Technology-related investments and employment composition
Evidence from the Italian business sector, 2011-2015

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ISTAT, DIPS/PSS and DIPS/DCSS
Exploring the level of capital-skill complementarity as a preliminary stage of an ISTAT monitoring project on the impact of technology on jobs

Key research questions:

- Has the skill structure of Italian limited companies changed as a result of the post-crisis recovery effort (2011 to 2015)?
- Has the investment dynamics of Italian limited companies affected their skill structure in the 2011-2015 period?
Empirical evidence

- **ISTAT Register of employees in enterprises. Years 2011-2016.**
  It includes information on all the persons employed by Italian businesses on a yearly basis. Data come from administrative sources.

- **Competitiveness Research Network (CompNet) Database (ECB). Years 2011-2015.**
  Systematic collection of balance sheets’ data for analytical purposes as well as for those of the National Accounts.

- **Digitalisation taxonomy based on the ICT survey 2016-17 dataset.**
Definitions and assumptions

- **Investments.** Calculated as the difference between the capital stock (both tangible and intangible) reported by a limited companies in a fiscal year compared to the previous one.

- **Enterprise.** A statistical unit matching a legal entity which is an economic actor required by law to disclose its accounting data.

- **Employee.** A person who has a contract to carry out work for an enterprise and receives a compensation for it.

- **Capital.** Tangible and intangible (non financial) assets.

- **Skills.** Calculated, at employee level, as a combination of occupational status, level of formal education attainment and tenure (period in the enterprise, years).
## The skills’ grid

<table>
<thead>
<tr>
<th>Occupational status</th>
<th>Blue collars</th>
<th>White collars</th>
<th>Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of education</td>
<td>Lower secondary</td>
<td>Higher secondary</td>
<td>Tertiary</td>
</tr>
<tr>
<td>Tenure (years)</td>
<td>0 to 1</td>
<td>1 to 3</td>
<td>More than 3</td>
</tr>
</tbody>
</table>
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Skill groups: level of education

- Lower Sec.: 21.7%
- Higher Sec.: 15.4%
- Tertiary: 9.4%
- 9.1%
- 6.2%
- 5.7%
- 5.1%
- 4.6%
- 3.9%
- 3.2%
- 2.6%
- 2.3%
- 2.2%
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Skill groups: tenure

- <1 year: 21.7%
- 1 to 3 years: 15.4%
- > 3 years: 9.4%

Other tenure categories:
- 9.1%
- 6.2%
- 5.7%
- 5.1%
- 4.6%
- 3.9%
- 3.2%
- 2.6%
- 2.3%
- 2.2%
Skill groups: occupational status

- Blue collars: 21.7%
- White collars: 15.4%
- Managers: 9.4%
- 9.1%
- 6.2%
- 5.7%

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Skill structure: 2011, 2015

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Data integration

- **First step.** Matching between the Register of employees (ASIA-Occ, more than 16 M individual records) and the CompNet Database (more than 400K enterprises, around 11 M employees).

- **Second step.** Descriptive statistics. Variables are highly correlated. High heterogeneity found across size classes and economic activities.

- **Third step.** Exploratory analysis. *Weak evidence of a mutual moderating effect between indicators on investments* (per capita net capital, composed rate of investment) *and the skill dynamics* (both considering the single components and their combination).

- **Fourth step.** Calculation of indicators according to the Taxonomy by digital intensity.
ISTAT Digital intensity taxonomy (2016-2017 data)

- Analogic, 64.6%
- Potentially digital-oriented, 20.7%
- Partially digitalised, 2.3%
- Digital-oriented, 9.4%
- Fully digitalised, 3.0%
Digital intensity, capital and skills, 2011-2015

1. Key indicators

![Bar chart showing digital intensity, capital, and skills from 2011 to 2015. The chart compares analog, potentially digital-oriented, digital-oriented, partially digitised, and fully digitalised sectors. The y-axis represents percentage change, ranging from 0.0% to -15.0%, and the x-axis categorises the sectors.]
Firms are recovering after the crisis but at different speed.

Further increase of employment is reported until 2017.

Productivity is still decreasing along the observed period (at the best is stagnant).
2. Capital indicators

Digital intensity, capital and skills, 2011-2015

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Digital intensity, capital and skills, 2011-2015

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Digital intensity, capital and skills, 2011-2015

3. Human capital indicators

- Education (years)
- Tenure (years)

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On average, formal education levels are on the increase (also because of a similar trend in the whole population).

Technology seems associated to a demand for better educated employees.

Average work tenure is increasing but is also largely affected by the legislation on retirement.
Preliminary evidences and open issues

- A huge inertia affects the digital transformation of Italian enterprises. A large percentage of SMEs (as well as micro-enterprises, not considered here) with low productivity makes size and features of technological phenomena less visible at macro level.

- As a strategy to recover from the crisis, firms invest more on labour than on capital. To be understood whether because of the specific national conditions (incentives, labour market) or as a strategic positioning.

- Skill measurement is still an issue. More information at individual and firm level are being collected by ISTAT (incl. ISCO codes, work contracts, etc.) to shed light on this key topic.