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A new future of work: The race to deploy AI and raise skills in Europe and beyond

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At a glance

Amid tightening labor markets and a slowdown in productivity growth, Europe and the United States face shifts in labor demand, spurred by AI and automation. Our updated modeling of the future of work finds that demand for workers in STEM-related, healthcare, and other high-skill professions would rise while demand for occupations such as office workers, production workers, and customer service representatives would decline. By 2030, in a midpoint adoption scenario, up to 30 percent of current hours worked could be automated, accelerated by generative AI. Efforts to achieve net-zero emissions, an aging workforce, and growth in e-commerce as well as infrastructure and technology spending and overall economic growth could also shift employment demand.

By 2030, Europe could require up to 12 million occupational transitions, double the prepandemic pace. In the United States, required transitions could reach almost 12 million, in line with the prepandemic norm. Both regions navigated even higher levels of labor market shifts at the height of the COVID-19 period, suggesting that they can handle this scale of future job transitions. The pace of occupational change is broadly similar among countries in Europe, although the specific mix reflects their economic variations.

Businesses will need a major skills upgrade. Demand for technological and social and emotional skills could rise as demand for physical and manual and higher cognitive skills stabilizes. Surveyed executives in Europe and the United States expressed a need not just for advanced IT and data analytics but also for critical thinking, creativity, and teaching and training—skills they report as currently being in short supply. Companies plan to focus on retraining workers, in addition to hiring or subcontracting, to meet skill needs.

Workers with lower wages face challenges of redeployment as demand reweights toward occupations with higher wages in both Europe and the United States. Occupations with lower wages are likely to see reductions in demand, and workers will need to acquire new skills to transition to better-paying work. If that doesn't happen, there is a risk of a more polarized labor market, with more higher-wage jobs than workers and too many workers for existing lower-wage jobs.

Choices made today could revive productivity growth while creating better societal outcomes. Embracing the path of accelerated technology adoption with proactive worker redeployment could help Europe achieve an annual productivity growth rate of up to 3 percent through 2030. However, slow adoption and slow redeployment would limit that to 0.3 percent, closer to today's level of productivity growth in Western Europe. Slow worker redeployment would leave millions unable to participate productively in the future of work.

1 Context: Labor shortages and a slowdown in productivity growth

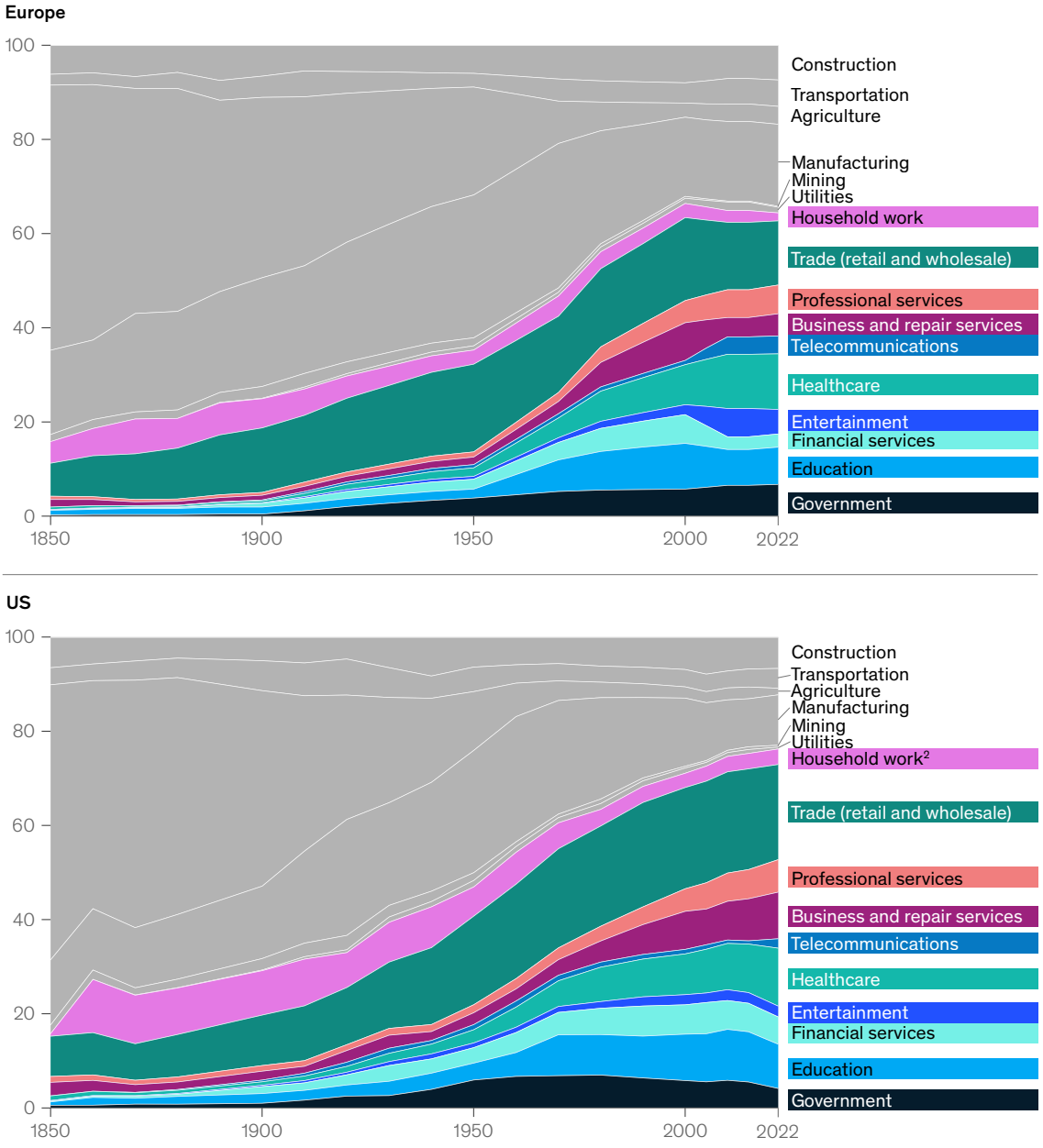
This report focuses on labor markets in Europe and the United States, looking at the next few years to 2030. Technology and other factors will spur changes in the pattern of labor demand, but these expected shifts need to be taken in the context of deep-seated labor market changes already under way. Our study focuses on nine major economies in the European Union along with the United Kingdom (which we refer to collectively in this report as "Europe"), in comparison with the United States.

Structural shifts in labor markets have been ongoing for decades, including the very long-term decline in the share of employment in agriculture, industry, and mining in favor of services (Exhibit 1). More recently, labor markets were buffeted by pandemic shocks that propelled not only faster shifts in hiring needs and more job switching but also new employee preferences such as hybrid work. While COVID-19 exacerbated labor market tightening, Europe's high employment rate, a rapidly aging population, and a steady fall in working hours make continuing shortages of workers and skills a persistent challenge for the future. The burning question that remains is this: to what extent can the forthcoming technological disruption solve labor market challenges in Europe?

Exhibit 1

Employment in Europe and the United States has shifted toward service sectors.

Share of total employment by sector, Europe[1] and US, 1850–2022, %



[1]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[2]Increase from 1850 to 1860 in US primarily due to changes in how unpaid labor was tracked.
Source: Eurostat; Integrated Public Use Microdata Series USA, 2017; Ivan T. Berend, *An Economic History of Twentieth-Century Europe*, Cambridge University Press, October 2016; US Bureau of Labor Statistics

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Europe's future of work unfolds amid labor shortages and a slowdown in productivity growth

In both Europe and the United States, labor market tightness has been on the rise, with unfilled positions on the rise in both regions and unemployment at historically low levels.[1] As populations age on both sides of the Atlantic and the number of hours worked per worker falls, particularly in Europe, labor market tightness is not likely to resolve naturally. In this context, employers are increasingly competing for talent.

The pandemic had additional lasting impacts on workplaces, notably the increased adoption of hybrid work. While about 90 percent of the working population was working fully on-site in 2018, that number dropped to some 60 percent between 2021 and 2022. Since then, the number has stabilized. However, only 40 percent of the 72 minutes saved daily from not having to commute is allocated to work, with the rest mostly allocated to leisure and caregiving.[2] The overall impact on productivity is still being debated.[3]

Overall, in the global economy, productivity is crucial for remaining competitive.[4] When a company becomes more productive, it can produce more or higher-quality goods or services with the same amount of resources. This often leads to lower production costs, allowing companies to remain competitive or even expand. As a result, they may need to hire more workers to meet the increased demand for their products or services. Also, increased productivity in one sector can stimulate job growth in related industries; it boosts innovation and leads to the creation of new job roles in areas such as research and development, engineering, and information technology. Increased productivity would help address labor market challenges, enabling employers to produce more even in tight talent markets, driving economic growth, and creating better-paying jobs with opportunities to build human capital.

Yet Europe has experienced a long-term productivity slowdown, with productivity growth almost steadily decreasing since the 1960s (Exhibit 2).[5] Alongside its divergence in productivity growth relative to the United States, Europe's competitiveness is also waning. The issues appear to be systemic rather than cyclical. European companies lag behind US peers on multiple key metrics, such as return on invested capital, revenue growth, capital expenditure, and R&D. Initial delays in Europe in technology development and adoption help explain this gap, as Europe did not benefit from the information communications and technology–driven productivity advancements that have occurred in the United States since the 1990s. Our previous research indicates that Europe lags behind in eight out of ten key cross-sector technologies where "winner takes most" effects are common, widening the gap between the two regions.[6] The two areas in which European companies still have an edge are cleantech and next-gen materials, the research found.

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1 In third quarter 2023, the unemployment rate stood at 6.0 percent in Europe and 3.7 percent in the United States, compared with a peak of 11.5 percent in Europe in 1994 and 7.5 percent in the United States in 1992. For detailed data, see "Unemployment Statistics," Eurostat, March 2024; "Job Vacancies," Eurostat, March 2024; and "Job Openings and Labor Turnover," US Bureau of Labor Statistics, March 2024.

2 Cevat Giray Aksoy et al., *Time savings when working from home*, National Bureau of Economic Research working paper, number 30866, January 2023.

3 Several studies have associated remote work with productivity decreases ranging from 8 to 19 percent, whereas some reports show a reduction of 4 percent for individual employees. Conversely, other research indicates productivity improvements of 10 percent and more when switching to hybrid work. See, for example, Michael Gibbs, Friederike Mengel, and Christoph Siemroth, *Work from home & productivity: Evidence from personnel & analytics data on IT professionals*, Becker Friedman Institute for Economics at the University of Chicago working paper, number 2021-56, July 2021; Natalia Emanuel and Emma Harrington, *Working remotely? Selection, treatment, and the market provision of remote work*, Federal Reserve Bank of New York staff reports, number 1061, May 2023; Marta Angelici and Paola Profeta, *Smart-working: Work flexibility without constraints*," CESifo working paper, number 8165, March 2020.

4 Assuming constant exchange rates.

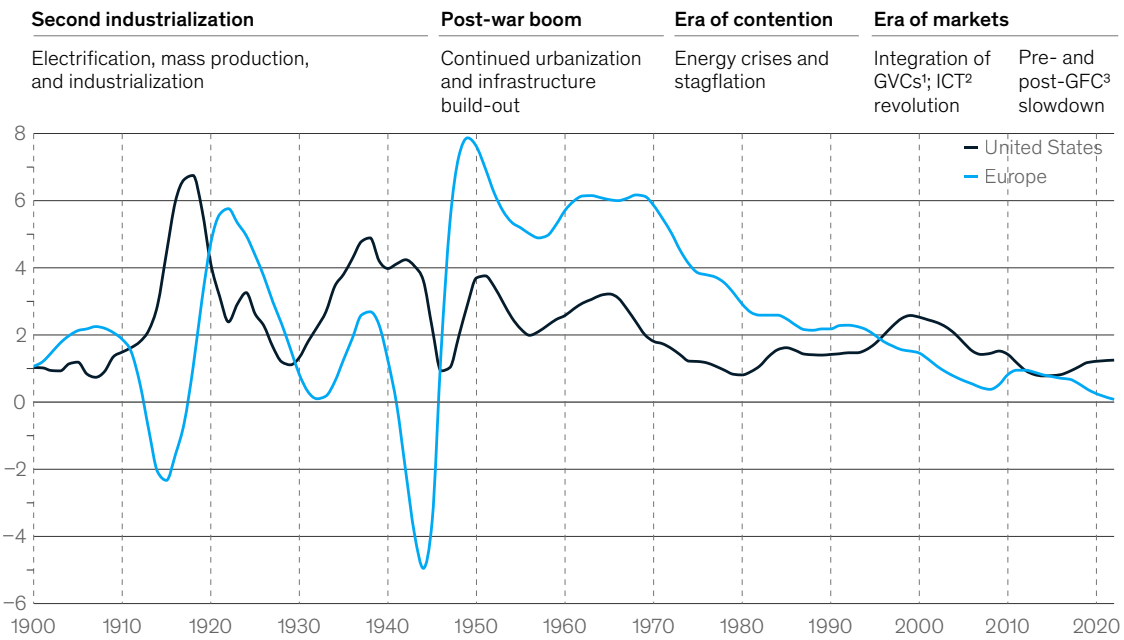
5 "Investing in productivity growth," McKinsey Global Institute, March 1, 2024.

6 "Securing Europe's competitiveness, addressing its technology gap," McKinsey Global Institute, September 22, 2022.

Exhibit 2

European and US productivity growth decreased seven and three percentage points, respectively, between 1950 and 2022.

Labor productivity growth (annual change in GDP per hours worked), % year over year



Note: Productivity is defined as GDP per hour worked, in 2010 dollars, as measured by purchasing-power parity. Calculated using a Hodrick-Prescott filter (λ = 6.25). Europe is calculated using the simple average of France, Germany, Italy, Spain, Sweden, and the United Kingdom. The remaining ten European countries in our analysis were excluded because of data availability issues.
[1]Global value chains.
[2]Information and communication technology.
[3]Global financial crisis.
Source: Antonin Bergeaud, Gilbert Cette, and Rémy Lecat, "Productivity trends in advanced countries between 1890 and 2012," *The Review of Income and Wealth*, September 2016, Volume 62, Number 3; McKinsey Global Institute analysis

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Automation technology has the potential to revive productivity growth, allowing economies to solve most of today's labor market challenges. However, Europe and the United States are not on the same trajectory for capturing this productivity growth: most AI-related innovations are developed in the United States. There are fears in both regions that the adoption of these technologies could prove disruptive to labor markets and exacerbate the challenges of both finding requisite skills in the workforce and enabling workers to move from declining occupations into rising ones.

Workers navigated major changes in demand for work during COVID-19, which resulted in a temporary surge in occupational transitions—a sign that labor markets could successfully adjust to rapid and heightened shifts in the pattern of employment demand. In Europe, some 3 percent of the working population voluntarily or involuntarily exited their occupational categories between 2019 and 2022, more than triple the historical average. In the period between 2019 to 2022, 5.5 percent of the US working population was affected by occupational shifts, 1.5 times the historical average.[7] The occupational shifts in both Europe and the United States have subsequently returned to their historical rate, although some professions continue to be affected, including food service.

[7] Estimates based on US Bureau of Labor Statistics data.

Now, as Europe looks ahead, automation, AI, and other trends present opportunities for higher productivity growth but with faster occupational transitions. Business leaders and policy makers will face critical choices on how much to embrace technological change and investment while training and redeploying workers into the jobs of the future. These choices will determine whether Europe's countries, companies, and labor force can derive the full productivity and human capital benefits of the future of work.

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2 Potential for accelerated work transitions ahead

Demand for labor will continue to evolve over time, affected by structural trends at play in Europe and the United States. Foremost among these is the expected advancements in technology, especially AI, which could accelerate productivity growth and alter labor demand. Structural factors such as the aging workforce and rising healthcare needs, particularly pronounced in Europe, and additional priorities such as climate change will also reshape demand for workers. Additionally, some trends that were boosted by the pandemic are likely to endure, including the growth in e-commerce and the switch to remote work.

These trends represent opportunity for productivity growth but also underscore the need for workers to transition from declining occupations to rising ones. In Europe, by our estimates, a faster technology adoption scenario could be associated with productivity growth of roughly 2 to 3 percent per year, requiring some 12 million occupational transitions, or roughly double the pace of occupational shifts in the prepandemic period. In the United States, with its more dynamic labor market, the trend would be closer to the historical norm, but automation adoption could accelerate further after 2030 in both regions. While the scale of occupational transitions may appear daunting, both Europe and the United States navigated even higher levels of labor market shifts during the pandemic, signaling the potential to handle future transitions as well.

In this chapter, we outline how demand for labor could evolve and require accelerated occupational transitions in the coming years, considering a range of scenarios to reflect the uncertainties around pace of technology adoption (see Box 1, “Our methodology for estimating occupational transitions”).

Box 1

Our methodology for estimating occupational transitions

We used methodology consistent with other McKinsey Global Institute reports on the future of work, dating back to 2017, to model trends of job changes at the level of occupations, activities, and skills.[1] For this report, we focused our analysis on the 2022–30 period. We also considered how automation adoption could evolve beyond 2030 to 2035.[2] The drivers of the model have been updated accordingly.

Our model differentiates between employment demand and occupational transitions. For the first, it estimates net changes in employment demand by sector and occupation; for the second, it estimates the net decline in occupations across sectors compared with the 2030 baseline. When counting transitions, we do not include gains in this calculation to avoid double counting.

In this report, we focus our analysis on Europe and the United States. For Europe, we included ten countries: nine EU members that together represent 75 percent of the European working population—the Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, and Sweden—and the United Kingdom. In this report, numbers referring to "Europe" correspond to the total estimates for these ten focus countries, which were analyzed individually. Numbers have not been extrapolated to the full European working population. For the United States, we build on estimates published in our 2023 report *Generative AI and the future of work in America*.[3]

To understand the impact of automation and overall potential changes in demand in each occupation, we included multiple drivers in our modeling: automation adoption, net-zero transition, e-commerce growth, remote work adoption, increases in income, aging populations, technology investments, infrastructure investments, marketization of unpaid work, new jobs, and increased educational levels.

A critical driver of occupational transitions is the rate at which automation, AI, and generative AI (gen AI) will be adopted (exhibit). Two scenarios are used to bookend the work-automation model: "late" and "early." The "early" scenario flexes all parameters to the extremes of plausible assumptions, resulting in the fastest pace of automation development and adoption, and the "late" scenario flexes all parameters in the opposite direction. The reality is likely to fall somewhere between the two.[4]

For this report, we have modeled region-specific scenarios:

- For Europe, we modeled two outcomes: a "faster" scenario and a "slower" one. For the faster scenario, we use the midpoint—the arithmetical average between our late and early scenarios. For the slower scenario, we use a "mid late" trajectory, an arithmetical average between a late adoption scenario and the midpoint scenario. We model this slower, mid-late scenario for Europe because achieving the faster, midpoint scenario by 2030 would require an occupational transition rate significantly higher than seen in Europe's recent prepandemic past.
- For the United States, we use the midpoint scenario, based on our earlier research. This is an arithmetical average between our late and early scenarios of automation technology adoption.

We also estimate the productivity effects of automation, using GDP per full-time-equivalent (FTE) employee as the measure of productivity. We first calculated automation displacement under different scenarios by multiplying the projected number of FTEs by the estimated automation adoption rate for each occupation in each country. We considered only job activities that are available and well defined as of the date of this report. Also, to be conservative, we assumed automation has a labor substitution effect but no other performance

[1] The modeling examines more than 850 unique occupations, more than 2,000 different activities, and 18 technical capabilities for each activity. We also leveraged the framework devised in MGI's 2018 report *Skill shift: Automation and the future of the workforce*. For more detail, see the technical appendixes in *A future that works: Automation, employment, productivity*, McKinsey Global Institute, January 2017.

[2] For 2035, we modeled only the potential automation adoption rates for each occupation, not the occupational transitions required.

[3] For more, see "Generative AI and the future of work in America," McKinsey Global Institute, July 26, 2023.

[4] "The economic potential of generative AI: The next productivity frontier," McKinsey, June 14, 2023.

gains. We assumed that workers displaced by automation rejoin the workforce at 2022 productivity levels, net of automation.

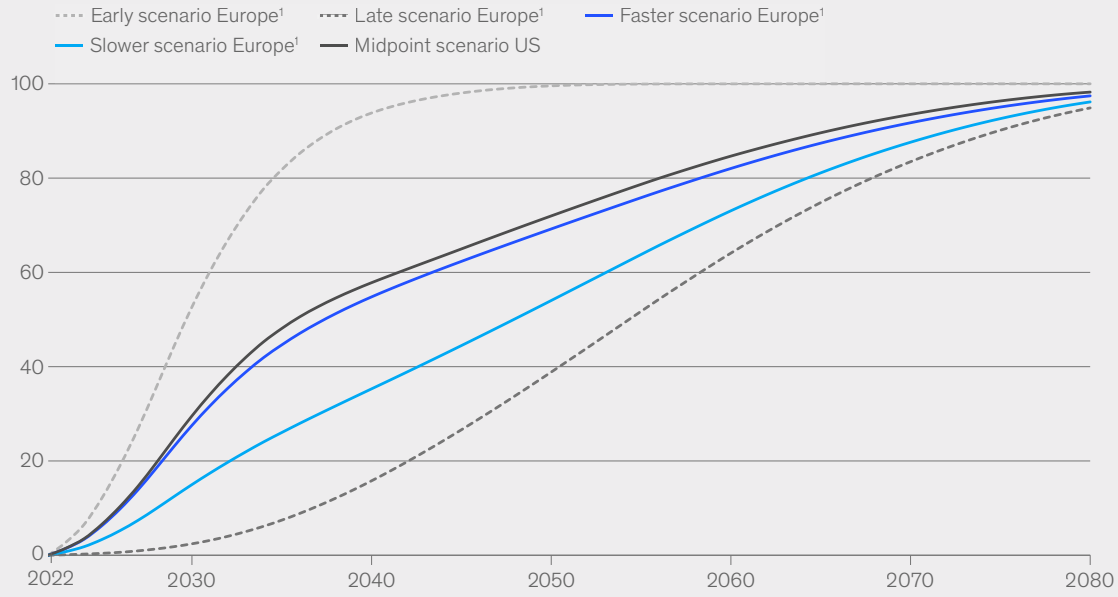
Our main sources of data are national and regional labor surveys. For the United States, we used data from the Current Population Survey, conducted by the US Census Bureau for the US Bureau of Labor Statistics. For Europe, we used data from the Labor Force Survey carried out by the European Commission and local labor agencies' data. As described in chapter 4, we also conducted a survey of more than 1,100 executives in five countries.

Our model has some important uncertainties and limitations. First, structural attributes—such as management–employee relations, the regulatory and investment framework, and current AI and innovation momentum—would affect which scenario evolves. Second, labor demand could shift based on macroeconomic shifts in consumption due to changes in prices and costs, which our model does not account for. Indeed, as automation increases productivity and income and lowers costs and the prices of goods and services, it could shift consumption, and thus labor demand, in unanticipated ways. In the literature, this specific impact of automation has been framed as the "deflationist" nature of technology adoption. Rapid adoption of technology could therefore establish a new equilibrium of demand. Third, the shifts we model are the ones broadly anticipated given the underlying base and current momentum of economies. We do not model changes in industrial production, trade, or labor migration that may be driven by geopolitical, climatic, or social factors, for example.

Exhibit

Europe has varying automation adoption scenarios through 2030.

Automation of current work activities, % of working hours modeled to be automated, with generative AI acceleration, Europe[1] and the US, 2022–80



Note: The range of scenarios represents uncertainty regarding the availability of technical capabilities, based on interviews with experts and survey responses. The early scenario makes more-aggressive assumptions for all key model parameters (technical potential, integration timeline, economic feasibility, and regulatory and public adoption). The "faster" or midpoint adoption scenario is the average between the early and late scenarios. The "slower" scenario is the average between the late scenario and the midpoint scenario.
[1]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
Source: Eurostat; Occupational Information Network; Oxford Economics; US Bureau of Labor Statistics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

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As technology reshapes work, demand is changing for a wide range of occupations

Our analysis suggests that demand for some occupations could grow sharply by 2030. In our faster, midpoint technology adoption scenario, demand for STEM and health professionals would grow by 17 to 30 percent between 2022 and 2030, adding seven million positions in Europe and an additional seven million in the United States. Despite the surge in tech sector layoffs in 2023 and the potential of generative AI (gen AI) to augment tasks such as coding, the broader, long-term demand for tech talent could remain robust across businesses of every size and sector in an increasingly digital economy (Exhibit 3). Similarly, demand for health aides, technicians, and wellness workers could continue growing by 25 to 30 percent between 2022 and 2030, adding 3.3 million positions in Europe and 3.5 million in the United States.

By contrast, demand for workers in food services, production work, customer services, sales, and office support—all of which declined over the 2012–22 period—could continue to decline until 2030.[8] These jobs involve a high share of repetitive tasks, data collection, and elementary data processing—all activities that automated systems can handle efficiently. In all, our analysis suggests that this could lead to decreases in demand for these positions of between 300,000 and 5.0 million positions in Europe and 0.1 million to 3.7 million positions in the United States.

Demand for other occupations would remain in line with overall demand growth. This includes positions for educators and workforce trainers in Europe and includes businesses and legal professionals, as well as community services workers, in the United States. Demand for occupations such as management, construction, creative and arts management, and transportation services is expected to increase by about 8 to 9 percent.

Our analysis highlights some differences between Europe and the United States in the occupations with growing or diminishing demand. Those differences are a result of the differences in occupational composition between the two regions, as well as cultural specificities. For example, the greater share of public employment in Europe, especially in administrative activities, may reduce the impact of the expected disruption on these workers for the coming years. Understanding the nuances of how this might play out and who might be affected is critical to ensuring a smooth transition for individuals and businesses alike.

[8] Examples here include cashiers, call-center representatives, tellers, and guest service agents.

Exhibit 3

Demand for healthcare and STEM roles could grow, while demand for office support and customer service roles could decline.

Net expected change in labor demand, Europe[1] and US, faster/midpoint scenario,[1] 2022–30

	Europe[2]		US	
Occupational category	**Employment change vs 2022,** million	**Employment change vs 2022, %**	**Employment change vs 2022,** million	**Employment change vs 2022, %**
Health aides, technicians, and wellness	3.3	25.2	3.5	29.7
STEM professionals	2.3	16.7	1.8	23.1
Health professionals	1.5	23.6	2.0	30.1
Managers	1.1	9.1	1.1	11.3
Business or legal professionals	1.0	6.9	1.1	6.6
Builders	0.7	6.9	0.8	11.9
Transportation services	0.5	7.9	0.5	9.5
Property maintenance	0.4	5.3	0.5	10.3
Creatives and arts management	0.4	8.6	0.2	10.7
Community services	0.3	3.5	0.4	6.6
Educator and workforce training	0.2	1.6	0.3	2.6
Mechanical installation and repair	0.1	1.2	0.5	7.0
Agriculture	−0.2	−3.8	0	2.3
Food services	−0.3	−3.3	−0.3	−1.9
Production work	−0.9	−5.3	−0.1	−0.7
Customer service and sales	−1.7	−12.1	−2.0	−13.4
Office support	−5.0	−18.3	−3.7	−18.5

[1]For Europe, we used the "faster" scenario, which corresponds to the "midpoint" scenario in the United States. The "faster" or midpoint adoption scenario is the average between the early and late scenarios. The "slower" scenario is the average between the late scenario and the midpoint scenario.
[2]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
Source: Eurostat; Occupational Information Network; Oxford Economics; US Bureau of Labor Statistics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

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Some 12 million occupational transitions may be needed in both Europe and the United States by 2030

Our analysis finds that in our faster automation adoption scenario, some 12.0 million occupational transitions would be needed by 2030 in the ten European countries, affecting 6.5 percent of the current employed workforce.[9] Under the slower scenario, the number of occupational transitions needed would amount to 8.5 million in Europe, affecting 4.6 percent of the current employed workforce. In the United States, the figures for the midpoint scenario we use (which corresponds to the faster European scenario) are 11.8 million occupational shifts, affecting 7.5 percent of the current employed workforce.

The range of outcomes for Europe from the two scenarios reflects different potential for the number of work hours that could be automated, thereby affecting both potential productivity gains and the number of occupational transitions that might be needed. A failure to achieve the faster-paced adoption model would mean fewer occupational transitions are needed. But it would also mean failing to achieve some significant productivity gains in the period to 2030.

Occupational transitions would need to roughly double in Europe but return to their historical level in the United States

The pace of change in required occupational transitions is uneven between Europe and the United States. Europe could experience a stark acceleration in the pace of occupational change needed in both the faster and slower scenarios, with the number rising to between 1.1 million and 1.5 million occupational transitions annually between 2022 and 2030. That is 1.6 to 2.2 times the historical 2016–19 rate, before the COVID-19 pandemic, indicating a potential doubling of this measure of change in the European employment market. By contrast, in the United States, the number of occupational transitions needed annually between 2022 and 2030 could reach 1.5 million, our analysis suggests (Exhibit 4). This would be slightly lower than the historical 2016–19 rate. The difference arises mainly because of the historical dynamism of the US employment market, which sees about 1.2 percent of the US workforce shifting occupations every year. In comparison, just 0.4 percent of the European workforce shifted occupations annually between 2016 and 2019.

The potential pace of yearly occupational changes needed from 2022 to 2030 is lower than those experienced by both regions during the COVID-19 pandemic from 2019 to 2022. In Europe and the United States, occupational shifts during the pandemic increased significantly, reaching 2.2 million in Europe and 2.9 million in the United States each year, or 1.2 percent and 1.8 percent of their respective workforces. The changes to labor markets in Europe and the United States caused by COVID-19 were both rapid and wrenching, but both regions adapted to them, suggesting that they have the potential to respond effectively to disruptions brought about by AI, automation, and other drivers of change in labor demand.[10]

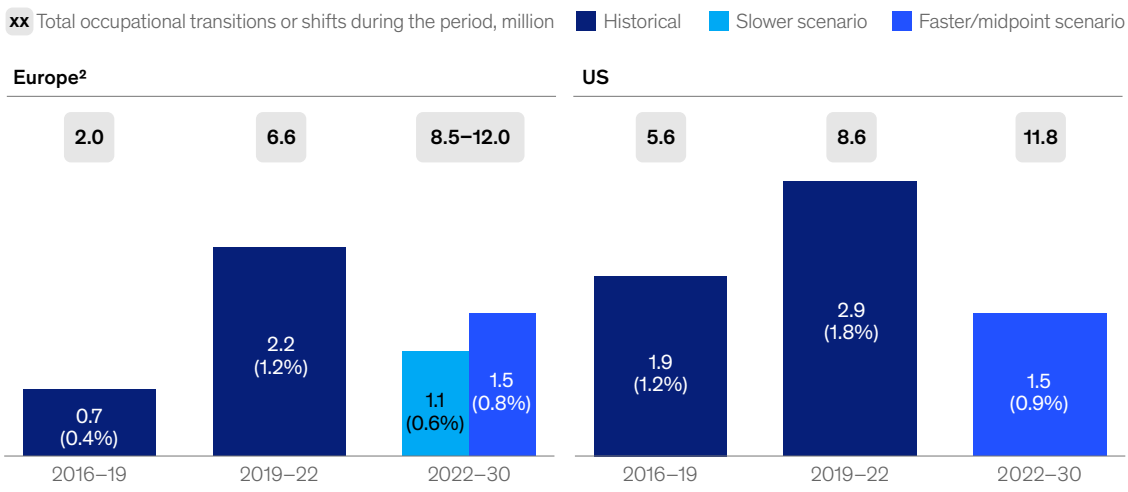
[9] Here, "occupational transition" refers to an individual's move from one occupation to another, as distinct from regular employment churn, which includes the movement of individuals between businesses to perform the same occupation.

[10] A large share of occupational transitions that occured during COVID-19 were voluntary. This may not be the case with future ones.

Exhibit 4

Europe may need faster occupational transitions relative to the past, while the United States could return to its prepandemic pace.

Occupational shifts, 2016–19 and 2019–22, and anticipated occupational transitions, 2022–30, slower, faster/midpoint,[1] yearly average



Example occupational categories with highest transitions or shifts in respective time periods

- Agriculture
- Property maintenance
- Community services
- Production work
- Office support

- Agriculture
- Property maintenance
- Community services
- Production work
- Customer service and sales

- Office support
- Customer service and sales
- Production work
- Food services
- Mechanical installation and repair

- Office support
- Production work
- Customer service and sales
- Mechanical installation and repair
- Builders

- Food services
- Customer service and sales
- Office support
- Production work
- STEM professionals

- Office support
- Customer service and sales
- Production work
- Food services
- Business or legal professionals

Note: "Occupational shifts" refers to net declines in employment in specific occupations in 2016–19 and 2019–22. However, we do not know exactly how individuals moved from one occupation to another or if they made multiple moves; for that reason, we refer to the number of occupational shifts rather than specifying the number of workers making those changes. Transitions are calculated where there is a decline in net demand for an occupation and employees of that workforce would have to leave for another occupation. Even in categories that are growing overall, employment may decline in specific occupations, requiring some workers to find new roles. People joining a new occupation are not counted toward transitions, to avoid double counting.
[1]For Europe, we used the "faster" scenario, which corresponds to the "midpoint" scenario in the United States. The "faster" or midpoint adoption scenario is the average between the early and late scenarios. The "slower" scenario is the average between the late scenario and the midpoint scenario.
[2]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
Source: Eurostat; Occupational Information Network; Oxford Economics; US Bureau of Labor Statistics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

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About 30 percent of current work activities could be automated by 2030, accelerated by gen AI deployment

The automation of work is the predominant driver of the need for occupational transitions by 2030, our analysis finds. Automation and AI technologies have already changed the way people work and will continue to do so. More recently, the emergence of gen AI and the rapid spread of solutions such as ChatGPT are likely to mark a paradigm shift in the automation of work activities, since this technology significantly accelerates the automation potential of complex and cognitive tasks once thought to be the sole domain of human judgment.[11]

Our analysis finds that, with gen AI, 27 percent of the hours worked in Europe and 30 percent of hours worked in the United States today could be automated by 2030, based on a midpoint adoption scenario (Exhibit 5).[12] By 2035, these figures could rise to 45 percent in Europe and 48 percent in the United States—reflecting a continuing increase of automation potential in the coming decade. (Our model suggests that many hours worked would still be automated even without gen AI but fewer than with it: 20 percent in Europe and 21 percent in the United States by 2030.)

With gen AI, 27 percent of the hours worked in Europe and 30 percent of hours worked in the United States today could be automated by 2030, based on a midpoint adoption scenario.

[11] McKinsey has published extensively on gen AI and its potential uses. See, for example, "The economic potential of generative AI: The next productivity frontier," McKinsey, June 14, 2023.

[12] Hours worked refers to hours worked on specific activities in today's economy. Automation adoption is derived from automation potential, which is the theoretical maximum that could be automated, considering current technological capabilities. The pace of actual adoption typically lags behind technical potential. It is affected by the time needed for solution integration, whether it is economically feasible to replace human labor with technology, and multiple other barriers such as customer acceptance, labor laws, and companies lacking the right workforce skills.

Exhibit 5

With a boost from generative AI, up to 30 percent of work hours could become automated by 2030 in Europe and the United States.

Automation adoption,[1] Europe[2] and US faster/midpoint scenario, 2030, % as a share of time spent on current work activities

◆ Automation adoption without generative AI, %
◆ Automation adoption with generative AI, %
xx Acceleration in automation adoption from generative AI, percentage points

		Europe[2]			US		
		Automation adoption, %		2022 employment, million	Automation adoption, %		2022 employment, million
Highly accelerated	Educator and workforce training	6	15	11.6	7	16	9.9
	STEM professionals	13	14	14.0	14	16	7.9
	Creatives and arts management	9	13	4.1	10	15	2.2
	Business or legal professionals	13	13	14.9	16	14	16.0
	Community services	18	8	8.8	19	9	6.8
	Office support	29	8	27.1	31	7	20.1
	Managers	12	7	12.4	14	9	9.7
	Property maintenance	13	7	7.9	12	6	4.6
	Builders	24	6	9.7	26	6	7.0
	Mechanical installation and repair	27	6	6.1	28	5	6.6
	Production work	31	5	16.6	31	4	13.3
	Food services	32	5	8.5	32	5	13.7
	Transportation services	19	5	6.3	21	5	5.6
	Health professionals	11	5	6.3	12	6	6.5
	Customer service and sales	21	5	14.0	23	6	14.7
	Agriculture	26	4	4.1	27	3	2.1
Moderately accelerated	Health aides, technicians, and wellness	14	3	12.9	16	4	11.6
	All occupational categories[3]	20	8	**185**	21	8	**158**

Note: Figures may not sum, because of rounding.
[1]Midpoint automation adoption is the average of early and late automation adoption scenarios as referenced in "The economic potential of generative AI: The next productivity frontier," McKinsey Global Institute, June 14, 2023. The "slower" scenario is the average between the late scenario and the midpoint scenario.
[2]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[3]Totals are weighted by 2022 employment in each occupation in respective occupational categories.
Source: Eurostat; Occupational Information Network; Oxford Economics; US Bureau of Labor Statistics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

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The potential for automation varies greatly across occupations. With the integration of gen AI, STEM professionals in Europe could see automation of the percentage of hours worked more than double, from 13 percent to 27 percent. Automation of hours worked for roles in education and workforce training could more than triple, from 6 percent without integration of gen AI to 21 percent with it.

Gen AI could also extend automation's influence into areas requiring imagination, creativity, and critical judgment. For example, the creative and arts sectors, typically associated with a high degree of human originality and innovation, face a possible increase in the proportion of hours worked from 9 percent being automated without gen AI to 22 percent with it. Similarly, the automation adoption of business and legal professions could rise from 13 percent without gen AI to 26 percent with it.

In evaluating the impact of automation technologies, the technical ability of machines is not the only factor. Complementarity between the worker and the technology—notably AI—will be decisive in propelling adoption. The concept of complementarity, although not the focus of our report, is critical for the future of work. As discussed in a recent report by the International Monetary Fund (IMF),[13] AI complementarity measures the extent to which technologies can support workers in their tasks (expanding human labor without replacing it). Complementarity varies across different types of occupations, measured through the technicality of applying AI as well as social acceptability.

These insights suggest a considerable shift toward embracing gen AI across the board and automation of work hours more broadly. However, our analysis also indicates that the effect of gen AI on the workforce is not linear and uniform but nuanced and occupation-specific (see Box 2, "What could hinder technology adoption including AI?").

[13] Mauro Cazzaniga et al., *Gen-AI: Artificial intelligence and the future of work*, IMF, January 2024.

Box 2

What could hinder technology adoption including AI?

Numerous factors might hinder the estimated growth of AI and generative AI (gen AI) that underpins our analysis in this report.

On the demand side, the integration of automation, AI, and gen AI into existing systems could take longer than expected if companies struggle to pinpoint effective applications or lack relevant workforce expertise. Furthermore, the costs associated with developing and deploying these technologies may escalate if there are shortages in computing power or energy resources. Another potential challenge is the sustainability of wage increases due to labor augmentation, which could impede further technological uptake. Finally, customer acceptance and other factors including social, political, or regulatory developments that we have not explicitly modeled, may need to be considered, as AI-fueled automation may require behavioral changes in some cases—for example, customers may need to accept that they will not speak to human agents during customer support calls. A perception of lacking risk management by AI suppliers could also hinder customer acceptance.

On the supply side, technological advancements may stall, especially if adoption rates fall short of expectations or if other factors impede technological development. For example, physical constraints on energy supply could pose significant barriers to the rapid increase in computing demands: AI and deep learning models require substantial computational power (approximately 40 percent of data centers' electricity consumption is dedicated to computing). The International Energy Agency (IEA) estimates in a high-case scenario that the amount of electricity data centers consume could more than double from 2022 to 2026, from 460 terawatt-hours to about 1,000.[1]

[1] "Electricity 2024," IEA, 2024.

Net-zero actions, aging demographics, and e-commerce will also affect employment demand

Among other trends that will affect labor markets in Europe and the United States in the years ahead, we focus here on three: the impact of the push to achieve net-zero emissions, changing demographics, and the rise of e-commerce.

Net-zero actions could increase demand for work and lead to occupational transitions in both Europe and the United States

Europe and the United States have committed to achieving net-zero emissions by 2050 with interim targets of reducing emissions 55 percent and 50 percent, respectively, by 2030.[14] EU countries have also committed to binding principles affecting almost all sectors by 2030 in the Fit for 55 package of measures.[15] Along with heightened regulation, the European Union is emphasizing sustainable spending and aims to mobilize a minimum of €1 trillion in green investments by 2030.[16] In the United States, the Inflation Reduction Act has boosted green spending, allocating approximately $400 billion toward green initiatives.[17]

These regulatory and investment commitments to the net-zero transition could lead to structural shifts in the labor market by 2030. To estimate the effect of the net-zero transition, we built on previous McKinsey research[18] assessing the global impact through 2050 with regional deep dives on the European Union and the United States, using the Net Zero 2050 scenario from NGFS.[19]

Our analysis suggests that the net-zero transition in Europe could result in 3.0 million gross displacements by 2030 through direct and indirect effects across the economy and driven by lower demand for jobs in carbon-intensive industries such as oil, gas, and coal. These losses could be offset by the potential gross gains of 4.5 million to 5.0 million jobs, primarily led by fields such as renewable-power generation and storage, construction, and electric vehicles. In the United States, our analysis suggests that the transition could result in gross displacement of some 3.5 million positions through direct and indirect effects across the economy. But these losses should be more than offset by the gains of 4.2 million jobs.

Capital spending to build low-emissions facilities and to retrofit existing infrastructure is expected to drive much of the demand. In the power sector, in both the European Union and the United States, our analysis suggests that about a million new jobs (gross) could be added by 2030, boosted mainly by new employment in solar and wind power, with a share of these power jobs involving manufacturing and installing new infrastructure. Retrofitting homes and commercial buildings with green heating and improved insulation systems could add a gross 500,000 to one million jobs in the buildings sector in both regions. Some of these shifts are already playing out: in the United States, the solar industry employs twice as many workers as the coal industry.[20]

[14] "The European Green Deal: Striving to be the first climate-neutral continent," European Commission, accessed May 1, 2024; *The long-term strategy of the United States: Pathways to net-zero greenhouse gas emissions by 2050*, US Department of State and US Executive Office of the President, November 2021.
[15] "Fit for 55," European Council, accessed May 1, 2024.
[16] "Europe's one trillion climate finance plan," European Parliament, updated June 2021.
[17] "The Inflation Reduction Act: Here's what's in it," McKinsey, October 2022.
[18] "The net-zero transition: What it would cost, what it could bring," McKinsey Global Institute, January 2022.
[19] Net Zero 2050 scenario using REMIND MAgPIE 2.1-4.1, NGFS, accessed May 1, 2024. For details, see the technical appendix.
[20] "National solar jobs census 2021," Interstate Renewable Energy Council, July 2022.

Some countries with high concentrations of jobs in affected industries may experience bigger shifts. For example, Poland and other countries in Central and Eastern Europe that have strong legacies of coal mining and power generation may face higher levels of occupational transitions. At the same time, the emergence of new industries such as hydrogen and biofuels could create new industrial hubs in areas where sustainable and low-priced electricity will be available. For example, Spain could become a competitive producer of green hydrogen, leveraging its historical leadership in wind energy (with about 30 gigawatts installed capacity) and solar resources.[21]

With aging demographics and higher spending, demand for healthcare-related services could significantly increase

Developed countries are already demanding more healthcare-related services. This trend is expected to continue and accelerate in the coming years. Two drivers behind this acceleration are the aging population and surging healthcare spending.

In the ten European countries that are the focus of this report, the elder population—that is, people over age 65—almost doubled between 1980 (43 million) and 2022 (82 million). In the same period in the United States, the elder population more than doubled, from 24 million to 57 million. While growth is expected to slow slightly in both regions in coming years compared with the past decade, the increase in the elder population will still be significant, amounting to 94 million people in the ten European focus countries in 2030 (18 percent of the overall population) and 70 million people in the United States (19 percent of the population) in the same period.[22] This in turn will drive demand for healthcare.

A surge in per capita spending on healthcare will also lift the demand for healthcare services. Historically, the United States has spent more on healthcare per capita than Europe and has increased its spending at a faster rate. While per capita healthcare spending in the United States is higher than in Europe, the acceleration could be steeper in Europe, with spending growing at an annual average rate of 6.5 percent between 2022 and 2030, compared with 2.4 percent annually in the United States, according to our analysis.

E-commerce is among factors that could affect occupational transitions

E-commerce exploded during the COVID-19 pandemic, and it could continue to affect labor demand and drive occupational transitions. Its continued growth will likely increase demand for logistics and warehousing workers but could decrease demand for in-store occupations. Our analysis suggests that this trend could be broadly similar across Europe, with decreases in labor demand in traditional retail balanced by a similar scale of increase in e-commerce.

[21] "Net-zero Spain: Europe's decarbonization hub," McKinsey, September 23, 2022.

[22] The elder population would increase by 1.6 percent annually in Europe and by 2.6 percent in the United States between 2022 and 2030, compared with 1.8 percent in Europe and 3.2 percent in the United States between 2012 and 2022. For details, see "Population data," OECD, accessed May 3, 2024; and "Healthcare spending projections," IMF, accessed May 3, 2024.

3 The varied geography of labor market disruptions

The scale of the occupational transitions required is roughly on the same order of magnitude across economies, but the specifics vary depending on each region's economic structure—that is, differences in sectoral structure and occupational mix. The impact of automation and the other trends we used in our modeling reflect this. Nonetheless, there are notable differences in the mix of occupations affected in each country. In this chapter, we highlight those differences, with a focus on Europe.

The scale of occupational transitions required is similar across countries, but their mix differs

For Europe, our analysis indicates that the impact of occupational transitions between 2022 and 2030 will range quite narrowly, from a net 6.0 percent of employment in transition across occupations in the United Kingdom to 7.4 percent in Sweden—relatively small differences over an eight-year period. Yet a closer look at how labor market trends will affect each country reveals some local divergences, notably in the mix of occupations likely to be affected (Exhibit 6). Such variations are driven by two considerations. First, differences in the structure of employment, such as the preponderance of certain sectors, determine the share of the workforce in occupations likely to be disrupted. For example, the share of employment in occupations with high technical automation potential—those involving more routine predictable tasks or more advanced work that gen AI technologies can perform—varies across economies. Additionally, some types of work are more susceptible to dislocation due

to net-zero actions; countries heavily invested in the oil, gas, and coal sectors, for example, could have a higher concentration of occupational transitions. Second, wage levels vary among countries.[23] Within the same occupation, countries with higher wages could have more occupational transitions because higher wages give companies an economic incentive to automate.

Office support, production work, and agriculture—all of which would see a decrease in labor demand, according to our analysis—exemplify the regional variations in occupational transitions ahead.

— *Office support.* Occupational transitions required in office support constitute the largest share of transitions in all ten European countries we studied. This is particularly true in Denmark, Germany, and Italy, where they account for more than 50 percent of the overall number of occupational transitions, while in Poland and Sweden they represent only 30 to 35 percent. Germany and Italy have a relatively high concentration of employment in office support work, which is why the share of occupational transitions from these jobs would be so high. By contrast, in Sweden, office support accounts for less than 11 percent of employment, and thus the share of occupational transitions from this occupational category is likely to be lower, based on our analysis. Wages for office support workers are higher in Denmark than in, say, Poland, making automation adoption in office work more likely in Denmark than in Poland. Consequently, Denmark could experience 50 percent of its occupational transitions in office support, due to the strong wage-related incentives to automate these jobs, while in Poland, where wages are relatively lower, the share of office support in total potential occupational transitions could fall to 30 percent.

— *Production work.* Occupational transitions from production work constitute a higher share of total transitions in the Czech Republic and Poland (32 percent and 23 percent, respectively). In the Netherlands and the United Kingdom, by contrast, this share falls to 9 percent and 8 percent, respectively. More production work stems from carbon-intensive industry in Poland and the Czech Republic than in the Netherlands or the United Kingdom. These occupations could face disruptions because of net-zero transitions, driving up the share of production work in occupational transitions in these countries.

— *Agriculture.* Poland would experience the most impact in agriculture, with more than 11 percent of its 2030 potential occupational transitions coming from farming. In other European countries, the share of agriculture in occupational transitions would be much lower, ranging from 4 percent in Spain to less than 1 percent in the United Kingdom. Poland is particularly susceptible to occupational transitions in agriculture because the agricultural occupation category represents 6 percent of total employment, two to three times higher than in other countries. The share held by agriculture in the expected occupational transitions in Poland is thus three to ten times higher than in other countries. This is exacerbated by the fact that agriculture in Poland is not yet highly automated today.

[23] *Gen-AI: Artificial intelligence*, January 2024.

Beyond current employment structure and wage rates, research indicates that AI readiness will be needed to unlock AI potential and can explain some local divergences in labor market outcomes across countries. "AI readiness" refers to a country's ability to adopt and deploy AI technologies across the private and public sectors. The IMF, for example, groups factors influencing AI readiness into four categories: digital infrastructure, innovation and economic integration, human capital and labor market policies, and regulation.[24] These elements vary across the ten European countries that are the focus of this report and imply different labor market outcomes. For example, Germany shows the highest level of preparedness among the ten European countries (around 0.8 on a scale of 0.0 to 1.0). Germany and the United Kingdom are two of the highest-scoring countries in terms of AI readiness.

Such differences also exist within countries. Our prior research on the future of work in Europe has shown that Europe has highly varied local labor markets with strong local specificities. In Europe, only a few dozen cities drive GDP growth, while hundreds of shrinking regions have declining workforces, older populations, and lower educational attainment.[25] Similar geographic concentrations exist in the United States.

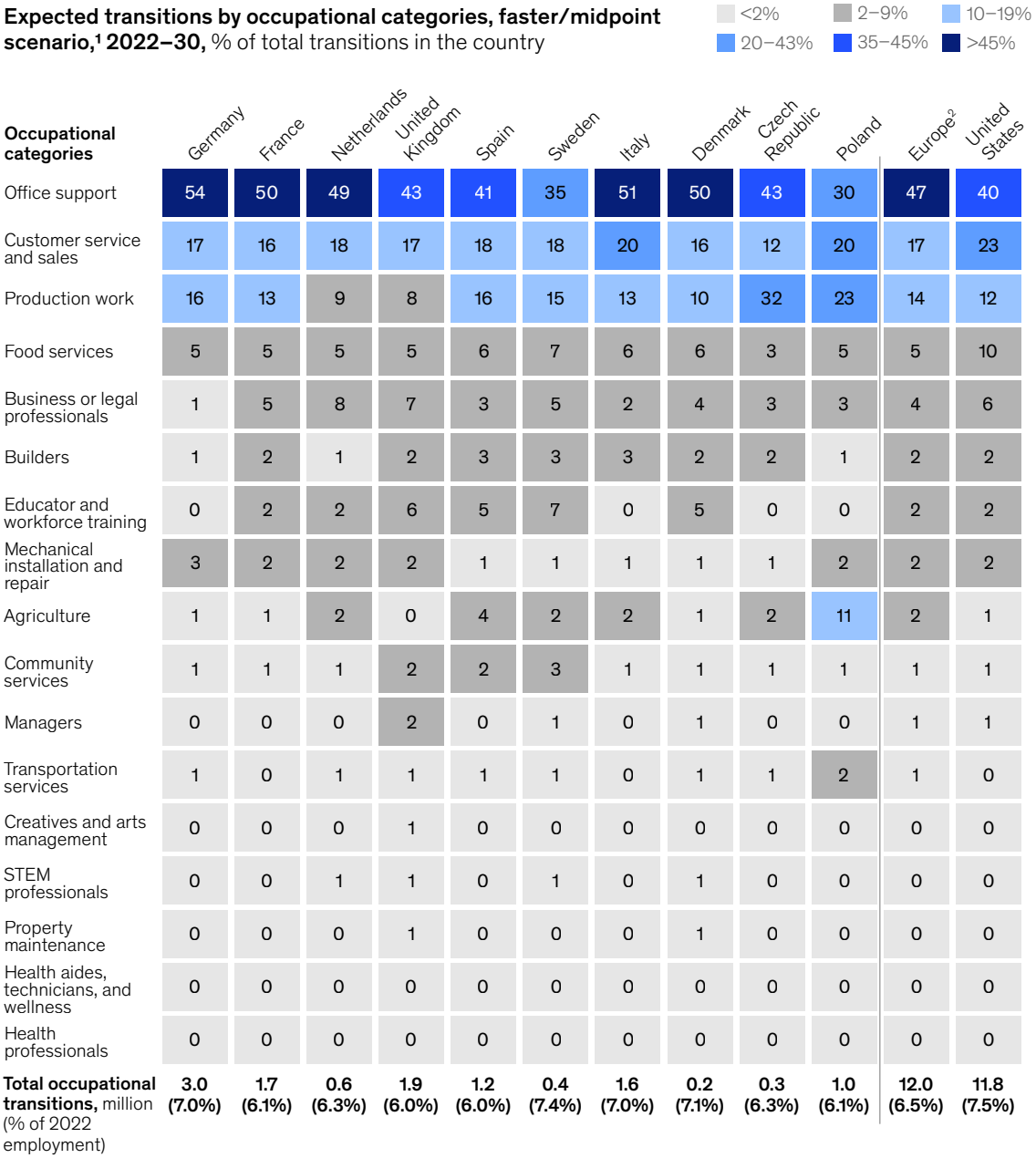
While the scale of the occupational transitions required is roughly on the same order of magnitude across the economies we analyzed, there are notable differences in the mix of occupations likely to be affected in each country, based on our modeling.

[24] Ibid.; see also "Government AI Readiness Index 2023," Oxford Insights, December 2023.
[25] "The future of work in Europe," McKinsey Global Institute, June 10, 2020.

Exhibit 6

The scale of occupational transitions is broadly similar across countries, with some differences in the mix.

Expected transitions by occupational categories, faster/midpoint scenario,[1] 2022–30, % of total transitions in the country



Occupational categories	Germany	France	Netherlands	United Kingdom	Spain	Sweden	Italy	Denmark	Czech Republic	Poland	Europe[2]	United States
Office support	54	50	49	43	41	35	51	50	43	30	47	40
Customer service and sales	17	16	18	17	18	18	20	16	12	20	17	23
Production work	16	13	9	8	16	15	13	10	32	23	14	12
Food services	5	5	5	5	6	7	6	6	3	5	5	10
Business or legal professionals	1	5	8	7	3	5	2	4	3	3	4	6
Builders	1	2	1	2	3	3	3	2	2	1	2	2
Educator and workforce training	0	2	2	6	5	7	0	5	0	0	2	2
Mechanical installation and repair	3	2	2	2	1	1	1	1	1	2	2	2
Agriculture	1	1	2	0	4	2	2	1	2	11	2	1
Community services	1	1	1	2	2	3	1	1	1	1	1	1
Managers	0	0	0	2	0	1	0	1	0	0	1	1
Transportation services	1	0	1	1	1	1	0	1	1	2	1	0
Creatives and arts management	0	0	0	1	0	0	0	0	0	0	0	0
STEM professionals	0	0	1	1	0	1	0	1	0	0	0	0
Property maintenance	0	0	0	1	0	0	0	1	0	0	0	0
Health aides, technicians, and wellness	0	0	0	0	0	0	0	0	0	0	0	0
Health professionals	0	0	0	0	0	0	0	0	0	0	0	0
Total occupational transitions, million (% of 2022 employment)	**3.0 (7.0%)**	**1.7 (6.1%)**	**0.6 (6.3%)**	**1.9 (6.0%)**	**1.2 (6.0%)**	**0.4 (7.4%)**	**1.6 (7.0%)**	**0.2 (7.1%)**	**0.3 (6.3%)**	**1.0 (6.1%)**	**12.0 (6.5%)**	**11.8 (7.5%)**

Note: Figures may not sum, because of rounding. Transitions are calculated where there is a decline in net demand for an occupation and employees of that workforce would have to leave for another occupation. Even in categories that are growing overall, employment may decrease in specific occupations, requiring some workers to find new roles. People joining a new occupation are not counted toward transitions, to avoid double counting.

[1]For Europe, we used the "faster" scenario, which corresponds to the "midpoint" scenario in the United States. The "faster" or midpoint adoption scenario is the average between the early and late scenarios. The "slower" scenario is the average between the late scenario and the midpoint scenario.

[2]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.

Source: Eurostat; Occupational Information Network; Oxford Economics; US Bureau of Labor Statistics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

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4 New skills for a new era

New technologies require new workforce skills. As a result of the advent of digital, for example, almost all jobs, from nursing to truck driving, have some digital component today. With AI and gen AI on the rise, this chapter looks at which skills could be in high demand by 2030 and which may see a decline.

In our McKinsey Global Institute Future of Work model, we categorized 25 workforce skills into five groups: physical and manual, basic cognitive, higher cognitive, social and emotional, and technological. We measured the current time allocation for each skill and projected the shifts that could be needed by 2030 as a direct consequence of the shifts in employment demand we modeled.[26] We find that the need for technological expertise, as well as social and emotional skills, could continue to rise to 2030.

We supplemented our modeling with a survey of more than 1,100 C-level executives in France, Germany, Italy, the United Kingdom, and the United States.[27] They report that some of the skills most valued for the future are scarce in today's market. Companies and workers will thus need to pivot quickly to adapt to the changes. Businesses face critical choices about retraining staff, recruiting new talent, or finding alternative strategies to secure the necessary skills for a new era of technology.

[26] See technical appendix for details. Workers use multiple skills to perform a given task, but for the purposes of our quantification, we identified the predominant skill used. For example, in banking and insurance, we mapped "prepare business correspondence" and "prepare legal or investigatory documentation" to the skill "advanced literacy and writing," which is grouped in the category of higher cognitive skills. In retail, we classified "stock products or parts" into gross motor skills and strength in the category of physical and manual skills, while "greeting customers, patrons, or visitors" is mapped to basic communication skills, in the basic cognitive category.

[27] The survey was conducted by Dynata in March 2024. Thirty-three percent of the companies surveyed had fewer than 500 employees, 44 percent had 500–5,000, and the remainder were larger. Companies were active in sectors ranging from technology and financial services to healthcare, automotive, and retail. The survey also asked respondents to self-report whether their profit margin was higher or lower relative to the industry average. For details, see the technical appendix.

Occupational transformations will require a large shift in skills

The occupational transitions outlined in the previous chapter underscore substantial shifts in workforce skills in a future in which automation and AI are integrated into the workplace. Physical skills remain important, but technological and social and emotional skills could be in higher demand (Exhibit 7).[28]

Demand for technological skills—by which we mean the number of hours worked for which technological skills are predominant—could see substantial growth in Europe and in the United States (increases of 25 percent and 29 percent, respectively, in hours worked by 2030 compared to 2022) under our faster, midpoint scenario of automation adoption.

Demand for social and emotional skills could rise by 11 percent in Europe and by 14 percent in the United States. Underlying this increase is higher demand for roles requiring empathy and leadership skills, which could rise by 20 percent and 14 percent in Europe and by 23 percent and 15 percent in the United States by 2030, according to our analysis. These skills are crucial in healthcare and managerial roles in an evolving economy that demands greater adaptability and flexibility.

Conversely, demand for work in which basic cognitive skills are predominant is expected to decline. Basic cognitive skills are required primarily in office support or customer service roles, which are highly susceptible to being automated or enhanced by AI. Our analysis suggests that demand for these types of activities could decrease by 14 percent. Among these basic cognitive skills that characterize work experiencing significant drops in demand are basic data processing and literacy, numeracy, and communication (by 17 percent and 9 percent, respectively, in Europe and by 16 percent and 11 percent, respectively, in the United States).

Demand for work in which higher cognitive skills are predominant would also decline slightly—by 4 percent in Europe and 2 percent in the United States by 2030—according to our analysis. While creativity is expected to remain highly sought after, with a potential increase of 12 percent in Europe and 16 percent in the United States by 2030, activities predominated by other advanced cognitive skills such as advanced literacy and writing, along with quantitative and statistical skills, could likely see lower demand, with both declining by 19 percent in Europe. This can be attributed to the potential of automating activities primarily requiring these skills and may particularly affect business and legal professions.

Demand for work in which physical and manual skills are predominant on the other hand, could decrease by 1 percent by 2030 in Europe. These activities remain the largest share of labor, representing about 30 percent of total hours worked in 2022. Lower than expected decline in these skills between 2022 and 2030 could come from the build-out of infrastructure and production shifts in sustainability sectors.[29] Higher demand may also reflect a renewed focus in both Europe and the United States on industrialization and the reshoring of production.[30] In addition, e-commerce drives demand for warehousing and transportation work, which involves physical and manual skills. Healthcare occupations, particularly in healthcare support, also require a high degree of physical skills.

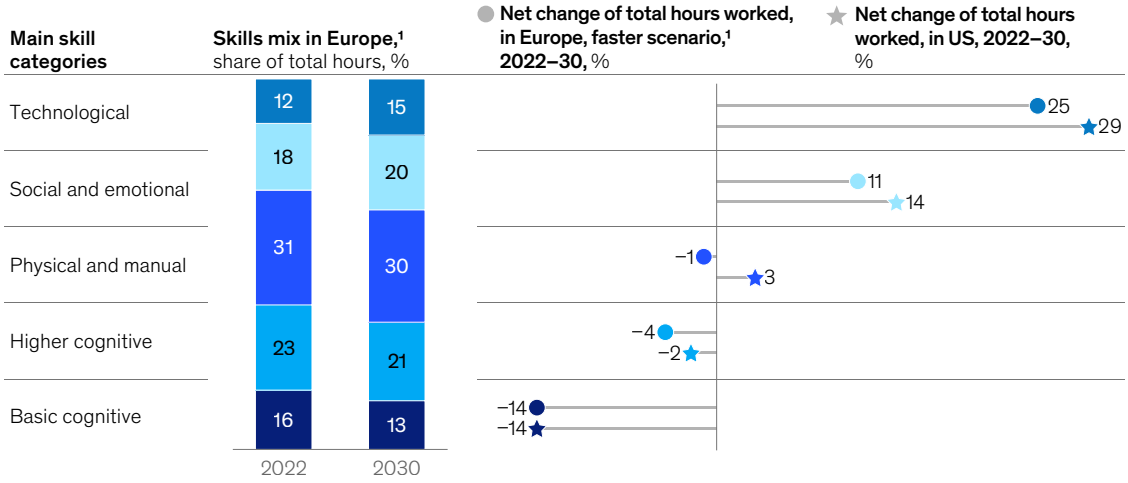
[28] Estimations of future demand for skills are based on the predominant skill used to perform one activity rather than the full spectrum of skills used to perform an activity.

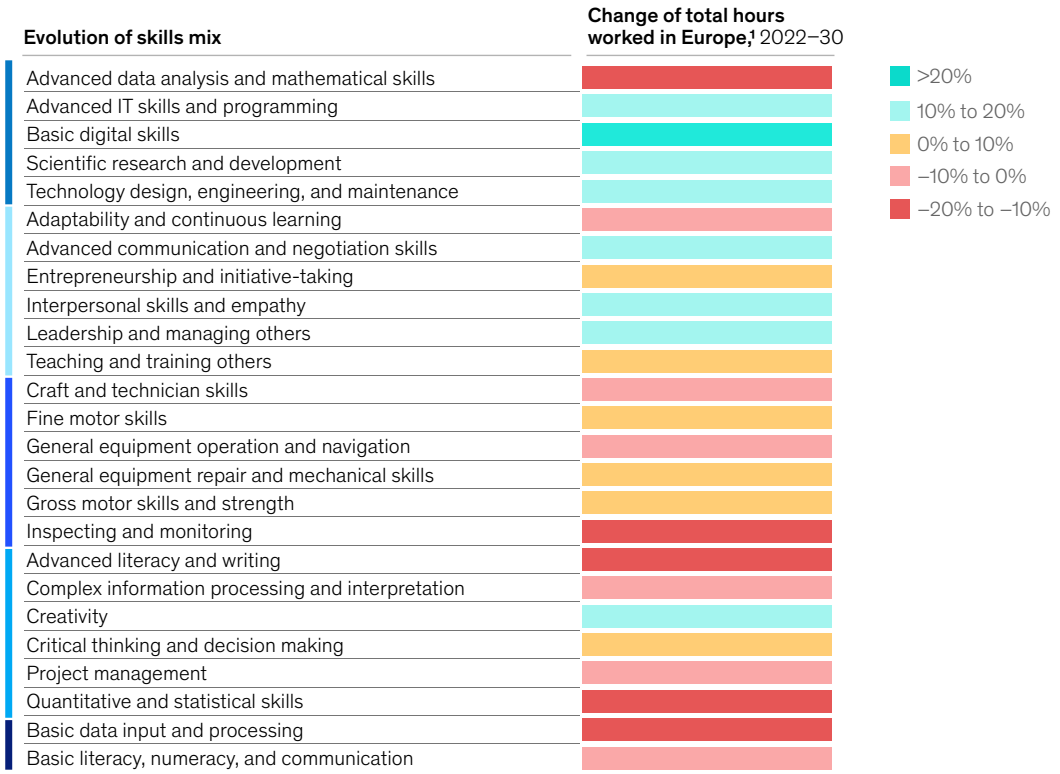
[29] See Ezra Greenberg, Erik Schaefer, and Brooke Weddle, "Tradespeople wanted: The need for critical trade skills in the US," McKinsey, April 9, 2024.

[30] In Europe, for example, the 2024 Antwerp Declaration seeks to enhance the competitiveness, resilience, and sustainability of Europe's industrial landscape by tackling significant challenges such as dwindling demand, stalled investments, and the need for a vigorous, green transition. Almost 700 European companies have endorsed declaration. See "The Antwerp Declaration for a European Industrial Deal," accessed May 2, 2024. US legislation—including the Bipartisan Infrastructure Law and the America Creating Opportunities for Manufacturing Pre-Eminence in Technology and Economic Strength (America COMPETES) Act—aims to modernize transportation systems, bolster supply chains, and enhance domestic manufacturing.

Exhibit 7

Demand for technological and social and emotional skills could increase in Europe.





Note: Figures may not sum to 100%, because of rounding. For percentage values, upper bounds are exclusive, while lower bounds are inclusive. Europe includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[1]While workers might use multiple skills to perform a given task, for the purposes of our quantification, using O*NET data, we classified ~2,100 work activities associated with approximately 850 occupations according to the primary type of skill used.The "faster" or midpoint adoption scenario is the average between the early and late scenarios. The "slower" scenario is the average between the late scenario and the midpoint scenario.
Source: Eurostat; Occupational Information Network; Oxford Economics; US Bureau of Labor Statistics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

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Business executives report skills shortages today and expect them to worsen

The shift in skill requirements has major implications for businesses. Our survey of C-suite executives shows that companies are already grappling with skills challenges—and highlights how they are responding.

Indeed, executives face a skills mismatch even today, particularly in technological, higher cognitive, and social and emotional skills: about one-third of companies report a shortfall in these critical areas. At the same time, a notable number of executives say they have enough employees with basic cognitive skills and, to a lesser extent, physical and manual skills. This situation stems from the shift toward a service-based economy that prioritizes higher cognitive and technological skills, rather than basic cognitive and physical and manual skills, as well as the rise of automation and AI, which diminishes the demand for easily replaceable skills.

Within technological skills, companies in our survey reported that their most significant shortages are in advanced IT skills and programming, advanced data analysis, and mathematical skills. Among higher cognitive skills, significant shortfalls are seen in critical thinking and problem structuring and in complex information processing. About 40 percent of the executives surveyed pointed to a shortage of workers with these skills, which are needed for working alongside new technologies. Indeed, the survey highlights a demand for complex analytical and cognitive abilities that automation and AI have yet to supplant.

The challenge is more acute in Europe, where more companies report a shortfall of technological and higher cognitive skills compared to the United States; the difference is six percentage points for technological skills and two percentage points for higher cognitive skills. Conversely, more companies in Europe reported having sufficient workers with physical and manual skills and basic cognitive skills than in the United States.

Skill shortages are perceived to be getting more acute: our survey shows that the skills projected to experience the most demand growth by 2030 are precisely those that are currently in shortest supply. Comparing this year's survey results with a 2018 survey that examined skill shift requirements for the automation age, we find that the demand for skills may be even more pronounced than we suggested just six years ago.[31] In our latest survey, about one in five respondents reported an increase in expected future skills needed by 2030,[32] while about one in four expressed a need for more technological, social and emotional, and higher cognitive skills—the same skills that are perceived to be in shortage today.

Technological skills have the highest overall expected need in response to the digital transformation of all sectors, while higher cognitive skills and social and emotional skills are also expected to experience significant growth in demand. Survey respondents also anticipate continued growth in demand for physical and manual skills and basic cognitive skills, although at slower rates compared to other skills, reflecting their ongoing, albeit diminishing, role in the evolving economic structure. Compared with the 2018 executive survey, companies today expect a greater need for physical and manual skills in the future than they previously anticipated.[33] This trend is in line with the results of other recent skill-focused research led by the World Economic Forum and others.[34]

[31] "Skill shift: Automation and the future of the workforce," McKinsey Global Institute, May 23, 2018.
[32] Difference between percent of survey respondents who expect to need a skill more and share of survey respondents who expect to need it less in the next six years.
[33] "Skill shift," May 23, 2018.
[34] *The future of jobs report 2023*, World Economic Forum, May 2023; see also Rui Costa, Christopher A. Pissarides, and Bertha Rohenkohl, "Old skills, new skills: What is changing in the UK labour market?," Centre for Economic Performance, London School of Economics and Political Science, February 21, 2024.

Mismatches could be even greater in skills that are not widely used today

The executives we surveyed anticipate that demand for skills will be more differentiated in the future. For example, within the group of technological skills, the picture varies by specific skill. Demand for basic IT skills is projected to grow by 15 percent, driven by the widespread need for proficiency across all roles. Meanwhile, demand for advanced IT skills is expected to surge by 34 percent, along with demand for data analytics and scientific research. This indicates that companies will need to acquire or build specialized technology skills even as more routine IT tasks are automated by AI. Coding remains a complex skill today that requires deep technical knowledge and problem-solving abilities. Demand for more technical roles requiring advanced IT skills will continue to grow. Similarly, within higher cognitive skills, critical thinking and creativity are seen as more essential skills of the future, which executives link to the need for innovation and strategic differentiation. Within social and emotional skills, adaptability and entrepreneurship are highlighted as key future needs, linked to being able to navigate future disruptions and embrace a culture of learning and flexibility that will be essential in adopting automation and AI.

To understand the challenges companies face, we compared the expected future need for skills with the degree to which companies use those skills today (Exhibit 8). The skills that are both heavily used today and expected to significantly increase in demand include advanced IT, technology engineering, advanced data analytics, and creativity. Winning the race to acquire such skills will remain a challenge for companies. Yet they may face even greater challenges in acquiring skills that are less used today but predicted to be in high demand by 2030. These include critical thinking, complex information processing, product design, scientific research, and most social and emotional skills. Some skills that are widely used today but for which demand will grow only modestly include basic IT, basic data input, and equipment operation. These represent opportunities for companies to find workflow efficiencies and strategies for worker retraining. Finally, the skills that respondents say are not much in use today and will grow only modestly in demand represent niche skills (such as craft and technician skills) or basic nondifferentiated competencies (such as basic literacy or gross motor skills).

Skill shifts vary by type of company, based on the rate of technology adoption and the underlying industry

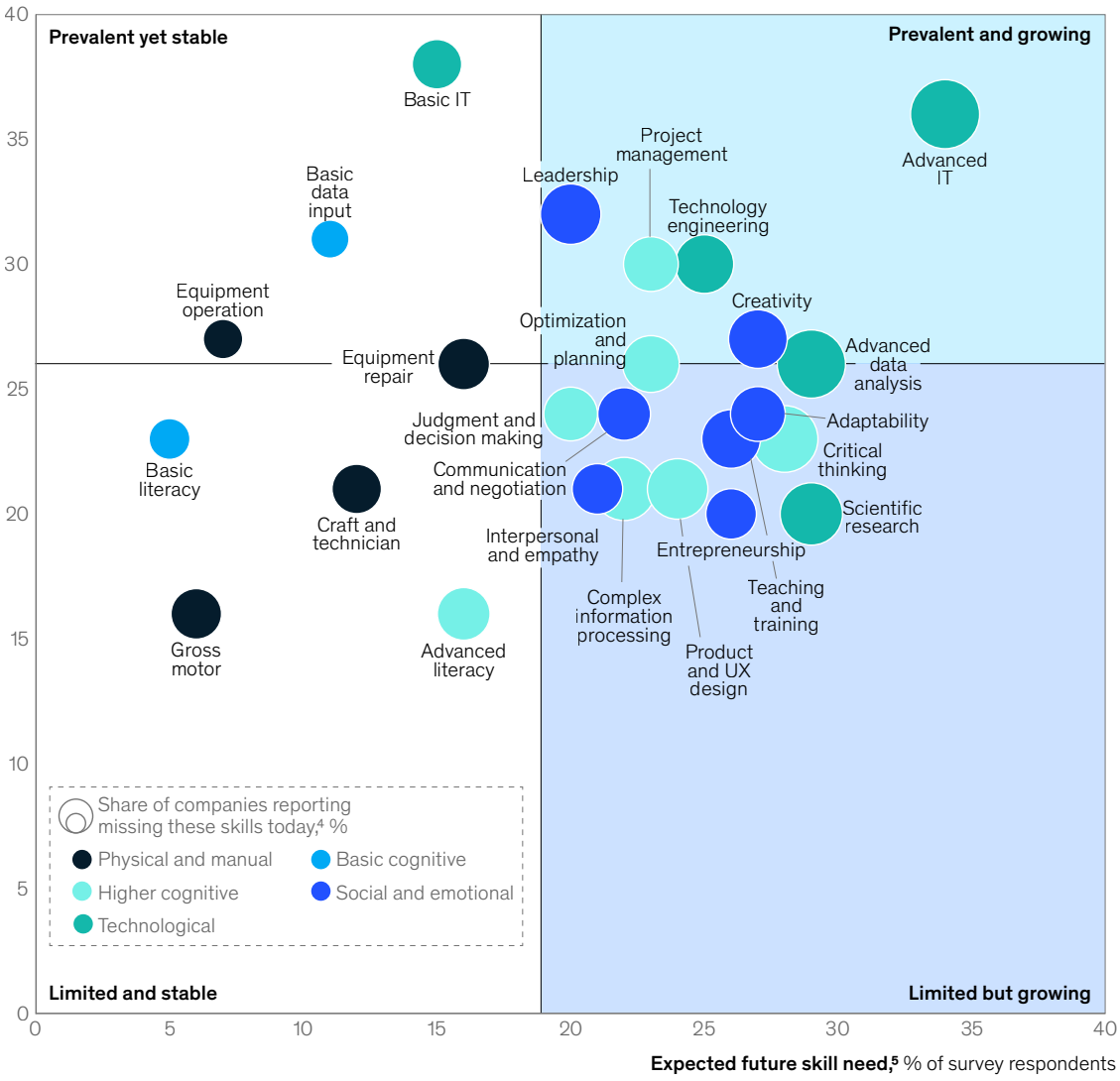
In our survey, executives from companies with higher financial performance—measured by their self-reported net profit margin relative to peers—were more likely to anticipate an increase in expected future skills needed by 2030 than their lower-performing counterparts.[35] On average, survey participants expect a 21 percent demand increase, but that figure rises to 30 percent among executives at higher-profit companies. This is likely because they have a greater capacity to invest in automation and AI technologies; companies that self-report higher profit margins say they allocate more than 20 percent of their digital budget to AI, some 14 percentage points more than medium performers (that is, executives who reported a similar net profit margin to their peers).

[35] Average across all skills of the difference between the percentage of survey respondents who expect to need a skill more and the percentage of respondents who expect to need it less.

Exhibit 8

Surveyed executives reported rising demand for technological and advanced cognitive skills, relative to their share in today's workforce.

Skills[1] of today vs skills of tomorrow in Europe[2] and the US, %



Note: Chart does not include fine motor skills, inspecting and monitoring, or quantitative and statistical skills. Axes represent median of corresponding data points.
[1]Skills descriptions were shortened.
[2] Includes France, Germany, Italy, and the United Kingdom.
[3]Question: What are the most widely used workforce skills in your organization today?
[4]Question: In which workforce skills do you currently have a mismatch between those needed and those your workforce has (that is, which skills do too many or too few workers have currently)?
[5]Difference between % of survey respondents who expect to need a skill more and % of survey respondents who expect to need it less. Q: How do you anticipate the skill needs of your workforce will evolve driven by AI-related technologies adoption in your organization within the next 6 years?
Source: 2024 McKinsey Global Institute survey, n = 1,128 C-level executives (305 from the US, 213 from Germany, 209 from the UK, 201 from Italy, and 200 from France)

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The expected demand for skills varies across industries, our survey reveals. Executives from technology and financial-services companies expect a more significant increase in demand for skills by 2030 (at 35 percent and 21 percent growth, respectively) compared with those from retail, healthcare, and automotive (at 17 percent, 14 percent, and 13 percent, respectively). This may be because retail and healthcare have fewer workers using AI today than technology and financial services. Indeed, the extent of the anticipated skill shifts by 2030 in each industry appears to be linked to technological familiarity and the disruptions that their adoption entails.

The adoption of technology and variations in industrial structure are leading to differing demands for skills across regions. For instance, US executives anticipate a greater increase in skill demand by 2030—on average, 13 percentage points higher than in Europe, a trend observed across all skill categories.

Companies see retraining as key to acquiring needed skills and adapting to the new work landscape

Surveyed executives expect significant changes to their workforce skill levels and worry about not finding the right skills by 2030. Executives said they view the lack of skills and the skills mismatch as barriers to future growth and profitability: more than one in four survey respondents report that failing to capture the needed skills could directly harm financial performance and indirectly impede their efforts to leverage the value from AI.

To acquire the skills they need, companies have three main options: retraining, hiring, and contracting workers. Our survey suggests that executives are looking at all three options, with retraining the most widely reported tactic planned to address the skills mismatch: on average, executives plan to retrain 32 percent of employees, followed by hiring (23 percent) and contracting (18 percent) (Exhibit 9). Retraining is the predominant strategy across industries, although it varies in degree. For example, respondents in the automotive industry expect 36 percent of their workforces to be retrained, compared with 28 percent in the financial-services industry.

Retraining enhances the skill sets of current employees, maintaining organizational knowledge and potentially boosting employee motivation and loyalty.[36] While training may require significant time and up-front costs, companies will need to weigh the benefits of developing in-house training programs against those of outsourcing the training, for example by partnering with educational institutions.

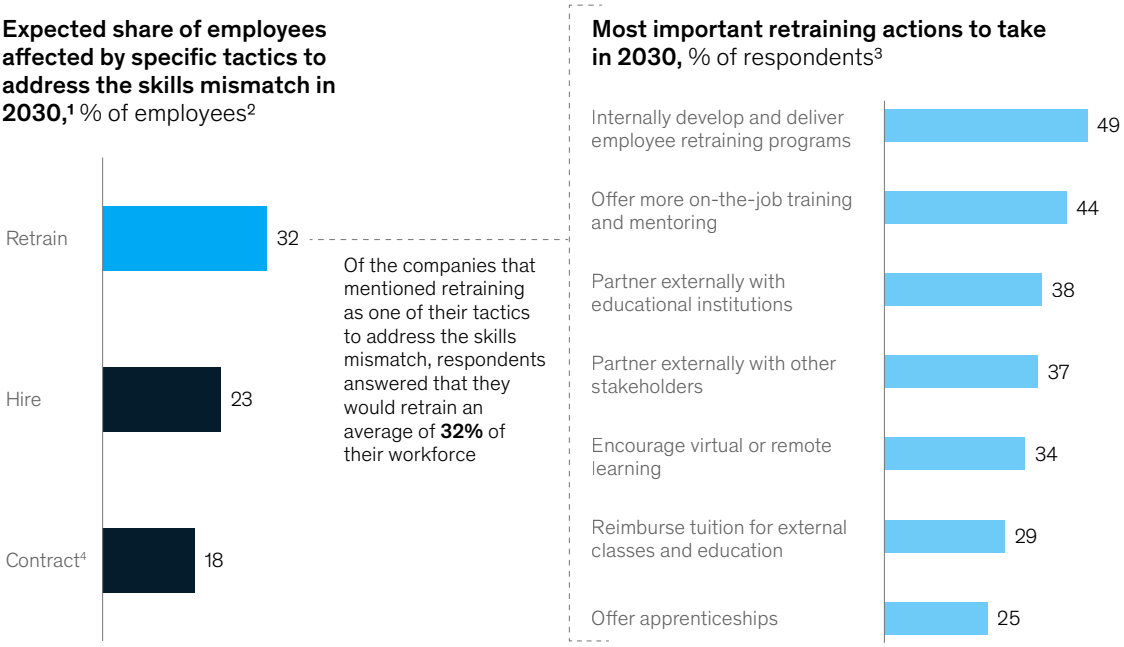
Hiring can be used to bring skills into an organization, but it has risks associated with talent shortages and the unpredictability of new hires' performance. Companies can improve their hiring outcomes by using digital recruitment tools to ensure better matches, offering an attractive work culture and benefits, and onboarding new hires in a deliberate way.

Contracting gives companies access to skills through contractors, freelancers, or temporary workers. It enables rapid skill acquisition but may lead to loss of proprietary knowledge and a mismatch with company culture. Currently, contracting fills primarily noncore, low-skill roles, but shifts are occurring as highly educated professionals, attracted by flexibility and autonomy, enter the contracting market and command high rates for specialized skills.

[36] Sandra Durth, Asmus Komm, Florian Pollner, and Angelika Reich, "Reimagining people development to overcome talent challenges," McKinsey, March 3, 2023.

Exhibit 9

Companies expect to reskill one-third of their current workforce to address the skills mismatch.



[1]Question: Within the next 6 years, when you think about how the use of AI will affect your workforce skill needs, how much are you planning on addressing the potential skills mismatch with the following tactics?
[2]"Figures do not sum to 100%, because "No change" and "Displacement" responses are excluded.
[3]Question: With regard to retraining existing talent, which of the following actions will be most important for your organization to take in 6 years?
[4]Freelance or consulting workers.
Source: 2024 McKinsey Global Institute survey, n = 1,128 C-level executives (305 from the US, 213 from Germany, 209 from the UK, 201 from Italy, and 200 from France)

McKinsey & Company

Our survey responses suggest that these strategies have specific applications by job type. Hiring as a strategy seems to be relatively successful for high- and medium-skill jobs but less so for low-skill jobs—some 76 percent of surveyed executives expect to hire high- and medium-skill workers compared to 58 percent expecting to hire low-skill workers. Retraining and contracting follow the same trend, albeit with less variation among job categories.

These findings highlight the importance for companies to invest in skills development now. Transitioning from manual and physical skills to advanced IT skills is a time-intensive process, and early action is critical. By focusing on workforce training today, companies can ensure they have the necessary technological and other skills by 2030. Our survey results suggest that companies favor internal training programs, with 49 percent and 44 percent of respondents, respectively, choosing to develop and provide in-house training and to offer on-the-job training coupled with mentorship. Internal training allows companies to better align their needs with the programs they offer and teach the precise skills they require. External or remote retraining actions are less popular but remain under consideration, with 38 percent of executives surveyed planning to partner externally with educational institutions. This type of action can remain relevant in learning highly technical skills or skills that are not yet prevalent within a company.


#2
#1

Sector spotlights

In this section, we examine four sectors in greater depth: wholesale and retail trade, financial services, manufacturing, and healthcare. Based on our modeling, we explore how these sectors would be affected by automation, AI, actions aimed at achieving a net-zero transition, e-commerce, the aging population, and other trends. Focusing on Europe and the United States, we assess how changes in labor demand could affect the occupational mix and skills demand at a sector level.

Wholesale and retail trade

Wholesale and retail trade would be the sector most affected by changes in employment demand in Europe, with an estimated 2.8 million people potentially needing to change occupations by 2030. Reductions in demand for office support and customer service occupations could be significant, while managerial, business, and legal professionals could see increased demand, along with transportation services roles.

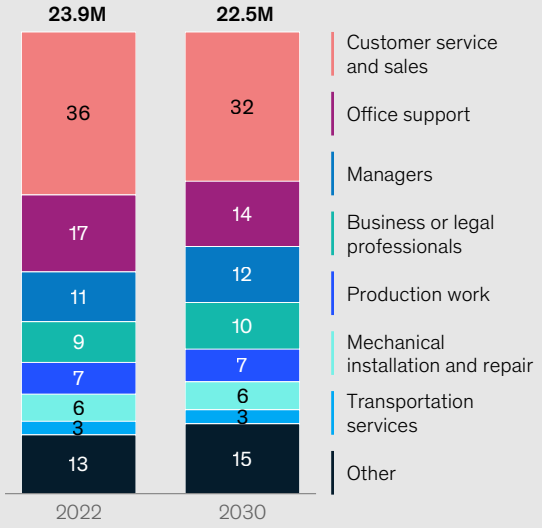
Technologies such as automated checkout systems and chatbot-equipped kiosks are taking over routine tasks such as payment processing and price checking. The continued rise of e-commerce could further reduce demand for customer service occupations and increase demand for jobs in logistics. With the rise of gen AI, roles such as office clerks and executive secretaries would increasingly be supplanted by digital productivity tools.

Technological proficiency would also become more important as innovations such as virtual try-on features and augmented reality transform consumer interactions.

Wholesale and retail trade stands to be the sector most affected by changes in European employment demand.

Wholesale and retail trade, Europe,[1] faster scenario[2]

Share of labor demand, 2022–30, %

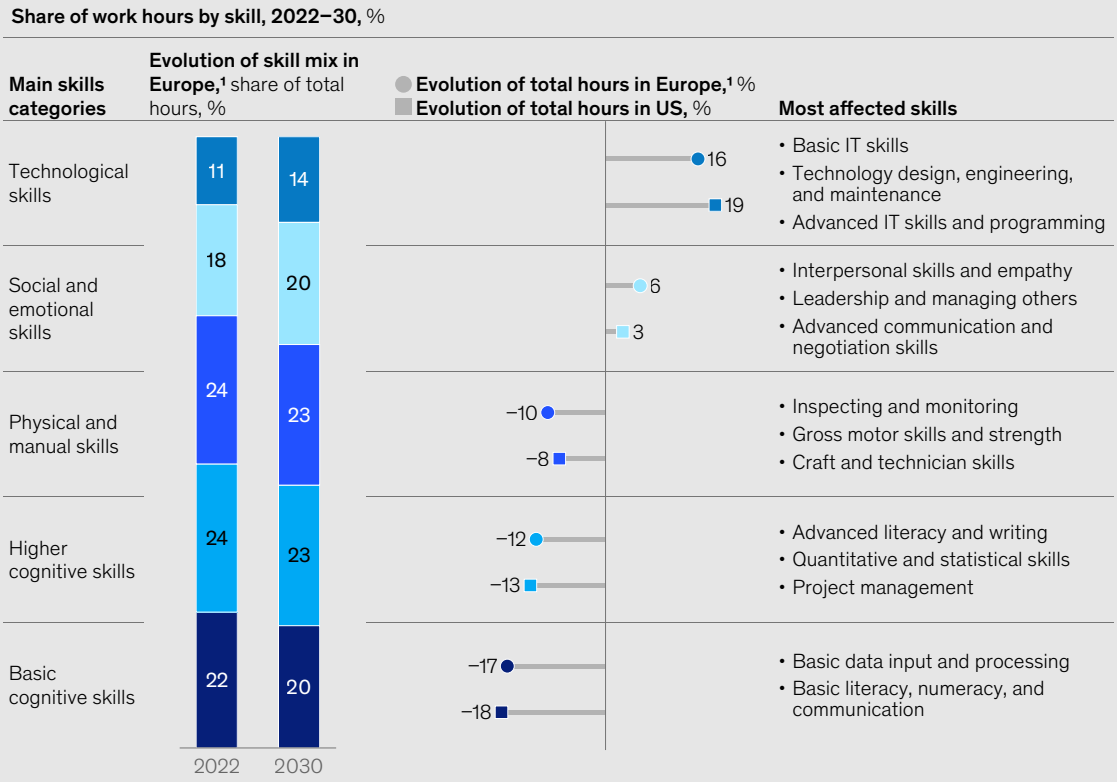


Top 5 growing and declining occupational groups

	Detailed occupational groups	Labor demand change, 2022–30, thousands	Labor demand change, 2022–30, %	Employment, 2022, thousands
TOP 5	Managers and team leaders	213	8	2,596
	Material movers and loaders	136	16	870
	Health technicians and pharmacists	131	21	629
	Computer engineers and specialists	60	24	247
	Business and financial specialists	60	7	928
BOTTOM 5	Financial clerks	−138	(32)	427
	Wholesale and retail production workers	−173	(17)	1,034
	Administrative assistants	−246	(30)	814
	Information and record clerks	−289	(13)	2,312
	Sales workers	−1,209	(13)	9,498

Note: Figures may not sum to 100%, because of rounding.
[1]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[2]"Faster" scenario automation adoption is the average of early and late automation adoption scenarios as referenced in "The economic potential of generative AI: The next productivity frontier," McKinsey Global Institute, June 14, 2023. The "slower" scenario is the average between the late scenario and the midpoint scenario.

Wholesale and retail trade, Europe,[1] faster scenario[2]



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[2]Faster scenario automation adoption is the average of early and late automation adoption scenarios as referenced in "The economic potential of generative AI: The next productivity frontier," McKinsey Global Institute, June 14, 2023.

Financial services

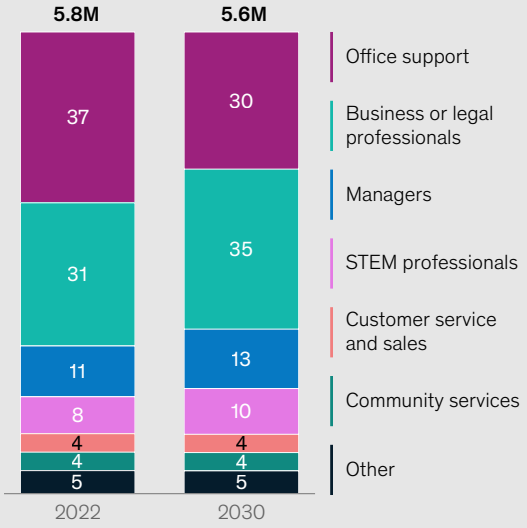
With the adoption of gen AI, Europe's finance sector could see a decrease in labor demand by 2030, with the largest reductions in office support and customer service roles. The shift from traditional banking to digital platforms, accelerated by the pandemic, could drive demand for STEM professionals, reflecting a strategic focus on using data to enhance customer engagement. This trend requires specialists including data scientists and software engineers, particularly as financial services companies invest in digital architecture and IT modernization.

In line with these trends, approximately 600,000 individuals in banking might need to change occupations by 2030. However, the demand for professionals in STEM and management roles, which generally require higher education, would grow. Demand for technological skills is expected to increase. The importance of social and emotional skills would also rise, reflecting an increased need for people in managerial and interpersonal roles.

The adoption of generative AI could cause the finance sector to see a decrease in labor demand by 2030.

Financial services, Europe,[1] faster scenario[2]

Share of labor demand, 2022–30, %



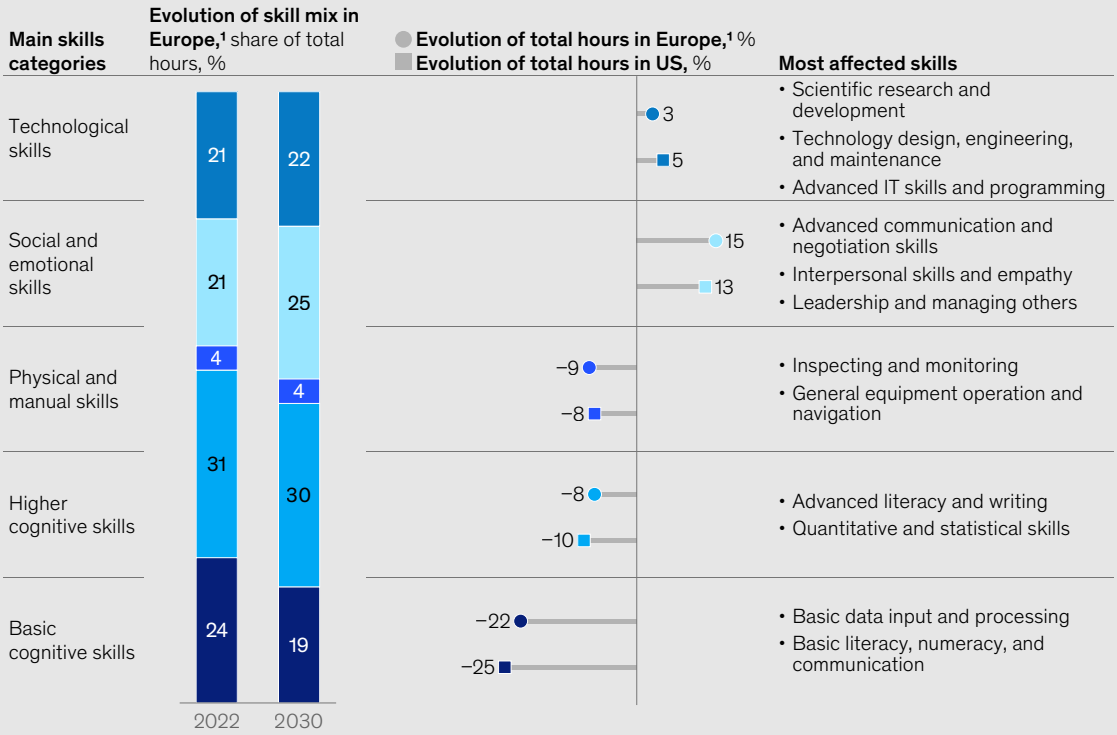
Top 5 growing and declining occupational groups

	Detailed occupational groups	Labor demand change, 2022–30, thousands	Labor demand change, 2022–30, %	Employment, 2022, thousands
TOP 5	Business and financial specialists	91	7	1,356
	Executives and managers	60	8	703
	Computer engineers and specialists	51	15	330
	Computer support workers	9	11	82
	Lawyers and legal professionals	5	7	67
BOTTOM 5	Sales workers	−16	(3)	608
	Administrative assistants	−64	(21)	305
	Information and record clerks	−72	(12)	599
	Office support workers	−98	(22)	436
	Financial clerks and tellers	−242	(27)	900

Note: Figures may not sum to 100%, because of rounding.
[1]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[2]"Faster" scenario automation adoption is the average of early and late automation adoption scenarios as referenced in "The economic potential of generative AI: The next productivity frontier," McKinsey Global Institute, June 14, 2023. The "slower" scenario is the average between the late scenario and the midpoint scenario.

Financial services, Europe,[1] faster scenario[2]

Share of work hours by skill, 2022–30, %



Note: Figures may not sum to 100%, because of rounding.
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[2]Faster scenario automation adoption is the average of early and late automation adoption scenarios as referenced in "The economic potential of generative AI: The next productivity frontier," McKinsey Global Institute, June 14, 2023.

Manufacturing

Europe's manufacturing sector could see a net decline in employment demand by 2030. Production work and office support are likely to see the greatest decline, while demand for workers in STEM, management, and business and legal fields could grow. This shift toward more knowledge-intensive roles is driven by technological advancements and the decreasing costs of robotic solutions, which promote automation. Furthermore, actions related to net zero would have a dual impact on the manufacturing sector. They would foster job creation in expanding industries, such as renewable energy, low-emissions vehicles, and electrical appliances, while potentially reducing demand in contracting industries, such as those involved in the production of vehicles with internal combustion engines.

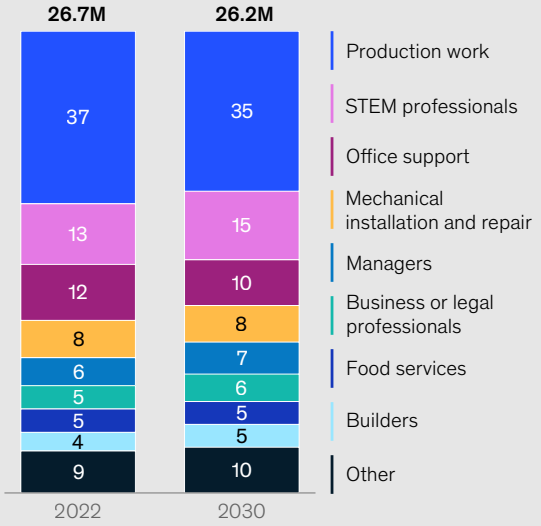
Approximately 2.1 million individuals in Europe's manufacturing sector might need to change occupations by 2030, the second-most-affected sector across all sectors. This transition would be particularly pronounced in production work because of its core role in the sector. Specialized roles in management, business, and legal professions would be less likely to undergo occupational transitions; these roles currently tend to be held by workers with postsecondary education.

Demand for technological skills in the manufacturing sector is expected to increase, along with demand for social and emotional skills. The sector could experience a decline in demand for basic cognitive skills, physical and manual skills, and higher cognitive skills, highlighting the increasing replaceability of these skills due to automation and AI advancements.

While demand for some roles may increase, there could be a net decline in employment demand in Europe's manufacturing sector by 2030.

Manufacturing, Europe,[1] faster scenario[2]

Share of labor demand, 2022–30, %



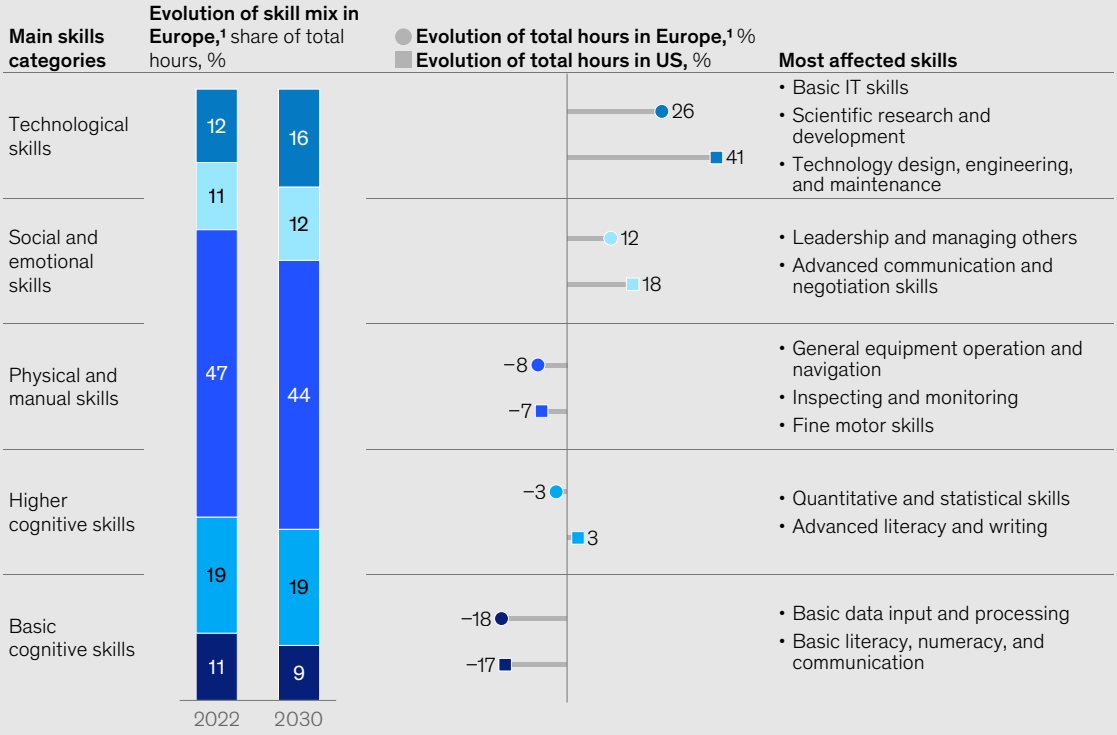
Top 5 growing and declining occupational groups

	Detailed occupational groups	Labor demand change, 2022–30, thousands	Labor demand change, 2022–30, %	Employment, 2022, thousands
TOP 5	Engineers, except computer engineers	254	15	1,723
	Material movers and loaders	180	15	1,214
	Computer engineers and specialists	164	24	686
	Executives and managers	140	8	1,758
	Business and financial specialists	85	11	802
BOTTOM 5	Financial clerks	−112	(25)	439
	Office support workers	−112	(21)	535
	Administrative assistants	−165	(22)	751
	Information and record clerks	−235	(16)	1,489
	Production workers	−927	(10)	9,414

Note: Figures may not sum to 100%, because of rounding.
[1]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[2]"Faster" scenario automation adoption is the average of early and late automation adoption scenarios as referenced in "The economic potential of generative AI: The next productivity frontier," McKinsey Global Institute, June 14, 2023. The "slower" scenario is the average between the late scenario and the midpoint scenario.

Manufacturing, Europe,[1] faster scenario[2]

Share of work hours by skill, 2022–30, %



Note: Figures may not sum to 100%, because of rounding.
[1]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[2]"Faster" scenario automation adoption is the average of early and late automation adoption scenarios as referenced in "The economic potential of generative AI: The next productivity frontier," McKinsey Global Institute, June 14, 2023. The "slower" scenario is the average between the late scenario and the midpoint scenario.

Healthcare

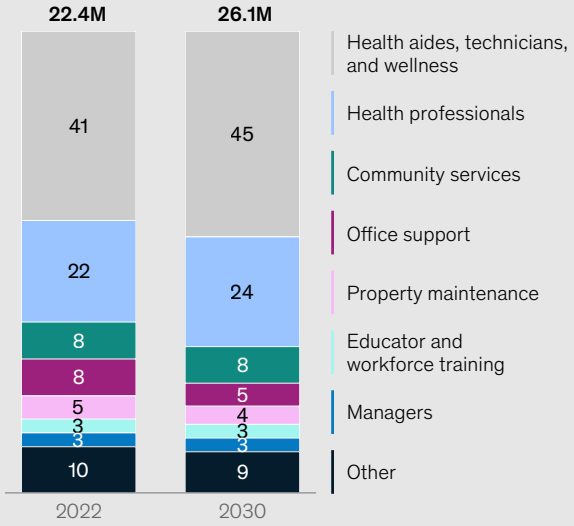
Europe's healthcare sector is projected to experience the most significant growth in labor demand by 2030, with the potential to add approximately 3.7 million jobs. This surge would be driven primarily by rising demand for health aides and healthcare professionals, while demand for office support roles would decline because of automation and AI. Key growth drivers include an aging population and rising challenges from mental health issues and chronic diseases.

Around 500,000 healthcare workers in Europe could have to change occupations by 2030, with office support roles constituting the bulk of these transitions. The increase in demand for technological skills reflects the sector's integration of advanced technologies, while demand for social and emotional skills would also see substantial growth to meet the needs of Europe's aging population.

The healthcare sector in Europe is projected to experience the largest growth in labor demand by 2030.

Healthcare, Europe,[1] faster scenario[2]

Share of labor demand, 2022–30, %



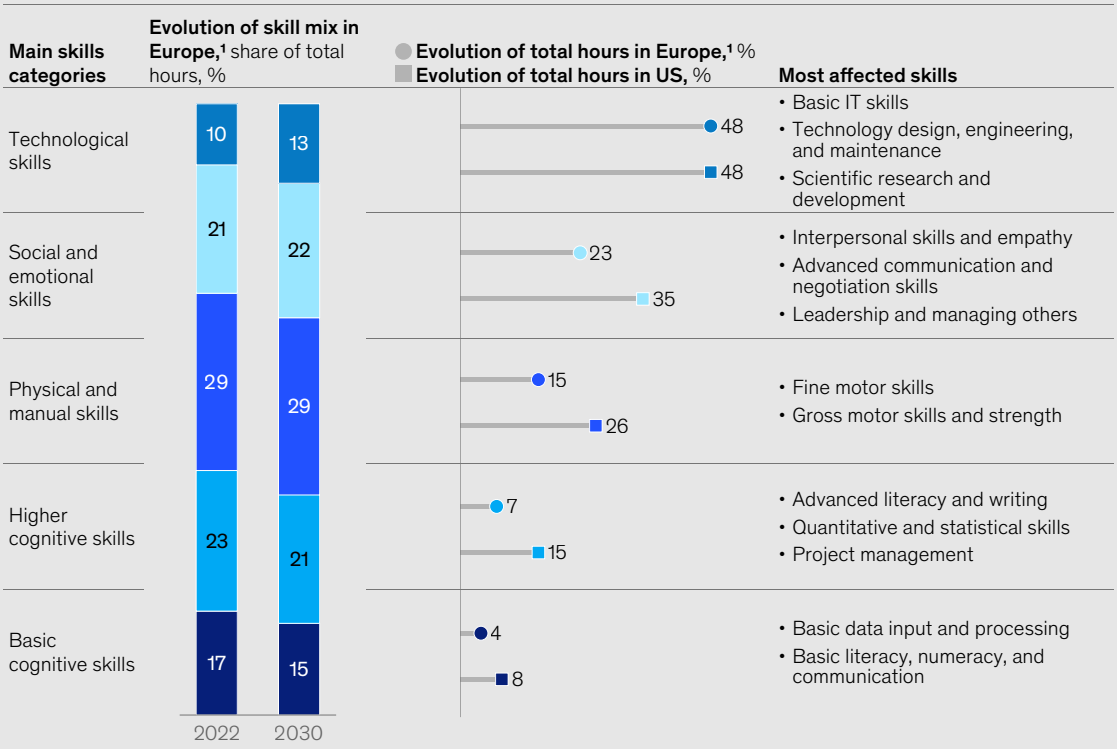
Top 5 growing and declining occupational groups

	Detailed occupational groups	Labor demand change, 2022–30, thousands	Labor demand change, 2022–30, %	Employment, 2022, thousands
TOP 5	Health aides and health support	1,720	27	6,399
	Nurses, physician assistants, and pharmacists	559	31	1,801
	Personal care workers	414	29	1,405
	Doctors	378	18	2,108
	Health technicians and pharmacists	194	17	1,118
BOTTOM 5	Production workers	−26	(12)	217
	Financial clerks and tellers	−42	(23)	178
	Information and record clerks	−76	(15)	501
	Office support workers	−94	(23)	399
	Administrative assistants	−111	(18)	619

Note: Figures may not sum to 100%, because of rounding.
[1]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[2]"Faster" scenario automation adoption is the average of early and late automation adoption scenarios as referenced in "The economic potential of generative AI: The next productivity frontier," McKinsey Global Institute, June 14, 2023. The "slower" scenario is the average between the late scenario and the midpoint scenario.

Healthcare, Europe,[1] faster scenario[2]

Share of work hours by skill, 2022–30, %



Note: Figures may not sum to 100%, because of rounding.
[1]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[2]Faster scenario automation adoption is the average of early and late automation adoption scenarios as referenced in "The economic potential of generative AI: The next productivity frontier," McKinsey Global Institute, June 14, 2023.

5 Implications for the workforce

Shifts in demand for certain skills and occupations could have a significant impact on society more broadly. In this chapter, we explore various potential implications.

Demand for higher-wage occupations could rise, with uncertain consequences for workers in lower-wage jobs

A critical question in the upcoming technological age will be which segments of the population capture the income benefits of AI and gen AI deployment. According to UK scenarios built by the IMF, AI would benefit mostly workers with above-median incomes, while those below the median would see limited wage increases in the best-case scenario and decreasing income in the worst case.[37]

We mapped our estimated shifts in employment demand to current wage bands of occupations to infer the potential impact on different types of workers. The wage levels of occupations might change in coming years in response to demand and supply mismatches. Rather than modeling future trends in wages, an uncertain exercise, we point to the implications of rising or falling demand for occupations in wage bands as they exist today.

The past four decades have seen a divergence in outcomes for low- and middle-wage workers on the one hand and high-wage workers on the other.[38] Now, technology

[37] *Gen-AI: Artificial intelligence*, January 2024.

[38] Wage concentration is significantly higher in the United States than in European countries, although the United States has experienced wage compression recently. See David Autor, Arindrajit Dube, and Annie McGrew, *The unexpected compression: Competition at work in the low wage labor market*, NBER working paper, number 31010, March 2023; and "Inequality: A persisting challenge and its implications," McKinsey Global Institute, June 26, 2019.

development and labor market disruptions could further reweight demand toward skills associated with higher-wage jobs. Enabling labor market transitions that allow workers to move from lower-pay to higher-pay work could minimize wage polarization, while rising demand for technological and social and emotional skills could be detrimental to workers in low- and middle-wage occupations if they do not have or are unable to acquire these skills.

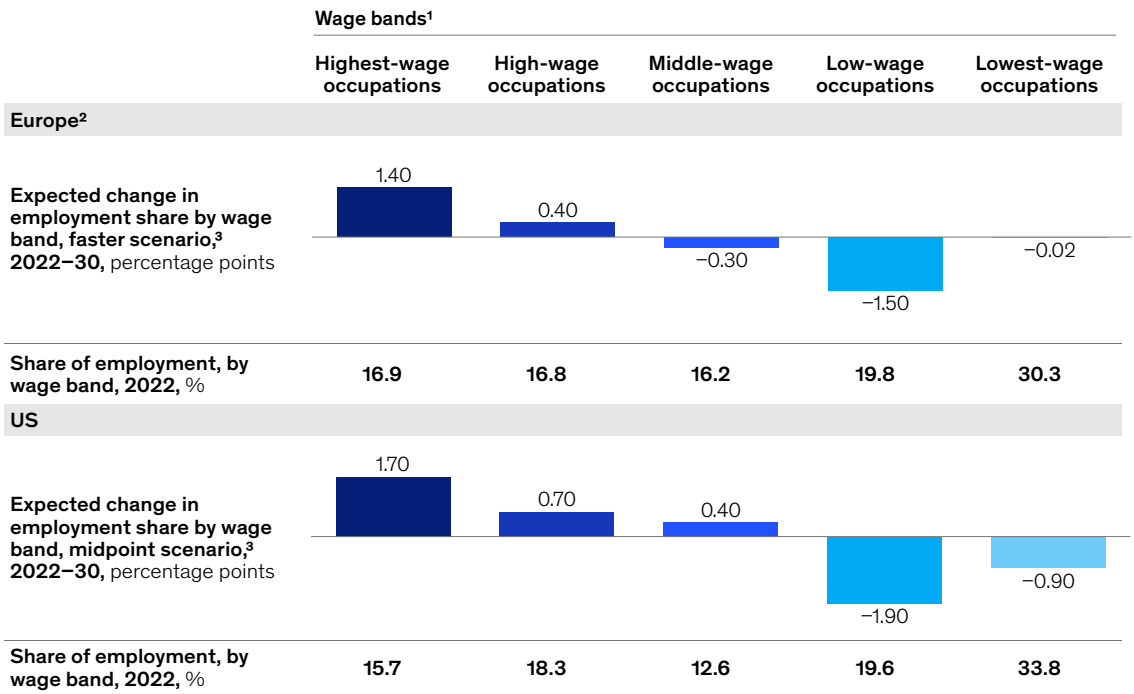
Rising demand for occupations with currently high wages offers an opportunity

The interplay between occupational transitions and wage levels differs among countries based on their current occupational structure and automation potential. All ten European countries we examined for this report may see increasing demand for top-earning occupations (Exhibit 10).

Countries vary in terms of their potential reallocation toward higher-wage occupations. Workers in the Czech Republic and Sweden could potentially benefit the most if they can make the transition into higher-wage occupations with rising demand; this can be explained by the potential automation of production and agricultural workers and the surging demand for managerial positions. In fact, the Czech Republic has the highest potential to reweight toward high-wage occupations, with share in employment demand for the two highest-wage bands increasing by 3.4 percentage points. Conversely, Denmark shows a higher increase in demand for middle-wage occupations than other European countries.

Exhibit 10a

In both Europe and the United States, labor demand could reweight toward occupations that currently command higher wages.



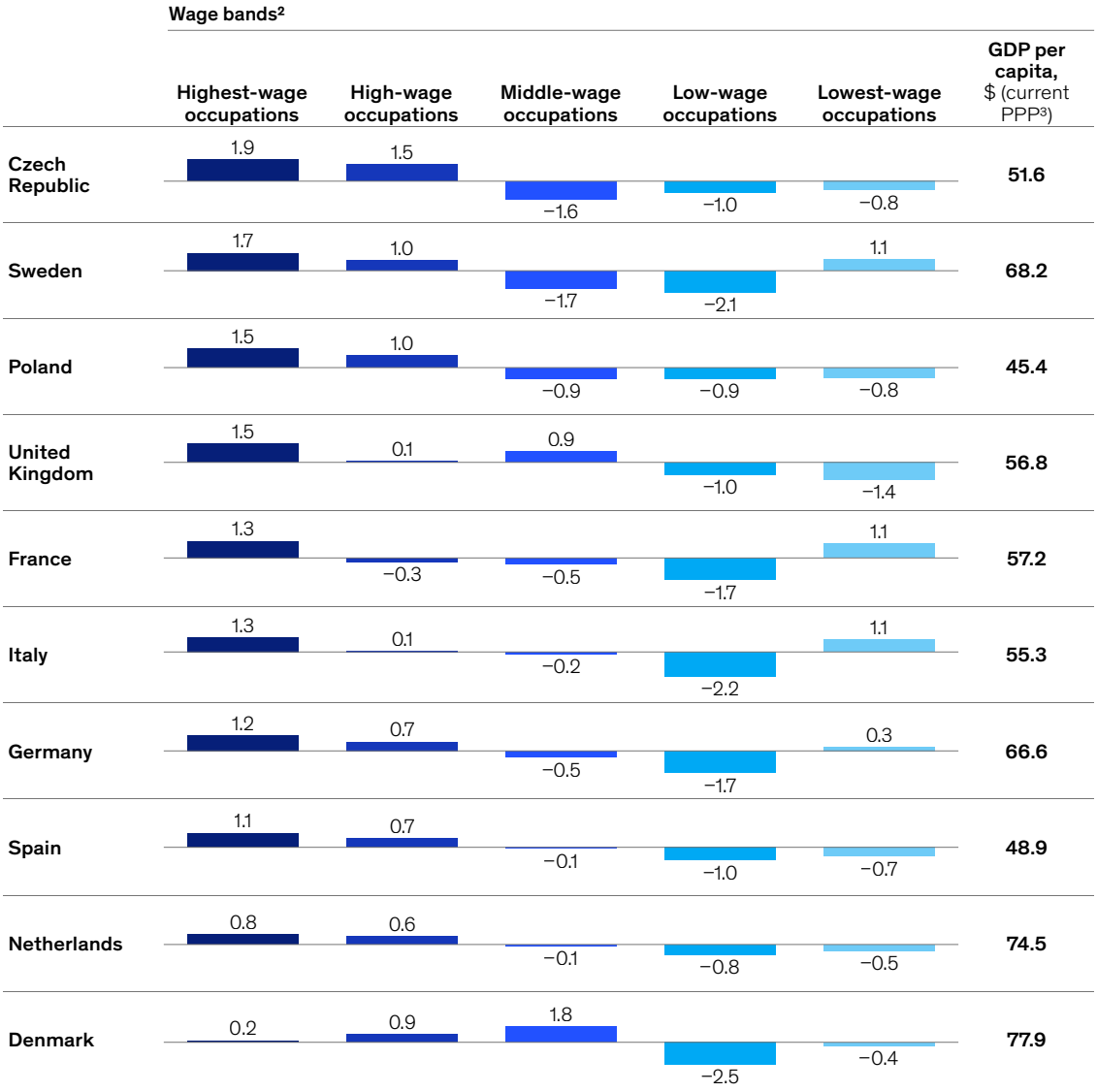
[1]Occupations are ranged into quintiles based on their average wages. They are specific for each European country considered (see appendix). As an example, data for France and the US is as follows: lowest-wage occupations: $15.3k–30.3k annually in France, $21.0k–31.0k in the US; low-wage occupations: $30.3k–34.7k in France, $31.0k–38.0k in the US; middle-wage occupations: $34.7k–41.7k in France, $38.0k–50.0k in the US; high-wage occupations: $41.7k–55.4k in France, $50.0k–69.0k in the US; highest-wage occupations: more than $55.4k in France, more than $69.0k in the US. For dollar values, note that upper bounds are exclusive, while lower bounds are inclusive. Wages are in 2010 dollars.
[2]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[3]With generative AI acceleration. For Europe, we used the "faster" scenario, which corresponds to the "midpoint" scenario in the United States.
Source: Eurostat; Occupational Information Network; Oxford Economics; US Bureau of Labor Statistics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

McKinsey & Company

Exhibit 10b

In both Europe and the United States, labor demand could reweight toward occupations that currently command higher wages.

Change in employment share by wage band, faster scenario,[1] 2022–30, percentage points



[1]With generative AI acceleration. For Europe, we used the "faster" scenario, which corresponds to the "midpoint" scenario in the United States.
[2]Occupations are ranged into quintiles based on their average wages. They are specific for each European country considered (see appendix). As an example, data for France and the US is as follows: lowest-wage occupations: $15.3k–30.3k annually in France, $21.0k–31.0k in the US; low-wage occupations: $30.3k–34.7k in France, $31.0k–38.0k in the US; middle-wage occupations: $34.7k–41.7k in France, $38.0k–50.0k in the US; high-wage occupations: $41.7k–55.4k in France, $50.0k–69.0k in the US; highest-wage occupations: more than $55.4k in France, more than $69.0k in the US. For dollar values, note that upper bounds are exclusive, while lower bounds are inclusive. Wages are in 2010 dollars.
[3]Purchasing-power parity.
Source: Eurostat; Occupational Information Network; OECD; Oxford Economics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

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Additional skills are necessary for low- and middle-wage workers to transition to higher-wage jobs

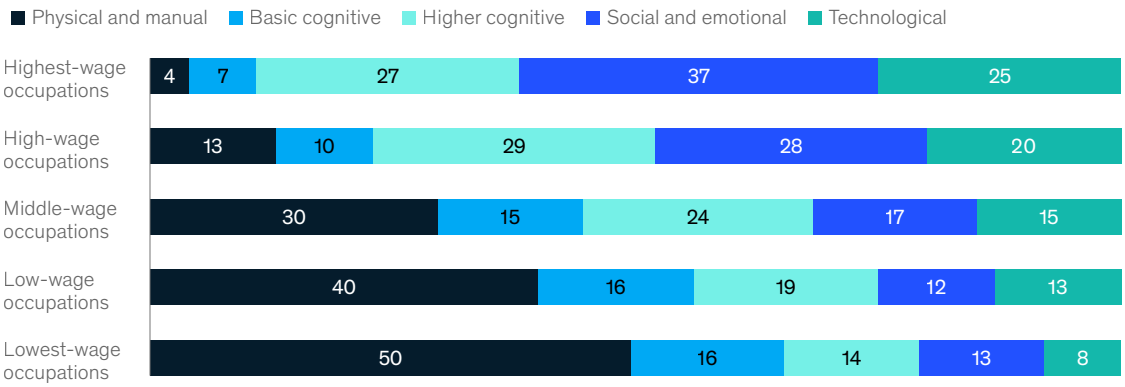
While increasing demand for high-wage occupations may present a social opportunity, low-wage workers may need to overcome a double disadvantage: they face a risk of job loss due to declining demand for their occupations and, at the same time, may encounter potential barriers to accessing higher-paying jobs if they lack requisite skills.[39] This could result in a temporary mismatch between job demand and skills supply.

Our analysis identifies the potential skills profile of occupations based on their current wages (Exhibit 11). Physical and manual skills are likely to be predominantly used in the three lowest-wage brackets of occupations. Basic cognitive skills could be the most used in the first and second brackets, while higher cognitive skills would dominate the fourth wage-bracket occupations, indicating their association with high-paying jobs. Meanwhile, social and emotional, higher cognitive, and technological skills would be most prevalent in the top-wage occupations. Similar trends appear in the United States.[40]

Exhibit 11

To move to higher-wage occupations, workers will need more technological and social and emotional skills.

Time spent using various types of skills[1] by wage band,[2] Europe[3] faster scenario,[4] 2030, %



Note: Figures may not sum to 100%, because of rounding. Similar trends were observed in the US; see "Generative AI and the future of work in America," McKinsey Global Institute, July 26, 2023.
[1]While workers might use multiple skills to perform a given task, for the purposes of our quantification, using O*NET data, we classified ~2,100 work activities associated with approximately 850 occupations according to the primary type of skill used.
[2]Occupations are ranged into quintiles based on their average wages. They are specific for each European country considered (see appendix). As an example, data for France and the US is as follows: lowest-wage occupations: $15.3k–30.3k annually in France, $21.0k–31.0k in the US; low-wage occupations: $30.3k–34.7k in France, $31.0k–38.0k in the US; middle-wage occupations: $34.7k–41.7k in France, $38.0k–50.0k in the US; high-wage occupations: $41.7k–55.4k in France, $50.0k–69.0k in the US; highest-wage occupations: more than $55.4k in France, more than $69.0k in the US. For dollar values, note that upper bounds are exclusive, while lower bounds are inclusive. Wages are in 2010 dollars.
[3]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[4]With generative AI acceleration.
Source: Eurostat; Occupational Information Network; OECD; Oxford Economics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

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[39] This is true for low-wage workers in all countries, but demand for the lowest-wage workers will remain stable or increase in some countries, as highlighted in Exhibit 12.
[40] For more, see "Generative AI," July 26, 2023.

By 2030, roles which are currently highest paid will require mostly social and emotional, technological, and higher cognitive skills, our analysis suggests. Indeed, 37 percent of workers' time in the highest-wage occupations could be spent doing activities in which social and emotional skills will predominate. Technological and higher cognitive skills will also be needed in these high-paid jobs, where they are likely predominant, representing 27 percent and 25 percent of hours worked, respectively.

The rising demand for occupations that currently command higher wages—and require more social and emotional, technological, and higher cognitive skills—underscores the critical role of strategic skill acquisition. Workers will be able to move to better-compensated positions if they have access to effective education and retraining programs that can equip them with the requisite skills (see Box 3, "How generative AI could be used as a tool to enhance and reshape skills acquisition"). However, if workers are not reskilled appropriately or in a timely manner, an increasing gap will emerge between demand for and supply of highly valued skills. This disparity could result in labor shortages for positions in high demand—often in the STEM fields, as well as in business and legal professions. Such a shortage could dampen productivity growth and hinder AI's growth potential.

Box 3

How generative AI could be used as a tool to enhance and reshape skills acquisition

The daunting task of reskilling workers rapidly could be made easier with corporate learning and development tools that are enhanced by generative AI (gen AI). The technology can potentially reshape training from generic offerings to a personalized, interactive journey, addressing specific skills gaps and preparing employees for challenges.

At the outset, gen AI could craft a customized curriculum that discerns and targets the learning needs and skill deficits of each employee. It would achieve this through an analysis of personal profiles, effectively aligning learning objectives with the employee's role, tenure, and location to ensure relevant and accelerated skill development.

For content creation, gen AI could leverage its ability to synthesize vast amounts of standard operating procedures, compliance regulations, and traditional training materials into coherent, accessible just-in-time formats and nudges. This synthesis would not only improve engagement by simplifying complex information but also reduce the need to manage the shelf life of program content.

For training delivery, gen AI could introduce instructional methods, deploying digestible, real-time training content across multiple platforms. By adapting to various learning styles and preferences, gen AI could deliver a more intuitive and interactive learning experience that is both scalable and efficient. The platform also could foster the development of competencies by enabling assessments that discern an employee's understanding and retention of training, thus potentially ensuring that the transition of knowledge is effective and measurable.

Last, gen AI could provide immediate, data-driven feedback on an employee's learning progress. This would allow both content and format updates in real time for maximum efficiency and effectiveness, both individually and collectively.

One case study involving a global specialty-materials company illustrates how gen AI is emerging as a tool to support individual professional growth. The US-based company faced obstacles in training and upskilling its workforce to adopt a new supply chain planning solution. To address this, the company improved support for workers' learning needs by organizing a comprehensive digital library, integrating external resources, and implementing an AI assistant. The AI tool bolstered workers' daily performance and reduced the time they needed for learning activities. It enhanced operational efficiency by up to 15 percent, increased productivity by up to 20 percent, and improved the accuracy of forecasts. By enabling workers to swiftly adapt to new methods, the company achieved significant gains in value and performance from the supply chain planning solution, unlocking an additional 10 to 15 percent in value.[1]

[1] *The collaborative supply chain: Tech-driven and human-centric*, MHI Annual Industry Report 2024, accessed May 2, 2024.

Workers in low- and middle-wage jobs would be more likely to have to change occupations

With millions of workers in advanced economies potentially facing the prospect of transitioning between occupations, groups that are heavily concentrated in lower-wage occupations will be more likely to have to change occupations than others. But the scale of those differences varies between European countries and the United States (Exhibit 12). In Europe, workers in the two lowest-wage-bracket occupations will be three to five times more likely to have to change occupations compared to the top wage earners, our analysis finds. The disparity is much higher in the United States, where workers in the two lowest-wage-bracket occupations are ten to 14 times more likely to face occupational shifts than the highest earners. In Europe, the middle-wage population could be almost twice as affected by occupational transitions as the same population in United States, representing 7.3 percent of the working population who might face occupational transitions.

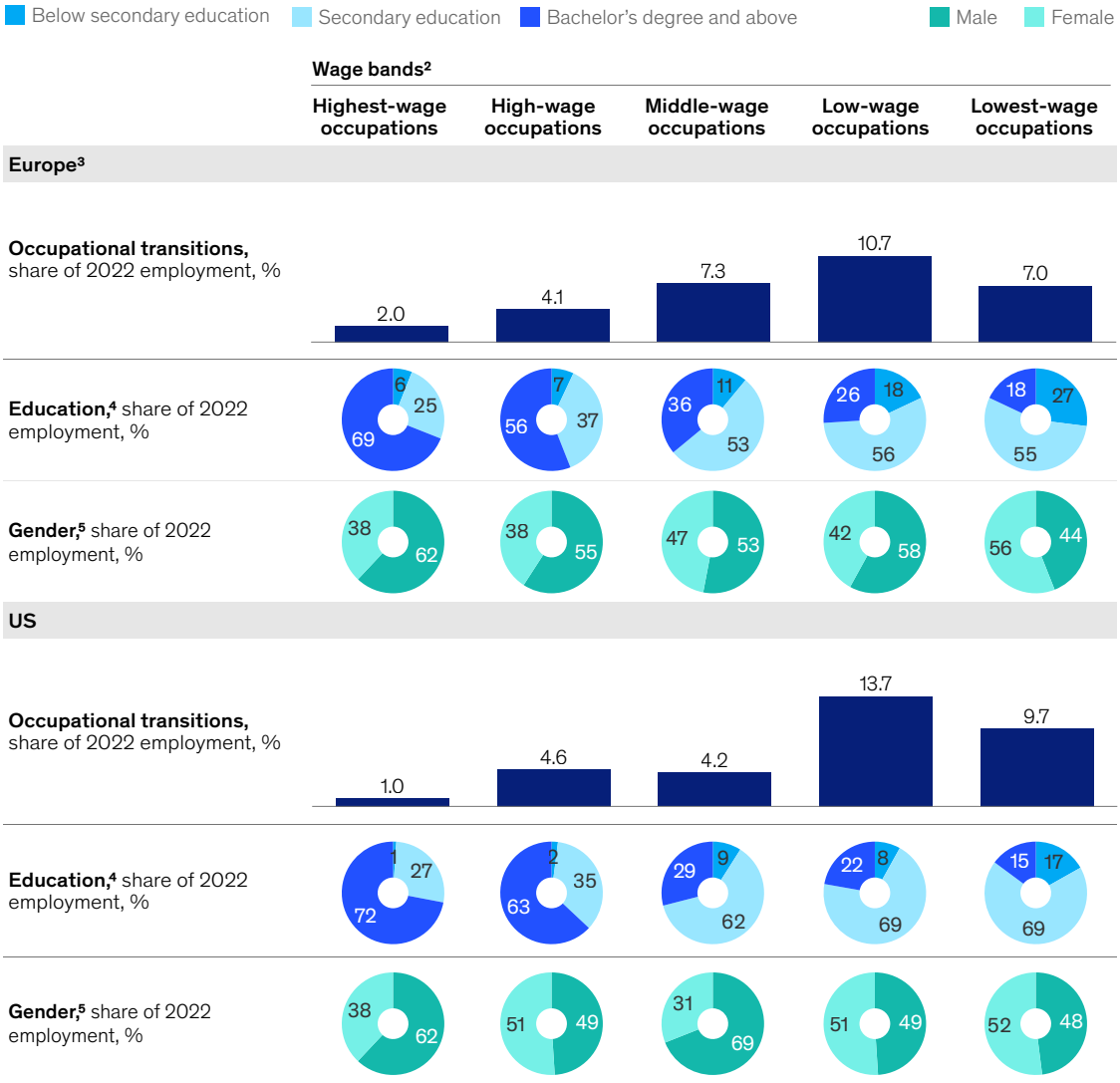
Intervention mechanisms to support labor market transitions would need to be designed to address the needs of those most at risk of displacement. Based on current labor demographics in both Europe and the United States, workers with lower educational attainment are disproportionately represented among those who may need to find new types of work by 2030. The need for higher qualifications is likely to surge as the demand for jobs that require higher levels of formal education—STEM jobs and roles in the health professions, for example—increases demand for tertiary degrees. However, occupational shifts will primarily concern those without a tertiary education. Similarly, certain types of lower- and middle-wage occupations, such as clerical roles, that are highly susceptible to automation, tend to be disproportionately held by women currently. The importance of reskilling for all workers in occupations that face a higher need for transition cannot be overemphasized.

In Europe, workers in the two lowest-wage brackets will be three to five times more likely to have to change occupations compared to top wage earners.

Exhibit 12

Workers in lower-wage positions are more likely to face the need for occupational transitions.

Expected change in employment share by wage band, faster/midpoint scenario,[1] 2022–30, percentage points



Note: Figures may not sum to 100%, because of rounding.
[1]With generative AI acceleration. For Europe, we used the "faster" scenario, which corresponds to the "midpoint" scenario in the United States.
[2]Occupations are ranged into quintiles based on their average wages. They are specific for each European country considered (see appendix). As an example, data for France and the US is as follows: lowest-wage occupations: $15.3k–30.3k annually in France, $21.0k–31.0k in the US; low-wage occupations: $30.3k–34.7k in France, $31.0k–38.0k in the US; middle-wage occupations: $34.7k–41.7k in France, $38.0k–50.0k in the US; high-wage occupations: $41.7k–55.4k in France, $50.0k–69.0k in the US; highest-wage occupations: more than $55.4k in France, more than $69.0k in the US. For dollar values, note that upper bounds are exclusive, while lower bounds are inclusive. Wages are in 2010 dollars.
[3]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
[4]Share of educational attainment of current wage band occupations based on current demographics.
[5]Share of male and female in current wage band occupations based on current demographics.
Source: Eurostat; Occupational Information Network; Oxford Economics; US Bureau of Labor Statistics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

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Conclusion

Enhancing productivity and human capital in a time of technological ferment

Many structural trends will shape the future of work—from AI and automation to the transition to net-zero emissions and rising demand for healthcare services. Yet the primacy of technological transformation as a driver of changes in the future of work is hard to ignore. The technology adoption we describe in this report will drive both the occupational transitions and skills upgrades that will be needed in the decade to come, as well as the productivity growth that will be possible. Organizations and policy makers have choices to make; the way they approach AI and automation, along with human capital augmentation, will affect economic and societal outcomes. Will they go all out to adopt the new technologies quickly? In their adoption strategy, will they also focus actively on the occupational transitions ahead, looking to raise skill levels and enhance human capital while they automate? In this concluding chapter, we look at these choices and their implications for businesses, policy makers, and overall productivity growth.

Choices for managing the technology and workforce transition

Technology is not intrinsically good or bad. Artificial intelligence, like other technologies, can produce positive or negative outcomes—and often both—depending on how it is deployed. Policy makers and businesses face significant choices about what to prioritize and how to manage potential trade-offs between technological deployment and the furthering of human capital. How they think about these choices will be decisive for human capital and societal well-being more broadly.

Building on previous work on the deployment of technology for social good,[41] we have identified the need to address a critical factor: the way in which the workforce and skills transition is managed.

The stance of businesses affects workers' capabilities and the pace at which technologies can spread through the economy. Companies taking a proactive stance (or path) would anticipate and implement technological changes while establishing worker training structures, supporting employees, and seeking to attract the right talent. Such an approach might require significant capital investment and training hours. Policy makers would also have a role to play—for example, by potentially framing smart public policies that facilitate occupational transitions while supporting skill building.[42] Developing "lighthouse examples" in public services could be one important way to show the path toward human capital development. For example, the French government recently introduced "Albert," a large language model assistant designed to help civil servants search for information and formulate specific responses.[43]

Companies taking a proactive stance would anticipate and implement technological changes while establishing worker training structures, supporting employees, and seeking to attract the right talent.

Conversely, a reactive stance (or path) would inherently pay little heed to the capability-building and human capital implications of automation. This path may appear easier in the short term—for example, it may require less effort and incur lower immediate costs for companies. But it comes with risks, both for companies and for society more broadly. For example, workers might lose their jobs and be unable to find their way into occupations for which demand is rising. And companies may be unable to participate fully in the technological transition because they lack much-needed AI capabilities. If such issues become widespread, they may ultimately choke technology deployment for the economy as a whole, hindering growth.

[41] "'Tech for Good': Using technology to smooth disruption and improve well-being," McKinsey Global Institute, May 15, 2019.
[42] For a discussion of AI and its deployment implications, see Daron Acemoglu and Pascual Restrepo, *The wrong kind of AI? Artificial intelligence and the future of labor demand*, NBER working paper, number 25682, March 2019.
[43] "L'IA et la débureaucratisation pour simplifier la vie des usagers" ("AI and debureaucratization to simplify users' lives"), French Government, April 23, 2024.

Estimating the productivity implications of the technological transition for Europe

The approach that businesses take to technology deployment and skills transitions affects the balance between job displacement and productive job creation. Thus it also affects overall economic productivity. We have attempted to quantify at a high level the potential effects of different stances to technology deployment on productivity in Europe. For this exercise, we refer to productivity (rather than income or GDP) to measure economic potential and express the results as annual growth rate in productivity until 2030. This exercise focuses on all the European economies we looked at in this report.

Our analysis considers two dimensions. The first is the adoption rate of AI and automation technologies. We consider two of our scenarios outlined earlier in chapter 2: the "faster" scenario and the "late" scenario for technology adoption. As discussed in chapter 2, faster adoption would unlock greater AI growth potential but also, potentially, more short-term labor disruption than the late scenario. The late scenario anticipates about 2 percent of time spent on current work activities to be automated by 2030, in contrast to the 27 percent assumed in the faster scenario. The second dimension we consider is the level of automated worker time that is redeployed into the economy. This represents the ability to redeploy the time gained by automation and productivity gains (for example, new tasks and job creation). This could vary depending on the success of worker training programs and strategies to match demand and supply in labor markets. We based our analysis on two potential scenarios: either all current work hours automated are fully redeployed into the economy at a similar productivity level as in 2022 or only some 80 percent of the automated workers' time will be redeployed into the economy.

Exhibit 13 illustrates the various outcomes in terms of annual productivity growth rate. The top-right quadrant illustrates the highest economy-wide productivity, with an annual productivity growth rate of up to 3.1 percent. It requires fast adoption of technologies (faster scenario) as well as full redeployment of automated hours. The top-left quadrant also demonstrates technology adoption on a fast trajectory and shows a relatively high productivity growth rate (up to 2.5 percent). However, about 6 percent of total hours worked (equivalent to 10.2 million people not working) would not be redeployed in the economy, meaning that some affected workers could be unable to find meaningful ways to reenter the economy—a painful outcome for many with potential social implications. Finally, the two bottom quadrants depict the failure to adopt AI and automation, leading to limited productivity gains and translating into limited labor market disruptions. In terms of productivity levels, these would be the least favorable outcomes, with annual productivity growth at 0.3 percent or below.

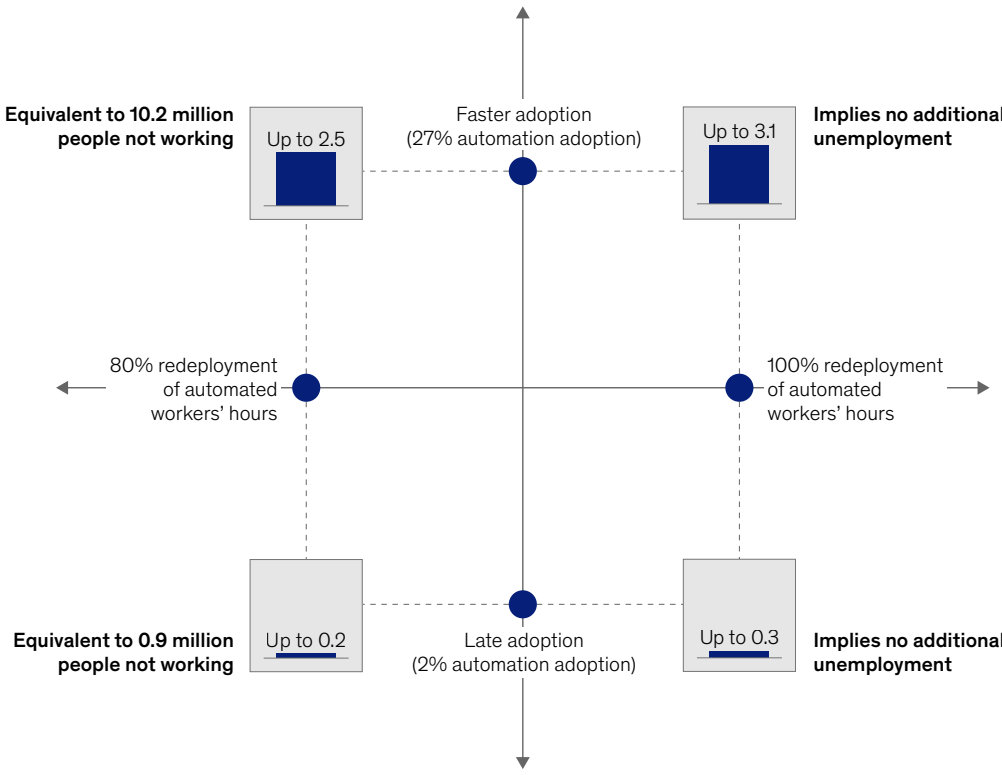
While this calculation is a thought exercise, it nonetheless highlights the impact that decisions and choices made today could have in the future. The calculation is for 2030, but it would be a starting point for upcoming decades.

Decisions that companies make today could help them boost both growth and human capital development.

Exhibit 13

Europe faces choices about the pace of AI adoption and redeployment of work hours, with different social and economic outcomes.

Potential annual labor productivity growth rate in Europe[1] until 2030, %



[1]Includes Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, and United Kingdom.
Source: Eurostat; Occupational Information Network; Oxford Economics; US Bureau of Labor Statistics; national statistical agencies of the European countries considered; McKinsey Global Institute analysis

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Four priorities for companies

Companies will need to transform and retrain their workforces to adapt to the new work landscape. The decisions they make today could help them boost both growth and human capital development. Already, many employers seem ready to take on the challenge—and they have the potential to create a new ethos of AI social responsibility.[44]

The adoption of automation technologies will be decisive in protecting businesses' competitive advantage in an automation and AI era. To ensure successful deployment at a company level, business leaders can embrace four priorities (Exhibit 14):

Understand the potential. What is the potential impact of automation technologies, and what is the starting point? Leaders need to understand the potential of these technologies, notably including how AI and gen AI can augment and automate work. This includes estimating both the total capacity that these technologies could free up and their impact on role composition and skills requirements. Understanding this allows business leaders to frame their end-to-end strategy and adoption goals with regard to these technologies. As an example, one leading financial institution analyzed the current activities of its workforce and concluded that AI and gen AI have the potential to save about half of worked-hour capacity at the company. While this finding will need to be tempered by the adoption strategy the company puts in place, it nonetheless highlights the very significant potential workforce implications of these technologies.

Plan a strategic workforce shift. What are the key steps to identifying the starting point of the transformation? Once they understand the potential of automation technologies, leaders need to plan the company's shift toward readiness for the automation and AI era. This requires sizing the workforce and skill needs, based on strategically identified use cases, to assess the potential future talent gap. From this analysis will flow details about the extent of recruitment of new talent, upskilling, or reskilling of the current workforce that is needed, as well as where to redeploy freed capacity to more value-added tasks. As an example, a large financial institution successfully pinpointed its key opportunity pools for AI and gen AI implementation by estimating 2030 talent gaps compared with its current workforce. This enabled the company to determine that AI and gen AI had immediate potential to fill skills gaps for two main groups of roles: those with the largest projected workforce gaps in 2030, such as data science, information security, and business intelligence, and those with the highest business value, such as machine learning engineering and software engineering. This led the company to put a priority on filling those gaps, through both talent sprints and the deployment of AI and gen AI use cases to address anticipated talent shortages in those functions. In another example, a leading US financial firm partnered with large language model vendors to develop its own gen AI solutions. The firm set up an operating model with a center of excellence to guide the effort and get the most out of more than 150 use cases deployed. This effort included value measurement and close collaboration with compliance, legal, and risk departments. For all businesses, these kinds of strategies offer a prime opportunity to enhance operational efficiency and output growth, build trust with the workforce, and overcome some of the hurdles posed by labor shortages.

[44] While our report focuses on the potential labor market impact of AI, the technology has many broader benefits and also raises important concerns such as security and privacy. The responsible use of AI is increasingly the focus of evolving company actions, policies and regulations. For a previous discussion of this topic, see Jacques Bughin and Eric Hazan, "Can artificial intelligence help society as much as it helps business?," *McKinsey Quarterly*, August 6, 2019.

Prioritize people development. Who does the company need to succeed in this transformation? To ensure that the right talent is on hand to sustain the company strategy during all transformation phases, leaders could consider setting up dedicated talent "win rooms"[45] to identify, attract, and recruit future AI and gen AI leaders in a tight market. They also will likely need to accelerate the building of AI and gen AI capabilities in the workforce. Nontechnical talent will also need training to adapt to the changing skills environment. Finally, leaders could deploy an HR strategy and operating model to fit the post–gen AI workforce.[46] To that end, companies are increasingly setting up AI and gen AI departments specifically to spearhead gen AI transformation efforts. These include roles focusing on strategy along with technical roles essential for executing strategies and developing future gen AI expertise across the organization. As an example, a Caribbean-based bank recently implemented specific gen AI–supported coding solutions to improve the productivity of its more than 100 software developers and attract new talent. To bring software developers up to speed quickly, the bank provided four immersive, hands-on half days of training on using gen AI tools optimally and responsibly. As a result, 80 percent of the software developers indicated that the solutions improved their coding experience and were easy to adopt.

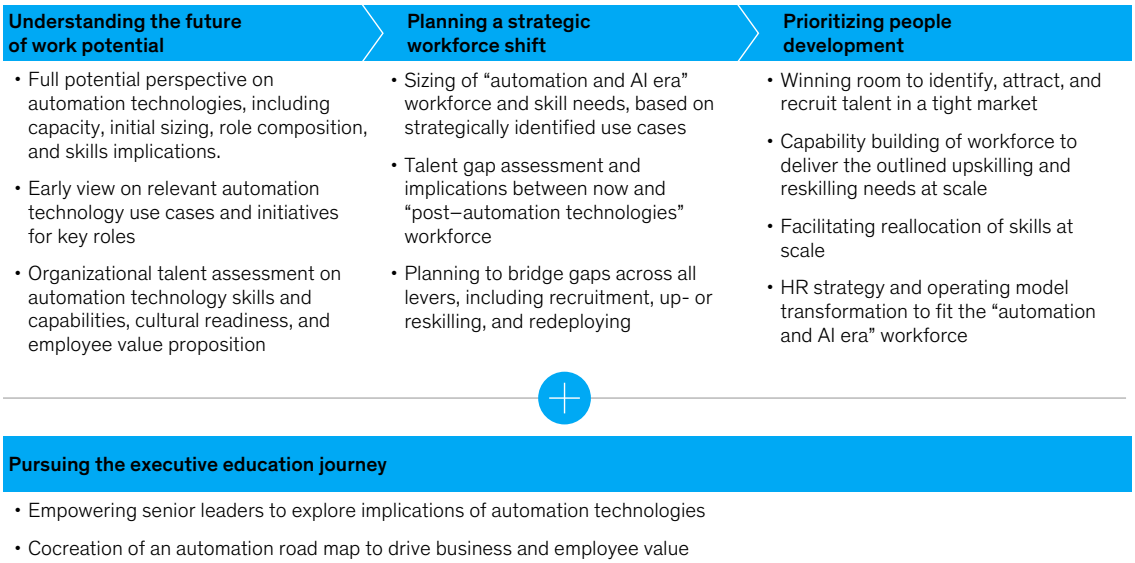
Pursue the executive-education journey on automation technologies. Leaders also need to undertake their own education journey on automation technologies to maximize their contributions to their companies during the coming transformation. This includes empowering senior managers to explore automation technologies implications and subsequently role model to others, as well as bringing all company leaders together to create a dedicated road map to drive business and employee value. A fundamental objective of this journey is for leaders to not only reskill but also achieve a deep understanding of the value and challenges that gen AI poses. This nuanced comprehension is crucial for formulating more-effective strategies and fostering a collective conviction about the transformation within leadership. As an example, when a motor racing league developed its next-generation electric racing car with the objective of breaking indoor land speed records and exciting fans in a new way, two gen AI models supported the ground team, helped guide the driver, and allowed the fans to "communicate" with the cars (for example, asking the car, "How fast can you go on this straight line during this lap?"). To make this a success, all the teams had to collaborate, from the league's chief technical officer to the motor engineers and the drivers themselves. Another example is a Europe-based global telecommunications and media company that has held dedicated board workshops to demystify gen AI and shape the gen AI road map. Such comprehensive involvement ensures that leaders are not just strategy setters but also deeply informed and engaged participants in the gen AI transformation.

[45] The "talent win room" model creates a hub for prioritizing and executing on the most pressing talent needs. Win rooms are based on two key mandates: fast-track all critical talent decisions (for example, talent acquisition, attraction, and selection) and adapt rapidly to all new workforce practices (for example, a laboratory environment for new ways of working).

[46] See "The human side of generative AI: Creating a path to productivity," *McKinsey Quarterly*, March 18, 2024.

Exhibit 14

There are four action pillars for leaders when engaging with automation technologies to unlock optimum outcomes through fast adoption.



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Work is not static. Labor markets have been in a state of flux since the Industrial Revolution and continue to change, particularly as new technologies come into play and take over activities previously undertaken by human labor—which then adapts and finds new work that makes use of the new technologies. Will this pattern continue? AI and the toolbox of advanced new technologies are evolving at a breathtaking pace. For companies and policy makers, these technologies are highly compelling because they promise a range of benefits, including higher productivity, which could lift growth and prosperity. Yet, as this report has sought to illustrate, making full use of the advantages on offer will also require paying attention to the critical element of human capital. In the best-case scenario, workers' skills will develop and adapt to new technological challenges. Achieving this goal in our new technological age presents significant challenges—but the benefits will be great.

Technical appendix

This report draws on the methodology and findings from two 2023 McKinsey Global Institute (MGI) reports: *Generative AI and the future of work in America* and *The economic potential of generative AI*. A full description of the methodology used is detailed in the technical appendices of those reports. Below is a brief summary of the methodology and how it was applied to produce the findings of this report. We also conducted a proprietary survey to assess current and future skill demand influenced by AI adoption and evaluate strategies to address the skills gap. For details about the terms we use throughout the report, see Box, "A note on terminology."

Model methodology

Our model includes the following data and assumptions:

Employment. Our analysis draws on aggregated employment and growth projections from the US Bureau of Labor Statistics, Eurostat, and the following national statistics agencies: the Czech Statistical Office, France's National Institute of Statistics and Economic Studies (INSEE), Germany's Federal Statistical Office, the Italian National Institute of Statistics (Istat), Spain's National Statistics Institute (INE), Statistics Denmark, Statistics Netherlands (CBS), Statistics Poland, Statistics Sweden, and the UK Office for National Statistics. Where employment projections were not available from national sources, we used projections from Oxford Economics. Granular occupational-level data across sectors was not available for the Czech Republic, Italy, and Poland. To derive employment insights, we estimated the occupational structure of these countries by benchmarking with other countries in our European sample and scaled to match the country level aggregates. Our analysis does not seek to predict overall employment levels; rather, it models various factors driving labor demand to understand how occupational composition may change.

Automation potential and adoption scenarios. To analyze the impact of automation on work activities, the MGI model breaks down some 850 occupations into about 2,100 constituent activities using data from the Occupational Information Network (O*NET). Each activity was further mapped to a set of 18 capabilities required to perform that activity. For all 18 capabilities, we assess current availability of technology and scenarios for future availability across required proficiency levels. This helps us assess the automation potential for an activity today and in the future. This potential at an activity level is further aggregated by time spent on those activities in an occupation to calculate occupation-level automation potential. These occupational estimates are then aggregated at sector and country level by a weighted average of employment in respective occupations to estimate overall impact.

Scenarios for automation adoption. Several factors can hinder or enable the timing and pace of adoption. Solutions requiring different technologies have varying levels of ease of integration. It takes time to integrate capabilities into current technical platforms and combine them into an organic entity. Further, these solutions have to be economically feasible relative to the labor cost or wages in order to allow organizations to implement at scale. Barriers also exist on the organizational side. Human talent and organizational structures might act as bottlenecks to implementation. Policies and regulations can also affect the pace of technology innovation and adoption. Finally, depending on their preferences, consumers might have varying levels of acceptance for automated solutions that could affect the pace of adoption. To incorporate all these factors, we used the mathematics of the Bass diffusion model, a well-known and widely used function in forecasting, especially for new product sales forecasting and technology forecasting.

$$f(t)/1\text{-}F(t) = (p + qF(t))$$

F(t) is the installed base fraction (that is, adoption of a given technology or product) and *f*(t) is the corresponding rate of change.

We then simulated two scenarios for historic technology adoption curves. The fitted values of parameters p and q are consistent with historical adoption curves for multiple technologies. It takes about five years to reach 50 percent adoption in the earliest scenario and approximately 16 years in the latest scenario.

Impact of automation on productivity. In our model we used GDP per full-time equivalent employee (FTE) as the measure of productivity. To measure automation's effect on productivity, we first calculate FTEs impacted by automation by multiplying the projected number of FTEs in 2030 by the estimated automation adoption rate. To maintain consistency with other data sources, we made several additional assumptions. We consider only job activities that are currently available and well defined as of the date of this report. Also, to be conservative, we assume automation has a labor substitution effect but no other performance gains. Finally, we create a scenario in which FTEs displaced by automation rejoin the workforce at 2022 productivity levels. Under the assumptions outlined above, we first calculate the additional GDP impact of FTEs joining back the labor force after the defined automation adoption scenario, as follows:

Additional GDP from displaced FTEs joining back the economy = FTE impact of automation adoption X productivity of 2022.

The additional GDP is then added to 2022 GDP, to derive the productivity impact and its growth over 2022–30.

Impact of net-zero transition. The European Union, the United Kingdom, and the United States have made international commitments to reduce greenhouse gas emissions to net zero by 2050. We examined the impact of these commitments on jobs using a scenario-based analysis drawing on the approach used by NGFS (scenario REMIND-MAgPIE 2.1-4.1, published in June 2022). We have built on previous McKinsey research assessing the impact at a global level to analyze the specific implications for the European Union, the United Kingdom, and the United States, adding sectoral and occupational dimensions to the analysis. This net-zero analysis assumes that current supply chain composition remains the same until 2030. We consider the impact of the European Union, the United Kingdom, and the United States meeting their own emissions targets as well as their role in meeting global demand for products. Jobs gained and lost are allocated as per the occupational mix of 2022. We have considered job losses and gains directly and indirectly associated with the transition for operations and maintenance and capital expenditure. We do not include other macroeconomic forces such as population and income growth.

Long-term labor market trends. In estimating labor demand, we factored in six macroeconomic catalysts—rising incomes, healthcare and aging, technological innovation, infrastructure investment, education, and the marketization of unpaid work—across the economy. We captured direct and indirect jobs that could be created from each catalyst by leveraging job multipliers from input-output tables.

Trends accelerated by COVID-19. We incorporated broad trends accelerated by the pandemic that may influence labor demand and jobs in the economy through 2030, including increased remote work and virtual meetings and the shift to e-commerce and other virtual transactions.

Skills demand and transitions. Our skills demand and transition modeling is based on the framework devised in MGI's May 2018 report, *Skill shift: Automation and the future of the workforce*. We looked at 25 workforce skills that fall into five broad categories: physical and manual, basic cognitive, higher cognitive, social and emotional, and technological. The number of hours that workers spend performing specific work activities were then mapped to a predominant skill. Since one-to-one mapping of skills and activities undercounts digital skills, we corrected this by reallocating a portion of hours from activities requiring nontechnological skills to those requiring basic digital skills.

Box

A note on terminology

We use the term "occupational shifts" to mean declines in employment in specific occupations between 2016 and 2022. (We do not include gains in this calculation to avoid double counting.)

Since the number of total workers grew over this period, losses in some occupations were offset or more than offset by gains in other occupations. From the gross declines in each occupation, we also reduced a proportional share of total retirements. We calculated this by taking the number of total retirements and allocating a share to each occupation according to its proportion of workers aged 65 and over.

However, we do not know exactly how many individuals moved from one occupation to another or if they made multiple moves; for that reason, we refer to the number of occupational shifts that occurred during this period rather than specifying the number of workers making those changes.

Much of our analysis looks at occupational categories. Each of those categories contains multiple occupations. A move from one occupation to another within the same category is counted as a shift (in historical context) or a transition (in the context of future projections). Within any given category, some individual occupations may experience declines while others increase.

Proprietary skills demand survey methodology

We complemented the labor demand analysis of our model with a survey of executives to gauge current and future expectations of demand for skills.

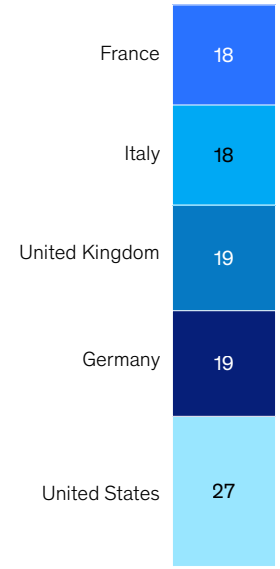
Target sample. To supplement the findings of our model, we ran a proprietary skill survey in March 2024 with 1,128 C-level executives from five representative countries: France, Germany, Italy, the United Kingdom, and the United States. Survey respondents came from a range of industrial sectors, per the NACE statistical classification of economic activities used in the European Union, and included all types of companies with 50 employees or more.

Collection methodology. Respondents were asked to provide insights on three key areas: (1) current and future skill demands, (2) the impact of AI and AI adoption on workforce skills demand, and (3) companies' strategies for bridging the existing skills gap. Participants responded to a ten-minute online survey that focused on both the present (2024) and a forecasted future (2030) regarding these three aspects (exhibit). Additionally, we compared our results with the World Economic Forum's *The future of jobs report 2023* and found similar results in both the scale and types of skill shifts needed.

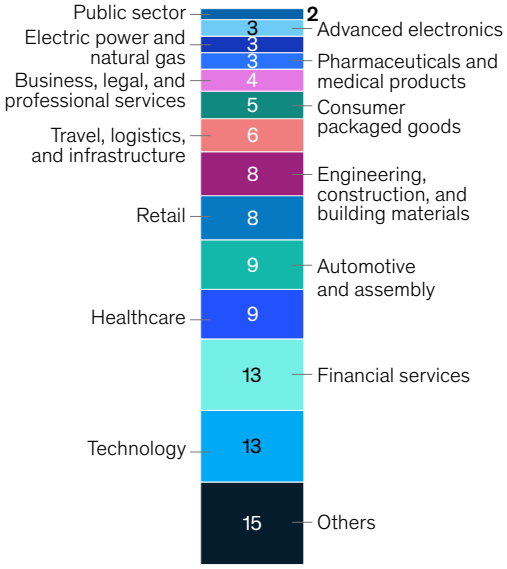
Exhibit A1

Companies participating in a recent McKinsey Global Institute survey represented five countries and leading sectors.

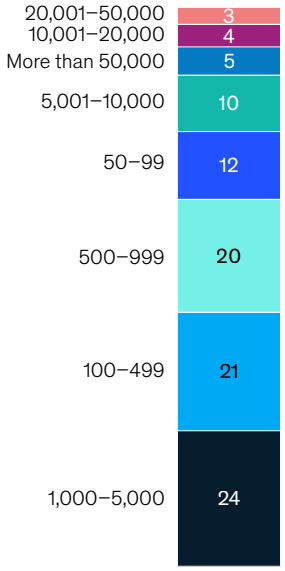
Geography, % of respondents



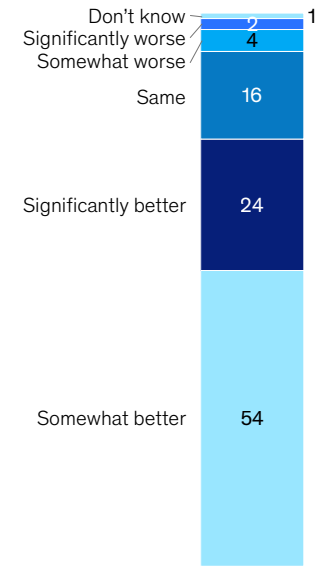
Sector, % of respondents



Company size,[1] % of respondents



Company performance,[2] % of respondents



Note: Figures do not sum to 100%, because of rounding.
[1]Companies with fewer than 50 employees were screened out.
[2]Company net profit margin compared to sector average.
Source: 2024 McKinsey Global Institute Survey, n = 1,128 C-level executives (305 from the US, 213 from Germany, 209 from the UK, 201 from Italy, and 200 from France)

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