Technological unemployment, skills and wages

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Papers, focus Europe, industries

- Pianta, Tech and empl, twelve stylised facts, Indian Jnl Labour Econ, 2018
- Cirillo, Pianta, Nascia, Technology and occupations in cycles, Sustainability, 2018
- Bramucci, Cirillo, Evangelista, Guarascio, Offshoring, employm, skills, SCED 2018
- Cirillo, Technology, Employment and Skills, EINT 2017
- Vivarelli Pianta (eds) The employm impact of tech. change, Routledge 2000
- Franzini-Pianta, Explaining inequality, Routledge 2016
Technology saves labour, technological unempl. is a concern

- In capitalism technology is shaped by social relations and embodied in means of production and in knowledge of workers. Technology aims to replace labour, reduce wage, accumulate capital. Technological unemployment is rooted in the nature of capitalism.

- The long term reduction in working hours per workers has been reversed.
In the digital age work and skills are changing

- We are in the techno-economic paradigm of Information and Communication Technologies: a digital age

- Boundaries change between market and non-market goods, between private and public goods, between work and (unpaid) human activities, between waged employment and other forms of (somehow paid) work

- Cases of Google, Facebook, AirB&B, Uber
Theory: disequilibrium, demand and struct. change

- **Mainstream econ**: equilibrium of product and labour markets; technology is exogenous. New growth theory assume some firms innovate. Technol. unempl. is ‘assumed away’

- **Disequilibrium approaches** more appropriate:
  - Neo-Schumpeterian: technol. paradigms, waves
  - Evolutionary: innovation variety and selection
  - Post-Keynesian: demand and structural change
Effects are at the firm, industry and macroeconomic levels

- At firm level all innovations improve firms’ performance (at the expense of non-innovators)
- At industry level (constrained by demand and trade) technology can create or destroy jobs
- At macroeconomic level indirect effects and compensation mechanisms operate (changes in prices, wages, demand for new goods, etc.)
There is no single technology
Different strategies, differ. effects

- Different technol. strategies exist
- *Technological competitiveness*: new products open up new markets, leading to job creation;
- *Cost (or price) competitiveness*: labour saving new processes lead to job losses
- Innovation surveys on firms show this diversity, beyond the limitations of R&D and patent data as technological indicators.
Industry level. Differences in employment impact of digitalisation

- High-tech/low-tech distinction and Pavitt taxonomy show how technology drives the different evolution of activities and jobs. Is digitalisation different?

- A **first dimension** of digitalisation follows the high tech, knowledge creation, supply capabilities patterns of industries, as in the past.

- A **second dimension** is based on marketing, producer-consumer interaction, e-sales, etc.
Value added, employment, productivity in high/low tech five major EU countries (DE, ES, FR, IT, UK)

Source: Cirillo (2016), OECD STAN data
Employment change in Revised Pavitt classes six major EU countries (DE, ES, FR, IT, NL, UK)
There is no single labour
Different types, which skills?

- Gender, age, ethnicity, etc.
- How we define skills in relation to tech?
  Occupational groups ISCO provide the best picture. Hierarchy, knowledge, competences, wage levels matter
- Skill bias was a simplistic view
- Polarisation is the dominant pattern
- Routine vs non routine is not the main issue
- Precarisation is a major divide within labour
# Four ISCO occupational groups

<table>
<thead>
<tr>
<th>PROFESSIONAL GROUPS</th>
<th>ISCO 1 Digit</th>
<th>ISCED</th>
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<tbody>
<tr>
<td><strong>MANAGERS</strong></td>
<td>Managers, Senior officials and legislators</td>
<td>3 + 4</td>
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<tr>
<td></td>
<td>Professionals</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Technicians and associate professionals</td>
<td>3</td>
</tr>
<tr>
<td><strong>CLERKS</strong></td>
<td>Clerks</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Service and sales workers</td>
<td>2</td>
</tr>
<tr>
<td><strong>CRAFT WORKERS</strong></td>
<td>Skilled agricultural and fishery workers</td>
<td>2</td>
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<tr>
<td></td>
<td>Craft and related trade workers</td>
<td>2</td>
</tr>
<tr>
<td><strong>MANUAL WORKERS</strong></td>
<td>Plant and machine operators and assemblers</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Elementary occupations</td>
<td>1</td>
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</tbody>
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Annual earnings of occupational groups in EU 28 (Euros 2010)
Change of employment by occupations, 2000-2014

Average annual rates of change, manufacturing and services, five major EU countries
Business cycles matter

- Technol. change and job dynamics are cyclical
- Expansions provide space for new products, new markets, new jobs;
- Recessions bring new processes, restructuring and job destruction.
- The nature of the innovation-employment relationship changes in up/downswings
Employment change in North, South, Eastern Europe Upswing and Downswing
Expansions are polarising, mostly in services
Contractions are reducing polarisation mostly in manufacturing due to huge losses of lowest skills.
Explaining change in employment

- Industry level models, manuf, serv, different bus. cycle, 5 major EU countries, SID data

\[ \Delta emp_{it} = \beta_1 \Delta dem_{it} + \beta_2 \Delta export_{it} - \beta_3 \Delta w_{it} + \beta_4 tc_{it} - \beta_5 cc_{it} + \beta_6 \Delta offsh_{it} + \varepsilon_{it} \]

- Total empl: ++ new products, – new processes, – offshoring + demand (value added, int. dem, exports), – wages

- Tests for High-low tech, North-South EU. 
  **Upswings:** general results. **Downswings:** no new products, new processes drive restructuring and job destruction in all professional groups.
Models for each occup. group

- **Managers**: ++ new products, + share of univ. edu
- **Clerks**: + demand, + new products – new processes, – offshoring
- **Craft workers**: – – new processes, – offshoring + new products, - wages
- **Manual workers**: – – new processes, – offshoring

Different determinants of employment change
Innovation in firms and shares of managers in employment
Innovation in firms and shares of manual workers in employment
Technology is an engine of hierarchy and inequality

- Countries change their position
- Record income inequality, 10-15 percentage points of GDP from wages to profits
- Productivity growth is leaving behind wages, extra-profits on new products, wage savings on new processes
- Wage disparities increase, low wage for low skills, precarious workers.
- Policies favoured disparities. Now OECD: “when income inequality rises, growth falls”
Figure 10 Adjusted labour income share in developed G20 countries, 1991–2013

Note: Adjusted wage share, total economy, as a percentage of GDP at current market prices (compensation per employee as a percentage of GDP at market prices per person employed).

Source: European Commission AMECO database. Data accessible at: www.iло.org/gwr-figures
Figure 7  Trends in growth in average wages and labour productivity in developed economies (index), 1999–2013

Note: Wage growth is calculated as a weighted average of year-on-year growth in average monthly real wages in 36 economies (for a description of the methodology, see Appendix I). Index is based to 1999 because of data availability.

Value added and profits in manuf. and services
Germany and Italy indexes 2000=1
Total wage bill in Italy’s manuf. Ind.
Indexes 2000=1
Product innov. and wage growth
Manif. Ind., 4 macrosect. 1995-2014

Change in Wages per empl. 1995-2014

Germany

Italy

SB: science based
SS: machinery
SI: scale intens.
SD: traditional

% firms with product innov.
Profits per empl. and prod.innov, Italy manuf and serv. ind.

SB: science based
SS: machinery
SI: scale intens.
SD: traditional
Inequality within wages, Italy

- INPS database LOSAI (one fifteenth of all Italian workers with a labour contract)
- 1985 to 2014, Italy only
- Pre-tax earnings in real terms (using consumer price index; top earners with more than 250,000 euros are assigned with that income)
- Full time, full year, temporary, perman. workers
Italy, change in real wages, 1985-2014

Gross CPI adjusted earnings

- Top 10%: +27%
- Mean: +7%
- Bottom 25%: -22%
- Bottom 10%: -29%
Italy, change in real wages, 1985-2014

Workers employed full time, full year

Gross CPI adjusted earnings (FTFY workers)

- Top 10%
- Mean
- Bottom 25%
- Bottom 10%

Mean earnings of those in the bottom 10%
Mean earnings of those in the bottom 25%
Mean earnings of those in the top 10%

Italy, share of temporary workers 1998-2014

INPS LOSAI data, representative sample of private sector employees
Bloise, Pianta, Raitano, 2018
Earnings variation by decile in Italy, 1985-2014

% variation of gross real earnings between 1985 and 2014 at each decile

Poor losers
Policies are needed for:

- shaping technological change in the interest of society, limiting its polarisation effects
- reducing its negative employment effects (quantity and quality) with economic, demand, struct. change, institut. policies
- making sure that the gains from innovation and productivity go (also) to labour in the forms of higher wages, lower working hours and improved working conditions