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Generative AI and the future of work in America

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Authors

Kweilin Ellingrud
Saurabh Sanghvi
Gurneet Singh Dandona
Anu Madgavkar
Michael Chui
Olivia White
Paige Hasebe

Editor

Lisa Renaud

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At a glance

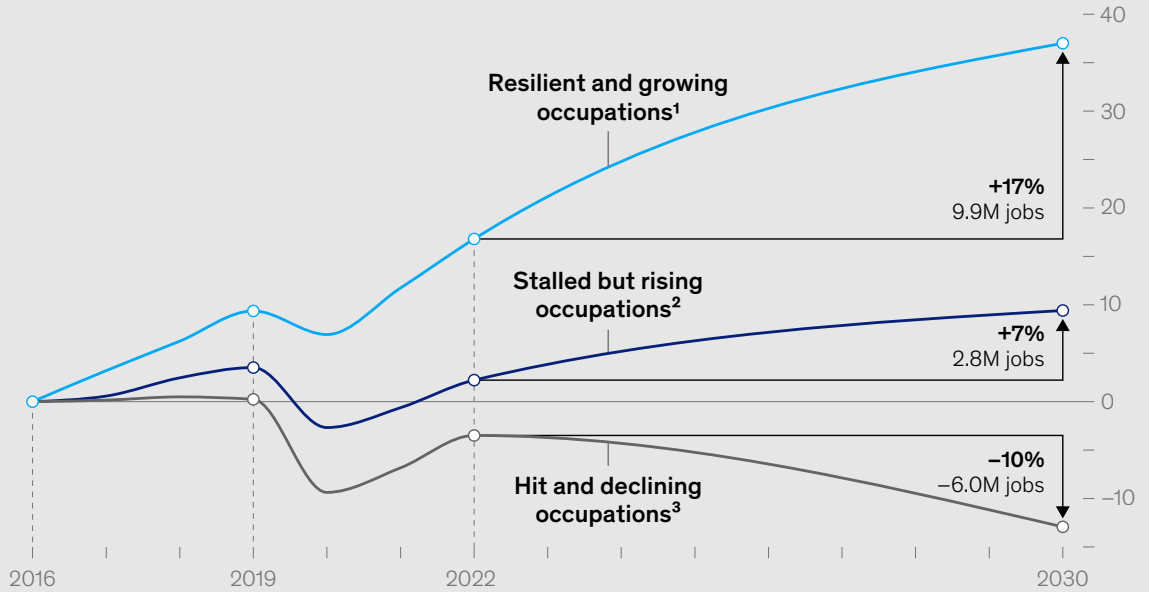— **During the pandemic (2019–22), the US labor market saw 8.6 million occupational shifts, 50 percent more than in the previous three-year period.** Most involved people leaving food services, in-person sales, and office support for different occupations.

— **By 2030, activities that account for up to 30 percent of hours currently worked across the US economy could be automated—a trend accelerated by generative AI.** However, we see generative AI enhancing the way STEM, creative, and business and legal professionals work rather than eliminating a significant number of jobs outright. Automation's biggest effects are likely to hit other job categories. Office support, customer service, and food service employment could continue to decline.

— **Federal investment to address climate and infrastructure, as well as structural shifts, will also alter labor demand.** The net-zero transition will shift employment away from oil, gas, and automotive manufacturing and into green industries for a modest net gain in employment. Infrastructure projects will increase demand in construction, which is already short almost 400,000 workers today. We also see increased demand for healthcare workers as the population ages, plus gains in transportation services due to e-commerce.

— **An additional 12 million occupational transitions may be needed by 2030.** As people leave shrinking occupations, the economy could reweight toward higher-wage jobs. Workers in lower-wage jobs are up to 14 times more likely to need to change occupations than those in highest-wage positions, and most will need additional skills to do so successfully. Women are 1.5 times more likely to need to move into new occupations than men.

— **The United States will need workforce development on a far larger scale as well as more expansive hiring approaches from employers.** Employers will need to hire for skills and competencies rather than credentials, recruit from overlooked populations (such as rural workers and people with disabilities), and deliver training that keeps pace with their evolving needs.

We expect an additional 12 million occupational transitions through 2030.

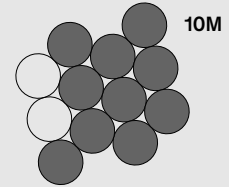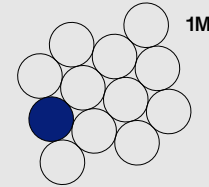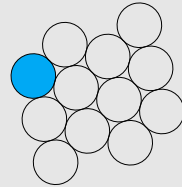**US job growth,** index (0=2016 levels)

Resilient and growing occupations[1]

+17%
9.9M jobs

Stalled but rising occupations[2]

+7%
2.8M jobs

Hit and declining occupations[3]

−10%
−6.0M jobs

Growth trajectory driven by	• Healthcare demand increase as the population ages • The push toward digitization and technology • Demand for last-mile delivery	• Investments in infrastructure and the net-zero transition • Demand for reskilling and lifelong learning	• Automation adoption • Sustained e-commerce trend • Reduced need for customer-facing roles
Projected transitions[4] to new occupations,[5] 2022–30	**1M** From a resilient and growing occupation to any other occupation	**1M**	**10M**
Occupational categories within each profile ■ Occupations where generative AI could accelerate automation significantly	**36% of US workers in 2022:** • Health professionals • Health aides, technicians, and wellness ● STEM professionals • Managers • Transportation services ● Business and legal professionals	**25% of workers:** • Builders ● Creatives and arts management • Property maintenance • Mechanical installation and repair • Community services ● Education and workforce training • Agriculture	**39% of workers:** • Production work • Food services • Customer service and sales • Office support

[1]Resilient during the pandemic, 2019–22, and expected to grow between 2022 and 2030.
[2]Stalled during the pandemic, 2019–22, and expected to rise between 2022 and 2030.
[3]Hit during the pandemic, 2019–22, and continuing to decline between 2022 and 2030.
[4]Job transitions are defined as jobs in net declining occupations across sectors compared with the 2030 baseline.
[5]Even in categories that are growing overall, employment may decrease in specific occupations, requiring some workers to find new roles.
 Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

Executive summary

The US labor market is going through a rapid evolution in the way people work and the work people do. Months after MGI released its last report on the future of work in America, the world found itself battling a global pandemic.[1] Since then, the US job market has come roaring back from its sudden drop. The nature of work has changed as many workers have stuck with remote or hybrid models and employers have sped up their adoption of automation technologies. More recently, the accelerated development of generative AI, with its advanced natural language capabilities, has extended the possibilities for automation to a much wider set of occupations.

Amid this disruption, workers changed jobs at a remarkable pace—and a subset made bigger leaps and moved into entirely different occupations. Some 8.6 million occupational shifts took place from 2019 through 2022. Now even more change is in store. We expect an additional 12 million occupational shifts by 2030. The total number of transitions through 2030 could be 25 percent higher than we projected a little over two years ago.[2]

Multiple forces are set to fuel growth in certain occupations and erode jobs in others. They generally fall into three categories: automation, including generative AI; an injection of federal investment into infrastructure and the net-zero transition; and long-term structural trends such as aging, continuing investment in technology, and the growth of e-commerce and remote work. We do not forecast how aggregated employment may be affected by the business cycle in the short term; instead, we focus on how these forces may reshape the composition of labor demand over the long term.

Across a majority of occupations (employing 75 percent of the workforce), the pandemic accelerated trends that could persist through the end of the decade. Occupations that took a hit during the downturn are likely to continue shrinking over time. These include customer-facing roles affected by the shift to e-commerce and office support roles that could be eliminated either by automation or by fewer people coming into physical offices. Declines in food services, customer service and sales, office support, and production work could account for almost ten million (more than 84 percent) of the 12 million occupational shifts expected by 2030.

Multiple forces are set to fuel growth in certain occupations and erode jobs in others.

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1   *The future of work in America: People and places, today and tomorrow*, McKinsey Global Institute, July 2019.
2   *The future of work after COVID-19,* McKinsey Global Institute, February 2021.

By contrast, occupations in business and legal professions, management, healthcare, transportation, and STEM were resilient during the pandemic and are poised for continued growth. These categories are expected to see fewer than one million occupational shifts by 2030.

For the other categories that account for the remaining one million occupational shifts still to come, the pandemic was a temporary headwind. Employment in fields like education and training should rise in the years ahead amid a continuous need for early education and lifelong learning. Demand for construction workers also stalled during the height of the pandemic but is expected to rebound strongly.

The changes estimated in our earlier research are happening even faster and on an even bigger scale than expected. It is becoming even more urgent to solve occupational and geographic mismatches and connect workers with the training they need to land jobs with better prospects. The fact that workers have been willing to pivot and change career paths, while a tighter labor market encouraged companies to hire from broader applicant pools, gives cause for optimism—but not complacency. The future of work is already here, and it's moving fast.

In a tighter labor market, workers have been moving into new roles, accelerating occupational shifts

By the end of 2022, employment had bounced back to its 2019 level. But a great deal was in flux.

Are pandemic-era labor shortages here to stay?

The quits rate soared to new heights during the pandemic, with roughly 48 million Americans leaving their jobs in 2021 and 51 million in 2022. What people did next is not fully evident from the data. Some moved into better jobs with higher pay. Others left the labor force, whether out of discouragement or for personal or health reasons, and it is unclear if or when they will return.

Total employment hit an all-time high after the pandemic, with many employers encountering hiring difficulties. As of April 2023, some ten million positions remained vacant; labor force participation had ticked up but was 0.7 percentage point below its prepandemic level. That translates into roughly 1.9 million workers who are neither employed nor actively looking for jobs. This erosion comes after an extended 20-year trend of steadily falling participation.

Labor supply may continue to be constrained, given that one in four Americans will be of retirement age or older by 2030. Without higher participation rates, increased immigration, or meaningful productivity growth, labor shortages could be a lasting issue as the economy and the population grow. This remains an open question confronting markets, economists, and employers.

Workers have shown a willingness to change career paths, while a tighter labor market has encouraged companies to hire from broader applicant pools.

More than 50 percent of recent occupational shifts in the United States involved workers leaving roles in food services, customer service, office support, and production.

Estimated shifts to another occupation, by category,[1] 2019–22, %

(XX) — Number of occupational shifts in each occupational category, 2019–22

Food services (1.3M)

>75% low-wage jobs
>75% workers without college degree

Top 3 occupations	Number of shifts over 2019–22
Fast food and counter workers	529K
Waiters and waitresses	397K
Cooks	96K

Customer service and sales (1.3M)

>75% low-wage jobs
>75% workers without college degree

Retail salespersons	447K
Cashiers	158K
Hairdressers, hairstylists, and cosmetologists	96K

Office support (1.2M)

>75% low-wage jobs
>70% workers without college degree

Office clerks, general	443K
Secretaries and administrative assistants	96K
First-line supervisors of office and administrative support workers	70K

Production work (900K)

>75% low-wage jobs
>75% workers without college degree

Laborers and freight, stock, and material movers	126K
Production helpers	68K
Machinists	66K

Hit and declining occupations

Hit during COVID-19 and continuing to decline

Resilient and growing occupations

Resilient during COVID-19 and continuing to grow

Stalled but rising occupations

Stalled during COVID-19 but starting to rise

~8.6M total occupational shifts

50% faster rate of change than in previous 3 years

Food services 16
Customer service and sales 15
Office support 14
Production work 10
Others 7
Community services 7
Builders 3
Educators 4
Educators 5
Others 7
STEM professionals 5
Business and legal professionals 6
Health aides 8

Health aides, technicians, and wellness (700K)

>75% low-wage jobs
>75% workers without college degree

Nursing assistants	93K
Recreation workers	87K
Childcare workers	85K

Business and legal professionals (600K)

<25% low-wage jobs
25–50% workers without college degree

Project management specialists	110K
Sales representatives	100K
Business operations specialists	38K

STEM professionals (400K)

<25% low-wage jobs
25–50% workers without college degree

Computer systems analysts	66K
Computer programmers	56K
Electrical and electronic engineering technologists and technicians	21K

Others (600K)

<25% low-wage jobs
25–50% workers without college degree

Light truck drivers	62K
Bus drivers, transit and intercity	35K
School psychologists	25K

Other categories include health professionals, managers, and transportation services.

Education and workforce training (400K)

25–50% low-wage jobs
<25% workers without college degree

Substitute teachers	154K
Tutors	81K
Preschool teachers	25K

Builders (300K)

25–50% low-wage jobs
>75% workers without college degree

Carpenters	40K
Painters, construction and maintenance	25K
Drywall and ceiling tile installers	14K

Community services (300K)

25–50% low-wage jobs
50–75% workers without college degree

Correctional officers and jailers	65K
Lifeguards, ski patrol, and other recreational protective service workers	36K
Rehabilitation counselors	25K

Others (600K)

50–75% low-wage jobs
>75% workers without college degree

Maids and housekeeping cleaners	134K
Coaches and scouts	26K
Computer, automated teller, and office machine repairers	23K

Other categories include agriculture, creatives and art management, mechanical installation and repair, and property maintenance.

Note: Figures may not sum to 100%, due to rounding.
[1]"Occupational shifts" refers to net declines in employment in specific occupations between 2019 and 2022. 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.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

The Great Attrition obscured deeper shifts

While most attention was focused on soaring quits rates during the pandemic, something more structural was also occurring. A subset of people did more than change employers; they moved into different occupations altogether. Based on net increases and decreases in employment, some 8.6 million occupational shifts took place from 2019 through 2022—50 percent more than in the previous three-year period (Exhibit E1).[3] While it is impossible to trace individual moves, many people left their previous roles and landed better-paying jobs in other occupations.

The majority of these shifts came from people leaving jobs in food services, customer service and sales, office support, and production work (such as manufacturing). At the same time, managerial and professional roles plus transportation services collectively added close to four million jobs from 2019 to 2022. Our previous research had anticipated these types of changes over a longer time frame, but the pandemic suddenly accelerated matters. The past few years have been a preview of trends we expect to continue through the end of the decade.

More high-wage jobs—and fewer workers taking lower-wage service jobs

Overall employment in low- and middle-wage occupations has fallen from prepandemic levels, while occupations that pay more than $57,000 annually added about 3.5 million jobs. However, it is unclear how many higher-paying roles were filled by people who moved up and how many were filled by new entrants to the labor force. Meanwhile, the number of lower-wage job openings has not declined. Demand for lower-wage service work remains, but fewer workers are accepting these roles.

What is clear from the job switching and occupational shifts of the past three years is that the US labor market accommodated a higher level of dynamic movement. Spiking demand and labor scarcity forced many employers to consider nontraditional candidates with potential and train them if they lacked direct experience. While this may not hold in the future, employers and workers alike can draw on what they have learned about the potential for people to make quick pivots and add new skills.

Automation and other forces will continue to reshape the labor market

Automation, from industrial robots to automated document processing systems, continues to be the biggest factor in changing the demand for various occupations. Generative AI is both accelerating automation and extending it to an entirely new set of occupations. While this technology is advancing rapidly, other forces are also affecting labor demand. Overall, we expect significant shifts in the occupational mix in the United States through the end of the decade.

The effects of automation and generative AI

Automation has taken a leap forward with the recent introduction of generative AI tools. "Generative" refers to the fact that these tools can identify patterns across enormous sets of data and generate new content—an ability that has often been considered uniquely human. Their most striking advance is in natural language capabilities, which are required for a large number of work activities. While ChatGPT is focused on text, other AI systems from major platforms can generate images, video, and audio.

Although generative AI is still in the early stages, the potential applications for businesses are significant and wide-ranging. Generative AI can be used to write code, design products, create marketing content and strategies, streamline operations, analyze legal documents, provide customer service via chatbots, and even accelerate scientific discovery. It can be used on its own or with "humans in the loop"; the latter is more likely at present, given its current level of maturity.

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[3] Measured as net job losses for individual occupations across sectors, net of estimated retirements; derived from US Bureau of Labor Statistics (BLS) data. An administrative assistant who takes a similar position with another employer has simply switched jobs and is not part of this analysis. If that person becomes an office manager, they have changed occupations within the same category (office support). If they become a computer systems analyst, they have moved into a different occupational category (STEM professionals). The latter two moves are the kind of occupational shifts that we measure. Since we are unable to trace exactly how individual workers moved, we use net declines as a broad proxy. In our forward-looking scenario, we refer to people needing to make transitions if demand is projected to decline in their current occupation.
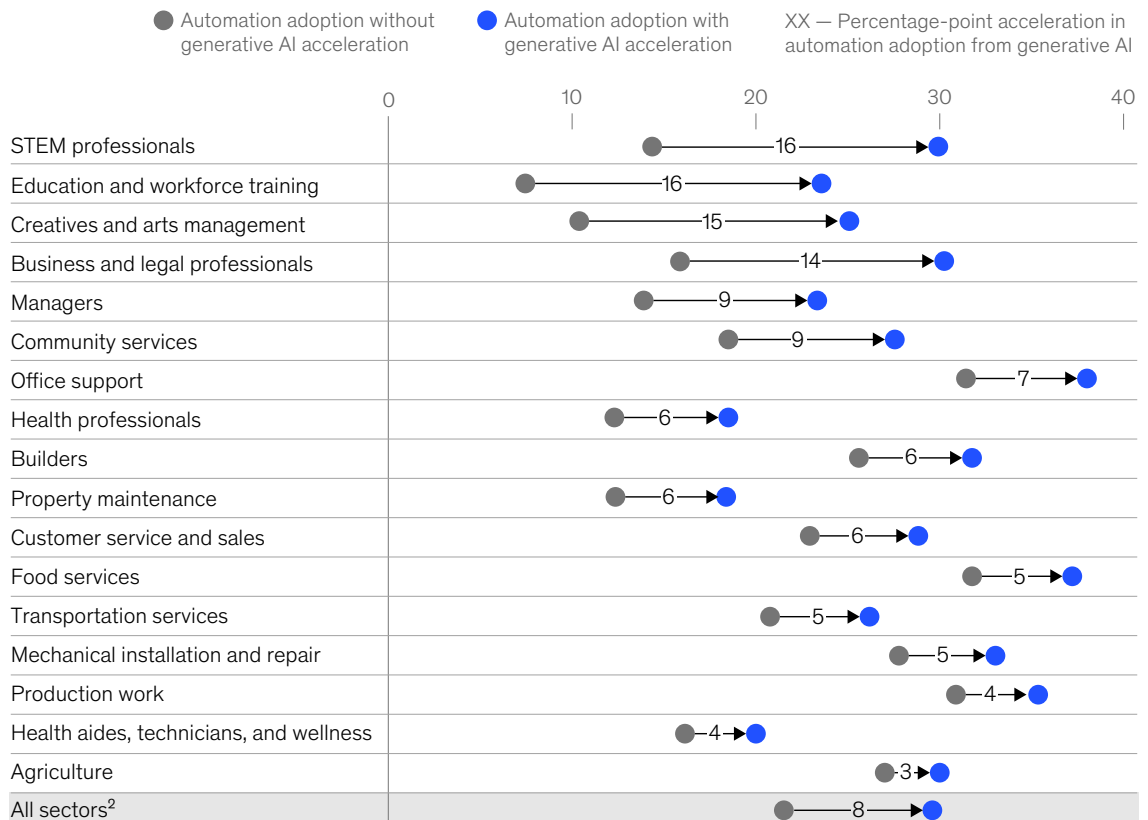
All of this means that automation is about to affect a wider set of work activities involving expertise, interaction with people, and creativity. The timeline for automation adoption could be sharply accelerated. Without generative AI, our research estimated, automation could take over tasks accounting for 21.5 percent of the hours worked in the US economy by 2030. With it, that share has now jumped to 29.5 percent (Exhibit E2).[4]

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[4] Note that this is the midpoint, representing the average of a very wide range, from 3.7 to 55.3 percent.

Exhibit E2

With generative AI added to the picture, 30 percent of hours worked today could be automated by 2030.

Midpoint automation adoption[1] by 2030 as a share of time spent on work activities, US, %

● Automation adoption without generative AI acceleration

● Automation adoption with generative AI acceleration

XX — Percentage-point acceleration in automation adoption from generative AI

[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 & Company, June 2023.
[2]Totals are weighted by 2022 employment in each occupation.
Source: O*NET; US Bureau of Labor Statistics; McKinsey Global Institute analysis

Other forces affecting future labor demand

Automation is not occurring in a vacuum, of course. Other trends are affecting the demand for certain occupations, and we expect the employment mix to change significantly through 2030, with more healthcare, STEM, and managerial positions and fewer jobs in customer service, office support, and food services.

— **Federal investment:** Recent federal legislation is driving momentum and investment in other areas that will affect jobs.[5] Reaching the net-zero emissions goal is one of these priorities. Some 3.5 million jobs could be displaced through direct and indirect effects across the economy. But at the macro level, these losses should be more than offset by gains of 4.2 million jobs, primarily led by capital expenditures on renewable energy. The net-zero transition will likely be a net positive for jobs, but those jobs may be located in different places and require different skills.

   Similarly, major investment in infrastructure projects across the country will bolster construction jobs, which could see employment growth of 12 percent from 2022 through 2030. However, the sector already had some 383,000 unfilled positions in April 2023. This shortage will have to be addressed to bring infrastructure projects to life from coast to coast.[6]

   The CHIPS and Science Act is putting additional funding into semiconductor manufacturing as well as R&D and scientific research.[7] This comes at a time when some companies have been adjusting their supply chains, leading to an uptick in domestic manufacturing. While manufacturing is likely to boost employment demand overall in the years ahead, the sector is becoming more high-tech. It will involve fewer traditional production jobs than in the past but more workers with technical and STEM skills.[8]

— **Other structural trends:** At the same time, other trends like rising incomes and education levels will sustain jobs. An aging population will need more healthcare workers in multiple roles, while the ongoing process of digitizing the economy will require adding more tech workers in every sector.

Putting it all together, the mix of jobs is changing, and we anticipate an additional 12 million occupational shifts

One of the biggest questions of recent months is whether generative AI might wipe out jobs. Our research does not lead us to that conclusion, although we cannot definitively rule out job losses, at least in the short term. Technological advances often cause disruption, but historically, they eventually fuel economic and employment growth.

This research does not predict aggregated future employment levels; instead, we model various drivers of labor demand to look at how the *mix* of jobs might change—and those results yield some gains and some losses.[9] In fact, the occupational categories most exposed to generative AI could continue to add jobs through 2030 (Exhibit E3), although its adoption may slow their rate of growth. And even as automation takes hold, investment and structural drivers will support employment. The biggest impact for knowledge workers that we can state with certainty is that generative AI is likely to significantly change their mix of work activities.

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[5]   While our scenario includes the impact of federal investment in the net-zero transition and infrastructure, it does not include the full impact of the CHIPS and Science Act and the Inflation Reduction Act, since implementation remained unclear at the time of this analysis. However, both pieces of legislation point to the possibility of additional upside.

[6]   Garo Hovnanian, Adi Kumar, and Ryan Luby, "Will a labor crunch derail plans to upgrade US infrastructure?" McKinsey & Company, October 2022.

[7]   Note that both the CHIPS and Science Act and the Inflation Reduction Act create room for additional upside in employment. But since there is still uncertainty about their implementation as of this writing, their effects on jobs are not explicitly incorporated into our scenario.

[8]   For more on this topic, see Asutosh Padhi, Gaurav Batra, and Nick Santhanam, *The titanium economy: How industrial technology can create a better, faster, stronger America,* Public Affairs, 2022.

[9]   We rely on employment projections from the US Bureau of Labor Statistics for 2030 employment levels.

While STEM, healthcare, builders, and professional fields continue to add jobs, generative AI could change work activities significantly for many occupations.

Estimated labor demand change and generative AI automation acceleration by occupation, US, 2022–30

Midpoint automation adoption¹ by 2030, %

- 15–25
- 25–35
- 35–40

Employment, absolute

5M   10M

Change in labor demand,² %

Increase in automation adoption driven by generative AI acceleration, percentage points

Health professionals

Health aides, technicians, and wellness

STEM professionals

Increasing labor demand and modest change of work activities

Increasing labor demand and high change of work activities

Builders

Managers

Creatives and arts management

Transportation services

Property maintenance

Business and legal professionals

Agriculture

Mechanical installation and repair

Community services

Education and workforce training

Production work

Food services

Decreasing labor demand with modest change of work activities

Customer service and sales

Office support

¹Midpoint 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 & Company, June 2023.
²We consider multiple drivers affecting demand: rising income, aging populations, technology investment, infrastructure investment (including Bipartisan Infrastructure Law), rising education levels, net-zero transitions, marketization of unpaid work, creation of new occupations, automation (including generative AI), increased remote working and virtual meetings, and e-commerce and other virtual transactions.
Source: US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

Resilient and growing occupational categories

The largest future job gains are expected to be in healthcare, an industry that already has an imbalance, with 1.9 million unfilled openings as of April 2023. We estimate that there could be demand for 3.5 million more jobs for health aides, health technicians, and wellness workers, plus an additional two million healthcare professionals.[10]

By 2030, we further estimate a 23 percent increase in the demand for STEM jobs. Although layoffs in the tech sector have been making headlines in 2023, this does not change the longer-term demand for tech talent among companies of all sizes and sectors as the economy continues to digitize. Employers in banking, insurance, pharmaceuticals, and healthcare, for example, are undertaking major digital transformations and need tech workers with advanced skills.[11] In addition, the transportation services category is expected to see job growth of 9 percent by 2030.

Declining occupational categories

The biggest future job losses are likely to occur in office support, customer service, and food services. We estimate that demand for clerks[12] could decrease by 1.6 million jobs, in addition to losses of 830,000 for retail salespersons, 710,000 for administrative assistants, and 630,000 for cashiers. These jobs involve a high share of repetitive tasks, data collection, and elementary data processing, all activities that automated systems can handle efficiently. Our analysis also finds a modest decline in production jobs despite an upswing in the overall US manufacturing sector, which is explained by the fact that the sector increasingly requires fewer traditional production jobs but more skilled technical and digital roles.[13]

We estimate that 11.8 million workers currently in occupations with shrinking demand may need to move into different lines of work by 2030. Roughly nine million of them may wind up moving into different occupational categories altogether. Considering what has already transpired, that would bring the total number of occupational transitions through the decade's end to a level almost 25 percent higher than our earlier estimates, creating a more pronounced shift in the mix of jobs across the economy.

Overall, we expect more growth in demand for jobs requiring higher levels of education and skills, plus declines in roles that typically do not require college degrees (Exhibit E4).

Almost 12 million additional occupational transitions may be needed by the end of the decade.

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[10] Note that registered nurses, nurse practitioners, and nurse anesthetists are in the healthcare professionals category; nurse midwives and licensed practical and licensed vocational nurses are in the health aides category.

[11] Jon Swartz, "As Big Tech cuts workers, other industries are desperate to hire them," MarketWatch, February 18, 2023; and Steve Lohr and Tripp Mickle, "As Silicon Valley retrenches, a tech talent shift accelerates," *New York Times,* December 29, 2022.

[12] Note that clerks include receptionists and information clerks, general office clerks, bookkeeping, accounting, and auditing clerks, and shipping, receiving, and inventory clerks

[13] *Building a more competitive US manufacturing sector,* McKinsey Global Institute, April 2021.

Healthcare, STEM, and builder roles could grow, while demand for office support and customer service roles could decline.

Estimated future US job growth by occupational category
Midpoint automation scenario,[1] with generative AI acceleration

■ Resilient and growing occupations[2] ■ Stalled but rising occupations[3] ■ Hit and declining occupations[4]

Occupational category	Net change in labor demand, 2022–30, %	Employment, 2022, million
Health professionals	30	6.5
Health aides, technicians, and wellness	30	11.6
STEM professionals	23	7.9
Builders	12	7.0
Managers	11	9.7
Creatives and arts management	11	2.2
Property maintenance	10	4.6
Transportation services	9	5.6
Mechanical installation and repair	7	6.6
Business and legal professionals	7	16.0
Community services	7	6.8
Education and workforce training	3	9.9
Agriculture	2	2.1
Production work	−1	13.3
Food services	−2	13.7
Customer service and sales	−13	14.7
Office support	−18	20.1

[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 & Company, June 2023.
[2]Resilient during the pandemic, 2019–22, and expected to grow between 2022 and 2030.
[3]Stalled during the pandemic, 2019–22, and expected to rise between 2022 and 2030.
[4]Hit during the pandemic, 2019–22, and continuing to decline between 2022 and 2030.
 Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

Workers in jobs with lower wages and educational requirements could be the most affected

People in the two lowest wage quintiles (those earning less than $30,800 a year and those earning $30,800 to $38,200 a year) are up to 10 and 14 times more likely, respectively, to need to change occupations by the end of this decade than the highest earners.[14] Changing occupations, as opposed to finding a new job within the same occupation, often requires adding new skills and is more challenging.

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[14]   Workers in the second-lowest wage quintile (earning $30,800 to $38,200 per year) have an even higher risk of needing to transition occupations than the lowest-wage workers, who earn less than $30,800 a year. Replacing the lowest-wage workers with technology may not make economic sense, but at a certain wage level, the equation changes. In addition, some lower-wage jobs involve unpredictable physical work or customer-facing work that does not lend itself well to automation.

The jobs in the two lowest wage quintiles are disproportionately held today by those with less education, women, and people of color. Women are heavily represented in office support and customer service, which could shrink by about 3.7 million and 2.0 million jobs, respectively, by 2030. Similarly, Black and Hispanic workers are highly concentrated in some shrinking occupations within customer service, food services, and production work.

While our analysis shows a decrease of 1.1 million jobs in the two lowest wage quintiles by 2030, jobs in the highest wage quintile could grow sharply, by 3.8 million. Helping workers in lower-wage, shrinking occupations move into better-paying jobs with more stability will require widespread access to training programs, effective job matching, different hiring and training practices by employers, and better geographic mobility.

The overall labor market will have higher demand for social-emotional and digital skills. Although the demand for basic cognitive and manual skills is likely to decline, physical work is not going away. It may still account for just under 31 percent of time spent, driven by growth in sectors such as transportation services, construction, and healthcare.

This period of change can be an opportunity for more inclusive growth

With the pace of change unlikely to let up, the challenge will be helping workers match up with the jobs of the future. While some of this may require large-scale collaboration, individual companies can fill many of the gaps by adapting their own approaches to hiring and training.

Boosting productivity through automation and generative AI

Recent MGI research focused on how to reignite productivity growth in the United States.[15] Automation and reskilling will be vital to this effort. Automation could jump-start lackluster productivity while simultaneously easing labor shortages.

Generative AI has the potential to increase US labor productivity by 0.5 to 0.9 percentage points annually through 2030 in a midpoint adoption scenario. The range reflects whether the time freed up by automation is redeployed at 2022 productivity levels or 2030 levels, with both scenarios accounting for the occupational mix expected in 2030.

Combining generative AI with all other automation technologies, the potential growth could be even larger. All types of automation could help drive US productivity growth to 3 to 4 percent annually in a midpoint adoption scenario. However, this will require significant action from stakeholders across the public and private sector. Workers will need support in learning new skills, and other risks associated with generative AI also need to be mitigated and controlled. But if worker transitions and risks are well managed, generative AI could contribute substantively to economic growth.

To capture the full benefits of generative AI to make knowledge work more productive, employers, policy makers, and broader ecosystems would need to establish clear guidelines and guardrails—and workers would need to see these tools not as job destroyers but as work enhancers. When machines take over dull or unpleasant tasks, people can be left with more interesting work that requires creativity, problem-solving, and collaborating with others. Workers will need to gain proficiency with these tools and, importantly, use the time that is freed up to focus on higher-value activities. When managers automate more of their administrative and reporting tasks, for example, they can spend more time on strategic thinking and coaching. Similarly, researchers could speed up projects by relying on automation tools to sort and synthesize large data sets.

For employers, doubling down on innovative hiring strategies

Most employers can benefit from using a broader lens in hiring. Instead of insisting on prior experience that matches the responsibilities of an open role as closely as possible, organizations can evaluate candidates on their capacity to learn, their intrinsic capabilities, and their transferable skills.

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15   *Rekindling US productivity for a new era,* McKinsey Global Institute, February 2023.

A great deal of skills development happens on the job. Previous MGI research found that work experience contributes 40 percent of the average individual's lifetime earnings in the United States.[16] Skills learned through work experience are an even bigger determinant for people without educational credentials who start out in lower-wage work.

Filling the jobs of the future is an opportunity to make the labor market more inclusive. Employers may need to reconsider whether some credential requirements are really necessary. Some 60 percent of US workers have skills gained through experience but lack four-year college degrees. Initiatives like Tear the Paper Ceiling are supporting workers who have experience but not degrees by raising awareness among employers and providing resources.

Employers can also recruit from populations that are often overlooked, such as retirees who want to return to work, people with employment gaps, and the formerly incarcerated. Remote work, for example, is opening up long-needed opportunities for people with disabilities who cannot commute and those in rural communities.

Tackling other structural issues

Women left the workforce in relatively higher numbers than men during the pandemic. It took three full years for the number of working women in the United States to fully bounce back. Many women doing lower-wage work have family obligations that may leave them feeling that they can't take the risk of going back to school or trying a new occupation. Beyond the hiring practices that can encourage and enable women to make career transitions, the need for affordable childcare remains a major barrier.[17] To address it, a number of private-sector employers are expanding childcare benefits, while some state and local governments are providing tax credits, subsidies, or direct funding. In addition, historically male-dominated fields such as construction that are facing labor shortages can fill those gaps with more women, improving diversity in the process.

One key area of job demand is in caregiving, which is critical social infrastructure. We anticipate that the two fastest-growing occupations through the end of this decade will be nurses and home healthcare aides.[18] Childcare workers, as noted above, provide a vital service to working families. But people have been leaving these types of jobs in droves. Meeting these growing needs will likely hinge on upgrading the quality of what are today typically low-paying jobs with little security or advancement opportunities.

While large employers may be able to handle their own training needs, the magnitude of the reskilling challenge for the nation as a whole calls for broader partnerships with industry groups, educational providers, and nonprofits as well as incentives for investing in human capital. Addressing the need for reskilling with efforts beyond individual companies would help spread the cost, addressing the concerns of employers who might be reluctant to invest in training for employees who can subsequently leave.

With millions of jobs potentially being eliminated by automation—and even more being created in fields requiring different skills—the United States needs broad access to effective training programs as well as job-matching assistance that can help individuals find opportunities. Many initiatives are in place, but it will be critical to dramatically scale up what works and take a proactive approach to filling key shortages. One promising solution, still in the early stages, involves digital learning and employment records—a kind of digital microcredential that can document how an individual worker has acquired skills and also translate across companies and over time.

The US labor market has been remarkably resilient in the face of recent challenges and rapid changes. That kind of adaptability is exactly what it will take to navigate the next chapter as well, supporting individuals while helping businesses meet their talent needs so they can continue driving growth.

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16   *Human capital at work: The value of experience,* McKinsey Global Institute, June 2022.
17   Sarah Gitlin, Ayushi Gummadi, Alexis Krivkovich, and Kunal Modi, "The childcare conundrum: How can companies ease working parents' return to the office?" McKinsey & Company, May 2022.
18   For occupations that employed more than 50,000 people as of 2022.

Introduction

This report offers a fresh look at how the future of work could shape up for the United States. It's a timely moment to take stock; the landscape has changed dramatically since the McKinsey Global Institute published research on automation and the US workplace in 2019. We found that the trends we were anticipating in our previous research have indeed been unfolding—and even faster than our research originally indicated.

The US labor market had just come out of the pandemic when a revolutionary technology development burst on the scene. ChatGPT, along with other generative AI tools, attracted millions of users virtually overnight. The potential applications for cognitive and creative tasks have raised questions about the implications for workers. This research attempts to answer those questions while putting generative AI in context with many other trends that are likely to raise or lower demand for certain occupations.

Our forward-looking analysis incorporates the pandemic-era changes that appear to be lasting, along with new estimates for technology adoption and advancement. This time, it also considers trends fueled by major infusions of federal investment in the clean-energy transition and the renewal of the nation's infrastructure.[19] Our primary focus is on labor demand, although we include some observations about the future labor supply and how technology might change the day-to-day nature of work.

We look to the future with full awareness of how much is uncertain. Some data on what is occurring today is still limited, and future disruptions could always change the trajectory. This research is not meant to provide a short-term job forecast affected by fluctuations in the business cycle. Instead, it offers a longer-term structural view of how the US labor market could keep evolving.

The clear takeaway is the need to prepare for continued big occupational shifts in the years ahead. Millions of jobs could be phased out even as new ones are created. Preparing American workers for the jobs of the future is a top priority for leaders across the private, public, and social sectors. If handled well, this period of change could create a more inclusive economy with higher productivity growth.

The future of work is no longer something to look for over the horizon. We're already in the midst of it.

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[19] While our scenario includes the impact of federal investment in the net-zero transition and infrastructure, it does not include the full impact of the CHIPS and Science Act and the Inflation Reduction Act, since implementation remained unclear at the time of this analysis. However, both pieces of legislation point to the possibility of additional upside.

1. A robust recovery marked by job switching and labor shortages

Gaining a clearer picture of how America's future of work could shape up through the end of this decade involves taking the nation's new starting point into account. More than two years after the initial COVID-19 shutdowns, the US labor market has regained its footing, with the economy continuing to add jobs steadily. The unemployment rate dipped below 4 percent at the beginning of 2022 and has remained there through the first half of 2023.

Against the backdrop of a tight labor market, a massive wave of job switching occurred. About 48 million people quit their jobs in 2021, followed by 51 million in 2022. With openings readily available, many workers felt empowered to seek out new positions that offered higher pay or better alignment with priorities such as flexibility or opportunities to advance.[20]

A subset of those people did more than simply change employers while doing essentially the same job. They moved into different occupations altogether, accelerating shifts in the mix of employment that our ongoing body of research has been anticipating. In this chapter, we take stock of these recent changes, which inform the updated baseline and reaffirm some of the drivers of labor demand used in our refreshed research.

The pandemic changed the mix of employment, with tougher implications for workers with less education

From the very start of the pandemic, it was evident that demand would rachet up for some types of work and dry up for others, simply due to which occupations were deemed essential or could be performed remotely. This unevenness has held true throughout the recovery (Exhibit 1).[21] These changes offer a preview of trends that we expect to continue through the end of the decade.

Managerial roles and business, legal, and STEM professions were resilient during the pandemic, since these jobs could be done remotely and were often critical to helping businesses navigate new challenges. These categories added 3.3 million jobs from 2019 to 2022. At the same time, e-commerce fueled growth in transportation services—specifically in warehousing. Jobs for stockers and order fillers, for example, grew by more than 30 percent between 2019 to 2022, while shipping, receiving, and inventory clerks grew by about 15 percent. These trends are likely to continue.

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[20]   See, for example, Jo Constanz, "The Great Resignation worked: Most job-swappers got a raise," Bloomberg, July 29, 2022; and Te-Ping Chen, "Better pay and career paths drive US workers' decisions to quit," *Wall Street Journal,* March 9, 2022.

[21]   As of this writing, 2022 is the latest year with detailed data on employment by occupation; see "Occupational Employment and Wage Statistics," US Bureau of Labor Statistics.

Exhibit 1

Customer-facing jobs sustained the biggest losses due to the pandemic, while business, transportation, and STEM roles were more resilient.

Employment change by occupational category, 2019–22

■ Resilient and growing occupations[1]   ■ Stalled but rising occupations[2]   ■ Hit and declining occupations[3]

Occupational category	Employment change, 2019–22, absolute	Employment change, 2019–22, %	Employment, 2019, million
Managers	1.6M	20	8.1
Business and legal professionals	1.2M	8	14.8
STEM professionals	509K	7	7.4
Health professionals	249K	4	6.3
Transportation services	224K	4	5.4
Mechanical installation and repair	81K	1	6.5
Agriculture	30K	1	2.1
Creatives and arts management	8K	0	2.2
Community services	−82K	−1	6.9
Builders	−113K	−2	7.1
Property maintenance	−124K	−3	4.7
Production work	−128K	−1	13.4
Office support	−128K	−1	20.3
Health aides, technicians, and wellness	−163K	−1	11.8
Education and workforce training	−298K	−3	10.2
Food services	−844K	−6	14.6
Customer service and sales	−1.3M	−8	16.0

[1]Resilient during the pandemic, 2019–22, and expected to grow between 2022 and 2030.
[2]Stalled during the pandemic, 2019–22, and expected to rise between 2022 and 2030.
[3]Hit during the pandemic, 2019–22, and continuing to decline between 2022 and 2030.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

Most other occupational groups did not recover so quickly, and the categories that took the biggest hits are likely to continue declining. During the height of the pandemic, many food service jobs were lost. Once businesses reopened their doors, however, they struggled to hire and retain workers. While total employment in the leisure and hospitality sector remained down throughout 2021, it has largely recovered. But as of April 2023, employment specifically in accommodation and food services was still slightly below prepandemic levels, with about 40 percent more job openings than before the pandemic.

Customer service and sales roles decreased throughout the pandemic as many brick-and-mortar retail locations closed. They have recovered slowly; as of 2022, customer service employment was still 8 percent below its 2019 level, which equates to 1.3 million fewer jobs. Much of this is due to consumers' changing preferences for e-commerce.[22]

Office support remained 1 percent below its 2019 levels as of 2022. In a recent McKinsey survey, nearly half of respondents said the COVID-19 pandemic accelerated their organization's deployment of automation technologies such as intelligent document management and processing tools.[23] Office clerks, secretaries, and tellers were most affected, a trend that is likely to continue as automation continues to become more ubiquitous.

The recovery in healthcare employment is more nuanced. The overall healthcare sector was down about 400,000 jobs from 2019 to 2021, although it has since recovered. While employment increased for health professionals, it has continued to lag for health aides, technicians, and wellness workers. The issue has not been lack of demand but rather lack of workers. This is likely

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22   *The future of work after COVID-19,* McKinsey Global Institute, February 2021.
23   "Your questions about automation, answered," McKinsey Global Survey, McKinsey & Company, July 2022.

due to a combination of burnout, particularly for those in frontline care roles, and workers in the lowest-paid roles leaving the field.[24] There is potential for shortages to continue unless these roles can become more attractive for workers.

Mirroring the uneven gains and losses across occupations were uneven effects for different segments of the labor force. Those without four-year college degrees were harder hit than college-educated workers. People of color disproportionately struggled since they were overrepresented in occupations that sustained losses. While the national unemployment rate during COVID-19 peaked at 14.7 percent in April 2020, it hit 18.8 percent for Hispanic workers in the same month and 16.9 percent for Black workers a month later. Women were also concentrated in sectors such as accommodation and education, which shed about 700,000 and 300,000 jobs, respectively, between 2019 and 2022.

In the economic recovery, the United States developed a labor shortage

As of May 2023, total employment stood at two million above its prepandemic level. While labor force participation has ticked back up, it remained 0.7 percentage point below where it was in February 2020. That translates into roughly 1.9 million fewer workers at a time when about ten million positions remained vacant. The job market was also tight in 2018 and 2019, but the postpandemic labor shortage has been even more pronounced. In fact, taking a longer historical view, labor force participation has been steadily falling, from 67.3 percent in January 2000 to 62.6 percent in May 2023.

Despite a wave of white-collar layoffs in 2023 that received substantial media coverage, the job market has remained robust overall, especially for blue-collar workers.[25] Many employers have been coping with unfilled positions and competing for talent. This has driven wages upward, in stark contrast to the prolonged weak jobs recovery that followed the Great Recession of 2008.

Where are the workers?
A great deal of uncertainty surrounds the current labor shortage. It is unclear whether people have left the labor force permanently or might return. Several drivers help to explain at least part of what is going on and shed light on who might be drawn back in to meet future demand and fill more of the ten million positions that are vacant today as well as those that will be created at a time when the workforce is shrinking due to aging.[26]

— **People have retired.** According to the US Bureau of Labor Statistics (BLS), labor force participation for Americans over age 65 fell from 20.8 percent in February 2020 to 19.1 percent in May 2023. Additionally, some workers in their late 50s and early 60s exited the workforce early. One study estimates that half of the recent increase in retirements was driven by "excess retirements" above the prepandemic trend line. This translates into roughly 1.6 million missing older workers.[27]

— **People have quit.** During the pandemic, an unprecedented number of workers headed for the exits, roughly a third of whom left without having their next jobs lined up.[28] While many people landed new positions, others appear to have left the workforce, whether temporarily or permanently.

24 "Assessing the lingering impact of COVID-19 on the nursing workforce," McKinsey & Company, May 2022. See also Bryan Sexton et al., "Emotional exhaustion among US health care workers before and during the COVID-19 pandemic, 2019–2021," *JAMA Network Open* (American Medical Association), September 2022; and Carlo Giacomo Leo et al., "Burnout among healthcare workers in the COVID-19 era: A review of the existing literature," *Frontiers in Public Health,* October 2021. See also Lauren Kaori Gurley, "Why nurses say they are striking and quitting in droves," *Washington Post,* January 14, 2023.

25 Justin Lahard et al., "It's a richcession, not a recession. Here's your investing playbook," *Wall Street Journal,* February 17, 2023.

26 "Why did the labor force participation rate decline when the economy was good?" US Census Bureau, June 2021; "Supporting labor supply in the American Jobs Plan and the American Families Plan," The White House, 2021; and "Can a hot but smaller labor market keep making gains in participation?" Brookings Institution, August 2022.

27 Joshua Montes, Christopher Smith, and Juliana Dajon, "'The great retirement boom': The pandemic-era surge in retirements and implications for future labor force participation," Finance and Economics Discussion Series, Federal Reserve, November 2022.

28 Aaron De Smet, Bonnie Dowling, Marino Mugayar-Baldocchi, and Bill Schaninger, "'Great Attrition' or 'Great Attraction'? The choice is yours," *McKinsey Quarterly,* September 2021.

— **Health concerns are taking a significant if hard-to-measure toll.** While data is scarce, some people stricken with COVID-19 struggle with long-term effects that hamper their ability to work.[29] In addition, studies have documented a rise in burnout and mental health challenges.[30]

— **Immigration was stalled for an extended period.** Immigrants have always been part of the American labor force. But migration into the United States began dropping in 2016, and pandemic-related restrictions accelerated the decline further. The number of foreign-born workers experienced a sharp decline from the onset of the pandemic. In 2016, more than a million immigrants (including asylum seekers, students, and holders of both work and immigrant visas) entered the country. By 2021, that number was down to fewer than 400,000. Those annual drops compound over time. Keeping 2014–16 levels of net international migration in place, for example, would have added 1.7 million people over 2017–21. However, immigration is estimated to have rebounded in 2022, with net international migration returning to 2018 levels.[31] The foreign-born share of the US labor force was higher than the prepandemic level as of May 2023.[32]

Whether current hiring difficulties turn out to be a preview of a lasting structural issue is the question of the moment for markets, economists, and employers; it is also the subject of forthcoming research from MGI. What we do know is that the tight environment is driving home the urgency of ensuring that critical occupations are filled and that people have opportunities to add the skills required to move into these roles.

Millions of workers not only changed jobs but made bigger leaps into new occupations

The Great Attrition saw Americans switching jobs in record numbers. Within that group, a significant subset of people not only changed employers but took up entirely new lines of work.

We estimate that some 8.6 million occupational shifts took place between 2019 and 2022—an increase of almost 50 percent from the preceding three-year period.[33] Declines in food services, customer service and sales, office support, and production accounted for more than half of these transitions (Exhibit 2). Losses in these categories are part of a longer-term structural change that we expect to continue.

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29 Katie Bach, "New data shows long Covid is keeping as many as 4 million people out of work," Brookings Institution, August 2022. This analysis is based in part on data from the US Census Bureau, the Minneapolis Fed, and *The Lancet.*
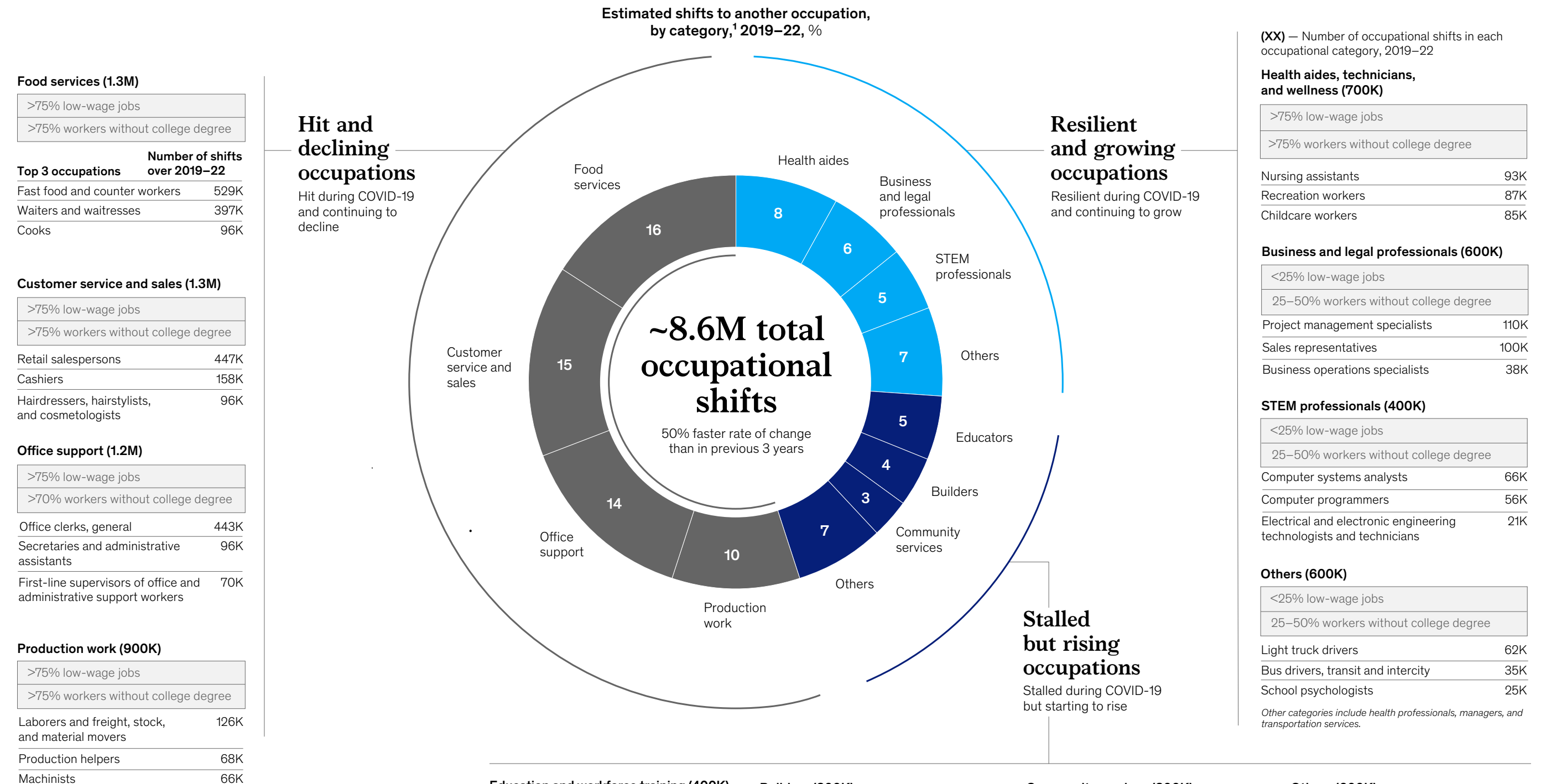
30 See, for example, "Present company included: Prioritizing mental health and well-being for all," McKinsey Health Institute, October 2022.

31 "Net migration between the United States and abroad in 2022 reaches highest level since 2017," US Census Bureau, December 2022.

32 Gabriel T. Rubin and Rosie Ettenheim, "Immigrants' share of the U.S. labor force grows to a new high," *Wall Street Journal*, May 22, 2023.

33 We measure occupational shifts as net job losses for individual occupations across sectors, net of estimated retirements; derived from BLS data. An administrative assistant who leaves one employer to take a similar position with another has simply switched jobs and is not part of this analysis. If that person becomes an office manager, they have changed occupations within the same category (office support). If they become a computer systems analyst, they have moved into a different occupational category (STEM professionals). The latter two moves are the kind of occupational shifts that we measure. Since we are unable to trace exactly how individual workers moved, we use net declines as a broad proxy for how labor demand and supply have changed across occupations. In our forward-looking scenario, we refer to people needing to make transitions if labor demand in their current occupation is projected to decline.

Exhibit 2

More than 50 percent of recent occupational shifts in the United States involved workers leaving roles in food services, customer service, office support, and production.

Estimated shifts to another occupation, by category,[1] 2019–22, %

(XX) — Number of occupational shifts in each occupational category, 2019–22

Food services (1.3M)

| >75% low-wage jobs |
| >75% workers without college degree |

Top 3 occupations	Number of shifts over 2019–22
Fast food and counter workers	529K
Waiters and waitresses	397K
Cooks	96K

Customer service and sales (1.3M)

| >75% low-wage jobs |
| >75% workers without college degree |

Retail salespersons	447K
Cashiers	158K
Hairdressers, hairstylists, and cosmetologists	96K

Office support (1.2M)

| >75% low-wage jobs |
| >70% workers without college degree |

Office clerks, general	443K
Secretaries and administrative assistants	96K
First-line supervisors of office and administrative support workers	70K

Production work (900K)

| >75% low-wage jobs |
| >75% workers without college degree |

Laborers and freight, stock, and material movers	126K
Production helpers	68K
Machinists	66K

Hit and declining occupations

Hit during COVID-19 and continuing to decline

Resilient and growing occupations

Resilient during COVID-19 and continuing to grow

Stalled but rising occupations

Stalled during COVID-19 but starting to rise

~8.6M total occupational shifts

50% faster rate of change than in previous 3 years

Food services 16
Customer service and sales 15
Office support 14
Production work 10
Others 7
Community services 7
Builders 3
Educators 4
Educators 5
Others 7
STEM professionals 5
Business and legal professionals 6
Health aides 8

Health aides, technicians, and wellness (700K)

| >75% low-wage jobs |
| >75% workers without college degree |

Nursing assistants	93K
Recreation workers	87K
Childcare workers	85K

Business and legal professionals (600K)

| <25% low-wage jobs |
| 25–50% workers without college degree |

Project management specialists	110K
Sales representatives	100K
Business operations specialists	38K

STEM professionals (400K)

| <25% low-wage jobs |
| 25–50% workers without college degree |

Computer systems analysts	66K
Computer programmers	56K
Electrical and electronic engineering technologists and technicians	21K

Others (600K)

| <25% low-wage jobs |
| 25–50% workers without college degree |

Light truck drivers	62K
Bus drivers, transit and intercity	35K
School psychologists	25K

Other categories include health professionals, managers, and transportation services.

Education and workforce training (400K)

| 25–50% low-wage jobs |
| <25% workers without college degree |

Substitute teachers	154K
Tutors	81K
Preschool teachers	25K

Builders (300K)

| 25–50% low-wage jobs |
| >75% workers without college degree |

Carpenters	40K
Painters, construction and maintenance	25K
Drywall and ceiling tile installers	14K

Community services (300K)

| 25–50% low-wage jobs |
| 50–75% workers without college degree |

Correctional officers and jailers	65K
Lifeguards, ski patrol, and other recreational protective service workers	36K
Rehabilitation counselors	25K

Others (600K)

| 50–75% low-wage jobs |
| >75% workers without college degree |

Maids and housekeeping cleaners	134K
Coaches and scouts	26K
Computer, automated teller, and office machine repairers	23K

Other categories include agriculture, creatives and art management, mechanical installation and repair, and property maintenance.

Note: Figures may not sum to 100%, due to rounding.
[1]"Occupational shifts" refers to net declines in employment in specific occupations between 2019 and 2022. 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.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

In the wake of all this switching, more Americans are now employed in higher-wage occupations than before the pandemic, even beyond the effects of wage inflation. Overall employment in lower-wage occupations (which we define as those paying less than $35,000 annually) has fallen by 3.7 percent.[34] Meanwhile, middle-wage occupations (those paying $35,000 to $57,000 annually) stayed roughly constant, with a small rise of 0.1 percent. By contrast, the number of people in higher-wage occupations (earning more than $57,000 annually) is up 9 percent. This slice of the labor market has added about 3.5 million jobs.

We lack clear data on how individuals moved from job to job; some may have shifted more than once. Many Americans who changed jobs did land positions with higher pay.[35] But some portion of the growth in higher-wage employment could be attributed to new entrants to the labor force with higher levels of education. Some of the job losses in lower-wage occupations may be due to people opting not to take on that work, driven by either choice or inability.

At the same time, the number of lower-wage job openings has not declined. Demand to fill lower-wage service jobs persists, but fewer candidates want these jobs. Employers are having hiring difficulties for many roles that do not require college degrees. Improvements in job quality, pay, benefits, a stronger promise of career advancement, or a higher level of automation may be necessary to resolve these shortages. As the next chapter suggests, some lower-wage occupations (such as home healthcare aides) will be in high demand in the future, too. Improvements in job quality, pay, benefits, a stronger promise of career advancement, or a higher level of automation may be necessary to resolve these shortages.

Improvements in job quality, pay, benefits, a stronger promise of career advancement, or a higher level of automation may be necessary to resolve labor shortages in lower-wage occupations.

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34 We split occupations into three bands, designating the bottom 30 percent as lower wage, the middle 40 percent as middle wage, and the top 30 percent as high wage. These designations were based on the 2022 median annual wage for each occupation, weighted by 2022 employment. As of 2022, there were about 40 million Americans in high-wage occupations, 45 million in middle-wage occupations, and 72 million in lower-wage occupations. The prepandemic January 2020 baseline was about 37 million, 45 million, and 75 million, respectively.

35 See, for example, "Majority of US workers changing jobs are seeing real wage gains," Pew Research Center, July 2022. Similarly, the Atlanta Fed's Wage Growth Tracker shows sharply higher wage gains for workers who switch jobs than for those who don't; see atlantafed.org/chcs/wage-growth-tracker.aspx.

2. Job gains and losses through 2030

It is impossible to know exactly what lies ahead, especially in the short term. Yet we can piece together a picture of how multiple trends might change the mix of jobs in the US economy by the end of the decade.[36]

While automation has the biggest impact, our research incorporates a much broader range of factors. These include shifts that were accelerated by the pandemic and appear to be lasting, including increased remote work and virtual meetings that have reduced demand for business travel as well as consumers embracing e-commerce. We also weigh federal investment in infrastructure and the net-zero transition, as well as ongoing investment to digitize the economy, rising incomes and education levels, the healthcare needs of an aging population, and the potential marketization of unpaid domestic and care work. In addition, we assume that some new occupations may be created at similar rates as in the past. This approach builds on previous MGI research on the future of work as well as McKinsey's just-published report on generative AI more specifically.[37]

The resulting analysis shows which occupations can expect to see growing demand and which are likely to see job losses. As a result of these changes, we estimate that another 11.8 million occupational transitions could occur by 2030. This is on top of the 8.6 million occupational shifts that took place from 2019 to 2022. 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.

The burning question: Will generative AI be a job destroyer for white-collar workers?

One of the burning questions of 2023 is whether generative AI might wipe out a significant share of jobs and, if so, which ones.

Our research does not lead us to estimate job losses, although we cannot definitively rule out that conclusion, at least in the short term. Technological advances often cause disruption—but historically, they have eventually fueled economic and employment growth.

This research relies on aggregated employment growth projections from the US Bureau of Labor Statistics, which assume full employment in the target year (2030).[38] While we do not predict aggregate employment levels ourselves, we do model various drivers of labor demand to look at how the *mix* of jobs might change—and those results yield some gains and some losses. In fact, the occupational categories most exposed to generative AI could continue to add jobs through 2030, although its adoption may slow their rate of growth (Exhibit 3).
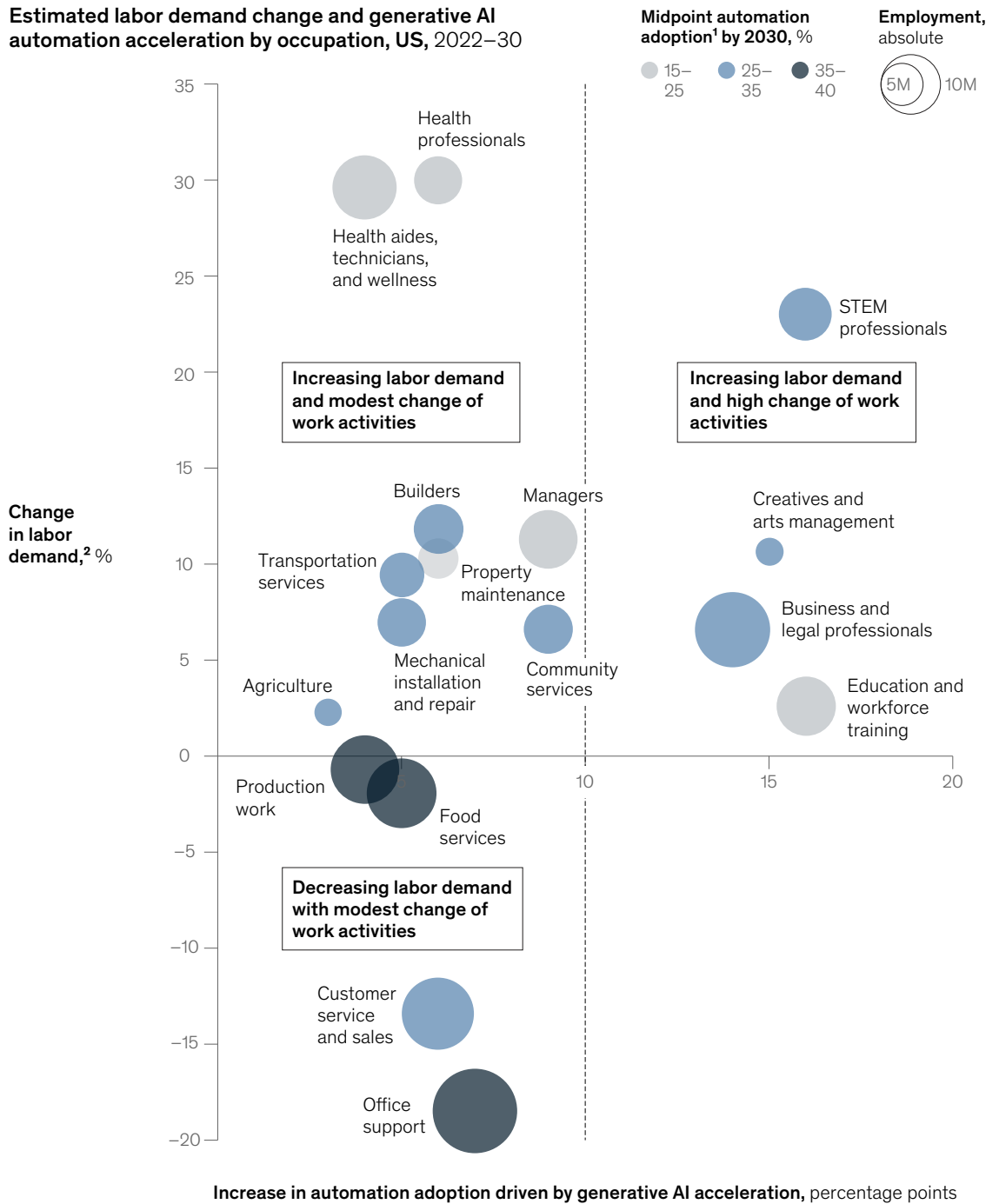
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[36] We do not attempt to forecast how employment may be affected by the business cycle in the short term. Our scenario offers a longer-term structural view focused on changes in the employment mix. For a deeper discussion of the employment effects of generative AI and federal investment in the net-zero transition and infrastructure, see chapter 3.

[37] See the following McKinsey and MGI reports: *The economic potential of generative AI: The next productivity frontier,* June 2023; *Jobs lost, jobs gained: Workforce transitions in a time of automation,* December 2017; *The future of work in America: People and places, today and tomorrow,* July 2019; and *The future of work after COVID-19,* February 2021.

[38] *Projections overview and highlights, 2021–31,* US Bureau of Labor Statistics, November 2022

Exhibit 3

While STEM, healthcare, builders, and professional fields continue to add jobs, generative AI could change work activities significantly for many occupations.

Estimated labor demand change and generative AI automation acceleration by occupation, US, 2022–30

Midpoint automation
adoption[1] by 2030, %

Employment,
absolute

○ 15–25   ○ 25–35   ● 35–40   ◯ 5M 10M

Change in labor demand,[2] %

Increasing labor demand and modest change of work activities

Increasing labor demand and high change of work activities

Decreasing labor demand with modest change of work activities

Health professionals

Health aides, technicians, and wellness

STEM professionals

Builders

Managers

Creatives and arts management

Transportation services

Property maintenance

Business and legal professionals

Mechanical installation and repair

Agriculture

Community services

Education and workforce training

Production work

Food services

Customer service and sales

Office support

Increase in automation adoption driven by generative AI acceleration, percentage points

[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 & Company, June 2023.
[2]We consider multiple drivers affecting demand: rising income, aging populations, technology investment, infrastructure investment (including Bipartisan Infrastructure Law), rising education levels, net-zero transitions, marketization of unpaid work, creation of new occupations, automation (including generative AI), increased remote working and virtual meetings, and e-commerce and other virtual transactions.
Source: US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

Even in the absence of job losses, professional roles that have largely been immune to automation until now will still feel the effects through substantial changes in how people allocate their time at work.[39] In the meantime, other forces, such as the aging population and the need for

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[39] Generative AI is new and highly dynamic, so we acknowledge that the effects could be larger depending on adoption and the development of new capabilities.

software and digital tools to continue to be deployed across the economy, will maintain demand for healthcare, tech, and other professional roles.

It is worth noting that business and legal professions and managerial jobs grew during the pandemic. Employers need managers to hold operations together, and it is logical that would also be the case as new technologies redefine roles. However, within the business and legal occupational category, some specific occupations (such as paralegals) appear likely to decline.

Net job gains for healthcare, STEM, construction, and business and legal professionals could offset losses elsewhere

First, let's consider the occupational categories that are **resilient and growing.** Healthcare jobs are expected to have the highest demand growth, with a 30 percent increase for health professionals and similar growth for health aides, technicians, and wellness professionals (Exhibit 4). An aging population increases the need for specialized healthcare. In fact, four of the ten largest job-creating occupations in our analysis are healthcare roles. Keeping the ratio of healthcare workers to the population over age 65 roughly constant with today's level in 2030, we estimate that 3.8 million jobs could be added for registered nurses, personal care assistants, home health aides, nursing assistants, licensed practical and vocational nurses, and medical assistants. The imbalance between supply and demand is already evident. Many hospitals and nursing homes are coping with staffing shortages that can affect the quality of care.[40]

Jobs in STEM fields are estimated to grow by 23 percent by 2030. This equates to an average annual growth rate of 2.6 percent, which represents an acceleration from the past few years. The top-growing occupations include software developers, computer systems analysts, and data scientists. Some of this growth is related to the deployment of automation systems themselves.

Although layoffs in the tech industry have made headlines in 2023, and generative AI can handle some of the current work activities done by tech professionals, there is still a great need for digital talent in sectors throughout the economy. The sheer scale of ongoing digitization, a surge in the number of connected devices, and the growing need to guard against data breaches should continue to fuel STEM demand.[41] In addition, the CHIPS and Science Act is putting additional funding into R&D, scientific research, and STEM workforce development.[42] It aims to address reliance on imported chips by directing $280 billion toward US semiconductor capabilities, including domestic manufacturing, high-tech regional hubs, and developing the nation's STEM workforce.[43]

The transportation services category is expected to see job growth of 9 percent by 2030, driven by the continuing shift toward e-commerce and the delivery economy associated with it. We also expect 12 percent growth in construction jobs as infrastructure projects break ground nationwide.

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[40] Steven Ross Johnson, "Staff shortages choking U.S. health care system," *U.S. News & World Report,* July 28, 2022.
[41] Alan Zilberman and Lindsey Ice, "Why computer occupations are behind strong STEM employment growth in the 2019–29 decade," US Bureau of Labor Statistics, *Beyond the Numbers: Employment & Unemployment,* volume 10, number 1, January 2021.
[42] Note that both the CHIPS and Science Act and the Inflation Reduction Act create room for additional upside in employment. But since uncertainty about their implementation persists as of this writing, our estimates do not explicitly incorporate their effects on jobs.
[43] "The CHIPS and Science Act: Here's what's in it," McKinsey & Company, October 2022.

Exhibit 4

Healthcare, STEM, and builder roles could grow, while some occupations requiring lower education attainment, particularly service jobs, could decline.

Estimated future US job growth and current educational attainment by occupational category
Midpoint automation scenario,[1] with generative AI acceleration

■ Resilient and growing occupations[2]　■ Stalled but rising occupations[3]　■ Hit and declining occupations[4]

Occupational category	Net change in labor demand, 2022–30, %	Share of workers with bachelor's degree or above,[5] 2022, %	Employment, 2022, million
Health professionals	30	77	6.5
Health aides, technicians, and wellness	30	21	11.6
STEM professionals	23	73	7.9
Builders	12	8	7.0
Managers	11	64	9.7
Creatives and arts management	11	66	2.2
Property maintenance	10	9	4.6
Transportation services	9	11	5.6
Mechanical installation and repair	7	10	6.6
Business and legal professionals	7	68	16.0
Community services	7	44	6.8
Education and workforce training	3	75	9.9
Agriculture	2	12	2.1
Production work	−1	10	13.3
Food services	−2	11	13.7
Customer service and sales	−13	22	14.7
Office support	−18	28	20.1

[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 & Company, June 2023.
[2]Resilient during the pandemic, 2019–22, and expected to grow between 2022 and 2030.
[3]Stalled during the pandemic, 2019–22, and expected to rise between 2022 and 2030.
[4]Hit during the pandemic, 2019–22, and continuing to decline between 2022 and 2030.
[5]Based on 2019 demographic shares by occupation applied to 2022 employment by occupation.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

In contrast to the growing categories described above, we expect **the biggest declines** in office support, customer service, and food services—the same categories that took the biggest hits during the pandemic. We estimate future losses of 1.6 million clerical jobs, for instance, plus some 830,000 retail salespeople and 630,000 cashiers (Exhibit 5). Automated systems can efficiently handle jobs with a high share of repetitive tasks, data collection, and elementary data processing. This trend was looming even before the arrival of generative AI.

The modest expected net losses in production work may seem puzzling in light of recent announcements about investments in domestic manufacturing. Manufacturing growth should boost overall US employment demand in the years ahead—but the sector is becoming more high-tech and automated, which will change its mix of occupations. Advanced manufacturing requires fewer jobs such as assemblers, packers, and molding machine workers but more jobs such as software developers and industrial engineers, which fall into the STEM professional occupational category.[44] Manufacturing also requires supporting function roles such as market research analysts, supply chain managers, and truck drivers.[45]

Even more workers may need to make occupational transitions

Compared with our previous estimates, we now see a larger number of workers potentially needing to change occupations through 2030. A transition is needed when someone is involuntarily displaced from a job by automation, the shift to e-commerce, the phaseout of a high-emissions activity, or some other trend, and they are unable to get a new job in the same occupation because demand has declined.

Some displaced workers may find alternative jobs within the same occupational category. For example, a bookkeeping and accounting clerk could take a job as a database administrator; this move would involve a change of occupations but keep this individual within the office support category. But a displaced waiter who can no longer find a job in food services, a category in decline, might need to transition to another type of work altogether. That person might become a light truck delivery driver since demand is growing for those roles.

We find that just under 12 million additional occupational shifts could be needed by 2030 (Exhibit 6). Of those, some nine million may involve moves into entirely different occupational categories (for example, going from a production-related job to one in transportation, or from a customer service role to one in arts management).

People currently working in office support, customer service and sales, production, and food service occupations—the same categories that were the source of a majority of shifts during the pandemic—account for more than 80 percent of these potential transitions. While this could be disruptive for many workers, it could also provide an opportunity. Many of the growing jobs that could absorb these displaced workers are in higher wage brackets.

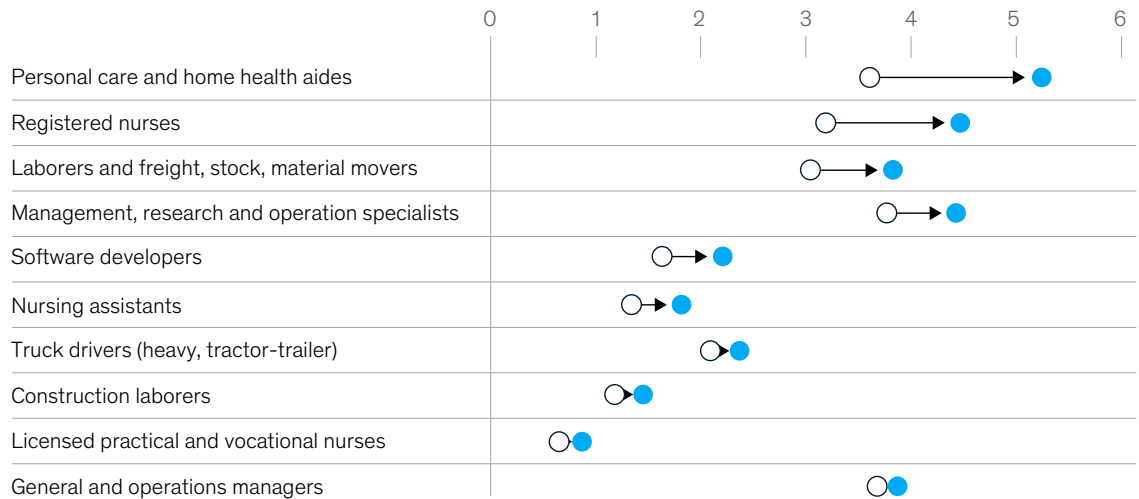# Just under 12 million additional occupational transitions may be needed by 2030.

44 For more on this topic, see Asutosh Padhi, Gaurav Batra, and Nick Santhanam, *The titanium economy: How industrial technology can create a better, faster, stronger America,* Public Affairs, 2022.

45 *Building a more competitive US manufacturing sector,* McKinsey Global Institute, April 2021.

Exhibit 5

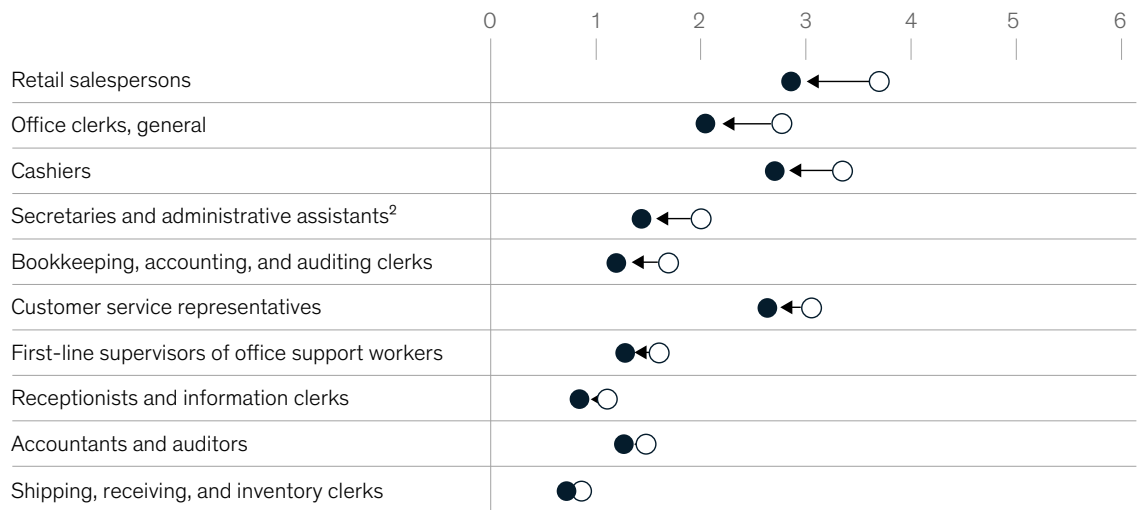## While future demand looks robust for some occupations, it is declining for others.

Net labor demand change in top growing occupations, 2022–30, million
Midpoint automation scenario,[1] with generative AI acceleration

○ 2022 ● 2030

	0	1	2	3	4	5	6

Personal care and home health aides ○ → ● (4.7 → 5.3)
Registered nurses ○ → ● (3.6 → 4.5)
Laborers and freight, stock, material movers ○ → ● (3.6 → 4.3)
Management, research and operation specialists ○ → ● (4.1 → 4.5)
Software developers ○ → ● (2.0 → 2.3)
Nursing assistants ○ → ● (1.5 → 1.8)
Truck drivers (heavy, tractor-trailer) ○ → ● (2.1 → 2.4)
Construction laborers ○ → ● (1.6 → 1.8)
Licensed practical and vocational nurses ○ → ● (1.4 → 1.5)
General and operations managers ○ → ● (3.8 → 3.9)

Net labor demand change in top declining occupations, 2022–30, million
Midpoint automation scenario,[1] with generative AI acceleration

○ 2022 ● 2030

	0	1	2	3	4	5	6

Retail salespersons ● ← ○ (3.0 ← 3.8)
Office clerks, general ● ← ○ (2.0 ← 2.3)
Cashiers ● ← ○ (2.6 ← 3.0)
Secretaries and administrative assistants[2] ● ← ○ (1.6 ← 2.0)
Bookkeeping, accounting, and auditing clerks ● ← ○ (1.4 ← 1.7)
Customer service representatives ● ← ○ (2.8 ← 3.1)
First-line supervisors of office support workers ● ← ○ (1.5 ← 1.7)
Receptionists and information clerks ● ○ (1.3 ← 1.5)
Accountants and auditors ● ○ (1.5 ← 1.6)
Shipping, receiving, and inventory clerks ● ○ (1.3 ← 1.4)

[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 & Company, June 2023.
[2]Does not include legal, medical, and executive.
 Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

Exhibit 6

Twelve million more occupational shifts could occur by 2030.

Estimated number of occupational transitions by category, 2022–30
Midpoint automation scenario,[1] with generative AI acceleration

■ Resilient and growing occupations[2]　■ Stalled but rising occupations[3]　■ Hit and declining occupations[4]

Occupational category	Occupational transitions, absolute	Employment, 2022, million
Office support	4.7M	20.1
Customer service and sales	2.7M	14.7
Production work	1.4M	13.3
Food services	1.2M	13.7
Business and legal professionals	676K	16.0
Education and workforce training	280K	9.9
Builders	243K	7.0
Mechanical installation and repair	184K	6.6
Community services	167K	6.8
Managers	130K	9.7
Agriculture	78K	2.1
Transportation services	59K	5.6
STEM professionals	30K	7.9
Creatives and arts management	27K	2.2
Health aides, technicians, and wellness	23K	11.6
Property maintenance	19K	4.6
Health professionals	15K	6.5

[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 & Company, June 2023.
[2]Resilient during the pandemic, 2019–22, and expected to grow between 2022 and 2030.
[3]Stalled during the pandemic, 2019–22, and expected to rise between 2022 and 2030.
[4]Hit during the pandemic, 2019–22, and continuing to decline between 2022 and 2030.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

3. New forces changing labor demand: Generative AI and federal investment

America is living through one of its most disruptive economic periods in decades, with pandemic-driven changes in consumption patterns, an inflationary spike, and a shift to remote work that changed the daily habits of a third of all workers. Against this backdrop, the arrival of ChatGPT was another seismic event. Some users who initially tried out ChatGPT and the other generative AI tools that quickly followed were drawn by curiosity. In subsequent months, many have already begun to use these tools to assist in a range of work tasks.

Other forces are at work, too. One of the biggest recent developments has been the passage of legislation that will put significant federal investment into decarbonizing the economy and modernizing America's infrastructure.

Generative AI and other automation technologies can handle a growing range of work activities

Rarely has a tech innovation created such a splash as ChatGPT, which has achieved one of the fastest adoption rates in history.[46] But what is it exactly, and how could it affect jobs? We consider it alongside other automation technologies, many of which are already having major effects, from robots on factory floors to automated document processing in back-office functions.

What is generative AI?
Part of the field known as deep learning, generative AI refers to applications typically built using a class of artificial neural networks called foundation models, structures inspired by the billions of neurons connected in the human brain. These models have taken AI applications to the next level.

ChatGPT is only one of several new generative AI tools. The "generative" in the name refers to its ability to identify patterns across enormous sets of data and generate new content—something that has often been considered uniquely human. ChatGPT can be used to write correspondence, essays, articles, stories, poetry, and computer code, in addition to scraping the internet for information and answering questions.

Another AI tool, Dall-E, can create images and illustrations in multiple styles. Dall-E and similar image generators were "trained" by absorbing huge quantities of images and reading their captions. They can produce new images as specified by users, in a variety of styles, and even take stories and turn them into illustrated storyboards. Other AI systems from major platforms can generate images, video, audio, and text.

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46   Andrew R. Chow, "How ChatGPT managed to grow faster than TikTok or Instagram," *Time*, February 8, 2023.

Much of the buzz today is about users interacting with these systems for fun or to satisfy their curiosity. But the potential applications for businesses are exceptionally wide-ranging. Generative AI can be used to write code, design products, create marketing content and strategies, streamline operations, analyze legal documents, provide customer service via chatbots, or even accelerate scientific discovery. The ability to generate images is the first step toward creating immersive experiences.

Generative AI is still in the early stages, and these tools are far from perfect. They can produce inaccurate results, and many legal, ethical, and intellectual property questions still need to be resolved.

What types of work can it do?
One of the biggest leaps forward in AI is in natural language capabilities, which are required for a large number of work activities. Previously, these were not expected to match median human performance for natural language understanding until around 2028 at the earliest, but they are already reaching that point today.

These advances mean that automation is about to affect a wider set of work activities. As a result, the share of hours spent on work tasks today across the US economy that have the **technical potential** to be automated with currently demonstrated technologies has jumped from 44 percent to 62 percent in our midpoint scenario.[47]

But technical potential does not always match what happens on the ground. It is the theoretical maximum that could be automated, considering current technological capabilities at any given time. But not everything that *could* be done in a theoretical world would be adopted by businesses. 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.

Yet the introduction of generative AI has sharply accelerated the timeline for **automation adoption,** since these tools are easy to access and integrate and are relatively low cost. Without generative AI, we estimate that automation could take over tasks accounting for 21.5 percent of the hours currently worked in the US economy by 2030. With it, that share jumps to 29.5 percent (Exhibit 7).[48] This includes a significant increase in tasks involving expertise, interactions with people, and even creativity.[49] Tasks requiring physical work, by contrast, are expected to be less affected.

One of the biggest leaps forward in AI is in natural language capabilities, which are required for a large number of work activities.

47   The midpoint scenario is the average of the early and late automation adoption scenarios referenced in McKinsey's recent report *The economic potential of generative AI: The next productivity frontier* (June 2023).
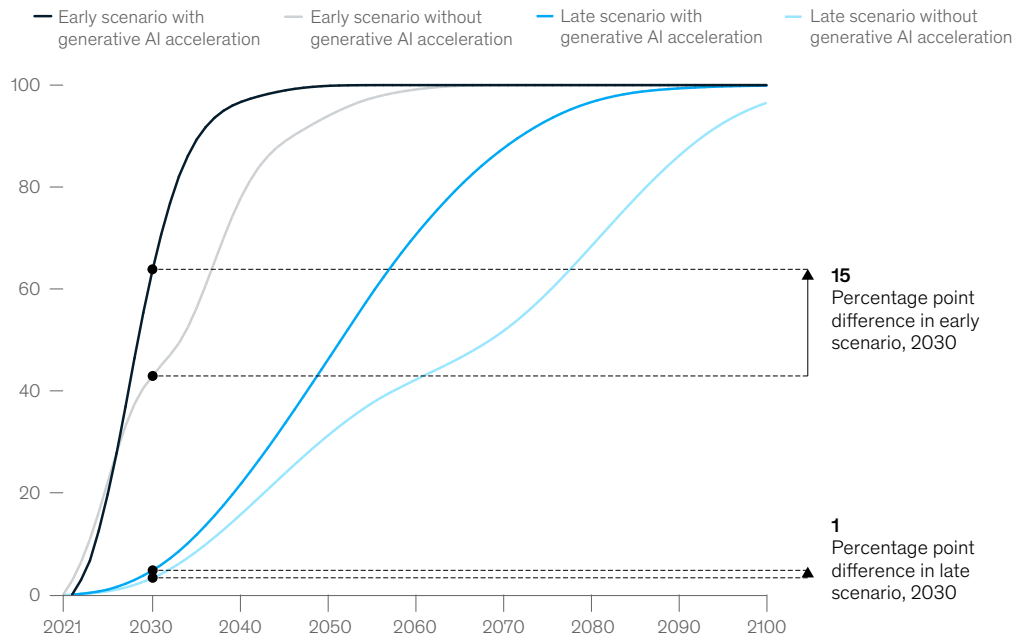
48   This is the average of a very wide range, from 3.7 to 55.3 percent.

49   Thomas H. Davenport and Nitin Mittal, "How generative AI is changing creative work," *Harvard Business Review,* November 2022; and Michael Chui, Roger Roberts, and Lareina Yee, "Generative AI is here: How tools like ChatGPT could change your business," McKinsey & Company, December 2022.

Exhibit 7

Generative AI accelerates automation adoption in all scenarios.

Automation adoption, US, %

— Early scenario with
generative AI acceleration

— Early scenario without
generative AI acceleration

— Late scenario with
generative AI acceleration

— Late scenario without
generative AI acceleration

15
Percentage point
difference in early
scenario, 2030

1
Percentage point
difference in late
scenario, 2030

Note: The range of scenarios reflects 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).
Source: O*NET; US Bureau of Labor Statistics; McKinsey Global Institute analysis

Exhibit 8 shows how this might play out across occupational categories. Labor economists have often noted that the deployment of automation technologies tends to most affect workers with the lowest levels of skills, as measured by educational attainment; in other words, automation has been "skill biased." Generative AI turns that on its head, however, automating some of the activities of knowledge workers at the higher end of the income spectrum.[50] However, it is important to note that other types of automation technologies are continuing to affect lower-wage occupational categories.

Computer programmers, scientific researchers, market researchers, translators, and financial advisers are just a small sample of the specific occupations that could be affected. A recently published report from MGI found the greatest potential economic value could be unlocked in customer operations, marketing and sales, software engineering, and R&D.[51]

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[50] Tyna Eloundou et al., *GPTs are GPTs: An early look at the labor market impact potential of large language models*, arXiv, March 2023.

[51] *The economic potential of generative AI: The next productivity frontier,* McKinsey & Company, June 2023.

Exhibit 8

With generative AI added to the picture, 30 percent of hours worked today could be automated by 2030.

Midpoint automation adoption[1] by 2030 as a share of time spent on work activities, US, %

● Automation adoption without generative AI acceleration   ● Automation adoption with generative AI acceleration   XX — Percentage-point acceleration in automation adoption from generative AI

STEM professionals	16
Education and workforce training	16
Creatives and arts management	15
Business and legal professionals	14
Managers	9
Community services	9
Office support	7
Health professionals	6
Builders	6
Property maintenance	6
Customer service and sales	6
Food services	5
Transportation services	5
Mechanical installation and repair	5
Production work	4
Health aides, technicians, and wellness	4
Agriculture	3
All sectors[2]	8
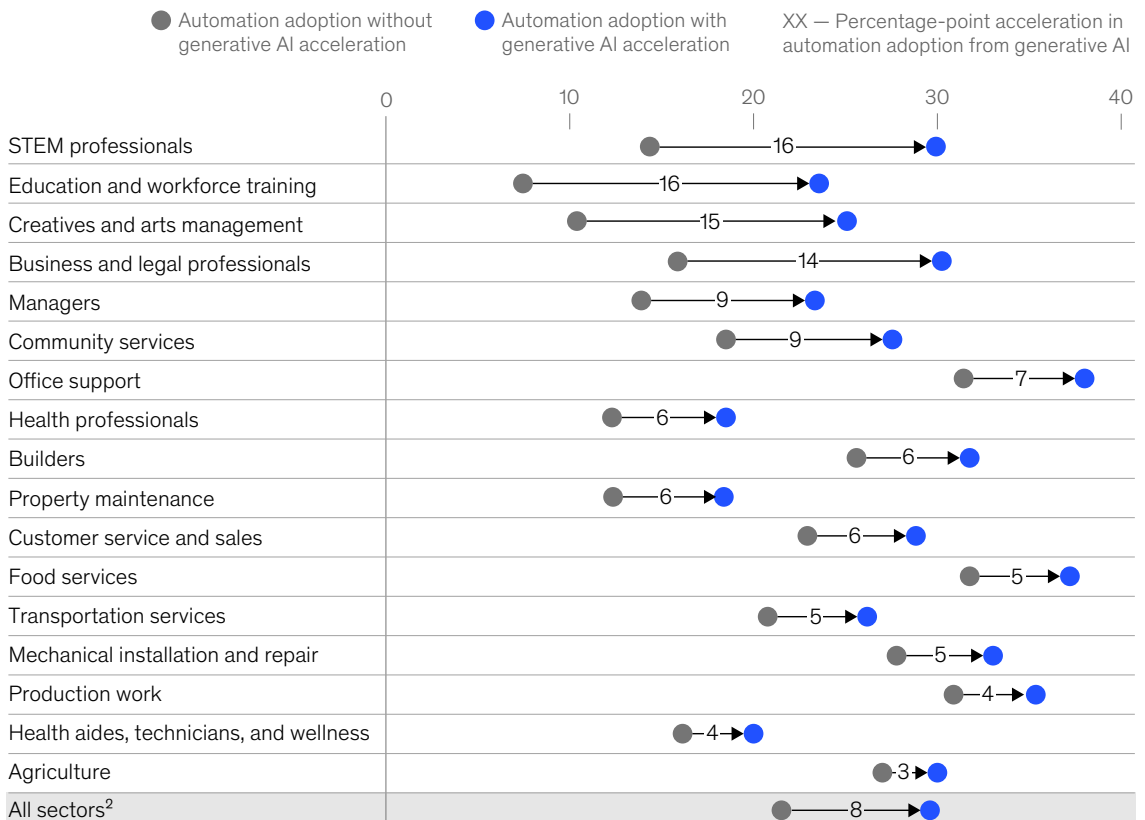
[1]Midpoint automation adoption is the average of early and late automation adoption scenarios as referenced in *The economic potential of generative AI: The next productivity frontier,* McKinsey & Company, June 2023.
[2]Totals are weighted by 2022 employment in each occupation.
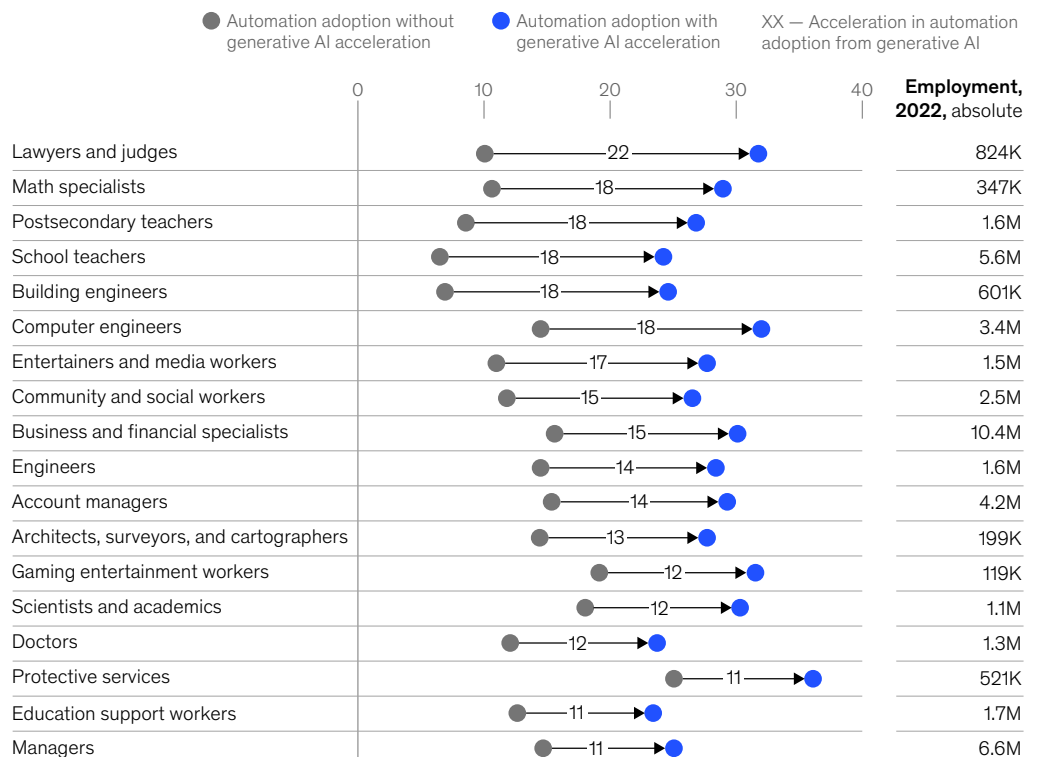Source: O*NET; US Bureau of Labor Statistics; McKinsey Global Institute analysis

Looking in more detail at specific occupations, we see the biggest impact of generative AI occurring for lawyers (Exhibit 9). Generative AI can search through case law for the most relevant precedents, freeing lawyers to think through how to apply them in new legal arguments. Lawyers also spend a great deal of time tailoring form documents, but they could use generative AI to take the first cut and then quickly edit.[52] In a completely different field, civil engineers can use generative AI to accelerate the design process, taking all building codes into account for fewer errors and less rework, particularly when it comes to complex mechanical, electrical, and plumbing systems. Generative AI can also enable engineering to explore alternative designs quickly to find the option with the best energy efficiency or the lowest use of materials. Making engineering and architecture more productive is vital at a time when the nation needs to deliver more affordable housing and major infrastructure projects.

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[52]   Ilona Logvinova, "Legal innovation and generative AI: Lawyers emerging as 'pilots,' content creators, and legal designers," In the Balance blog, McKinsey & Company, May 11, 2023.

Exhibit 9

White-collar jobs are among the most potentially impacted by generative AI.

Midpoint automation adoption by 2030 as a share of time spent on work activities, US, % by occupation[1]

⬤ Automation adoption without generative AI acceleration   🔵 Automation adoption with generative AI acceleration   XX — Acceleration in automation adoption from generative AI

		Employment, 2022, absolute
Lawyers and judges	22	824K
Math specialists	18	347K
Postsecondary teachers	18	1.6M
School teachers	18	5.6M
Building engineers	18	601K
Computer engineers	18	3.4M
Entertainers and media workers	17	1.5M
Community and social workers	15	2.5M
Business and financial specialists	15	10.4M
Engineers	14	1.6M
Account managers	14	4.2M
Architects, surveyors, and cartographers	13	199K
Gaming entertainment workers	12	119K
Scientists and academics	12	1.1M
Doctors	12	1.3M
Protective services	11	521K
Education support workers	11	1.7M
Managers	11	6.6M

[1]Occupations for which generative AI increased automation adoption by more than 10 percentage points in the midpoint scenario. 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 & Company, June 2023.
Source: O*NET; US Bureau of Labor Statistics; McKinsey Global Institute analysis

Changing the way people work

Before the arrival of generative AI, the pandemic accelerated the adoption of automation systems as many employers scrambled to respond. For greater flexibility to meet erratic demand, for example, retailers including Amazon, Walmart, and Target started to enlist industrial robots to pick, sort, and track merchandise in their warehouses. Restaurants shifted to automated order taking, while many retailers opted for self-checkout and touchless technology.

It is important to note that automation adoption is not the same as eliminating jobs. Many jobs with some automatable tasks will remain, but the day-to-day nature of what people do and how they do it changes. In fact, employment demand should continue to rise in many occupations most exposed to generative AI, although perhaps at a slower rate.

Generative AI and other automation technologies could help the United States reignite its flagging productivity growth, partially compensating for declining employment growth as the population ages.[53] Capturing that effect means that workers would have to use these technologies properly and effectively.

Importantly, individuals would need to use the time that is freed up to focus on higher-value activities. Managers, for instance, could rely on automation for mundane administrative and reporting tasks and use the time saved to provide more one-on-one coaching. Researchers could dramatically reduce the time they spend sorting and synthesizing data or conducting literature searches of existing studies, spending more time on original contributions and speeding research projects. Teachers could use generative AI to grade tests and flesh out lesson plans (at least partially) and focus more of their energy on interacting with students.[54]

Things may be produced faster, potentially with smaller teams. If generative AI can create intricate storyboards, animated films could be produced with fewer artists, although artists would still provide the ideas and shape what the tools produce. Generative AI can compose technical writing, but writers will still need to report, edit, think, and apply real-world judgment. At the moment, these tools might be best used to produce first drafts in creative fields—but assistance with first drafts can be a major productivity lift.

While automation tends to dominate the conversation when it comes to the future of work, it is not the only force at work. The remainder of this chapter will touch on the ways that investment priorities shape the labor market.

An infusion of federal investment is poised to shift employment demand to greener sectors and boost construction

While technology is evolving, other priorities are coming to the forefront. The United States has recently passed major funding bills that will change the scope of employment demand across the country, including the Inflation Reduction Act, the Bipartisan Infrastructure Law, and the CHIPS and Science Act.

Funding for the net-zero transition

The United States, along with other countries, has made a formal international commitment to address climate change by reducing greenhouse-gas emissions to net zero by 2050 at the latest.[55] Meeting this target requires extensive groundwork to transform everything from energy generation and transmission to transportation, industry, and agriculture. These changes are already getting under way and will continue to do so through 2030. The Inflation Reduction Act, passed in August 2022, adds both public funding and momentum, although its precise implementation was not clear at the time of our analysis.

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[53] *Rekindling US productivity for a new era,* McKinsey Global Institute, February 2023.
[54] Jake Bryant, Christine Heitz, Saurabh Sanghvi, and Dilip Wagle, "How artificial intelligence will impact K–12 teachers," McKinsey & Company, January 2020.
[55] See "Raising ambition: Net-zero coalition," United Nations, accessed June 25, 2023.

The net-zero transition could reallocate a substantial number of American jobs. To estimate these effects, we build on previous McKinsey research assessing the impact at a global level and zoom in on the United States.[56] We use a scenario-based analysis, drawing on the approach used by the Network for Greening the Financial System.[57]

We estimate that the effort to get to net zero could create a net gain of some 700,000 jobs in the United States by 2030. But the churn could be far greater than this number implies. Some 3.5 million jobs could be lost through direct and indirect effects across the economy. This should be more than offset by a gain of 4.2 million positions, primarily led by capital expenditures on renewable energy.[58] However, the new jobs may be in different locations and require different skills.

Our estimates point to job growth in fields such as renewable power generation and storage—positions such as wind turbine technicians, electrical engineers, and solar photovoltaic installers. Capital spending to build low-emissions facilities and retrofit existing plants and buildings with cleaner technologies is expected to drive demand for construction and specialized manufacturing workers. At the same time, the economy will need fewer jobs in carbon-intensive industries, particularly oil, gas, and mining. Some of these shifts are already playing out: the US solar industry currently employs twice as many workers as the nation's coal industry, and it is struggling to hire quickly enough to keep up with its rapid expansion.[59]

Our findings are based on an "orderly transition" scenario—and it is important to note that the impact on the labor market could be more severe if the transition is "disorderly" (for example, if the shift away from fossil fuels occurs before a sufficient and reliable supply of renewables is ready to deliver). Power disruptions and spikes in energy prices would have economic ripple effects that could lead to more abrupt job losses.

To ensure that the availability of workers does not become a bottleneck to achieving its climate goals, the United States will need to develop the skills required for the jobs that will be in demand in a greener economy. Training and redeployment will be especially important in regions where industries such as oil refining and traditional auto manufacturing are major employers. Specific communities could face significant displacement as legacy industries shrink, while others that seed green industries could enjoy more robust job growth. Geographic mismatches and the availability of retraining programs will determine to a large extent whether this process is smooth. Identifying transferable skills can illuminate some of the most viable pathways and inform retraining efforts (Exhibit 10).

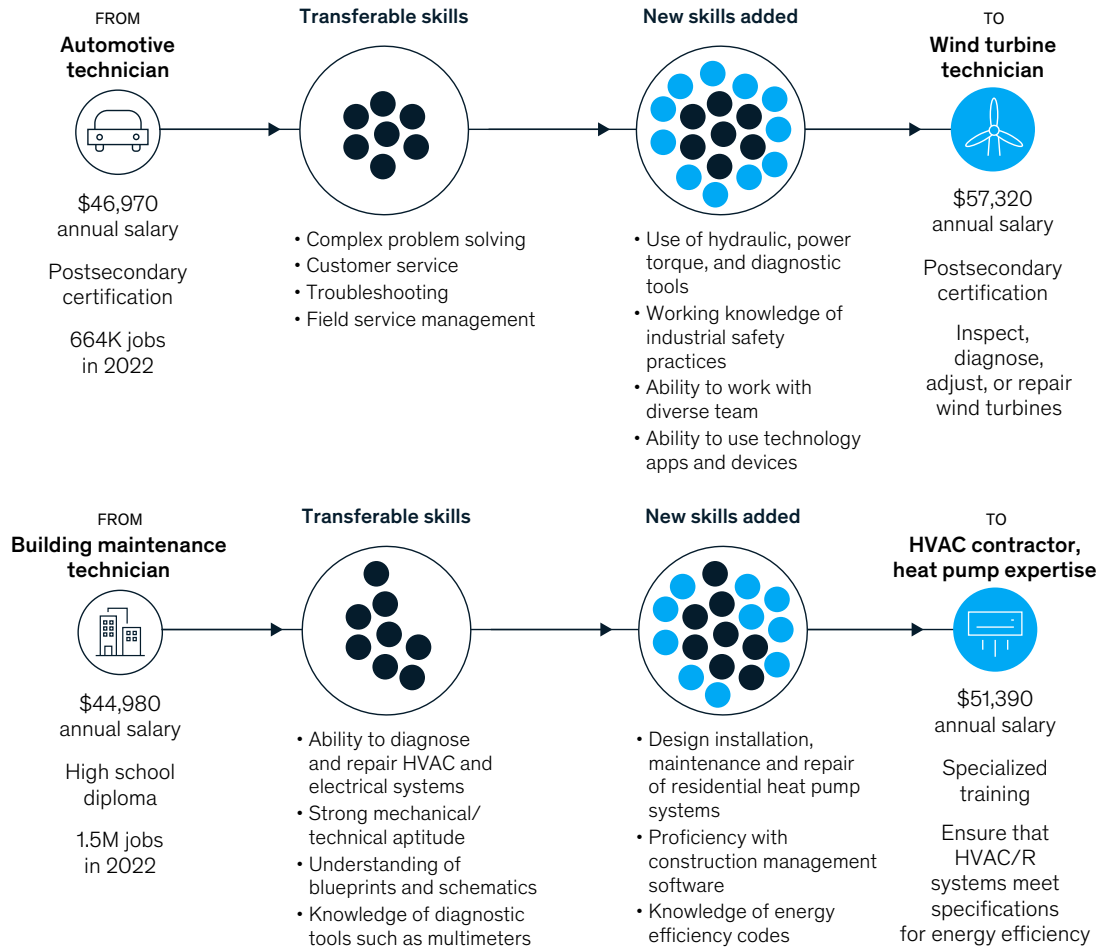# The net-zero transition could reallocate a substantial number of American jobs.

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[56] This research analyzes the magnitude of what is needed in 69 countries that account for about 95 percent of global GDP. *The net-zero transition: What it would cost, what it could bring,* McKinsey Global Institute, January 2022.

[57] NGFS Net Zero 2050 scenario using REMIND-MAgPIE (phase 2). Under the scenario, the United States reaches net-zero emissions across all greenhouse gases.

[58] This analysis assumes that the supply chain composition remains the same by 2030. We consider the impact of the United States meeting its own emission targets as well as its role in meeting global demand for products. We consider both direct and indirect jobs.

[59] *National solar jobs census 2021,* Interstate Renewable Energy Council, July 2022.

Exhibit 10

Transferable skills can help workers move into growing and higher-paying jobs.

FROM	Transferable skills	New skills added	TO
Automotive technician			**Wind turbine technician**

$46,970 annual salary

Postsecondary certification

664K jobs in 2022

Transferable skills
- Complex problem solving
- Customer service
- Troubleshooting
- Field service management

New skills added
- Use of hydraulic, power torque, and diagnostic tools
- Working knowledge of industrial safety practices
- Ability to work with diverse team
- Ability to use technology apps and devices

$57,320 annual salary

Postsecondary certification

Inspect, diagnose, adjust, or repair wind turbines

FROM	Transferable skills	New skills added	TO
Building maintenance technician			**HVAC contractor, heat pump expertise**

$44,980 annual salary

High school diploma

1.5M jobs in 2022

Transferable skills
- Ability to diagnose and repair HVAC and electrical systems
- Strong mechanical/ technical aptitude
- Understanding of blueprints and schematics
- Knowledge of diagnostic tools such as multimeters

New skills added
- Design installation, maintenance and repair of residential heat pump systems
- Proficiency with construction management software
- Knowledge of energy efficiency codes

$51,390 annual salary

Specialized training

Ensure that HVAC/R systems meet specifications for energy efficiency

Source: EMSI Burning Glass; US Bureau of Labor Statistics; Lightcast; Indeed.com; IREC (2022) Green Buildings Career Map; McKinsey Global Institute analysis

Renewing America's infrastructure

Recent federal commitments to expand and revitalize infrastructure could boost employment and eventually improve the overall productivity of the US economy. But labor shortages in the construction and manufacturing sectors will need to be addressed in order to achieve these national priorities.[60]

The Bipartisan Infrastructure Law, signed in 2021, includes $1.2 trillion in federal funding, almost half of which is new spending. This investment will go to a variety of projects nationwide: repairing roads and bridges, rebuilding water infrastructure to eliminate lead pipes, expanding high-speed internet, improving public transit and passenger rail, modernizing ports and airports, and building a national electric vehicle charging network.[61] To put this into perspective, the legislation will boost federal infrastructure spending during the next five years to almost the same average share of GDP spent during the New Deal from 1933 to 1937.[62]

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[60] Garo Hovnanian, Adi Kumar, and Ryan Luby, "Will a labor crunch derail plans to upgrade US infrastructure?" McKinsey & Company, October 2022.
[61] "President Biden's Bipartisan Infrastructure Law," The White House, November 2021.
[62] Adie Tomer, "The Senate infrastructure bill puts America close to another New Deal," Brookings Institution, August 2021.

Seizing the electric vehicle opportunity

Transportation accounted for a larger share (37 percent) of the nation's CO_2 emissions in 2021 than any other sector.[1] Switching to electric vehicles (EVs) is therefore critical to getting to net zero. The federal government has set a goal that half of all vehicles sold by 2030 should be electric; it recently committed $7.5 billion to help set up a national charging system as part of the Bipartisan Infrastructure Law and established tax credits for the purchase of EVs as part of the Inflation Reduction Act.[2]

This will be a massive shift, creating disruption for current market participants and legacy automotive employees. EVs have fewer moving parts than traditional internal combustion engines, which makes their production less labor-intensive. This may result in job losses for assembly line workers, molders, and machinists.

Even as demand falls for traditional automotive production roles, automakers will need more tech-oriented workers, from software developers and IT managers to computer hardware engineers. EVs require expertise in chemical and electronic engineering in their design, testing, and repair.[3] The industry will have a heavier emphasis on electronics, mechatronics and calibration, advanced materials, and additive manufacturing. There may be a need to repurpose engineering talent toward electrical and electronics specialties.

EVs run on thousands of chips—in fact, roughly double the number found in conventional vehicles.[4] Manufacturers ran into shortages in 2022, and McKinsey has estimated that automotive semiconductor demand could rise by about 11 percent annually through 2030. The CHIPS and Science Act of 2022 aims to address US reliance on imported chips by directing $280 billion toward US semiconductor capabilities, including domestic manufacturing, high-tech regional hubs, and developing the nation's STEM workforce. Intel has broken ground on a new $20 billion semiconductor factory in Ohio; this is on top of $20 billion to expand its production footprint in Arizona, a state that has also captured one of the largest foreign investments in US history from chip giant TSMC.[5]

New types of jobs associated with EVs are already growing as production takes root in states including California, Georgia, Michigan, North Carolina, and Tennessee. Established automakers are opening battery hubs in Kentucky, Michigan, Nevada, North Carolina, and Tennessee. Additional jobs will be created to produce and install charging equipment and infrastructure nationwide.

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[1] "Energy and the environment explained: Where greenhouse gases come from," US Energy Information Administration, 2022.
[2] "Fact sheet: Biden-Harris administration announces new standards and major progress for a made-in-America national network of electric vehicle chargers," The White House, February 15, 2023.
[3] Manuel Altmeier, Harald Bauer, Anna-Christina Fredershausen, and Markus Simon, *Electromobility's impact on powertrain machinery*, McKinsey & Company, May 2021.
[4] David Ferris, "Chip shortage threatens Biden's electric vehicle plans, Commerce secretary says," *Scientific American*, November 2021.
[5] "Intel announces next US site with landmark investment in Ohio," Intel, January 21, 2022; "Intel breaks ground on two new leading-edge chip factories in Arizona," Intel, September 24, 2021; and Cecilia Kang, "How Arizona is positioning itself for $52 billion to the chips industry," *New York Times*, February 22, 2023.

In 2022, the infrastructure law was followed by the Inflation Reduction Act, which includes an additional $369 billion in complementary funding. Its provisions are meant to spur domestic manufacturing and energy efficiency upgrades, decarbonize and shore up the US electric grid, establish a national green bank, and improve resilience in agriculture and rural areas.[63] However, both pieces of legislation establish myriad programs, with much of the funding directed toward state and local governments through competitive grants. Coordination and implementation will be complex, and the full impact will take time to manifest.[64]

From a labor market perspective, the United States will need to address its existing shortage of construction workers to realize these plans. Employment has stalled, but demand is growing. We estimate that jobs in the construction sector could increase by 12 percent by 2030, translating to

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[63] Savannah Bertrand, "How the Inflation Reduction Act and Bipartisan Infrastructure Law work together to advance climate action," Environmental and Energy Study Institute, September 2022.
[64] See, for example, "Delivering on the promise of federal infrastructure funds in states," McKinsey & Company, May 2022; and "A new era of infrastructure grants," McKinsey & Company, May 2022.

more than a million net jobs gained, in addition to growth in affiliated sectors. The construction sector could also see significant increases in labor demand from other factors, such as the need to rebuild in the aftermath of natural disasters.[65]

In the peak years of infrastructure spending, about half of the demand for labor may come from contractor roles in the construction industry itself. Another large share, just over 40 percent, is likely to come from the materials sector, which combines manufacturing, distribution, and warehousing.[66] This part of the value chain is equally important, since delays and shortages in obtaining materials can grind construction projects to a halt or drive up their costs.

In terms of specific occupations within the sector, our estimates indicate that construction laborers (with 240,000 positions added), supervisors (150,000), and electricians (130,000) could experience the largest growth in demand by 2030.

Yet the United States already has a shortage of construction workers. Some 490,000 positions were unfilled in December 2022—the highest number recorded since industry-level data collection began in 2000. This number dropped slightly to roughly 383,000 positions in May 2023. In September and December 2022, unfilled construction positions exceeded the number of unemployed individuals seeking construction jobs. This imbalance is caused by a mix of short-term, cyclical, and more structural factors. The workforce is getting older, with the share of construction workers age 55 and older having doubled, from 11 to 22.7 percent, between 2003 and 2022. The industry is also heavily reliant on immigrants (who represent more than a quarter of construction workers) at a time when immigration is only now picking up after a drop of several years. In addition, women make up only about 10 percent of the construction sector's workforce.[67]

Most infrastructure development companies are competing with other industries when it comes to skilled trades. A large number of welders, for example, will be needed in both manufacturing and construction, and without cooperation to train new talent, competition for this small pool of skilled tradespeople will only increase. In fact, people with skills crucial to the construction industry have broader options. There is competing demand in both construction and logistics for truck drivers and freight movers, who are already in short supply. The same goes for electricians, who can work for construction companies or utilities.

Addressing these labor shortages is an opportunity to diversify the construction workforce. According to the BLS, nine out of ten US construction workers are men; 30 percent are Hispanic; and almost 61 percent are non-Hispanic White. Recruiting and training more women and people of color can help companies meet the coming demand while diversifying their own workforces and expanding opportunity more broadly.

Most infrastructure development companies are competing with other industries when it comes to skilled trades.

65   See, for example, Maria Sacchetti, "Florida needs workers to rebuild after Ian. Undocumented migrants are stepping in," *Washington Post,* October 23, 2022; and Tatiana Flowers, "Supply and labor shortages double the time it'll take to rebuild homes lost in the Marshall fire," *Colorado Sun*, January 13, 2022.
66   Garo Hovnanian, Adi Kumar, and Ryan Luby, "Will a labor crunch derail plans to upgrade US infrastructure?" McKinsey & Company, October 2022.
67   "The construction industry: Characteristics of the employed, 2003–20," US Bureau of Labor Statistics, Spotlight on Statistics, April 2022.

4. Who's vulnerable?

At the heart of it, displacement and change affect workers and their families in significant ways. Some of the people most likely to be affected by automation are already living paycheck to paycheck, and for them, even a short period of disruption could provoke tremendous stress.

Millions of Americans may need to switch occupations to find new ways to support themselves. Designing interventions starts with identifying exactly who is at risk of displacement. Overlaying our analysis showing which occupations have the most automatable activities with data on who holds those jobs today paints a picture of uneven effects, since many occupations have skewed demographics.

But what lies ahead is not only about risk; it is also about opportunity. With low-wage jobs decreasing, more people could land better-paying jobs if they can access skills training and if employers are willing to take more chances in hiring. The United States has no time to lose in setting up large-scale retraining programs and better job-matching systems to help people make successful transitions.

The decline of low- and middle-wage jobs could continue as more high-wage jobs are added

The loss of middle-wage jobs and the resulting polarization in the job market is a well-documented historical trend.[68] While the share of middle-wage jobs is likely to continue declining, our analysis finds that lower-wage jobs could see an even faster decrease, especially as office support and customer service and sales jobs continue to disappear (Exhibit 11).

With low-wage jobs decreasing, more people could land better-paying jobs if they can access skills training and if employers are willing to take more chances in hiring.

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68   See, for example, David H. Autor, *The polarization of job opportunities in the U.S. labor market: Implications for employment and earnings,* Center for American Progress and The Hamilton Project, Brookings Institution, April 2010.

Exhibit 11

As the US economy adds more high-wage jobs, the shares of low and middle-wage jobs could decline.

Change in US employment by wage band,[1, 2] 2022–30, jobs share change, percentage points

High wage Annual salary: >$57K		2.6
Middle wage $35K–$57K	−0.3	
Low wage <$35K	−2.3	
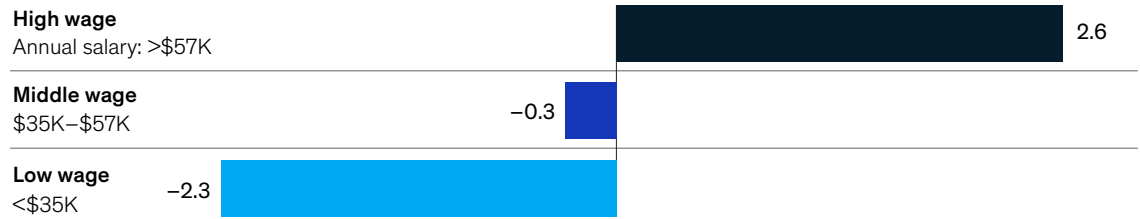
Employment distribution of occupational categories by wage terciles,[1, 2] 2022, %

■ High wage   ■ Middle wage   ■ Low wage

	High wage	Middle wage	Low wage
Managers	97		3
Health professionals	91	6	3
STEM professionals	86	14	0.6
Business and legal professionals	79	21	
Creatives and arts management	48	42	10
Education and workforce training	20	55	26
Builders	12	81	7
Community services	6	63	31
Health aides, technicians, and wellness	3	23	73
Office support	3	33	64
Mechanical installation and repair	2	90	7
Customer service and sales	2	11	87
Transportation services	2	43	56
Production work	0.8	30	70
Agriculture		12	88
Food services		1	99
Property maintenance		8	92

Note: Figures may not sum to 100%, due to rounding.
[1]Based on 2022 real wages (base year = 2010).
[2]Lower-wage jobs are those below the 30th percentile; mid-wage jobs are those between the 30th and 70th percentiles; and high-wage jobs are those above the 70th percentile of wage distribution. Growth from 2022 to 2030 holds 2022 wage categorization constant.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

While the individuals in low-wage jobs today are most vulnerable due to shrinking demand in office support and customer service and sales jobs, this also presents an opportunity to help them land better-paying jobs. Looking at this shift from a different vantage point, this could be a positive opportunity for more inclusive growth as the US economy rebalances toward higher-wage jobs (Exhibit 12). As we will discuss further in chapter 5, training and less rigid hiring approaches will be essential to creating those pathways.

Despite this overall rebalancing toward higher-wage jobs, it is important to note that some of the fastest-growing occupations are still some of lowest paying in the economy. Several of these are roles that provide vital social and economic infrastructure—most notably home healthcare aides, nursing assistants, and childcare workers. These jobs are disproportionately held by women (Exhibit 13). Meeting these needs, especially at a time when workers have more options, may depend on upgrading the quality of those jobs. Indeed, a shortage of childcare and elder care is already keeping some people out of the workforce.

Exhibit 12

The economy could reweight toward higher-wage jobs.

Potential impact of occupational transitions on wage distribution,[1] million
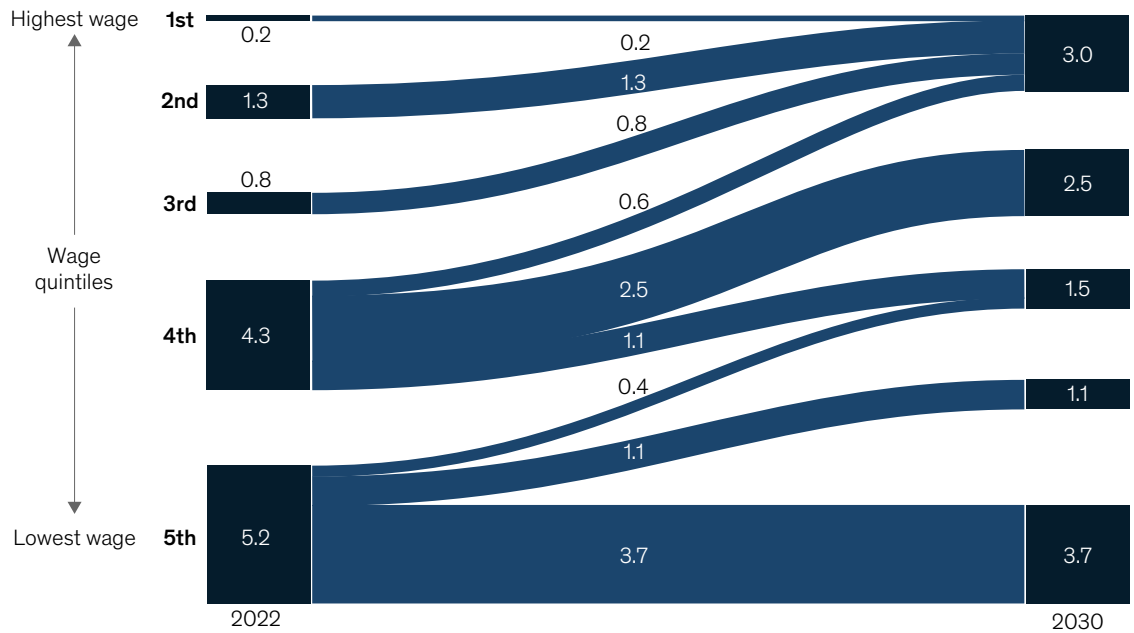
Note: Figures may not sum to 100%, due to rounding.
[1]We expect 11.8 million occupational transitions by 2030. We refer to people needing to make transitions if demand is projected to decline in their current occupation. Assumes workers move to jobs in higher-wage quintiles if there are not enough jobs in their current wage quintile.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

Exhibit 13

Women are underrepresented in high-growth and high-wage jobs.

Female representation in occupations projected for greatest job growth, 2022–30, US
Midpoint automation scenario,[1] with generative AI acceleration

● High female representation[2]   ● Low female representation[2]

Net job growth 2022–30, thousand

Below average wage   *Above average wage*

Health aides and health support

Nurses, physicians assistants, and pharmacists

Personal care workers

Computer engineers

Managers

Material movers and loaders

Construction workers

Community and social workers
Health technicians
Installation and repair workers (buildings and infrastructure)
Computer support workers
Scientists and academics
Therapists
Engineers
Building engineers
Computer specialists
Math specialists

Building and grounds cleaners

Fine equipment installation and repair workers

Childcare workers

Personal appearance workers

Artists and designers

Doctors

Architects, surveyors, and cartographers

Wages 2022,³ $ thousand

¹Midpoint 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 & Company, June 2023.
²High representation = equal to or above 50% in 2022; low = below 50%.
³Based on 2022 real wages, base year = 2010.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

Workers in low-wage jobs and those without college degrees are more likely to need to change occupations by 2030

Based on the demographics of various jobs today, workers in lower-wage roles, those with less education, women, and people of color are disproportionately represented among those who may need to find new types of work by 2030 (Exhibit 14). Workers with these profiles are more vulnerable to job displacement and will need support to make successful job transitions.

— **Workers in lower-wage jobs are up to 14 times more likely to face the need to change occupations.** We estimate that almost 80 percent of all potential transitions (affecting some 9.4 million people) could occur among workers in the two lowest quintiles of wages—that is, people earning less than $38,200. Retail salespeople, cashiers, and stockers and order fillers all fall within the lowest quintile and could account for some 18 percent of all potential transitions by 2030. But notably, the most vulnerable group overall is not the very lowest wage bracket; it is those earning between $30,800 and $38,200. This group specifically is 14 times more likely to need to find new roles by 2030 than the highest-wage earners.

— **Workers without college degrees are 1.7 times more likely** to face displacement and the need to change occupations than those with bachelor's degrees or above. It is well established that workers with a high school diploma or less have experienced limited job prospects in the United States.[69] Assuming the distribution of educational attainment levels across occupations remains the same as in 2022, workers without bachelor's degrees could account for about 8.9 million of the estimated 11.8 million occupational shifts (roughly three-quarters of the total). Notably, 90 percent of production workers are not college educated, and about 1.4 million may need to change fields by 2030. Similarly, 72 percent of office support workers lack college degrees, and about 4.7 million may need to move to different occupations. Higher levels of educational attainment remain strongly positively correlated with being in less automatable roles.

— **The youngest and oldest workers are 1.4 and 1.1 times more likely** to face occupational changes, respectively. In our estimates, workers between the ages of 18 and 24 and those above age 50 are more likely to face job transitions than workers ages 25 to 49. As younger workers are just starting their careers and many are likely still attending school, they may be better positioned to adapt and find different pathways. But older workers may find it harder to start new chapters.

— **Women are 1.5 times more likely** to face occupational transitions than men. Women could face 57 percent of all the transitions envisioned in our estimates, which is greater than their overall workforce representation of 47 percent. This reflects the fact that women are heavily represented in office support and customer service roles, which could shrink by about 3.7 million and 2.0 million jobs, respectively, by 2030.

— **Hispanic workers are 1.1 times more likely** to need to change occupations than White workers. Based on the jobs they hold today, Hispanic Americans could account for 2.1 million potential job transitions (18 percent of the total through 2030). Much of this is driven by relatively higher representation in automatable food service roles.

— **Black workers are 1.1 times more likely t**o face occupational changes than White workers. Some 1.5 million Black Americans could face the need to change roles, accounting for 12 percent of all estimated transitions. While the magnitude may seem relatively small, Black Americans have experienced higher unemployment rates than White workers since the Census Bureau Current Population Survey began publishing data in 1972. Ensuring that Black workers in shrinking occupations have pathways to move into high-quality jobs can help to relieve labor supply constraints while creating a more inclusive economy.

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69   See, for example, Ariel J. Binder and John Bound, *The declining labor market prospects of less-educated men,* NBER working paper number 25577, February 2019.

Exhibit 14

Workers in lower-wage jobs, those who have less education, and women are more likely to face displacement and need to change occupations.

Estimated occupational transitions by 2030, % transition of employment within each category[1]
Midpoint automation scenario, with generative AI acceleration
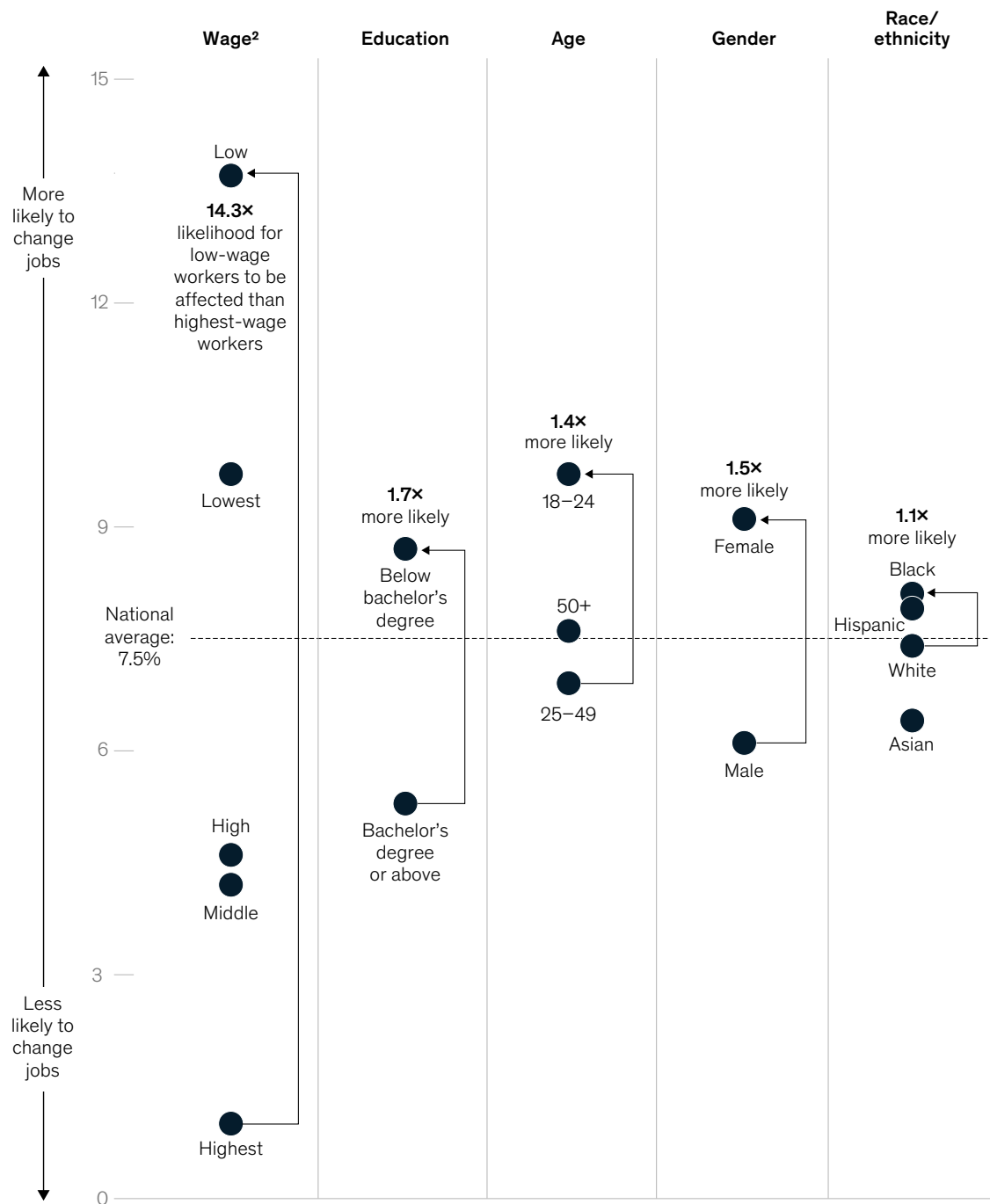
¹Average national transition rate = 7.5%, calculated as total estimated transitions by 2030 divided by total employment in 2022.
²We split occupations into quintiles according to their wage distributions. Highest ≥ $68,700; high = $49,500–$68,700; middle = $38,200–$49,500; low $30,800–$38,200; lowest < $30,800. These designations are based on 2022 average annual real wages (base year = 2010) associated with each occupation, weighted by 2022 employment.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

The workforce of the future will need more technological and people skills—but physical work is not disappearing

To assess the potential shift in demand for workforce skills, we look into the change in skill mix for each occupation as well as the change in demand for each occupation, and then aggregate them for the country. To assess the skill mix of each occupation, MGI used about 2,100 individual work activities that make up more than 850 occupations from O*NET. We mapped each activity to a specific skill within five broad categories: physical and manual, basic cognitive, advanced cognitive, social and emotional, and technological. The results reaffirm the trends identified in our earlier research.

Social and emotional skills and technological skills

Given the impact of automation on individual activities as well as the shifting mix of occupations projected in our estimates, we find that social and emotional skills and technological skills will see the biggest increase in demand by 2030. These types of skills are particularly important in the healthcare and STEM occupations that are poised for strong growth. However, it is possible that generative AI could change our definitions and the way these skills are deployed over time.

Social and emotional skills (such as empathy) have always been critical in healthcare, and that will remain paramount. But now healthcare delivery increasingly involves the use of digital systems as well. One study found that digital content in healthcare roles like registered nurses rose by 40 percent or more between 2002 and 2016.[70] That is in line with the generally observed increase in digital content across jobs in that period.

Skill shifts within occupations present some opportunities for people to direct more of their time to higher-value work. For example, retail employees could spend less time processing payments and more time assisting customers and delivering a superior experience. Healthcare workers could reallocate time spent filling out insurance paperwork to interacting with patients. Importantly, managers can save time on administrative work, freeing them up for more coaching and collaboration. Any potential increase in managerial attention to team building and developing people is important, especially at a time when being valued by a boss and having a sense of belonging are important factors for employees weighing whether to stay in their current jobs.[71]

Skill shifts within occupations present some opportunities for people to direct more of their time to higher-value work.

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70   Mark Muro et al., *Digitalization and the American workforce,* Brookings Institution, November 2017.
71   Aaron De Smet, Bonnie Dowling, Marino Mugayar-Baldocchi, and Bill Schaninger, "'Great Attrition' or 'Great Attraction'? The choice is yours," *McKinsey Quarterly,* September 2021.

Basic cognitive or physical skills

By contrast, demand will shrink for activities that primarily require basic cognitive skills (Exhibit 15). More of the routine tasks associated with office support roles can be handled by software and AI, for example, while robots are able to handle tasks in warehouses and assembly lines with greater dexterity and accuracy. People who need to move out of declining lower-wage occupations that emphasize manual and basic cognitive tasks could have more choices— including better-paying options—if they can interact with people and digital systems.

The share of physical work in the US economy could decline slightly, accounting for about 31 percent of total skills deployed by 2030.

The recent increase in transportation services employment seems likely to endure, and a renewed national focus on infrastructure, climate, and resilience is set to add construction and manufacturing jobs, as described in the previous chapter. Some healthcare roles similarly require physical skills. The sustained importance of physical and manual skills is also informed by the fact that robots do not yet have the sensory abilities and flexibility of the human hand; people with fine motor skills can still do many things that machines cannot.

Additionally, those who stay in the same line of work or even in the same job are not immune to change. Technology will alter the day-to-day tasks most Americans perform in the course of their jobs. Staying relevant in this rapidly changing environment will mean that workers need to continually learn new skills.

Exhibit 15

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

Time spent using various types of skills by wage quintile in the United States,[1] 2030, %
Midpoint automation scenario, with generative AI acceleration

		Basic cognitive skills	Higher cognitive skills	Physical and manual skills	Social and emotional skills	Technological skills
Highest wage quintile	1st	7	24	3	40	26
	2nd	9	33	10	31	17
	3rd	12	21	40	14	14
	4th	21	18	35	13	13
Lowest wage quintile	5th	17	12	52	12	8
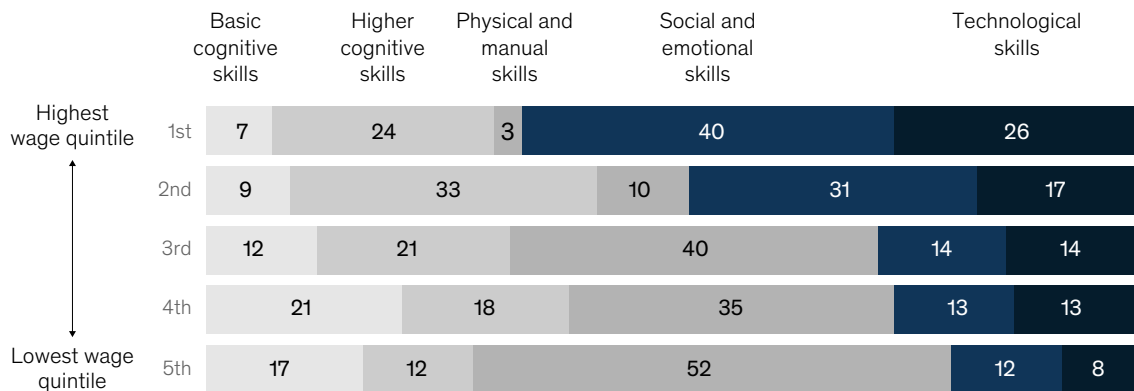
Note: Figures may not sum to 100%, due to rounding.
[1]We analyzed the skills needed across a workforce by reviewing around 850 occupations and 2,100 activities, and then classifying each work activity according to the primary skill used among a set of 25 skills, which are further categorized into 5 skill categories mentioned. We use the methodology in this report that was first developed in MGI's research in *Skill shift: Automation and the future of the workforce,* May 2018.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

5. Preparing for the future of work

As automation and other structural trends continue to raise demand for some occupations and lower it for others, more turbulence could lie ahead. The Great Attrition caught many employers by surprise. But mobility can be a healthy dynamic if it's fueled by growth and leads people to better matches where they can realize their potential.

Leaders in the business, policy, and education domains can prepare for what comes next by keeping employees engaged, helping them add more advanced skills, making training widely available, and bringing more people off the sidelines and into the workforce. Instead of watching people drop out of the workforce from discouragement, stakeholders will need to help midcareer workers reinvent themselves and pull in more of the people who are currently on the sidelines. The nation needs clear pathways for people to enter roles that are critical to its priorities, such as healthcare and skilled trades involved in infrastructure and advanced manufacturing.

While many new initiatives have gotten under way to help workers add new skills and change career paths, this is a moment to double down on what works and commit to creating a more inclusive future with greater opportunities for a bigger slice of the workforce.

The workplace plays a powerful role in developing the nation's human capital

While much of the debate over the future of work focuses on the need for large-scale training programs, a great deal of skills development happens day-to-day on the job. Previous MGI research on human capital examined the job moves made by millions of workers over a decade and found that work experience contributes 40 percent of the average individual's lifetime earnings in the United States. Skills learned on the job are an even bigger determinant for people with lower educational credentials who start out in lower-wage work.[72]

MGI's research showed that almost one-third of US workers are on a path to move into higher earning brackets, and amassing work experience in an effective way seems to be their key to upward mobility. Each job move typically increased wages—and the bolder the move, the bigger the boost. Companies with the strongest organizational health, those that offer more coaching and training for their employees, and those that provide more opportunities for internal advancement seem to help increase lifetime earnings.[73]

Most employers can benefit from expanding the lens through which they evaluate candidates. Instead of insisting on prior experience that best matches the responsibilities in an open role, organizations can shift toward evaluating candidates on their capacity to learn, their intrinsic capabilities, and their transferable skills. This requires removing biases that pigeonhole people into the roles they are already performing. In our sample, more than half of all role moves undertaken by individuals involved a substantial share of new skills, which implies that most people are capable of learning and doing more than they are doing today. Employers can benefit from being more open to hiring candidates who have taken unconventional career paths.

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[72] *Human capital at work: The value of experience,* McKinsey Global Institute, June 2022.
[73] Ibid.

Capturing the productivity potential of automation, including generative AI, requires changing the way people work

The United States urgently needs to jump-start its flagging productivity growth, which has been a lackluster 1.4 percent since 2005. Recent MGI research noted that the economy faces looming headwinds, including workforce shortages, debt, inflation, and the cost of the energy transition— and higher productivity will make it easier to navigate these challenges.[74]

Technology is one of the critical levers, and generative AI in particular is opening up many possibilities for making knowledge work more productive. But employers need to have a sustained strategy for implementation that includes complementary investment in talent and ecosystems, plus a willingness to update organizational models. Studies have shown that this process can create a productivity "J-curve" over time, with small initial benefits eventually yielding much bigger long-term value for businesses that stay the course.[75]

To capture the full benefits, employers and policy makers would need to establish clear guidelines and guardrails for the responsible use of generative AI. Businesses will need to think through how jobs and responsibilities could evolve, and workers would need to see these tools not as job destroyers but as work enhancers. When machines take over dull or unpleasant tasks, people can be left with more interesting work that requires creativity, problem solving, and collaborating with others (Exhibit 16).

Importantly, workers would need to become proficient in using AI—and use the time that is freed up to focus on higher-value activities. Leaders can spend more time on strategic thinking and coaching when they automate more of their administrative and reporting tasks. Researchers could speed up projects by relying on automation tools to sort and synthesize large data sets. Writers can use generative AI to produce first drafts, then spend time refining and shaping the output.

When machines take over dull or unpleasant tasks, people can be left with more interesting work that requires creativity, problem solving, and collaborating with others.

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[74] *Rekindling US productivity for a new era,* McKinsey Global Institute, February 2023.
[75] Erik Brynjolfsson, Daniel Rock, and Chad Syverson, *The productivity J-curve: How intangibles complement general-purpose technologies,* NBER working paper number 25148, October 2018.

Exhibit 16

The evolution of a software developer's job shows how generative AI can boost productivity.

Illustrative

Today, Serena works as a software developer

She shifts among 21 unique activities.

Current mix of activities

Collaborating and communicating with technical colleagues

Writing software code

R&D and innovation

Code correction

Assessing database performance

Serena's company adopts new technologies

The company sets guidelines for using generative AI to write code.

The company also invests in cloud infrastructure that enables easier collaboration across geographies as well as a version-control system that streamlines team projects.

By 2030, Serena is more productive

The automation of some of Serena's activities allows her to focus on more valuable tasks and brings new opportunities to her firm. The activities that make up her work shift.

Future mix of activities

Some tasks expand, such as communicating and collaborating with colleagues across the organization

Some tasks are automated, such as writing initial drafts of code

R&D and innovation

Assessing database performance

Code correction

And her firm is larger and more versatile

Technological advances enable the company to expand its product and service offerings.

With better technology infrastructure, the company collects and stores more data, builds and tests new features more quickly, and provides its customers with more personalized service.

Some new tasks are created, such as establishing and aligning data privacy and security protocols and developing for edge computing that enables real-time decision making.

Source: McKinsey Global Institute analysis

Filling the jobs of the future is an opportunity to build a more inclusive economy

The challenge facing the US labor market through the end of this decade will be helping people move out of declining occupations, equipping them with new skills, and matching them with better opportunities. Filling the jobs with rising demand may require companies to recruit from different talent pools—and it creates an opportunity to engage underrepresented groups.[76] One way to do this is creating new options for work that meet the needs of workers, whether that means offering more flexible or part-time roles or hiring freelancers for appropriate tasks.

Remove unnecessary credential requirements

We estimate that workers without four-year college degrees will face 75 percent of all job transitions that could occur by 2030. Many of these workers have what it takes to perform higher-wage jobs, but they are often passed over. In fact, Americans without bachelor's degrees tend to have lower labor participation overall (58 percent versus 73 percent for college graduates), perhaps due in part to discouragement over what kinds of roles they can land. This is an enormous population; almost 37 percent of Americans over age 25 have a high school diploma or less. An additional 15 percent attended college but did not earn degrees.[77]

To help displaced workers find new career paths, more employers will need to begin looking beyond educational credentials to consider candidates' transferable skills, mindset, and potential. Companies such as IBM and Hilton are among many that are no longer requiring four-year degrees during hiring. Pennsylvania recently removed college degrees as a prerequisite for more than 90 percent of all state government jobs.[78]

A number of coalitions are working to broaden opportunity for those without college degrees. A national campaign to "tear the paper ceiling," sponsored by Opportunity@Work, aims to raise awareness among employers that talent can come from community colleges, workforce training, boot camps or certificate programs, military service, or on-the-job learning. Year Up offers high school graduates training, six-month paid corporate internships, and networking opportunities. The Rework America Alliance brings together employers, labor unions, community organizations, educators, and advocacy groups to expand opportunities for workers in lower-wage occupations to move into better jobs based on their skills and experience. One solution, still in the early stages, involves digital learning and employment records—a sort of digital microcredential that can document how an individual worker has acquired skills and also translate across companies and over time.[79]

Remove barriers for women

It took three full years for the number of working women in the United States to fully bounce back after the pandemic. What could be done to maintain their participation?

— **Expand access to affordable, high-quality childcare.** The lack of affordable childcare has long been a major issue for parents in the United States, and it came to a head during the pandemic.[80] In a recent McKinsey survey, women cited childcare expenses or availability as the number one reason for voluntarily leaving the workforce.[81] Coming out of the pandemic, more employers are adding childcare benefits, from on-site services to subsidies. But individual employers cannot solve this issue on a large enough scale to move the needle on women's labor force participation. Efforts to secure federal funding for universal childcare have not come to fruition, but some individual cities and states are acting on their own.[82]

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[76] Aaron De Smet, Bonnie Dowling, Bryan Hancock, and Bill Schaninger, "The Great Attrition is making hiring harder. Are you searching the right talent pools?" *McKinsey Quarterly,* July 2022.

[77] *Educational attainment in the United States: 2021,* US Census Bureau, 2022.

[78] Jane Thier, "Pennsylvania is axing its college degree requirement for 65,000 state jobs, calling it an 'arbitrary requirement,'" *Fortune*, January 20, 2023.

[79] *Learning and employment records: Progress and the path forward,* American Workforce Policy Advisory Board, Digital Infrastructure Working Group, September 2020.

[80] Ryan Nunn and Katherine Lim, "A COVID-19 labor force legacy: The drop in dual-worker families," Brookings Institution, September 2022.

[81] Sarah Gitlin, Ayushi Gummadi, Alexis Krivkovich, and Kunal Modi, "The childcare conundrum: How can companies ease working parents' return to the office?" McKinsey & Company, May 2022.

[82] Lisa Dodson and Amanda Freeman, "The road to universal childcare will be local," *The Hill,* December 23, 2022.

The US infrastructure law, which requires private companies receiving contracts to provide childcare for their workers, helps to address childcare gaps and increase the low share of construction workers who are women; this could provide a useful template. Demand for childcare is high, but childcare providers are among the lowest-paid workers in the US economy—a situation that prompted Treasury Secretary Janet Yellen to comment that childcare is "a textbook example of a broken market."[83]

— **Companies can reexamine hiring.** Hiring managers may need to rid themselves of biases—especially those against candidates who have gaps in their experience due to time taken for family responsibilities. In general, companies may need to be more open to hiring candidates with potential and training them on the job, especially when it comes to new technology skills.

— **Consider "returnship" programs.** JPMorgan Chase, for example, has introduced a paid fellowship for women returning to the industry after time off. Companies with returnships and formal mentorship and sponsorship programs have managed to develop and retain talented women in addition to boosting their representation in the C-suite.[84]

Overall, the United States could benefit from holistically considering how to boost women's participation in the labor market.

Keep experienced older workers engaged

The end of this decade marks a demographic inflection point. By 2030, the entire baby boom generation will have passed age 65—meaning one in four Americans could be of retirement age.[85]

As described in chapter 1, the pandemic prompted many older workers to retire early. But as pandemic-related health concerns ease and remote work becomes more accepted, this trend could reverse to some degree. More Americans will need to work longer to shore up their finances, given the decline of defined-benefit pension plans. In fact, in a recent Federal Reserve survey, only 40 percent of non-retired Americans reported that their retirement savings were on track, and a quarter reported having no retirement savings at all.[86] In addition, Social Security is gradually raising the age for receiving full benefits.

In a recent CNBC economic survey, 68 percent of people who retired during the pandemic said they would consider returning to work.[87] The survey also found that retired respondents prioritized flexible hours even above pay. Businesses that need to retain experienced workers with hard-to-find skills may need to redesign work arrangements, perhaps focusing on mentoring younger coworkers. Unilever's "U-Work" model aims to provide flexibility by offering varying intermittent assignments and allowing workers to do other things between assignments while receiving a monthly retainer and other tailored benefits.

Helping people in low-wage, shrinking roles add the skills they need to move into growing jobs will require significant effort.

83   Heather Long, "'The pay is absolute crap': Child-care workers are quitting rapidly, a red flag for the economy," *Washington Post,* September 19, 2021. See also Maureen Coffey, "Still underpaid and unequal: Early childhood educators face low pay and a worsening wage gap," Center for American Progress, July 2022.

84   *Women in the workplace 2019,* McKinsey & Company and LeanIn.org, October 2019.

85   Jonathan Vespa, David M. Armstrong, and Lauren Medina, *Demographic turning points for the United States: Population projections for 2020 to 2060,* US Census Bureau, report P25-1144, February 2020.

86   *Report on the economic well-being of US households in 2021,* Federal Reserve, May 2022.

87   Steve Liesman, "Many who lost jobs during pandemic would return for the right pay and position, CNBC survey finds," CNBC, June 8, 2022.

Businesses can team up with nonprofits and local economic development agencies to find and train experienced workers interested in "second acts." AARP's Back to Work 50+ program teams with community partners to help older workers train for positions that are in demand and update their job-hunting strategies.

Activate historically overlooked populations

Another way to increase inclusion in the labor force is by reducing barriers for often-overlooked populations. This is one area where companies can take the lead simply by revising their own hiring practices to take a broader perspective on candidates.

Remote work, for example, is opening up long-needed opportunities for people with disabilities, a notably underutilized pool of talent. Employment among this group is higher than before the pandemic.[88] Continuing this trend could be pivotal for those with chronic conditions and those suffering from long COVID.

Residents of rural areas, too, can benefit from the shift to remote work. These areas have historically missed out on the kind of job growth enjoyed by large coastal cities, particularly when it comes to higher-paying and more knowledge-intensive jobs. But during the pandemic, many urban residents relocated to smaller towns while keeping their jobs and working online. Many companies no longer have to be constrained by geography in hiring—and there is a great deal of untapped talent to be found in small towns and rural areas. To make the most of this opportunity, local governments need to ensure that robust digital networks are in place.

Other traditional hiring barriers could also be eliminated, such as biases against workers with employment gaps. Automated screening tools may be weeding out talented applicants with gaps and other anomalies on their résumés.[89]

Similarly, some employers are revisiting the requirement that employees not have criminal records. Companies across sectors (including JPMorgan Chase and Amazon) are willing to consider some former offenders on a case-by-case basis.[90] One organization focused on making reentry possible is Homeboy Industries. Every year, Homeboy takes hundreds of former gang members and formerly incarcerated people through an intensive 18-month employment program, giving them opportunities to add skills and work experience in social enterprises. Removing the stigma surrounding those who have served their time would create opportunities for people to redirect their lives and become contributing members of their communities.

American workers will need opportunities to acquire the skills that will be in demand

With millions of jobs potentially being eliminated by automation—and an even larger number being created in fields requiring different skills—the United States faces an immense challenge and a huge opportunity. Many initiatives are in place, but not necessarily at the scale that will be required for a smooth transition in the future. It will be critical to scale up what works and connect displaced workers with the resources they need to make successful career transitions. The Bipartisan Infrastructure Law, for example, includes programs focused on expanding access to broadband as well as digital skills training, classroom instruction, and on-the-job training in fields related to infrastructure and energy efficiency. Similarly, the CHIPS and Science Act will fund not only semiconductor manufacturing but also STEM workforce development.

Employers can make a meaningful difference in filling roles and solving job mismatches through new recruiting policies as well as paid internships, apprenticeships, and training programs so that

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88 Don Lee, "Surge in remote working due to COVID fuels record employment for people with disabilities," *Los Angeles Times,* December 15, 2022; and Gleb Tsipursky, "Disabled people have been demanding remote work for decades. Here's what happened when the pandemic made it possible," *Fortune*, January 3, 2023.

89 Kathryn Dill, "Companies need more workers. Why do they reject millions of resumes?" *Wall Street Journal,* September 4, 2021.

90 For a list, see Eugene Casey, "Companies that hire felons," NCESC.com.

individuals can earn while they learn. It will take coalitions of employers, educational institutions, nonprofits, labor unions, and industry groups to tackle this challenge.

— **Pre-college students.** Initiatives in schools can prepare tomorrow's workforce for the science, technology, healthcare, and engineering jobs of the future. These can include extracurricular activities and external competitions to encourage early engagement. For example, Million Girls Moonshot runs after-school activities and summer programs to inspire and prepare more girls to pursue studies and careers in STEM.

— **College students.** Many companies are teaming up with universities and community colleges to build highly targeted vocational pipelines and academic programs in areas of high demand.[91] Educational institutions can shape curricula toward skills and growing local industries, while companies can offer hands-on experience and immediate employment after students complete their programs. With guidance from nonprofits and industry advisers, the City University of New York, for example, has been revising its curriculum in data analytics and cybersecurity to prepare students to better meet labor demand.[92] Looking beyond individual programming choices, the United States also needs to tackle some broader structural issues, including access to education as well as rising costs and debt burdens. In addition, institutions need to do more to boost completion rates: only about 60 percent of students who start a four-year program obtain a bachelor's degree, and about 30 percent of those who pursue a certificate or associate degree actually earn those credentials.[93]

— **Unemployed individuals.** Organizations can build out training programs and pathways to pull the unemployed into high-demand lines of work. For example, a nonprofit initiative called Generation, founded by organizations including McKinsey, targets unemployed youth worldwide. The program works with employers to identify the essential skills new employees need, then distills those skills into short-term four- to 12-week technical training courses, accompanied by mentorship and placement services with partnering employers.[94]

— **Displaced workers.** In the years ahead, millions of midcareer workers will need to leave declining occupations and enter new arenas. Workers will need to be adaptable and rise to the challenge of acquiring new skills. Companies can recruit from specific industries that are shrinking, particularly if they map out which skills are transferable, and hire and train people with potential. They can also invest in learning programs to help their own workers make internal transfers into growing roles. With labor in shorter supply, companies will not only need to attract new talent. They will also need to focus on retention by keeping current workers engaged. Some attrition is to be expected, but employers cannot afford excessive turnover and the loss of too much experience and institutional knowledge. Workers value flexibility and a positive experience with their managers and teams more than ever—and they are demanding more from their employers.

Workers value flexibility and a positive experience with their managers and teams more than ever.

91   David Tobenkin, "Employers partner with community colleges to fill the talent pipeline," SHRM, November 2021; and Olivia Sanchez, "Business partnerships with community colleges help funnel workers into better jobs," Hechinger Report, July 2021.

92   Lilah Burke, "An industry-aligned education," Inside Higher Ed, December 13, 2019.

93   "Increase completion and reduce inequities," in *The future of undergraduate education, the future of America,* Commission on the Future of Undergraduate Education, American Academy of Arts & Sciences, November 2017.

94   See generation.org.

Retention will also matter more than ever. Employers can use what they learned from the pandemic to keep their workforces more engaged. In a McKinsey survey, employees cited not feeling valued by their organizations or their managers as primary reasons for quitting. Those who identified as non-White or multiracial were more likely than their White counterparts to say they had left companies because they didn't feel they belonged. Employers have learned that employees want meaningful work, job flexibility and autonomy, connection, and opportunities to learn and advance. Part of keeping them involves removing toxic managers in favor of those who motivate and inspire; aligning benefits with employee priorities; strengthening the sense of community; and creating career paths and development opportunities.[95]

Where it's feasible, employers could consider hybrid work models as the rule and not the exception. This could include both work-from-home accommodations and flexible working hours. This is easier in occupations with clearer productivity measures. As the pandemic demonstrated, hybrid models help sustain productivity in the face of disruptive events; they can also help employees balance their work and personal lives. If flexibility is offered universally, but with some clear structures and policies in place, it can be a powerful source of employee satisfaction and loyalty.[96]

Offering existing employees learning opportunities and a clear path toward moving into new roles can reduce attrition—a major cost and a perennial headache in industries such as hospitality and retail. Walmart's Live Better U, for example, offers employees the chance to add skills for future roles (or even to stay in their current roles); this program covers the full cost of tuition and books for those pursuing college degrees.

Companies can also think more broadly about where their workforce is located. Rural and low-growth areas have lagged behind the national average in employment growth and recovery. But remote work presents opportunities for non-urban areas to draw consumers and workers. Not only can rural areas thrive and become more attractive to workers, but they may invest in becoming centers for growing areas of demand such as warehousing and automation.[97] Some low-growth and rural areas have been offering financial incentives such as paying eligible workers to relocate. Other programs offer to reimburse moving expenses, provide free recreational services, or host coworking spaces.

Some people look at the spread of automation with a sense of foreboding about what it will mean for livelihoods. The good news is that the United States will likely have more jobs in the future, and they will be higher-paying positions on average. But helping people in low-wage, shrinking roles add the skills they need to move into growing jobs will require significant effort. In addition, employers will need to redesign many jobs and make them more fulfilling, and workers will need to adapt as technology changes the nature of what they do.

The US labor market is proving itself to be resilient, which bodes well for the nation's ability to handle the churn and change that the next several years may bring. Employers feel a new sense of urgency, not only about their own workforce needs but also about what lies ahead for the US economy. This is a moment when smart policy can make a difference—and when companies can step up and lead in positioning people and communities for success.

[95] Aaron De Smet, Bonnie Dowling, Marino Mugayar-Baldocchi, and Bill Schaninger, "'Great Attrition' or 'Great Attraction'? The choice is yours," *McKinsey Quarterly,* September 2021.
[96] Ellen Ernst Kossek, Patricia Gettings, and Kaumudi Misra, "The future of flexibility at work," *Harvard Business Review,* September 2021.
[97] Mike Kerlin, Neil O'Farrell, Rachel Riley, and Rachel Schaff, "Rural rising: Economic development strategies for America's heartland," McKinsey & Company, March 2022.

Methodology brief

This research draws on a large body of MGI research on the future of work.[98] Its foundational methodology, approach, and assumptions remain consistent with those reports, with some additions and refinements. In this report, our analysis focuses on 2022–30, and all the driver models have been updated accordingly. Additionally, we have updated two of our trends to incorporate developments that have gained momentum in the United States, as follows:

— **The push to achieve net-zero emissions:** The United States has made a formal international commitment to reduce greenhouse-gas emissions to net zero by 2050 at the latest. We examined the impact of this move on jobs using a scenario-based analysis drawing on the approach used by the Network for Greening the Financial System. We built on previous McKinsey research assessing the impact at a global level to analyze the specific implications for the United States, adding sectoral and occupational dimensions to the analysis.[99]

   This net-zero analysis assumes that current supply chain composition remains the same by 2030. We consider the impact of the United States meeting its own emissions targets as well as its role in meeting global demand for products. Jobs gained and lost are allocated as per the occupational mix of 2022. We consider job losses and gains directly associated with the transition and do not include other macroeconomic forces like population and income growth. In addition to creating a scenario, we consulted other estimates of the net-zero transition's impact on jobs by 2030. These range from job gains of 178,000 (Decarb America) and 300,000 to 600,000 (Princeton Net-Zero America) to gains of 6.5 million (World Resources Institute 2035 estimate).[100] Estimates vary depending on assumptions about productivity and the US role in the global energy market, plus whether direct and indirect impacts are included.

— **Infrastructure spending:** The Bipartisan Infrastructure Law, signed in 2021, allocated $1.2 trillion in federal funding toward a variety of projects nationwide.[101] To reflect the impact of additional spending on jobs creation mandated by the legislation, we updated our infrastructure driver by incorporating construction-sector value-added estimates inclusive of Bipartisan Infrastructure Law allocations through 2030.

We use the following data sources and methodology:

— **Labor force data:** The Current Population Survey (CPS), conducted by the US Census Bureau for the US Bureau of Labor Statistics (BLS), is the primary data source for workforce statistics in this report. The CPS provides monthly data on detailed labor force variables, which are used here as reported at the source. The Census Bureau integrates updated population estimates into the CPS each January, but the historical estimates are not revised. We use the published unrevised estimates for purposes of comparison, while acknowledging the data limitations.

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[98] This research draws on the methodology and findings of multiple MGI reports: *A future that works: Automation, employment, and productivity,* January 2017; *Jobs lost, jobs gained: Workforce transitions in a time of automation,* November 2017; *The future of work in America: People and places, today and tomorrow,* July 2019; and *The future of work after COVID-19,* February 2021.

[99] *The net-zero transition: What it would cost, what it could bring,* McKinsey Global Institute, January 2022.

[100] *Employment impacts in a decarbonized economy,* Decarb America, June 2022; *Net-zero America: Potential pathways, infrastructure, and impacts,* Princeton University, October 2021; and *How a clean energy economy can create millions of jobs in the US,* World Resources Institute, September 2022.

[101] "President Biden's Bipartisan Infrastructure Law," The White House, November 2021.

A note on terminology

We use the term "occupational shifts" to mean declines in employment in specific occupations between 2019 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. We interpret these losses or declines that are offset by other gains as the effect of workers switching from one type of work to another. 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 from the BLS and allocating a share to each occupation according to its proportion of workers ages 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, using BLS groupings. 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. The results by category reflect their offsetting effects.

— **Baseline employment:** We use Occupational Employment Statistics data for 2022 from the BLS to capture the occupational structure of the workforce across sectors. The numbers are then proportionately scaled to CPS total employment to enable the inclusion of farm and self-employed workforce statistics. We apply annual growth rates from BLS 2021–31 projections to the 2022 baseline to estimate 2030 employment levels.

— **Automation:** To determine the potential impact of automation in the workplace, we use data published by the BLS and O*NET to break down some 850 occupations into about 2,100 constituent activities. Each activity is matched to one or more of 18 capabilities to assess the potential for a known technology to handle this work. In addition to looking at what is possible, we also consider what is feasible by assessing the solution development timeline, the economics of adoption versus paying wages, and the time required for adoption and deployment. We use the scenario inclusive of the impact of generative AI.

— **Impact of automation on productivity:** We used GDP per full-time employee (FTE) as the measure of productivity. We calculated automation output under different scenarios by multiplying the projected number of FTEs by the estimated automation adoption rate. To maintain consistency with other data sources, we made several additional assumptions. 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 gains. Finally, we created two scenarios: a pessimistic scenario in which labor displaced by automation rejoins the workforce at 2022 productivity levels, and a more optimistic scenario in which they rejoin at 2030 productivity levels, net of automation. In both scenarios, we have incorporated labor displaced rejoining in line with the expected 2030

occupational mix. We also assumed that additional output from automation will not decrease, even if the total number of FTEs declines as a result of demographic changes. Under the assumptions outlined above, we calculated the GDP impact of automation adoption by country as follows:

Additional GDP impact of automation = FTE impact of automation X productivity$_{2022}$

The additional GDP impact of automation is then added to 2022 GDP to estimate the productivity impact of automation.

— **Long-term labor market trends:** We estimate labor demand factoring in seven macroeconomic catalysts: rising incomes, healthcare and aging, technological innovation, infrastructure investment, education, the marketization of unpaid work, and the push to reach net-zero emissions across the economy. We capture direct and indirect jobs that could be created or lost from each catalyst by leveraging job multipliers from input-output tables.

— **Trends accelerated by COVID-19:** We incorporated several 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:** We look 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 are then mapped to each skill. Since one-to-one mapping of skills and activities undercounts digital skills, we correct this by reallocating a portion of hours from activities requiring non-technological skills to those requiring basic digital skills.

Acknowledgments