SkiLMeeT

POLICY BRIEF
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Technological Change, Skills Gaps, and Workers' Careers in Europe: Why Updating Skills Matters

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HIGHLIGHTS

- Evidence from the scientific literature and from Project SkiLMeeT shows that new technologies shift demand toward digital, social, and less routine skills; when training content is updated in time, workers benefit, while outdated skill profiles can leave workers behind.
- Regularly updating vocational education and training content is an effective way to reduce skill gaps between the skills employers demand and those supplied by training systems. Technological change does not widen skills gaps when curricula are revised often enough to keep pace. Technological change does, however, make outdated vocational training content more costly.
- The policy priority for Europe should be to strengthen institutions that update skills continuously and inclusively, ensuring that technological progress supports productivity and good career opportunities rather than widening divides between workers with current and obsolete skills.

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1. Why keeping skills up-to-date matters for Europe

Across advanced economies, technological change is reshaping jobs from within occupations, not only by creating and destroying jobs across sectors (Spitz-Oener, 2006; Atalay et al. 2020; Salomons et al. 2025). The scientific literature shows that technological progress changes task content, raises demand for new combinations of skills, and can widen differences in wages and career stability when workers' skills do not keep pace (Deming & Noray, 2020; Guvenen et al., 2020).

For policy makers, the key issue is therefore not simply whether Europe has "enough skills" in aggregate. The more important question is whether education, vocational training, and adult learning systems can update quickly enough so that workers acquire skills that remain relevant as technologies evolve (Vandeplas & Thum-Thysen, 2019; OECD, 2025).

2. What the evidence shows about technological change and skills

The scientific literature points to four robust messages. First, new technologies often reduce the value of labour in routine tasks while increasing the importance of digital, problem-solving, communication, and other complementary skills (Autor et al., 2003; Acemoglu & Autor, 2011; Deming, 2017). Second, much of this change happens within existing occupations, which means workers in familiar jobs may still need new skill bundles (Spitz-Oener, 2006). Indeed, most workers today are employed in detailed job titles that were created only after 1940 (Autor et al., 2024). A clerk, technician, production worker, or care worker may still hold the same occupation label, but the daily tasks increasingly involve digital systems, data handling, coordination, customer interaction, and non-routine problem-solving (Atalay et al., 2020; Autor et al., 2024).

Third, skill mismatch has real career costs. Recent work links mismatch to lower wages, weaker job stability, and more difficult mobility after job loss or displacement (Guvenen et al., 2020; Neffke et al., 2024). Fourth, skill obsolescence is uneven: workers entering the labour market with updated skills to work with new technologies tend to benefit, while incumbent workers with older skill bundles can face losses if they are not supported in adapting (Deming & Noray, 2020; Janssen & Mohrenweiser, 2018; vom Baur, 2026).

3. New evidence from SkiLMeeT: Why curriculum updates matter

SkiLMeeT provides new evidence on the supply side of skills, using the near-universe of German vocational curricula over roughly five decades and linking them to technological change, worker outcomes, and job-ad-based measures of skill demand (Salomons et al., 2025; Jonas et al., 2026).

The first core finding is that technological change does spur updates in training content. Occupations that are more exposed to digital breakthrough technologies are more likely to update their curricula, and they do so sooner (Salomons et al., 2025). The same work shows that updated curricula shift skill supply toward digital and social skills and away from routine-intensive content,

with curriculum updates accounting for about two-thirds of the long-run decline in routine task content in vocational skill supply (Salomons et al., 2025).

The second core finding is that these updates matter for workers' careers. New labour-market entrants trained under updated curricula earn higher wages on average, with wage gains of about 3.3 per cent overall and up to 5.5 per cent for technology-exposed occupations (Salomons et al., 2025). They are also more likely to remain in their trained occupation and to move to better-paying firms, suggesting that updated skills improve both productivity and match quality early in workers' careers (Salomons et al., 2025).

The third finding is more cautionary: not all workers gain automatically. SkiLMeeT finds signs of skill obsolescence among the oldest incumbent workers, with wage declines of more than 3 per cent when new-skilled cohorts enter their occupation, while younger incumbents are more likely to respond by changing occupation (Salomons et al., 2025). This underscores that technological change can deepen career risks when continuing training and mid-career adaptation are too weak.[1]

The fourth finding is directly relevant to current policy debates on skill gaps. Using German job ads over 2017–2025 linked to vocational curricula, SkiLMeeT measures the share of skills demanded by employers but not covered in training curricula (Jonas et al., 2026). It finds that curriculum updates reduce this mismatch by about 4 percentage points relative to comparable occupations without an update, showing that timely curriculum reform is an effective policy tool for narrowing technology-related skill gaps (Jonas et al., 2026).

Importantly, the project does not find that technology-exposed occupations are fundamentally impossible to keep aligned. Rather, they need more frequent updates to stay aligned, because technological change makes skills age faster in those occupations (Salomons et al., 2025; Jonas et al., 2026).

4. Ensuring technological progress benefits workers

For workers, the main lesson is that technological change creates both opportunity and risk. Workers who enter with updated skills are better positioned to obtain higher wages and stronger career stability, but workers relying on older skill bundles may face declining returns unless they can refresh their skills during their careers (Salomons et al., 2025).

This matters especially for Europe's middle-skilled workforce. Many occupations most affected by automation and digitalisation are not disappearing outright; instead, they are being redesigned, often in ways that combine technical capabilities with social and organisational skills. That means the policy challenge is less about replacing whole occupational groups and more about enabling continuous skill renewal within occupations (Atalay et al. 2020; Boustan et al., 2022; Spitz-Oener 2006).

The evidence also suggests that waiting too long is costly: As curricula age, mismatch tends to

1 Such risks are typically highly skewed. For example, Hanushek et al. (2025) show that the distribution of earnings losses after displacement are driven by a small number of workers who suffer catastrophic losses, while most recover quickly.

rise, which means delayed reform allows gaps between training supply and labour-market demand to accumulate (Jonas et al., 2026).

5. A policy agenda for keeping skills aligned with technological change

Policymakers should focus on speeding up skill adaptation, not only on expanding formal qualification levels. Three priorities follow from the evidence.

- Make curriculum updating faster and more systematic. Technology-exposed fields likely need shorter revision cycles, supported by structured monitoring of changing skill needs using sources such as job ads, sector intelligence, and social partner input (Jonas et al., 2026; Guo et al., 2020). Systematic consultation of the firm side, as in the German vocational training system, can help in ensuring curricula stay well matched with firms' skill demands.
- Strengthen lifelong learning for incumbent workers. Initial education reforms help new cohorts, but they do not protect workers already in the labour market whose skills risk becoming obsolete; targeted mid-career training is therefore essential (Deming & Noray, 2020; Salomons et al., 2025).
- Prioritise broad, transferable skill bundles. Digital skills matter, but the evidence also points to rising importance of social, problem-solving, and adaptive skills that help workers move across firms, tasks, and technologies (Deming, 2017).

At EU level, this points to a practical agenda: support Member States in modernising vocational education and training, promote faster diffusion of intelligence on emerging skill needs, and link skills policy more closely to industrial, innovation, and labour-market policy (Vandeplas & Thum-Thysen, 2019; OECD, 2025). Because the gains from innovation depend partly on whether workers can acquire the skills to use new technologies productively, technology and skills policy are best designed together (Acemoglu & Restrepo, 2018; Biasi & Ma, 2023). Targeted, timely revision of training curricula is one concrete lever for that coordination.

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SkiLMeeT



Skills for Labour Markets in the Digital and Green Transition

SkiLMeeT, a three-year project funded by Horizon Europe, aims to advance policy-relevant research that will help leverage the opportunities of the digital and green transition and equip the European workforce with the skills required for the future of work.

SkiLMeeT explores how the digital and green transition is reshaping the demand for skills. We will analyse in detail:

- the extent of skills shortages and mismatches
- the drivers of skills gaps
- strategies to close the skills gaps, including re- and upskilling initiatives



Our project conducts quantitative and qualitative research using innovative data and methods. Throughout the research process, we engage with stakeholders such as trade unions, employers' organisations, and NGOs to ensure that our approach and recommendations are relevant and responsive to the needs of practitioners shaping skills policies.

SkiLMeeT brings together eight institutions from six European countries:

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