Technology, Trade and Structural Change

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Structural changes and job polarization

- Advanced economies have undergone rapid structural change across sectors over the last decades.
  - Share of French employment in services: 55% in the 1980s, 75% in the 2010s.

  ➔ Manifested in terms of industry, occupational composition, and in terms of the wage distribution.

  ➔ Can lead to *Job Polarization*.

  - Decline in employment share in middle-wage jobs, growth in both high and low-wage jobs.
  - Solidly documented in UK, US, continental Europe (Goos-Manning ’07; Autor et al. 08, Autor & Dorn ’13; Goos et al. ’14).
Main drivers of polarization

- Technology: “Routinization hypothesis"
  - Diffusion of information and communication technology (ICT) lowers demand for routine occupation employment.
  - ICT complements non-routine cognitive occupation employment.
  - Occupations at the bottom of the wage distribution are less affected by ICT in a direct manner.

→ One of the most important forces shaping the workforce (e.g., Autor et al. ’15; Goos et al. ’14, Michaels et al. ’14),
Main drivers of polarization

- Globalization
  - Offshoring: domestic labor is replaced by labor abroad (e.g., Feenstra and Hanson '96, Grossman and Rossi-Hansberg ’08, Rodriguez-Clare ’10, Blinder and Krueger ’13).
  - Exporting may contribute to job polarization by increasing demand for high-skill workers.
Globalization and technological changes

Renault (-Nissan)
France (1960s)  India (2010s)
Boulogne-Billancourt  Chenaï

⇒ Analyze the causes of changes in the structure of employment through the lens of the firm.
Most economic activities are organized by firms. Changes in the composition and internal organization of firms are important factors that drive structural change in the economy.

Firms make decisions on labor demand. Employment, occupational composition and the distribution of wages.

Industry level analysis masks substantial variation across firms. Exports, imports and foreign direct investments activities vary by firms and across industries.
Identifying the impacts of globalization and technology

- Berman-Bound-Griliches (1994): within-industry changes explains 70% of the increase in relative demand for nonproduction workers in U.S.
  - Globalization cannot account for much of this change.

- Bernard and Jensen (1997): using Berman et al.’s underlying firm-level data → Variation in firm sizes explains 60% of the increase, and that this is driven primarily by firms that trade.
  - Effect mostly driven by firms that trade.

- I analyze the impacts of globalization and technological changes in a series of research papers with James Harrigan, Ariell Reshef and other colleagues

- Clear pattern, consistent with routinization hypothesis.
- Drivers (64) not replaceable by computers (yet).

- Importance of techies, drop of mid-level professionals.
- Within blue collar skill upgrading (62 vs. 67).

- The change in the share of hours in occupation $o$ in the economy $S_{ot}$ can be decomposed into:
  1. Changes in the size of firms $\lambda_{ft}$ with different $s_{fot}$ ("between" changes).
  2. Changes in $s_{fot}$ within firms.

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\Delta S_o = \sum_f \Delta \lambda_f \bar{s}_{fo} + \sum_f \bar{\lambda}_f \Delta s_{fo}
$$

- **Between (composition/competitiveness):** Large when firm growth occurs in $o$-intensive firms.
- **Within (substitution):** Large when $o$-intensity increases in large firms.
• Substitution within broad PCS fits routinization hypothesis
• **Between** dominates for many important PCS.
3”. Changes in hours share 1994-2007: All firms
Within-between industries decomposition of occupational change

- Large within industry effects.
  ‣ Change in occupational shares occurs between firms within industries.
Main drivers of occupational changes

• Trade at firm-level: Exports and Imports.

• Technology at firm-level: Techies.
  • Techies develop, install, maintain ICT & other technology.
  • ITC share of techies is about 50% in non-manuf and about 25% in manuf. R&D share of techies is about 3% in non-manuf and about 18% in manuf.
  • Crucial link between economy-wide technological progress and firm level technology adoption (Tambe & Hitt, ’14; Brynjolfsson & Hitt, ’03).
Exposure to trade
Occupational share of trade relative to occupational share of hours
Structural shifts through the firm lens
Occupational changes in France
Drivers of occupational changes
Concluding remarks

Exposure to techies
Share of hours worked exposed to techies related to economy-wide exposure
Impact of techies and trade on firm-level employment growth

Competitiveness effect

- **Techies** caused faster growth...
  
  … Both in manufacturing and non-manufacturing.

- No China effect.
- **Exporting** has no effect.
- **Importing** has no overall effect.
- Imports of intermediates or from poor countries reduce growth in manufacturing firms.
  - Consistent with offshoring of replacing labor.
Magnitude of the competitiveness effect

- Compare firms at the 50\textsuperscript{th} and zero percentile of the techie share of hours, the former experiences
  - 23% faster employment growth in manufacturing.
  - 11% faster employment growth in non-manufacturing.

- Comparing firms in manufacturing at the 50\textsuperscript{th} and zero percentile of trade in intermediate inputs: the former experiences
  - 20% slower employment growth relative to the latter.
Within-firm (substitution) effects

- **Techies** cause:
  1. Skill upgrading in nonmanufacturing.
  2. Polarization in manufacturing.

- **Importing** cause blue-collar skill upgrading in manufacturing.
  - Consistent with offshoring of least skill-intensive tasks.

- **Exporting** cause:
  - Faster growth in managers consistent with higher nonproduction/production ratio among exporters, found repeatedly.
  - Blue collar skill downgrading not previously estimated.
Similar effects in other European countries?

- Falling ICT prices raise the competitiveness of firms.
  - OECD countries (Graetz & Michaels, ’16), European countries (Goos, Manning, & Salomons, ’14; Gregory, Salomons, & Zierahn, ’16).

- Impacts of offshoring.
  - Import competition with China accounts for about 17% of the aggregate decline in mid-wage employment in Denmark (Keller & Utar, 16).
Similar effects for trade in services?

- Many services are skill-intensive and are performed by highly educated individuals.
  - Service offshoring should exert a downward pressure on skilled labour demand (Crinó, ’09).

- Amiti and Wei (2005): jobs previously insulated from foreign competition may potentially be imported from abroad.

Change in services offshoring and change in share of:

- White-collar workers
- Skilled blue-col.
- Unskilled blue-col.
• Multinational firms account for a large share of domestic employment (24% of total French manufacturing employment).

• Debate over the possible adverse effect of multinational firms on employment (Harrison & McMillan, 2011).
  • Add to the process of deindustrialization in their countries of location by shifting manufacturing jobs to locations with lower wages or lower labor standards.
  • Substitute domestic unskilled labor intensive manufacturing activities by relatively more skilled labor intensive activities.
Analysis at the impact of Japanese MNEs on domestic employment (1980-2000)

• Drop in domestic employment might be due to a host of confounding factors unrelated to overseas investments.

• Identifying the effect is challenging as all firms reduced domestic employment during the sample period.
  • Comparing average differences in employment before and after overseas investments.
  • Account for post-1991: *the lost decade*. 
Average Annual Percentage Change in Parent and Overseas Affiliate Employment (1991-2000)
Analysis at the impact of Japanese MNEs on domestic employment

• Multinational firms have no significant effect on the hollowing out process over 1980-2000.

• Negative impact of Japanese multinationals on their domestic employment in the post-1991 period.
  • Magnitude of the effect is small.
  • Japanese multinationals have reduced their domestic employment by 0.17% per year from 1992 to 2001.
  • Effect is mostly due to vertical fragmentation in East-Asia.
How does the firm-level analysis help?

- Most economic activity is organized by firms.

- Important factors that drive structural change and changes in the wage distribution.
  - Changes in types of firms (Domestic, exporter, importer, MNE).
  - Internal organization (Offshoring, occupational mix).
  - Distribution of firms over time (Size and competitiveness effects).

- Allows distinguishing among competing theories about the determinants of structural change and how it affects the distribution of income.

- While the focus is on the demand side mechanisms, supply shifts are also important factors.
Policy implications

- Better assessment of firms that are more likely to affect the overall patterns of employment and wages.
- Targeting these firms may be more effective than blanket policies in mitigating the underlying demand-side driving factors.
- Targeting these firms may keep the costs of labor market regulation low.