



## Theme 1: Automation technologies, job and employment

Through history there have been recurring worries about the impact of new technologies upon employment and degrees of inequality. And from time to time regions and professions have suffered as new technologies have led to shifts in demand for labour. There is now a new wave of concern that is closely linked to the concept of Industry 4.0. Cyber physical systems, based on the principle of connectivity between the internet, computer-based algorithms and material equipment, open up new possibilities for automation. Certain studies estimate that the use of these new technologies, including artificially enhanced robotics, could eliminate 15% of jobs by 2030, with significant differences across countries (Brezki and Burk, 2015; OECD, 2016).

A positive, and conventional, view is that these labour displacing effects of technical change will be counterbalanced by increases in productivity and real incomes resulting in growing demand for goods and services and consequently an increase in the overall demand for workers. A more pessimistic account, however, argues that 'this time is different' and the scope for machine learning, robotics and digitisation to eliminate jobs at all levels of the skill hierarchy could well result in large scale job losses undermining the very fundamentals of work and society as we know it today (Brynjolfsson and McAfee, 2012; Frey and Osborne, 2013).

The impact is also expected to be different according to sector of activity and occupation. The ability of artificial intelligence endowed robots and big data analytics to replace jobs at intermediate or higher skill levels makes the impact of Industry 4.0 fundamentally different from previous waves of mechanization and automation that primarily substituted for low skilled job and workers. The conventional upgrading associated with 'skill-biased technical change' is arguably giving way to a new 'routine-biased technical change' as the tasks of an increasing array of mid-level jobs are being transformed into routine tasks. As a result, the major area of impact of this wave of technical change may be the jobs of intermediate level occupational categories, including those of white collar clerks. This new pattern can result in an increasing polarization of the labour market, with the employment shares of clerks and skilled operators declining at the expense not only of managers and technicians but also the least skilled categories (Autor, Levy and Murnane, 2003; Goos and Manning 2007)

As a result, in addition to the concerns about an absolute decline in employment, Industry 4.0 is expected to profoundly change the skill mix of different occupations as more routine tasks are automated. Employees of the future are expected to be required to develop transversal skills and competencies adapted to the digitisation of production as a complement to their more domain-specific technical skills. Growing skills gaps

and mismatches are expected to put new pressures on the education and training system to adapt in part through developing closer links with industry.

**The issues raised in this first half day raise a number of questions which the participants will seek to answer:**

1. What will be the impact of digitization, robotics and AI on jobs and employment and how will this vary across occupations and sectors of activity?
2. What are the likely impacts of Industry 4.0 on earnings and income inequality?
3. What will be the impact of Industry 4.0 on the future of work?
4. What are the implications of Industry 4.0 for skills gaps and needs and how can educational systems prepare for these changes.

**Proposed speakers:**

- 1) Benjamin Coriat (Université Paris 13, CEPN), "The 4th Industrial Revolution: A Historical Perspective".
- 2) Xiaolan Fu (Technology and Management Centre for Development, Oxford UK), "The Impact of Industry 4.0 on Jobs and Employment: A Global Perspective".
- 3) Samila Benhamou (France Stratégie, Paris), "Artificial Intelligence and the Future Work".
- 4) Thierry Bouron (Orange, Sophia Antipolis), "Innovation and Industry 4.0: 50 Success Stories".
- 5) Francine Charest (Université de Laval, Québec, Canada), "Digital Humanities".