Complex-Skill Biased Technical Change and Labor Market Polarization

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Labor Market Polarization

• Polarization of US labor market
  ○ well documented: employment, wages
  ○ potential explanations: computerization, labor force composition (education, gender), international trade, SBTC
    ○ Katz and Murphy (1992), Autor, Levy, Murnane (2003), Autor and Dorn (2013), Acemoglu and Autor (2011), many more

• This paper: wages and (some) employment
  ○ introduce own taxonomy of occupations by complexity of tasks
  ○ descriptive characterization of patterns by occupation type

• My plan
  ○ main exercise: motivation and results
  ○ interpretation: mechanism
The Exercise

- Use German ‘qualification and working conditions in Germany’ data
  - classify occupations into different complexity bins
  - map US occupations into those bins
  - document relation of wage and complexity
  - compare to Autor and Dorn (2013) routine task-intensity index
Questions

1. Why German data?
   - O*NET data contains detail task content of occupations
   - example: abilities: fluency of ideas.
     
     *The ability to come up with a number of ideas about a topic (the number of ideas is important, not their quality, correctness, or creativity).*

     truck drivers: 31 weight 30 importance
     aerospace engineers: 63 weight 57 importance
1. Why German data?

- O*NET data contains detail task content of occupations

  - example: skills: operation and control.
    
    *Controlling operations of equipment or systems.*

  - truck drivers: 53 weight 43 importance
  - aerospace engineers: 6 weight 0 importance
Questions

1. Why German data?
   - O*NET data contains detail task content of occupations
   - example: abilities: manual dexterity.
     *The ability to quickly move your hand, your hand together with your arm, or your two hands to grasp, manipulate, or assemble objects.*
     truck drivers: 72 weight 50 importance
     aerospace engineers: 0 weight 0 importance
Questions

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- example: abilities: manual dexterity.

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- truck drivers: 72 weight 50 importance
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- it is occupation level, but analysis on occupation level anyway

- are German occupations and workers similar enough to the US counterparts
- is the apprenticeship information worth it?
Questions

1. Why German data?

2. Why this comparison (A-D RTI index)?
   - 4 classes: routine vs. non-routine, manual vs. information processing
   - example
     - truck driver: non-routine manual
     - jobs involving forming/testing hypotheses: non-routine information processing
Questions

1. Why German data?

2. Why this comparison (A-D RTI index)?
   - 4 classes: routine vs. non-routine, manual vs. information processing
   - example
     - truck driver: non-routine manual
     - jobs involving forming/testing hypotheses: non-routine information processing
   - seems like a more relevant alternative
   - paper actually uses almost identical classification
     - routine, manual non-routine, cognitive routine, cognitive non-routine, interactive
Questions

1. Why German data?

2. Why this comparison (AD routinization index)?

3. Are we selecting on worker characteristics?
   - growth in labor payment shares in college and female intensive jobs
   - are we selecting occupations with growing importance of education, interpersonal interactions
   - selection on job composition changes must be a concern

• Bins in paper
  - simple, complex, advanced/managerial, college
  - are we capturing college, age and gender?
Wage Regressions

- Occupation-specific change in mean wages on complexity bins FE, wages in 1980

\[ \Delta W_o = \sum_{c=1,2,3,4} \beta_{c,o} I_{c,o} + \gamma w_{o,1980} + \nu_o \]
Wage Regressions

- Occupation-specific change in mean wages on complexity bins FE, wages in 1980

\[ \Delta W_o = \sum_{c=1,2,3,4} \beta_{c,o} I_{c,o} + \gamma w_{o,1980} + \nu_o \]

- Selection and composition: consider labor group \( L = (\text{gender, education, age}) \)

- Then: \( \Delta w_{o,L} = I_L + \sum_{c=1,2,3,4} \beta_{c,o} I_{c,o} + \gamma w_{o,1980} + \varepsilon_o \)
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• Suppose weights of \( L \) in occupation \( \pi_{o,L} \)

Aggregated LHS: \[ \sum_L \pi_{o,L} \Delta w_{o,L} = \Delta W_o \]

Aggregated RHS: \[ \sum_L \pi_{o,L} I_L + \sum_{c=1,2,3,4} \beta_{c,o} I_{c,o} + \gamma w_{o,1980} + \varepsilon_o \]
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• Ignoring labor group fixed effects on wage growth

\[ \Delta W_o = \sum_{c=1,2,3,4} \beta_{c,o} I_{c,o} + \gamma w_{o,1980} + \eta_o \]

\[ \eta_o = \varepsilon_o + \sum_L \pi_{o,L} I_L \]
Wage Regressions

- Occupation-specific change in mean wages on complexity bins FE, wages in 1980

$$\Delta W_o = \sum_{c=1,2,3,4} \beta_{c,o} I_{c,o} + \gamma w_{o,1980} + \nu_o$$

- Selection and composition: consider labor group
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$$\eta_o = \varepsilon_o + \sum_L \pi_{o,L} I_L$$

- Need $I_{c,o}$ to be independent of $\sum_L \pi_{o,L} I_L$

  example: ‘complex’ occupations are female and education intensive
Wage Regressions

• Solution, run Mincerian regression first
  \[ \Delta w_{o,L} = I_L + I_o + \varepsilon_o \]
  use residuals or \( I_o \) in second stage

• Acemoglu and Autor (2011):
  \[ \Delta w_{o,L} = I_L + \sum_{c=1,2,3,4} \beta_{c,o} I_{c,o} + \varepsilon_o \]

• Does the result survive controlling for these characteristics?

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<th>Independent Variable</th>
<th>(i)</th>
<th>(ii)</th>
<th>(iii)</th>
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<tr>
<td>Education group 2</td>
<td>0.0742***</td>
<td>0.102***</td>
<td>0.0956***</td>
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<td>(3.01)</td>
<td>(4.08)</td>
<td>(3.83)</td>
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<td>Education group 3</td>
<td>0.287***</td>
<td>0.303***</td>
<td>0.296***</td>
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<td>(8.58)</td>
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<td>Island 2</td>
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<td>0.0466**</td>
<td>0.0547***</td>
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<td></td>
<td>(3.31)</td>
<td>(2.51)</td>
<td>(2.94)</td>
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<td>Island 3</td>
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<td>Island 4</td>
<td>0.0397</td>
<td>-0.00267</td>
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<tr>
<td></td>
<td>(1.11)</td>
<td>(-0.07)</td>
<td>(-0.13)</td>
</tr>
</tbody>
</table>

• What if we control for age and gender, too?
Interpretation

• Suppose we estimate

\[ \Delta w_{o,L} = I_L + \sum_c \beta_{c,o} x_{c,o} + \varepsilon_o \]

• Changes are functions of the *equilibrium response* of the economy
  
  ○ descriptive, need model to take stand of role of shocks
  
  ○ then can evaluate potential policies
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• Microfoundation in Burstein, Morales, Vogel (2015)
  ○ decompose role of shocks for employment:
    labor composition, equipment prod. occupational shifter, labor prod.
  ○ extension to wages
Conclusion

- Wage inequality from the perspective of occupation complexity
  - not clear how much due to occupation characteristics
  - are we just renaming college and gender premium?
- What about employment
  - results much weaker
    - hard to put in framework of relative supply-demand of different labor groups
- Still some way to go before we can draw conclusions and address any policy responses