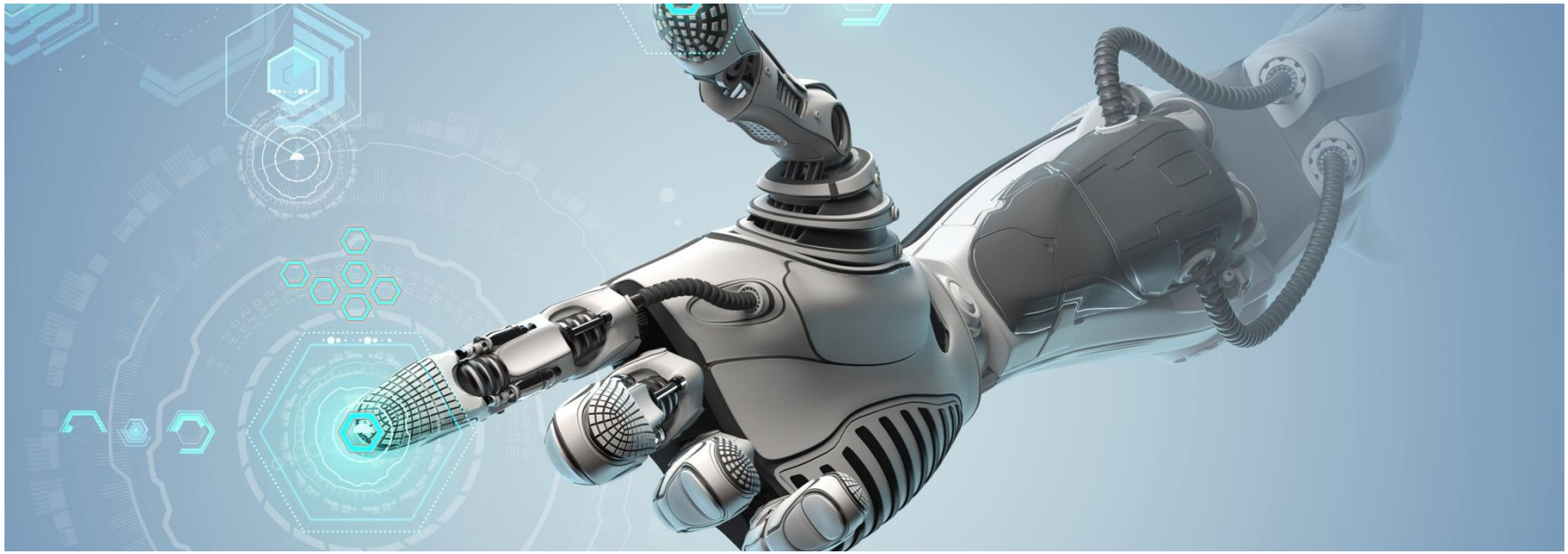


Machines, robots, people and skills

Changing jobs, work and skills

Konstantinos POULIAKAS & Jiri BRANKA
Department for Skills and Labour Market, CEDEFOP

Presentation of findings from Cedefop's 'Digitalisation and future of work programme'
http://www.cedefop.europa.eu/en/events-and-projects/projects/digitalisation-and-future-work

Part 1

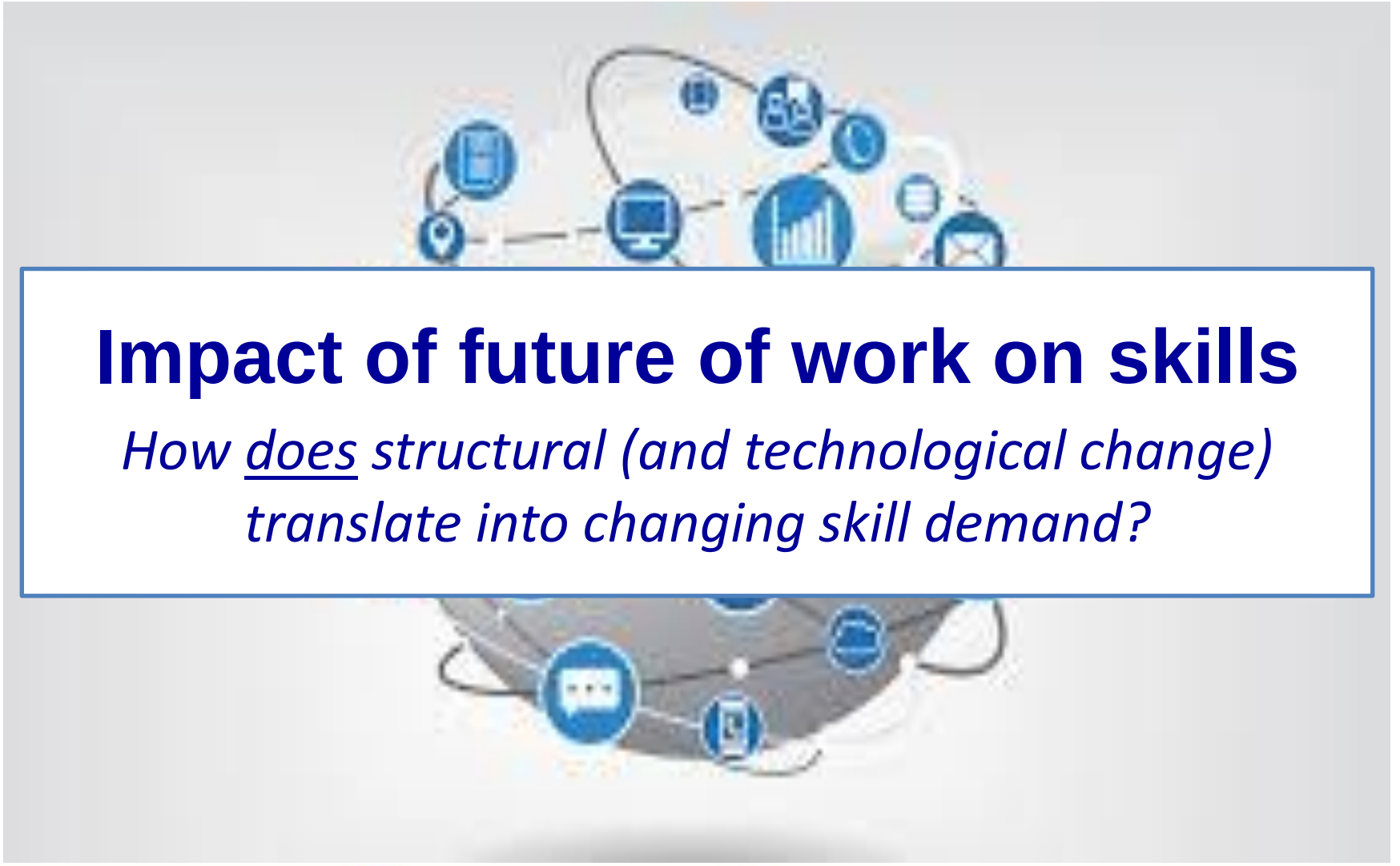
- Impact of future of work on skills and tasks
  - Structural change

Part 2

- Impact of automation on jobs
- Impact of technology on skills and labour market outcomes

Part 3

- Challenges for policy
- Are we prepared for the future of work?



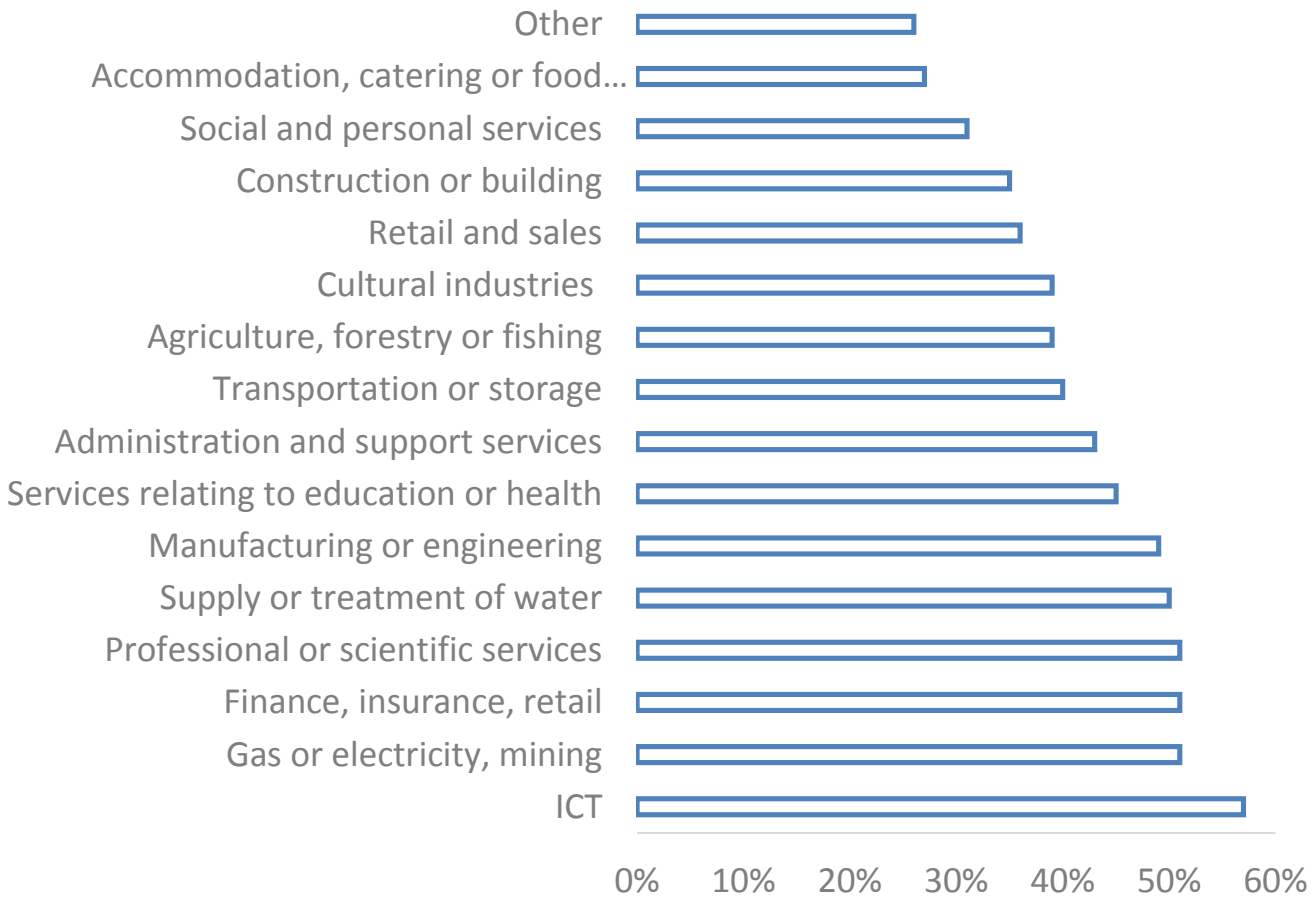
Impact of future of work on skills

How <u>does</u> structural (and technological change) translate into changing skill demand?

Technological change is affecting EU workers

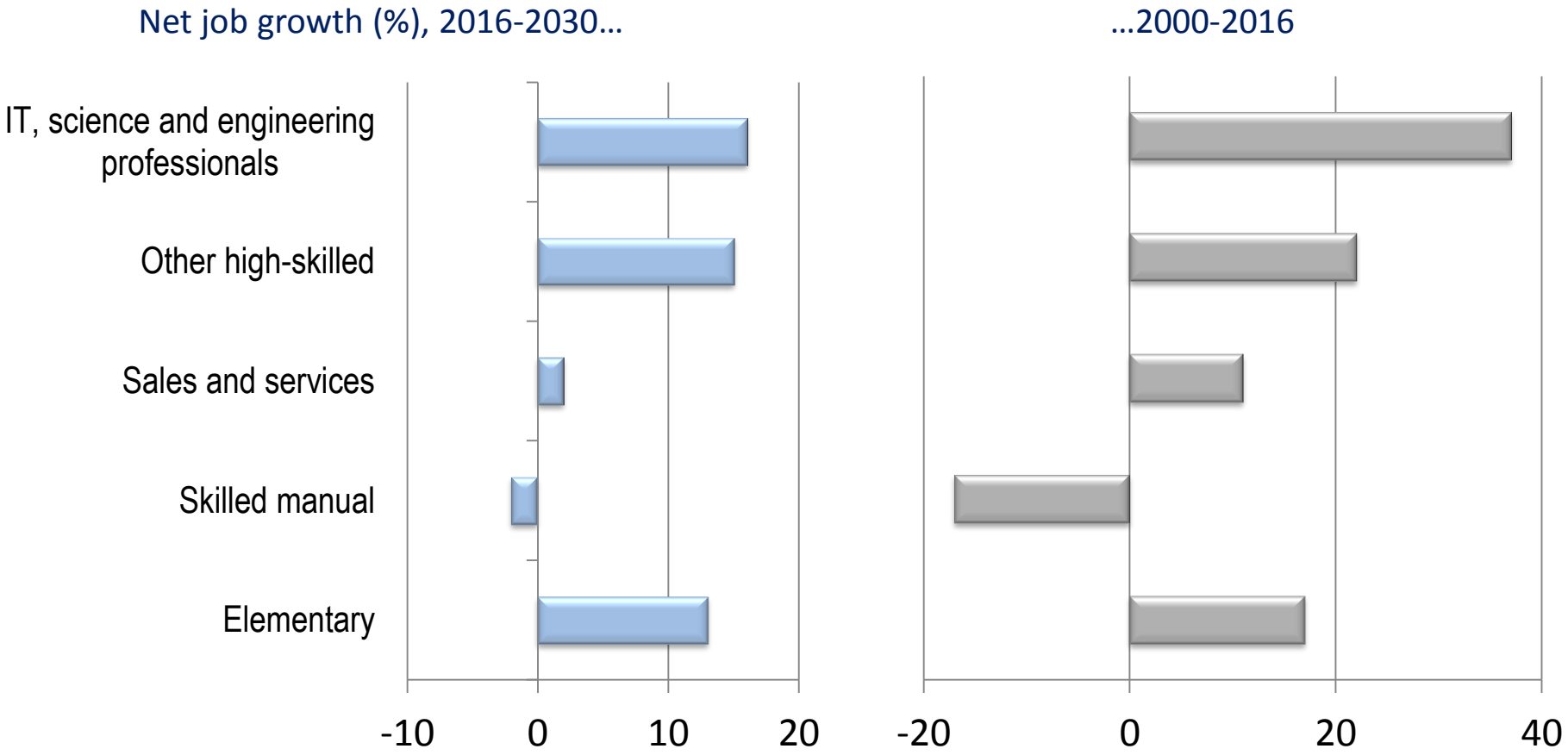
- 43% (47%) of EU adult workers experienced recent changes in the technologies (methods) used in their workplace.
- From 3 in 5 in ICT to only 1 in 4 in hospitality and personal services.

Extent of changing technologies (machines, ICT systems) by sector, 2014, EU28



Source: Cedefop European skills and jobs survey (ESJS)
http://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-esj-survey

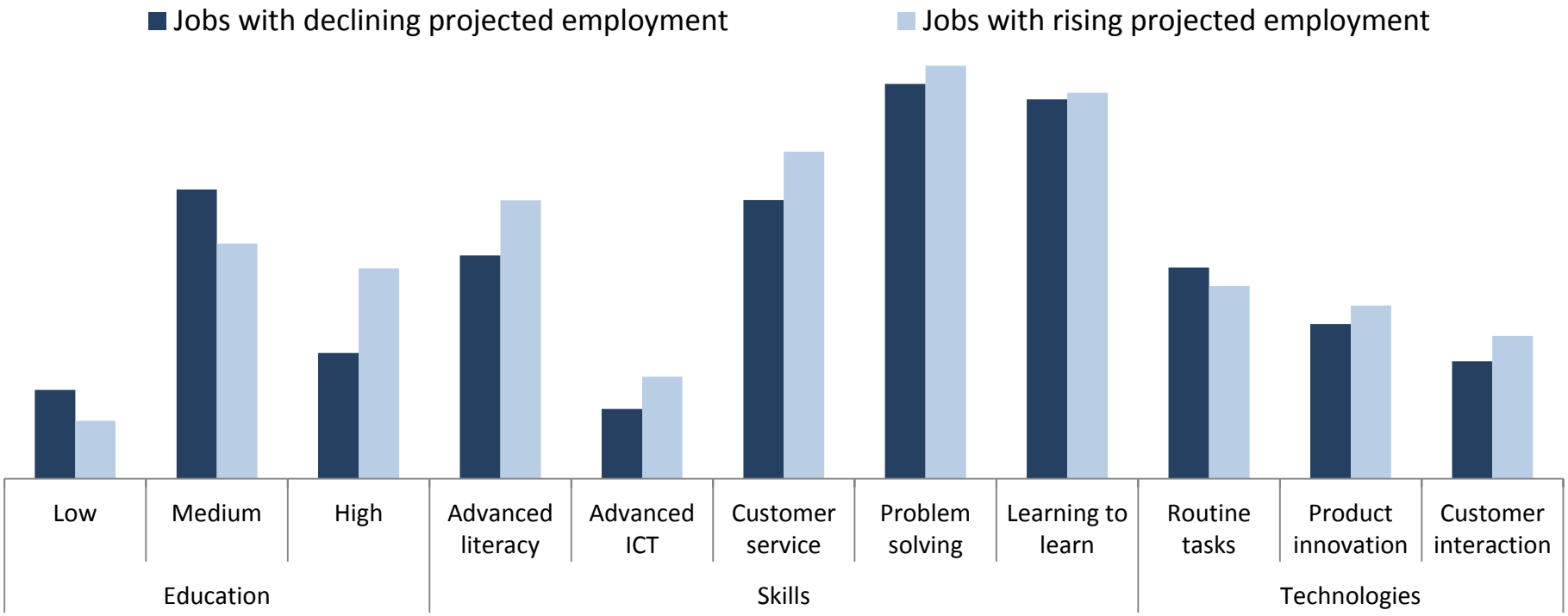
New jobs driven by technological progress



Source: Cedefop skills forecasts 2018 (forthcoming); EULFS

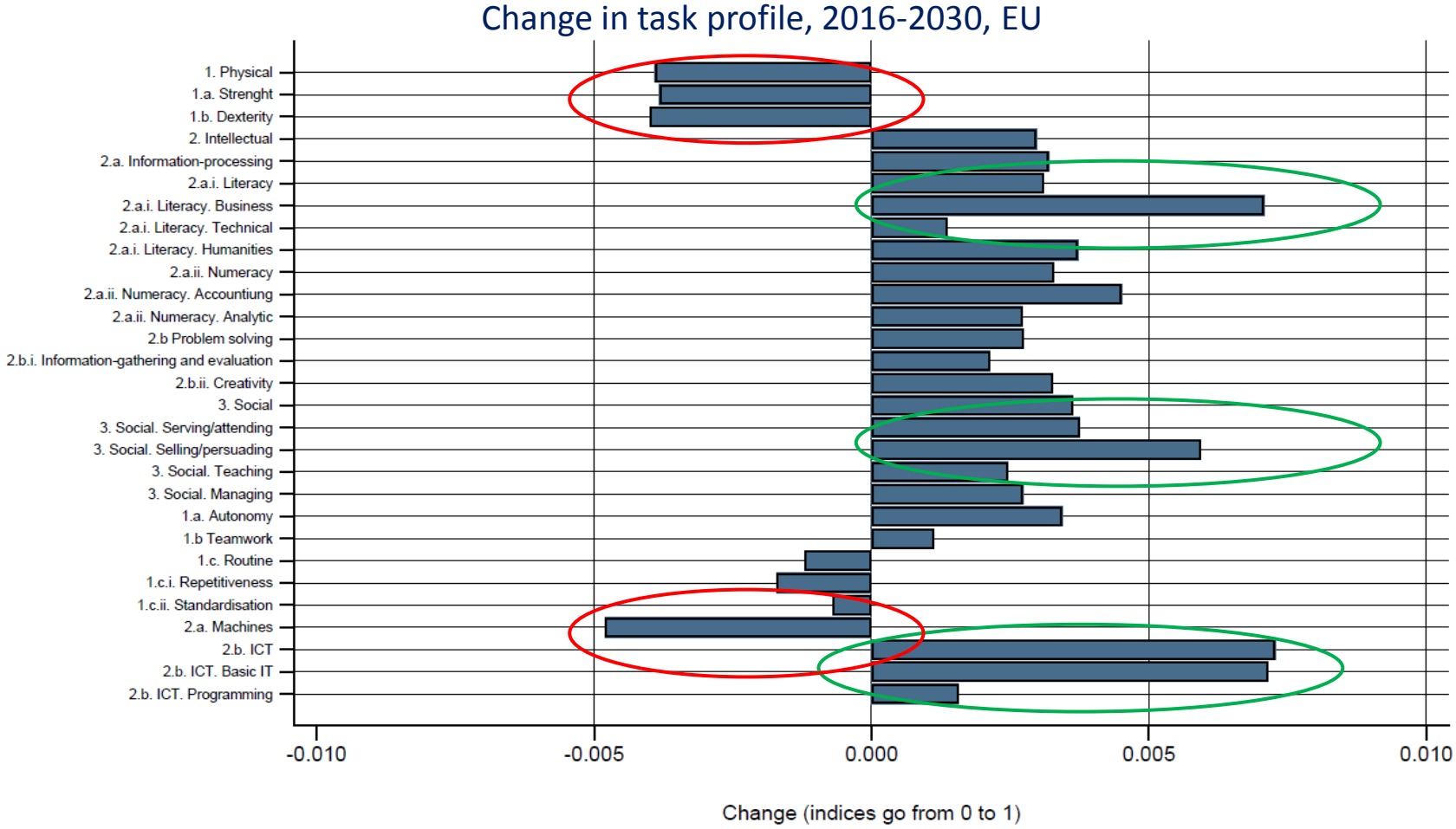
Future jobs in need of 21st century skills

Difference between «jobs» with positive vs. negative anticipated employment growth rate, 2014-25, EU28



Source: Cedefop European skills and jobs survey (ESJS); Cedefop skills forecasts 2016

…in non-routine, non-physical, social jobs



Source: Cedefop skills forecasts 2018 baseline scenario plugged into Eurofound's EJM framework

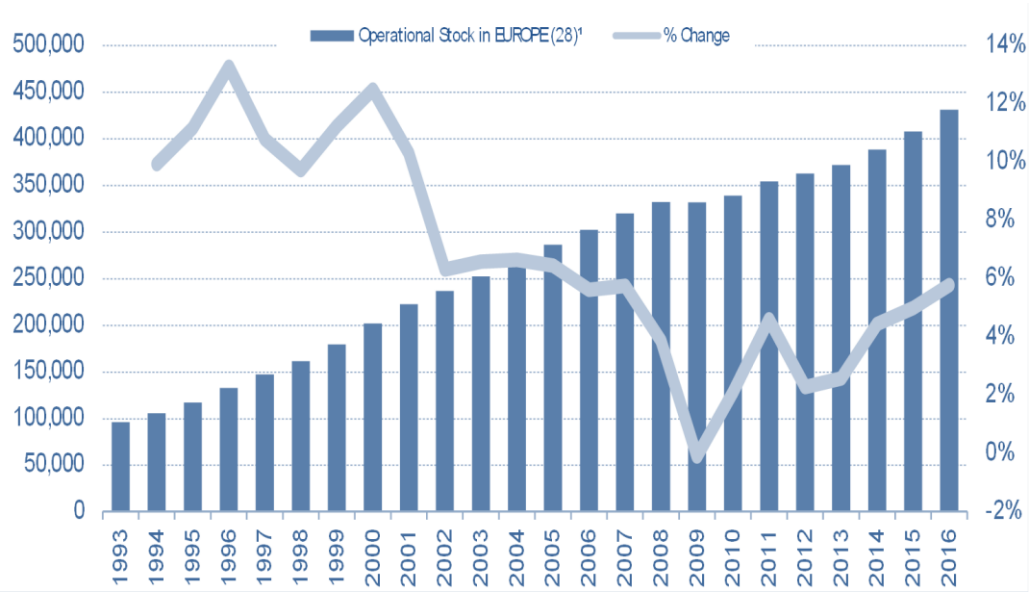
The risk of automation

How may technology affect jobs?

Why now?

- Rapid advances in machine learning, AI, visual-space perception, natural language processing, text mining etc.
- EU: From 0.6 robots to 2.6/1000 workers between early 1990s-2000s.
- US: 0.4 to 1.4.
- Eurobarometer (2017):
  61% positive view of robots/AI
  72% robots may steal jobs

Level and growth of the Operational Stock of robots in EU28



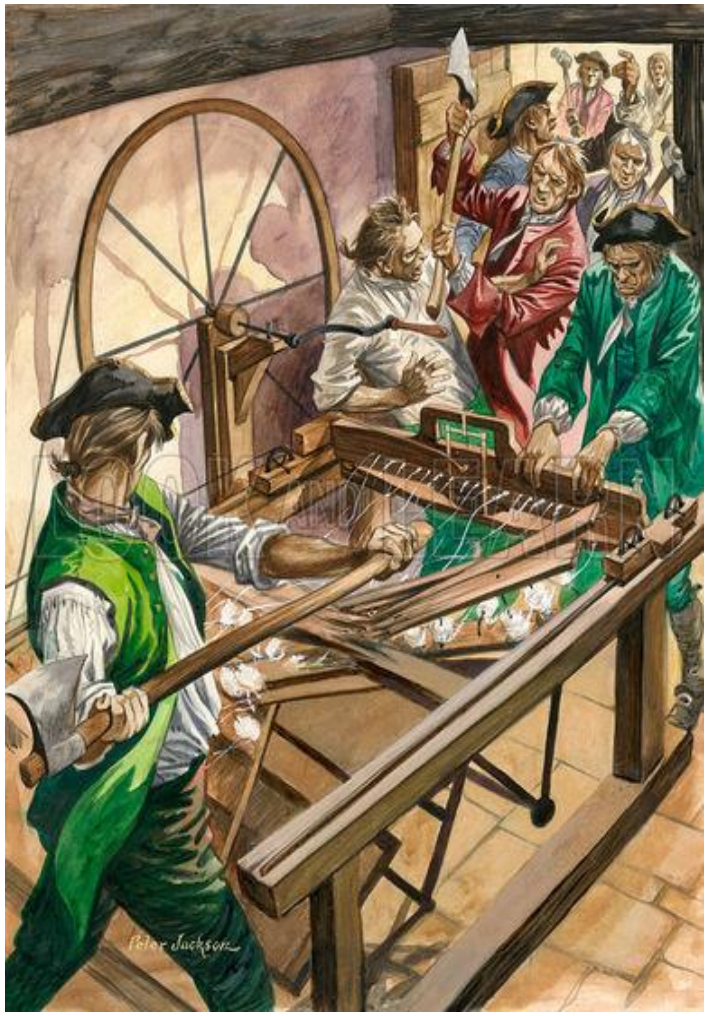
Source: International Federation of Robotics

One day in the 1760s James Hargreaves, a hand-loom weaver from Oswaldtwistle, was struck by the way an overturned wheel kept on spinning. What would happen, the weaver wondered, if several spindles were to be placed upright, side by side? Might it not be possible to spin several threads at once?

Working with a knife, Hargreaves shaped a primitive engine, a 'jimmy' – and the initial reaction from some was disgust. Angry neighbours raided Hargreaves's barn, on the grounds that the ***machines would 'ruin the country'****. If one jenny could do the work of eight spinners, reasoned the neighbours, that would put seven out of work.*

In fact, the spectacular new spinning capacity provided the basis for a cotton boom. In the 1770s, as earnings rose, spinners and weavers took to parading the streets on paydays with £5 notes in their hatbands. Their wives drank tea out of the finest china'.

(R.T. Lacey, Great tales from English History)



Are robots stealing our jobs?

Doom

- Inequality - SBTC
- Job polarisation - RBTC
- Sectoral/job restructruring
- Technological unemployment

Bloom

- Product innovation- ETC labour friendly for high-tech firms
- Scale/price effects
- New consumer demands & markets
- Technology does not cause jobless recoveries
- New (within job) tasks & jobs

Growth of platform/‘gig’ economy

upwork™

CrowdFlower

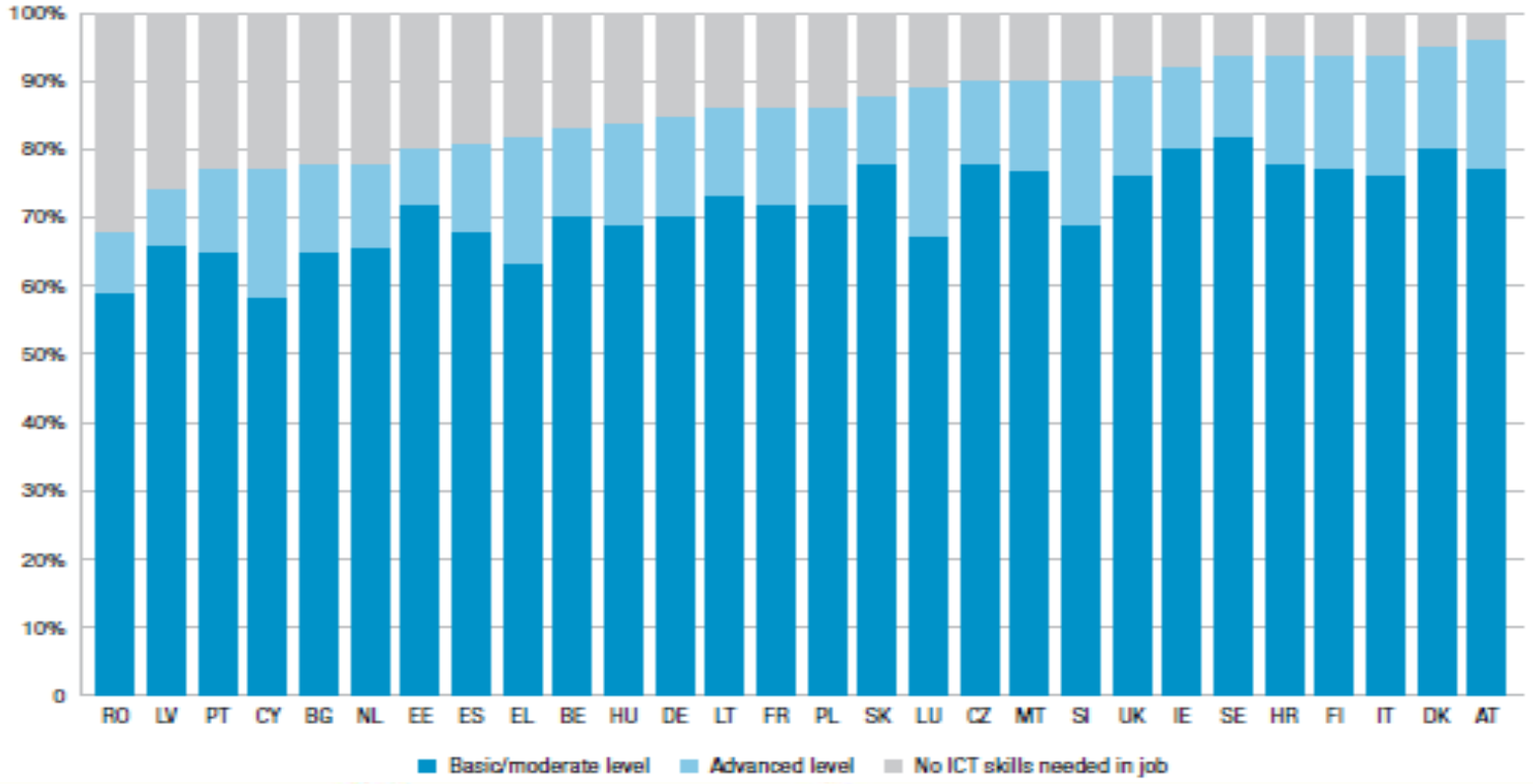
amazon mechanical turk
beta
Artificial Artificial Intelligence

* % projects carried out in five major English-speaking online platforms

Source: University of Oxford Online Index

7 in 10 EU workers need fundamental digital skills for their jobs

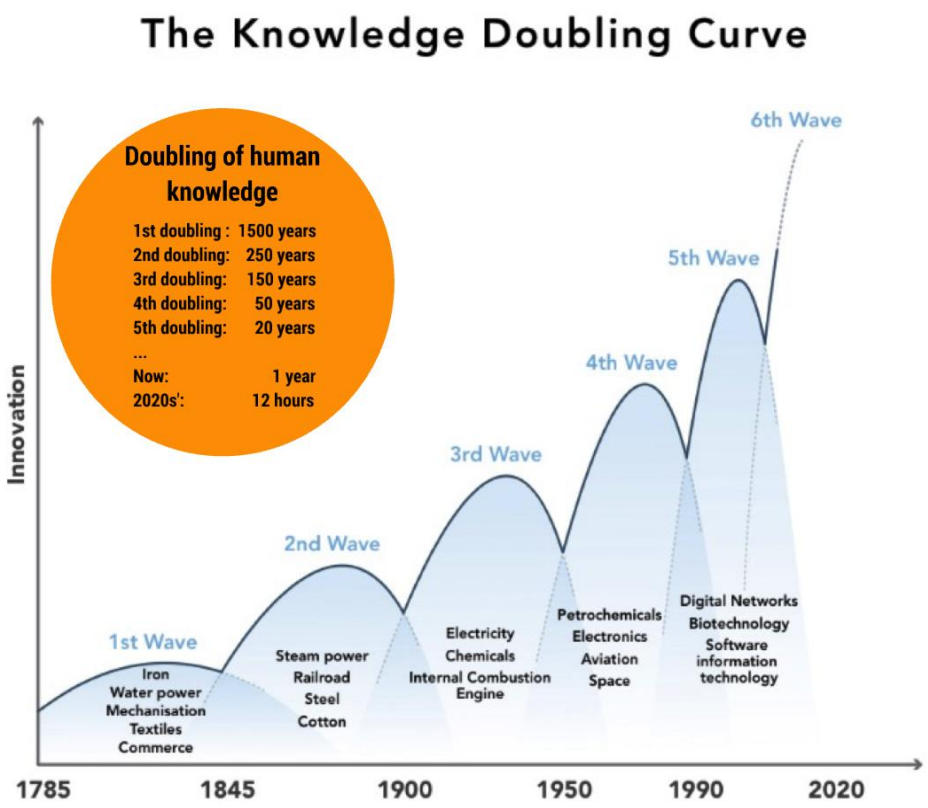
Level of importance of ICT skills in jobs, adult workers, 2014, EU28

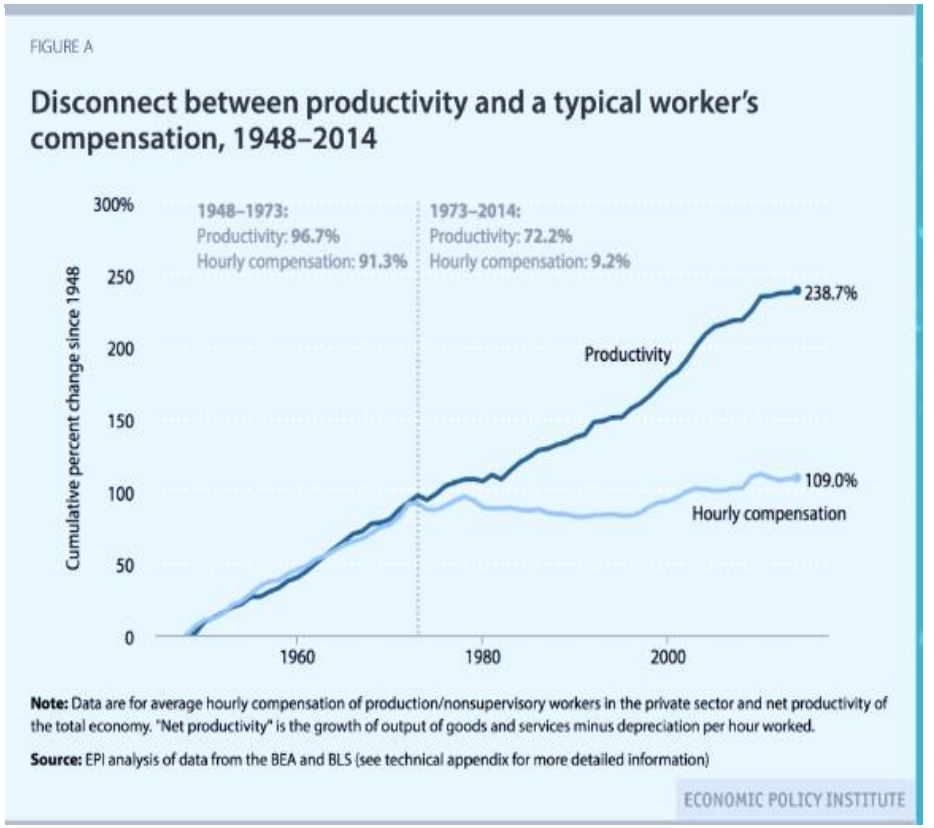


Source: Cedefop (2018) *Insights into skill shortages and skill mismatch: Learning from Cedefop's European skills and jobs survey (ESJS)*

Is it different this time?

- AI is making non-routine/white collar jobs vulnerable
- Faster innovation cycles
- Demography
- Falling labour income share



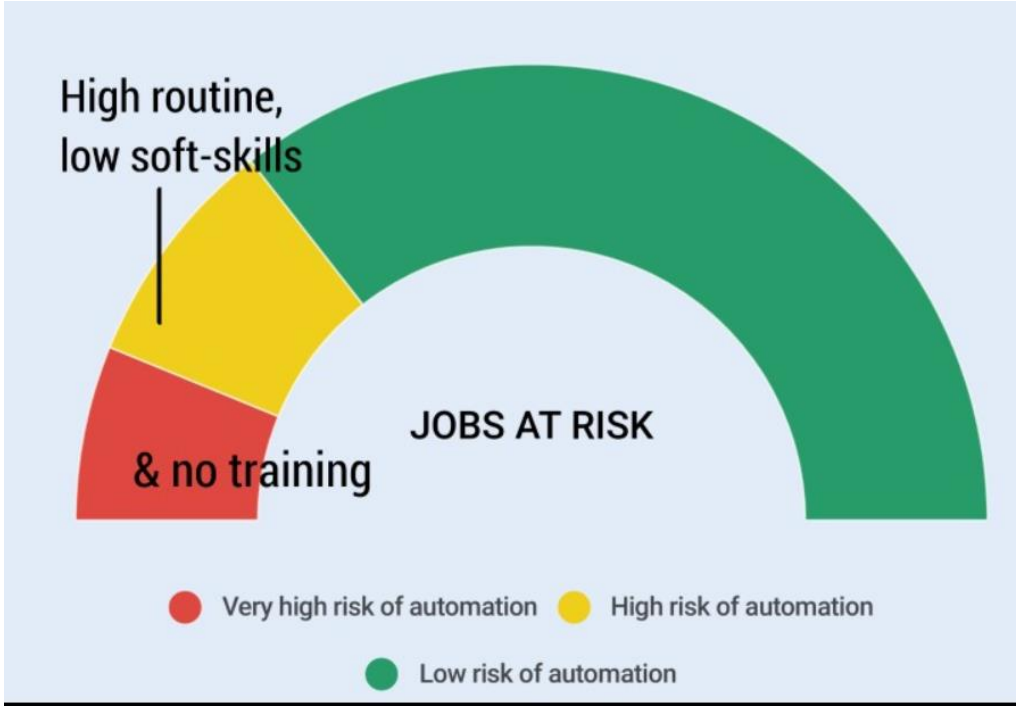


Important reflections

- Jobs at risk of automation posses certain 'attributes'
  - routine tasks
  - standardised or 'digital' content
  - less social interaction
  - non-complex problem solving
  - precise physical manipulation
- AI as opposed to robotics is making non-routine jobs vulnerable
- But estimates of automation subject to 'task measurement' (Biagi and Sebastian., 2018) and routinisation between and within occupations

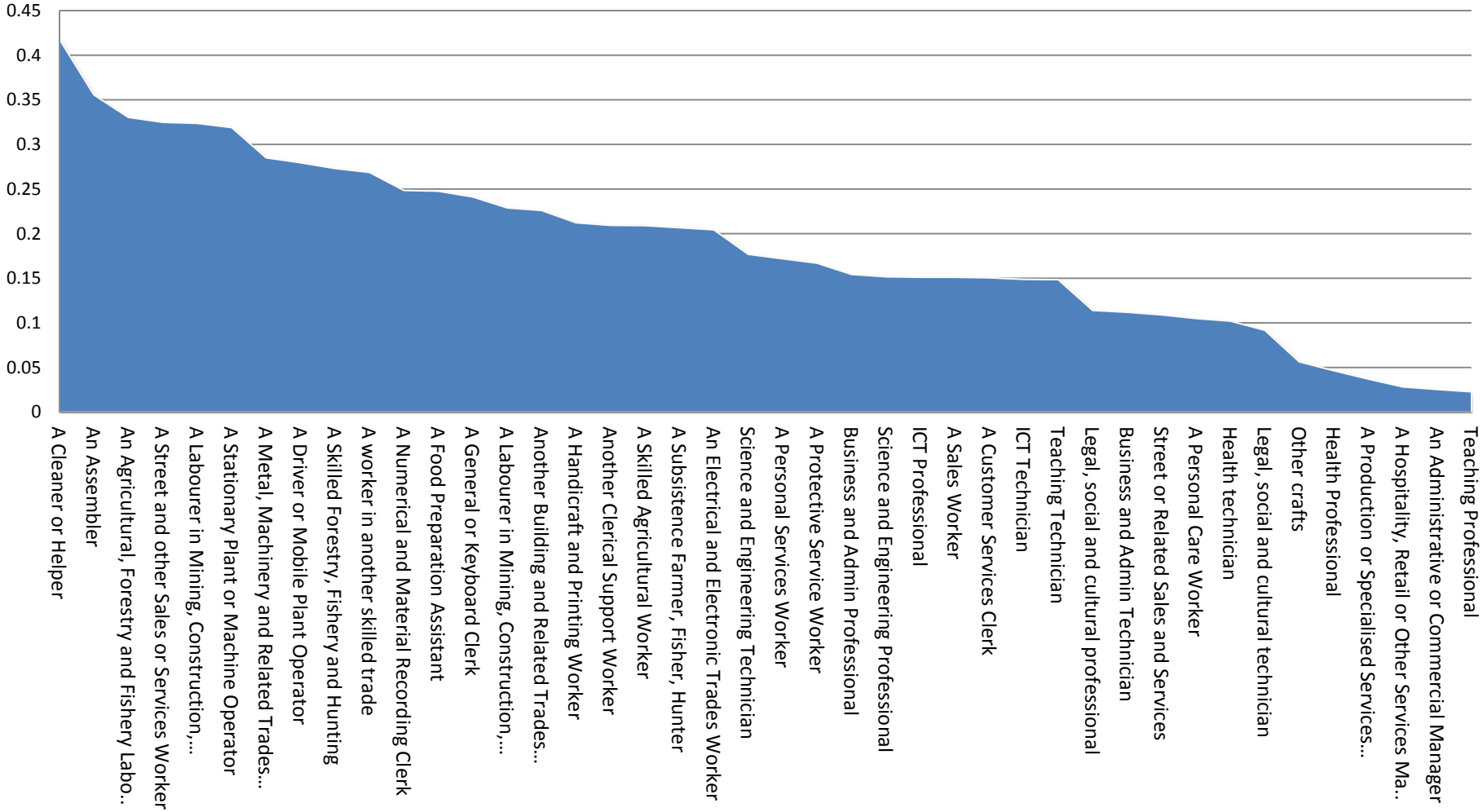
  E.g. a great paradox: ***fewer routine jobs but more routine work*** also in white-collar jobs (EWCS, 2000-2010) (Eurofound, 2016)

Risk of automation in EU jobs



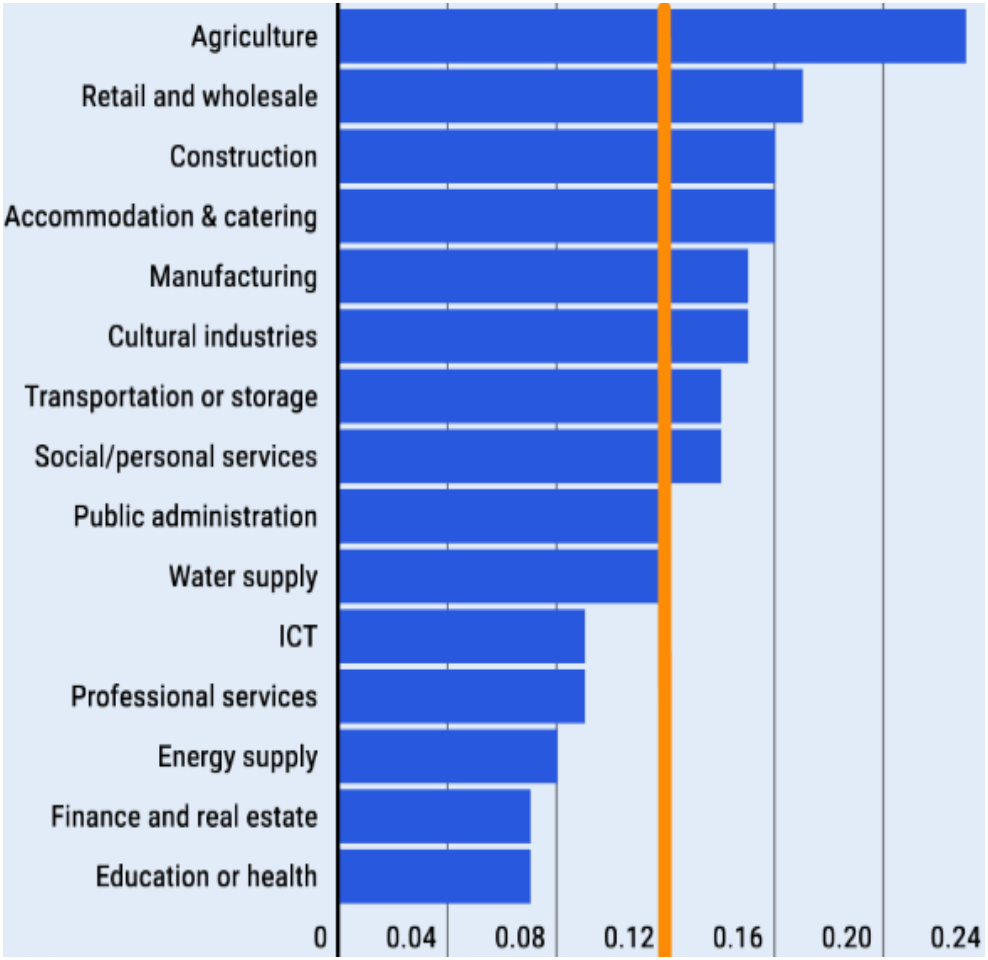
Source: Cedefop European skills and jobs survey (ESJS)
http://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-esj-survey

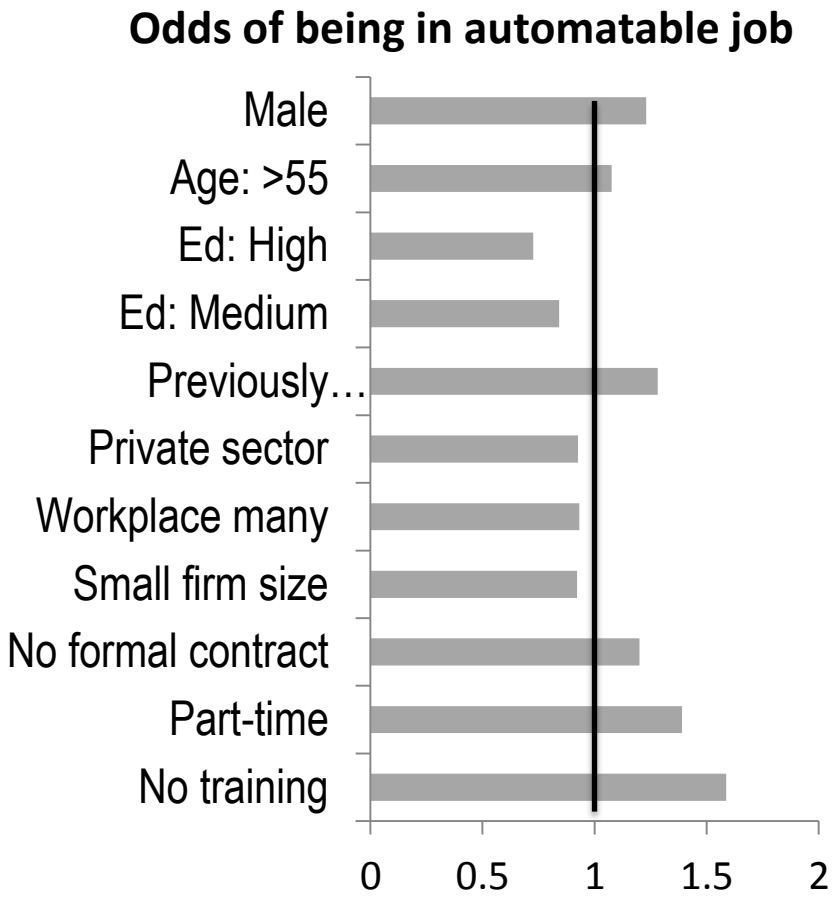
Estimated marginal probability of automation by 2-digit occupation, EU



Source: Cedefop European skills and jobs survey (ESJS)

Risk of automation in EU jobs





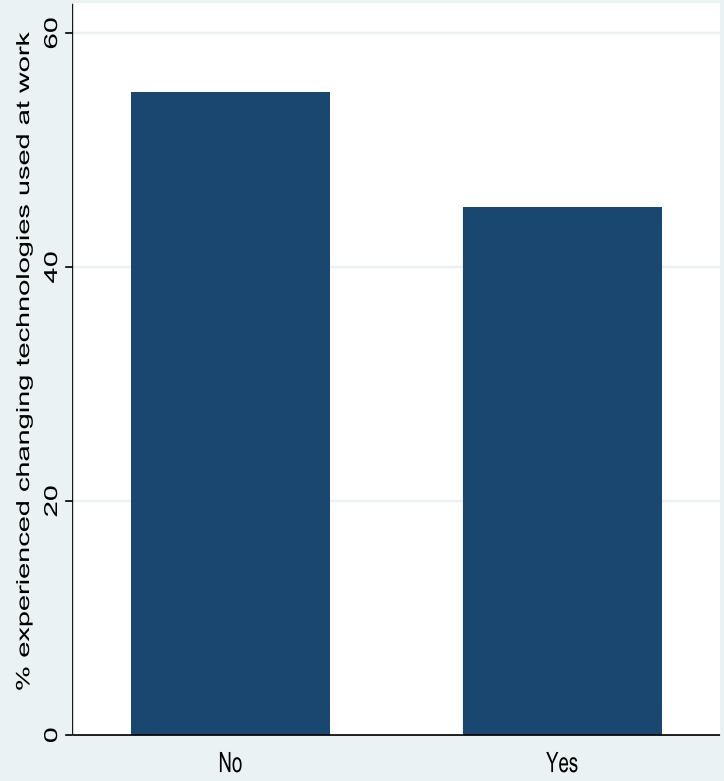
Source: Cedefop European skills and jobs survey (ESJS)

Impact of technology on skills

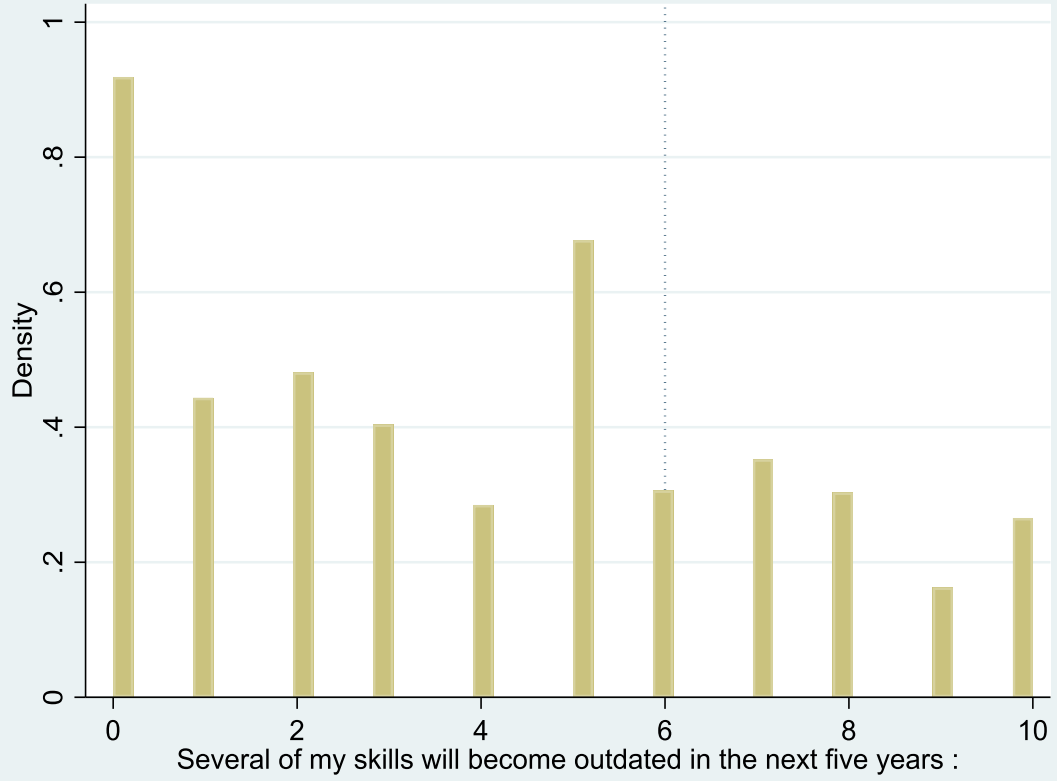
How does technological change affect labour market outcomes via skills obsolescence?

Technological skills obsolescence

43% new technologies at work



33% very high likelihood of skills obsolescence



Source: Cedefop European skills and jobs survey (ESJS)

Technology: a high-skills affair

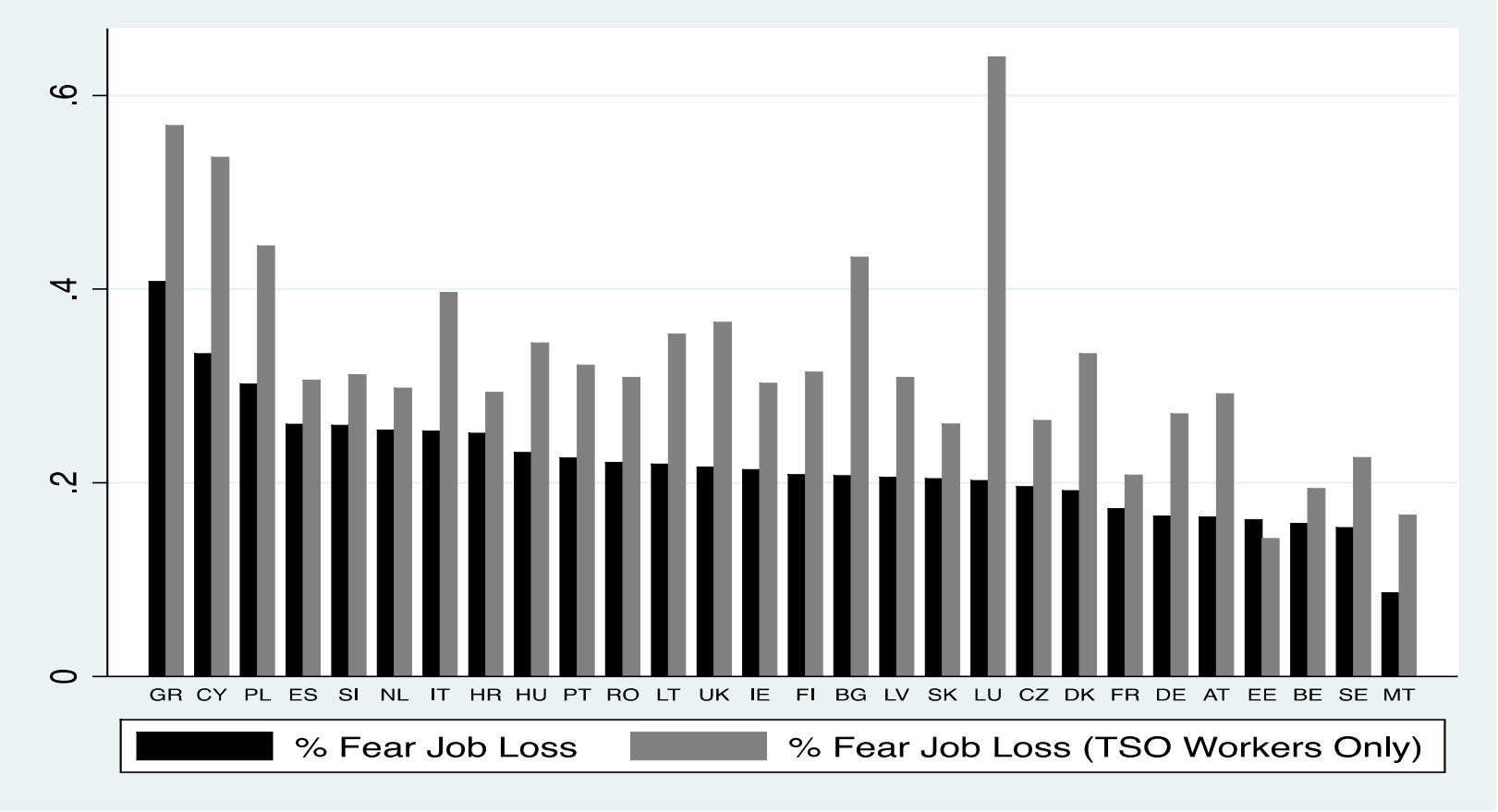
- *16% of EU adult employees at risk of TSO*:
  - *Individual:* older, males, *higher education*, longer tenure
  - *Job*: *non-routine tasks*, learning, large size, *training*, private sector
  - *Occupation*: mostly *high-skilled*/clerical/building and machine ops

- ***In contrast to automation, technological change (inc. digitisation) is dependent on high-skilled workplaces and workers in place!***

- If TSO is tantamount to labour-saving/job tasks replaced by technology -> lower productivity, job insecurity, lower job complexity, higher overskilling, lower job satisfaction….BUT…

Even though technology raises job insecurity…

Percentage of adult employees with fear of job loss by TSO



Source: McGuinness , S. Pouliakas, K. and Redmond, P. (2018) based on Cedefop European skills and jobs survey

…technological change ‘raises the bar’ for skills

Impact of technological skills obsolescence on LM outcomes, adult employees, EU28

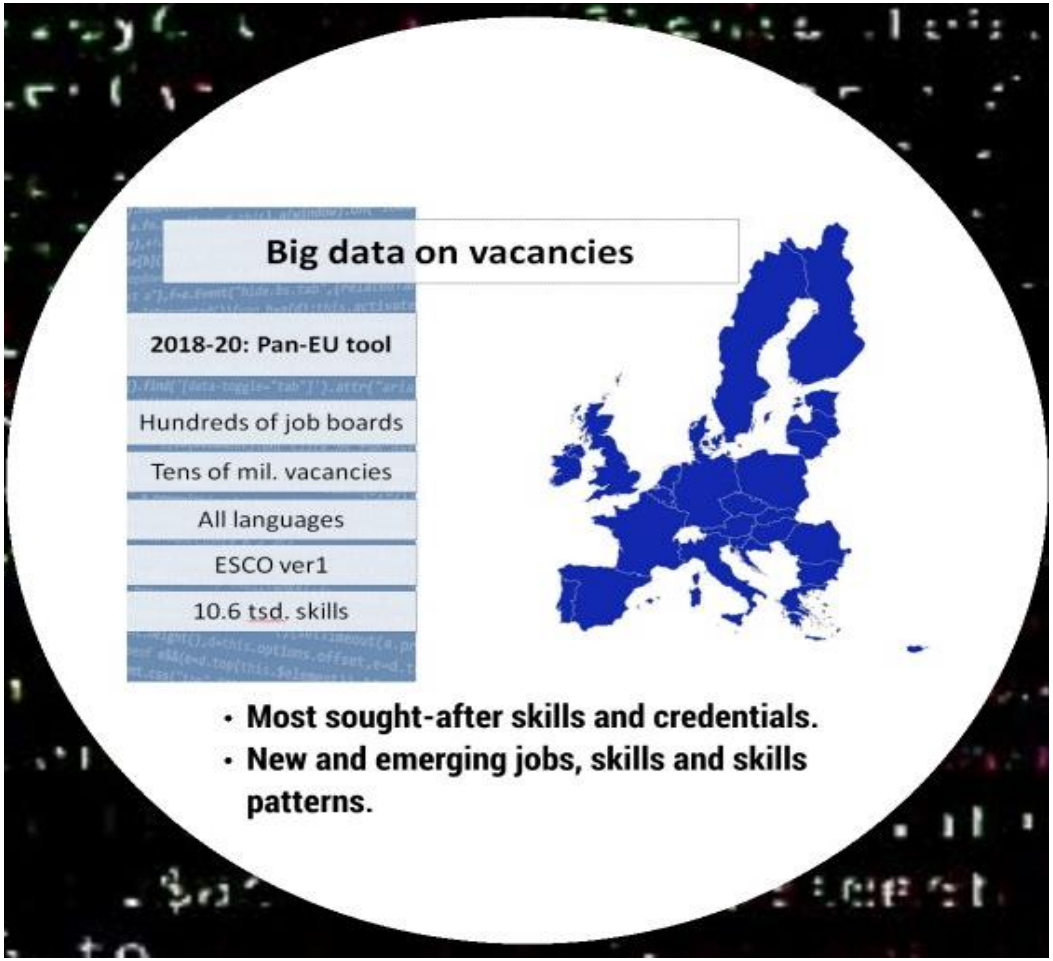
Skill complexity of job	1.784***
Underskilling	0.026***
Overskilling	-0.019**
Earnings	0.020*
Job Satisfaction	-0.034***
Job Insecurity	0.136***

Notes: Propensity score matching estimates – ATT of LM outcome by TSO propensity

Source: McGuinness , S. Pouliakas, K. and Redmond, P. (2018) based on Cedefop European skills and jobs survey

Challenges for policy

The power of Big Data



- Fast-deep LMI
- Skills matching
- Reskilling

- *Average no skills per vacancy*
- *% vacancies per occupation with skill 'i'*
- *Typical skills per vacancies of occupation*
- *% job-specific/transversal skills*
- *Occupation proximity by skills*
- *Regional concentration of vacancies*

The Upwork Skills Index

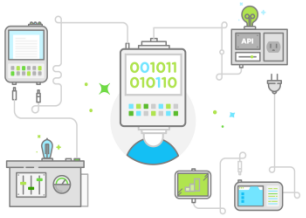
The top 20 fastest-growing skills, Q1 2017

1 ASANA WORK TRACKING

Track and manage projects with clear responsibilities and next steps.

2 ARTIFICIAL INTELLIGENCE

Harness the processing power of computers and AI algorithms to bring intelligent decision-making capabilities to systems.



3 RAPID PROTOTYPING

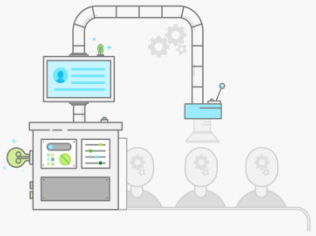
Quickly think up an idea and have a model in-hand that same day.

4 IMMIGRATION LAW

Navigate evolving policy changes and nuanced implications for your workforce.

5 NATURAL LANGUAGE PROCESSING

Use computers to understand human speech as it is spoken - what powers Alexa and Google Assistant.



6 INSTAGRAM MARKETING

Engage your customers and build your brand with organic and ad-based promotion.

ADDITIONAL SKILLS

7 A/B testing
8 Twilio API development
9 C++ development
10 Swift development
11 Brand strategy
12 Marketo marketing automation
13 Penetration testing
14 Docker development
15 Relationship management
16 Application security
17 AngularJS development
18 Accounting (CPA)
19 Machine learning
20 JIRA administration

Upwork™


MOST IMPORTANT QUALITIES OF A TOP EMPLOYEE?
• Being a good coach
• Communication skills
• Possessing insights into others and different values and points of view
• Empathy toward one's colleagues
• Critical thinking
• Problem solving
• Drawing conclusions (making connections across complex ideas)
• STEM skills
Google

Implications for education & training

The promise

- 'Individualisation'
- Massive, online, open
- Non-credentialism
- New learning platforms

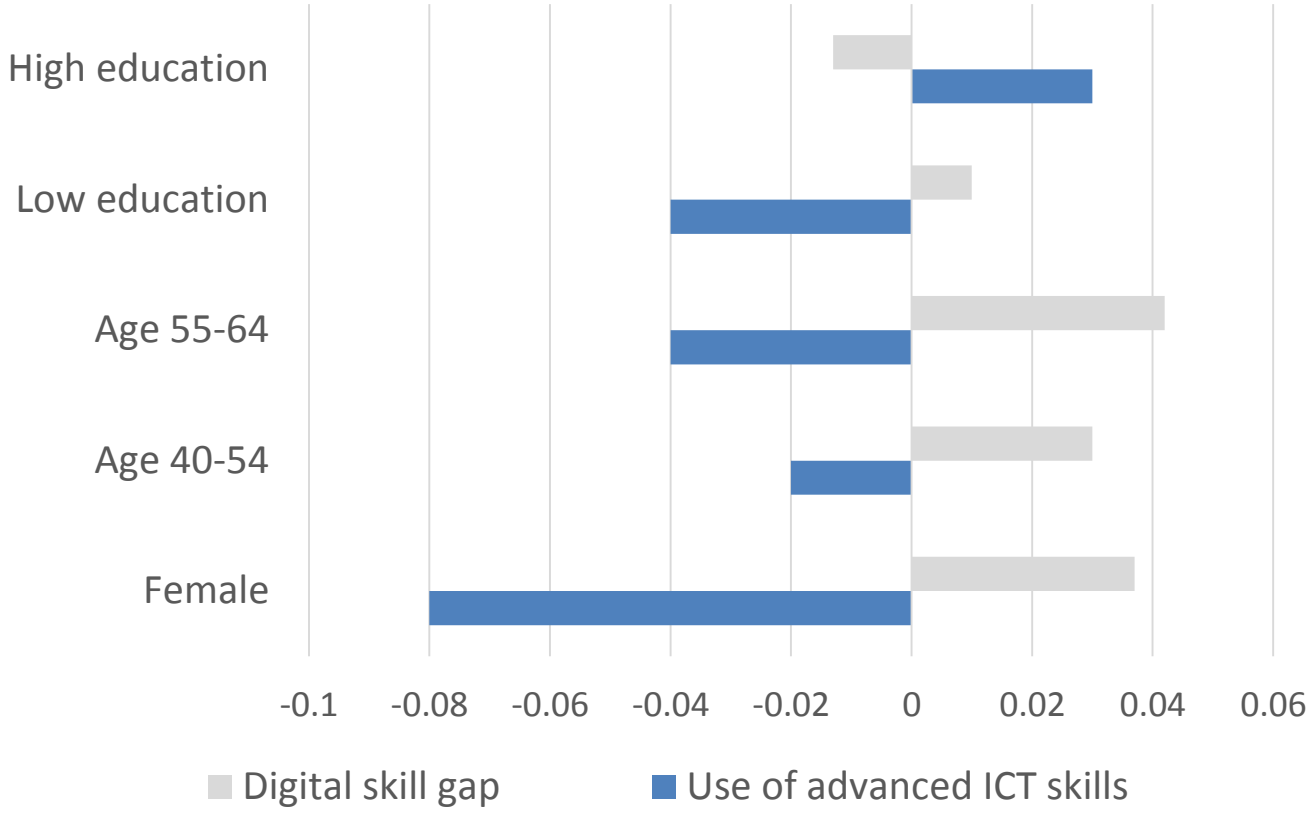
The challenge

- Biases
- Inequality

- Homo adaptus
- Quality assurance
- EQF responsiveness
- Governance
- 'Personalisation' (learning & career guidance)
- Humans-in-command

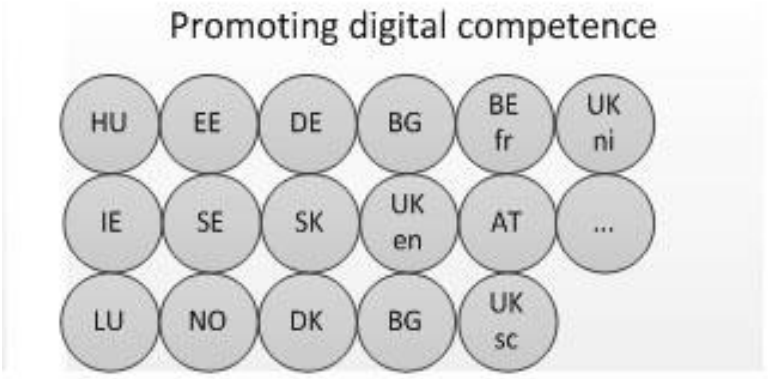
The digital divide fosters social exclusion

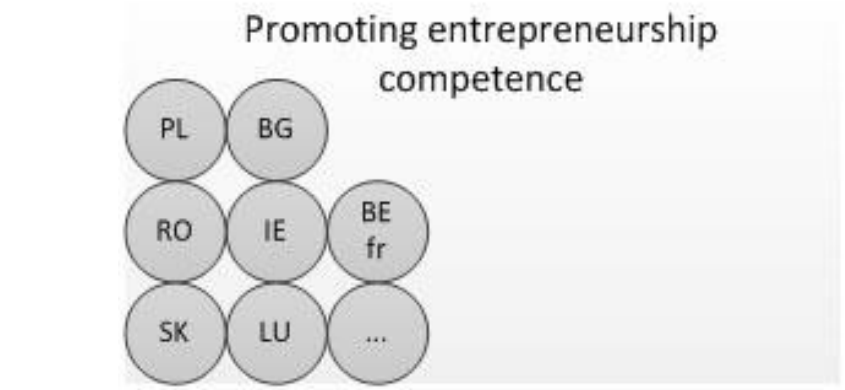
Use of advanced ICT skills in jobs and risk of digital skill gaps in jobs, 2014, EU28



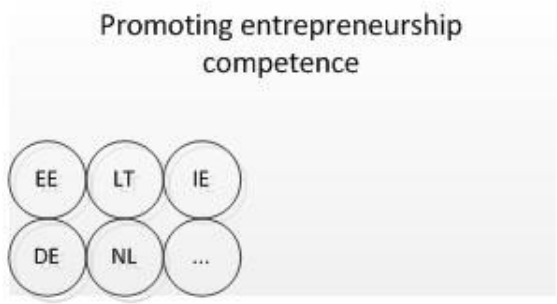
Source: Cedefop European skills and jobs survey (ESJS)
http://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-esj-survey

Initial VET policy clusters in 2015-17



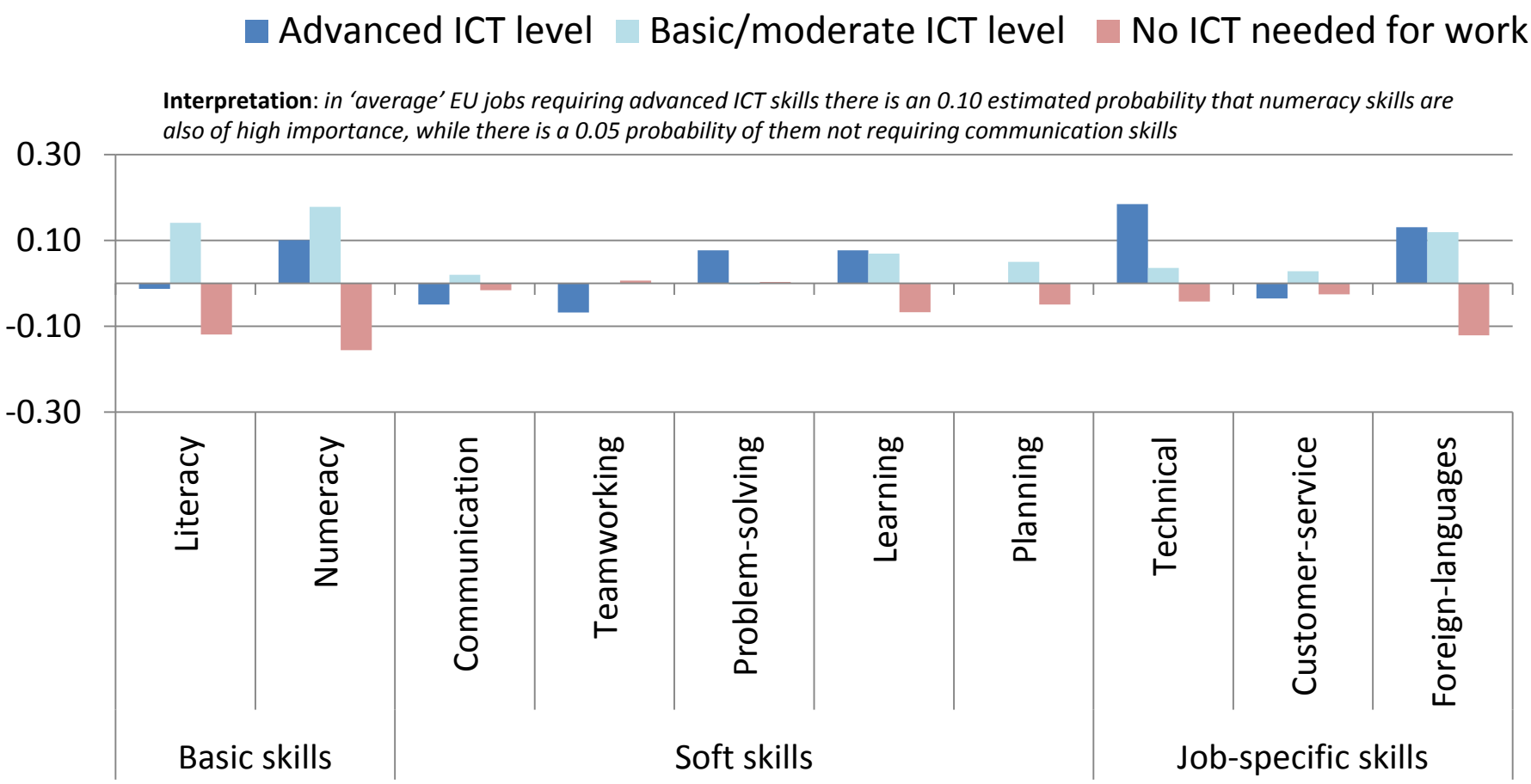


Continuing VET policy clusters in 2015-17



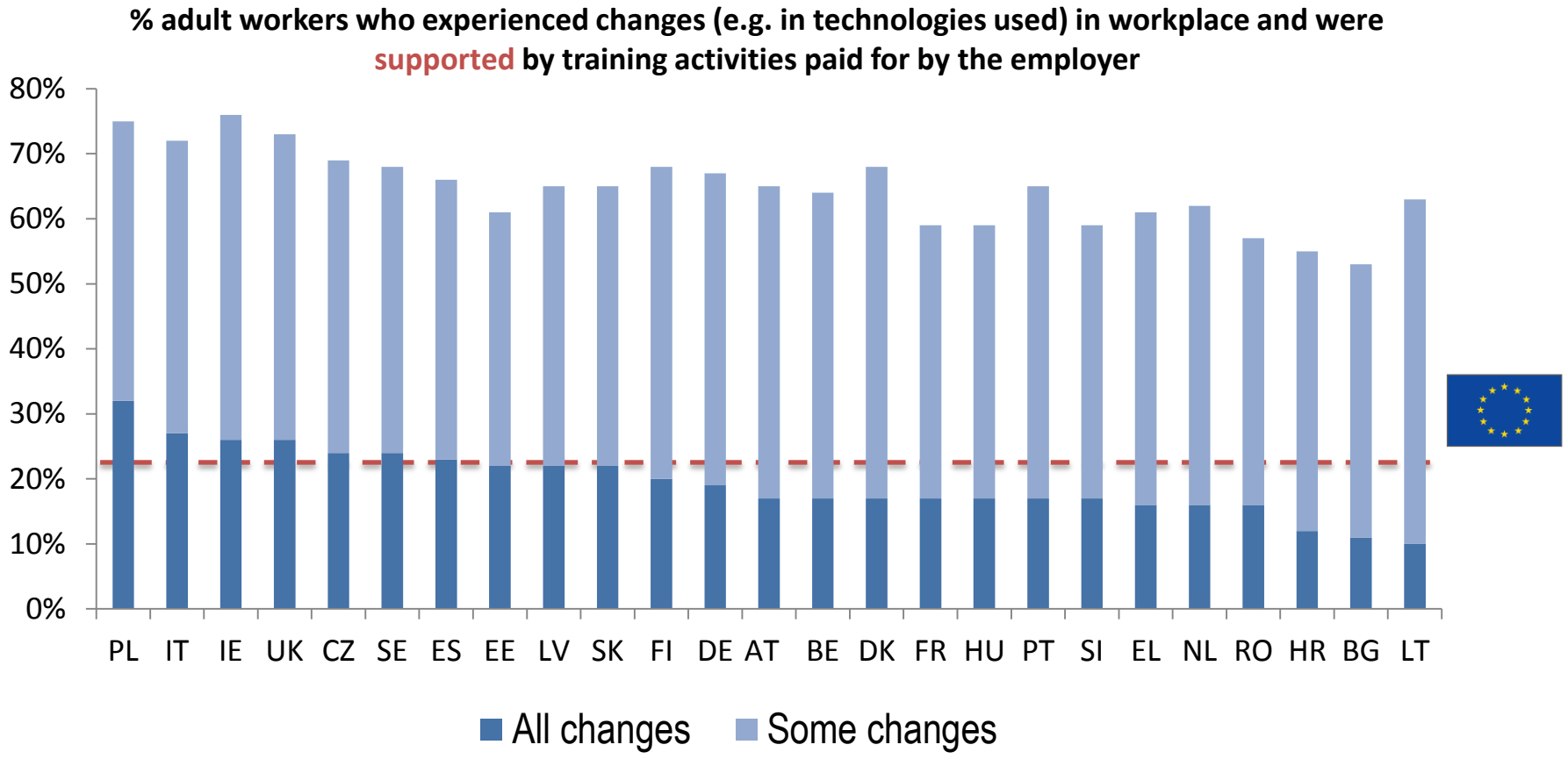
Source: Cedefop based on Refernet

Complementarity between ICT/other skills for work



Source: Cedefop European skills and jobs survey (ESJS)
http://www.cedefop.europa.eu/en/events-and-projects/projects/analysing-skill-mismatch

More supportive CVET needed

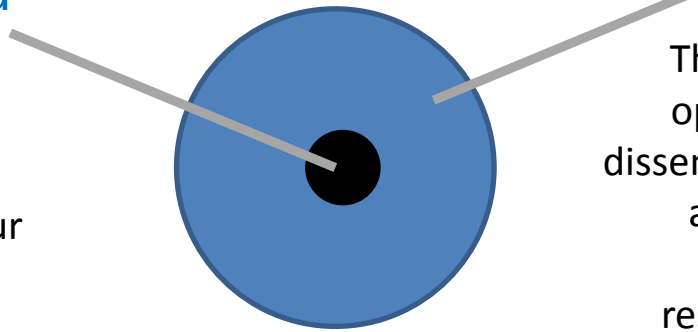


Source: Cedefop European skills and jobs survey (ESJS)

Strengthening system adaptability

labour market and skills intelligence

collecting and analysing data and information on current and future labour market trends and skill needs



Skills governance

The system of institutions, operational processes and dissemination channels aimed at facilitating stakeholder interaction and policy responses based on labour market information signals

Setting the framework for feedback loops

Formal feedback mechanisms

FI LV NL NO

Legislative framework

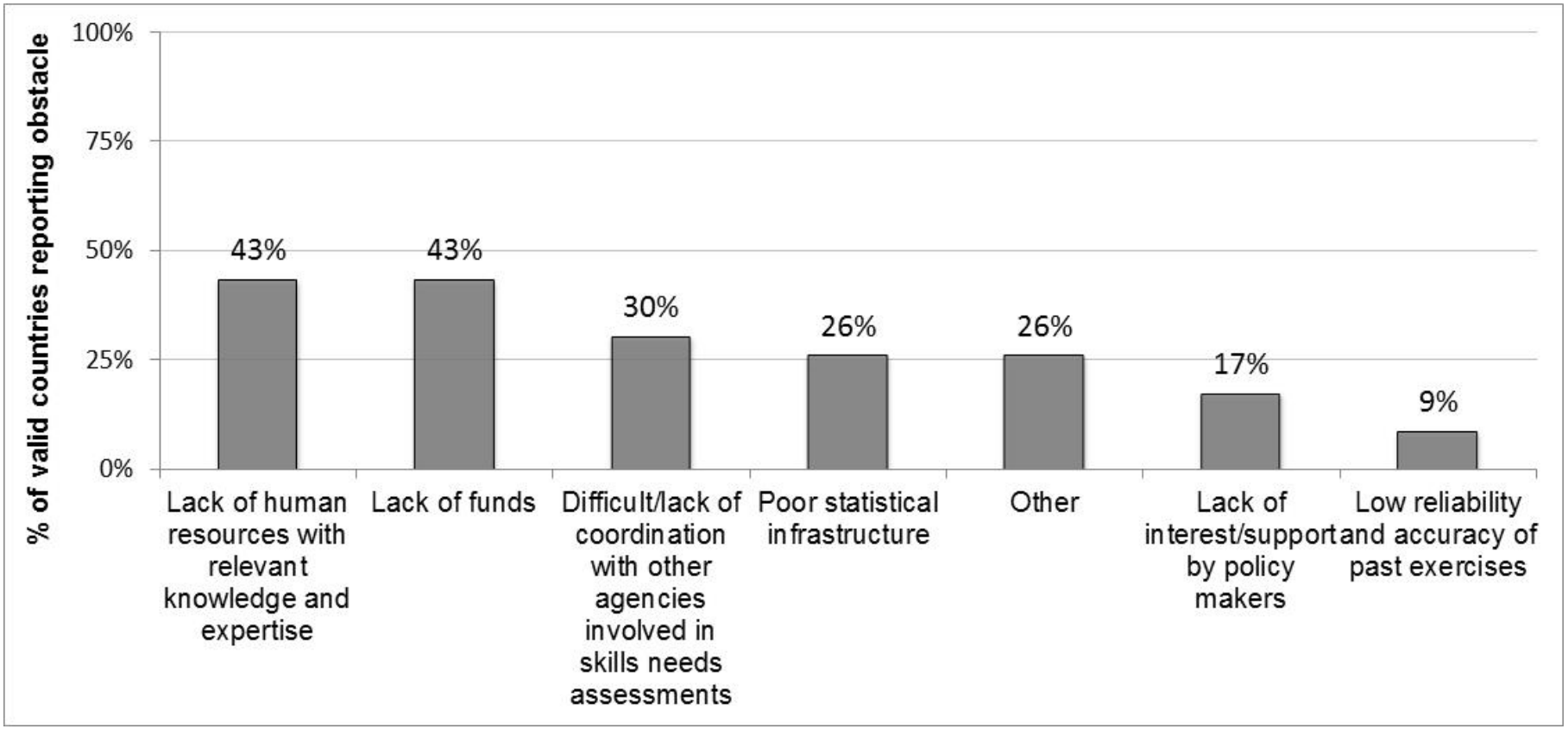
BE -FR EL FR IE SK

Anticipation and monitoring mechanisms as part of 2020 strategies

BE-FR CY RO SK UK-NI

Source: Cedefop based on Refernet

…by overcoming barriers to effective skills governance



Source: Pouliakas and Ranieri (2018) *Handbook of Vocational Education and Training – based on responses to OECD-CEDEFOP-ETF-ILO questionnaire 'Assessing and responding to changing skill needs'*

Cedefop's skills governance framework

history

culture

	Organisation	Resources	Stakeholders	Use of information
Foundations	A Legal and institutional framework	D Funding and human resources	G Cooperation arrangements	J Feedback mechanisms
Processes	B Management and control	E Data, methods and expertise	H Feedback and validation	K Customisation and dissemination
Sustainability	C Vision and strategy	F Stability	I Integration of stakeholder needs	L Reputation

economy

demography

Rewards and risks of online labour

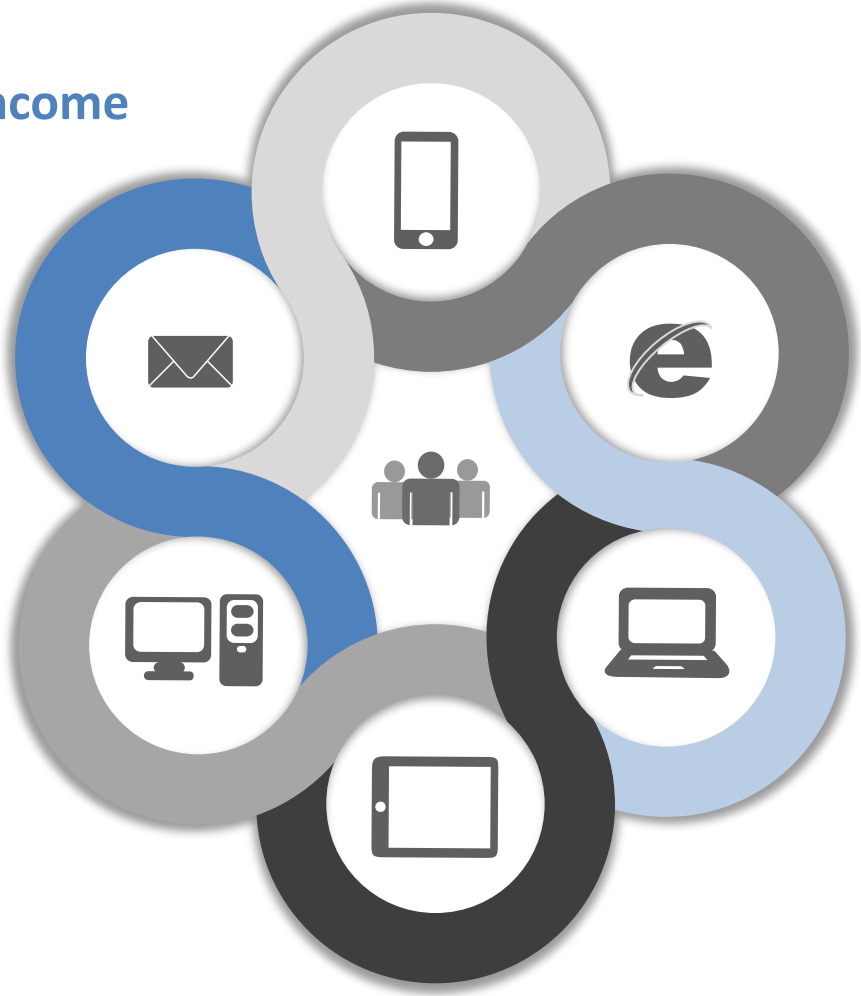
More & diversified income

Flexibility

Creativity

Talent management

Skills matching



Income uncertainty

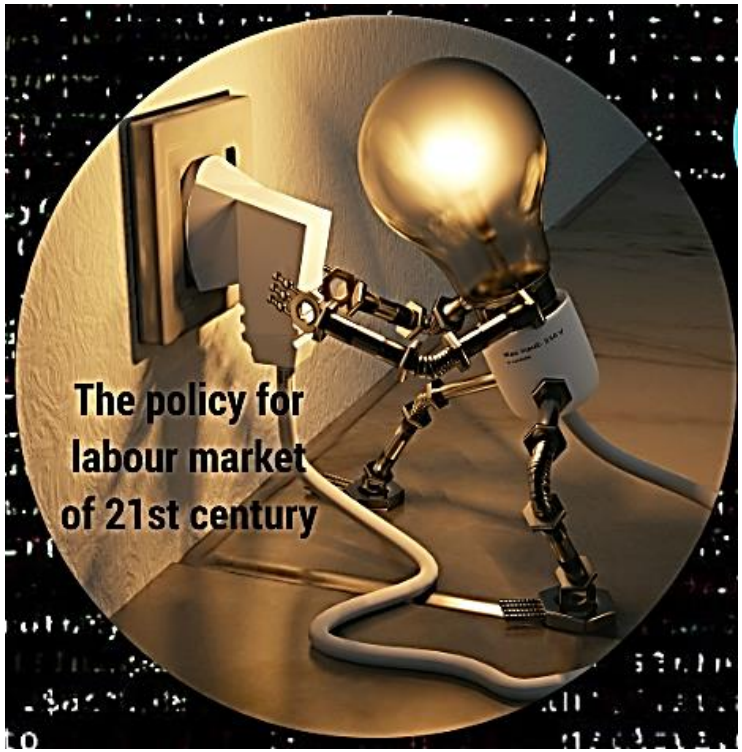
No social safety net

Discrimination

Health and safety

Skill underutilisation

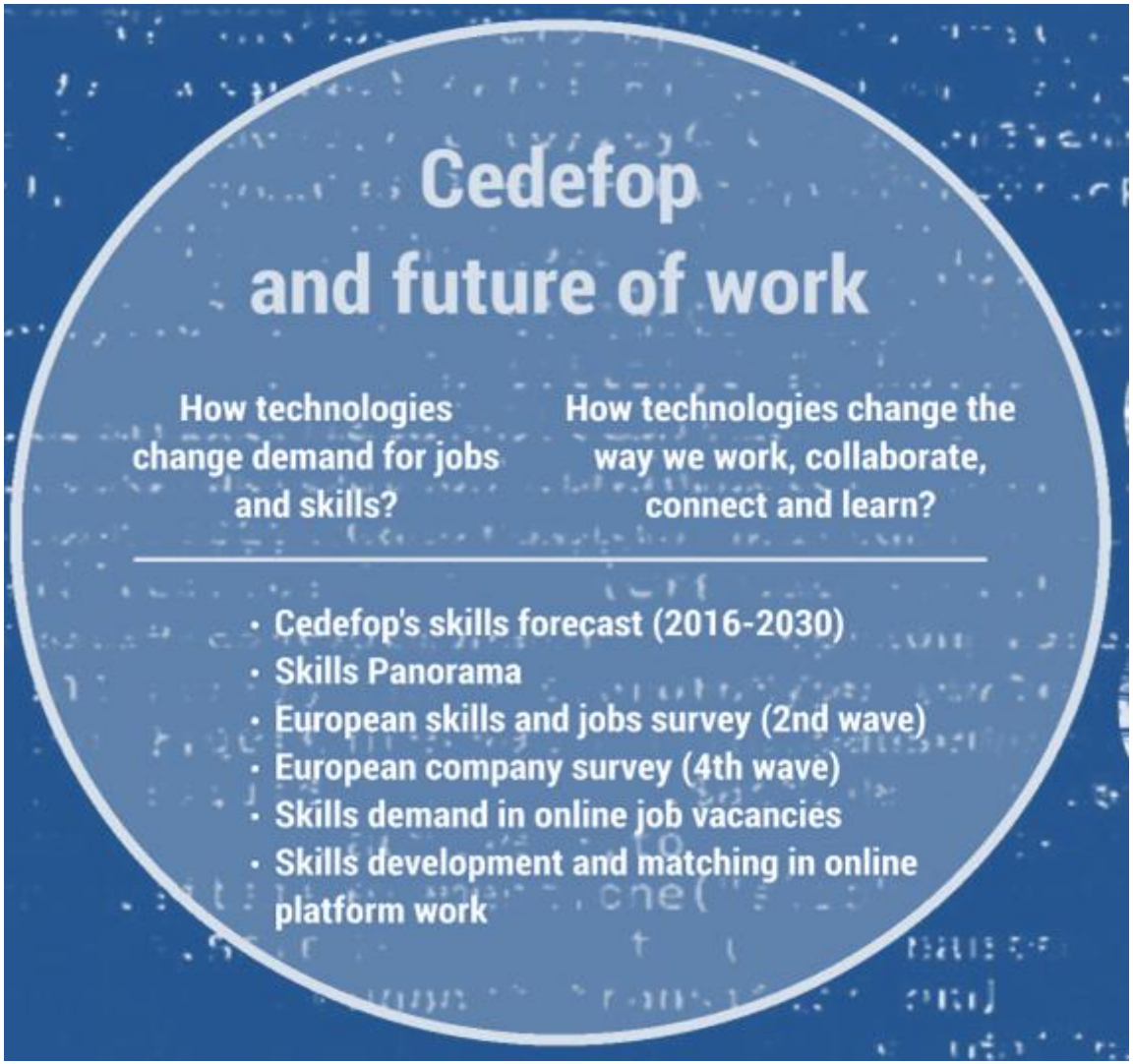
- AI fair, reliable, private, safe, inclusive, transparent, accountable



- A new regulatory model for digital labour

- Upskilling and reskilling…

- …with labour market reforms, innovation/competition policy, social equality



http://www.cedefop.europa.eu/en/events-and-projects/projects/digitalisation-and-future-work

Cedefop's project:

Skills formation and matching ... ... in online platform work (2018-2020)

amazon mechanical turk
Artificial Artificial Intelligence
CrowdFlower
upwork

Skills, careers and learning

- Skills utilization
- Work context
- Motivation & search strategies
- Skills gaps
- Learning and skills development
- Career development

Actors, institutions & policy

- Actors and institutions investing in crowdworkers' skills
- New forms of skills 'signalling'
- Role of commercial entities in certifying skills
- Implications on skills portability
- EU VET/employment policy?

http://www.cedefop.europa.eu/en/events-and-projects/projects/digitalisation-and-future-work

For more information

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