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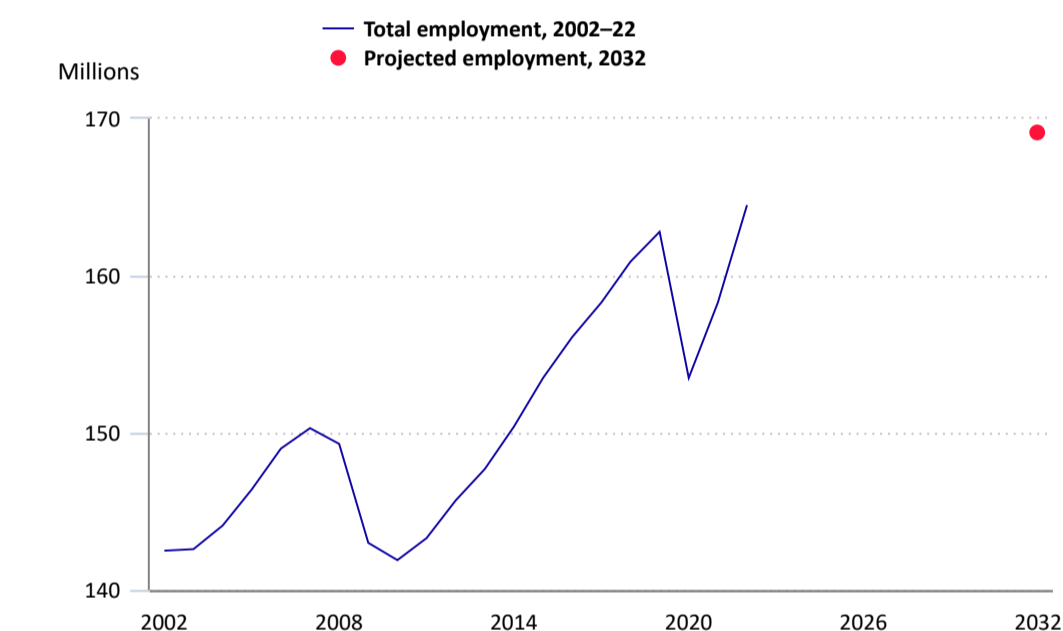
October 2023

## Industry and occupational employment projections overview and highlights, 2022–32

*Employment and real output are projected to grow from 2022 to 2032. The total economy is projected to add about 4.7 million jobs during this decade, with employment reaching a level of 169.1 million in 2032. Most of the projected employment gains are concentrated in the healthcare and social assistance sector and the professional, scientific, and technical services sector. The retail trade and manufacturing sectors account for the bulk of the projected job losses from 2022 to 2032.*

The U.S. Bureau of Labor Statistics (BLS) projects total employment to increase from 164.5 million in 2022 to 169.1 million in 2032, an increase of 2.8 percent. (See chart 1.) This projected growth is much slower than the 12.9-percent employment growth recorded over the 2012–22 decade, which was marked by strong recovery growth following the 2007–09 Great Recession and 2020 COVID-19 pandemic-induced recession. While wage and salary employment is projected to increase by 3.0 percent, the number of self-employed workers is projected to increase by 0.6 percent over the projections decade.

**Chart 1. Total employment, 2002–22 and projected 2032**



Click legend items to change data display. Hover over chart to view data.  
 Note: Total employment refers to wage and salary employment and self-employment.  
 The U.S. Bureau of Labor Statistics does not project employment for interim years 2023–31.  
 Source: U.S. Bureau of Labor Statistics.

[View Chart Data](#)

The overall growth in employment is driven by demographic trends—such as the aging U.S. population and slower growth in the civilian noninstitutional population—that are expected to cause declining labor force participation rates and slower labor force growth over the projections period. For a more detailed discussion of the 2022–32 BLS labor force and macroeconomic projections and their underlying trends, see “Labor force and macroeconomic projections overview and highlights, 2022–32.”<sup>1</sup> These aggregate projections are used to develop output and employment projections at the industry level, which then feed into the projections for occupational employment.<sup>2</sup> These more detailed projections are the focus of this article.

Highlights of the 2022–32 industry and occupational employment projections include the following:

- The healthcare and social assistance sector and the management of companies and enterprises sector are projected to experience the fastest employment growth between 2022 and 2032.<sup>3</sup> The aging population and growing prevalence of chronic conditions are the main drivers of the strong projected job growth for the healthcare and social assistance sector.
- The healthcare and social assistance sector is projected to account for the most new jobs, 2.1 million out of the 4.7 million total (or 45 percent) of all new jobs. The professional, scientific, and technical services sector will account for another 21 percent of all new jobs; the employment growth of this sector is largely driven by the growing demand for information technology (IT) products and services.
- The growth of the digital economy is expected to support solid job growth across the information and transportation and warehousing sectors, both of which rank among the top five fastest growing sectors. At the same time, the continued growth of e-commerce is expected to constrain retail trade employment, which is the sector projected to lose the most jobs over the 2022–32 decade.
- Employment in the manufacturing sector is likewise expected to decline, albeit slightly, because of the continued adoption of automation technologies. However, some industries, such as those engaged in battery and semiconductor production, are expected to add jobs between 2022 and 2032.<sup>4</sup>
- Although the utilities sector is projected to see employment decline overall, the four fastest growing industries are all utilities industries. This divergence reflects the energy transition, as employment in fossil-fuel-related utilities is expected to decline whereas green energy is projected to experience fast growth.
- The healthcare support occupational group is expected to see the fastest employment growth and to add the most jobs of any occupational group over the projections decade.<sup>5</sup> Together with the healthcare practitioners and technical occupational group, these 2 healthcare groups account for roughly 2 of every 5 new jobs projected to be added over

2022–32.

- The computer and mathematical occupational group is projected to experience the second-fastest job growth of all 22 groups. Of the 15 fastest growing occupations, 7 are computer and mathematical occupations.
- Employment in the production and sales and related occupational groups, which cover occupations largely employed by the manufacturing and retail trade sectors, respectively, is projected to decline between 2022 and 2032.

The next section of this article includes an overview of the interaction between projections for industry output and those for industry employment; this overview includes a brief description of the approach used to produce occupational employment projections. The article continues with a detailed discussion of the structural long-term factors expected to affect employment in several sectors, their underlying industries, related occupational groups, and relevant occupations.<sup>6</sup> A table is included at the end of each section, showing employment data for the various sectors, industries, occupational groups, and occupations discussed. The article concludes by summarizing the main highlights of the projections.

### **Industry output and projections methodology**

Industry output is comprised of final demand for goods and services as well as intermediate goods that are not reflected in gross domestic product estimates. Industry output is used by BLS to develop industry employment projections because it reflects total economic activity and is a key determinant of demand for labor, as workers are needed to produce intermediate as well as final goods and services.

BLS projects real output to increase by 19.8 percent, from \$35.9 trillion in 2022 to \$43.0 trillion in 2032 (1.8-percent compound annual growth rate), which is slightly slower than the 22.7-percent growth in real output registered from 2012 to 2022 (2.1-percent compound annual growth rate).

Because demand for goods and services is a fundamental driver of both output and employment, these latter variables often have broadly similar trends of growth or decline. One major exception to this pattern is in cases where output is increasing but higher labor productivity results in less demand for employment. For instance, in the manufacturing sector, although output is projected to increase 9.6 percent, employment is projected to decline 0.9 percent from 2022 to 2032.<sup>7</sup>

BLS produces occupational employment projections by analyzing current and projected future staffing patterns (the distribution of occupations within an industry) in an industry–occupation matrix. Changes in the staffing pattern for each industry are projected and applied to the final industry projections, which yield detailed occupational projections by industry. This projected employment matrix includes estimates for 832 occupations across 292 industries.

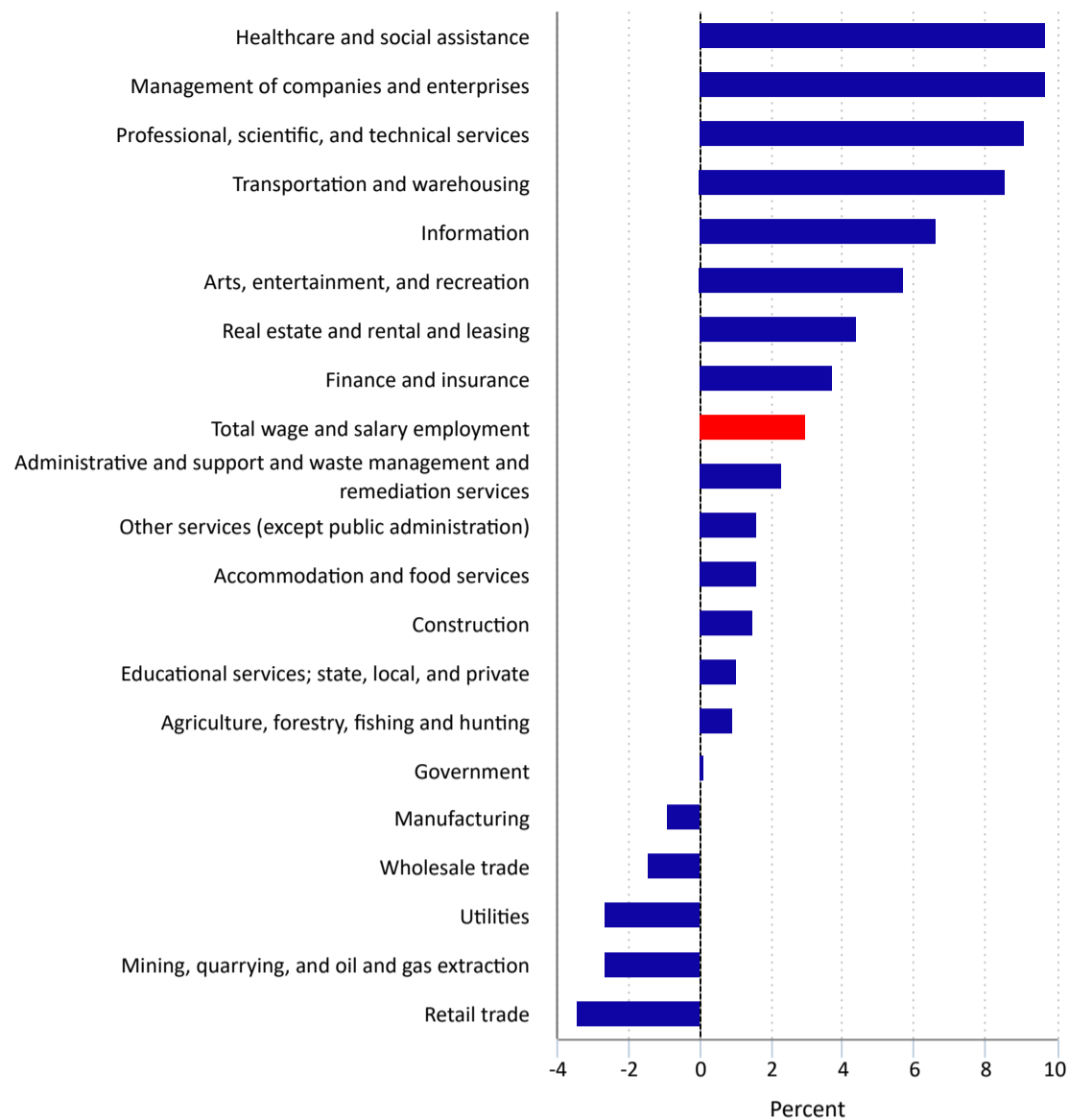
This article highlights the expected changes to industry and occupational employment over the 2022–32 decade and the trends expected to drive those changes. The employment projections for the occupations that are featured in this article represent the total employment change for these workers across the economy. Many of these occupations may have a high concentration of employment in specific industries. Therefore, the trends expected to affect employment in those industries largely drive the employment changes projected across these occupations. However, the employment outlook of occupations can also be influenced by factors specific to an occupation or by trends affecting other industries in which the workers in the occupation are employed.

Projections methods are heavily based on historical relationships in the data. Nevertheless, BLS also conducts research on factors that are expected to affect employment, particularly those which may not be reflected in historical data, such as new technologies and legislation. The analysis below reflects the research that BLS uses to develop and validate the projections. Projections always carry a degree of uncertainty, and the exact effect of developments such as new technologies on the labor market 10 years in the future is impossible to predict with precision. BLS issues new projections annually to incorporate new data, research, and analysis. BLS projections assume that technological change affects the labor market gradually, not suddenly. This assumption has been supported by the historical record.<sup>8</sup>

### **Aging population and chronic conditions to fuel job growth in the healthcare and social assistance sector**

Along with the management of companies and enterprises sector, the healthcare and social assistance sector is projected to see the fastest employment growth between 2022 and 2032. (See chart 2.) Employment in this sector is expected to grow 9.7 percent, over 3 times as fast as the average job growth for the overall economy. The healthcare and social assistance sector is also expected to add 2.1 million jobs over the projections decade, which represents the most jobs added by any sector and approximately 45 percent of all the projected job gains from 2022 to 2032.

**Chart 2. Projected percent change in wage and salary employment, by NAICS sector, 2022–32**



Hover over chart to view data.  
 Note: NAICS = North American Industry Classification System.  
 Source: U.S. Bureau of Labor Statistics.

[View Chart Data](#)

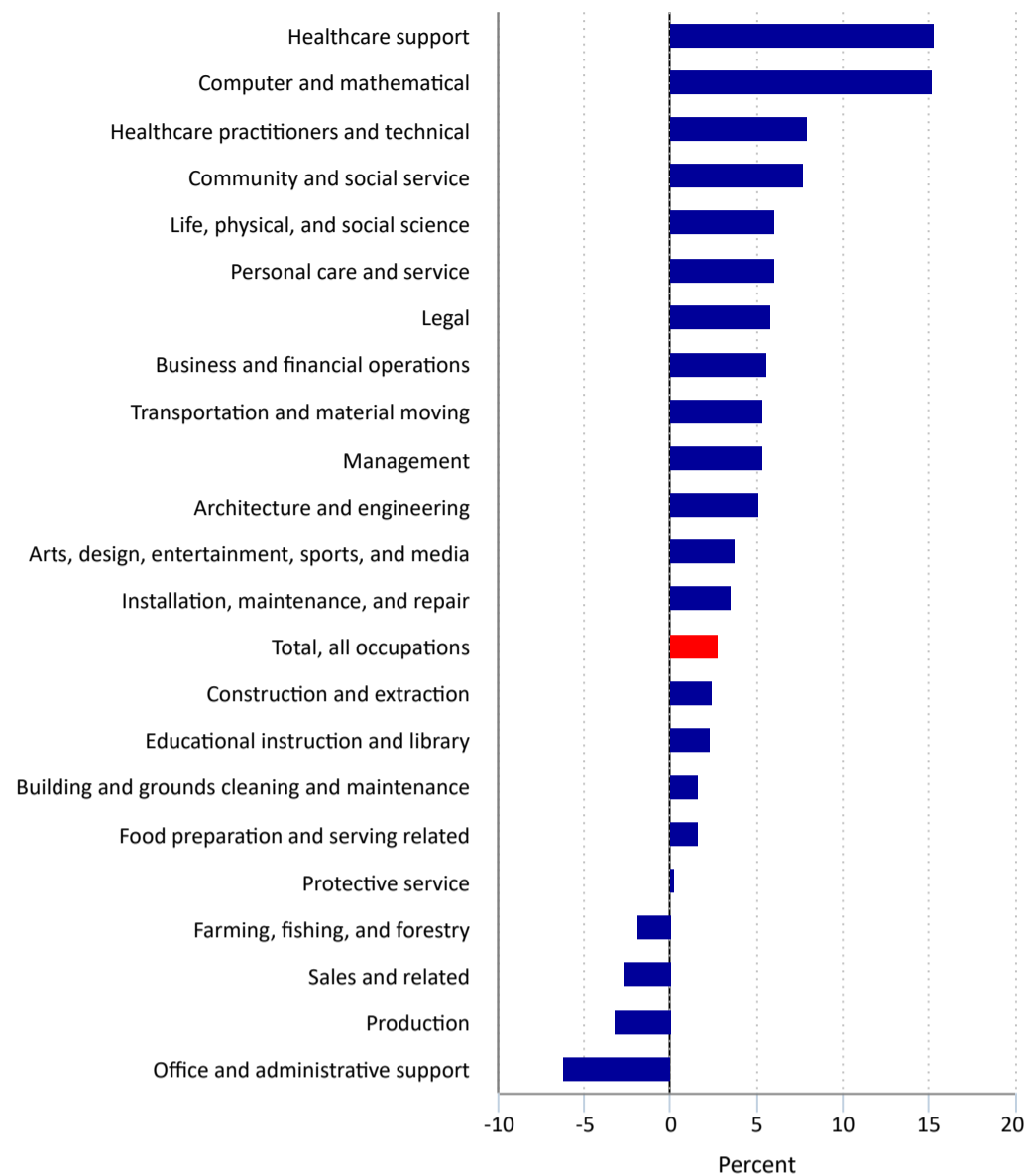
The social assistance segment within this sector covers industries that provide a wide range of services to various demographic groups, such as children and youth, and the largest industry in this segment is services for the elderly and persons with disabilities. Employment in the social assistance segment is projected to grow faster than in the healthcare segment (15.2 percent versus 8.4 percent). However, the latter is expected to see the most job growth over the 2022–32 decade, with a total of around 1.5 million jobs added. Thus, the healthcare segment alone accounts for roughly 70 percent of the employment gains projected for the sector overall.

There are two long-term structural factors that will drive the sector’s strong employment growth: the growing size of the older adult population, defined as those 65 years of age and over, and the increasing prevalence of chronic conditions, such as heart disease, cancer, and diabetes. There were an estimated 56.7 million older adults in 2022, and this number is expected to rise to 71.1 million by 2032.<sup>9</sup> Moreover, their share of the population is expected to increase from about 21 percent to 25 percent over this period.<sup>10</sup> Older adults tend to have more healthcare needs and to require more complex care than younger people because of their higher likelihood of experiencing health complications, including comorbidities. For example, only 6.7 percent of adults 18 to 44 years of age have at least two chronic conditions whereas 63.7 percent of older adults do.<sup>11</sup> This greater disease burden translates into a higher relative use of health services, which can be shown through expenditure data. In 2019, older adults represented 17 percent of the population, but they accounted for 35 percent of total health spending that year—far more than any other age group.<sup>12</sup> A growing number of older adults, then, will place a heavier demand on the use of medical and social services. Thus, the increased healthcare demand will fuel employment growth in the industries and occupations that provide these services.

In addition, the prevalence of chronic illness is already elevated, with about half of all Americans having a chronic disease and more than 85 percent of healthcare costs being attributable to chronic illness.<sup>13</sup> According to the National Center for Health Statistics, the prevalence of diabetes, hypertension, and obesity among adults has increased over the past couple of decades.<sup>14</sup> Chronic diseases are also the leading causes of death and disability in the nation.<sup>15</sup> Chronic conditions will become more prevalent in the years ahead because of the increasing number of older adults and existing risk factors for these diseases among the general population, such as poor nutrition and physical inactivity.<sup>16</sup> A recent study, for instance, projected that the number of people with chronic cardiovascular diseases, namely heart disease, heart failure and stroke, would increase by more than 30 percent between 2025 and 2060.<sup>17</sup> Against this backdrop, the demand for screening, diagnosing, treating, and managing these conditions will increase significantly; this will result in the strong employment growth projected for the healthcare and social assistance sector overall.

This sectoral growth is expected to drive employment growth across many industries and occupations within the healthcare and social assistance sector and occupations related to this sector. Three occupational groups are closely tied to the sector, all of which rank among the five fastest growing groups. These are the healthcare support, healthcare practitioners and technical, and community and social service occupational groups. Of all 22 occupational groups, the healthcare support group is expected to experience the fastest employment growth and add the most jobs from 2022 to 2032. (See chart 3.) The related healthcare practitioners and technical group is anticipated to be the third-fastest-growing occupational group. These 2 healthcare groups, combined, are projected to account for roughly 2 of every 5 new jobs added over the projections decade.

**Chart 3. Projected percent change in employment, by occupational group, 2022–32**



Hover over chart to view data.  
Source: U.S. Bureau of Labor Statistics.

[View Chart Data](#)

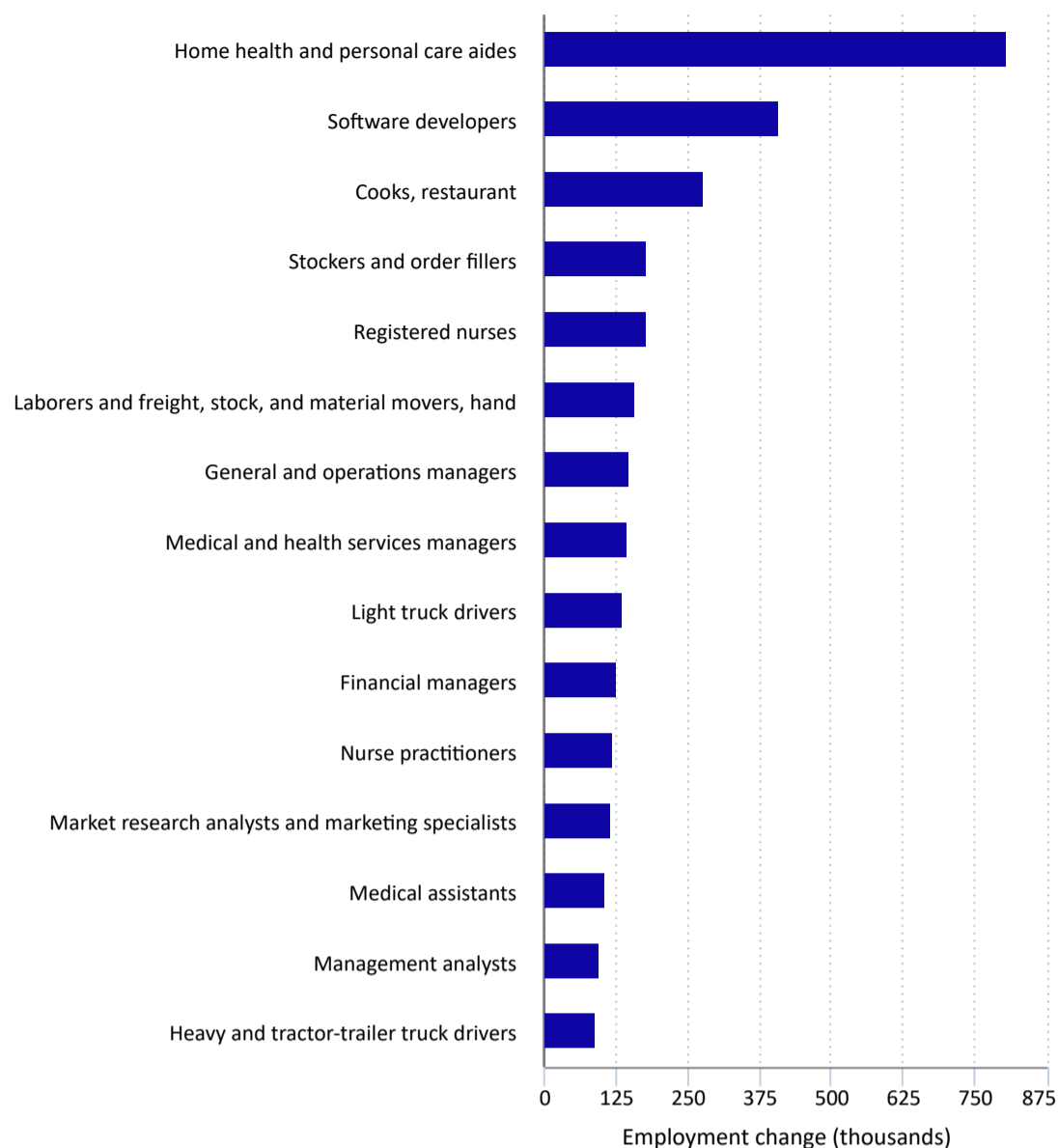


In terms of occupations, the 2 fastest growing healthcare occupations are nurse practitioners and physician assistants, which also feature on the list of 15 fastest growing occupations. Robust demand for these 2 occupations will stem from the need to mitigate physician shortages and from providers embracing team-based models of care delivery.<sup>18</sup> Furthermore, as the demand for healthcare grows, so too will the need for medical and health services managers to plan, coordinate, and implement services across all types of healthcare facilities. Although this occupation is classified under the management occupational group, it is central to the healthcare industry. Thus, strong job gains are projected. Aside from ranking among both the 15 fastest growing occupations and the 15 occupations with the most job growth between 2022 and 2032, medical and health services managers is projected to be the fastest growing occupation in the management occupational group.

Meanwhile, 5 of the 15 fastest growing industries are in the healthcare and social assistance sector. The services for the elderly and persons with disabilities industry is projected to see the fastest employment growth within the sector. It is also expected to add the most jobs of any industry, representing about 13 percent of all new jobs added over the 2022–32 decade. Employment growth in this industry will be driven primarily by the rising number of older adults who will require long-term care, particularly in the form of social assistance services like adult daycare and nonmedical home care. People with intellectual or developmental disabilities are another demographic group that will contribute to demand for these types of care and support services. Moreover, the aging population will boost demand for health and personal care services provided in the home, such as assistance with activities of daily living, fueling job growth in the home healthcare services industry. This industry is projected to be the 10th-fastest-growing industry and to add the 3rd-largest number of jobs between 2022 and 2032.

Beyond demographic trends, public policy has played a key role in encouraging the provision of long-term care services in home and community settings. Medicaid is the main payer for long-term services and supports, and the program has gradually shifted spending away from institutional settings, like nursing homes, to home- and community-based settings.<sup>19</sup> This policy shift, together with the general preference of older adults to “age in place,” will create strong demand for the services provided by the two industries mentioned above: home healthcare services and services for the elderly and persons with disabilities.<sup>20</sup> Community-based settings, such as those covered under the continuing care retirement communities and assisted living facilities for the elderly industry, are likewise expected to see strong job growth over the coming years. One occupation that is highly relevant for these three industries (i.e., home healthcare services, services for the elderly and persons with disabilities, and continuing care retirement communities and assisted living facilities for the elderly) is home health and personal care aides. Because workers in this occupation account for the most employment in these industries and are at the forefront of providing long-term care services to patients, demand for them will increase dramatically. In addition to being one of the 30 fastest growing occupations, home health and personal care aides are projected to add the most jobs of any occupation. In fact, this occupation is expected to account for about 1 of every 6 new jobs added over the 2022–32 decade, making it the largest occupation by 2032. (See chart 4.)

**Chart 4. Fifteen occupations with the most job growth, projected 2022–32**



Hover over chart to view data.  
Source: U.S. Bureau of Labor Statistics.

[View Chart Data](#)



The offices of physical, occupational and speech therapists, and audiologists industry is projected to be the second-fastest-growing industry within the healthcare and social assistance sector. As people age, the risk of having some form of disability increases. A Centers for Disease Control and Prevention study found, for example, that the prevalence of disability among older adults was much higher than among middle-aged and young adults, with disabilities related to hearing, mobility, and independent living particularly standing out.<sup>21</sup> Meanwhile, many chronic conditions, like heart disease and diabetes, contribute to disability as well, with arthritis being the leading cause of disability among adults.<sup>22</sup> As the number of older adults and the prevalence of chronic disease grow, more people will experience disability or other functional limitations. Therefore, the demand for occupational and physical therapy is expected to rise substantially, leading to strong employment growth for occupational and physical therapists and their assistants. Between 2022 and 2032, employment of these therapists is projected to increase by more than 10 percent, while employment growth of their assistants is expected to be above 20 percent.

Similarly, the prevalence and severity of hearing loss become more common as people age.<sup>23</sup> In addition, cognitive disorders like Alzheimer’s disease and dementia are more likely to occur in older people, which can lead to speech or language impairments.<sup>24</sup> The need for audiology and speech-language pathology services will increase significantly as people age. Therefore, the occupations that provide these services—namely audiologists, hearing aid specialists, and speech-language pathologists—are projected to experience much faster job growth than the all-occupation average between 2022 and 2032.

In addition to aging and chronic conditions, patient demand for specific healthcare services is another factor expected to drive strong employment growth. This is the case for complementary and alternative medicine (CAM) therapies, which are growing in popularity to maintain overall wellness and to treat various medical conditions.<sup>25</sup> People are using CAM therapies, such as chiropractic services, massage, and acupuncture, to address ailments like pain, stress, and anxiety. Moreover, some CAM therapies have gained institutional recognition for their effectiveness in dealing with certain health conditions, particularly chronic pain. For example, spinal manipulation (the core chiropractic service) and acupuncture are both covered benefits under Medicare for the treatment of chronic pain.<sup>26</sup> Additionally, in response to the opioid crisis, there has been a pivot away from prescribing opioids to recommending the use of nonpharmacologic and nonopioid therapies for the treatment of chronic pain, such as chiropractic services, massage, and acupuncture.<sup>27</sup> Altogether, the growing demand for CAM services is expected to contribute to above-average employment growth for chiropractors, massage therapists, and acupuncturists between 2022 and 2032.

Mental health services is another area in which fast employment growth is expected. The offices of mental health practitioners (except physicians) industry is projected to be the ninth-fastest-growing industry from 2022 to 2032. Related industries are likewise anticipated to see much-faster-than-average job growth over the projections period, such as outpatient mental health and substance abuse centers; private psychiatric and substance abuse hospitals; and residential mental health and substance abuse facilities. This growth reflects the strong demand for treatment stemming from the increasing number of people with mental health and behavioral issues. According to the National Survey on Drug Use and Health of 2019, 7.4 percent of people ages 12 and over (about 20 million people) had a substance use disorder; this share held largely steady from 2015 to 2019.<sup>28</sup> In 2021, these figures stood at around 17 percent and 46 million, respectively.<sup>29</sup> The National Survey on Drug Use and Health implemented major methodological changes between 2019 and 2021; thus, data points are not directly comparable between both survey years. Nevertheless, the data suggest an elevated prevalence of substance use disorders.

Furthermore, the percentage of adults 18 years of age and over diagnosed with any mental illness increased from about 18 percent in 2010 to 21 percent in 2019.<sup>30</sup> And, according to the 2021 National Survey on Drug Use and Health, roughly 23 percent of adults had a mental illness (almost 58 million people).<sup>31</sup> Also, the number of those receiving mental health services has increased, from about 14 percent in 2010 to 16 percent in 2019, with services provided in outpatient settings experiencing the most growth.<sup>32</sup> In 2021, almost 19 percent of adults received mental health services (approximately 47 million people).<sup>33</sup> The growing number of people with a mental illness or substance use disorder and those seeking mental health services will increase the demand for counseling, medication, and treatment. Accordingly, strong employment growth

is projected for occupations that provide or assist in the provision of mental health and social services, many of which are largely employed by the mental health-related industries mentioned previously. These occupations include substance abuse, behavioral disorder, and mental health counselors; clinical and counseling psychologists; mental health and substance abuse social workers; psychiatric technicians; and social and human service assistants—all of which are expected to see employment grow much faster than the average for all occupations between 2022 and 2032.

**Table 1. Employment in selected industries and occupations related to healthcare and social assistance, projected 2022–32**

NAICS or SOC code	Industry or occupation title	Employment, 2022	Employment, 2032	Numeric change, 2022–32	Percent change, 2022–32	Rank
N/A	<b>Total employment</b>	<b>164,482.6</b>	<b>169,148.1</b>	<b>4,665.5</b>	<b>2.8</b>	<b>N/A</b>
<b>62</b>	<b>Healthcare and social assistance</b>	<b>21,639.3</b>	<b>23,739.6</b>	<b>2,100.3</b>	<b>9.7</b>	<b>1st of 20</b>
621330	Offices of mental health practitioners (except physicians)	166.4	201.6	35.2	21.2	9th of 292
621340	Offices of physical, occupational and speech therapists, and audiologists	448.6	575.2	126.6	28.2	8th of 292
621420	Outpatient mental health and substance abuse centers	275.4	331.0	55.6	20.2	11th of 292
621600	Home healthcare services	1,533.6	1,843.8	310.2	20.2	10th of 292
622205	Psychiatric and substance abuse hospitals; private	150.1	168.3	18.2	12.1	29th of 292
623220	Residential mental health and substance abuse facilities	237.8	263.1	25.3	10.6	35th of 292
623300	Continuing care retirement communities and assisted living facilities for the elderly	897.7	1,024.0	126.3	14.1	22nd of 292
624120	Services for the elderly and persons with disabilities	2,152.1	2,776.0	623.9	29.0	6th of 292
<b>11-0000</b>	<b>Management occupations</b>	<b>12,574.7</b>	<b>13,257.7</b>	<b>683.0</b>	<b>5.4</b>	<b>10th of 22</b>
11-9111	Medical and health services managers	509.5	654.2	144.7	28.4	6th of 832
<b>19-0000</b>	<b>Life, physical, and social science occupations</b>	<b>1,473.7</b>	<b>1,563.2</b>	<b>89.5</b>	<b>6.1</b>	<b>5th of 22</b>
19-3033	Clinical and counseling psychologists	67.5	75.2	7.7	11.4	63rd of 832
<b>21-0000</b>	<b>Community and social service occupations</b>	<b>2,936.5</b>	<b>3,164.2</b>	<b>227.7</b>	<b>7.8</b>	<b>4th of 22</b>
21-1018	Substance abuse, behavioral disorder, and mental health counselors	388.2	459.6	71.5	18.4	27th of 832
21-1023	Mental health and substance abuse social workers	113.5	125.5	12.0	10.6	68th of 832
21-1093	Social and human service assistants	415.1	450.6	35.6	8.6	97th of 832
<b>29-0000</b>	<b>Healthcare practitioners and technical occupations</b>	<b>9,481.0</b>	<b>10,243.7</b>	<b>762.7</b>	<b>8.0</b>	<b>3rd of 22</b>
29-1011	Chiropractors	55.0	59.8	4.9	8.8	91st of 832
29-1071	Physician assistants	148.0	187.3	39.3	26.5	8th of 832
29-1122	Occupational therapists	139.6	155.6	16.1	11.5	61st of 832
29-1123	Physical therapists	246.8	284.1	37.3	15.1	42nd of 832
29-1127	Speech-language pathologists	171.4	204.5	33.1	19.3	25th of 832
29-1171	Nurse practitioners	266.3	384.9	118.6	44.5	2nd of 832
29-1181	Audiologists	14.4	15.9	1.5	10.6	67th of 832
29-1291	Acupuncturists	26.6	28.0	1.4	5.3	210th of 832
29-2053	Psychiatric technicians	107.1	117.5	10.4	9.7	79th of 832
29-2092	Hearing aid specialists	10.2	11.7	1.5	14.5	46th of 832
<b>31-0000</b>	<b>Healthcare support occupations</b>	<b>7,144.9</b>	<b>8,245.5</b>	<b>1,100.6</b>	<b>15.4</b>	<b>1st of 22</b>
31-1120	Home health and personal care aides	3,715.5	4,520.1	804.6	21.7	16th of 832
31-2011	Occupational therapy assistants	45.1	56.0	10.8	24.0	11th of 832
31-2021	Physical therapist assistants	100.7	126.9	26.3	26.1	9th of 832
31-9011	Massage therapists	134.3	158.9	24.6	18.3	29th of 832

Note: Industry or occupation code refers to the 2022 North American Industry Classification System (NAICS) or 2018 Standard Occupational Classification (SOC), respectively. Employment is listed in thousands of jobs. Employment for industries is wage and salary. Employment for occupations is total employment, which includes wage and salary employment in all industries and self-employment. Ranks refer to the rank of the employment percent change relative to all 20 sectors, 292 detailed industries, 22 occupational groups, or 832 detailed occupations. N/A = Not applicable. Source: U.S. Bureau of Labor Statistics.

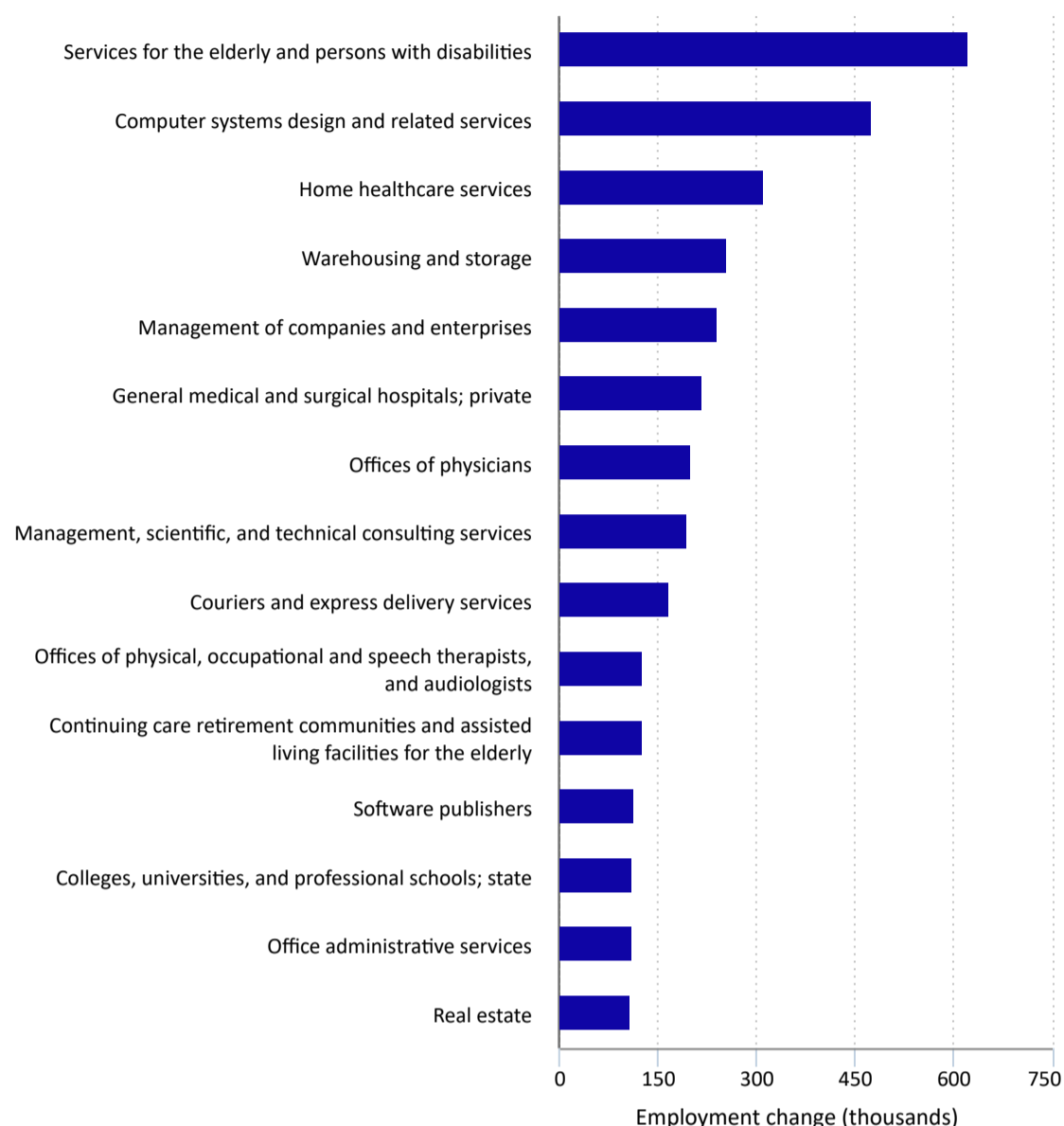
### **Demand for computer systems design and related services to contribute to fast employment growth in the professional, scientific, and technical services sector**

Establishments in the professional, scientific, and technical services sector offer expertise, knowledge, or skills to their clients. These services are often on an assignment basis in which an individual or a team is responsible for the delivery of services to the client.<sup>34</sup> The professional, scientific, and technical services sector is projected to have the second-largest increase in new jobs of any sector from 2022 to 2032 (960,400 jobs). Employment in this sector is projected to grow at an above-average rate of 9.1 percent over the decade. Among the detailed industries of the professional, scientific, and technical services sector, 7 of 12 are projected to have employment growth faster than the 2.8-percent average growth projected for the total economy. This includes three industries with growth rates at least 3 times faster than that of the total economy: computer systems design and related services; veterinary services; and management, scientific, and technical consulting services.

Computer systems design and related services—the largest industry in the professional, scientific, and technical services sector—is projected to grow the fastest (19.3 percent) and generate the most new jobs of all industries in the sector. The projected 474,800 new jobs in the industry ranks as the second-largest increase in jobs across all 292

detailed industries over the 2022–32 period. (See chart 5.) Because many computer and mathematical occupations have high concentrations of employment in the computer systems design and related services industry, the trends that are expected to increase industry employment are also drivers of employment growth for many of these occupations. For example, the computer and mathematical occupational group is projected to experience much-faster-than-average employment growth of 15.2 percent over the projections decade, the second-fastest rate of all 22 groups. This occupational group is also projected to record the second-largest increase in jobs from 2022 to 2032 (803,800). In addition, 7 computer and mathematical occupations are among the top 15 fastest growing occupations.

**Chart 5. Fifteen industries with the most job growth, projected 2022–32**



Hover over chart to view data.  
Source: U.S. Bureau of Labor Statistics.

[View Chart Data](#)

Employment opportunities in the computer systems design and related services industry are expected to increase because of businesses' need for custom software solutions to facilitate business operations or to interact with customers through websites and applications. In addition, IT professionals will be in demand to design, integrate, test, and operate IT infrastructure and to assist with cloud migrations.<sup>35</sup> Companies may find it more cost effective to contract with outside firms that specialize in these services rather than to internally hire IT professionals, which will benefit establishments in this industry.<sup>36</sup>

Moreover, a marked increase in the number and severity of cyberattacks and data breaches on U.S. businesses is expected to lead to greater demand for cybersecurity services and products.<sup>37</sup> This is expected to fuel demand for information security analysts to monitor and assess the security of computer networks and systems and respond to security threats. The information security analyst occupation is projected to grow 31.5 percent from 2022 to 2032, which makes it the fastest growing computer occupation and the fifth-fastest-growing occupation in the economy.

Another factor expected to drive employment growth in the computer systems design and related services industry is the adoption of automation technologies, such as artificial intelligence (AI) and robotics, across many industries.<sup>38</sup> Development and deployment of automation technologies require professionals in computer science, programming, data analysis, software development, and other related skills to build automation algorithms and software. Demand for these skills is expected to grow in response to the increased uptake of these and other automation technologies.<sup>39</sup> Technological developments in AI, robotics, and machine learning should create job opportunities for computer and information research scientists—nearly 30 percent of which are projected to be employed by the computer systems design and related services industry in 2032—to conduct research and to apply computer science theory and principles. Employment of these scientists is projected to grow 22.7 percent over the projections period.

**Table 2. Employment in selected industries and occupations related to professional, scientific, and technical services, projected 2022–32**

NAICS or SOC code	Industry or occupation title	Employment, 2022	Employment, 2032	Numeric change, 2022–32	Percent change, 2022–32	Rank
N/A	<b>Total employment</b>	<b>164,482.6</b>	<b>169,148.1</b>	<b>4,665.5</b>	<b>2.8</b>	<b>N/A</b>
<b>54</b>	<b>Professional, scientific, and technical services</b>	<b>10,514.5</b>	<b>11,474.9</b>	<b>960.4</b>	<b>9.1</b>	<b>3rd of 20</b>
541500	Computer systems design and related services	2,456.8	2,931.6	474.8	19.3	13th of 292
<b>15-0000</b>	<b>Computer and mathematical occupations</b>	<b>5,277.6</b>	<b>6,081.4</b>	<b>803.8</b>	<b>15.2</b>	<b>2nd of 22</b>
15-1212	Information security analysts	168.9	222.2	53.2	31.5	5th of 832
15-1221	Computer and information research scientists	36.5	44.8	8.3	22.7	13th of 832

Note: Industry or occupation code refers to the 2022 North American Industry Classification System (NAICS) or 2018 Standard Occupational Classification (SOC), respectively. Employment is listed in thousands of jobs. Employment for industries is wage and salary. Employment for occupations is total employment, which includes wage and salary employment in all industries and self-employment. Ranks refer to the rank of the employment percent change relative to all 20 sectors, 292 detailed industries, 22 occupational groups, or 832 detailed occupations. N/A = Not applicable.  
Source: U.S. Bureau of Labor Statistics.

### Demand for digital content to propel employment growth in the information sector

Establishments in the information sector produce and distribute content; provide the means to transmit and distribute content, data, and communications; and process data.<sup>40</sup> The 2022–32 employment projections for the information sector reflect the continued shift away from traditional media to an increasingly digital world. Demand for digital content and services, such as internet services, cloud computing, and software, is expected to increase further over the 2022–32 period. In contrast, demand for traditional media, such as print newspapers and radio programming, is expected to continue to wane. Related information industries, such as newspaper publishers and radio broadcasting stations, are expected to suffer job losses over the projections period.<sup>41</sup> Overall, the information sector is projected to grow at an above-average rate of 6.6 percent and add about 201,500 jobs from 2022 to 2032.

Undoubtedly, Americans spend more time connected to the internet and engaged with digital devices today than in any other time in history. Americans spent on average over 7 hours a day engaging with digital media in 2022—close to double the time they spent consuming digital media 10 years prior.<sup>42</sup> The internet has become an essential component of our daily lives, and consumers are expected to increase their use of internet-enabled activities and consumption of digital content over the next decade.<sup>43</sup> Younger generations growing up in the digital age tend to have a stronger appetite for digital content and platforms than other cohorts and are more likely to be regularly connected to the internet.<sup>44</sup> As a result, younger demographic groups are expected to contribute to stronger consumer demand for digital media and services over the 2022–32 decade. In addition, government funding and initiatives to help close the gap in internet access across geographic regions and sociodemographic groups should continue to expand the consumer base for these services.<sup>45</sup>

Stronger demand for digital content should drive rapid employment growth in the web search portals, libraries, archives, and other information services industry, which is projected to grow the fastest of all information industries and the 12th fastest among all industries (19.4 percent).

Employment in the software publishers industry, the second-largest information industry in 2022, is projected to grow by 17.8 percent and add 112,900 jobs over the 2022–32 decade. This is the largest increase of any information industry and the 12th largest across all detailed industries. Establishments in this industry design, develop, and publish computer software, software applications, and mobile applications for a wide range of uses and industries. Firms in various industries will require software programs and applications to conduct business; to support business activities in management, sales, logistics, or other business functions; and to improve productivity and collaboration.<sup>46</sup> Constant innovation in these spaces will require software developers and other occupations employed by this industry to develop and test upgrades and new programs and applications. In addition, strong demand for video games over the projections period is expected to contribute to employment growth in this industry. Globally, an estimated 2.9 billion people played a video game in 2021.<sup>47</sup> Improvements in gaming technology and graphics, faster network connections, and an expanding global consumer base are expected to continue to drive strong demand for video games over the projections period and, in turn, the design and development of the next generation of video games.<sup>48</sup>

In 2022, software developers made up more than 20 percent of employment in three separate industries: software publishers; web search portals, libraries, archives, and other information services; and computer systems design and related services. In addition, these three industries are projected to employ nearly half of all software developers in 2032. Because of strong demand for software development in these industries and the economy at large, this occupation is expected to have the 2nd-largest increase in jobs of any occupation and be the 10th-fastest-growing occupation from 2022 to 2032. Employment of software developers is projected to increase by 410,400, or 25.7 percent.

The expanding digital presence of businesses and consumers is expected to result in a substantial increase in the volume of data generated.<sup>49</sup> As a result, businesses will need cloud infrastructure to store and manage large databases. Cloud computing and cloud-based services continue to increase in popularity and the industry is expected to continue to grow.<sup>50</sup> One reason cloud-based services have grown so quickly is their cost savings for businesses; these services can reduce a firm’s need for some physical hardware and other legacy IT equipment.<sup>51</sup> Subsequently, as more businesses in a wide range of industries adopt Internet of Things (IoT) and cloud computing solutions, data centers will be needed to reduce data traffic congestion and to transmit data across networks quicker and more efficiently.<sup>52</sup> Altogether these factors are expected to drive employment growth in the computing infrastructure providers, data processing, web hosting, and related services industry (14.0 percent).

In addition, the rapid growth in data expected over the projections period will drive demand for mathematical science occupations to help businesses harness their data and analyze it to identify trends and inform decisions. These occupations will see employment growth across a wide range of sectors, such as professional, scientific, technical services; information; finance and insurance; government; healthcare; and other sectors.

Nearly all mathematical science occupations are expected to experience fast employment growth over the projections period, but employment in four occupations is projected to grow by more than 20 percent: data scientists, statisticians, actuaries, and operations research analysts. Data scientists are projected to be the third-fastest-growing occupation over 2022–32 (35.2 percent). They will be in demand across a range of industries and fields to build models and applications for the analysis and presentation of data.<sup>53</sup> Likewise, employment for statisticians is expected to grow 31.6 percent from 2022–32, the fourth-fastest of all occupations. The rise of big data and demand for data analysis should drive demand for statisticians to apply statistical theory and methods to collect, prepare, interpret, and summarize data. Actuaries will be hired by insurance carriers and other companies to use big data to assess and forecast the risk of potential events (employment projected to grow 23.2 percent). Meanwhile, operations research

analysts will be in demand to use and interpret data analysis to advise managers and other decisionmakers on business operations, supply chain management, price forecasting, and more (employment projected to grow 22.5 percent).

Strong consumer demand for digital entertainment should also support demand for streaming and internet broadcasting services and social media platforms. Many U.S. households continue to “cut the cord” on traditional paid TV services in favor of using only streaming services.<sup>54</sup> According to survey data, the share of U.S. households that subscribe to a video-on-demand service rose from 52 percent in 2015 to 78 percent in 2022.<sup>55</sup> Similarly, music streaming service subscriptions hit an all-time high of an average of 92 million subscribers in 2022 and represented about 84 percent of total 2022 recorded music revenue.<sup>56</sup> Likewise, nearly three-quarters of Americans reported using some kind of social media site in 2021, which was up from half of all Americans in 2011.<sup>57</sup>

As streaming services and social media sites continue to grow in popularity and increasingly penetrate entertainment markets, employment is expected to grow in the media streaming distribution services, social networks, and other media networks and content providers industry. More workers will be needed to develop and upgrade the platforms; produce and release content; and perform other related activities. Meanwhile, it is likely that streaming providers will continue to invest in the production of original content to attract and retain subscribers, which will support demand for movie, TV, and video production and distribution. This should increase employment in the motion picture and video industries and for a variety of arts, design, entertainment, and media occupations, such as producers and directors, film and video editors, and special effects animators and artists.

**Table 3. Employment in selected industries and occupations related to the information sector, projected 2022–32**

NAICS or SOC code	Industry or occupation title	Employment, 2022	Employment, 2032	Numeric change, 2022–32	Percent change, 2022–32	Rank
N/A	<b>Total employment</b>	<b>164,482.6</b>	<b>169,148.1</b>	<b>4,665.5</b>	<b>2.8</b>	<b>N/A</b>
<b>51</b>	<b>Information</b>	<b>3,074.4</b>	<b>3,275.9</b>	<b>201.5</b>	<b>6.6</b>	<b>5th of 20</b>
512100	Motion picture and video industries	437.6	463.7	26.1	6.0	N/A
513110	Newspaper publishers	100.4	81.3	-19.1	-19.0	278th of 292
513200	Software publishers	635.8	748.7	112.9	17.8	18th of 292
516110	Radio broadcasting stations	52.5	43.1	-9.4	-17.9	277th of 292
516210	Media streaming distribution services, social networks, and other media networks and content providers	237.5	251.5	14.0	5.9	62nd of 292
518000	Computing infrastructure providers, data processing, web hosting, and related services	466.3	531.7	65.4	14.0	23rd of 292
519000	Web search portals, libraries, archives, and other information services	189.2	225.8	36.6	19.4	12th of 292
<b>15-0000</b>	<b>Computer and mathematical occupations</b>	<b>5,277.6</b>	<b>6,081.4</b>	<b>803.8</b>	<b>15.2</b>	<b>2nd of 22</b>
15-1252	Software developers	1,594.5	2,004.9	410.4	25.7	10th of 832
15-2011	Actuaries	30.0	36.9	7.0	23.2	12th of 832
15-2031	Operations research analysts	109.9	134.7	24.7	22.5	14th of 832
15-2041	Statisticians	33.3	43.9	10.5	31.6	4th of 832
15-2051	Data scientists	168.9	228.2	59.4	35.2	3rd of 832
<b>27-0000</b>	<b>Arts, design, entertainment, sports, and media occupations</b>	<b>3,071.1</b>	<b>3,187.0</b>	<b>115.9</b>	<b>3.8</b>	<b>12th of 22</b>
27-1014	Special effects artists and animators	89.3	96.6	7.4	8.2	103rd of 832
27-2012	Producers and directors	175.3	187.0	11.7	6.7	147th of 832
27-4032	Film and video editors	51.0	55.8	4.8	9.4	84th of 832

Note: Industry or occupation code refers to the 2022 North American Industry Classification System (NAICS) or 2018 Standard Occupational Classification (SOC), respectively. Employment is listed in thousands of jobs. Employment for industries is wage and salary. Employment for occupations is total employment, which includes wage and salary employment in all industries and self-employment. Ranks refer to the rank of the employment percent change relative to all 20 sectors, 292 detailed industries, 22 occupational groups, or 832 detailed occupations. Motion picture and video industries is a summary level industry and therefore is not ranked. N/A = Not applicable.  
Source: U.S. Bureau of Labor Statistics.

### E-commerce growth to drive employment growth in transportation and warehousing services

The transportation and warehousing sector is projected to be the fourth-fastest-growing sector over the 2022–32 decade. This sector is also projected to add close to 570,000 new jobs over the period, the third-largest increase among all sectors. The vast majority of these employment gains will stem from only two industries: couriers and express delivery services and warehousing and storage. These industries rank among the top 15 industries expected to add the most jobs from 2022 to 2032. Moreover, the local messengers and local delivery industry is projected to grow the fastest of all transportation and warehousing industries. Another notable industry in this sector is freight transportation arrangement, as it is likewise expected to see much faster job growth than the average for the entire economy.

The expansion of e-commerce is set to drive rapid employment growth across those four industries: couriers and express delivery services, warehousing and storage, local messengers and local delivery, and freight transportation arrangement. During the 2010s, e-commerce was already taking business away from brick-and-mortar retail stores.<sup>58</sup> The onset of the COVID-19 pandemic accelerated this trend, as it prompted consumers to shift their spending online to avoid in-person shopping. Although consumers are returning to their prepandemic spending patterns, e-commerce activity has nevertheless remained strong.<sup>59</sup> For instance, total e-commerce sales crossed the \$1 trillion mark for the first time in 2022, increasing by more than 27 percent in only 2 years when the pandemic boosted sales in 2020.<sup>60</sup> E-commerce’s share of total retail sales has grown as

well, from 4.5 percent in 2010, to 10.6 percent in 2019, and then to 14.6 percent in 2020 as a result of the pandemic—a share that has remained largely stable since then.<sup>61</sup> Over the coming years, it is expected that both e-commerce sales and market share will continue to gain ground.<sup>62</sup>

As consumers increasingly shop online and more businesses turn to selling their products online, more goods are expected to be shipped on an on-demand basis. This increasing volume of parcels that need delivery is expected to create strong demand for couriers and express delivery services, fueling employment growth within this industry.<sup>63</sup> At the same time, with the expected increase in freight activity, demand for logistics coordination services is bound to increase as well, contributing to solid job growth in the freight transportation arrangement industry.<sup>64</sup> Establishments in this industry specialize in making the proper transportation arrangements with carriers to get goods to their destination. One occupation that is set to benefit from the growing demand for freight forwarding services is cargo and freight agents. Notably, this occupation is expected to have the fastest employment growth within the office and administrative support occupational group; this is in contrast to the employment decline projected for the group overall.

Meanwhile, food and grocery delivery is an e-commerce segment expected to contribute to strong job growth in the local messengers and local delivery industry. Demand for food delivery services was already growing prior to the pandemic, with the market doubling in size from 2018 to 2019.<sup>65</sup> The advent of food delivery apps contributed to this growth, as they offered convenience to consumers and enabled restaurants to broaden their customer base. And as with e-commerce generally, the onset of the pandemic fueled demand further. By 2021, the food delivery market had grown to more than 4 times its size in 2018.<sup>66</sup>

Similarly, grocery delivery services have seen increased use, a trend that predated the pandemic as well. While about 23 percent of adults reported buying groceries online in 2018, roughly 37 percent did in 2019. This share jumped during the pandemic, to 52 percent in 2020 and further to 59 percent in 2021.<sup>67</sup> Although the proportion of those who shop and intend to shop for groceries online subsided through 2022, they both remained well above their prepandemic levels.<sup>68</sup> Demand for online grocery shopping appears to remain strong. Another survey from late 2022 found that over 55 percent of shoppers were buying groceries online more frequently than before.<sup>69</sup> Both the grocery and meal delivery markets are expected to expand further, and thus lead to rapid job growth in the local messengers and local delivery industry.<sup>70</sup> Although driver/sales workers do not have a high concentration of employment in this industry, the increasing use of food delivery services is nevertheless expected to augment demand for this occupation. It is projected that employment of driver/sales workers will grow faster than the all-occupation average from 2022 to 2032.

E-commerce growth is also anticipated to raise demand for warehousing and storage services as online order fulfillment requires a much larger logistics space than the storage capacity available at traditional stores.<sup>71</sup> Therefore, more warehousing space will be needed to accommodate and process the growing number of products purchased online. In addition, companies are taking on larger inventories to avoid the effects of supply chain disruptions such as those created by the pandemic, increasing warehouse demand further.<sup>72</sup> Demand for warehouses is likewise likely to increase because of the need to have inventories closer to the end consumer in order to meet customer demands for fast delivery.<sup>73</sup>

At the same time, warehouses are adopting various automated systems to operate more efficiently. These include technologies like robotic shuttle carts, pocket sortation systems, and packaging machines that automate the warehouse functions of picking, sorting, and packaging.<sup>74</sup> During the pandemic e-commerce boom, demand for warehouse automation picked up considerably, a trend that is likely to persist over the coming years.<sup>75</sup> Thanks to technological advancements and falling costs, warehouse robotics in particular are poised to further permeate the industry. Although the productivity gains stemming from the continued embrace of automation are likely to limit labor demand, this effect is expected to be outweighed by the substantial demand for warehousing and storage services coming from e-commerce growth—therefore supporting strong job growth in the industry overall.

As for occupations, the rapid job growth projected for the four industries above will contribute to fast or large employment gains between 2022 and 2032 for various occupations tied to the areas of e-commerce and logistics. These occupations are primarily concentrated in the transportation and material moving occupational group. Chief among them are light truck drivers, which are projected to be the second-fastest-growing occupation in the group. Stockers and order fillers and hand laborers and freight, stock, and material movers are two related occupations expected to see faster job growth than the average for all occupations. Along with heavy and tractor-trailer truck drivers—another occupation poised to benefit from e-commerce growth—these 4 occupations account for more than 70 percent of the new jobs expected to be added by the transportation and material moving group. They also rank among the 15 occupations projected to add the most jobs over the 2022–32 decade.

**Table 4. Employment in selected industries and occupations related to transportation and warehousing services, projected 2022–32**

NAICS or SOC code	Industry or occupation title	Employment, 2022	Employment, 2032	Numeric change, 2022–32	Percent change, 2022–32	Rank
N/A	<b>Total employment</b>	<b>164,482.6</b>	<b>169,148.1</b>	<b>4,665.5</b>	<b>2.8</b>	<b>N/A</b>
<b>48-49</b>	<b>Transportation and warehousing</b>	<b>6,651.1</b>	<b>7,221.0</b>	<b>569.9</b>	<b>8.6</b>	<b>4th of 20</b>
488500	Freight transportation arrangement	268.0	293.5	25.5	9.5	39th of 292
492100	Couriers and express delivery services	941.2	1,107.9	166.7	17.7	19th of 292
492200	Local messengers and local delivery	187.8	223.7	35.9	19.1	15th of 292
493000	Warehousing and storage	1,936.8	2,191.1	254.3	13.1	25th of 292
<b>43-0000</b>	<b>Office and administrative support occupations</b>	<b>19,891.4</b>	<b>18,663.8</b>	<b>-1,227.6</b>	<b>-6.2</b>	<b>22nd of 22</b>
43-5011	Cargo and freight agents	95.9	105.2	9.3	9.7	80th of 832
<b>53-0000</b>	<b>Transportation and material moving occupations</b>	<b>14,302.8</b>	<b>15,082.2</b>	<b>779.4</b>	<b>5.4</b>	<b>9th of 22</b>
53-3031	Driver/sales workers	541.0	582.9	41.9	7.7	118th of 832
53-3032	Heavy and tractor-trailer truck drivers	2,192.3	2,281.5	89.3	4.1	302nd of 832
53-3033	Light truck drivers	1,164.6	1,298.4	133.8	11.5	62nd of 832
53-7062	Laborers and freight, stock, and material movers, hand	2,988.5	3,147.3	158.8	5.3	209th of 832
53-7065	Stockers and order fillers	2,851.6	3,030.3	178.6	6.3	162nd of 832

Note: Industry or occupation code refers to the 2022 North American Industry Classification System (NAICS) or 2018 Standard Occupational Classification (SOC), respectively. Employment is listed in thousands of jobs. Employment for industries is wage and salary. Employment for occupations is total employment, which includes wage and salary employment in all industries and self-employment. Ranks refer to the rank of the employment percent change relative to all 20 sectors, 292 detailed industries, 22 occupational groups, or 832 detailed occupations. N/A = Not applicable. Source: U.S. Bureau of Labor Statistics.

### Consumer shift to online shopping to dent retail trade employment

The retail trade sector is projected to have the steepest and largest employment decline of any sector between 2022 and 2032. Most of the sector’s job losses, almost 55 percent, are concentrated in three industries: electronics and appliance retailers, general merchandise retailers, and grocery and specialty food retailers. These three industries rank among the five industries projected to lose the most jobs from 2022 to 2032.

As with the transportation and warehousing sector, e-commerce growth is one major factor expected to affect retail trade employment. Prior to the pandemic, consumers’ gradual shift towards online shopping and strong price competition from e-retailers was already pressuring margins and reducing business at brick-and-mortar stores, which led to a reduction of staffing levels.<sup>76</sup> With the onset of the pandemic, e-commerce penetration in retail surged, prompting businesses to readjust operations to keep pace. One common strategy used was to offer consumers "buy online, pickup in store" (BOPIS) options, which proved to be widely popular.<sup>77</sup> Although consumers returned to in-person shopping as the effects of the pandemic dissipated, demand for BOPIS remains strong. For instance, a 2022 study showed that among consumers who bought groceries online, the most popular option to collect their orders was through curbside pickup, another form of BOPIS, which was followed by the options of home delivery and in-store pickup.<sup>78</sup> The report also found that uptake of these three fulfillment methods rose significantly from 2021 to 2022.

Although retailers’ adoption of omnichannel strategies—whereby customers are offered the choice to purchase products offline or online, such as through BOPIS—is likely to support employment demand in some retail segments, fewer jobs in the retail trade sector overall are nevertheless expected. For example, more jobs supported by online purchases would be found in other sectors, such as in transportation and warehousing, as discussed in the previous section. In addition, retailers are embarking on new strategies to respond to changing consumer spending behavior. For instance, large merchandise retailers and grocery stores are experimenting with reducing size formats, opening smaller stores to enter new markets.<sup>79</sup> Smaller stores may translate into less staffing needs. Moreover, readjusting strategy means shutting down stores too. This may be the case in unprofitable locations, as a way to save money, or again because of growing online competition.<sup>80</sup> Other business practices may put downward pressure on employment as well, such as the continued adoption of self-checkout machines. Customers are becoming more accustomed to them while retailers continue to roll them out; this includes establishing stores with self-checkout options only.<sup>81</sup> One occupation that is directly affected by this practice is cashiers given that customers take on the task of scanning items, a task that was previously performed by the worker.

The sales and related occupational group, which is closely tied to the retail trade sector, is expected to see the second-largest employment decline between 2022 and 2032, with job losses primarily driven by three occupations—cashiers, retail salespersons, and first-line supervisors of retail sales workers. Cashiers were the fifth-largest occupation in the economy in 2022. Not only are these workers projected to lose the most jobs within the group, but also to lose more jobs than any other occupation; it is projected that about 348,100 positions will be lost. Moreover, these 3 occupations rank among the 15 occupations expected to lose the most jobs from 2022 to 2032.<sup>82</sup>

**Table 5. Employment in selected industries and occupations related to retail trade, projected 2022–32**

NAICS or SOC code	Industry or occupation title	Employment, 2022	Employment, 2032	Numeric change, 2022–32	Percent change, 2022–32	Rank
N/A	<b>Total employment</b>	<b>164,482.6</b>	<b>169,148.1</b>	<b>4,665.5</b>	<b>2.8</b>	<b>N/A</b>
<b>44-45</b>	<b>Retail trade</b>	<b>15,475.4</b>	<b>14,946.3</b>	<b>-529.1</b>	<b>-3.4</b>	<b>20th of 20</b>
4450A1	Grocery and specialty food retailers	3,015.2	2,932.0	-83.2	-2.8	221st of 292
449200	Electronics and appliance retailers	446.5	338.5	-108.0	-24.2	286th of 292
455000	General merchandise retailers	3,136.5	3,038.9	-97.6	-3.1	224th of 292
<b>41-0000</b>	<b>Sales and related occupations</b>	<b>14,476.4</b>	<b>14,102.0</b>	<b>-374.5</b>	<b>-2.6</b>	<b>20th of 22</b>
41-1011	First-line supervisors of retail sales workers	1,405.8	1,311.8	-94.0	-6.7	731st of 832
41-2011	Cashiers	3,345.8	2,997.7	-348.1	-10.4	768th of 832
41-2031	Retail salespersons	3,765.6	3,686.4	-79.1	-2.1	648th of 832

Note: Industry or occupation code refers to the 2022 North American Industry Classification System (NAICS) or 2018 Standard Occupational Classification (SOC), respectively. Employment is listed in thousands of jobs. Employment for industries is wage and salary. Employment for occupations is total employment, which includes wage and salary employment in all industries and self-employment. Ranks refer to the rank of the employment percent change relative to all 20 sectors, 292 detailed industries, 22 occupational groups, or 832 detailed occupations. N/A = Not applicable.  
Source: U.S. Bureau of Labor Statistics.

**Expanding renewable energy capacity to drive fast employment growth in related industries and occupations and declines in fossil fuel industries**

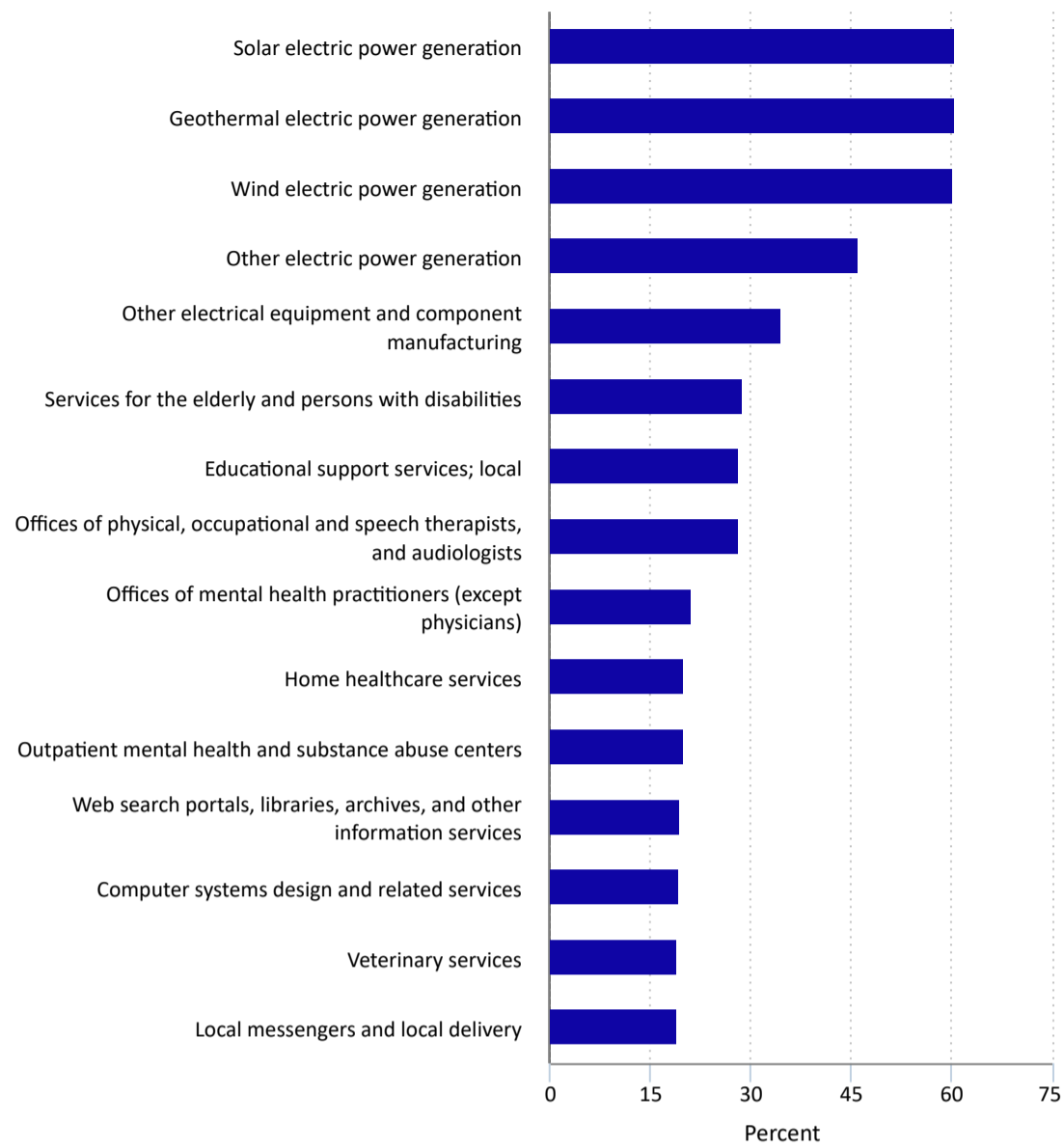
The clean energy transition is expected to be the main driver of fast growth for 4 of the top 15 fastest growing industries and 2 of the top 15 fastest growing occupations. Renewable energy generation has increased at a robust rate over the last decade and is expected to continue to expand considerably over the 2022–32 decade. The increasing penetration of renewables in the energy market has been driven by several key factors, which include lower production costs compared with fossil fuel electric power generation.<sup>83</sup> Government policies and technological advancements in renewable energy infrastructure and battery storage have also played an important role in the clean energy transition.<sup>84</sup>

Renewable energy represented nearly 22 percent of total U.S. utility-scale electricity generation in 2022, up from 12 percent 10 years prior.<sup>85</sup> In particular, wind energy, which generated the most electricity of any renewable energy source in 2022, and solar energy experienced rapid growth in net generation over the previous decade.<sup>86</sup> These renewable energy sources will continue to expand at a strong rate in the coming years.<sup>87</sup> Similarly, the generating capacity for emerging clean energy sources, such as geothermal energy and tidal power, is expected to increase relative to their 2022 capacity.<sup>88</sup>

The Inflation Reduction Act (IRA) of 2022 earmarked over \$360 billion in new federal spending and established tax credits to support the adoption and use of clean energy.<sup>89</sup> The IRA is expected to generate new momentum in the shift away from fossil fuel electric power generation toward renewable energy, namely wind and solar electric power generation. IRA tax credits and incentives are expected to fuel major investments in clean energy infrastructure and generation over the projections period.<sup>90</sup> Moreover, these investments paired with falling capital expenses are expected to further reduce the cost of renewable energy generation.<sup>91</sup>

Solar electric power generation, geothermal electric power generation, and wind electric power generation are projected to be the three fastest growing industries in the economy; all are projected to grow around 60 percent over the 2022–32 period. (See chart 6.) The other electric power generation industry, which includes tidal power, is expected to be the fourth-fastest-growing industry at 46.2 percent. The very fast growth rates projected for these industries are partially due to their small size; all had employment levels of less than 10,000 in 2022. Combined, they are expected to add only about 12,200 new jobs over the decade.

**Chart 6. Fifteen fastest growing industries, percent change, projected 2022–32**



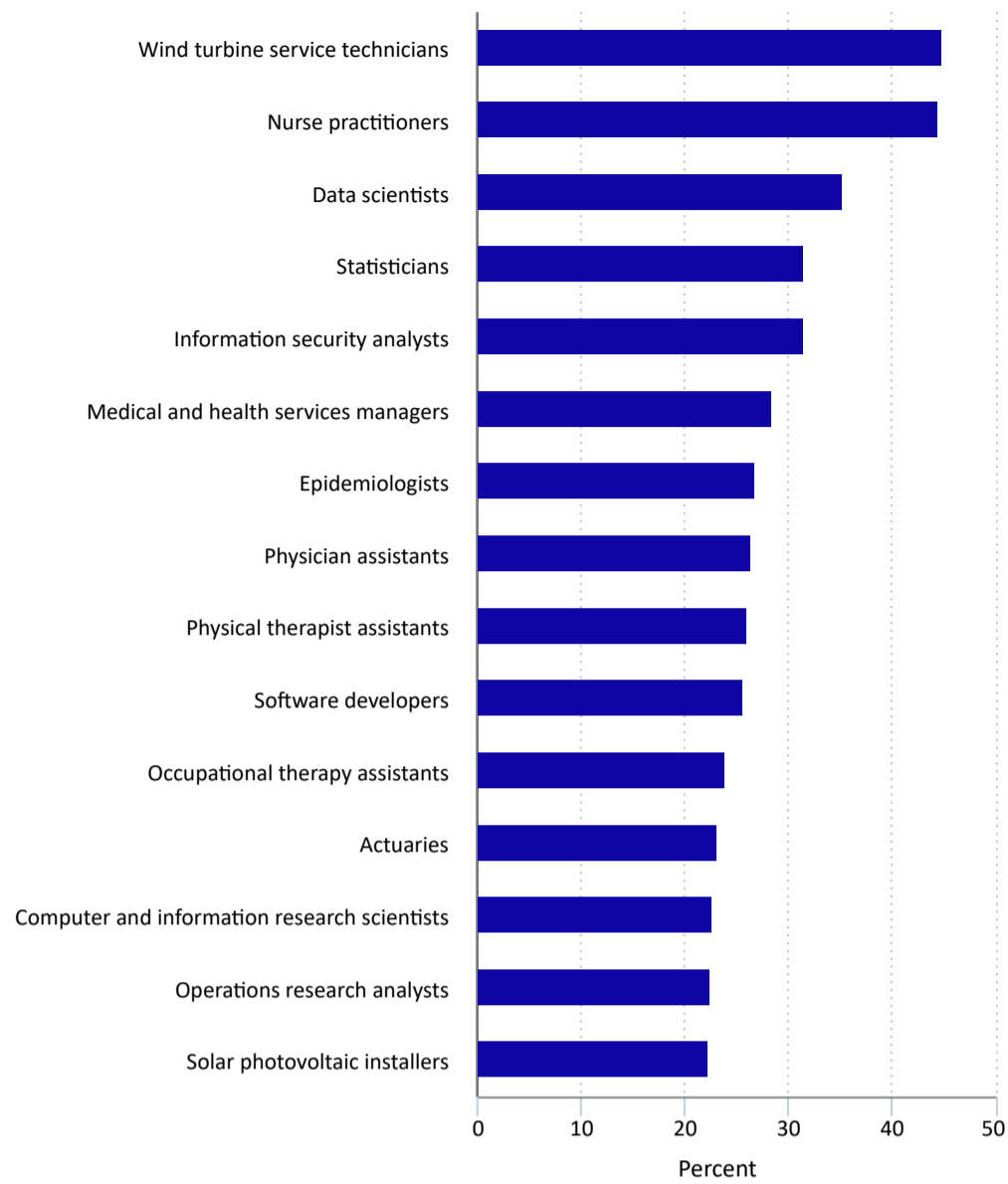
Hover over chart to view data.  
Source: U.S. Bureau of Labor Statistics.

[View Chart Data](#)



Demand for renewable energy will also translate to strong demand for the occupations tied to their operation, primarily wind turbine service technicians and solar photovoltaic installers. An expected increase in wind energy generation over the projections period should, in turn, create new job opportunities for wind turbine service technicians to inspect, adjust, or repair wind turbines. The employment of wind turbine service technicians is projected to grow the fastest of any occupation, at 44.9 percent. (See chart 7.) By the same token, increased solar energy deployment should, in turn, drive demand for solar photovoltaic installers to assemble and install solar photovoltaic systems. Employment of solar photovoltaic installers is projected to grow 22.3 percent over the projections period. However, because these are small occupations, the fast projected growth will result in a limited number of jobs added over the projections decade (5,000 and 6,600, respectively).

**Chart 7. Fifteen fastest growing occupations, percent change, projected 2022–32**



Hover over chart to view data.  
Source: U.S. Bureau of Labor Statistics.

[View Chart Data](#)



The corollary to lower costs for renewable energy and increased renewable energy generation is displacement of fossil fuel electric power generation. Electric power generation from coal-fired power plants declined notably over the last decade, and incentives supporting clean energy are expected to further reduce coal-fired power generation over the 2022–32 decade.<sup>92</sup> The Energy Information Administration projects electricity generation from coal to decline approximately 50 percent by 2032 because of the acceleration in the retirement of coal-fired power plants.<sup>93</sup> The increasing competitiveness of renewable energy is expected to also reduce the share of natural gas electric power generation over the projections period, which was the largest source of electricity generation in 2022.<sup>94</sup>

Consequently, employment in fossil fuel electric power generation is projected to decline by 35.4 percent from 2022 to 2032; this is the third-steepest decline of all industries. Job losses in the fossil fuel electric power generation industry will largely drive the overall decline in the utilities sector, despite strong growth in renewable energy generation. Meanwhile, the reduced use of coal-fired power will put downward pressure on the demand for coal. This will lead to continued declines in coal mining, which is projected to have the sharpest decline in employment of all industries (–43.3 percent). The projected decline in the coal mining industry contributes to job losses in the broader mining, quarrying, and oil and gas extraction sector.

**Table 6. Employment in selected industries and occupations related to mining and utilities, projected 2022–32**

NAICS or SOC code	Industry or occupation title	Employment, 2022	Employment, 2032	Numeric change, 2022–32	Percent change, 2022–32	Rank
N/A	<b>Total employment</b>	<b>164,482.6</b>	<b>169,148.1</b>	<b>4,665.5</b>	<b>2.8</b>	<b>N/A</b>
<b>21</b>	<b>Mining, quarrying, and oil and gas extraction</b>	<b>559.9</b>	<b>545.4</b>	<b>-14.5</b>	<b>-2.6</b>	<b>18th of 20</b>
212100	Coal mining	40.4	22.9	-17.5	-43.3	292nd of 292
<b>22</b>	<b>Utilities</b>	<b>553.6</b>	<b>539.2</b>	<b>-14.4</b>	<b>-2.6</b>	<b>19th of 20</b>
221112	Fossil fuel electric power generation	74.3	48.0	-26.3	-35.4	290th of 292
221114	Solar electric power generation	8.4	13.5	5.1	60.7	1st of 292
221115	Wind electric power generation	8.0	12.9	4.8	60.4	3rd of 292
221116	Geothermal electric power generation	1.2	1.9	0.7	60.5	2nd of 292
221118	Other electric power generation	3.4	4.9	1.6	46.2	4th of 292
<b>47-0000</b>	<b>Construction and extraction occupations</b>	<b>7,335.5</b>	<b>7,520.6</b>	<b>185.1</b>	<b>2.5</b>	<b>14th of 22</b>
47-2231	Solar photovoltaic installers	29.4	35.9	6.6	22.3	15th of 832
<b>49-0000</b>	<b>Installation, maintenance, and repair occupations</b>	<b>6,315.3</b>	<b>6,543.7</b>	<b>228.4</b>	<b>3.6</b>	<b>13th of 22</b>
49-9081	Wind turbine service technicians	11.2	16.2	5.0	44.9	1st of 832

Note: Industry or occupation code refers to the 2022 North American Industry Classification System (NAICS) or 2018 Standard Occupational Classification (SOC), respectively. Employment is listed in thousands of jobs. Employment for industries is wage and salary. Employment for occupations is total employment, which includes wage and salary employment in all industries and self-employment. Ranks refer to the rank of the employment percent change relative to all 20 sectors, 292 detailed industries, 22 occupational groups, or 832 detailed occupations. N/A = Not applicable.  
Source: U.S. Bureau of Labor Statistics.

### Manufacturing employment projected to fall, but some industries will still experience fast employment growth over 2022–32

Employment in the manufacturing sector is projected to decline slightly (–0.9 percent) over the 2022–32 decade as manufacturers continue to automate processes to improve production efficiency and throughput.<sup>95</sup> The manufacturing sector is projected to lose 113,400 jobs over the decade, the second-largest decline after that in retail trade. In turn, employment of production occupations, which are predominantly employed by the manufacturing sector, is also expected to decline over the period. Employment of the production occupational group is projected to decline 3.2 percent from 2022 to 2032. Furthermore, production occupations account for 13 of the 30 occupations expected to experience the fastest employment declines over the projections period.<sup>96</sup>

Despite the overall decline in manufacturing employment, some manufacturing industries are expected to experience faster-than-average employment growth over the projections period. These industries are expected to benefit from strong demand for their products, government industrial policies that incentivize the domestic production of certain goods, and the reshoring of some manufacturing to the United States. Among these industries are battery and semiconductor manufacturing. The expected expansion of U.S. production of these goods is projected to generate new jobs in manufacturing over the projections period.

The other electrical equipment and component manufacturing industry, which includes battery manufacturing, is projected to have the fastest employment growth of any manufacturing industry and is projected to be the fifth-fastest-growing industry overall. Stronger demand for electric vehicle (EV) batteries and energy battery storage systems is expected to result in a notable expansion in U.S. battery manufacturing capacity and, subsequently, fast employment growth in battery production.

EV adoption is expected to accelerate over the coming decade, and as a result, EVs are expected to account for a sizeable share of the new vehicle market by 2032.<sup>97</sup> The IRA extended the existing federal tax credit for consumers purchasing a new clean energy vehicle, which should continue to support consumer demand for EVs.<sup>98</sup> Moreover, the vehicle must meet certain battery sourcing criteria for models to be eligible for the maximum tax credit. By the 2032 projections target year, 100 percent of the value of battery components must be manufactured or assembled in North America to qualify for the tax credit, which should incentivize automakers to source some of their EV batteries from the United States.<sup>99</sup> In addition, the legislation included domestic production incentives, such as tax credits for manufacturers of EV batteries and renewable energy battery systems.<sup>100</sup> These factors are expected to drive more investment in U.S. EV battery production in the coming decade.<sup>101</sup>

At the same time, demand for battery storage systems is expected to rise markedly as renewable energy capacity continues to expand. Intermittent generation from wind and solar infrastructure will require battery storage to help smooth transmission across peak demand hours and ensure stable energy supply.<sup>102</sup> In many cases, wind and utility-scale solar projects are now being built with large battery systems.<sup>103</sup> A record 4.8 gigawatts of battery storage was added in 2022, and battery storage capacity is set to expand significantly over the next decade.<sup>104</sup> This trend should additionally support battery production and employment in the other electrical equipment and component manufacturing industry.

Semiconductor manufacturing is another manufacturing industry expected to benefit from strong demand fundamentals, government policies, and the reshoring of some manufacturing. Demand for semiconductors is expected to grow notably over the projections period. Semiconductors are fundamental to electronics and thus prevalent in smartphones, personal computers, and other electronic devices. They are also increasingly used in other products with electronic capabilities, such as vehicles, aircraft, military equipment, industrial machinery, and medical devices.<sup>105</sup> For instance, the development of semiautonomous vehicles and the inclusion of advanced safety systems in most new cars and trucks are expected to increase the number of semiconductors needed in automobiles over the projections period.<sup>106</sup> In addition, development of fifth generation mobile network (5G) and IoT devices will fuel demand for semiconductors that will enable the storage and transmission of data on these devices.<sup>107</sup> Meanwhile, AI and other emerging technologies will require cutting-edge and high-performance semiconductors to meet the complex computing and processing requirements of these technologies.<sup>108</sup>

The Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act, enacted on August 9, 2022, was designed to direct more federal investment into domestic semiconductor production.<sup>109</sup> The bill allocated \$39 billion in semiconductor manufacturing incentives and established a 25.0-percent investment tax credit for capital expenses for semiconductor manufacturing and related equipment to encourage new investments in semiconductor fabrication plants.<sup>110</sup>

The combination of strong demand for semiconductors and incentives provided through the CHIPS and Science Act has increased investment in domestic semiconductor manufacturing in recent years and is expected to fuel additional investments over the projections period.<sup>111</sup> Construction spending in manufacturing reached over \$108 billion

in 2022, which marked a record high and surpassed new construction spending related to healthcare, education, and office buildings.<sup>112</sup> Notably, semiconductor and EV battery manufacturing plants are estimated to have represented nearly half of all manufacturing construction starts by square footage in 2022.<sup>113</sup>

As a result of these trends, employment in the semiconductor and other electronic component manufacturing industry is projected to grow at a faster-than-average rate of 8.0 percent over the projections period. Employment of semiconductor processing technicians, over 90 percent of which were employed in this industry in 2022, is also projected to grow 8.0 percent from 2022–32, the second-fastest growth rate of all production occupations.

**Table 7. Employment in selected industries and occupations related to manufacturing, projected 2022–32**

NAICS or SOC code	Industry or occupation title	Employment, 2022	Employment, 2032	Numeric change, 2022–32	Percent change, 2022–32	Rank
N/A	<b>Total employment</b>	<b>164,482.6</b>	<b>169,148.1</b>	<b>4,665.5</b>	<b>2.8</b>	<b>N/A</b>
31-33	<b>Manufacturing</b>	<b>12,825.7</b>	<b>12,712.3</b>	<b>-113.4</b>	<b>-0.9</b>	<b>16th of 20</b>
334400	Semiconductor and other electronic component manufacturing	386.3	417.1	30.8	8.0	48th of 292
335900	Other electrical equipment and component manufacturing	152.2	204.9	52.7	34.6	5th of 292
51-0000	<b>Production occupations</b>	<b>9,134.5</b>	<b>8,845.8</b>	<b>-288.7</b>	<b>-3.2</b>	<b>21st of 22</b>
51-9141	Semiconductor processing technicians	24.6	26.6	2.0	8.0	112th of 832

Note: Industry or occupation code refers to the 2022 North American Industry Classification System (NAICS) or 2018 Standard Occupational Classification (SOC), respectively. Employment is listed in thousands of jobs. Employment for industries is wage and salary. Employment for occupations is total employment, which includes wage and salary employment in all industries and self-employment. Ranks refer to the rank of the employment percent change relative to all 20 sectors, 292 detailed industries, 22 occupational groups, or 832 detailed occupations. N/A = Not applicable.  
Source: U.S. Bureau of Labor Statistics.

## Summary

Most of the projected employment gains over the 2022–32 decade will occur in the healthcare and social assistance; professional, scientific, and technical services; and the transportation and warehousing sectors. An aging population and the growing prevalence of chronic conditions will drive rapid employment growth among occupations that provide healthcare or services related to healthcare.

Additionally, mathematical science and computer occupations are projected to be among the fastest growing occupations because of the growing demand for information technology (IT) products and digital services, which is also expected to bolster job growth in some information industries. Moreover, the industries expected to experience the fastest employment growth from 2022 to 2032 are those tied to renewable energy generation; this is in part because of recently passed legislation that aims to further support the clean energy transition.

Although the continued growth of e-commerce is set to fuel solid job growth among industries and occupations tied to the field of logistics, the growing popularity of online shopping is expected to contribute to lower employment across retail trade industries. Meanwhile, many industries and occupations tied to manufacturing are projected to experience job losses because of the continued adoption of automation technologies, but the expected increase in battery and semiconductor production are poised to generate new manufacturing jobs between 2022 and 2032.

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## Notes

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<sup>2</sup> For a more detailed discussion of the U.S. Bureau of Labor Statistics (BLS) Employment Projections methodology, see "Employment projections: overview," *Handbook of Methods* (U.S. Bureau of Labor Statistics, last modified September 6, 2023), <https://www.bls.gov/opub/hom/emp/>.

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<sup>4</sup> Discussion of industries in this article refers to three-, four-, five-, or six-digit level NAICS industries. For a list of all NAICS industries that BLS projects employment for, see "Table 1.9 2022–32 Industry-occupation matrix data, by industry," *Employment Projections* (U.S. Bureau of Labor Statistics, last modified September 6, 2023), <https://www.bls.gov/emp/tables/industry-occupation-matrix-industry.htm>.

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## Book Review

October 2023

### Raising awareness of new economic measures

*Alternative Economic Indicators*. Edited by C. James Hueng. Kalamazoo, MI: W. E. Upjohn Institute for Employment Research, 2020, 123 pp., [https://research.upjohn.org/up\\_press/263/](https://research.upjohn.org/up_press/263/).

This book, edited by C. James Hueng of Western Michigan University, is a collection of six lectures aiming to raise awareness of new economic indicators and the cutting-edge methods involved in their construction. The book also examines how the new indicators compare with and complement existing, traditional economic indicators.

The book has seven chapters, each penned by a different author or set of authors. The first chapter, by Hueng, previews and summarizes the next six chapters. The book has no concluding chapter, so Hueng's summary is helpful in introducing material the reader has not yet seen. However, the lack of a proper conclusion is noticeable throughout the book, with more than one chapter presenting new information or charts (rather than a summary of the chapter's thesis) in a subsection titled "Conclusion." While this variation in styles can be seen as a drawback, it is to be expected from a diverse collection of lectures.

The second chapter, by William A. Barnett and Kun He, is the first to delve deeper into the substance of the book. The chapter, which expands on previous research by Barnett, assumes that the reader is knowledgeable about most terms in the money and banking literature, such as inside versus outside money, liabilities versus assets, shadow banking, and the concept of a Divisia index. The authors propose an alternative measure of the money supply—a Divisia monetary aggregate that includes credit card expenditure data. This measure breaks traditional accounting structure (credit card balances are traditionally listed as liabilities rather than assets) and sets itself in opposition to regular measures of the money supply (for example, M1). Although Barnett and He draw few firm conclusions, their preliminary tests and results do not uncover any obvious issues with the inside-money and total-money Divisia measures augmented with credit card data.

Chapter 3, by Scott A. Brave, focuses on how the Federal Reserve Bank of Chicago produces the Chicago Fed National Activity Index (CFNAI) and the National Financial Conditions Index (NFCI). Both indexes are based on a mix of principal component analysis and dynamic-factor models, whose estimation is now possible because of recent advances in computational efficiency. The CFNAI, which is similar to gross domestic product (GDP), is a monthly measure of the strength of the real economy and has a strong record of predicting recessions with a zero-month lag, approximately 6 to 18 months ahead of official measures. The NFCI is a weekly measure of the health of the U.S. financial sector. It functions as a leading indicator of the stress of the financial sector, and its component indicators can be subdivided into three categories: risk, credit, and leverage (separate indexes for these categories can also be constructed). The chapter lays out why and how these indexes were constructed, and its conclusion clearly recaps relevant information and offers index extensions and ideas for future improvements.

Chapter 4, by Domenico Giannone, Eric Qian, Argia Sbordone, Mihir Trivedi, and Patrick Adams, focuses on the problem of timeliness of official GDP estimates, examining how the Nowcast measure of the Federal Reserve Bank of New York can ameliorate the issue. The Nowcast is based on a dynamic-factor model and aims to provide a real-time estimate of GDP. The authors present two case studies showing that the Nowcast is particularly useful and performs well when economic conditions are shifting rapidly, as in the 2007–09 Great Recession, and when official estimates are unavailable, as in the 2018–19 U.S. federal government shutdown. Although not as accurate as official measures published months later, the Nowcast could still signal the direction of GDP in near realtime in the Great Recession. During the federal government shutdown, the Nowcast had larger errors (because of several missing model inputs), but its accuracy was not substantially hampered. Overall, Giannone et al.'s chapter provides many avenues for evaluating and extending the Nowcast.

Chapter 5, written by Alessandro Barbarino and Chiara Scotti, varies in quality. The chapter seeks to answer the following question: "What is the probability of a recession?" Superbly breaking down the intricacies of the question, Barbarino and Scotti explain that its answer, and the answer's calculation, depends on one's time horizons. Predicting a recession 3 months in advance is different from predicting a recession 18 months in advance. The authors present a short but strong literature review of previous predictive attempts, and they also construct their own models of recession probability. Their default model uses the Aruoba-Diebold-Scotti (ADS) business conditions index, and they perform a variable selection process to determine if other variables, alongside the ADS index, can help predict recessions at various forecast horizons. Although Barbarino and Scotti present plenty of excellent information, they do not provide an answer, or even a range of answers, in the text itself. They do include several charts showing probabilities, but they miss the opportunity to offer even a single best-guess estimate.

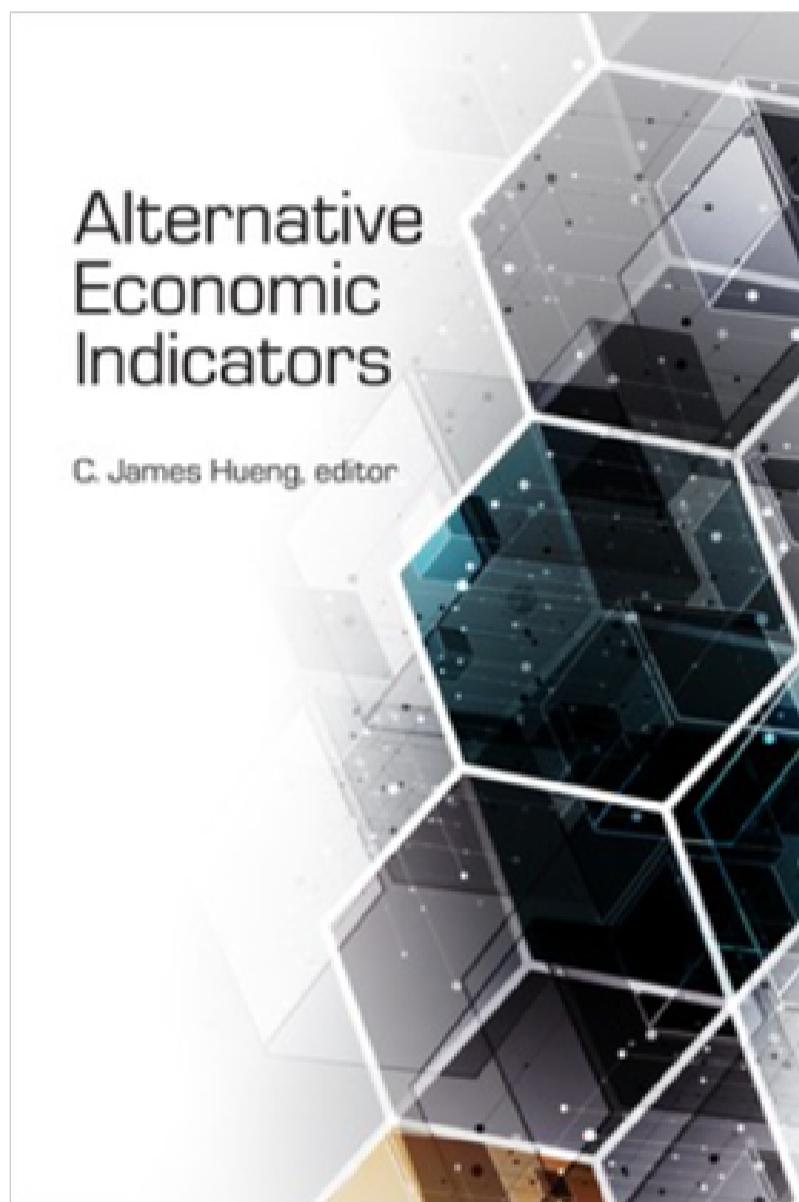
In chapter 6, Steven J. Davis introduces the economic policy uncertainty (EPU) index. This index, which Davis developed with Scott Baker and Nick Bloom, is constructed from a count of newspaper articles that contain at least three terms the researchers deem indicative of economic policy uncertainty. Because different countries can signal uncertainty at different times, Davis constructs EPU indexes for 20 countries besides the United States, as well as a global EPU index. Although the U.S. EPU index increases with elections, military engagements, and fiscal brinkmanship, the EPU indexes of countries in the Eurozone more strongly respond to local issues and crises. Increases in the global EPU index align well with large international events. Later in the chapter, Davis also introduces the trade policy uncertainty (TPU) index. This index, which is similar to the EPU index but focuses on trade uncertainty, rises during trade negotiations, trade disputes, and trade wars. An increase in the TPU index also signals a more volatile stock market. Overall, Davis's chapter does a good job of presenting the EPU and TPU alternative economic indicators, some of their potential uses, and their relation to broader economic trends and events.

Of all the chapters, chapter 7 offers the most tantalizing look at the future of economic indicators. Written by Adam Storeygard, this chapter presents a compelling case for the use of satellite data as a complement to current methods. Storeygard suggests that such use is advantageous because satellites can fill in missing data, gather spatial data in hard-to-reach locations, cheaply repeat measurements, provide data across the entire globe, ignore discontinuities at state lines or country borders, and verify other measurements that are more prone to false or biased reporting. The chapter presents concrete examples of each potential use of satellite data, and the author also addresses limitations and possible extensions of the method.

One solid throughline of the book is that the new alternative economic indicators complement rather than compete with the more traditional metrics. The Divisia index combines with M1, M2, and M3 measures to deepen our understanding of the money supply. The CFNAI provides a disaggregated view of why GDP rose or fell at any given

time, and the ADS index can show underlying weakness (or strength) in business conditions in times of strong (or weak) economic growth. The Nowcast fills in for GDP between official data releases, and satellite data can close information gaps when GDP data are impossible to collect. The NFCI provides a digestible alternative to the myriad yield curves common in finance circles, and the EPU and TPU indexes capture policy environment sentiments that would otherwise be available only through interviews of experts across disciplines. Another consistent thread across the indicators is that they all would have been impossible to construct before the 21st century, which saw dramatic advances in computation technology.

For those looking to be on the cutting edge of econometric measures, this book is an excellent primer. To get the most out of it, readers must have knowledge of economics and mathematics at the undergraduate level, but the book's conclusions and overall presentation remain accessible. Finally, the book is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International license, which allows anyone to legally obtain the book at no cost. Professors also can freely distribute the book to their students. Given its high quality and low barrier to entry, *Alternative Economic Indicators* may become a touchstone for future economists, if or when the new economic indicators reach the mainstream.



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## Beyond BLS

Beyond BLS briefly summarizes articles, reports, working papers, and other works published outside BLS on broad topics of interest to MLR readers.

October 2023

### The effect of location on wages

Summary written by: [Lisa N. Huynh](#)

Income levels in the United States vary greatly by location. Larger cities generally offer higher wages and returns to education, but even cities of comparable size have substantial income disparities. In the working paper, “[Location, location, location](#)” (National Bureau of Economic Research, Working Paper 31587, August 2023), authors David Card, Jesse Rothstein, and Moises Yi analyze how location-based factors affect wages. They find that mean wages vary across different commuting zones (CZs) because of differences in worker ability and place effects. Place effects refer to how outcomes of individuals may be influenced by the neighborhood they live in. Also, the authors observe that college-educated workers receive larger returns for living in higher-wage or larger cities.

The authors use the Longitudinal Employer–Household Dynamics program of the U.S. Census Bureau to calculate the average pay differences of workers who work in different CZs. To identify the factors that affect average pay differences, the authors use a fixed effects model, which controls for variables that are constant and do not change (such as age) across all individuals. They use the model to look at quarterly log earnings with person and establishment fixed effects, which include person and place effects. The authors then average the estimated effects across establishments by location to calculate CZ wage premiums, which represent losses or gains in workers’ pay associated with moving from an average establishment in one CZ to another.

In their analysis, the authors also identify the “effects of skill-based sorting on observed earnings differences across CZs.” They note that the variation in mean earnings across CZs is only half explained by place effects; the other half is explained by worker sorting. Worker sorting refers to how individuals with higher earning potential usually reside in CZs with higher wages, increasing inequality in average earnings across these different CZs. The authors discover that workers in larger CZs have more dispersion of skills. The college wage gap is also larger in higher-wage places. The earnings of individuals with a college degree compared with earnings of individuals without a college degree are greater.

The authors conclude that theories related to industry composition or location-specific factors suggest that when individuals relocate to larger or higher wage areas, they become more productive and subsequently earn higher wages. However, with local housing costs, places with a higher cost of living offset any local pay premiums that workers receive for working in larger CZs. Factors that affect pay premiums, such as productivity, could affect policy, whereas other local factors, such as climate conditions, could still signify the importance of increasing housing in highly productive locations.