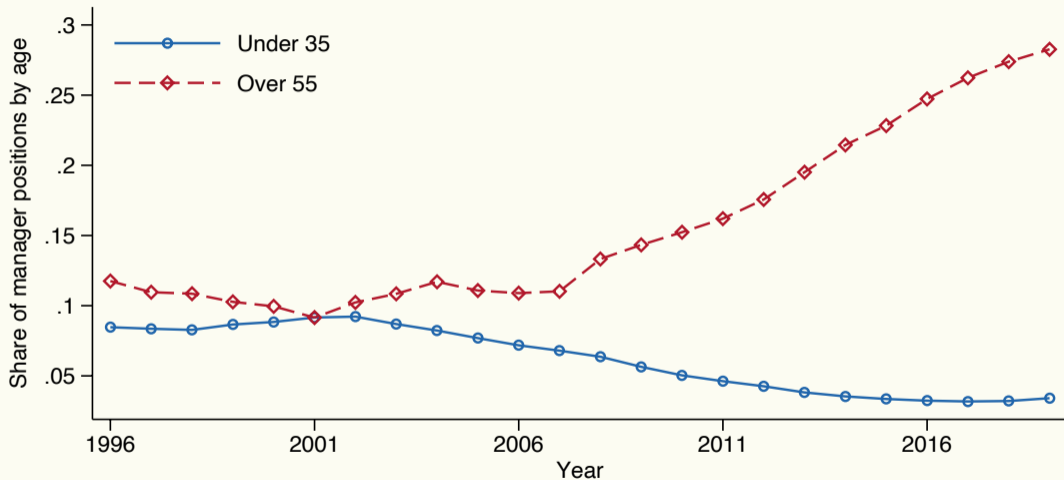# O55 Workers From Bottom to Top Quartile
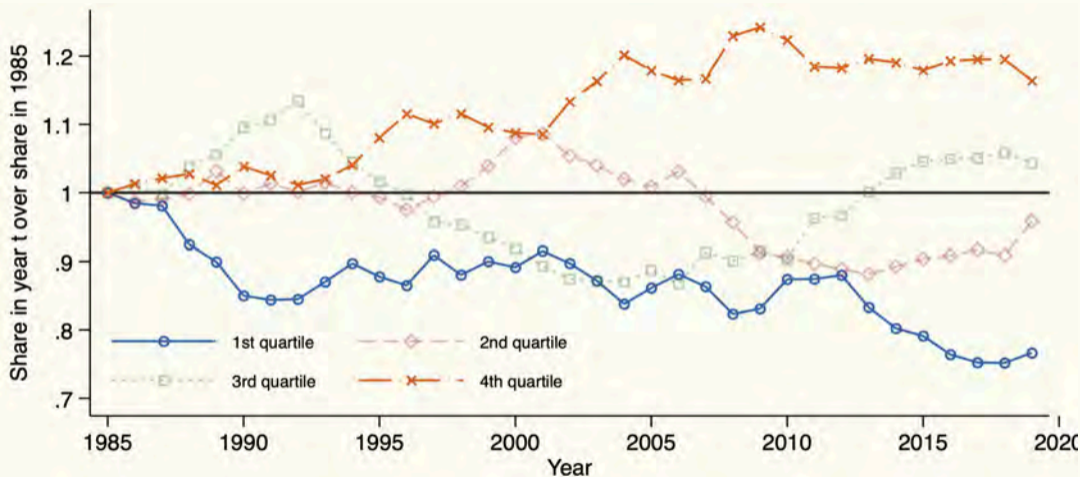
Vigintiles for O55 Workers
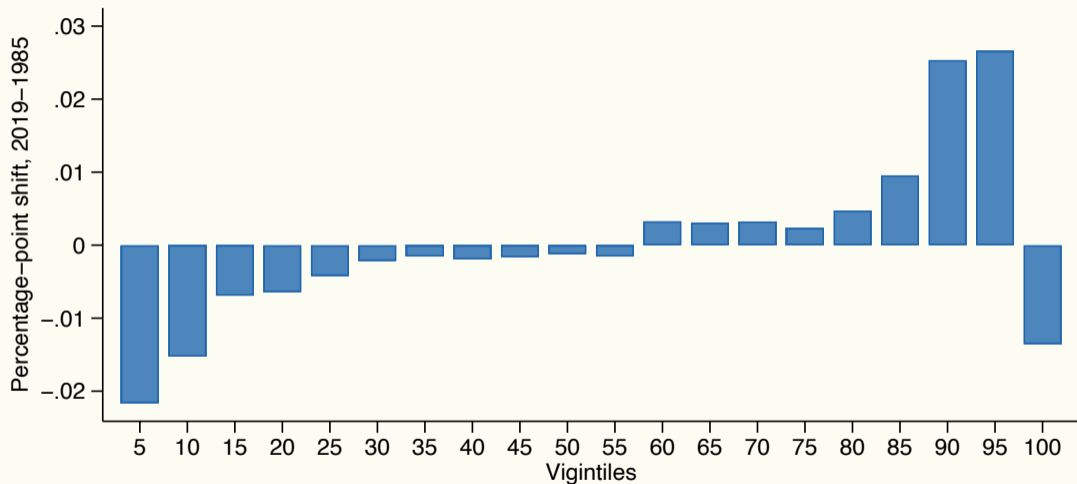
Between Vs. Within Firms in Germany
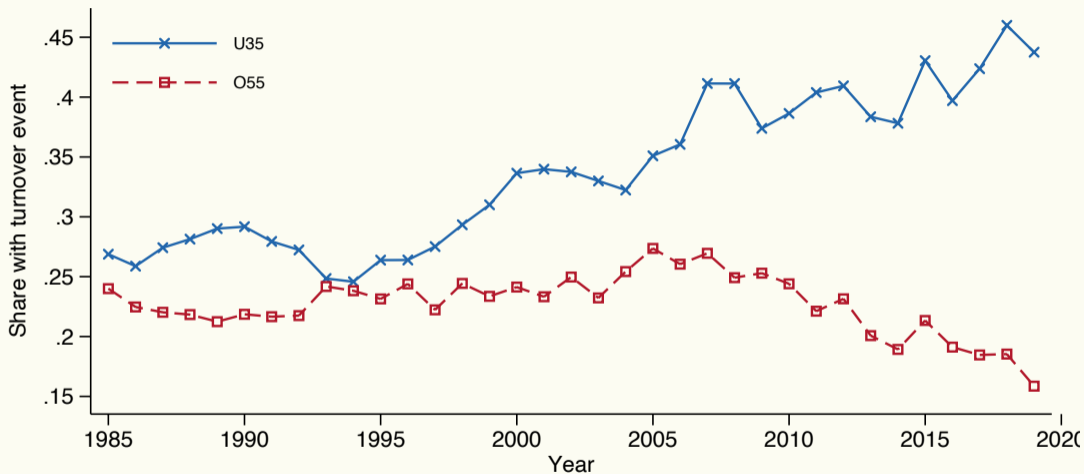
Between Vs. Within Firms in Germany - By Age Group

Shares of Managerial Positions

Shares in Age Group with Managerial Job
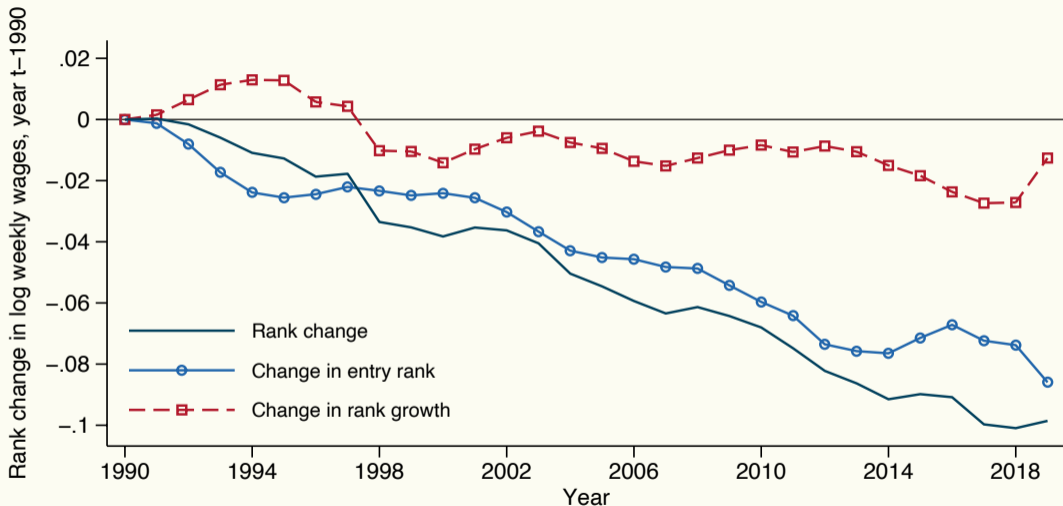

Share of age cohort in manager position (y-axis) vs. Year (x-axis). Lines: Under 35, Over 55.
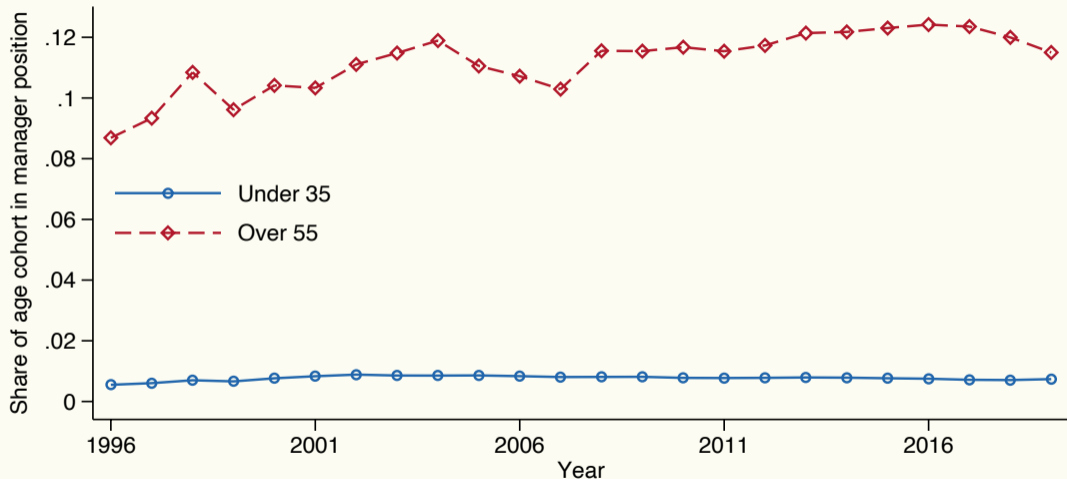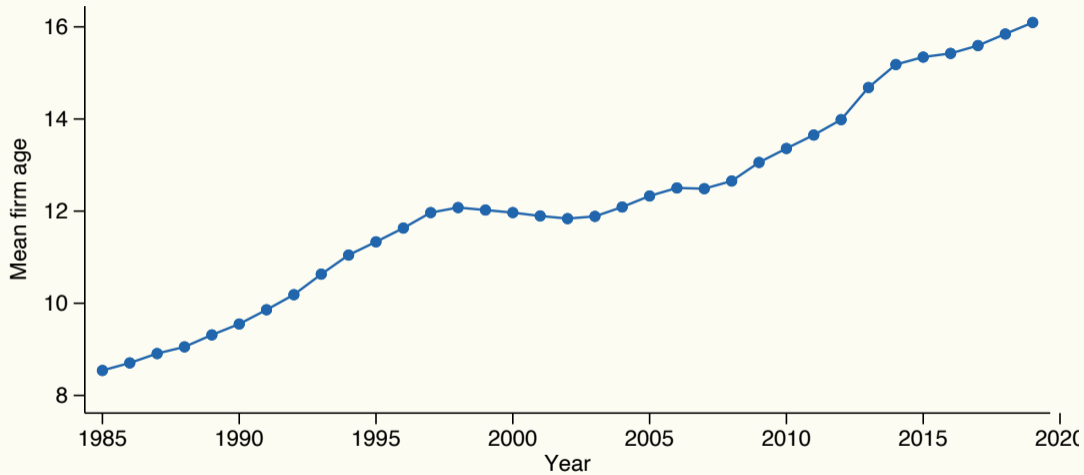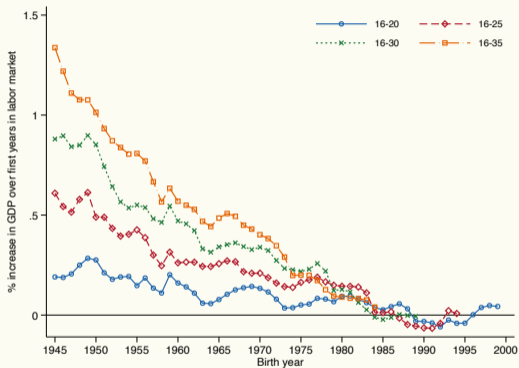
Shares with Turnover Events

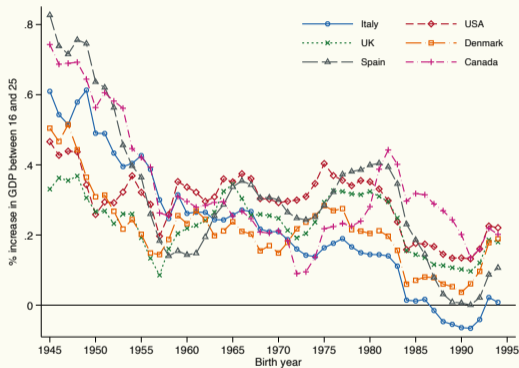# U30 Loss Mostly Comes from Worse Rank at Entry

Mean Firm Age

Back

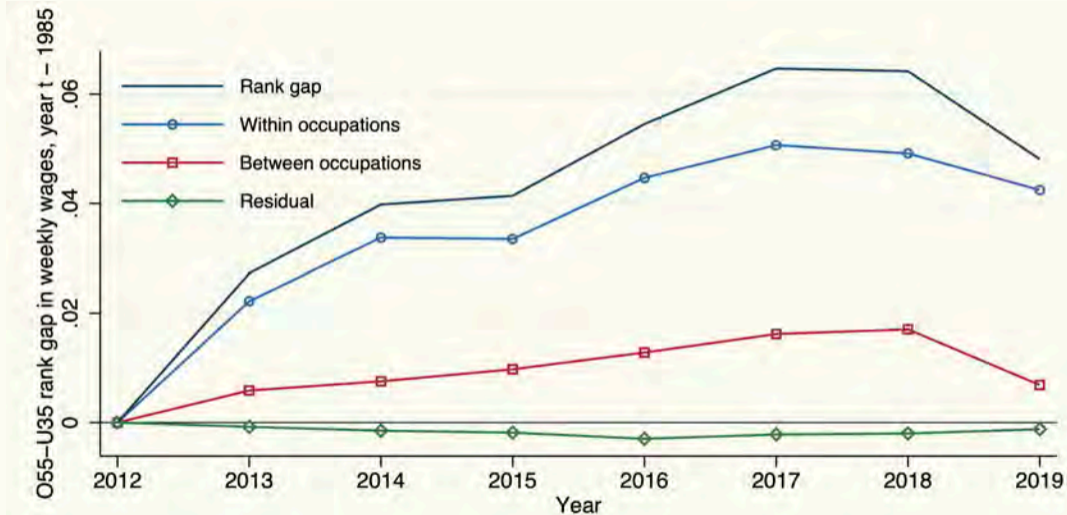# Decreasing GDP Growth In Most High-Income Countries

Several cohorts in Italy

16-25 across countries

Within-Occupation Component Accounts Most of Rank-Gap Increase

Numerical Framework - Mincerian Equation

► Consider a simple but general wage equation:

$$w_{i,a}^t = \beta_0 + \beta_1^t x_{i,a}^t$$

- $w_{i,a}^t$ = wage of worker i of age group a in period t
- $x_{i,a}^t$ = quantity of wage-enhancing factor possessed by worker i in period t
- β_1^t = unitary price of factor x in period t
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▶ Age wage gap can increase because

- Price of factor x increases
- Gap in quantity of x between older and younger workers increases

▶ Back

Simulate Changes in Price

▶ Baseline scenario (matches data moments in Italian admin data):

- $x_Y^t \sim N(4.6, 0.25)$ and $x_O^t \sim N(4.7, 0.49)$
- $\beta_1^t = 1, \beta_0 = 1$
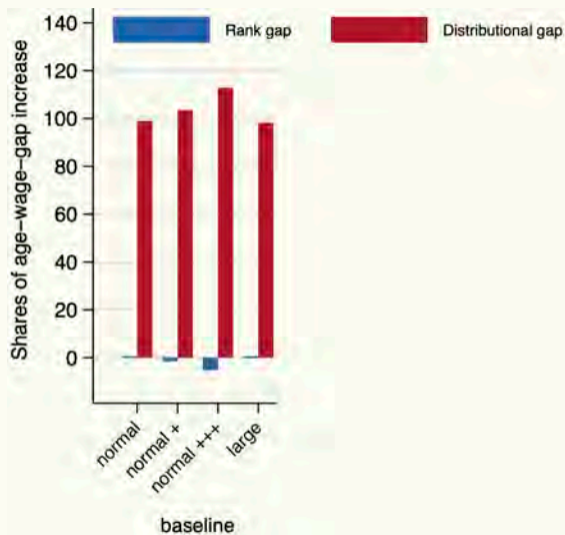- Share older workers $(s_O^t) = 0.08$

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▶ 4 simulated changes in price

- "Normal" price hike: $\beta_1^{t'} = 2$
- "Normal" price hike & more older workers: $\beta_1^{t'} = 2, s_0^{t'} = 0.2$
- "Normal" price hike & way more older workers: $\beta_1^{t'} = 2, s_0^{t'} = 0.35$
- "Large" price hike: $\beta_1^{t'} = 4$

Price Hikes Act Through Distributional Gap

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Simulate Changes in Quantities

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- $x_Y^t \sim N(4.6, 0.25)$ and $x_O^t \sim N(4.7, 0.49)$
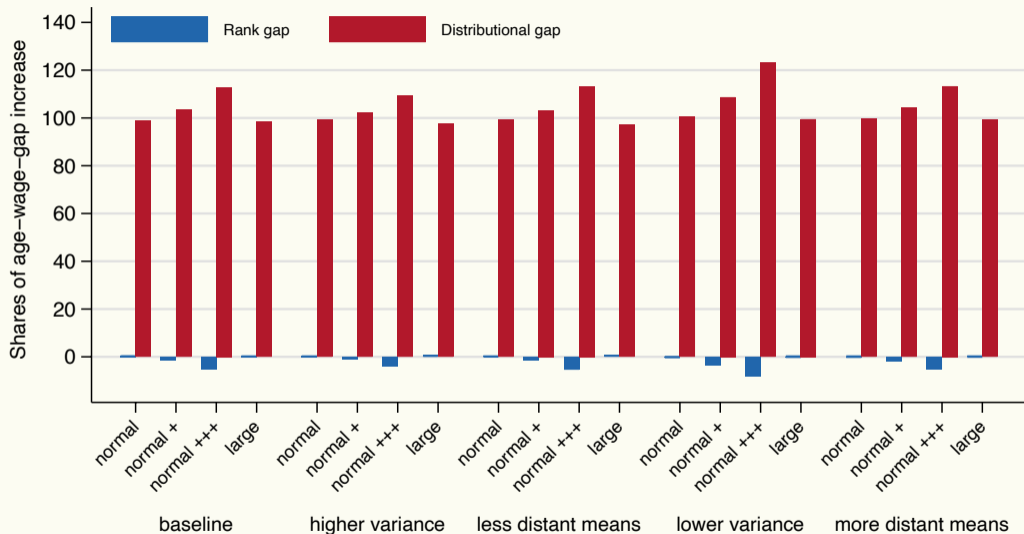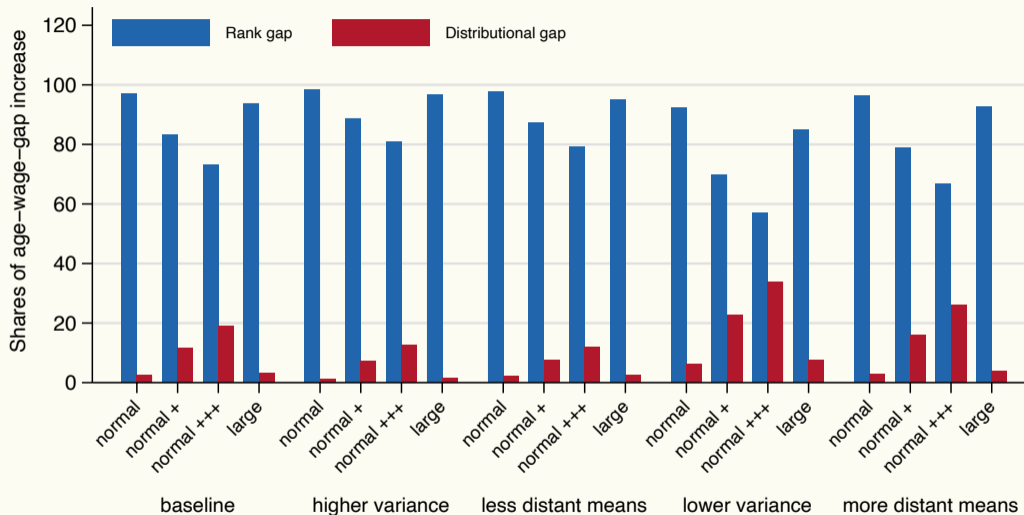- $\beta_1^t = 1, \beta_0 = 1$
- Share older workers $(s_O^t) = 0.08$

▶ 4 simulated changes in distribution of x

- "Normal" distribution change: $\mathbb{E}\left[x_O^{t'}\right] = 4.8$
- "Normal" distribution change & more older workers: $\mathbb{E}\left[x_O^{t'}\right] = 4.8, s_O^{t'} = 0.2$
- "Normal" distribution change & way more older workers: $\mathbb{E}\left[x_O^{t'}\right] = 4.8, s_O^{t'} = 0.35$
- "Large" distribution change: $\mathbb{E}\left[x_O^{t'}\right] = 5$

▶ Back

Quantity Changes Act Mostly Through Rank Gap

Intuition About Results of Numerical Framework

▶ Price increase when baseline difference in xs
  - increases dispersion of young and old distribution
  - spreads out the overall earnings distribution
  - captured by distributional component

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- more overlap at baseline: more older workers overcome young
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► Similar logic in Bayer and Charles (2018) for black-white gap
  - positional: reduced discrimination, better access to schools
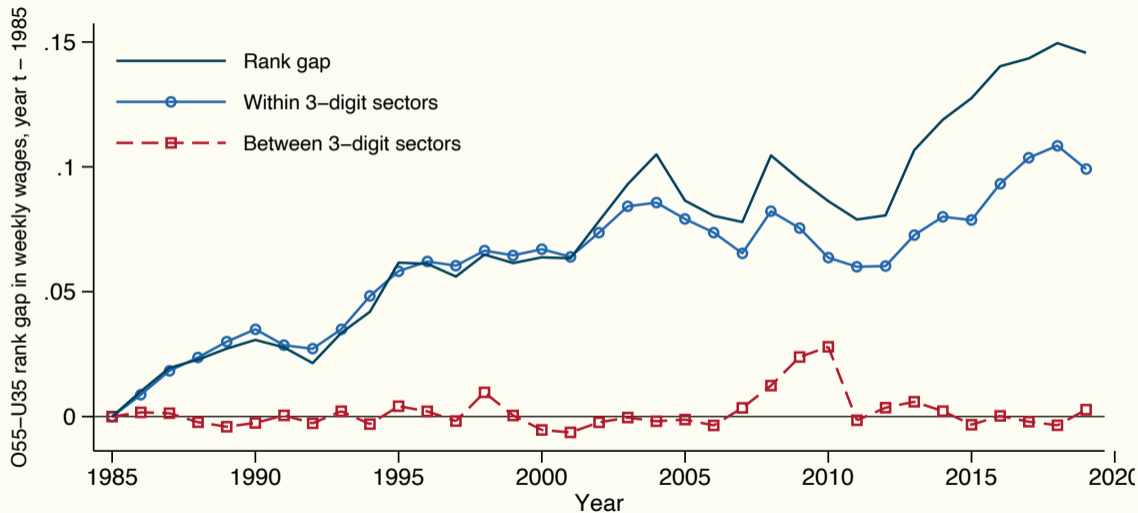 - distributional: changes in returns to education, skills

► Back

Takeaways From Numerical Framework

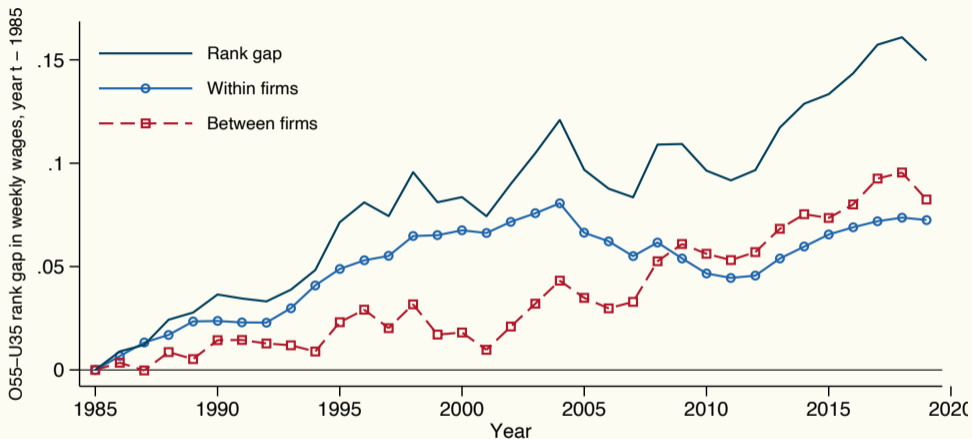Increases in price of wage-enhancing factors incompatible with increased rank gap:

- **Increase in returns to experience** (Jones (2009); Azoulay et al. (2020); Jeong et al. (2015))

- **Skill-biased technological change** (Acemoglu & Autor (2011); Autor et al. (2006))

▸ Back

Within-Sector Component Accounts for 90% of Rank-Gap Increase

y-axis: O55–U35 rank gap in weekly wages, year t – 1985
x-axis: Year

Legend:
- Rank gap
- Within 3–digit sectors
- Between 3–digit sectors

# Between Vs. Within Firms: No High-Outsourcing Sectors

Notes: Sample does not include all sectors identified by Goldschmidt and Schmieder (2017) as primary receivers of most domestically outsourced jobs: 49.2, 49.4, 50.2, 50.4, 51.2, 52.1, 52.2, 56.2, 78.1, 78.2, 78.3, 80.1, 80.2, 80.3, 81.1, 81.2, 82.1, 82.2, 82.9 (NACE Rev. 2). ▸ Back

Changing Composition of U-35 and O55 Workforce

▶ Trends in other characteristics of young and old can be confounders

▶ We might be referring to age the byproduct of something else

▶ Some contemporaneous changes in demographics
- increased share migrants in U35
- increased share temporary contracts in U35
- increased share of females in U35
- increased education for both age groups
- health improvements for older workers over time
- longer working lives for O-55

▶ Back

Age Wage Gap After Controlling for Demographic and Labor Variables
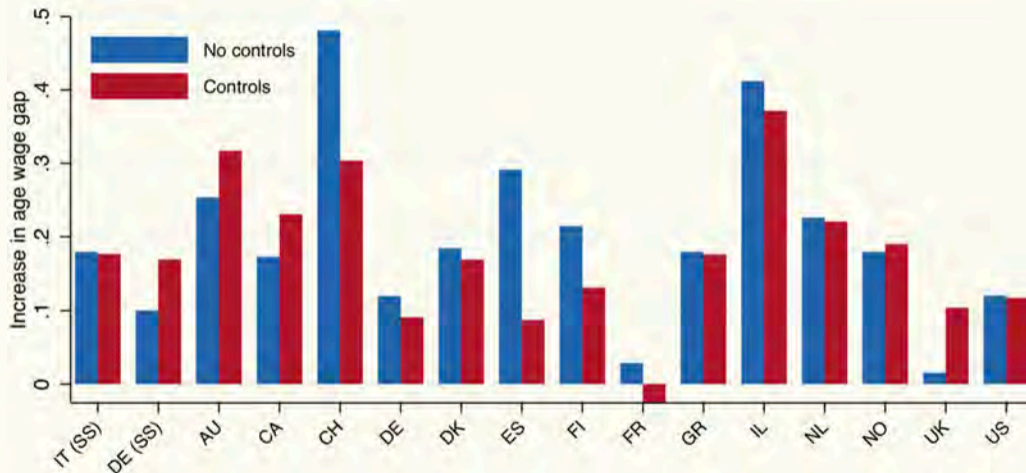
Notes: Age wage gap with controls uses residuals from year-specific regressions of log wages on gender, nationality (race in US), temp. contracts, education, disability status. ▶ Back

O55 Workers = 56-60 Years Old Men

Increase in age wage gap, by country:

Legend:
- O55 vs. U35 (blue)
- 56–60 vs. U35 (red)

Countries (x-axis): IT (SS), DE (SS), AU, CA, CH, DE, DK, ES, FI, FR, GR, IL, NL, NO, UK, US

▸ Back