

RECOVERY

JOB GROWTH AND EDUCATION REQUIREMENTS
THROUGH 2020



GEORGETOWN UNIVERSITY



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Center on Education and the Workforce

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RECOVERY:

Projections of Jobs and Education Requirements Through 2020

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he Great Recession of 2007 has clearly been the worst financial downturn in the U.S. economy since the Great Depression of the 1930s. Five years later, unemployment rates have only recently dropped below 8 percent, and the slow recovery has disproportionately affected minorities and young people. African Americans are twice as likely to be unemployed as their white counterparts and three times as likely to be unemployed if they are young. All Americans younger than age 24 are almost twice as likely to be unemployed as the rest of the working-age population. Given the weak political support for big-government solutions, the \$787 billion fiscal stimulus package of 2009 will probably be the last of its kind for the foreseeable future (although Federal Reserve Chairman Ben Bernanke's September 2012 pledge to pump \$40 billion per month into the economy has buoyed the stock market). So far, the average growth rate of about 160,000 jobs per month has not been enough to absorb both the existing pool of unemployed and the flow of new entrants into the workforce. But we have recovered just under 6.1 million jobs of the 8.7 million lost in the recession - though the jobs lost look nothing like the jobs we've gained.

In short, the U.S. economy is slowly returning to normal—albeit a new normal—characterized by an increase in the natural rate of unemployment, permanent job losses in sectors employing the less-educated, and an ever-increasing demand for better education credentials and upskilling across an array of new fields. For experienced workers slogging through the recession and new workers alike, the key survival tools for this new normal will be accurate and timely information on where the jobs are and which industries will continue to experience high growth.

This report is the successor to *Help Wanted: Projections of Jobs and Education Demand through 2018*, in which we examined the connections between educational attainment and educational demand in the labor market. Here, we update the jobs projected to be available through 2020,

using a macro-micro modeling framework to forecast educational demand by detailed occupations. Our methodology is grounded in a macroeconomic analysis of the overall economy with state-by-state analyses.

JOBS WILL RETURN, BUT NOT EVERYONE WILL BE READY FOR THEM.

Indicators point to a steady though painfully slow recovery. The gross domestic product (GDP) growth rate is steady and positive, despite being lower than some key economic forecasts, and has remained above 2.9 percent since the first quarter of 2010. Driving this growth in goods and services is the underlying restoration of productivity in two key sectors: healthcare and manufacturing. Healthcare, which remained strong throughout the recession, is one of the fastest growing industries in

the U.S. economy and pays well, especially for those with certificates, certifications and associate's degrees or better. Manufacturing is the big surprise. For the past three decades, manufacturing shed jobs as worker productivity increased and jobs moved offshore. Today, however, we see jobs returning in this sector, particularly in durables and high-tech manufacturing.¹

Our detailed analysis of the Great Recession's impact reveals very interesting trends on the nature of layoffs and rehires. In *The College Advantage: Weathering the Economic Storm*, Carnevale et al. showed the less educated were hardest hit. Talk of a "mancession" obscured the stark reality that those who lost jobs in construction, housing, and manufacturing were not only defined by sex but also by education: the least educated were the ones laid off, and the rehired have relatively higher educational attainment than their predecessors. Moreover, better-educated new hires are commanding higher wages than their predecessors (Mulligan et al. 2012).

JOBS WILL RETURN MUCH MORE SLOWLY THAN WE WOULD LIKE.

Almost all of the 8.6 million jobs lost during the recession have been restored in the recovery. Monthly job creation as reported by the Bureau of Labor Statistics (BLS) averages just over 160,000. Though an immense boost compared to the catastrophic loss of 800,000 jobs in February 2009, this meager growth is barely able to cover new entrants into the workforce, much less absorb workers who lost their jobs in the recession. At this rate, we will not reach that milestone until 2017.

We present three scenarios to forecast total jobs by 2020 (Figure 1). By then the U.S. economy will have 164.6 million jobs.² Ours is a middle-of-the-road estimate compared to two other well respected sources: BLS, which predicts 163.5 million jobs, and Macroeconomic Advisers, which forecasts 168.1 million.³

For the past two decades, the BLS has also issued biannual reports containing education data. This connection

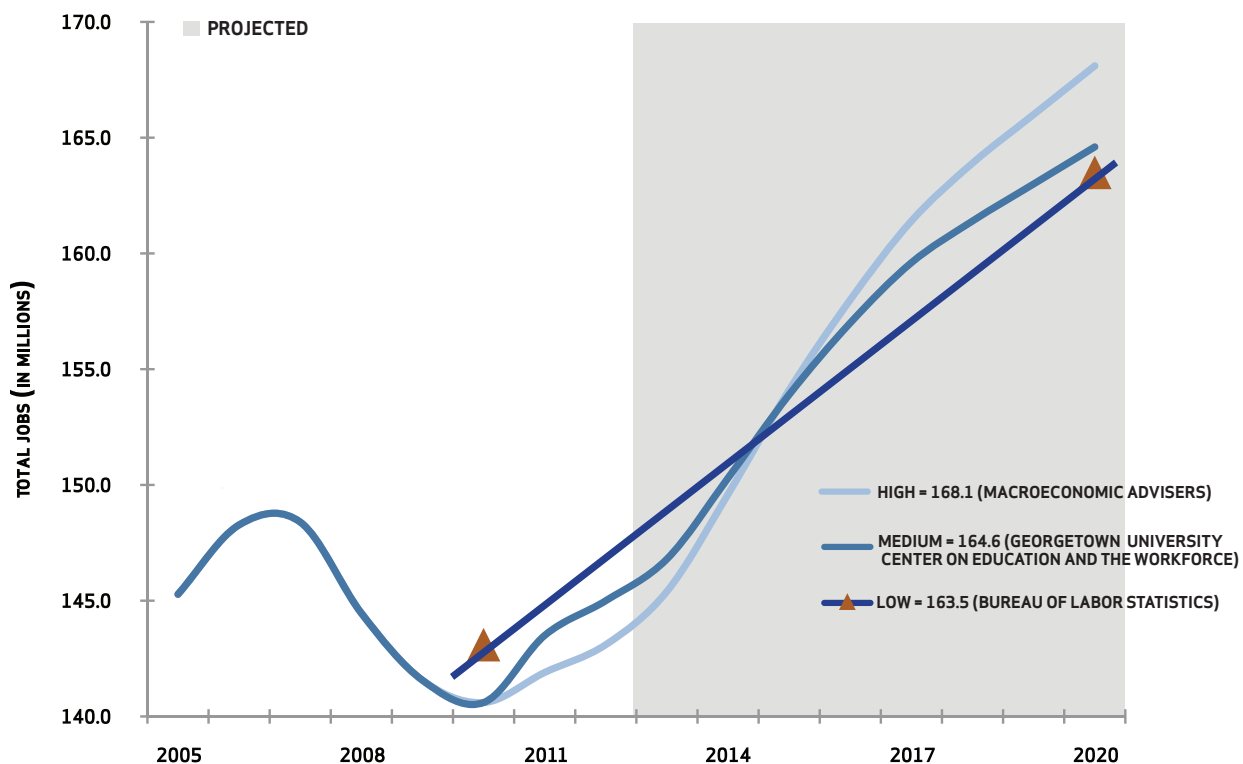
¹ See *projections by industry* for more detailed analysis.

² People working at more than one job make the job numbers appear slightly larger than the workforce.

³ The BLS is the primary source for labor data from the U.S. economy. Their publications and reports run the gamut from monthly unemployment figures to nonfarm payroll employment to labor force participation rates. Macroeconomic Advisers forecasts nonfarm payroll employment. To arrive at an estimate of total jobs, we add the self-employed to their original estimates.

Our projections are middle of the road. The BLS forecasts slightly lower jobs total in 2020 (163.5 million jobs) while Macroeconomic Advisers' estimate is slightly higher (168.1 million jobs).

FIGURE 1: Jobs 2005–2020—alternative projections



is natural: the education and training required for a job is an important indicator of economic prosperity. The BLS estimates the minimum education level required for each occupation.⁴ Experts in the field subjectively determine the education needed for each occupation and then aggregate the jobs data for each education level.

The BLS estimate of education needs in the U.S. economy falls far beneath actual expectations and certainly far beneath those of many developing countries. What's also surprising is that these numbers do not conform at

all to three other prominent government datasets: the U.S. Census, the American Community Survey (ACS), and the Current Population Survey (CPS).⁵ Table 1 demonstrates that, by BLS calculations, a mere 31 percent of all jobs could be classified as postsecondary, yet both the ACS and the CPS consistently report figures twice as high. Despite overwhelming evidence of increasing education requirements for jobs, the BLS estimates of education required for various occupations has remained stagnant (Figure 2).

⁴ Prior to the 2012 release, the BLS reported the most significant level of education and training required for a job. Help Wanted (Carnevale. et. al. 2010) provides a detailed critique of this methodology.

⁵ The ACS and the CPS data for 2010 show different proportions of adults in the amorphous "some college" category. This is most likely due to a coding error: some people with high school diplomas self-report their highest level of education in the some college category.

Both the CPS and the ACS show that 60 percent of prime-age workers workers have postsecondary education or training. The BLS projections numbers claim that only 31 percent of jobs in 2010 required postsecondary education and training.

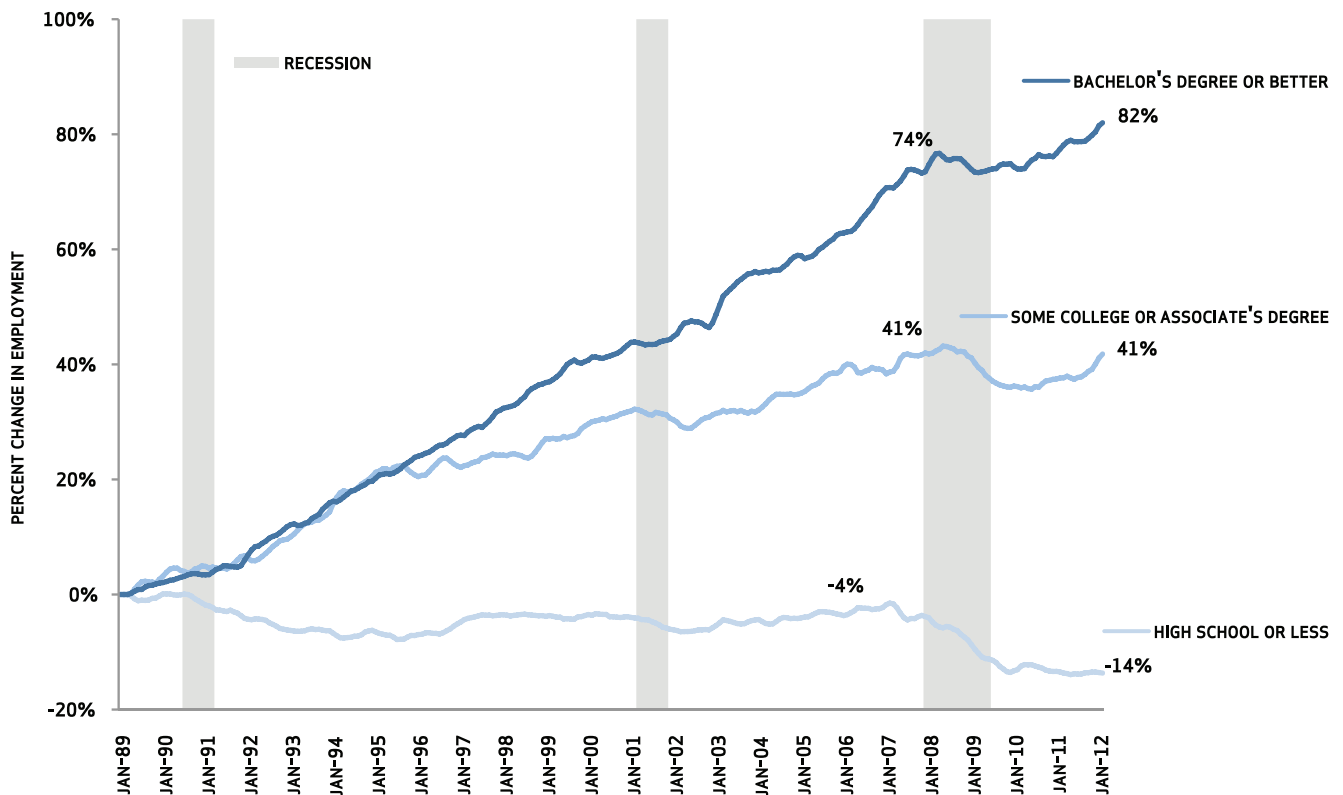
TABLE 1: Prime-age workers 2010—employment by educational attainment

Educational Attainment	Prime-age workers ^a		
	Current Population Survey 2010 (%)	American Community Survey 2010 (%)	Bureau of Labor Statistics 2010 (%)
Less than high school	10.9	12.6	25.9
High school diploma or equivalent	28.9	26.7	43.4
Some college/no degree and postsecondary vocational certificate	17.4	22.2	5.2
Associate's degree	10.4	8.6	5.6
Bachelor's degree	21.9	19.8	15.5
Master's degree	7.9	7.2	1.4
Professional degree	1.4	1.9	3.1
PhD	1.3	1.0	
Total	100	100	100
Postsecondary education and training required	60.2	60.7	30.8

^a Prime-age workers are 25 to 54 years old.

The highest job growth post-recession has been for holders with a bachelor's degree or better.

FIGURE 2: Jobs 1989–2012—by educational attainment



Note: Total employment of workers aged 18 and older is a CEW estimate from the CPS. Monthly employment numbers are seasonally adjusted using the U.S. Census Bureau X-12 procedure and smoothed using four-month moving averages. Areas shaded in gray indicate periods of recession as reported from the National Bureau of Economic Research.

BLS's government mandate prevents it from publishing commentary on the meaning of its numbers, but the implication here is clear: if only 31 percent of Americans need postsecondary education as the minimum education level required for their jobs, and 60 percent have postsecondary education, then 30 percent of our workforce is overqualified.

The problem with this approach is that jobs are not so rigidly defined in real life. For instance, many managerial jobs are staffed by workers with only a high school diploma, while others may have an associate's degree, a bachelor's degree, or even a master's degree or better. The presence in the labor market of managers with only a high school diploma does not mean that, when viewed as an occupational group, today's managers do not need postsecondary education. In fact, our analysis of the numbers shows older managers are least likely to have postsecondary education but counterbalance the deficit with experience. Human nature and personal decisions also play a role:

While some workers with doctoral degrees turn to bartending purely because of market forces (they can't find any other work), some people with doctoral degrees simply prefer to tend bar.

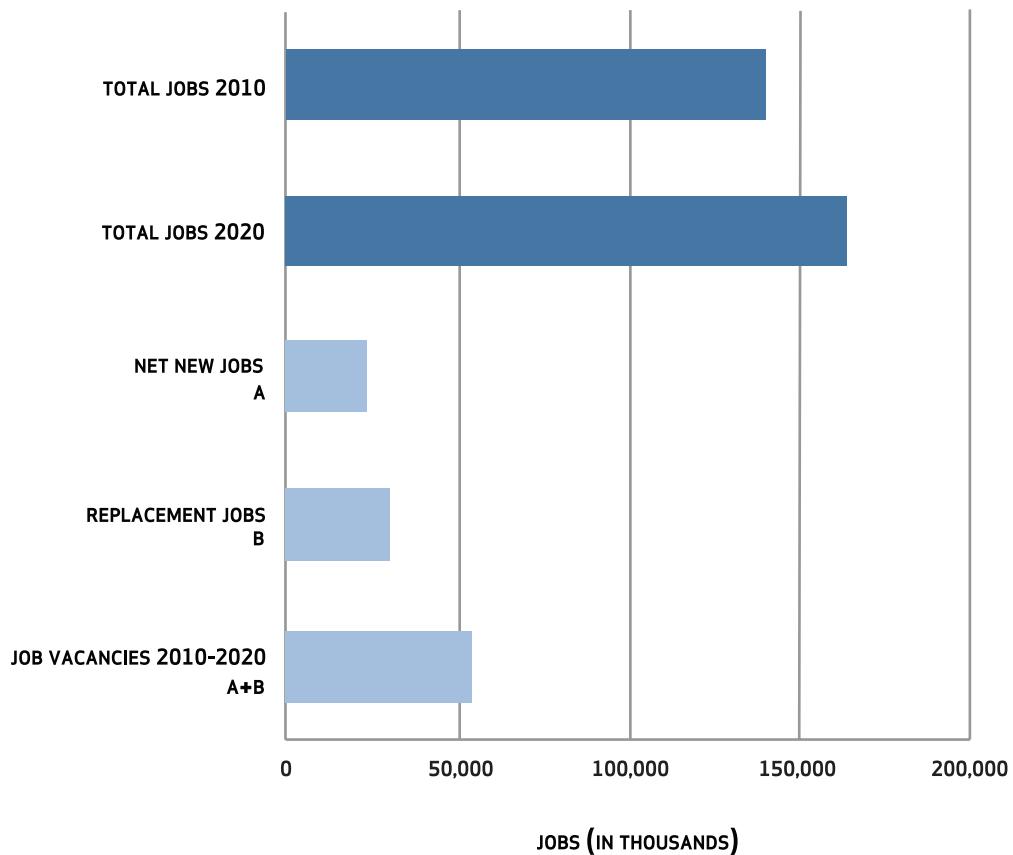
When faced with the limitations of pure numbers to describe and predict trends in the labor force, it's useful to turn to historical evidence of the value of education. Employers are still willing to pay more for the college degree—a symbol of a worker's attainment of the knowledge, skills, and abilities that improve productivity. This persistence of the college wage premium sends a clear message: Through booms and slumps, rising and falling unemployment, job creation and job loss, workers with postsecondary education earn 74 percent more than workers with a high school diploma or less. Among those with full-time, full-year jobs, the wage premium rises to 82 percent. If more than half of the workforce were really overqualified for their jobs, the college wage premium would dwindle and disappear.

PROJECTIONS, 2010–2020

Overall employment is expected to increase by almost 24 million over 10 years, from 140.6 million in 2010 to 164.6 million by 2020 (Figure 3). In addition, 30.8 million replacement jobs are expected to become available due to retirements and individuals leaving the labor force. Overall, the economy will create 54.8 million new and replacement jobs between 2010 and 2020.

Total jobs will increase from 140 million in 2010 to 165 million in 2020. There will be 55 million job vacancies between 2010 and 2020 due to net new jobs (24 million) and retirement (31 million).

FIGURE 3: Jobs 2010–2020—totals and vacancies



PROJECTIONS BY OCCUPATIONAL GROUP

Sales & office support occupations will represent the bulk—14 million—of all jobs created, a figure that includes 4.5 million new and 9.6 million replacement jobs (Table 2). Managerial & professional office occupations will generate the most new jobs—4.8 million—and by 2020 will account for 8.2 million jobs. Blue collar occupations are expected to grow to 30.7 million jobs, with 10.2 million job vacancies created between 2010 and 2020.

Food & personal services occupations will add over 9 million jobs; education occupations, another 3.4 million. Employment in healthcare professional & technical occupations will grow by more than 2 million, with another 820,000 replacement jobs added due to retirements and career changes. STEM occupations will create 2.6 million job vacancies over the decade. Community services & arts, healthcare support, and social sciences will together add more than 4 million more jobs.

Sales & office support and blue collar jobs remain the two largest occupational clusters. Healthcare and STEM grow fastest.

TABLE 2: Occupations 2010–2020—jobs and job vacancies (thousands)

Occupation	2010 Total jobs (‘000)	2020 Total jobs (‘000)	Net new jobs a	Replacement jobs b	Job vacancies 2010–2020 a+b
Sales & office support	37,660	42,130	4,470	9,550	14,020
Blue collar	28,400	30,750	2,350	7,880	10,230
Food & personal services	23,220	27,380	4,160	4,950	9,110
Managerial & professional office	19,980	24,740	4,760	3,480	8,240
Education	8,160	10,120	1,960	1,410	3,370
Healthcare professional & technical	6,480	8,490	2,010	820	2,830
STEM	6,050	7,600	1,550	1,090	2,640
Community services & arts	6,290	7,920	1,630	910	2,540
Healthcare support	3,660	4,610	950	590	1,540
Social science	700	830	130	140	270
Total jobs	140,600	164,590	23,990	30,780	54,770

PROJECTIONS BY INDUSTRY

Some industries will fare better than others because the United States has shifted from an agrarian to an industrial to a service-based economy with heavy demand for high technology (Table 3). The financial services industry will lead all industries in employment growth: It is forecast to create more than 10 million job vacancies by 2020, of which more than half will be new. Wholesale and retail trade will follow with more than 7 million job vacancies; Government & public education services, 6.7 million.

Healthcare services will add another 6.6 million job vacancies by the end of the decade; leisure and hospitality, more than 5 million. The rebounding manufacturing industry will add around 3.5 million job vacancies; Professional & business services, 4 million. The personal services industry will add slightly fewer than 3 million job vacancies. Construction is not expected to grow much by 2020, with about 2.8 million job vacancies. Private education services and information services are expected to grow the least: together, these industries will have fewer than 2.5 million job vacancies.

Wholesale and retail trade and government remain large employers though we expect government to grow much more slowly throughout the decade.

TABLE 3: Industry 2010–2020—jobs and job vacancies (thousands)

Industry	2010 Total jobs (‘000)	2020 Total jobs (‘000)	Net new jobs a	Replacement jobs b	Job vacancies 2010–2020 a+b
Financial activities	24,400	30,390	5,990	4,120	10,110
Wholesale and retail trade services	19,450	21,510	2,060	5,100	7,160
Government & public education services	18,120	20,180	2,060	4,660	6,720
Healthcare services	15,670	19,810	4,140	2,450	6,590
Leisure and hospitality services	12,930	15,320	2,390	2,710	5,100
Manufacturing	10,070	10,490	420	3,070	3,490
Professional & business services	9,690	12,130	2,440	1,600	4,040
Personal services	7,420	8,680	1,260	1,630	2,890
Construction	7,370	8,290	920	1,840	2,760
Transportation & utilities services	5,520	6,250	730	1,350	2,080
Natural resources	3,860	4,260	400	1,020	1,420
Private education services	3,450	4,400	950	510	1,460
Information services	2,650	2,890	240	720	960
Total jobs	140,600	164,590	23,990	30,780	54,770

PROJECTIONS BY OUTPUT

Output is the total value of goods and services produced by an industry. Manufacturing is the largest industry in the United States, with an output of \$5 trillion in 2010 (Table 4). It will remain the largest industry in 2020, with an expected output of \$7.6 trillion—the second-largest growth projected for any industry for the next 10 years. The second-largest sector, financial services, is expected to have the largest growth: Its current output of \$3.8 trillion is expected to nearly double to \$6.5 trillion by 2020.

Professional & business services will experience the fastest growth, with a 90 percent increase in output. As a result, it will advance from fourth largest in 2010 (an output of \$2.7 trillion) to third largest in 2020 (an output of more than \$5 trillion). The smallest industry—private education services—is expected to show the smallest growth between 2010 and 2020. The government & public education services industry is expected to grow the slowest and will drop from the third- to fourth-largest industry by 2020.

Manufacturing is a victim of its own success. It is a high output industry that now employs 13 percent of U.S. workers in 2010 down from 40 percent in the 1970s.

TABLE 4: Industry 2010–2020—output and rate of growth

Industry	2010		2020		Change 2010–2020		Rank	
	Output (US\$ billion)	Rank	Output (US\$ billion)	Rank	Change in total output (US\$ billion)	Rate of growth (% change in output)	Fastest rate of growth	Largest change in output
Manufacturing	5,040	1	7,590	1	2,550	51	10	2
Financial services	3,760	2	6,490	2	2,730	73	4	1
Government & public education services	3,250	3	4,590	4	1,340	41	13	6
Professional & business services	2,670	4	5,060	3	2,390	90	1	3
Wholesale and retail trade services	2,420	5	3,870	5	1,440	60	9	4
Healthcare services	1,760	6	3,150	6	1,380	78	3	5
Information services	1,280	7	2,400	7	1,130	88	2	7
Transportation & utilities services	1,250	8	2,010	8	760	61	7	8
Leisure and hospitality services	1,000	9	1,670	9	670	67	5	9
Construction	930	10	1,540	10	610	65	6	10
Natural resources	790	11	1,130	11	340	43	12	12
Personal services	590	12	950	12	360	60	8	11
Private education services	260	13	390	13	130	49	11	13

PROJECTIONS OF PRODUCTIVITY

Productivity indicates how effectively an industry is using its workforce to generate output. One simple measure of productivity is the average worker output, a figure derived by dividing an industry's total output by its total employment. By that measure, the most productive industry in 2010 was manufacturing, followed by information services and Professional & business services (Table 5). The least productive industries were private education services, leisure and hospitality services, and personal services. This is not a surprise as these industries tend to be labor intensive

and cannot effectively substitute capital for labor in any meaningful way. Between 2010 and 2020, information services will experience the largest growth in productivity (\$350,220 per employee) and become the most productive industry in the country. Manufacturing will experience the second-highest growth in productivity (\$222,450) but will still fall from first to second in productivity rankings. Private education services, leisure and hospitality services, and personal services will experience the lowest growth in productivity and are expected to remain the three least-productive industries in the country.

The least productive sectors are those that use labor intensively.

Healthcare and education will necessarily remain low productivity sectors by these simple standards.

TABLE 5: Industry 2010–2020—output per person employed

Industry	2010			2020		
	Total number employed ('000)	Output (US\$ billion)	Productivity (\$/employed)	Total number employed ('000)	Output (US\$ billion)	Productivity (\$/employed)
Information services	2,650	1,280	483,720	2,890	2,410	833,940
Manufacturing	10,070	5,040	500,830	10,490	7,590	723,330
Professional & business services	9,690	2,670	275,200	12,130	5,060	416,950
Transportation & utilities services	5,520	1,250	226,450	6,250	2,010	321,470
Natural resources	3,860	790	203,460	4,260	1,130	264,660
Financial services	24,400	3,760	154,140	30,390	6,490	213,560
Construction	7,370	930	126,560	8,290	1,540	185,700
Wholesale and retail trade services	19,450	2,420	124,520	21,510	3,870	179,750
Government & public education services	18,120	3,250	179,290	20,180	4,590	227,390
Healthcare services	15,670	1,760	112,510	19,810	3,150	158,780
Leisure and hospitality services	12,930	970	77,090	15,320	1,670	108,640
Personal services	7,420	590	79,700	8,680	950	109,110
Private education services	3,450	260	75,500	4,400	390	88,090
	Change 2010–2020					
	Change in number employed ('000)	Rate of growth in employment (% change)		Productivity (\$/employed)		
Information services	240	9		350,220		
Manufacturing	430	4		222,450		
Professional & business services	2,440	25		141,750		
Transportation & utilities services	730	13		95,020		
Natural resources	390	10		61,200		
Financial services	5,980	25		59,420		
Construction	930	13		59,140		
Wholesale and retail trade services	2,060	11		55,230		
Government & public education services	2,060	11		48,110		
Healthcare services	4,130	26		46,270		
Leisure and hospitality services	2,400	19		31,550		
Personal services	1,260	17		29,410		
Private education services	950	27		12,590		

FASTEST GROWING OCCUPATIONS

Professional and technical occupations in healthcare services will grow the fastest through 2020, with a 31 percent rise in employment (Table 6).

Healthcare support, community services & arts, and STEM occupations will be the next fastest to grow, with a 26 percent increase in employment in each category.

Healthcare, community services and arts, and STEM are the three fastest growing occupational clusters. Healthcare support, however, will have very low wage growth.

TABLE 6: Occupations 2010–2020—fastest growing

Occupation	2010		2020		Changes in employment 2010–2020		Rank	
	Total jobs ('000)	Rank	Total jobs ('000)	Rank	Increase in jobs ('000)	Rate of growth (% change)	Largest growth	Fastest growth
Healthcare professional & technical	6,480	6	8,490	6	2,010	31	5	1
Healthcare support	3,660	9	4,610	9	950	26	9	2
Community services & arts	6,290	7	7,920	7	1,630	26	7	3
STEM	6,050	8	7,600	8	1,550	26	8	4
Education	8,160	5	10,120	5	1,960	24	6	5
Managerial & professional office	19,980	4	24,740	4	4,760	24	1	6
Social science	700	10	830	10	130	19	10	7
Food & personal services	23,220	3	27,380	3	4,160	18	3	8
Sales & office support	37,660	1	42,130	1	4,470	12	2	9
Blue collar	28,400	2	30,750	2	2,350	8	4	10
Total jobs and rate of growth (% change)	140,600		164,590		23,990	17		

The largest occupations will experience the slowest growth, though through sheer size they will create large numbers of new jobs. Blue collar occupations, which form the second-largest occupational group, will grow the slowest, with only an 8 percent increase in employment. Sales & office support occupations, the largest occupational group, will be second slowest to grow at 12 percent. However, the size of these two occupational groups will still add a large number of jobs. Blue collar occupations

will add 2.4 million new jobs, the fourth-largest increase in employment among all occupational groups. Sales & office support occupations will add 4.5 million new jobs, the second-largest increase of any occupation group. Managerial and professional office occupations will experience the largest employment growth, with 4.8 million new jobs. This increase represents a 24 percent growth in employment for the fourth-largest occupational group.

FASTEST GROWING INDUSTRIES

Private education services will grow fastest of all industries, rising 28 percent between 2010 and 2020. Healthcare services will be second fastest to grow: Its 26 percent increase in employment represents more than 4 million new jobs (Table 7). Professional & business services will be the third-fastest growing industry, with 25 percent growth and 2.4 million new jobs. Financial services will also grow by

25 percent and add nearly 6 million new jobs, the largest increase in employment for any industry. Manufacturing is expected to grow the slowest, with just a 4 percent increase in employment and only 420,000 new jobs. Information services is expected to grow the least—only 9 percent—and is also expected to be one of the slowest, with only 240,000 new jobs added.

Education, healthcare, and professional & business services grow fastest with over 80 percent of its workers requiring postsecondary education and training.

TABLE 7: Industry 2010–2020—fastest growing

Industry	2010		2020		Difference 2010–2020		Rank	
	Total employment ('000)	Rank	Total employment ('000)	Rank	Change in employment ('000)	Rate of growth (% change in employment)	Largest growth	Fastest growth
Private education services	3,450	12	4,400	12	950	28	8	1
Healthcare services	15,670	4	19,810	4	4,140	26	2	2
Professional & business services	9,690	7	12,130	6	2,440	25	3	3
Financial services	24,400	1	30,390	1	5,990	25	1	4
Leisure and hospitality	12,930	5	15,320	5	2,390	18	4	5
Personal services	7,420	8	8,680	8	1,260	17	7	6
Transportation & utilities services	5,520	10	6,250	10	730	13	10	7
Construction	7,370	9	8,290	9	920	12	9	8
Government & public education	18,120	3	20,180	3	2,060	11	5	9
Wholesale and retail trade services	19,450	2	21,510	2	2,060	11	5	10
Natural resources	3,860	11	4,260	11	400	10	12	11
Information services	2,650	13	2,890	13	240	9	13	12
Manufacturing	10,070	6	10,490	7	420	4	11	13
Total jobs and rate of growth (% change)	140,600		164,590		23,990	17		

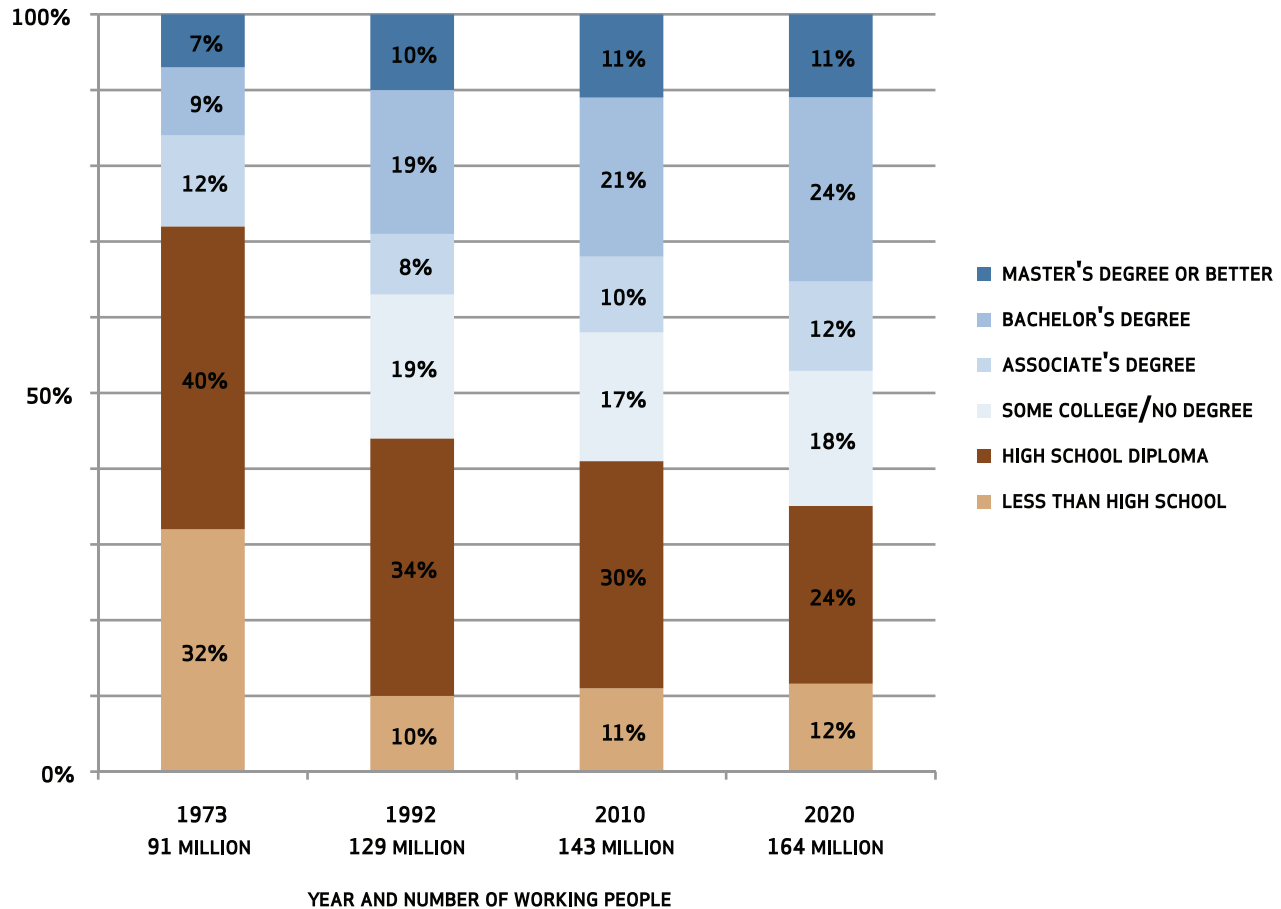
PROJECTIONS OF EDUCATIONAL DEMAND

Our methodology estimates the growth of educational demand within occupations based on data showing growth by industry and forecasts of macroeconomic expansion. Forecasts of educational demand within occupations are dynamic, and their microeconomic

focus reflects incremental changes in education requirements over time. The projection here is clear: by 2020, 65 percent of all jobs will require some form of postsecondary education or training (Figure 4). This number is 6 percentage points higher than in 2010 and 9 percentage points higher than in the 1990s.

By 2020, 65 percent of all jobs will require postsecondary education and training, up from 28 percent in 1973.

FIGURE 4: Postsecondary education and training



Note: Numbers may not sum to 100 percent due to rounding.

Over time, it is progressively difficult to increase the supply of workers with postsecondary education. Students from lower socioeconomic backgrounds, minority students, adult learners, and nontraditional students often face practical obstacles to getting an education and are harder to train using conventional teaching techniques. The result is an increasing labor shortage caused by the slowing pace of postsecondary attainment and the quickening pace of educational demand.

In base year 2010, 59 percent of all jobs in the U.S. economy required postsecondary education and training (Table 8). Bachelor's degree-holders accounted for roughly one-fifth of all workers with some form of postsecondary education, and more than half were employed in one of two categories: sales & office support; and managerial & professional office jobs, which had the highest volume of opportunities. Workers with associate's degrees were scattered more evenly across occupations, including blue collar, healthcare practitioner, managerial & professional office, and sales & office support.

Today, 24 percent of all jobs require a bachelor's degree. They are concentrated in managerial, office and education clusters.

TABLE 8: Occupations 2010—education distribution of jobs

Occupation	Educational attainment (thousands)					
	Less than high school	High school diploma	Some college/ no degree	Associate's degree	Bachelor's degree	Master's degree
Sales & office support	2,380	12,680	9,840	3,850	7,520	1,190
Blue collar	6,410	13,250	4,270	2,670	1,550	210
Food & personal services	4,900	9,000	4,820	1,780	2,320	330
Managerial & professional office	480	3,930	2,680	1,630	6,940	2,980
Education	70	730	600	420	3,040	2,680
Healthcare professional & technical	40	400	910	1,500	1,840	640
STEM	50	260	1,020	590	2,620	1,150
Community services & arts	120	670	890	500	2,650	1,290
Healthcare support	360	1,140	1,180	610	290	40
Social science	—	—	10	10	160	290
Total jobs	14,810	42,060	26,220	13,560	28,930	10,800
Percent of total jobs	17	24	18	12	24	8

Occupation	Educational attainment (thousands)			Postsecondary education only	
	Professional degree	PhD	Total	Total jobs ('000)	All jobs (%)
Sales & office support	150	50	37,660	22,600	60
Blue collar	30	10	28,400	8,740	31
Food & personal services	60	20	23,220	9,330	40
Managerial & professional office	1,060	280	19,980	15,570	78
Education	200	410	8,160	7,350	90
Healthcare professional & technical	890	260	6,480	6,040	93
STEM	80	290	6,050	5,750	95
Community services & arts	110	70	6,290	5,510	88
Healthcare support	30	10	3,660	2,160	59
Social science	40	190	700	700	100
Total jobs	2,650	1,590	140,600	83,750	
Percent of total jobs	2	1	100	59	

Note: Numbers differ slightly due to rounding.

Healthcare professional & technical and STEM occupations had the highest concentrations of jobs requiring postsecondary education and training credentials: 95 percent and 93 percent, respectively. Not surprisingly, these occupational groups compete directly with each other for

workers. In contrast, only 31 percent of blue collar jobs required postsecondary education and training, most often the vocational certificates, apprenticeship training, and certifications required to keep current in the field.

In base year 2010, bachelor's degrees were concentrated in finance, government, and healthcare industries, while wholesale and retail trade offered the greatest number of jobs for those with a high school diploma (Table 9).

Construction, manufacturing, and leisure and hospitality lost a substantial number of jobs in the recession. As these industries recovered somewhat, the education demanded of workers also increased.

Government, education and healthcare have the highest concentrations of demand for postsecondary education.

TABLE 9: Industry 2010—education distribution of jobs

Industry	Educational attainment (thousands)					
	Less than high school	High school diploma	Some college/ no degree	Associate's degree	Bachelor's degree	Master's degree
Financial activities	560	5,000	4,530	2,460	9,430	2,050
Wholesale and retail trade services	1,680	7,160	4,070	1,830	3,910	620
Government & public education	240	3,540	3,900	2,500	5,290	1,880
Healthcare and social assistance	560	2,670	2,160	2,220	4,180	2,790
Leisure and hospitality	2,120	4,370	2,580	1,230	2,200	370
Manufacturing	1,160	3,680	1,590	990	1,850	670
Professional & business services	800	1,910	1,450	880	2,970	1,080
Personal services	920	2,580	1,230	930	1,260	430
Construction	1,590	3,110	1,120	620	760	140
Transportation & utilities services	410	2,140	1,240	670	840	190
Natural resources	1,130	1,510	410	270	480	40
Private education services	120	590	470	490	920	610
Information	30	560	510	300	970	250
Total jobs	11,320	38,820	25,260	15,390	35,060	11,120
Percent of total jobs	8	28	18	11	25	8

Industry	Educational attainment (thousands)			Postsecondary education only	
	Professional degree	PhD	Total	Total jobs ('000)	All jobs (%)
Financial activities	260	110	24,400	18,840	77
Wholesale and retail trade services	70	110	19,450	10,610	55
Government & public education	370	390	18,110	14,330	79
Healthcare and social assistance	470	620	15,670	12,440	79
Leisure and hospitality	20	30	12,920	6,430	50
Manufacturing	40	100	10,080	5,240	52
Professional & business services	410	190	9,690	6,980	72
Personal services	20	50	7,420	3,920	53
Construction	20	10	7,370	2,670	36
Transportation & utilities services	20	10	5,520	2,970	54
Natural resources	10	10	3,860	1,220	32
Private education services	100	140	3,440	2,730	79
Information services	10	10	2,640	2,050	78
Total jobs	1,820	1,780	140,570	90,430	
Percent of total jobs	1	1		64	

Note: Numbers differ slightly due to rounding.

By 2020, fewer jobs will be available to people with less than high school or only a high school diploma. Jobs will increase for those with associate's degrees or better but flatten out overall at the highest educational attainment levels (Table 10).

Of all jobs in 2020, 24 percent will require a bachelor's degree. They are concentrated in managerial, office and education clusters.

TABLE 10: Occupations 2020—education distribution of jobs

Occupation	Educational attainment (thousands)					
	Less than high school	High school diploma	Some college/ no degree	Associate's degree	Bachelor's degree	Master's degree
Sales & office support	3,050	11,330	10,420	5,790	9,960	1,400
Blue collar	7,990	12,390	5,420	2,670	2,000	240
Food & personal services	6,590	8,900	5,370	2,810	3,220	410
Managerial & professional office	640	2,790	3,440	2,580	10,220	3,700
Education	100	530	790	660	4,200	3,300
Healthcare professional & technical	60	450	880	2,450	2,640	810
STEM	70	420	830	930	3,620	1,410
Community services & arts	160	590	950	790	3,670	1,590
Healthcare support	530	1,380	1,360	800	440	60
Social science	0	0	10	10	230	370
Total jobs	19,170	38,790	29,460	19,480	40,200	13,310
Percent of total jobs	12	24	18	12	24	8

Occupation	Educational attainment (thousands)			Postsecondary education only ('000)	
	Professional degree	PhD	Total	Total jobs	All jobs (%)
Sales & office support	150	40	42,130	27,760	66
Blue collar	30	10	30,750	10,370	34
Food & personal services	60	10	27,380	11,890	43
Managerial & professional office	1,140	240	24,740	21,320	86
Education	210	340	10,120	9,500	94
Healthcare professional & technical	980	220	8,490	7,990	94
STEM	80	240	7,600	7,120	94
Community services & arts	110	60	7,920	7,170	91
Healthcare support	30	10	4,610	2,700	58
Social science	50	160	830	830	100
Total jobs	2,840	1,340	164,590	106,630	
Percent of total jobs	2	1	100	65	

Note: Numbers differ slightly due to rounding.

Broken down by industry, 65 percent of all job openings will come from financial services, government, healthcare, leisure and hospitality, manufacturing, and wholesale and retail trade (Table 11). In addition to the job openings created when new businesses start up or existing ones

expand, replacement jobs will be created when a worker retires or moves into a different occupation. Our projection of 54.8 million job openings by 2020 breaks down to 23.8 million openings stemming from economic growth and 31 million openings stemming from replacement demand.

Government, education and healthcare services will also demand the highest concentration of postsecondary education of its workforce in 2020.

TABLE 11: Industry 2020—education distribution of jobs

Industry	Educational attainment (thousands)					
	Less than high school	High school diploma	Some college/ no degree	Associate's degree	Bachelor's degree	Master's degree
Financial activities	852	5,668	5,854	3,300	11,895	2,315
Wholesale and retail trade services	2,280	7,187	4,683	2,178	4,377	621
Government & public education	333	3,593	4,521	3,022	5,997	1,904
Healthcare services	878	3,099	2,859	3,046	5,413	3,232
Leisure and hospitality	3,024	4,607	3,119	1,536	2,595	393
Manufacturing	1,482	3,481	1,723	1,109	1,947	626
Professional & business services	1,219	2,144	1,868	1,171	3,717	1,213
Personal services	1,319	2,721	1,472	1,154	1,484	459
Construction	2,151	3,101	1,277	736	849	145
Transportation & utilities services	578	2,209	1,457	819	962	195
Natural resources	1,259	1,549	498	332	539	55
Private education services	192	690	637	677	1,201	717
Information services	45	559	581	350	1,080	253
Total jobs	15,612	40,607	30,550	19,429	42,057	12,128
Percent of total jobs	9	25	19	12	26	7

Industry	Educational attainment (thousands)			Postsecondary education only	
	Professional degree	PhD	Total	Total jobs ('000)	All jobs (%)
Financial activities	426	80	30,390	23,870	79
Wholesale and retail trade services	102	81	21,510	12,043	56
Government & public education	524	286	20,180	16,253	81
Healthcare services	778	505	19,810	15,833	80
Leisure and hospitality	24	24	15,320	7,690	50
Manufacturing	52	69	10,490	5,526	53
Professional & business services	649	150	12,130	8,767	72
Personal services	35	35	8,680	4,640	53
Construction	25	6	8,290	3,038	37
Transportation & utilities services	23	8	6,250	3,463	55
Natural resources	14	14	4,260	1,452	34
Private education services	173	113	4,400	3,517	80
Information services	15	7	2,890	2,287	79
Total jobs	2,838	1,378	164,600	108,381	
Percent of total jobs	2	1		66	

Note: Numbers differ slightly due to rounding.

Figure 5 shows a further breakdown of job openings by occupational group and educational attainment:

- 6.6 million (12%) will require less than high school;
- 13.2 million (24%) will require only a high school diploma;
- 9.8 million (18%) will require some college/no degree;
- 6.6 million (12%) will require an associate’s degree;
- 13.2 million (24%) will require a bachelor’s degree; and
- 6.0 million (11%) will require a master’s degree or better.

Sales & office support, blue collar and food & personal services have the greatest volume of job openings for high school graduates.

FIGURE 5: Occupations 2010–2020—job openings by educational attainment

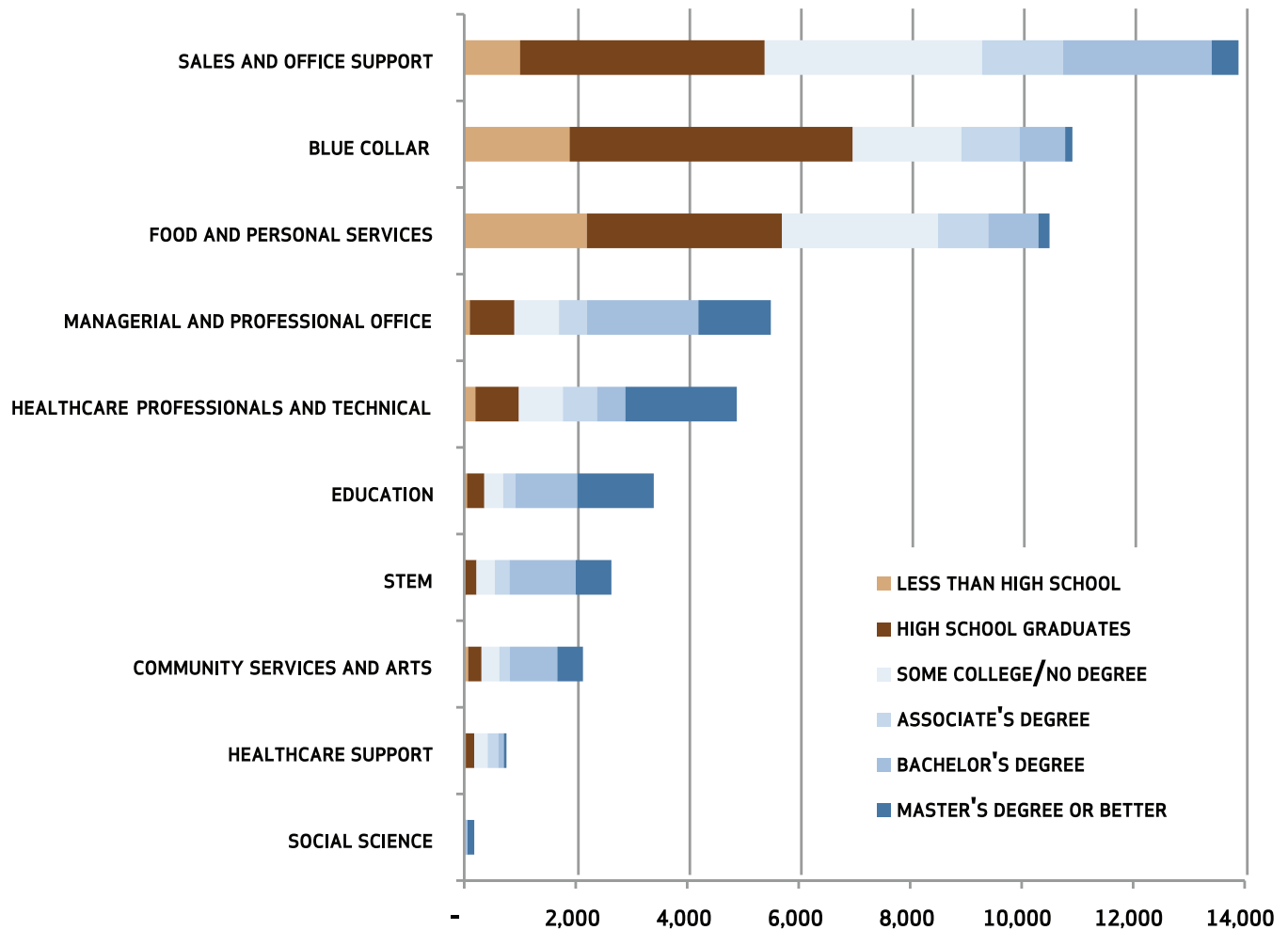
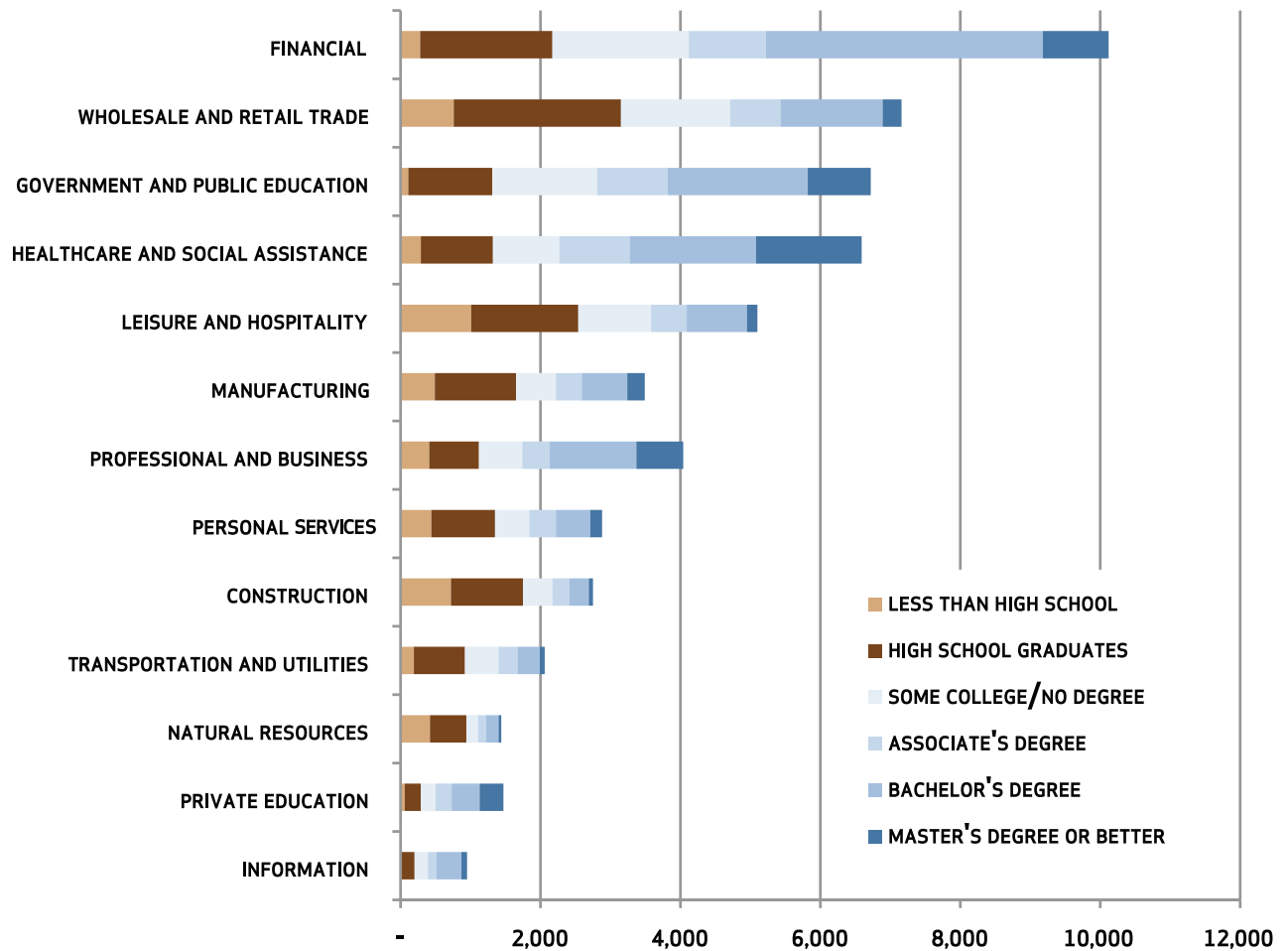


Figure 6 shows a further breakdown of job openings by industry and educational attainment:

- 5.2 million (9%) will require less than high school;
- 13.5 million (25%) will require high school;
- 10.1 million (19%) will require some college/no degree;
- 6.5 million (12%) will require an associate's degree;
- 14 million (26%) will require a bachelor's degree; and
- 5.4 million (10%) will require a master's degree or better.

Though negatively affected by the recession, financial services will provide many job openings, especially for those with a bachelor's degree or better.

FIGURE 6: Industry 2010–2020—job openings by educational attainment



The United States has been under-producing workers with postsecondary education since the 1980s. Now the problem is worsening: Carnevale et al. (2011) estimate

that the cumulative shortfall of postsecondary-educated Americans has risen each year and by 2020 will approach 20 million.

21ST-CENTURY COMPETENCIES: KNOWLEDGE, SKILLS, ABILITIES

In the previous section we detailed the education requirements of jobs in the future. Projections show that by 2020 65 percent of the jobs will require postsecondary education and training beyond high school. But what of the underlying competencies? Over and above the sheepskin credential, specific 21st century career competencies are required for success on the job.

A lot has been said about 21st-century skills, roughly defined as the competencies required to fill the jobs of the future. Having the appropriate skills for the job is critical if the United States is to remain competitive, attract the right type of industry, and engage the right type of talent in a knowledge-based and innovative economy. We examine the incidence of skills in the national economy and the characteristics of the occupations forecast to succeed. Among the major occupational groups, the fastest-growing occupations require more workers with postsecondary education. With the exception of healthcare support occupations, education, healthcare professional & technical, management, and STEM occupations will all grow by 24 percent or more between 2010 and 2020.

O*NET specifies the full set of occupational competencies required for success in particular occupations and related clusters of similar careers.⁶ The database includes occupational knowledge, skills, and abilities; work contexts, interests, and values; and key performances (tasks and activities). Its primary use so far has been as a counseling tool for career planning delivered online through a user-friendly interface. With the exception of occupational knowledge, very few O*NET competencies look like words found in a course catalog of a K-12 content model; they are multidimensional, and the interactions between them are highly correlated.

Using the O*NET database, we measure the value of core competencies in order to begin a dialogue about the appropriate roles education institutions and employers can take to provide the core competencies required for all occupations. We then compare the results with competencies in high-wage, high-growth, and high-demand occupations. We simplify the concepts by asserting that cognitive ability facilitates knowledge, a foundational requirement for skills-acquisition.

O*NET's occupational data are anchored in tripartite cognitive competencies

- Knowledge is “an organized set of mental structures (content) and procedures (procedural knowledge)... learning takes place when there is a change in these

mental structures and/or procedures” (Morgan et. al 1998). Anderson (1982) emphasizes the relationship between developing a knowledge-domain and cognitive processes: the first stage of acquiring a cognitive skill involves absorbing content knowledge and facts. The knowledge-domain therefore forms the basis upon which skills and abilities rest. Knowledge-domains are familiar to educators, from math and the sciences to the humanities to more applied disciplines like accounting.

- Skills promote further learning and comprise content, processing, and problem-solving. Content skills such as active listening, math, reading comprehension, science, speaking, and writing are fundamental for acquiring more specific skills in an occupation. Processing skills such as active learning, critical thinking, learning strategies, and monitoring contribute to more rapid acquisition of knowledge and skills. Problem-solving skills involve the identification of complex problems and related information required to develop and evaluate options and implement solutions.
- Abilities are enduring and developed personal attributes that influence performance at work. In the parlance of education psychology, these closely approximate “aptitudes.” O*NET divides abilities broadly into creativity, innovation, mathematical reasoning, and oral and written expression. Each is subdivided into component elements. For example, innovative abilities include deductive reasoning, fluency of ideas, inductive reasoning, and problem sensitivity.

Using O*NET, we identify the cognitive competencies—knowledge, skills, and abilities—most valued in the economy today and compare them to the competencies needed for high-wage, high-growth, and high-demand occupations.⁷

KNOWLEDGE-DOMAINS ARE BIASED IN FAVOR OF SERVICE OCCUPATIONS.

Knowledge is one of the most occupation-specific competencies. Because we are measuring the incidence of knowledge-domains and their intensity by occupation, the results will reflect the knowledge-domains of the largest occupational clusters in the economy.

Ten knowledge-domains appear most frequently within different occupations.⁸ Though knowledge tends to be highly specialized, it is both transferable and useful in contexts across occupations. Ultimately, this dynamic

⁶ O*NET is operated by the National O*NET Consortium and funded by the U.S. Department of Labor.

⁷ Our approach to this connection was twofold. First, we determined the extent of the relatedness of occupational clusters based on the similarities of the intensity of responses from incumbents in those occupations. Second, we determined the incidence in the national economy, controlling for the size of occupations. Factor analysis was our primary data-reduction tool.

⁸ O*NET measures both relative “intensity” of use (level of skill necessary) and “importance” of different competencies in an individual occupation.

gives rise to careers that mix essentially different academic disciplines and occupations. This mix of job-specific technical preparation plus preparation in other disciplines is becoming increasingly advantageous across a wide array of occupations and is ushering in a growing number of interdisciplinary academic and hybrid-career programs.

The shift toward interdisciplinary programs and hybrid careers results from the changing ways in which knowledge is produced and used. As technology automates

repetitive tasks in every occupation, workers are left to perform more general, non-repetitive functions like quality control and innovation that require heightened interaction with other workers across intellectual disciplines and occupations. The growth in overlapping assignments and performance goals increases the need for cross-training and soft skills like communications and teamwork.

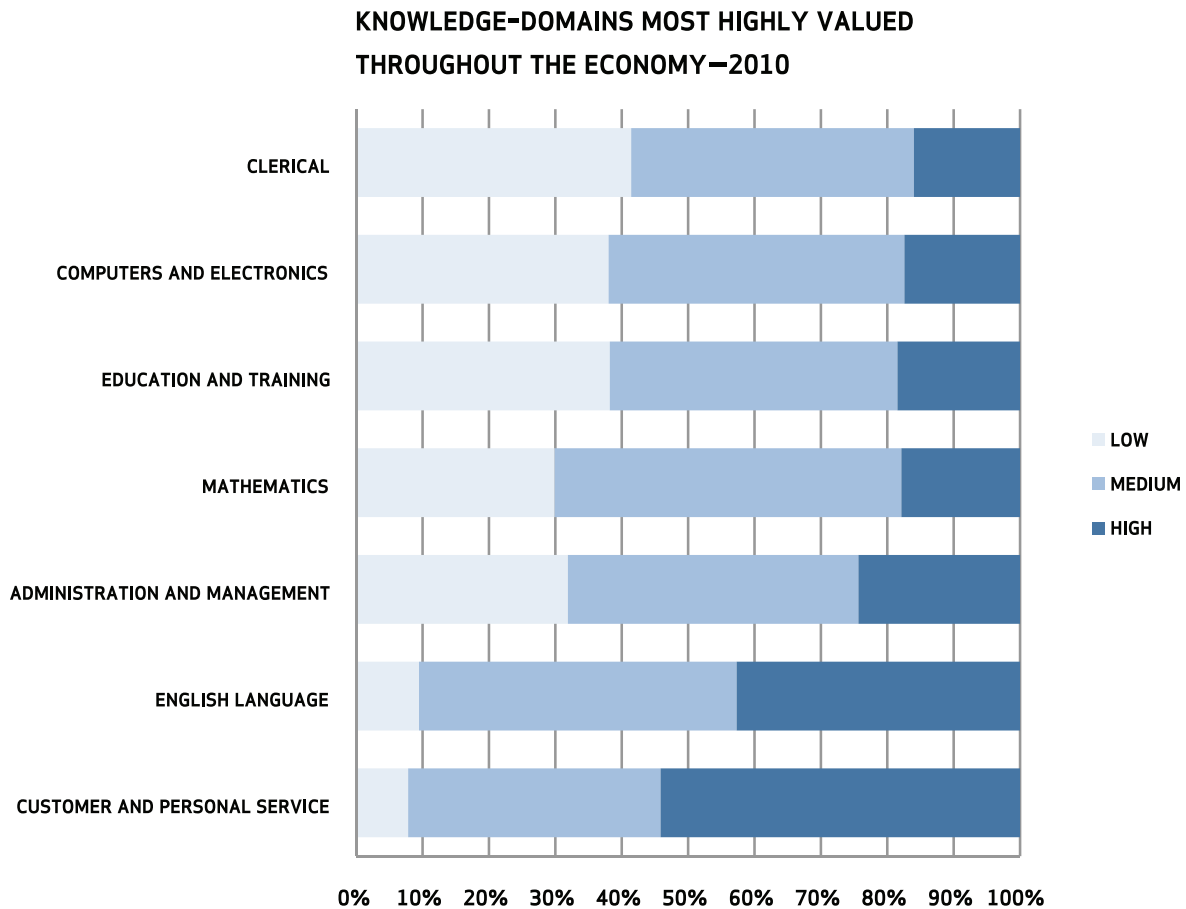
Knowledge-domains—intensity of use

Intensity of use	Occupation	Knowledge-domains
1	Customer and personal service	Knowledge of principles and processes for providing customer and personal services, including assessing customer needs, meeting quality standards for services, and evaluating customer satisfaction.
2	English language	Knowledge of the structure and content of the English language, including the meaning and spelling of words, rules of composition, and grammar.
3	Mathematics	Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
4	Computers and electronics	Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.
5	Clerical	Knowledge of administrative and clerical procedures and systems for word processing, file and records management, stenography and transcription, business-form design, and other office procedures.
6	Sales and marketing	Knowledge of principles and methods for showing, promoting, and selling products or services, including marketing strategy and tactics, product demonstrations, sales techniques, and sales control systems.
7	Personnel and human resources	Knowledge of principles and procedures for personnel recruitment, selection, training, compensation and benefits, labor relations and negotiation, and personnel information systems.
8	Production and processing	Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.
9	Public safety and security	Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.
10	Communications and media	Knowledge of media production, communication, and dissemination techniques and methods, including alternative ways to inform and entertain via written, oral, and visual media.
High-wage, high-growth and high-demand occupations	Administration and management	Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.
	Law and government	Knowledge of laws, legal codes, court procedures, precedents, government regulations, executive orders, agency rules, and the democratic political process.
	Economics and accounting	Knowledge of economic and accounting principles and practices, financial markets, banking, and analysis and reporting of financial data.

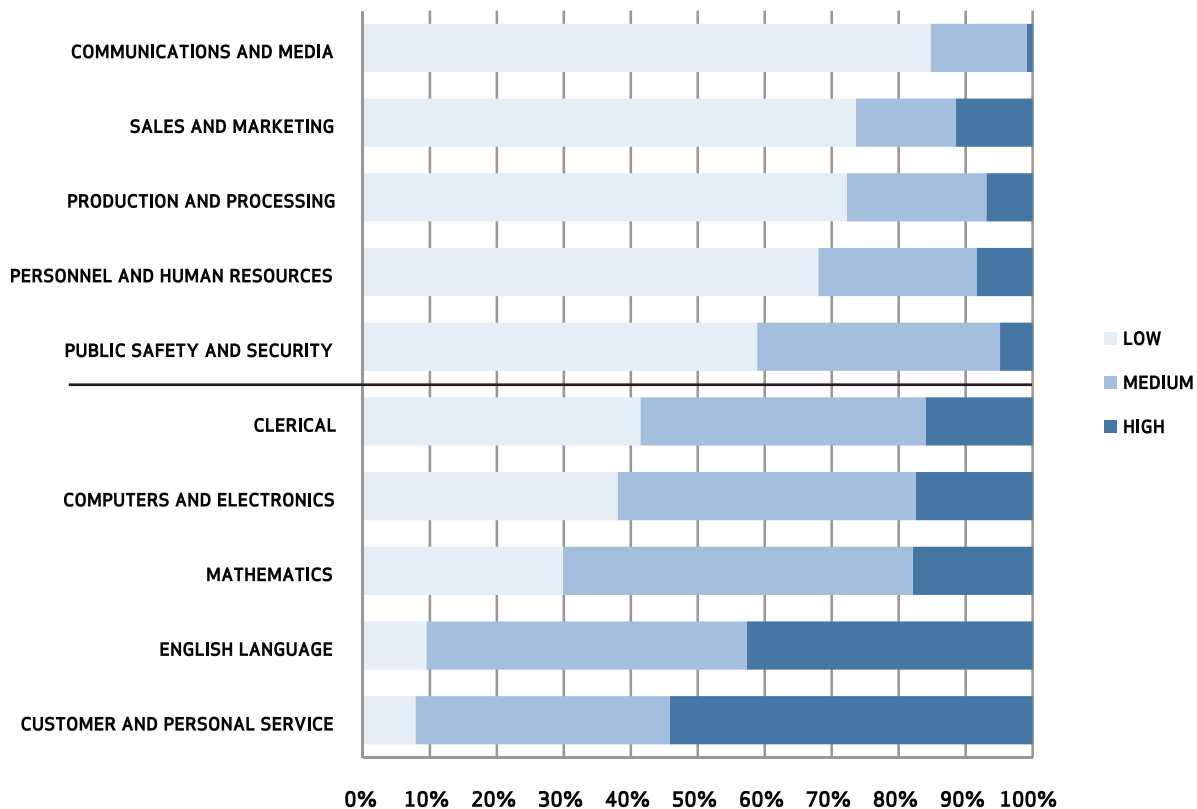
Figure 7 summarizes two sets of information: the top knowledge-domains in the economy and the intensity of their use. Customer and personal services and English language are used most intensely across occupations. High levels of customer service and English language skills are required in 55 percent of all jobs. This is not surprising: 80 percent of all jobs today are in the service sector. Jobs in industries like business services, education, healthcare, and office services require higher levels of interpersonal

and problem-solving skills because the work entails higher levels of human interaction and personalized responses to people's wants and needs. These same behavioral skills are required in high technology and manufacturing jobs. The technology itself takes on more of the rote, manual-processing tasks, allowing employees to spend more time interacting, exploiting the new flexible technologies, and delivering cutting-edge value (quality, variety, customization, convenience, speed, and innovation).

FIGURE 7: Knowledge-domains most highly valued throughout the economy—2010



KNOWLEDGE-DOMAINS MOST HIGHLY VALUED IN HIGH-WAGE, HIGH-GROWTH, HIGH-DEMAND OCCUPATIONS—2010



Mathematics and computers and electronics are also highly valued and transferable across occupations. Medium to high levels of mathematics and computational knowledge are required in 70 percent of all jobs; computer skills are required at these same levels in 62 percent of all jobs.

As expected, the knowledge-domains of high-wage, high-growth, and high-demand occupations include more complex competencies (communication & media; sales & marketing; production & processing; personnel & human resources; and public safety & security) than those in the general economy and exclude other competencies (education & training and administration & management). These advanced competencies are not necessarily demanded at the highest levels. Only 32 percent of these jobs require medium or high knowledge of law and government; only 15 percent require medium or high knowledge of communications & media.

SKILLS ARE MORE TRANSFERABLE BETWEEN OCCUPATIONS THAN KNOWLEDGE.

Knowledge gleaned from one discrete area may not be useful for another, but the broad skills and abilities needed to do a job could transfer between the two. However, skills

mismatch occurs when workers do not have the proper qualifications to perform their jobs. While skills mismatch could technically mean workers are either over-skilled (wasted resources) or under-skilled (productivity losses), under-skilled workers cause the greatest concern for employers, educators, and policymakers.

Skills mismatch is a symptom of structural unemployment: jobs lost in one sector, such as construction or real estate, disappear for good, while jobs in other sectors, such as healthcare and education, expand so fast the pool of qualified labor can't keep up. Federal economists attribute roughly 30 percent of the change in the U.S. unemployment rate during the Great Recession to skills mismatch. From this analysis, we estimate about 2 million jobs go unfilled today as a result of skills, training, and education gaps.

The most popular way to estimate skills mismatch is to use real-time data for job openings and education. Education, however, is a relatively poor marker for skills. Using O*NET, we quantify the incidence and intensity of skills by education within the economy. Skills highly concentrated in the economy include, among others, active listening, complex problem-solving, writing and time management.

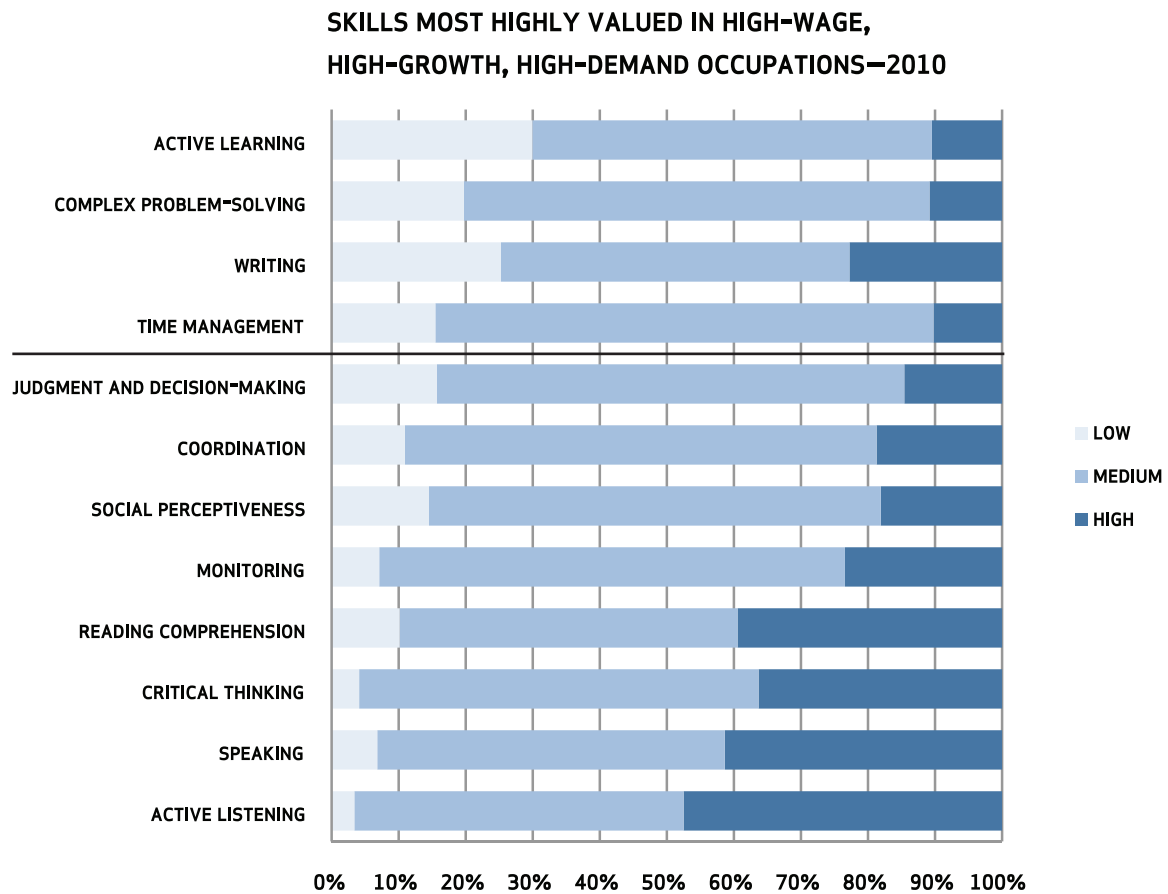
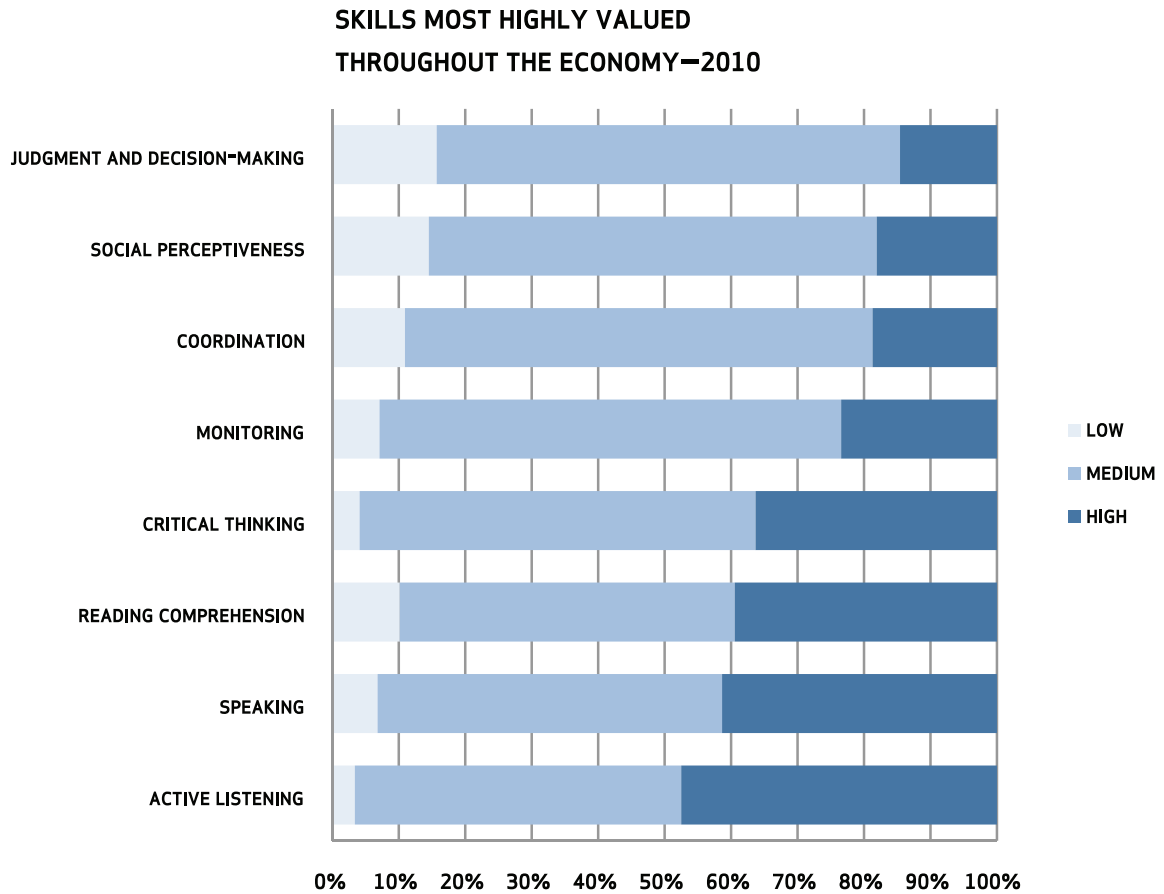
Skills most highly valued in high-wage, high-growth, high-demand jobs—2010

Intensity of use		Skills
1	Active listening	Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
2	Speaking	Talking to others to convey information effectively.
3	Reading comprehension	Understanding written sentences and paragraphs in work-related documents.
4	Critical thinking	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
5	Writing	Communicating effectively in writing appropriate for the needs of the audience.
6	Monitoring	Monitoring or assessing performance of oneself, other individuals, or organizations to make improvements or take corrective action.
7	Coordination	Adjusting actions in relation to others' actions.
8	Social perceptiveness	Recognizing others' reactions and understanding why they react as they do.
9	Judgment and decision-making	Considering the relative costs and benefits of potential actions to choose the most appropriate one.
10	Complex problem-solving	Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
11	Active learning	Understanding the implications of new information for both current and future problem-solving and decision-making.
12	Time management	Managing one's own time and the time of others.
High-wage, high-growth and high-demand occupations	Mathematics	Using mathematics to solve problems.
	Negotiation	Bringing others together and trying to reconcile differences.
	Science	Using scientific rules and methods to solve problems.

Five of the top 12 skills most valued in the economy are communicative in nature (Figure 8). Communications skills (active listening, speaking, reading comprehension, critical thinking, and writing) are highly valued in occupations. Active listening is extremely important to almost all jobs that require working in hierarchical teams or serving customers; 48 percent of jobs require high levels of active

listening. Other communications skills follow closely behind: reading comprehension, speaking, and critical thinking. In addition, active listening, interpreting and following instructions, and communicating them to other people both orally and in writing appear time and again in various jobs – even those requiring relatively lower educational attainment.

FIGURE 8: Skills 2010—demand



Skills that involve information processing and require sophisticated cost-benefit analyses such as critical thinking, complex problem-solving and decision-making are also highly valued. Critical thinking is a skill that is often touted by employers as a prerequisite for success in many occupations. (O*NET data confirm this assertion.) Close to 20 percent of all jobs require the skill; moreover, 96 percent of all occupations rank critical thinking as either very important or extremely important to that job.

Finally, skills involving social perceptiveness and the ability to do teamwork and complete tasks quickly are also high valued. Coordination and monitoring are especially important for STEM, healthcare, and production jobs. Social perceptiveness also carries “caregiver” undertones and favors the traditional concentration of females in healthcare occupations. The fastest-growing occupations

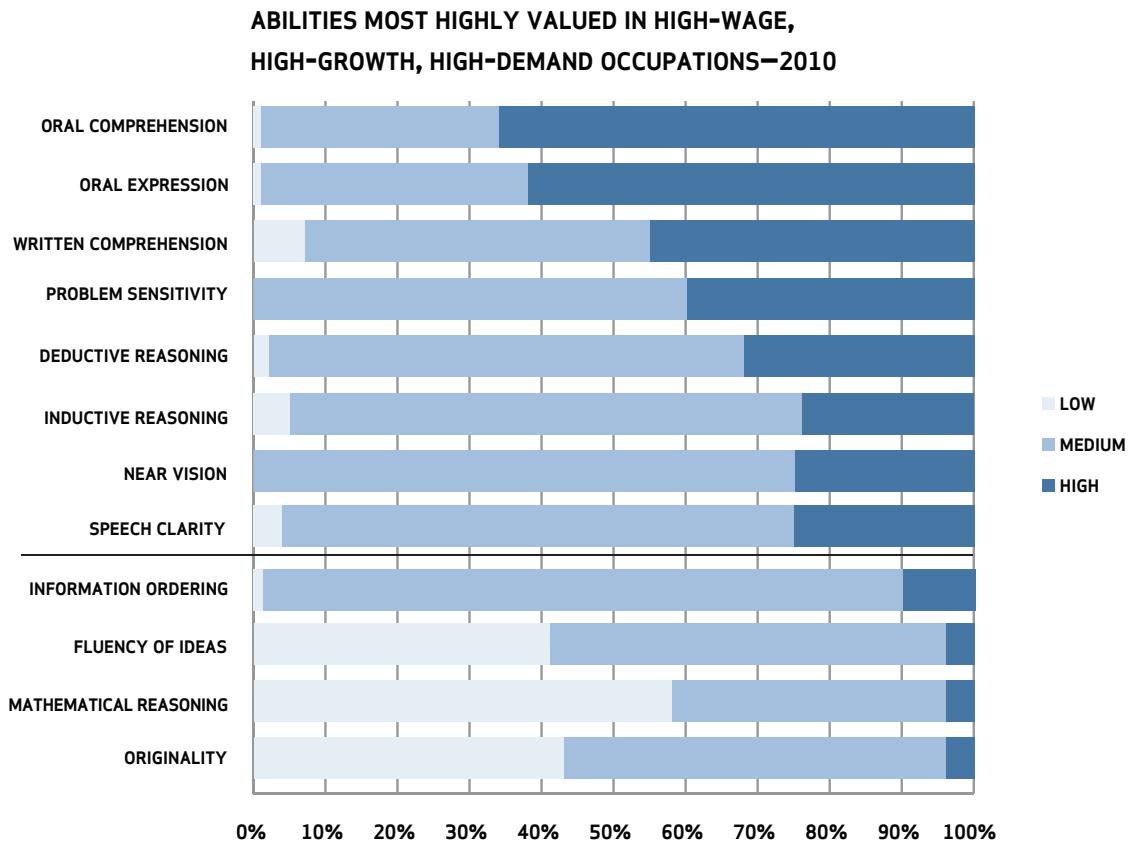
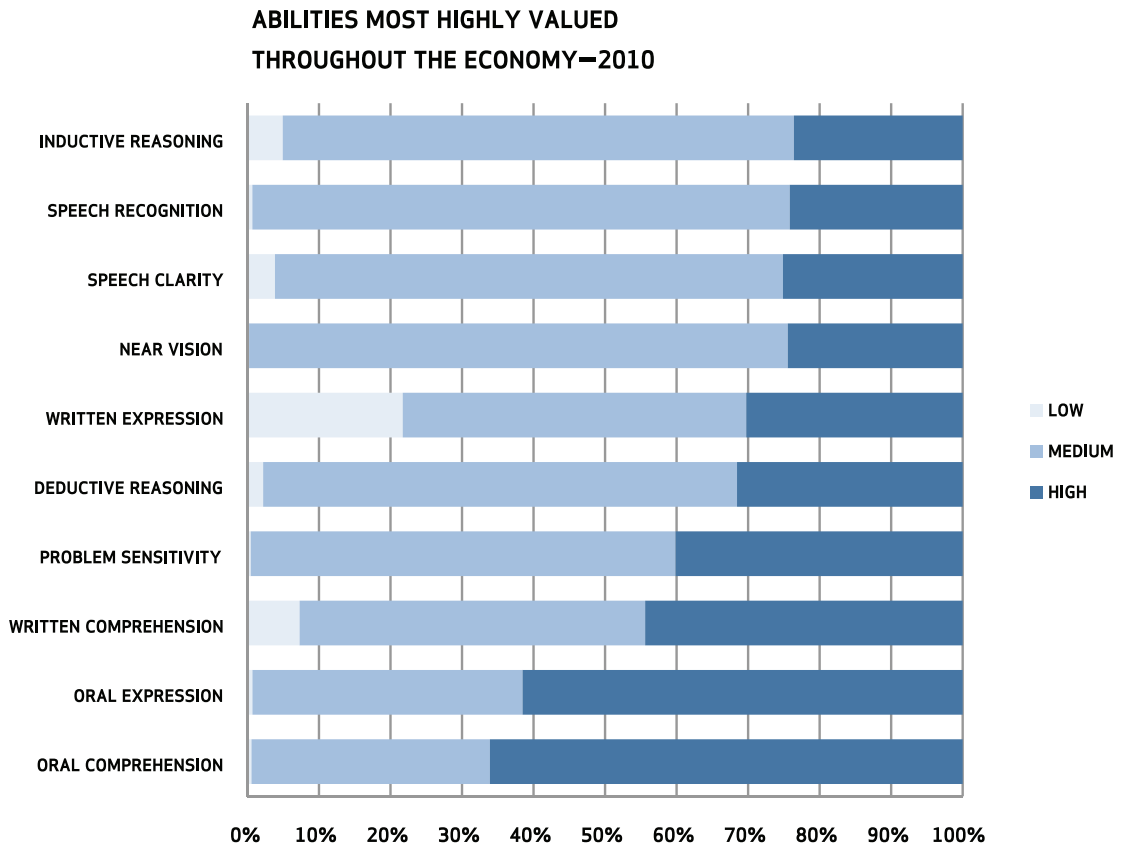
demand skills similar to all other occupations but require additional skills in mathematics, and advanced communications.

ABILITIES ARE MORE TRANSFERABLE BETWEEN OCCUPATIONS THAN KNOWLEDGE.

Oral comprehension, oral expression, and written comprehension are valued in occupations throughout the economy; written expression appears in the top four abilities for high-wage, high-growth, high-skill occupations (Figure 9). Of all the abilities listed on O*NET, these three are required at the highest level in the largest proportion of occupations. The fastest-growing occupations demand abilities similar to all other occupations but require fluency of ideas, mathematical reasoning, and originality.

Abilities most highly valued throughout the economy—2010		
Intensity of use	Abilities	
1	Oral comprehension	Listen to and understand information and ideas presented through spoken words and sentences.
2	Oral expression	Communicate information and ideas so others will understand.
3	Written comprehension	Read and understand information and ideas presented in writing.
4	Problem-sensitivity	Recognize when something is wrong or likely to go wrong. Does not involve solving the problem.
5	Deductive reasoning	Apply general rules to specific problems
6	Written expression	Communicate information and ideas in writing so others will understand.
7	Speech clarity	Speak clearly so others can understand.
8	Near vision	See under low light conditions.
9	Inductive reasoning	Combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).
10	Speech Recognition	The ability to identify and understand the speech of another person.
High-wage, high-growth and high-demand occupations	Fluency of ideas	Generate a number of ideas about a topic (the number of ideas is important, not their quality, correctness, or creativity).
	Information ordering	Arrange things or actions (patterns of numbers, letters, words, pictures, mathematical operations) in a certain order or pattern according to a specific rule or set of rules.
	Mathematical reasoning	Choose the right mathematical methods or formulas to solve a problem.
	Originality	Generate unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem.

FIGURE 9: Abilities 2010—demand



In addition to knowledge, skills and abilities (KSAs), O*NET classifies the competencies tied to individual personality traits. These markers for success in individual occupations are

- work values (individual preferences for work outcomes). Important outcomes include achievement, advancement, authority, compensation, recognition, responsibility, security, social status, and working conditions.
- work interest (individual preferences for work environment). Interests include artistic, conventional, enterprising, investigative, realistic, and social.
- personal qualities (characteristics that affect how well someone does a job). Some are agreeableness, conscientiousness, emotionality, and extroversion.

Education reform has shifted focus to these key competencies, particularly as they pertain to life and career skills. The move toward making people both college- and career-ready essentially amounts to finding ways to teach basic knowledge, transform these competencies into deeper learning, and help develop a flexible, adaptable individual with the skills appropriate for surviving in the 21st century.

We are only at the very beginning of the dialogue about exactly how we should teach these skills. What we do know, however, is that the learning curve is gentlest when

these competencies are introduced to students within a practical framework and appropriate context. Principal among these rough guidelines is that skills and abilities are best learned and used in the context of particular knowledge-domains and fields of practice. We also know skills and abilities are to some extent transferable across knowledge-domains and fields of practice, especially when the two overlap in related fields of study.

Much of the hard work has already been done to connect occupational groups and postsecondary education in the 16 career clusters designated by the Office of Vocational and Adult Education in the U.S. Department of Education. The occupations and curriculums within each cluster show considerable overlap in KSAs, work value, work interest, and personality qualities. The overlap among KSAs within clusters suggests the best chance for transferability between curriculums and career pathways. The transferability between career clusters is less powerful but quite possible in varying degrees.

JOBS FORECAST BY OCCUPATION, 2005–2020

Our forecasts show how each occupational group is expected to fare between 2010 and 2020 (Figure 10). Charts appear in descending order according to the maximum number of jobs in each occupational group.

Total job demand by occupation (in thousands, for various years)

OFFICE & ADMINISTRATIVE SERVICES

[administrative assistants, computer operators, customer service representatives, data entry and file clerks, human resources assistants, mail clerks and mail machine operators, office clerks, payroll and timekeeping clerks, receptionists, secretaries]

2006	Pre-recession high	21,410
2010	Low	19,650
2020	Estimated	22,070

SALES

[advertising sales agents, cashiers, models, product promoters, real estate agents and brokers, retail sales persons, telemarketers, travel agents]

2007	Pre-recession high	19,080
2010	Low	18,010
2020	Estimated	20,930

MANAGEMENT

[chief executives, education administrators, emergency management directors, financial and human resources managers, general and operating managers, legislators, mail superintendents, medical and health services managers, postmasters]

2007	Pre-recession high	11,410
2010	Low	11,100
2020	Estimated	12,850

FOOD PREPARATION & SERVING SUPPORT

[bartenders, cooks, dishwashers, waiters, waitresses]

2007	Pre-recession high	9,730
2010	Low	9,420
2020	Estimated	11,100

EDUCATION, TRAINING, & LIBRARY SCIENCE

[archivists, curators, librarians, school teachers, technical education specialists]

2006	Pre-recession high	8,070
2008	Low	8,000
2020	Estimated	9,710

PRODUCTION

[electrical and electronics equipment assemblers, furniture finishers, power plant operators, semiconductor processors, sewing machine operators, tire builders]

2006	Pre-recession high	9,620
2010	Low	7,810
2020	Estimated	8,460

TRANSPORTATION & MATERIAL MOVING

[airline pilots, parking lot attendants, sailors, ship engineers, truck, ambulance, taxi and bus drivers]

2006	Pre-recession high	9,390
2010	Low	8,240
2020	Estimated	9,180

CONSTRUCTION & EXTRACTION

[carpet installers, construction laborers, electricians, highway maintenance workers, mining machine operators, rock splitters, roofers, rotary drill operators]

2006	Pre-recession high	8,360
2010	Low	6,490
2020	Estimated	7,340

HEALTHCARE PROFESSIONAL & TECHNICAL

[doctors, medical and clinical laboratory technicians, nurses, pharmacists, physical therapists, respiratory therapists]

2007	Pre-recession high	6,390
2008	Low	6,360
2020	Estimated	8,070

PERSONAL CARE

[animal trainers, event planners, hairdressers, personal trainers, pet groomers, travel agents and guides, ushers]

2007	Pre-recession high	5,410
2010	Low	5,370
2020	Estimated	6,920

BUILDING AND GROUNDS CLEANING & MAINTENANCE

[groundskeepers, janitors, landscape workers, maids, pest control providers]

2007	Pre-recession high	5,680
2008	Low	5,560
2020	Estimated	6,700

INSTALLATION, MAINTENANCE, AND EQUIPMENT REPAIR

[aircraft mechanics; automotive service technicians; air conditioning, heating, and refrigeration mechanics; mechanical door repairers, vending machine servicers]

2006	Pre-recession high	5,510
2010	Low	4,930
2020	Estimated	5,640

ARTS, DESIGN, ENTERTAINMENT, SPORTS, & MEDIA

[actors, athletes, artists, authors, choreographers, directors, graphic designers, painters, radio and television announcers, public relation specialists, writers]

2007	Pre-recession high	4,310
2010	Low	4,200
2020	Estimated	5,010

FINANCIAL SPECIALIST

[accountants, auditors, budget analysts, credit counselors, financial examiners, real estate appraisers and assessors, tax preparers]

2007	Pre-recession high	3,570
2010	Steady increase	3,900
2020	Estimated	5,100

HEALTHCARE SUPPORT

[dental assistants, home health aides, nursing aides, physical therapist assistants, medical assistants, occupational therapy aides, psychiatric aides]

2007	Pre-recession high	3,430
2010	Steady increase	3,610
2020	Estimated	4,760

BUSINESS OPERATIONS

[buyers and purchasing agents, claims adjusters, compliance officers, cost estimators, human resources specialists, insurance appraisers, logisticians, and managerial occupations with authority over business functions]

2007	Pre-recession high	3,890
2010	Low	3,780
2020	Estimated	4,660

COMPUTER & MATHEMATICAL SCIENCE

[computer programmers, software developers, computer support specialists, database administrators, web developers and mathematicians]

2007	Pre-recession high	3,210
2010	Low	3,130
2020	Estimated	3,840

PROTECTIVE SERVICES

[firefighters, police officers, security guards, wildlife game wardens]

2007	Pre-recession high	2,720
2010	Low	2,690
2020	Estimated	3,140

COMMUNITY & SOCIAL SERVICES

[child, family, school, and healthcare social workers; clergy; counselors and religious workers; guidance and mental health counselors; substance abuse and behavioral disorder counselors]

2007	Pre-recession high	2,050
2008	Low	2,040
2020	Estimated	2,510

ENGINEERING

[aerospace, biomedical, computer hardware, environmental, and nuclear engineers; civil engineering technicians; industrial engineering technicians; mechanical drafters]

2006	Pre-recession high	1,820
2010	Low	1,680
2020	Estimated	1,940

LEGAL

[arbitrators, lawyers, legal secretaries, judges, mediators, paralegals, and others involved with interpreting the law, resolving legal disputes, and carrying out legal proceedings]

2006	Pre-recession high	1,210
2010	Low	1,190
2020	Estimated	1,390

FARMING, FISHING, & FORESTRY

[agricultural inspectors, conservation and forest workers, farm workers, fishermen, logging equipment operators]

2005	Pre-recession high	1,000
2009	Low	920
2020	Estimated	980

LIFE AND PHYSICAL SCIENCE

[agricultural and food science technicians, astronomers, chemical technicians, epidemiologists, forensic science technicians, medical scientists, microbiologists, physicists]

2007	Pre-recession high	760
2011	Increase	790
2020	Estimated	930

SOCIAL SCIENCE

[anthropologists, archeologists, economists, historians, political scientists, regional and urban planners, sociologists]

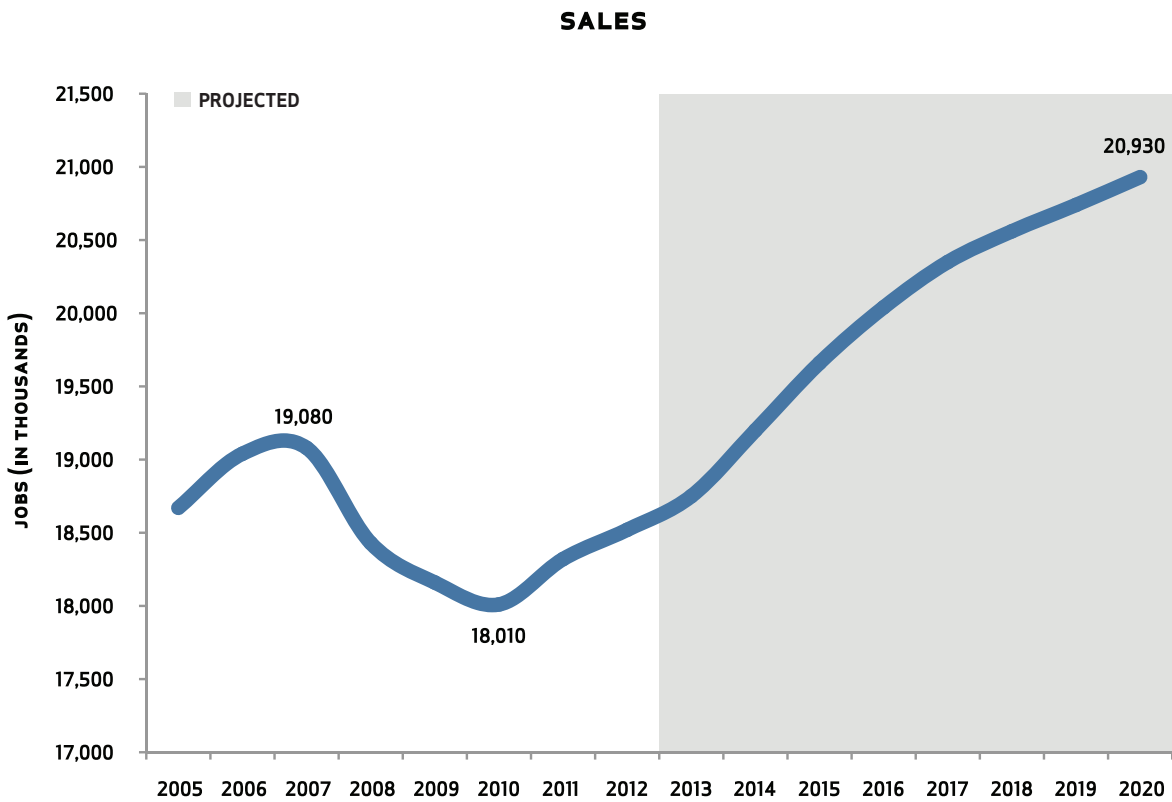
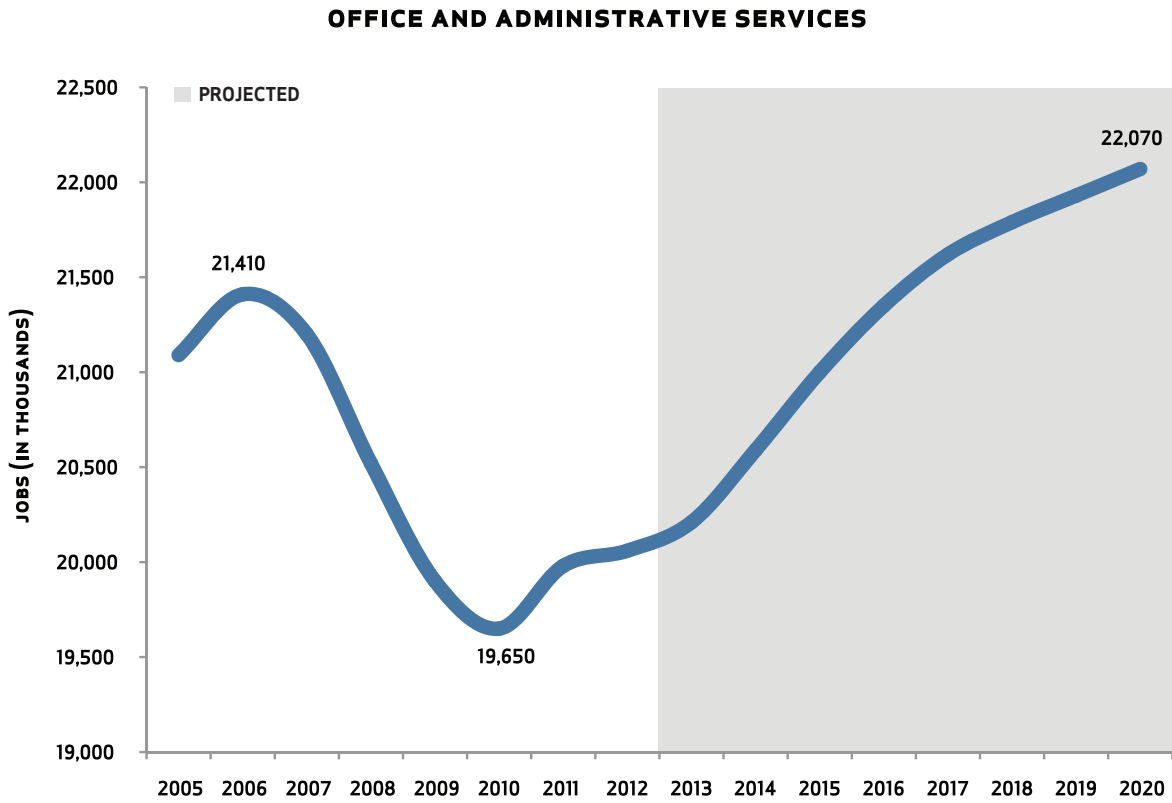
2007	Pre-recession high	700
2009	Low	690
2020	Estimated	870

ARCHITECT & TECHNICAL

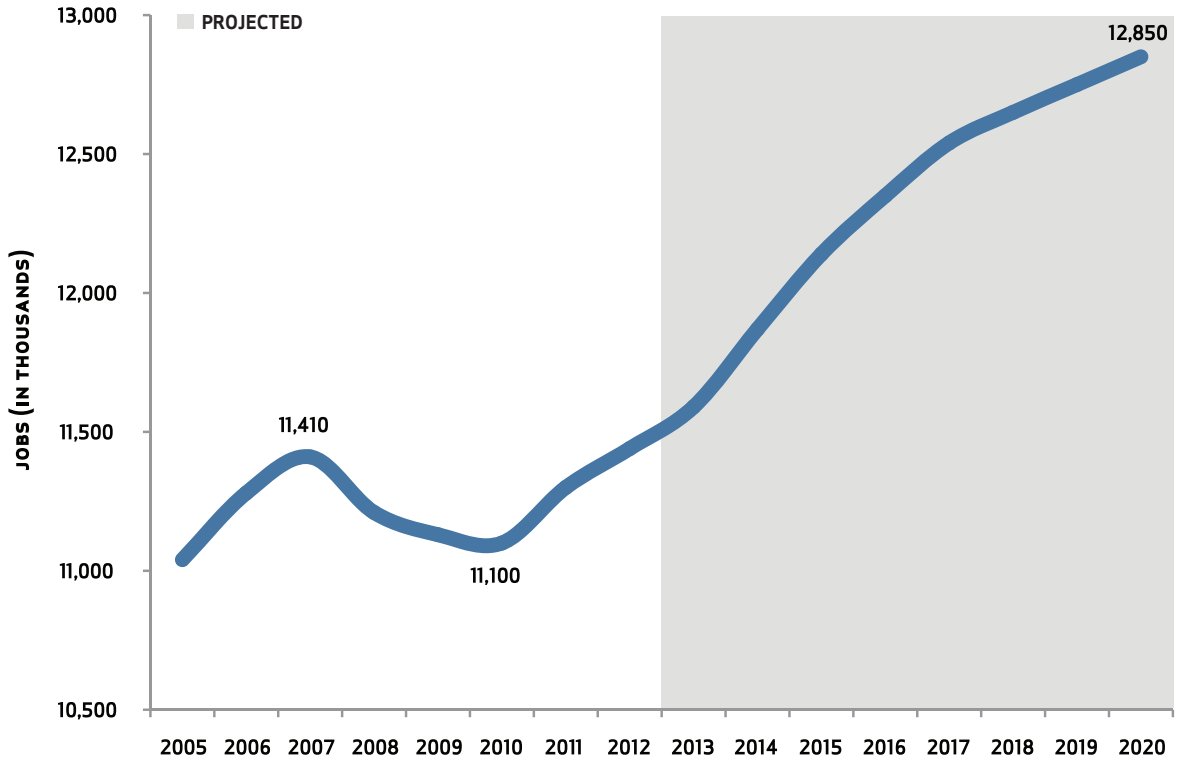
[building, structure, and landscape architects and designers; cartographers, geographers, mapping and surveying technicians, surveyors]

2007	Pre-recession high	550
2010	Low	470
2020	Estimated	520

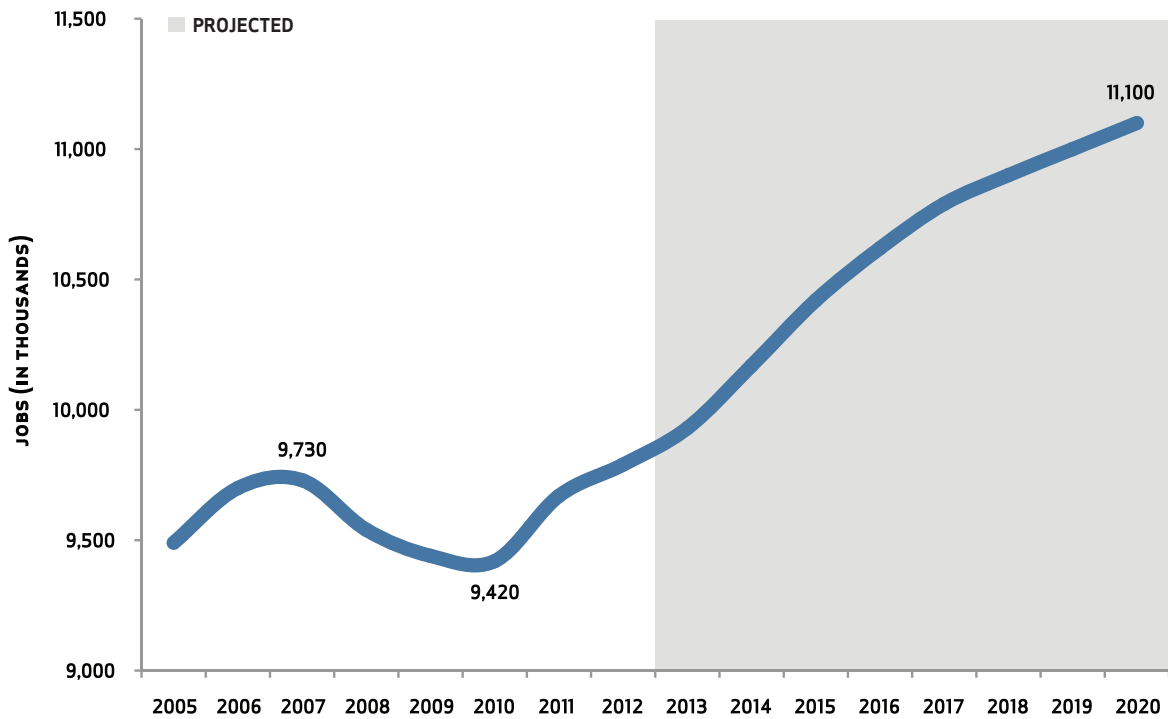
FIGURE 10: Total job demand by occupation (2005-2020)



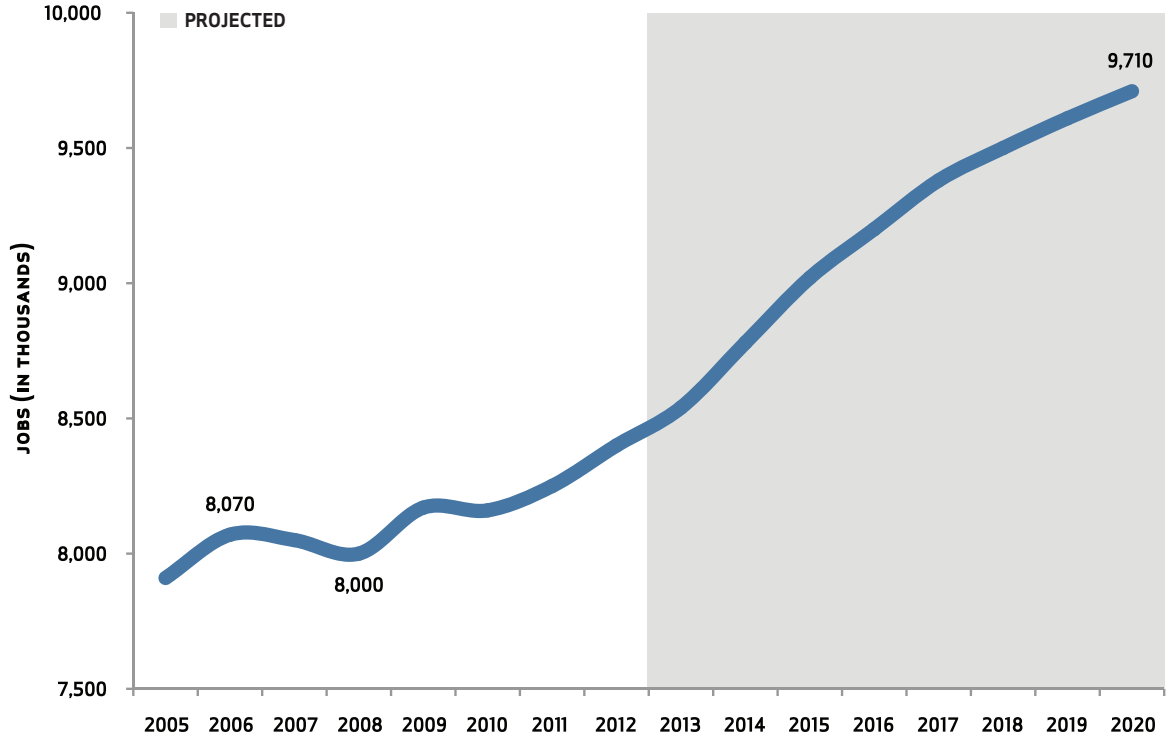
MANAGEMENT



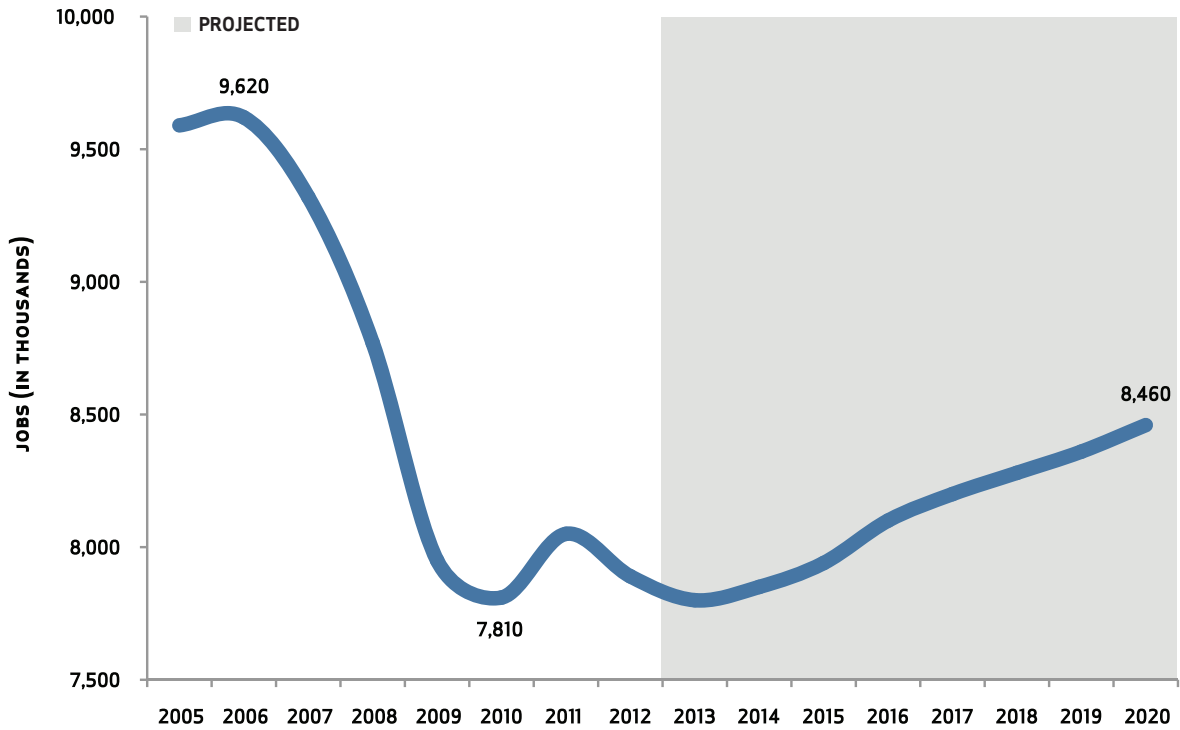
FOOD PREPARATION AND SERVING SUPPORT



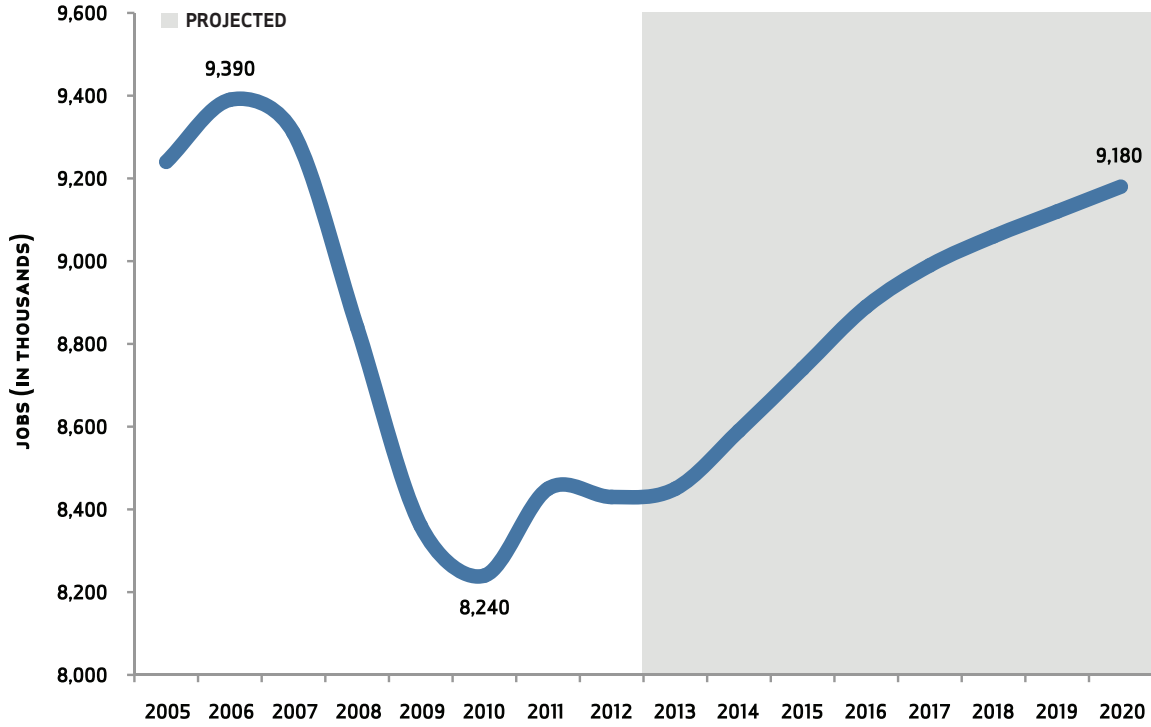
EDUCATION, TRAINING, AND LIBRARY SCIENCE



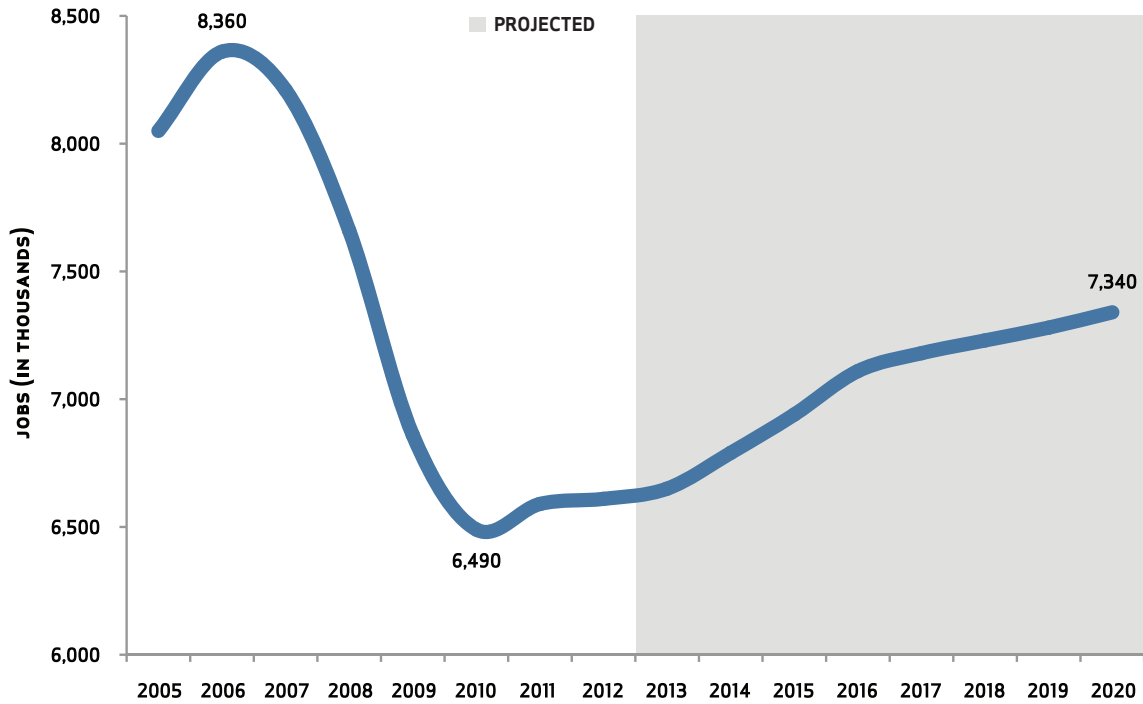
PRODUCTION



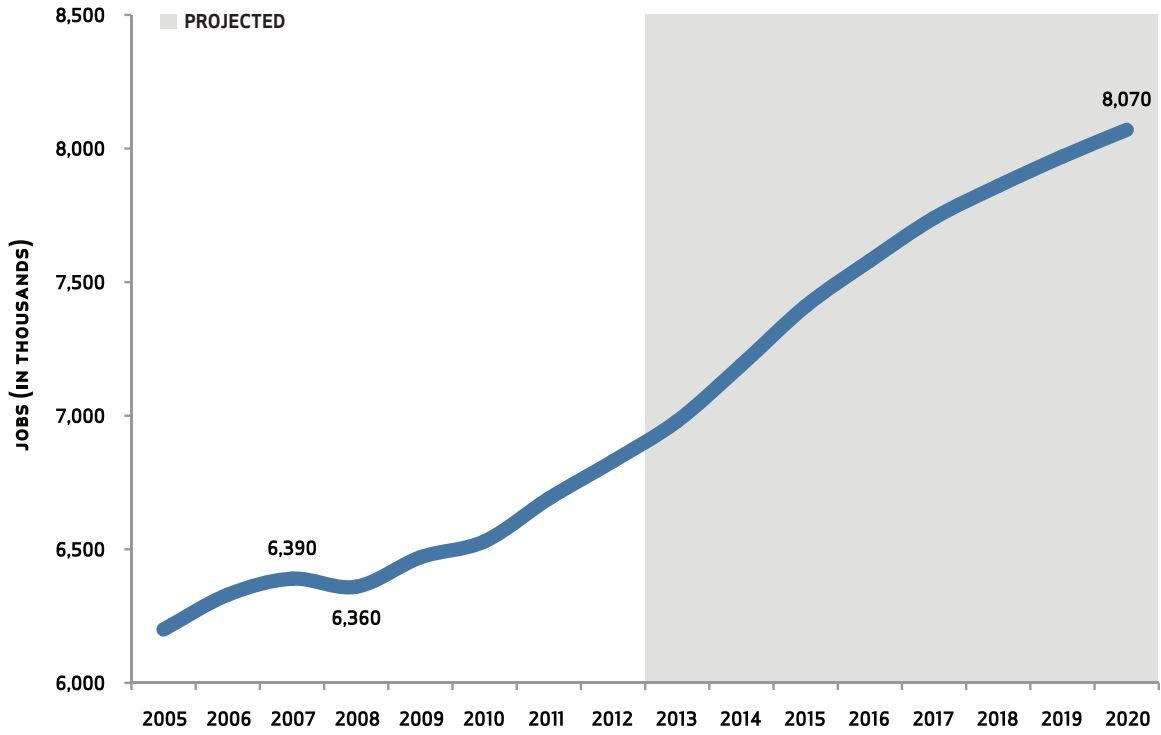
TRANSPORTATION AND MATERIAL MOVING



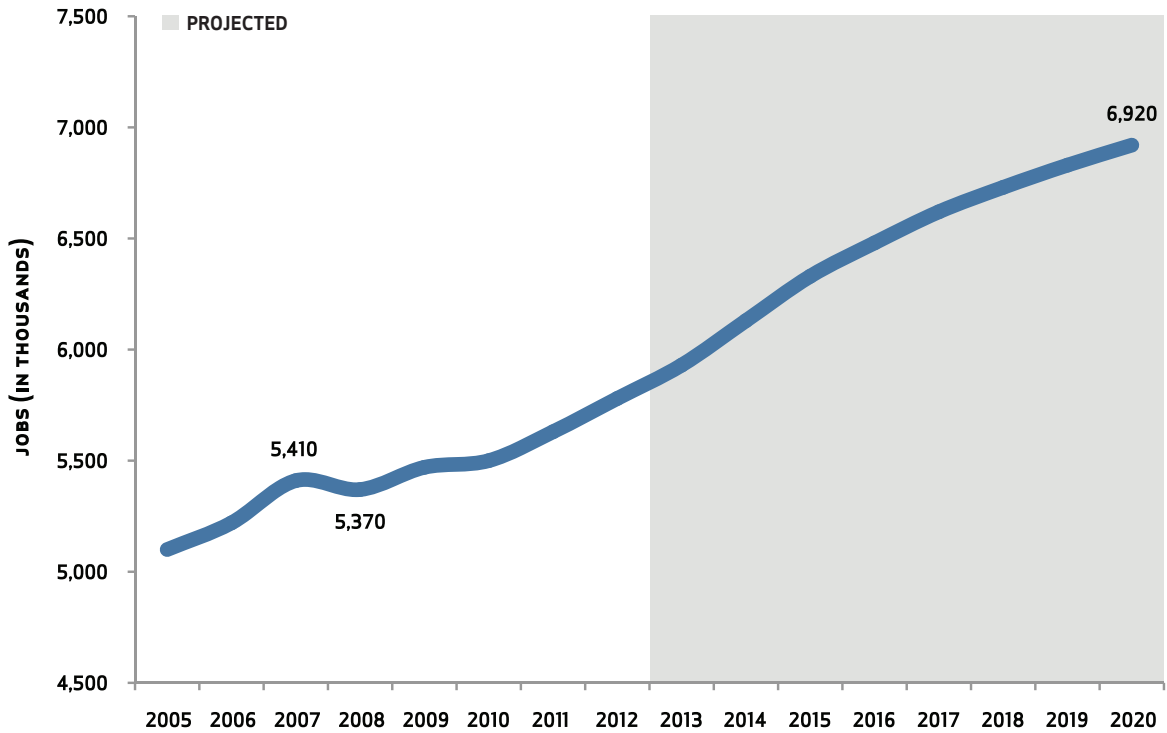
CONSTRUCTION AND EXTRACTION



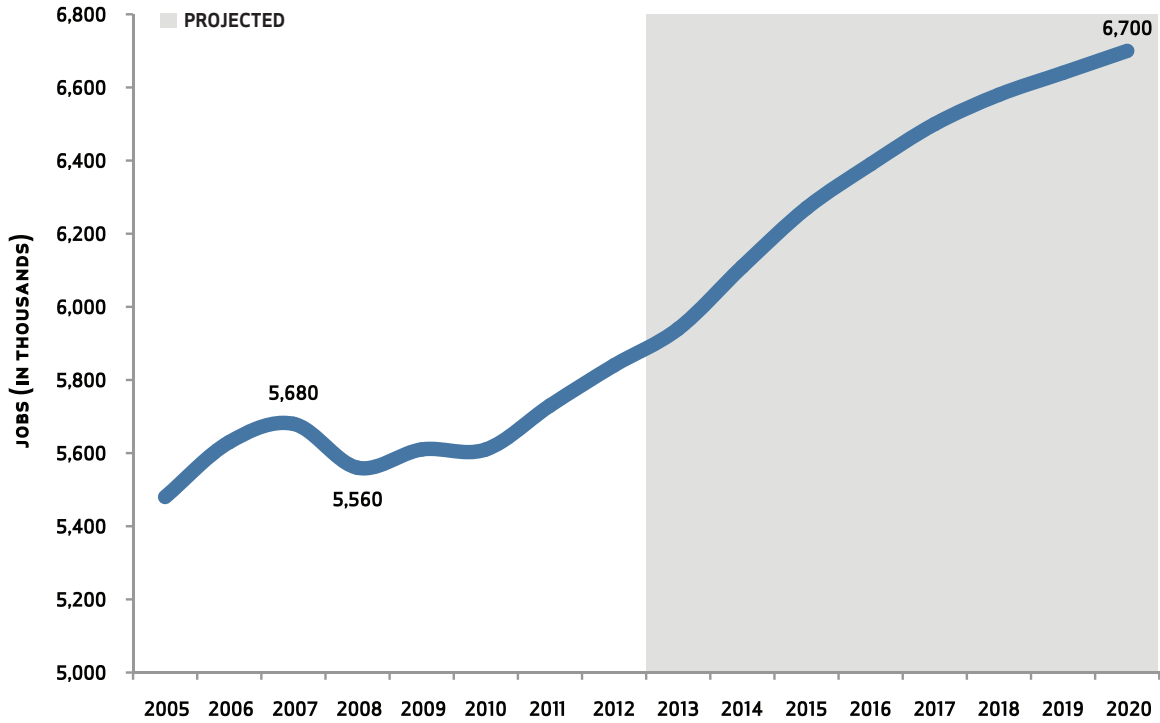
HEALTHCARE PROFESSIONAL AND TECHNICAL



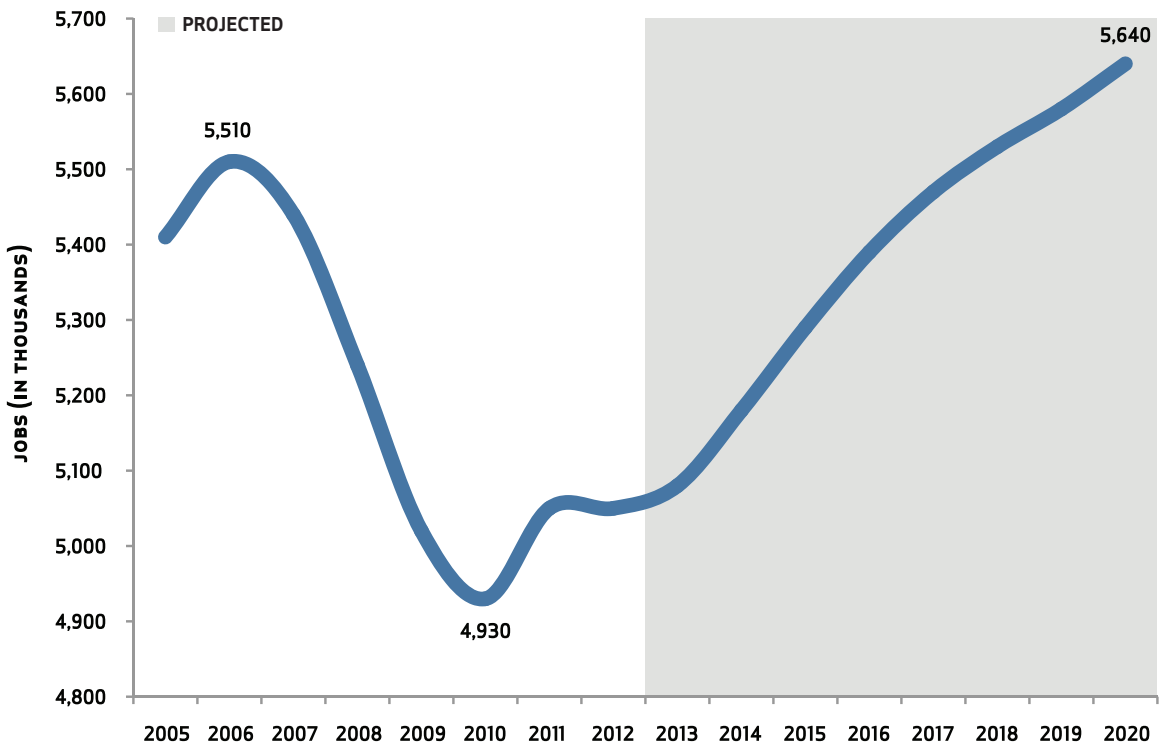
PERSONAL CARE



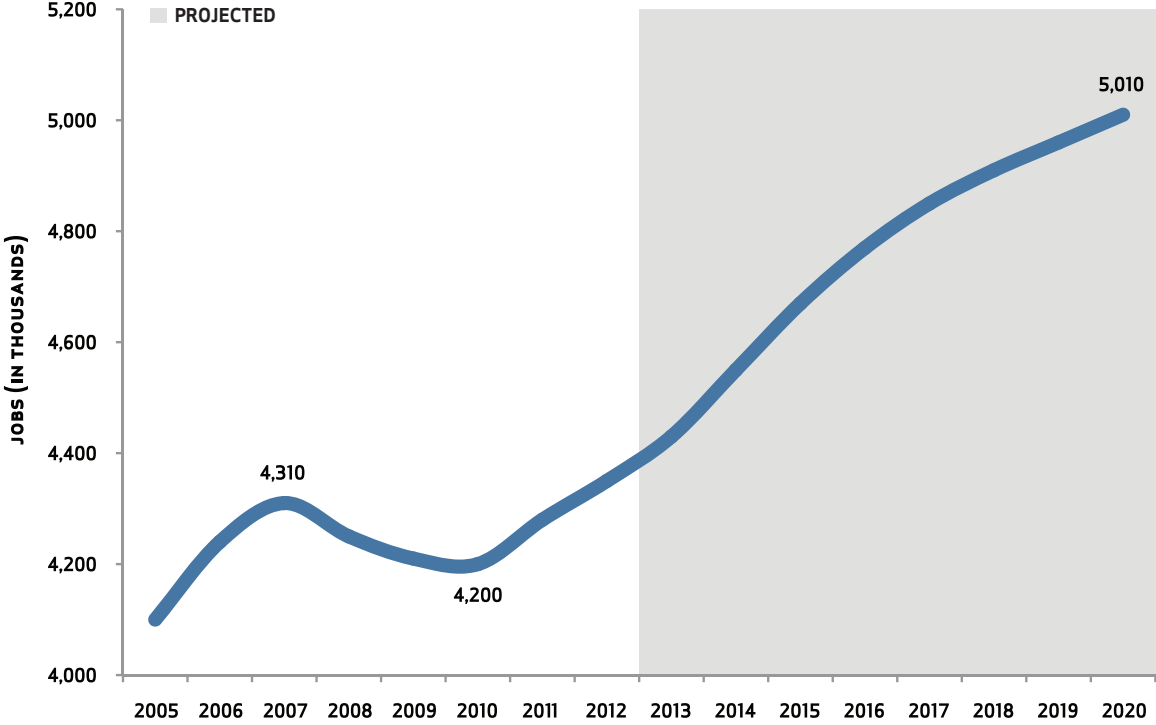
BUILDING AND GROUNDS CLEANING AND MAINTENANCE



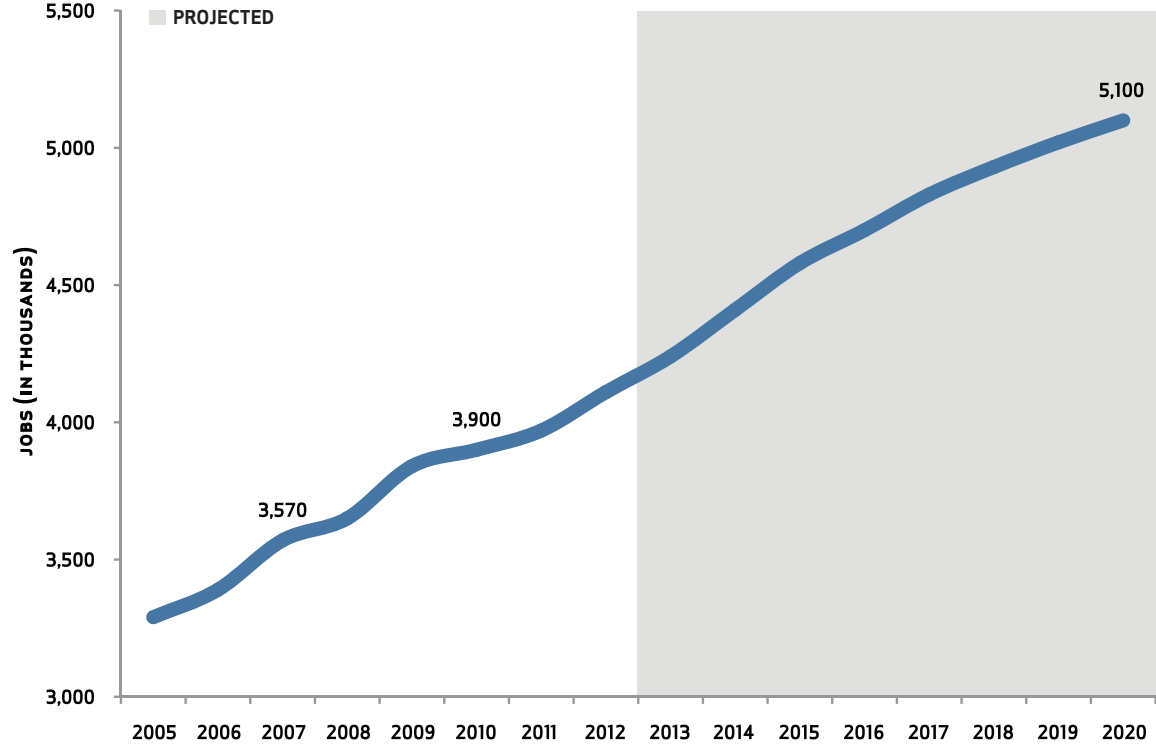
INSTALLATION, MAINTENANCE, AND EQUIPMENT REPAIR



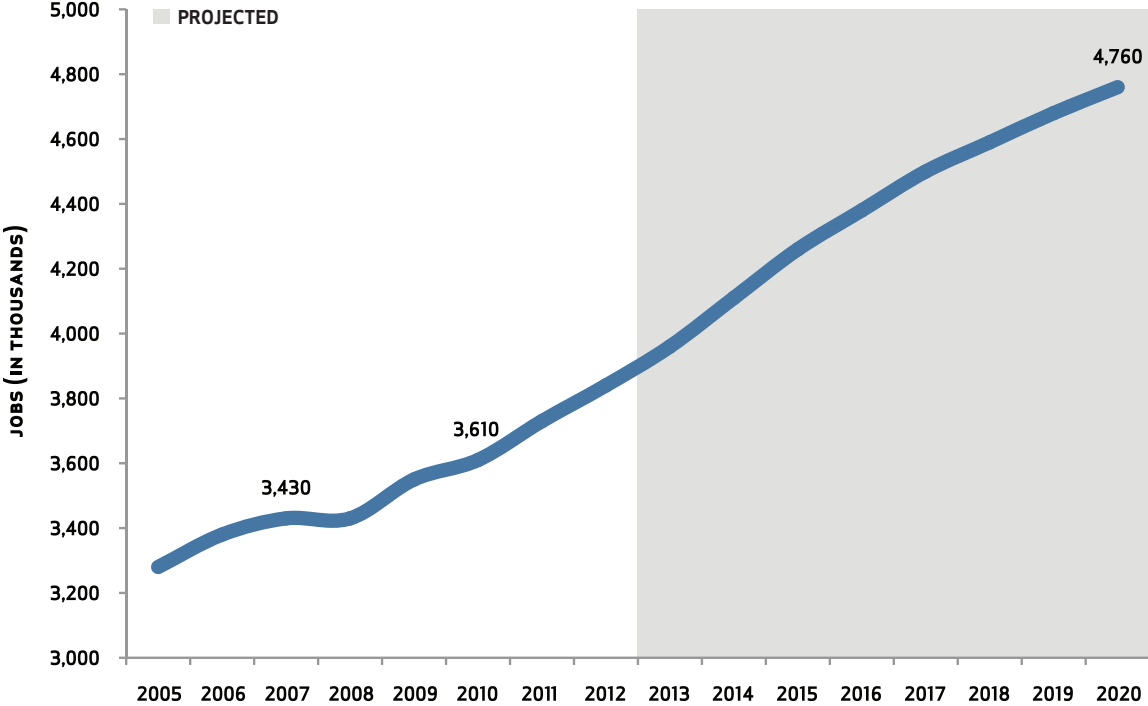
ARTS, DESIGN, ENTERTAINMENT, SPORTS, AND MEDIA



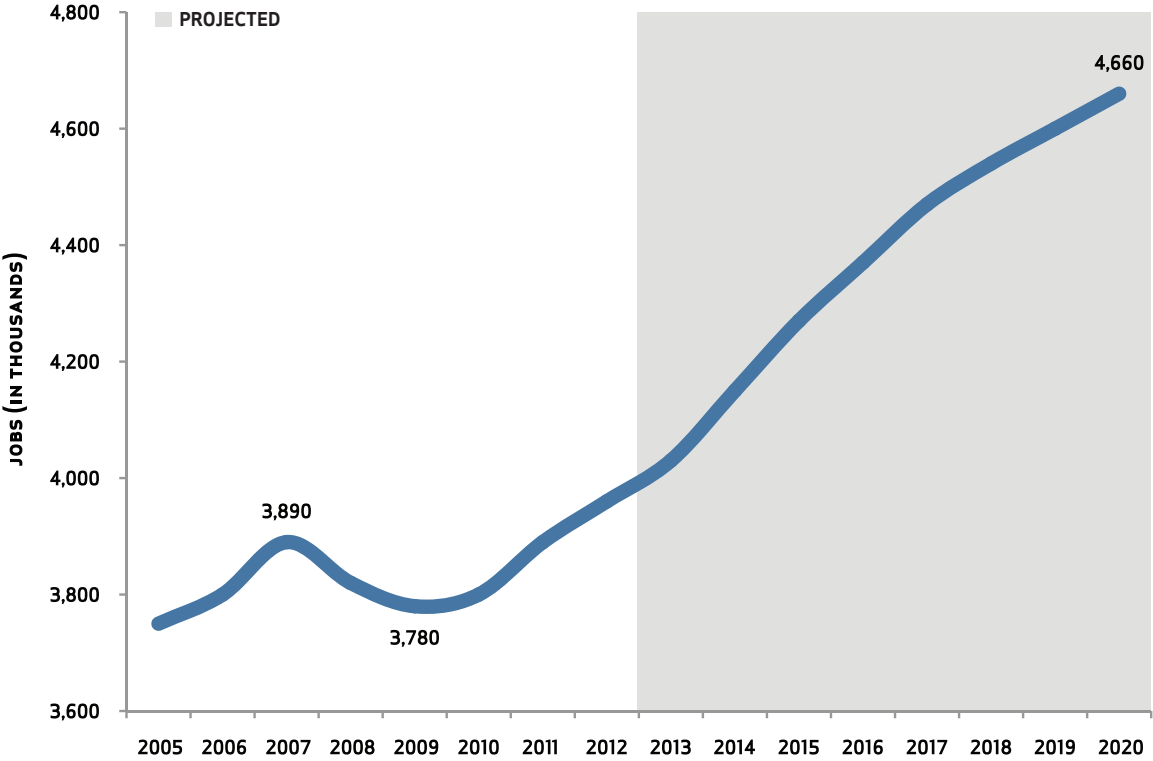
FINANCIAL SPECIALIST



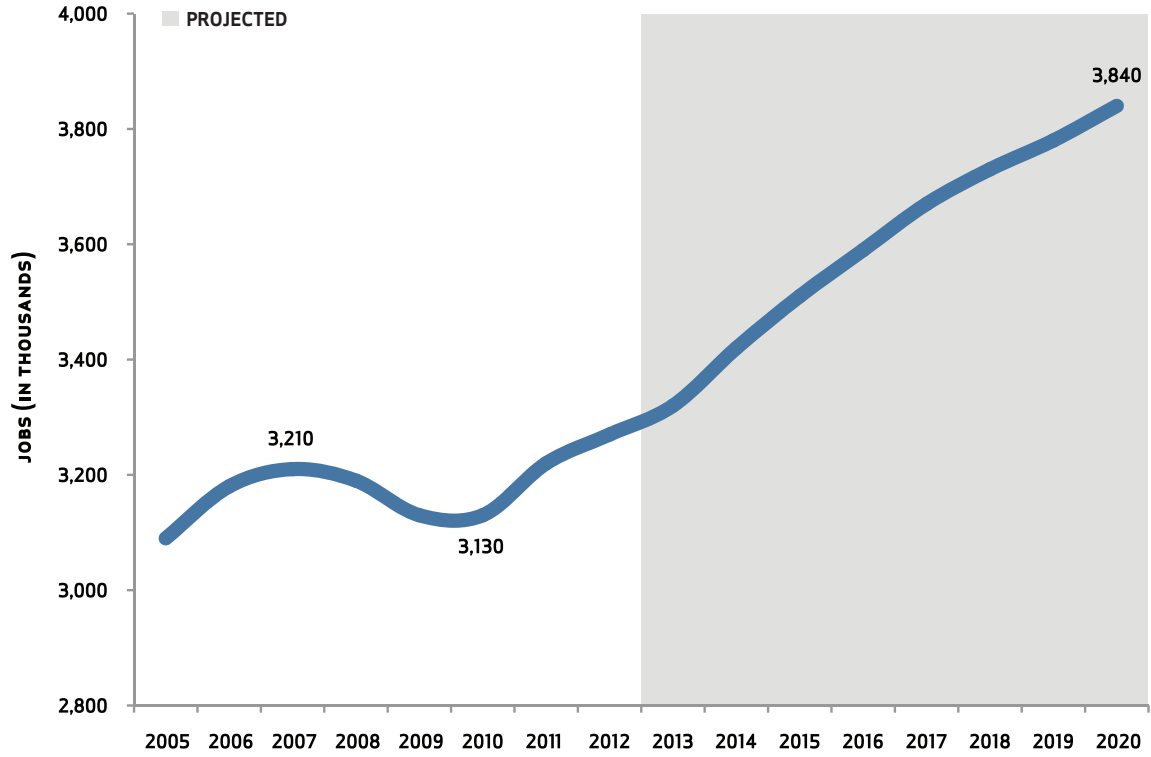
HEALTHCARE SUPPORT



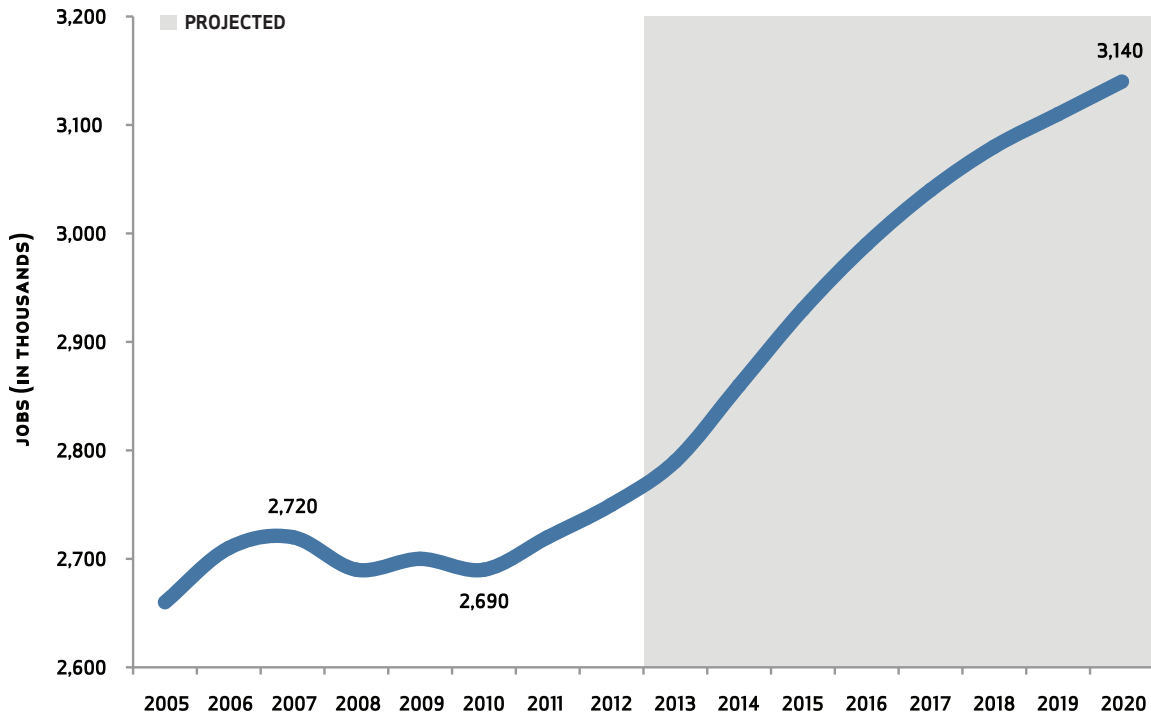
BUSINESS OPERATIONS



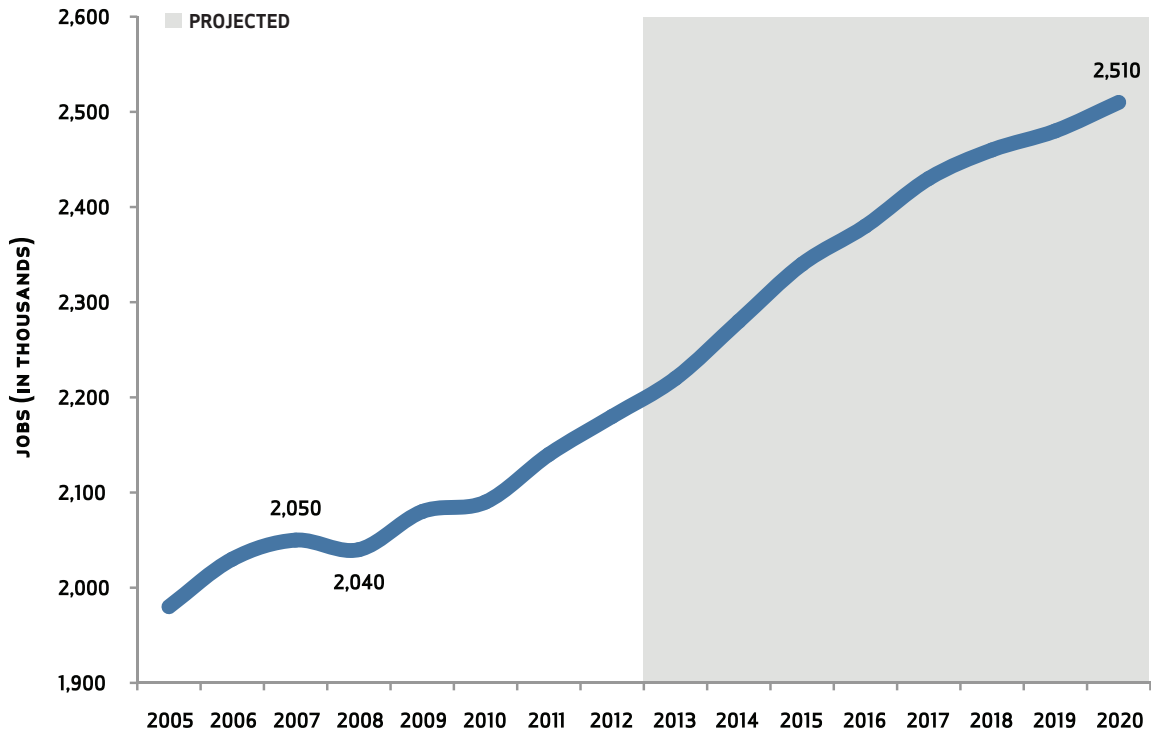
COMPUTER AND MATHEMATICAL SCIENCE



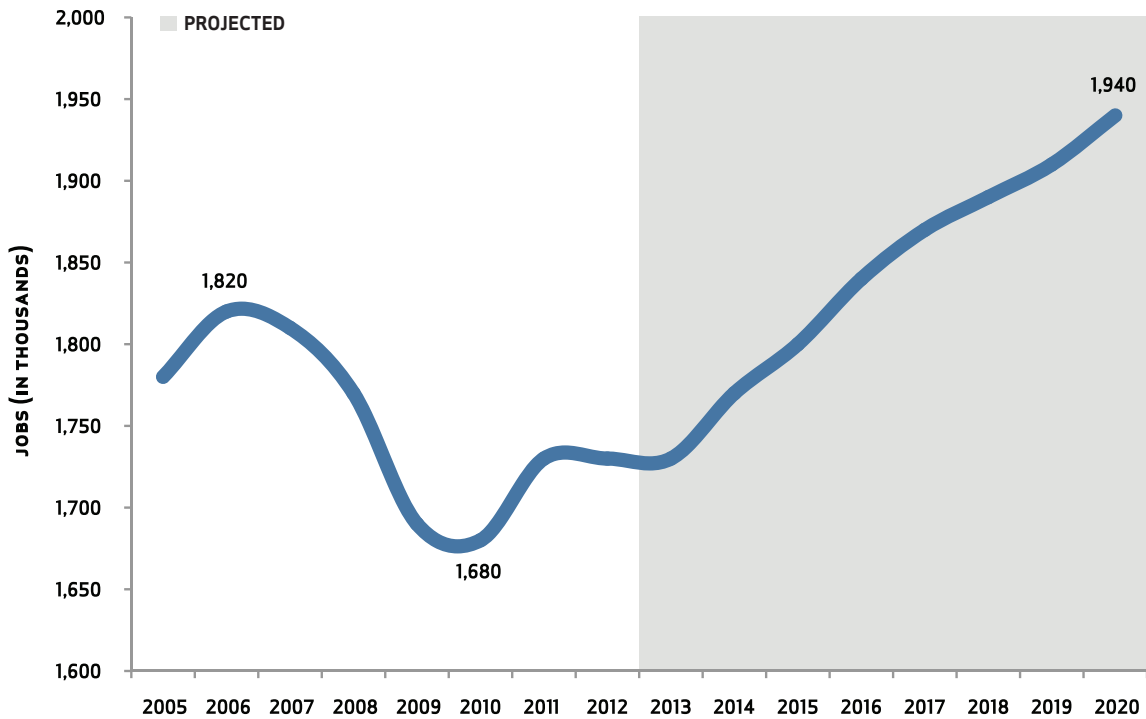
PROTECTIVE SERVICES



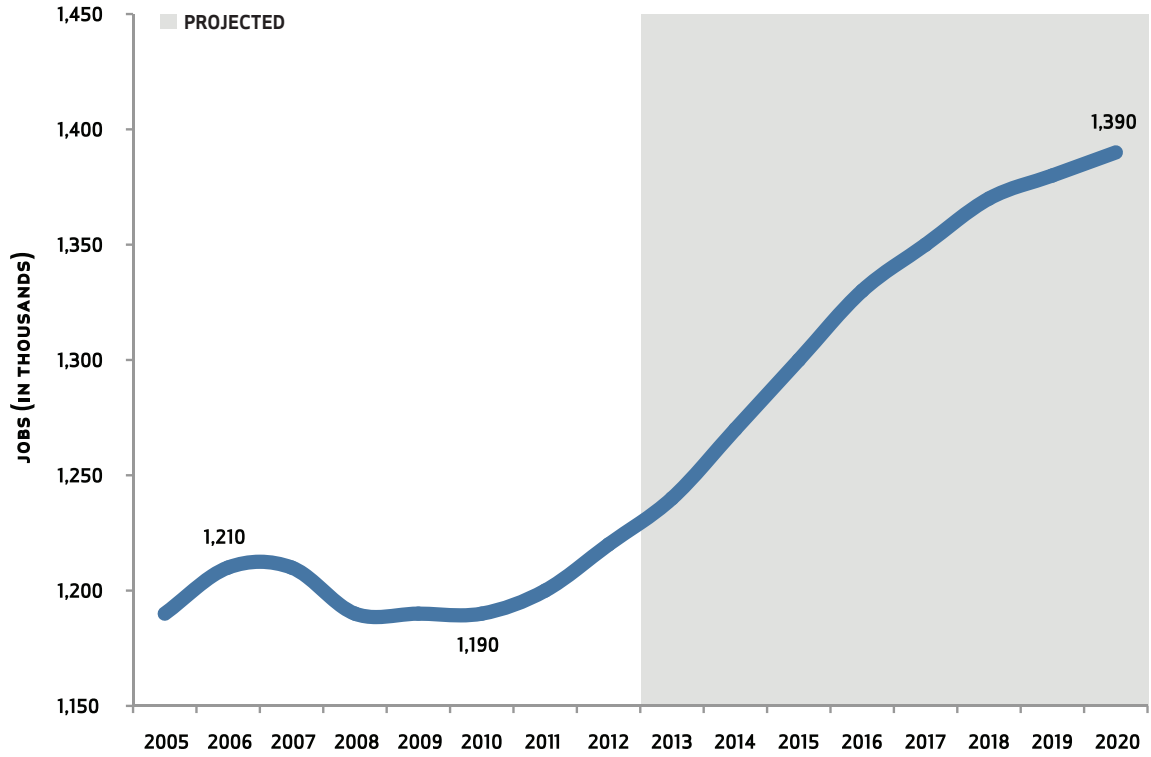
COMMUNITY AND SOCIAL SERVICES



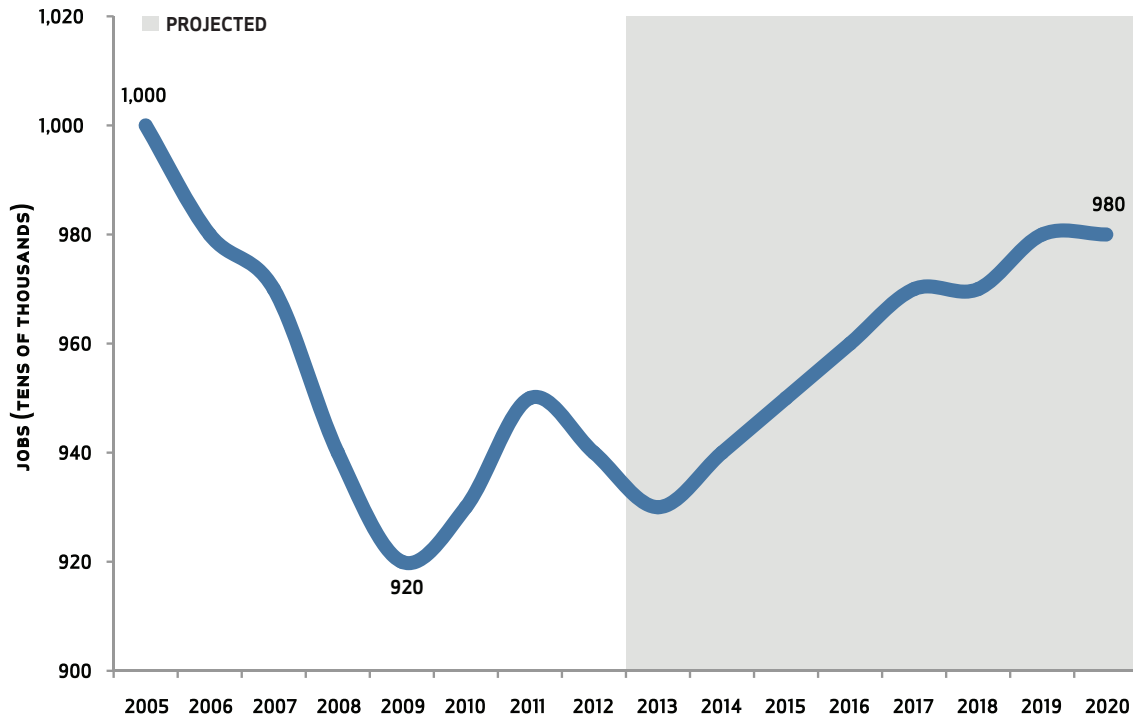
ENGINEERING



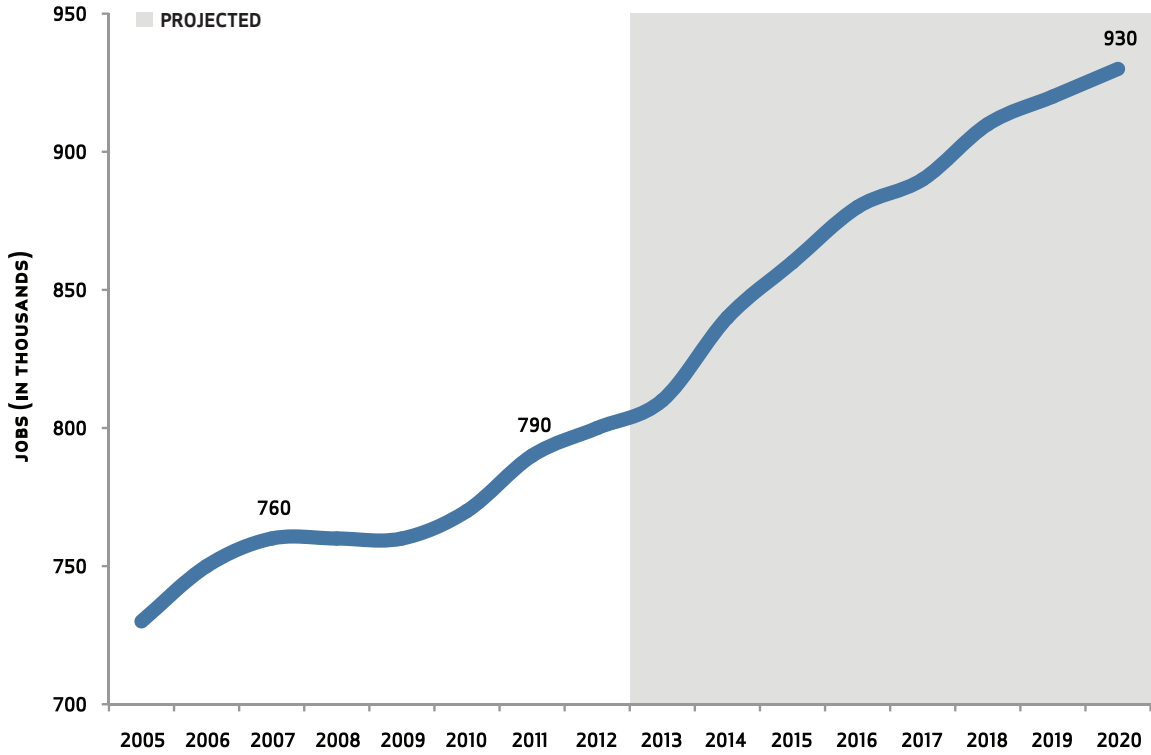
LEGAL



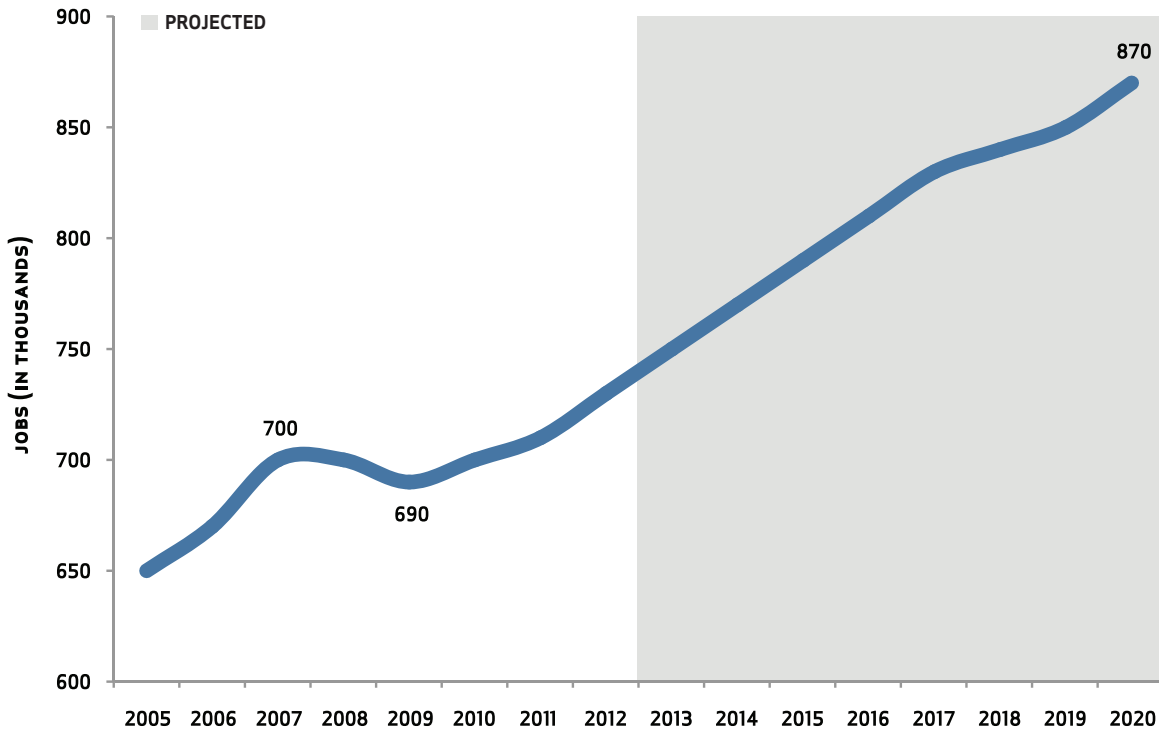
FARMING, FISHING, AND FORESTRY



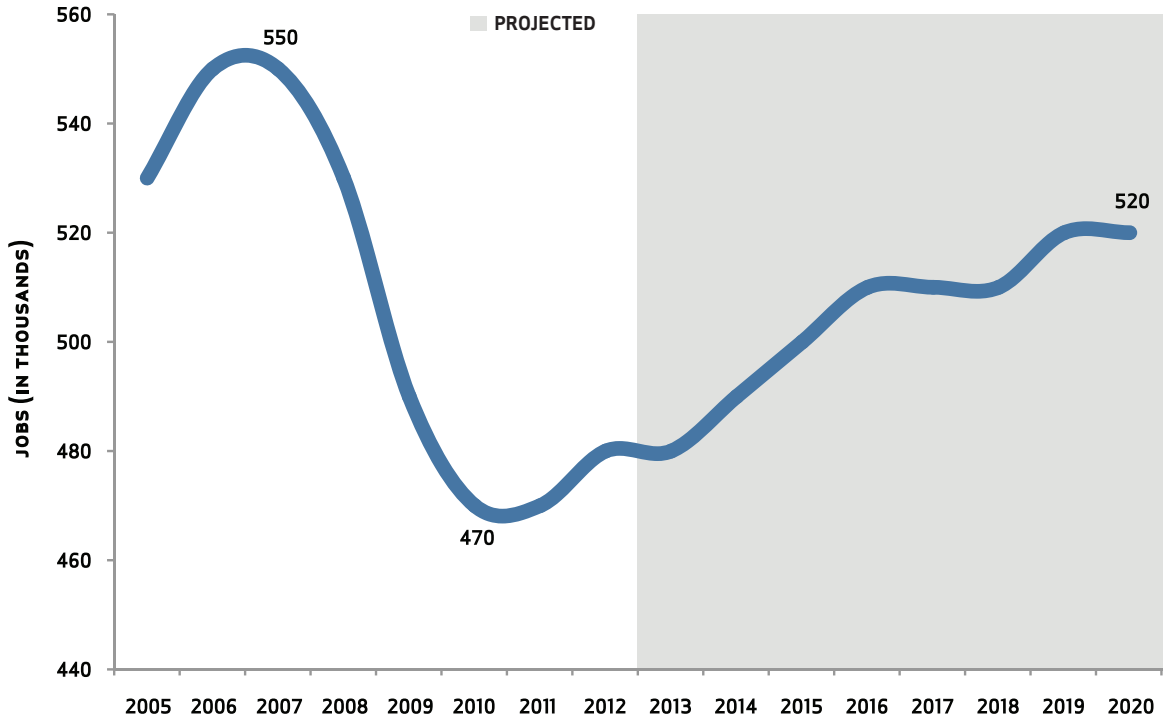
LIFE AND PHYSICAL SCIENCE



SOCIAL SCIENCE



ARCHITECT AND TECHNICAL



JOBS FORECAST BY INDUSTRY, 2005–2020

Figure 11 examines jobs in each industry through 2020. Trend lines show which ones were hardest hit during the recession. Charts appear in descending order according to the number of jobs forecast to be available.

Total job demand by industry (in thousands, for various years)

HEALTHCARE & SOCIAL ASSISTANCE

2007	Pre-recession high	15,060
2010	Increase	15,670
2020	Estimated	19,810

GOVERNMENT

2006	Pre-recession high	18,230
2008	Low	17,890
2020	Estimated	20,180

RETAIL TRADE

2006	Pre-recession high	16,030
2010	Low	14,480
2020	Estimated	15,900

MANUFACTURING

2006	Pre-recession high	12,660
2010	Low	10,070
2020	Estimated	10,490

PROFESSIONAL, SCIENTIFIC, & TECHNICAL SERVICES

2007	Pre-recession high	10,060
2010	Low	9,690
2020	Estimated	12,130

ACCOMMODATION & FOOD SERVICES

2007	Pre-recession high	10,210
2010	Low	9,840
2020	Estimated	11,570

ADMINISTRATIVE & SUPPORT, REMEDIATION, AND WASTE MANAGEMENT SERVICES

2006	Pre-recession high	9,370
2010	Low	8,330
2020	Estimated	10,930

FINANCE & INSURANCE

2007	Pre-recession high	7,420
2010	Increase	7,970
2020	Estimated	9,900

CONSTRUCTION

2006	Pre-recession high	9,860
2010	Low	7,370
2020	Estimated	8,290

**OTHER SERVICES
(EXCEPT PUBLIC ADMINISTRATION)**

2007	Pre-recession high	7,670
2010	Low	7,420
2020	Estimated	8,680

REAL ESTATE, RENTALS, AND LEASING

2007	Pre-recession high	6,540
2010	Low	6,160
2020	Estimated	7,610

TRANSPORTATION & WAREHOUSING

2007	Pre-recession high	5,610
2010	Low	5,040
2020	Estimated	5,750

WHOLESALE TRADE

2006	Pre-recession high	5,560
2010	Low	4,970
2020	Estimated	5,610

EDUCATION SERVICES

2006	Pre-recession high	3,220
2010	Increase	3,450
2020	Estimated	4,400

ARTS, ENTERTAINMENT, & RECREATION

2007	Pre-recession high	3,100
2010	Low	3,090
2020	Estimated	3,760

INFORMATION

2005	Pre-recession high	3,070
2010	Low	2,650
2020	Estimated	2,890

AGRICULTURE, FISHING, FORESTRY, & HUNTING

2005	Pre-recession high	2,990
2008	Low	2,860
2020	Estimated	2,910

MANAGEMENT

2007	Pre-recession high	1,640
2009	Increase	1,680
2020	Estimated	1,950

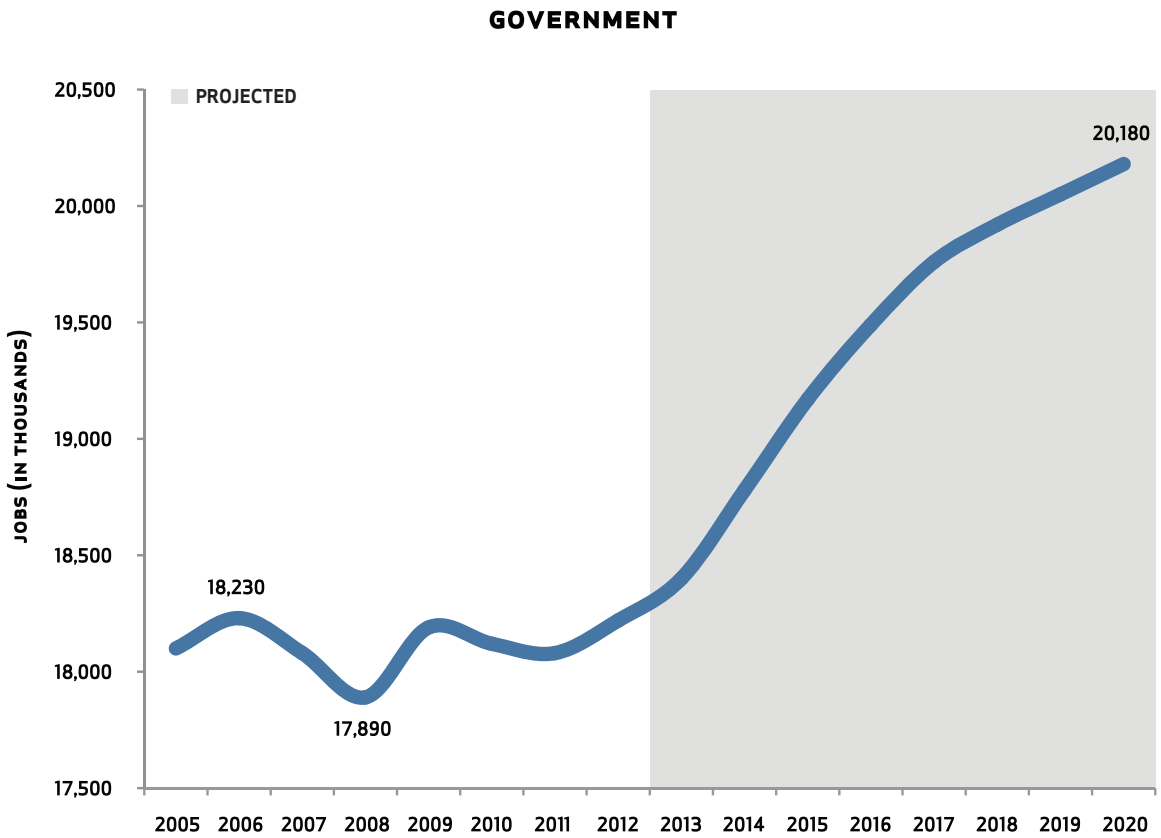
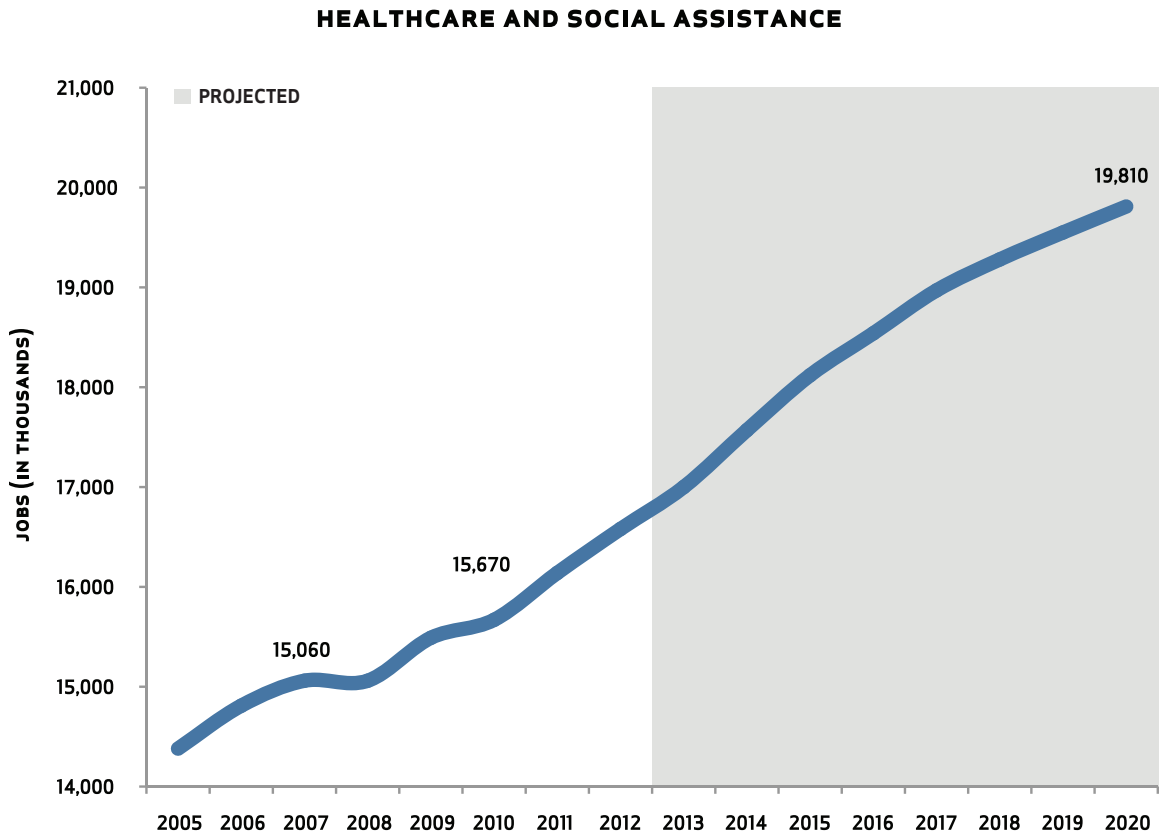
**MINING, OIL AND GAS EXTRACTION,
& QUARRYING**

2007	Pre-recession high	860
2010	Increase	980
2020	Estimated	1,350

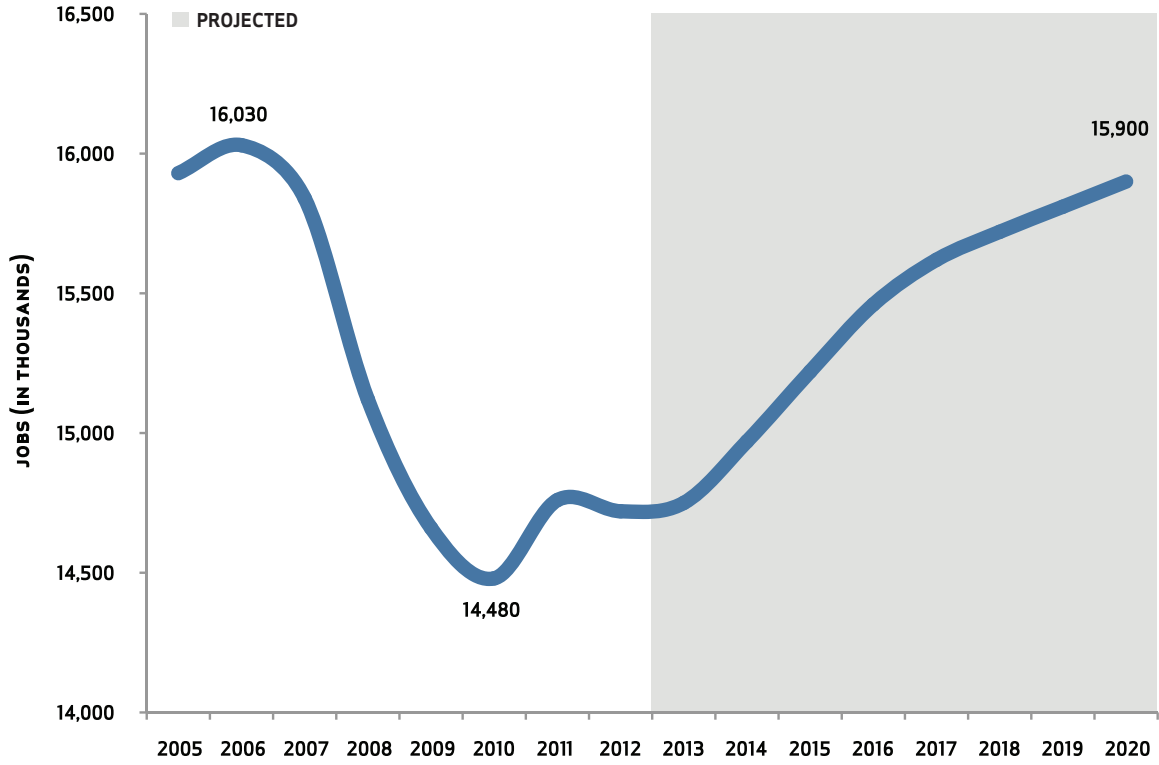
UTILITIES

2005	Pre-recession high	492
2010	Low	478
2020	Estimated	506

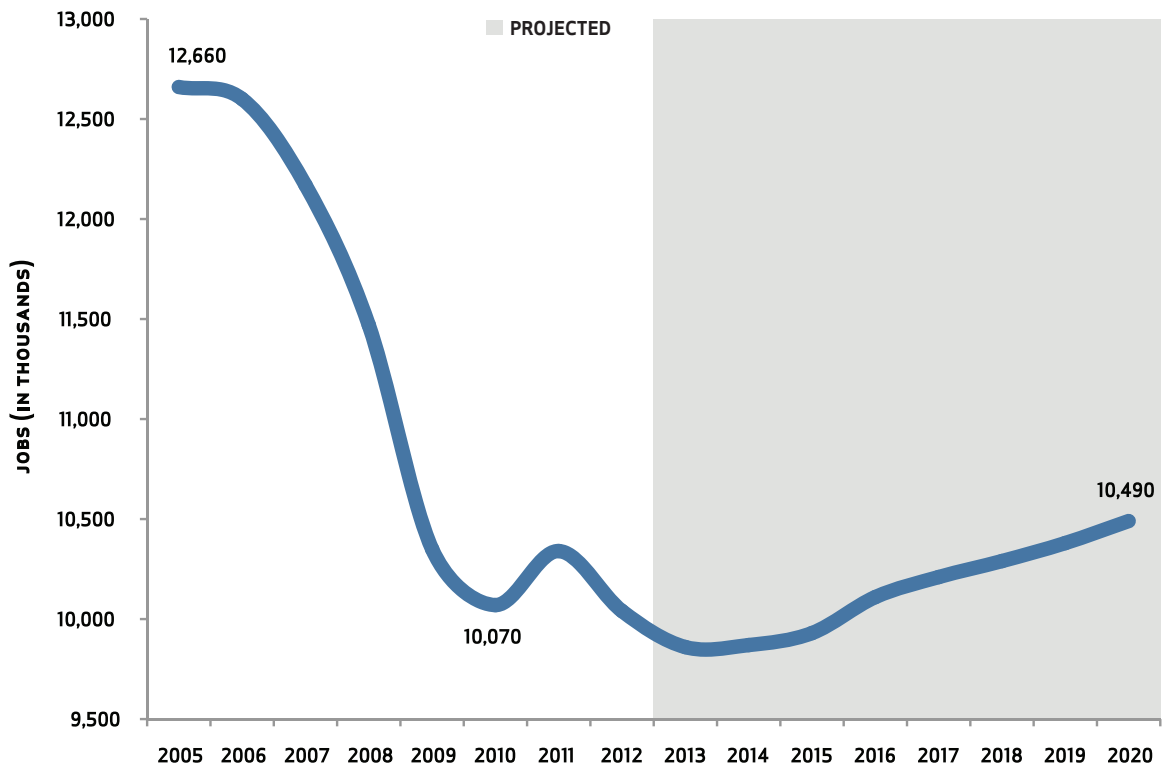
FIGURE 11: Industry 2005–2020—job growth



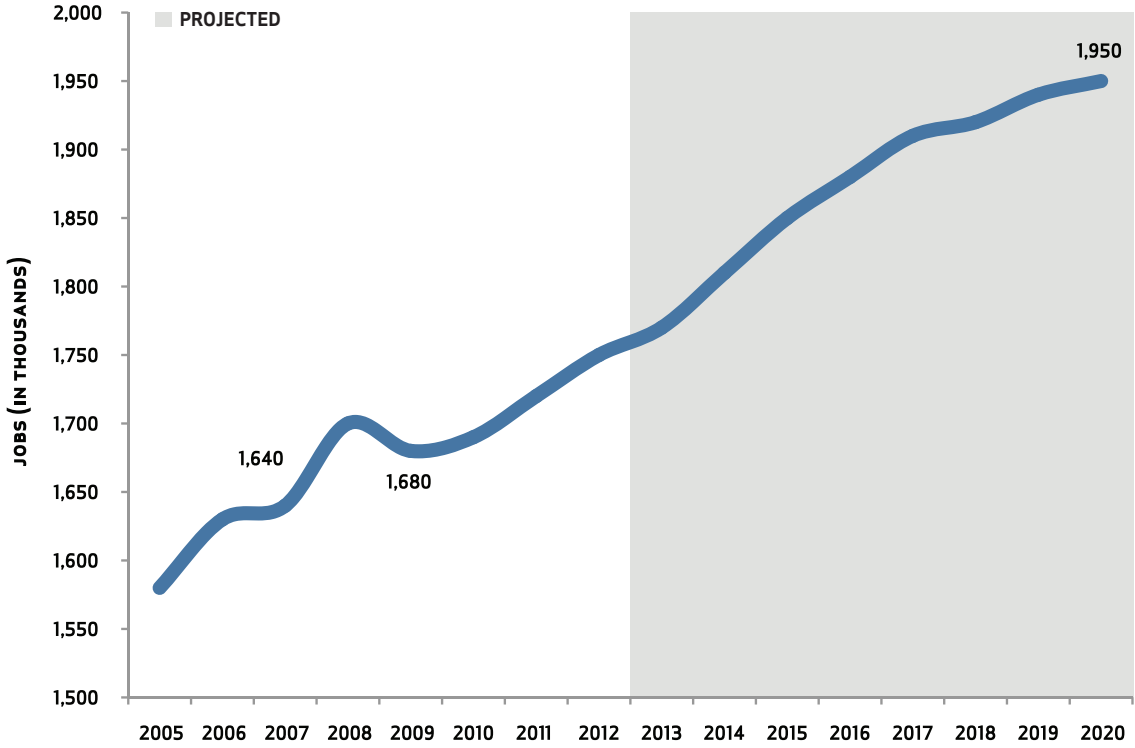
RETAIL TRADE



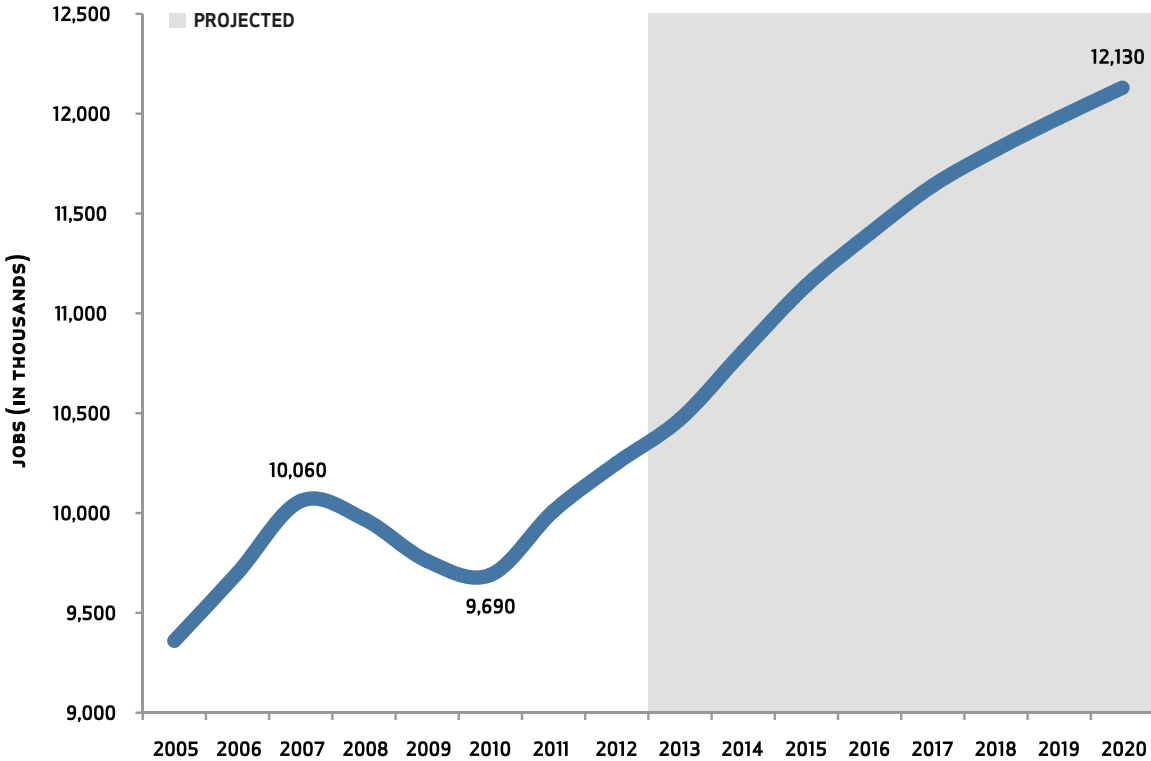
MANUFACTURING



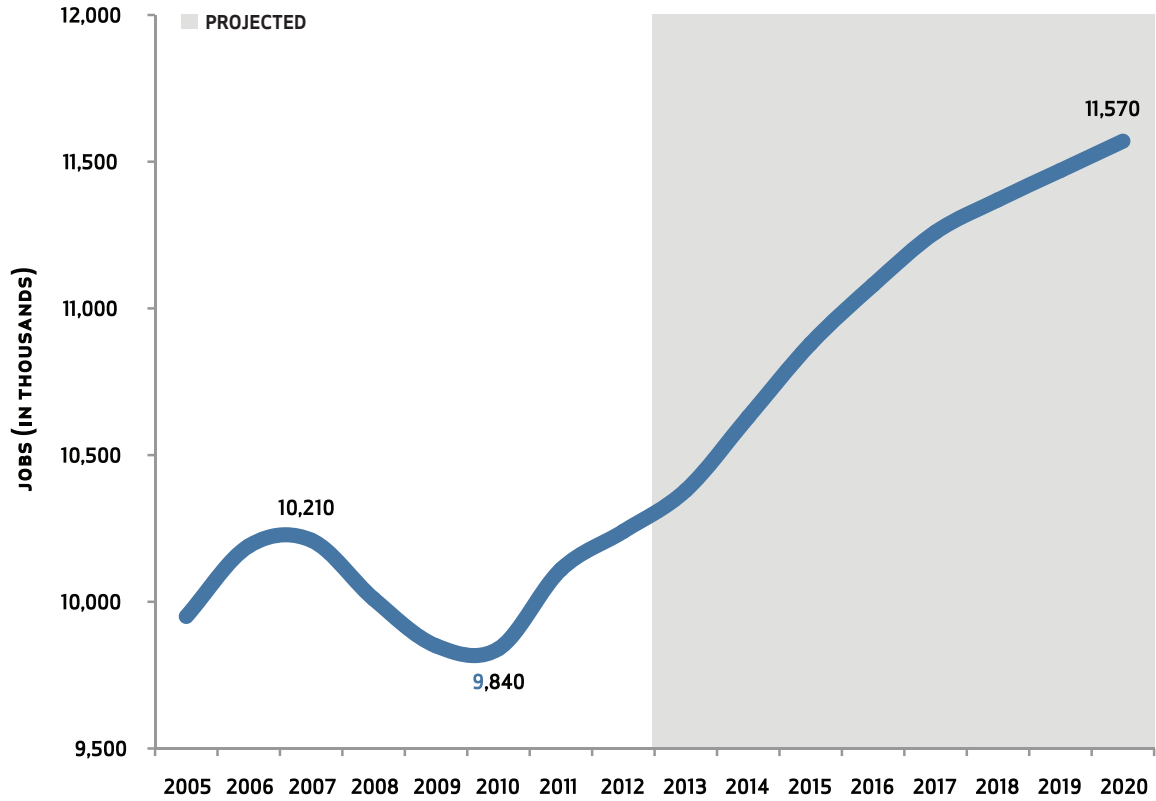
MANAGEMENT



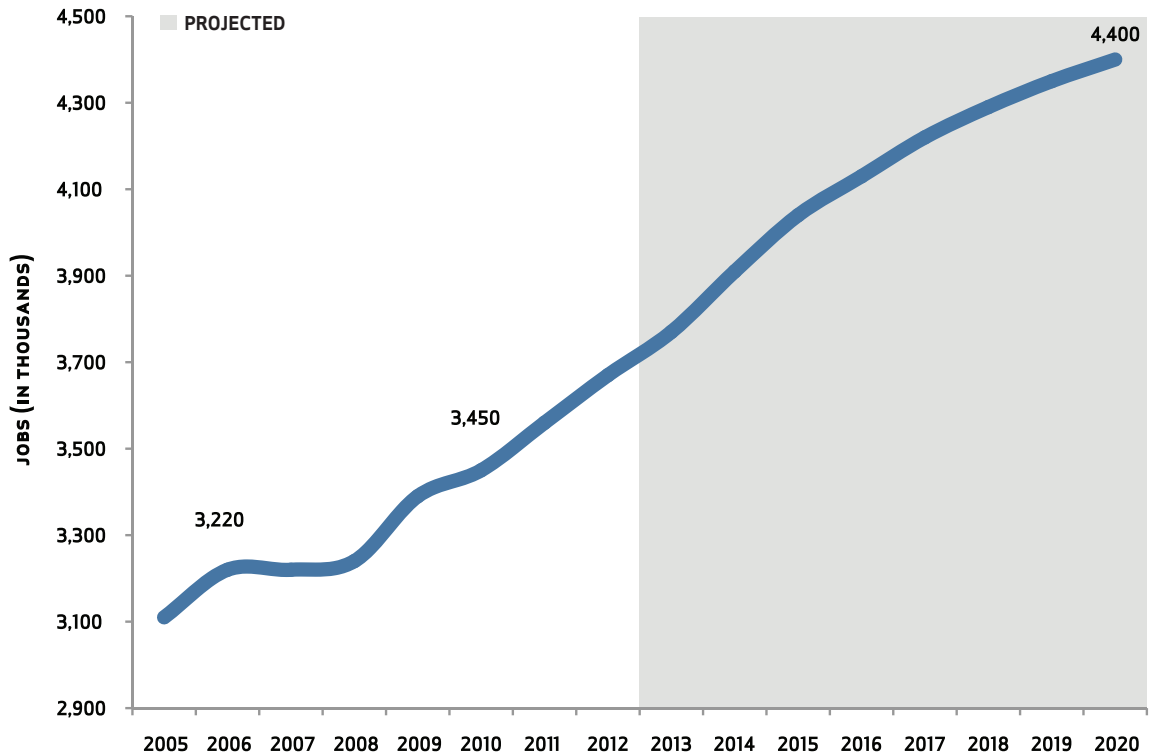
PROFESSIONAL, SCIENTIFIC, AND TECHNICAL SERVICES



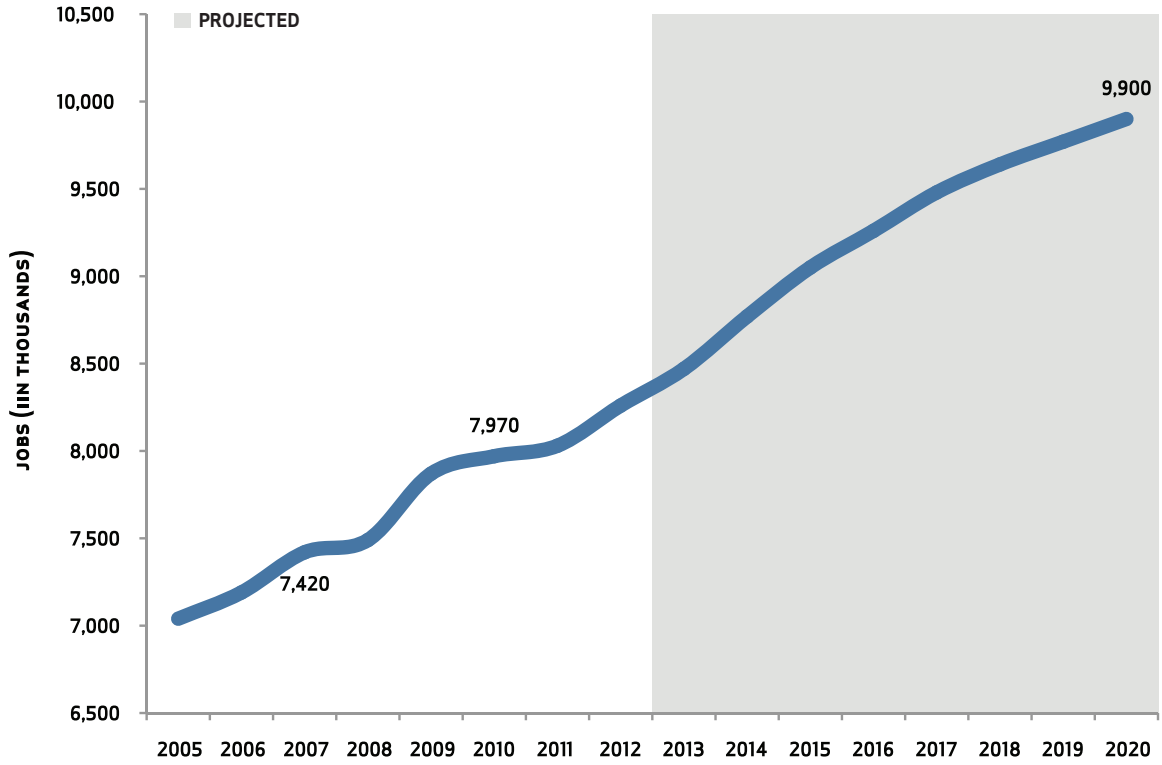
ACCOMMODATION AND FOOD SERVICES



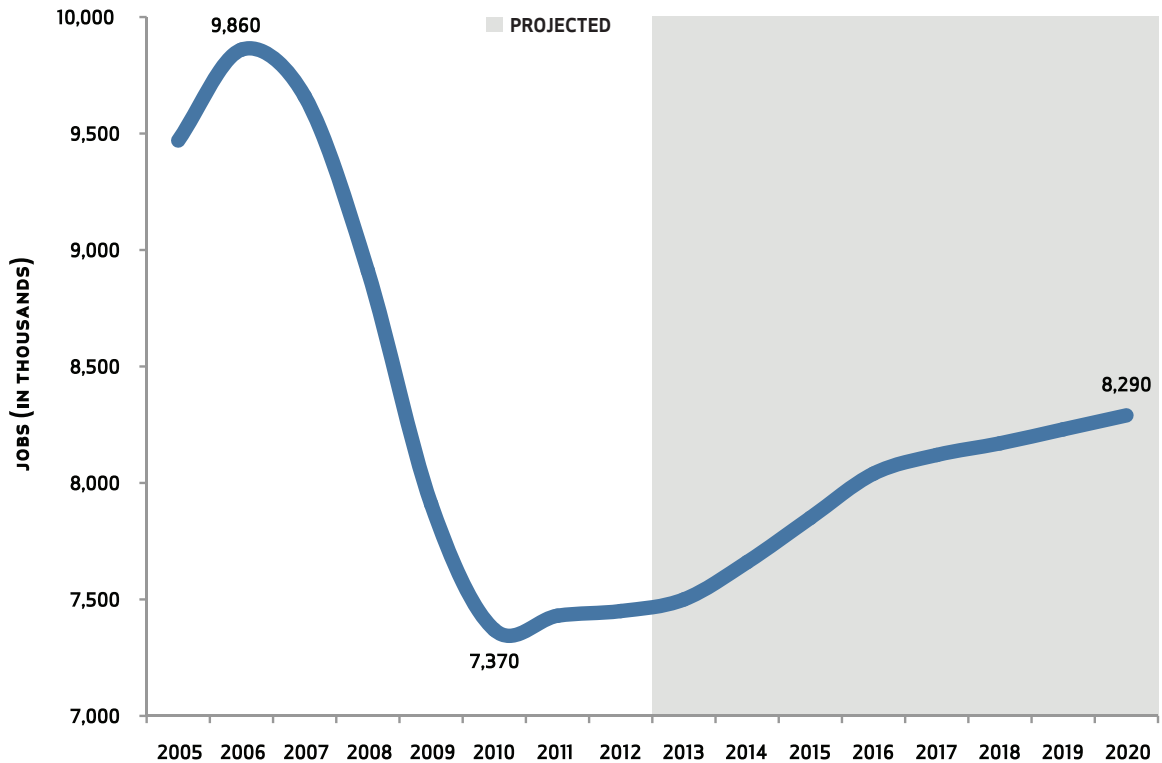
EDUCATION SERVICES



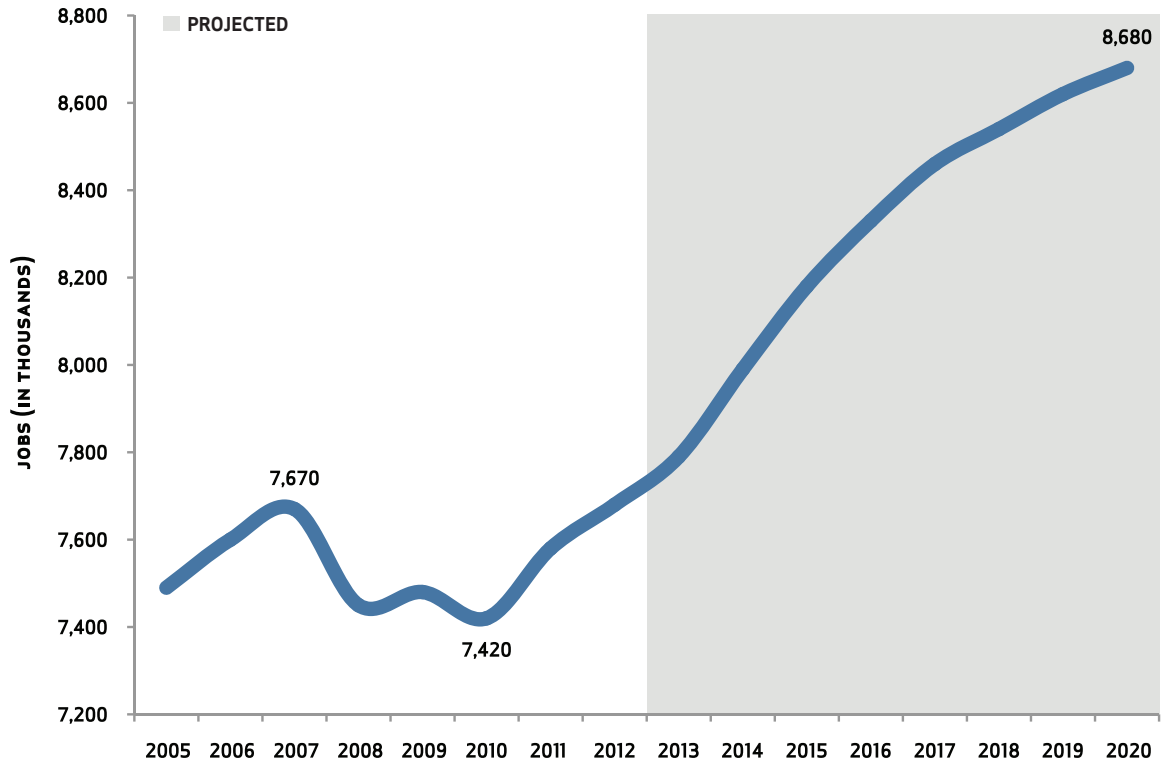
FINANCE AND INSURANCE



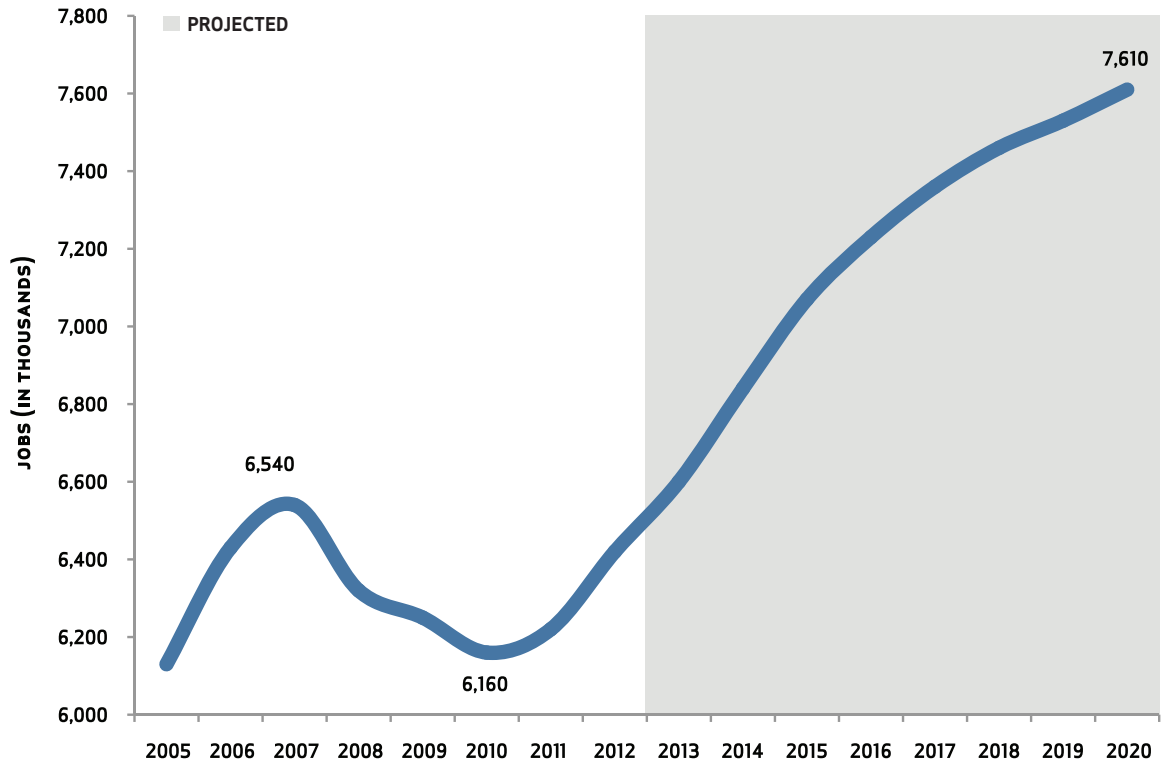
CONSTRUCTION



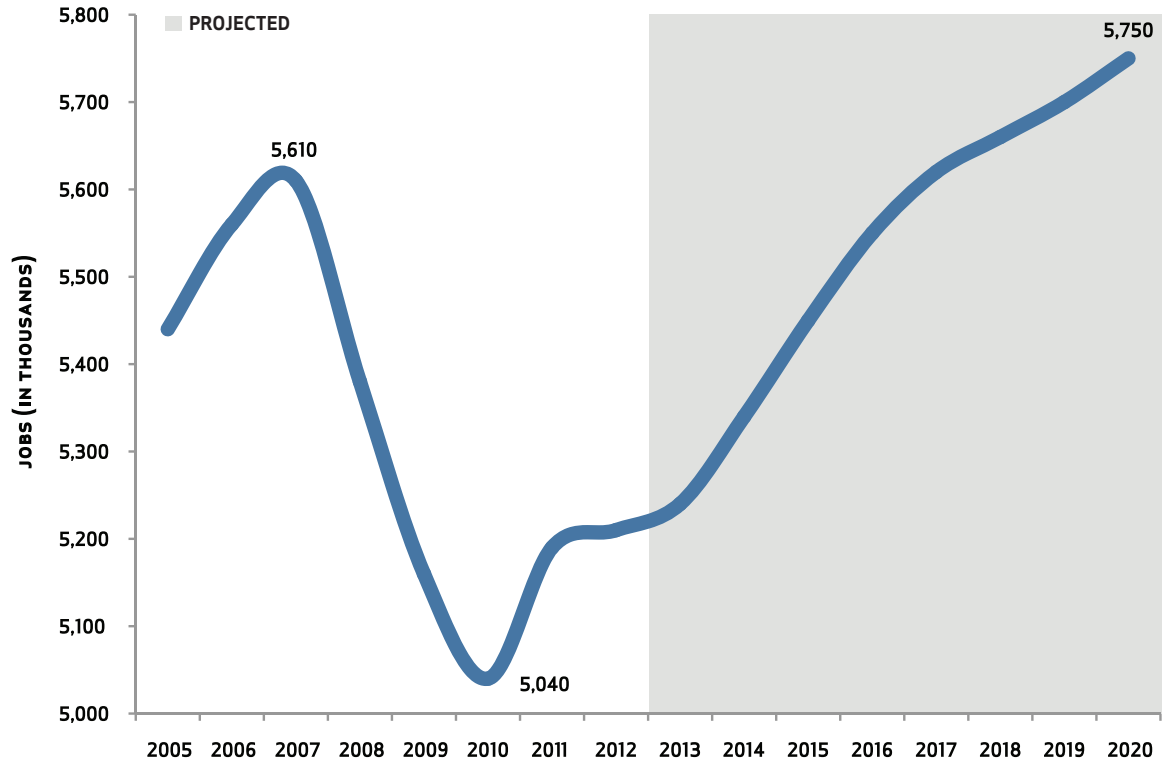
OTHER SERVICES (EXCEPT PUBLIC ADMINISTRATION)



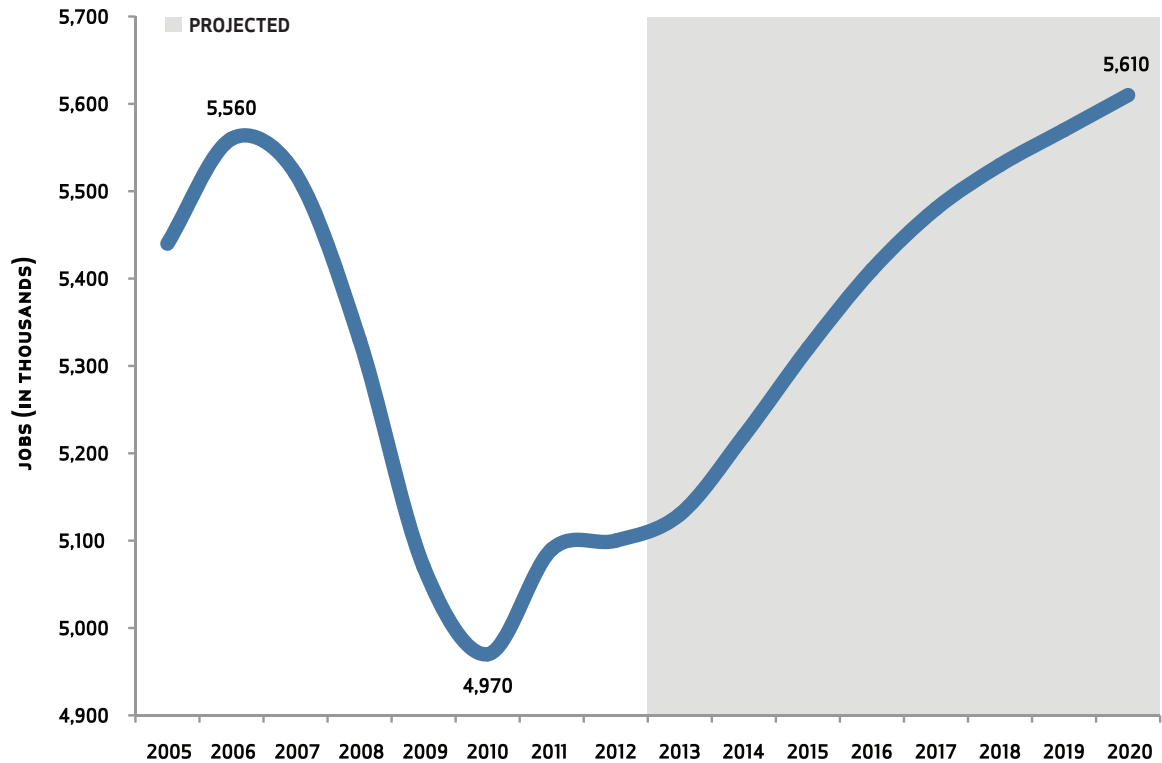
REAL ESTATE, RENTALS, AND LEASING



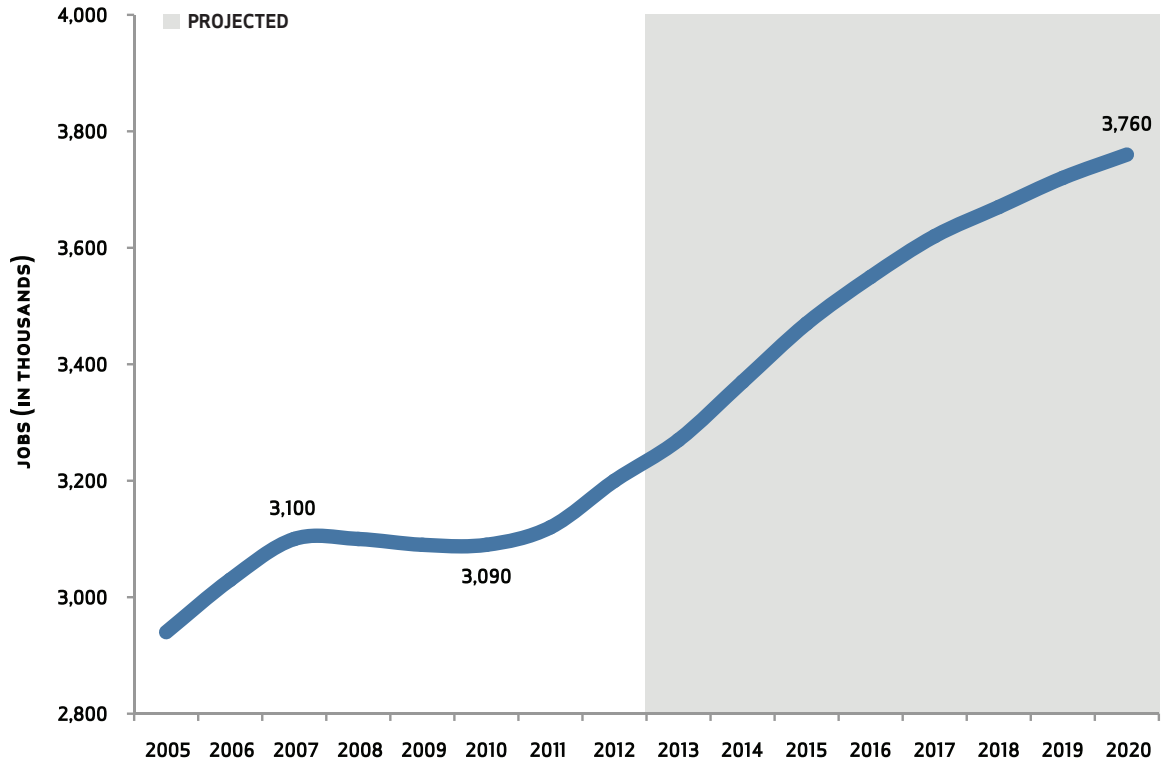
TRANSPORTATION AND WAREHOUSING



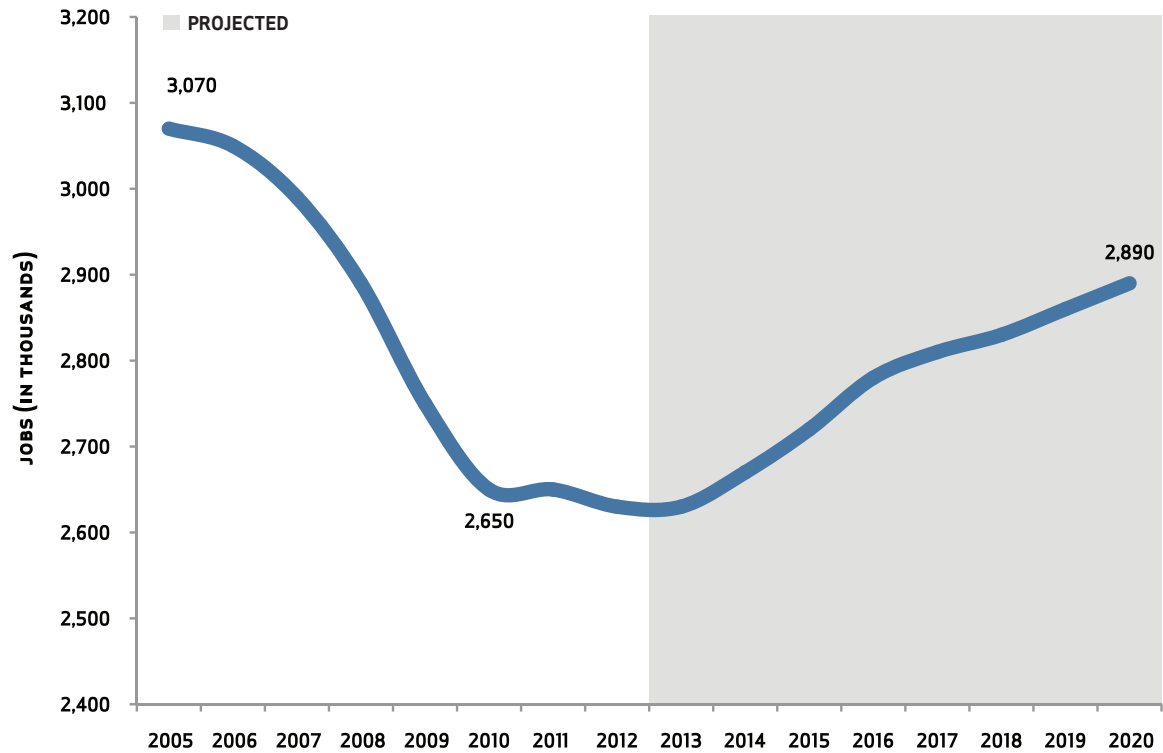
WHOLESALE TRADE



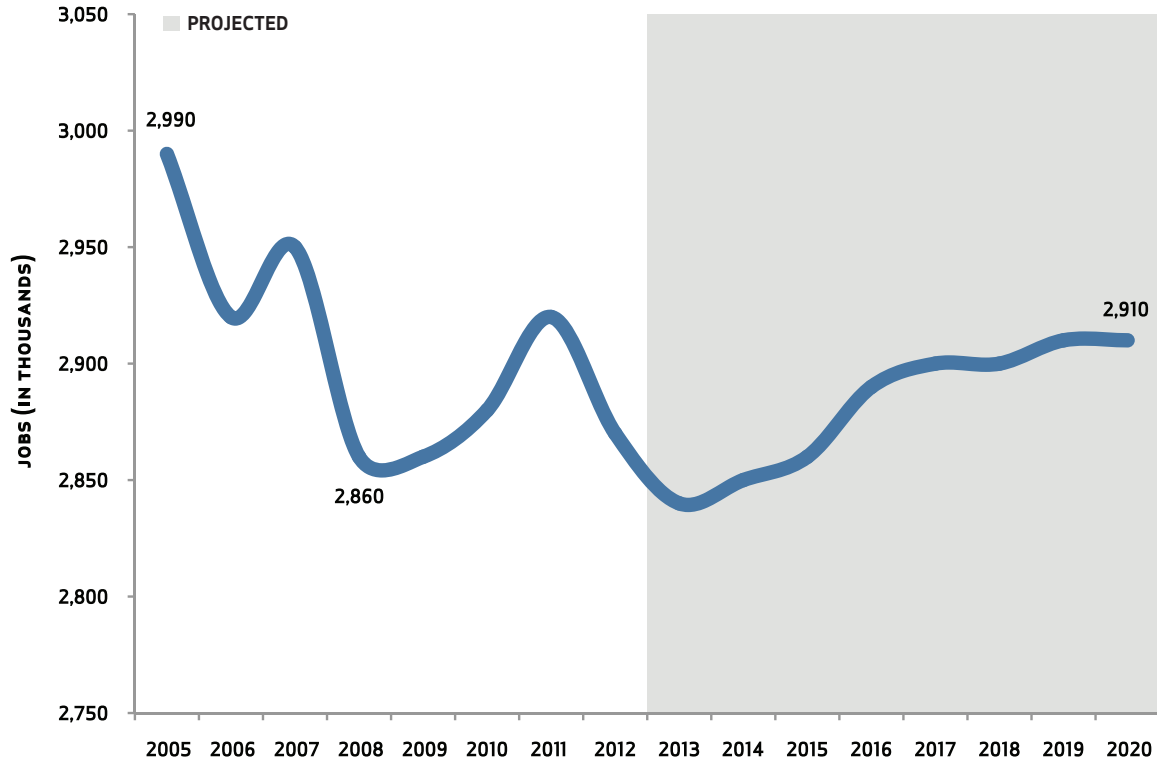
ARTS, ENTERTAINMENT, AND RECREATION



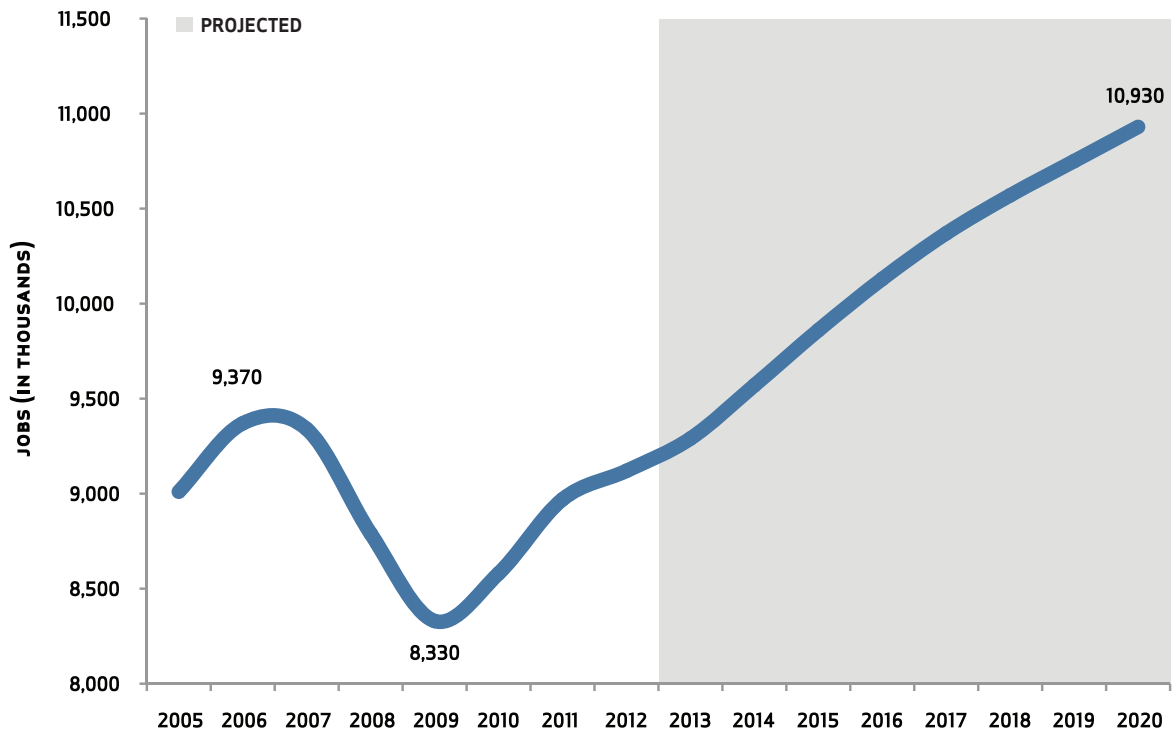
INFORMATION



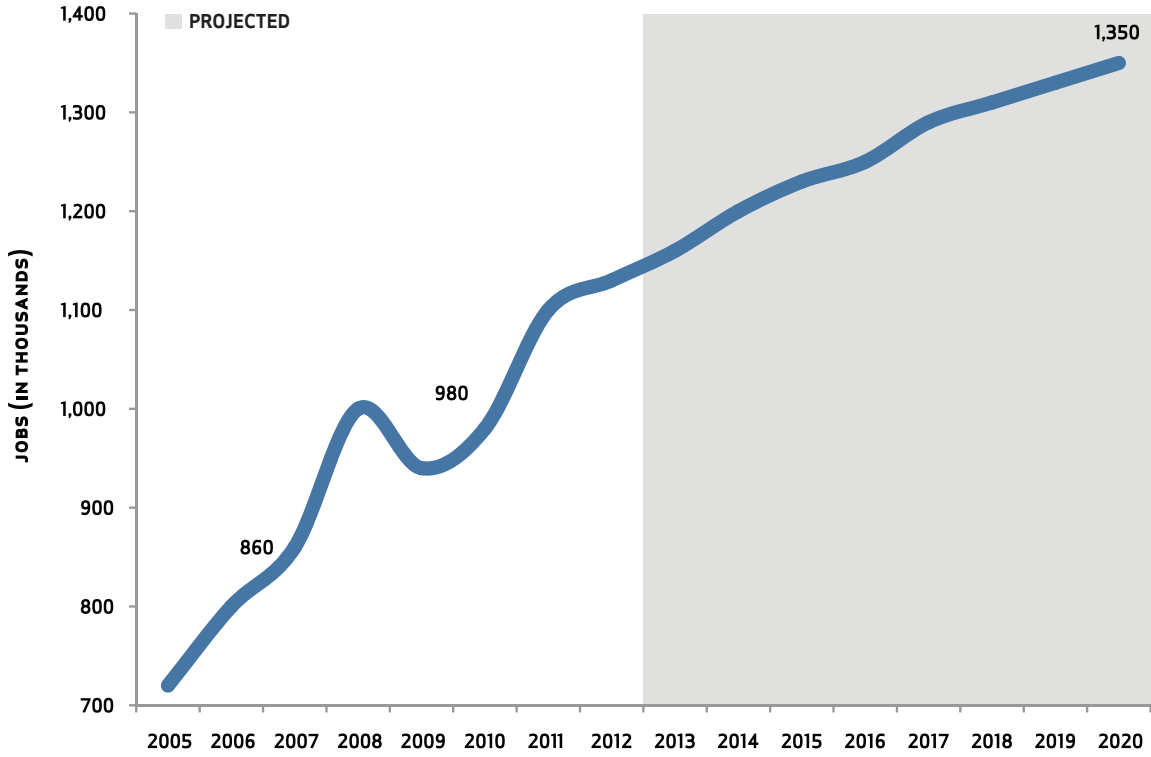
AGRICULTURE, FORESTRY, FISHING AND HUNTING



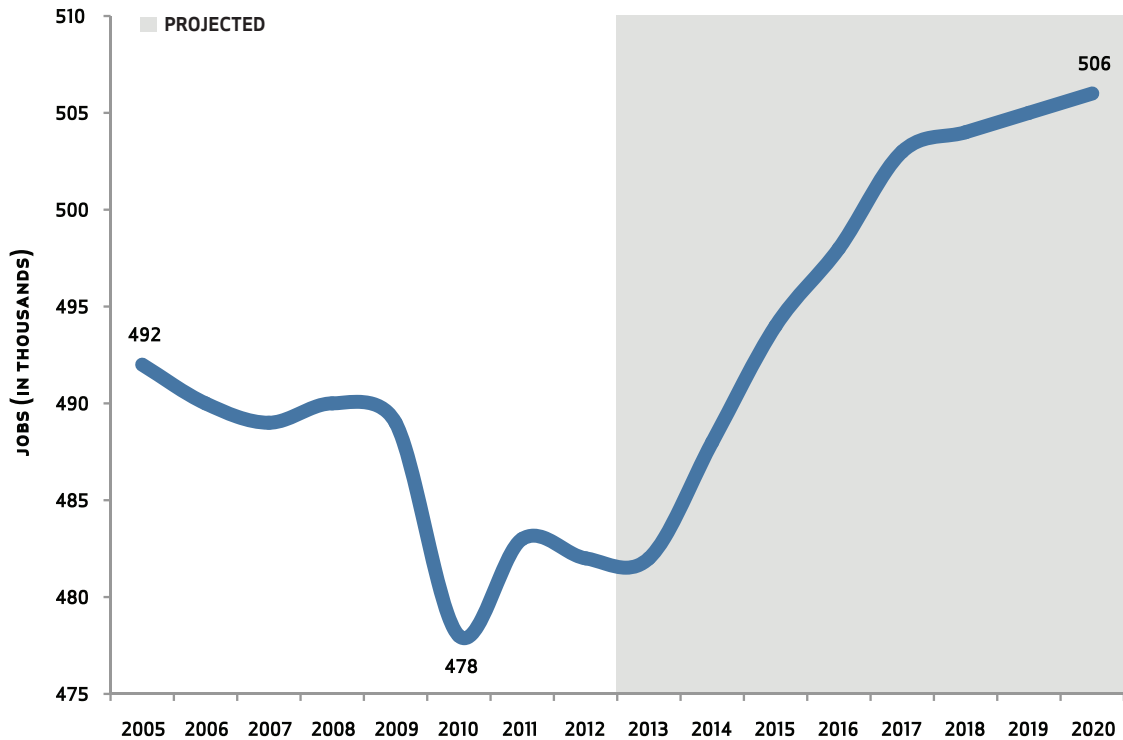
ADMINISTRATIVE AND SUPPORT, REMEDIATION, AND WASTE MANAGEMENT SERVICES



MINING, OIL AND GAS EXTRACTION, AND QUARRYING



UTILITIES



BEYOND THE FISCAL CLIFF, SEQUESTRATION AND DEBT CEILINGS

The fiscal cliff, sequestration, debt ceiling, domestic fiscal and monetary policy decisions and international shocks are just a few of the myriad of events that could possibly affect the outcome of projections analysis. For the most part, economic projections are only as good as the assumptions upon which they are based, and temporary variations in economic policy can have ripple effects on growth, output and employment. Notwithstanding short-term economic fluctuations, however, the economy is assumed to return to its long-run growth path, particularly since the forecast horizon extends through 2020.

One major concern for the projections analysis in this report is the impact of these events on GDP growth and the unemployment rate. For example, had we gone off the fiscal cliff at the end of 2012, GDP would have contracted by an estimated 4.25 percent while the unemployment rate would have risen quickly to 8.5 percent.

With the fiscal cliff averted, taxation negotiations are no longer in play. Sequestration, in turn, has had an immediate impact on spending and jobs. Of the estimated 746,222 jobs lost by 2014 due to sequestration of federal spending over 70 percent of those jobs lost will be for workers with postsecondary education and training. This translates into 129,000 jobs lost for people with some college or a postsecondary vocational certificate; 86,000 jobs lost for those with an associate's degree; 207,000 jobs lost for bachelor's degree-holders and 99,000 jobs for those with graduate degrees.

Many of the jobs lost between 2013 and 2014 will also come from the professional & business services industries, education, and administrative support services. Job losses in these labor-intensive sectors promise to add increased pressure on already strapped resources.

The most educated will also be hard hit. Forty percent of all jobs lost to the sequester will be for people with a bachelor's degree or better. This is because government employees, (federal, state, and local) tend to be very well educated. Close to 50 percent of them have a bachelor's degree or higher compared to 31 percent for the private sector. Moreover, these workers tend to be relatively older than for the nation as a whole, which leads us to two observations:

- The more educated workforce bearing the brunt of sequestration is better equipped to find alternative employment, given that bachelor-degreed workers are three times less likely to be unemployed than high school dropouts, and
- The more educated older workers have previously weathered the storm of the Great Recession and have a reduced ability to rely on pensions, 401(k)s and Social Security as a safety net.

But the sequestration debate also precedes yet another debt-ceiling decision. The country's ability to borrow is restricted by statute, and as of December 2012, the federal government reached its borrowing capacity of \$16.39 trillion. The debt limit now requires congressional approval to increase the borrowing cap so that the government can continue to finance its operations. If the ceiling is not raised, then the government must take measures to stave off a default—federal spending would have to fall and/or taxes would have to rise. Military salaries, Social Security and unemployment benefits are at risk. Bernanke has described a U.S. default as a “recovery-ending event” that could reignite another financial crisis and further cut jobs as the Great Recession did.

Either of these measures independently or combined leads to uncertainty, GDP decline and job losses—and can further contribute to a slower more painful recovery in the long run.

APPENDIX 1

BLS Education and Training Brief

BLS education and training requirements for occupations as part of their projections methodology remain somewhat vague. Based on comparisons with actual survey data (ACS and CPS), the BLS often assigns disproportional career pathways, particularly for those with relatively lower education levels. In this appendix, we demonstrate the extent of the disparities.

TABLE 1 : Share of current employment by educational attainment vs. BLS suggested education required for entry

		Share of current employment (%)						
		Less than high school	High school diploma	Some college/ no degree	Associate's degree	Bachelor's degree	Master's degree	PhD or professional
Typical education for entry	Less than high school	27	42	18	5	6	1	0
	High school diploma	13	37	25	9	13	3	1
	Some college/no degree	4	21	27	11	29	7	1
	Postsecondary/no degree	7	31	31	14	14	2	1
	Associate's degree	3	18	26	25	23	4	2
	Bachelor's degree	1	8	14	7	42	21	7
	Master's degree	1	4	7	5	27	41	16
	PhD or professional degree	0	1	3	2	15	15	63

■ We use green shading when the largest share of jobs requires the same education level that the BLS typically requires for entry.

■ We use yellow shading when the largest share of jobs requires the same education level that the BLS typically requires for entry.

Source : Center on Education and the Workforce analysis of Current Population (CPS) and Bureau of Labor Statistics (BLS) data, 2008, 2010. Row percentages may not sum up to 100 percent due to rounding.

TABLE 1: SHARE OF CURRENT EMPLOYMENT BY EDUCATIONAL ATTAINMENT VS. BLS SUGGESTED EDUCATION REQUIRED FOR ENTRY

Table 1 compares the BLS suggested education required for an entry-level position and the actual education-levels held by workers in those occupations, as seen in the Census data. For the typical job requiring less than high school, 27 percent are high school dropouts, but 42 percent have high school diplomas. Thus, over 70 percent of occupations suited for those with less than a high school diploma, according to the BLS, are in fact held by higher-educated workers. Further, these workers are paid a wage premium—more than their high school colleagues are paid for the same position—suggesting that higher educated workers in these jobs cannot simply be designated as over-qualified. Rather postsecondary education conditions the occupation and adds value to the way tasks are performed. For this reason, employers willing to pay a wage premium reflect the increasing marginal productivity of labor with postsecondary education.

On the other hand, occupations requiring relatively higher-education, particularly those requiring a Bachelor's degree or better, tend to demonstrate the greatest amount of consistency between BLS assignments and survey data. That is, those entering the labor force with higher educational attainment end up working alongside similarly educated colleagues. In other words, far fewer lower-educated workers hold a significant share of employment in occupations that typically require a PhD or a professional degree for job market entry. This is not true for lower-skilled positions, however. Similarly, those with some college/ no degree see their respective share of employment (27%) sandwiched between college graduates (29%) share and high school graduates (21%). The “high school for entry” assignment is consistent as reflected by the dominant share of high-school graduate employment (37%), but nearly half of workers in these jobs are better educated.

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TABLE 2: AVERAGE EDUCATION DISTRIBUTION WITHIN EACH BLS EDUCATION AND TRAINING CATEGORY

Table 2 demonstrates similar consistency when it comes to higher-educated career paths. On average, occupations that are deemed to require a Bachelor's or better in fact employ a majority share of such workers. It can also be seen that jobs demanding on-the-job training are predominantly taken by workers with less than a college degree. For example, over half of workers employed in occupations that rely on medium-term on-the-job-training have no more than a high school degree.

SUGGESTED “ON-THE-JOB TRAINING” AND “EDUCATION FOR ENTRY” USED BY THE BLS ARE:

- *Internship/residency*: preparation in a field such as medicine or teaching. This training is conducted under supervision in a professional setting, such as a hospital or classroom. Completion is mandatory for state licensure or certification in many fields including medicine, counseling, architecture, and teaching.
- *Apprenticeship*: formal relationship between a worker and sponsor. The apprenticeship combines on-the-job training and occupation-specific technical instruction, during which the worker learns the practical and theoretical aspects of an occupation. Completion typically requires 144 hours of technical instruction and 2,000 hours on-the-job training per year for three to five years.
- *Long-term on-the-job training*: more than 12 months of training or combined work experience and formal class instruction needed to attain competency. This training does not include apprenticeships.

TABLE 2: Average education distribution within each BLS education and training category.

	Less than high school	High school diploma	Some college/ no degree	Associate's degree	Bachelor's degree	Master's degree	PhD or professional degree
PhD or professional degree	0.2	1.2	3.1	2.2	14.8	15.1	63.4
Master's degree	0.6	3.6	7.2	4.6	27	41.4	15.5
Bachelor's degree or better, with work experience	1.3	8.2	15.1	6.5	39.2	20.2	9.6
Bachelor's degree	1.2	7.8	13.2	7.3	43.2	21.0	6.3
Associate's degree	2.6	17.6	25.9	25.3	22.8	4.2	1.6
Postsecondary vocational training	6.8	30.7	31	14.3	13.9	2.3	1.0
Work experience in a related occupation	10.4	27.4	20.9	8.9	19.5	8.2	4.7
Long-term, on-the-job-training	9.4	30.8	25.8	10.7	17.7	4.4	1.0
Moderate-term, on-the-job-training	14.1	37	23.1	8.1	13.1	3.0	1.6
Short-term, on-the-job-training	17.0	36.3	23.4	8.0	11.8	2.3	1.2

Source : Center on Education and the Workforce analysis of Current Population (CPS) and Bureau of Labor Statistics (BLS) data, 2008, 2010

TABLE 3: Comparison of BLS education and training requirements and education among employed workers in 2008, and 2010.

* Note: In this particular case, the column variables are mutually exclusive.

	BLS 2008		Labor Market		BLS 2010 ^a		Labor Market ^b	
	Education level (%)	Jobs in the economy ('000)	Education level (%)	Jobs in the economy ('000)	Education level (%)	Jobs in the economy ('000) ^c	Education level (%)	Jobs in the economy ('000) ^c
Total, all occupations	100	150,932	100	144,462	100	143,068	100	140,600
Postsecondary education ^d	25.1	37,884	57	82,340	25.2	36,053	59	82,950
First professional degree	1.3	2,001	2	2,890			2	2,810
PhD or professional degree	1.4	2,085	1	1,140	2.1	3,052	1	1,410
Master's degree	1.7	2,531	7	10,110	2.9	4,197	8	11,250
Bachelor's degree or better, with work experience	4.3	6,516	Unavailable	Unavailable	5.1	7,249	Unavailable	Unavailable
Bachelor's degree	12.3	18,584	20	28,890	11.2	16,024	21	29,530
Associate's degree	4.1	6,129	10	14,450	3.9	5,532	10	14,060
Some college/no degree	Unavailable	Unavailable	17	24,560	NA	NA	17	23,900
High school diploma or less	Unavailable	Unavailable	43	62,120	0.5	763	41	57,650
Post-secondary vocational training	5.8	8,787	Unavailable	Unavailable	5.1	7,249	Unavailable	Unavailable
Work experience in a related occupation	9.6	14,517	Unavailable	Unavailable	10.1	14,498	Unavailable	Unavailable
Long-term on-the-job-training	7.2	10,815	Unavailable	Unavailable	9.2	13,162	Unavailable	Unavailable
Moderate-term on-the-job-training	16.3	24,569	Unavailable	Unavailable	27.3	39,105	Unavailable	Unavailable
Short-term on-the-job-training	36	54,396	Unavailable	Unavailable	22.5	32,238	Unavailable	Unavailable

^aCalculated using BLS training requirements data.

^bCPS figures for prime-age workers (from projections tables).

^cDisparity between number of jobs for BLS and labor market is a projection error.

^dPostsecondary education includes all education levels higher than a high school diploma.

- *Moderate-term, on-the-job training*: roughly 1 to 12 months of training for workers to acquire the necessary skills. This training is occupation-specific, as opposed to job-specific; thus skills learned should be transferable. It includes employer-sponsored training programs.
- *Short-term, on-the-job training*: a month or less of on-the-job experience and informal training suffices competency in an occupation. Skills learned should be transferable.
- *Postsecondary/non-degree award*: entry leads to an award or certification, not a degree. Training can last from several weeks to a few years. Examples of occupations in this group include nursing aides, EMTs, and hair stylists.

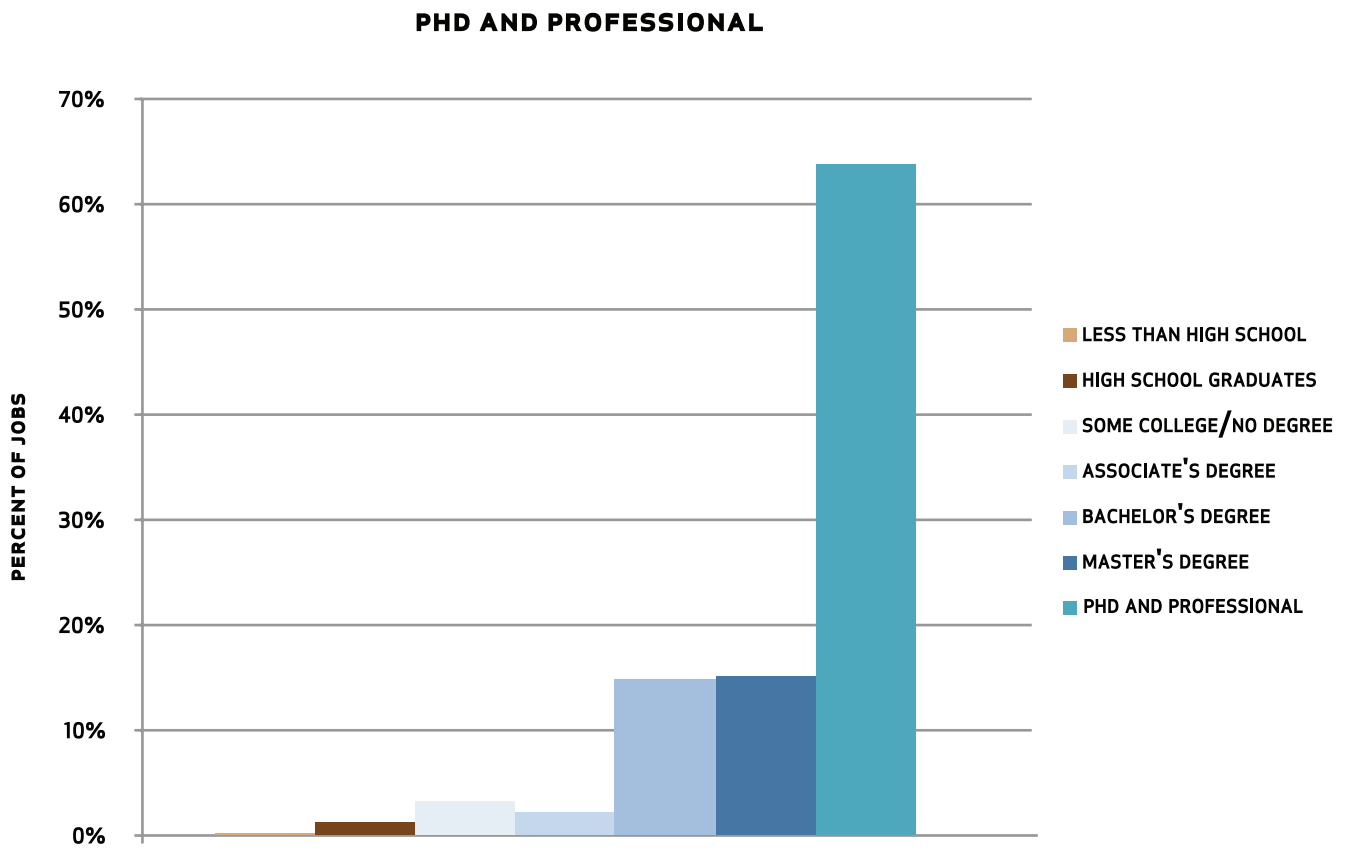
TABLE 3. COMPARISON OF BLS EDUCATION AND TRAINING REQUIREMENTS AND EDUCATION AMONG EMPLOYED WORKERS IN 2008 AND 2010.

Overall, 10 percent of occupations are assigned some sort of work experience and 59 percent come with a predetermined level of on-the-job training (excluding internships/residencies and apprenticeships). While there is no discernible pattern for on-the-job training and work experience assignments in “non-parity” occupations whose educational employment distribution is misaligned with the BLS assignment, Table 3 does reveal a recent BLS preference towards moderate-term on-the-job-training. Conversely, the share of occupations requiring short-term on-the-job training plunged 13.5 percentage points, from 36 percent to 22.5 percent. Finally, despite a rapidly changing job market, the BLS education requirements exhibit virtually no change in the share of jobs requiring postsecondary education.

PHD OR PROFESSIONAL DEGREE DEMANDED FOR ENTRY

Of the 25 occupations that typically require a PhD or professional degree for job entry, most had a dominant share of corresponding levels of educational attainment (Figure 1). All but eight occupations are suited for PhD/professional degrees. Master's degree-holders represented a larger share of employment, yet none of the eight required experience or formal training.

FIGURE 1: PhD or professional degree for entry vs. true PhD employment



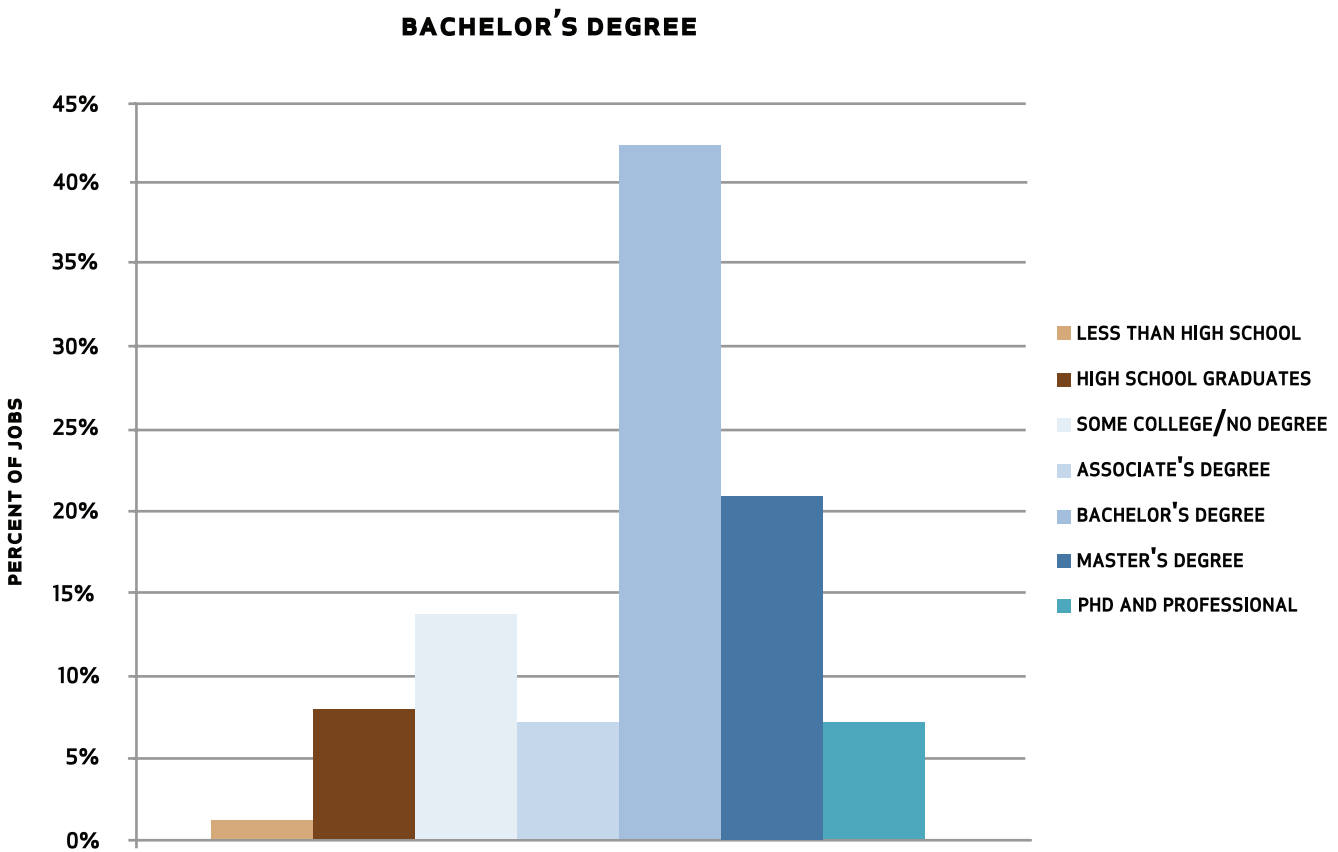
Source : Center on Education and the Workforce analysis of Current Population (CPS) and Bureau of Labor Statistics (BLS) data, 2008, 2010

BACHELOR'S DEGREE DEMANDED FOR ENTRY

Figure 2 is skewed left—as it should be. This group of occupations is the most balanced with respect to college graduates being employed in occupations appropriate for their degree level. While no occupations have a majority

of lower-educated workers, 20 occupations (13%) reveal higher educational standards, notably those with master's degrees. Moreover, five of these 20 occupations seek internship or residency experience but not minimal on-the-job training.

FIGURE 2: Bachelor's degree for entry vs. true employment



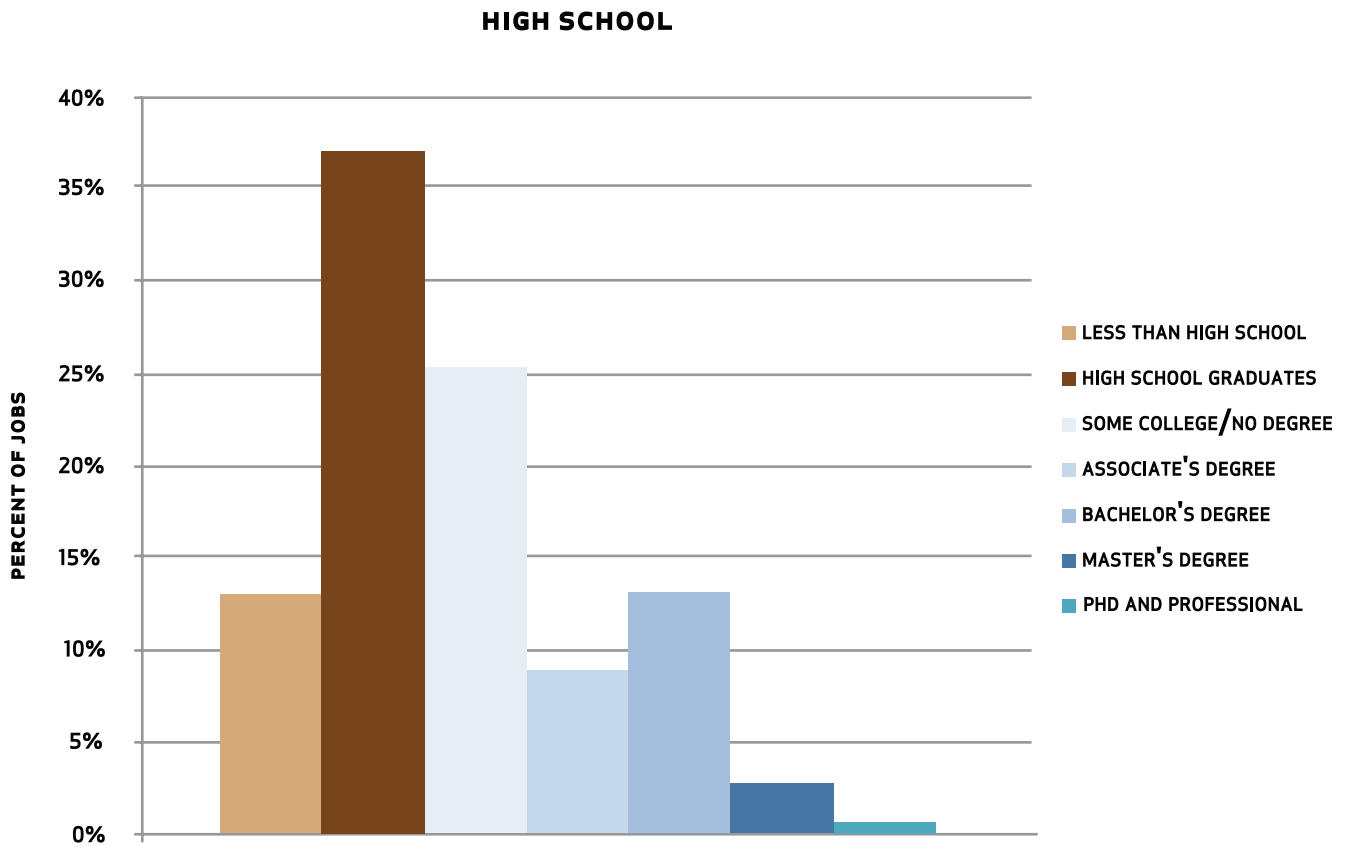
Source : Center on Education and the Workforce analysis of Current Population (CPS) and Bureau of Labor Statistics (BLS) data, 2008, 2010

HIGH SCHOOL DEGREE DEMANDED FOR ENTRY

Figure 3 shows that although high school graduates make up the bulk of their respective employment, a significant portion of better-educated workers are also employed within these occupations. More specifically, 108 of the 350 “high school entry” occupations are predominantly composed of workers with “some college” experience. These “over-qualified” occupations are also more likely to

demand some form of previous experience: 21 of 108 occupations compared to 22 of 237 “parity” occupations. On the other hand, occupations that are indeed dominated by high school graduates are deemed to require most of the apprenticeship experience. Only five cases show workers with less than high school hold a controlling share of “high school entry” occupations.

FIGURE 3: High school diploma for entry vs. true employment

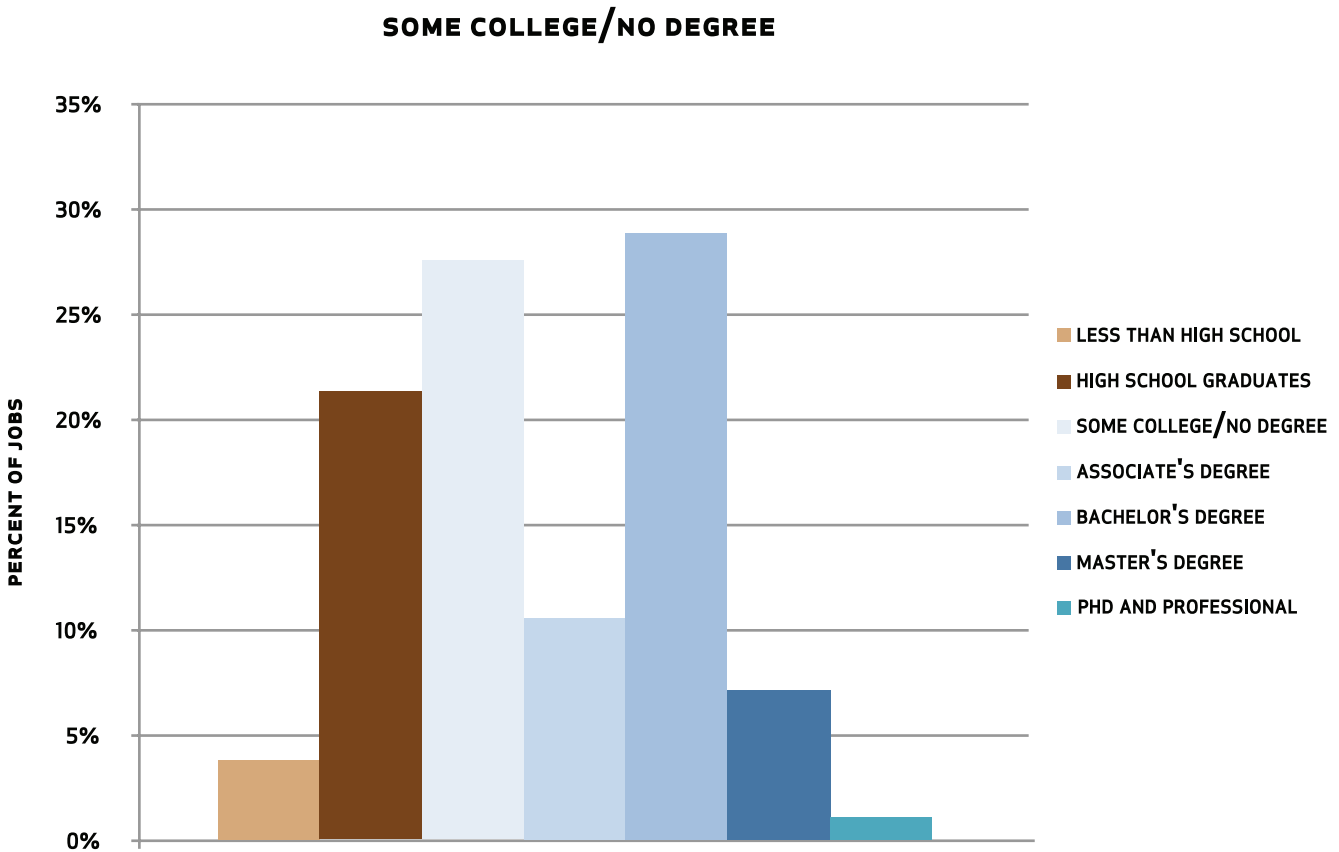


Source : Center on Education and the Workforce analysis of Current Population (CPS) and Bureau of Labor Statistics (BLS) data, 2008, 2010

SOME COLLEGE/NO DEGREE DEMANDED FOR ENTRY

The mere six occupations making up this category are split with respect to educational distribution (Figure 4). However, in terms of overall employment, college graduates (28.8%) are a larger force in “some college” jobs than those with “some college” experience, which account for 27.4 percent of the employment.

FIGURE 4: Some college/no degree for entry vs. true employment

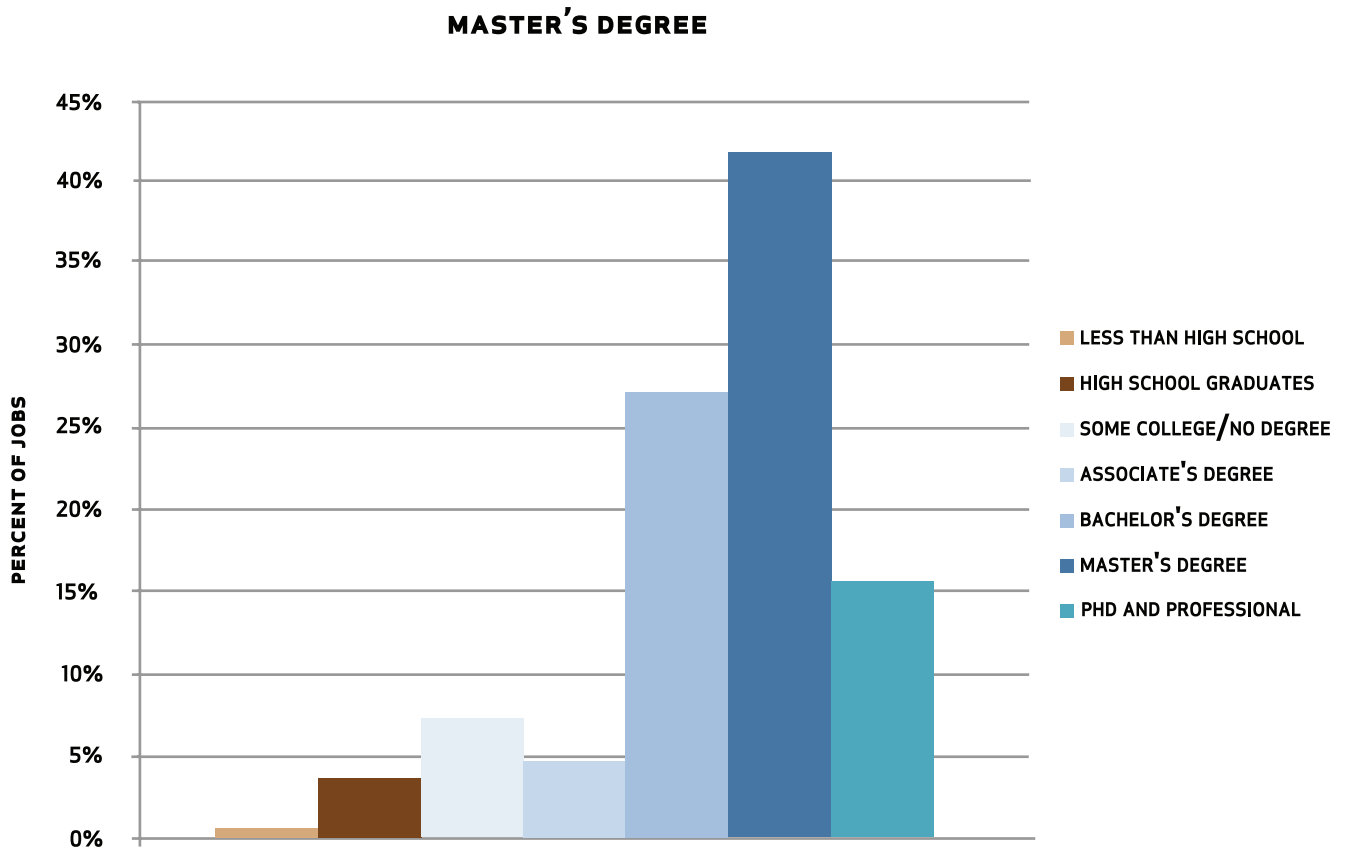


Source : Center on Education and the Workforce analysis of Current Population (CPS) and Bureau of Labor Statistics (BLS) data, 2008, 2010

MASTER'S DEGREE DEMANDED FOR ENTRY

With well over half of individual occupations and 48 percent of total employment in “master’s entry” jobs, this is the second most consistent group of occupations after bachelor’s degrees (Figure 5). Previous training or experience is relatively insignificant for these occupations.

FIGURE 5: Master’s degree for entry vs. true employment

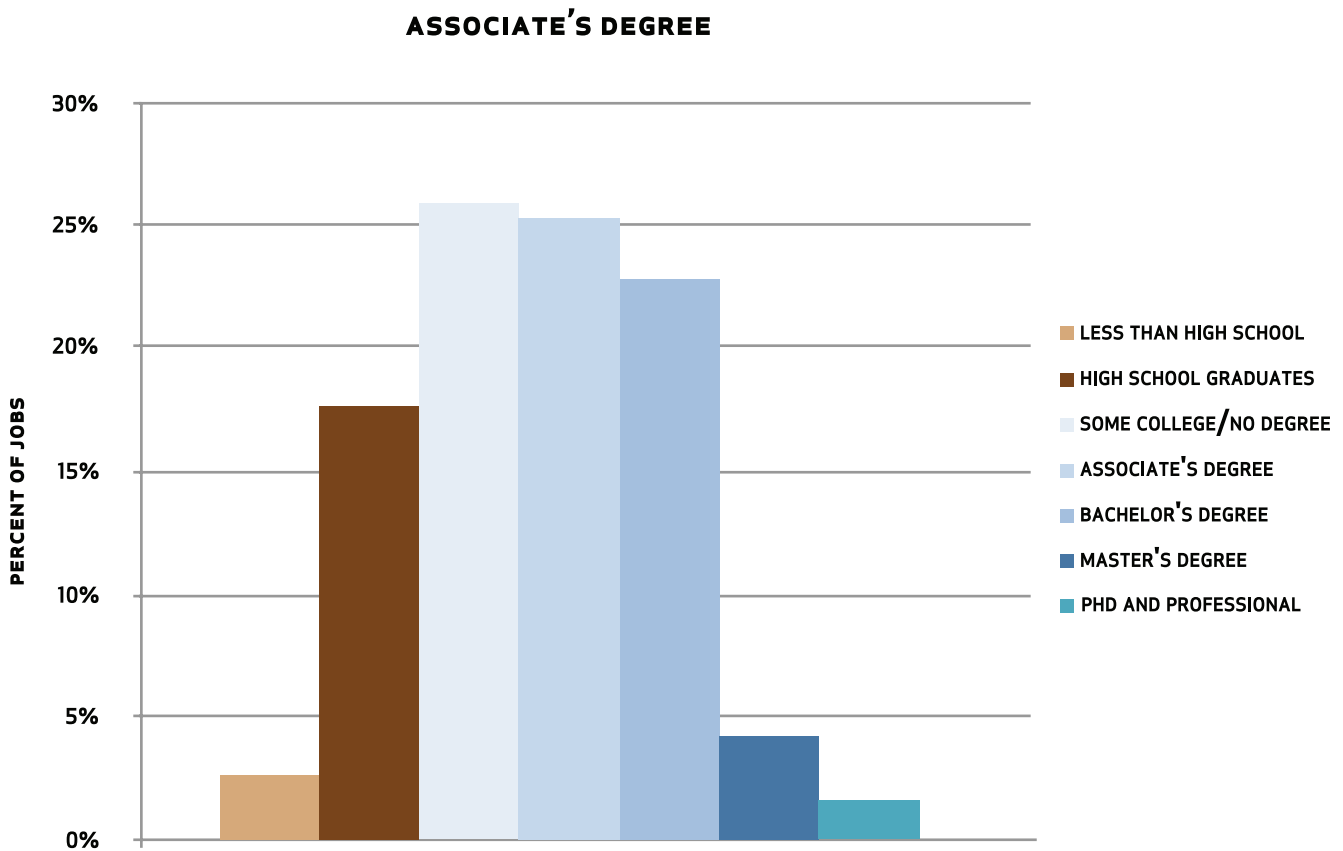


Source : Center on Education and the Workforce analysis of Current Population (CPS) and Bureau of Labor Statistics (BLS) data, 2008, 2010

ASSOCIATE'S DEGREE DEMANDED FOR ENTRY

This category is one of the most inconsistent with respect to employment distribution relative to its BLS assignment (Figure 6). The majority of occupations have either a bigger share of better-educated workers or alternatively, more lower-educated workers. The 32 occupations with a greater share of under-educated workers also tend to call for the bulk of on-the-job training requirements.

FIGURE 6: Associate's degree for entry vs. true employment

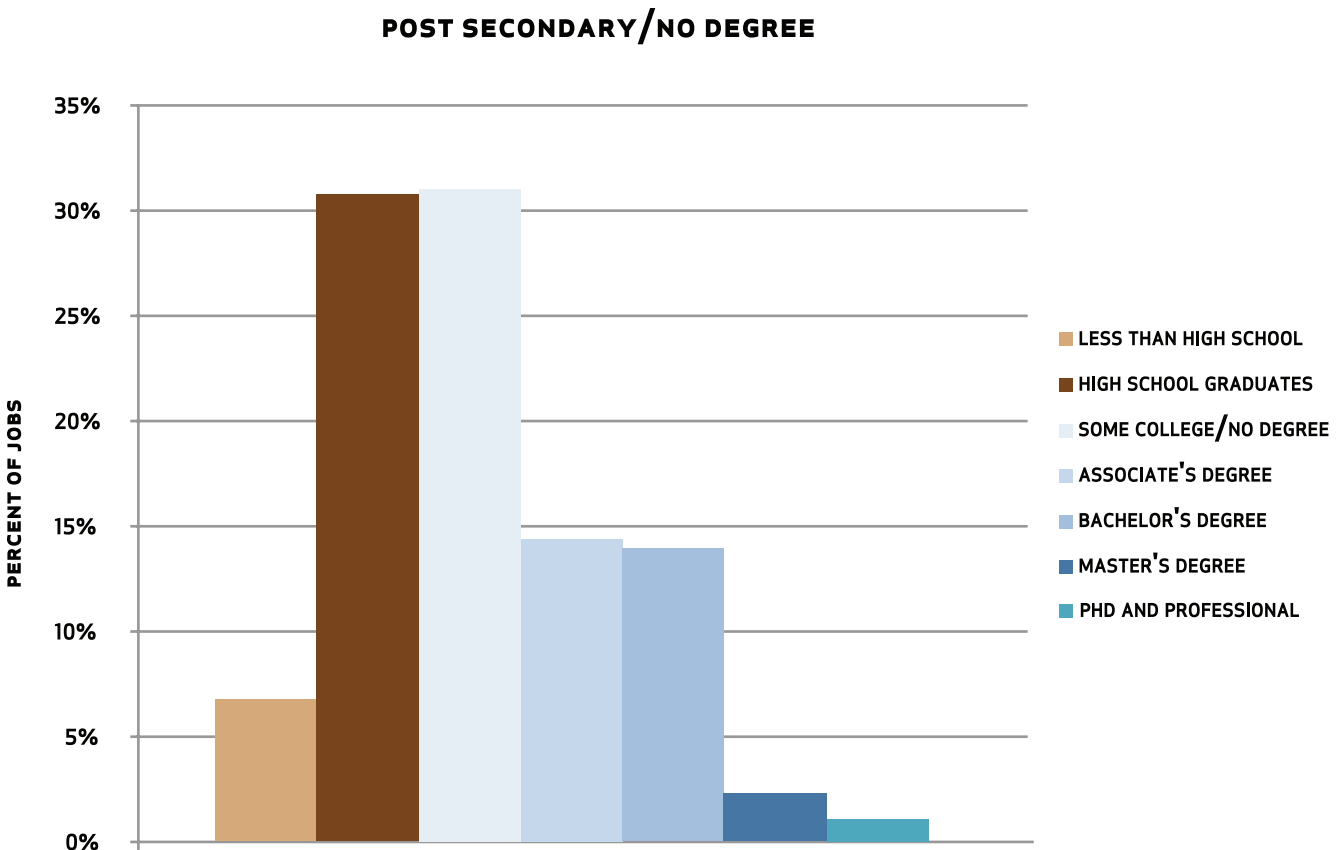


Source : Center on Education and the Workforce analysis of Current Population (CPS) and Bureau of Labor Statistics (BLS) data, 2008, 2010

**POSTSECONDARY/
NO DEGREE EDUCATION DEMANDED FOR ENTRY**

The majority of occupations in this group are dominated either by high school graduates or those with some college experience (Figure 7). In the few cases of higher-educated workers controlling the larger share of the employment pie, such as for commercial pilots, these are college graduates, not associate’s degree-holders.

FIGURE 7: Postsecondary (no degree) for entry vs. true employment

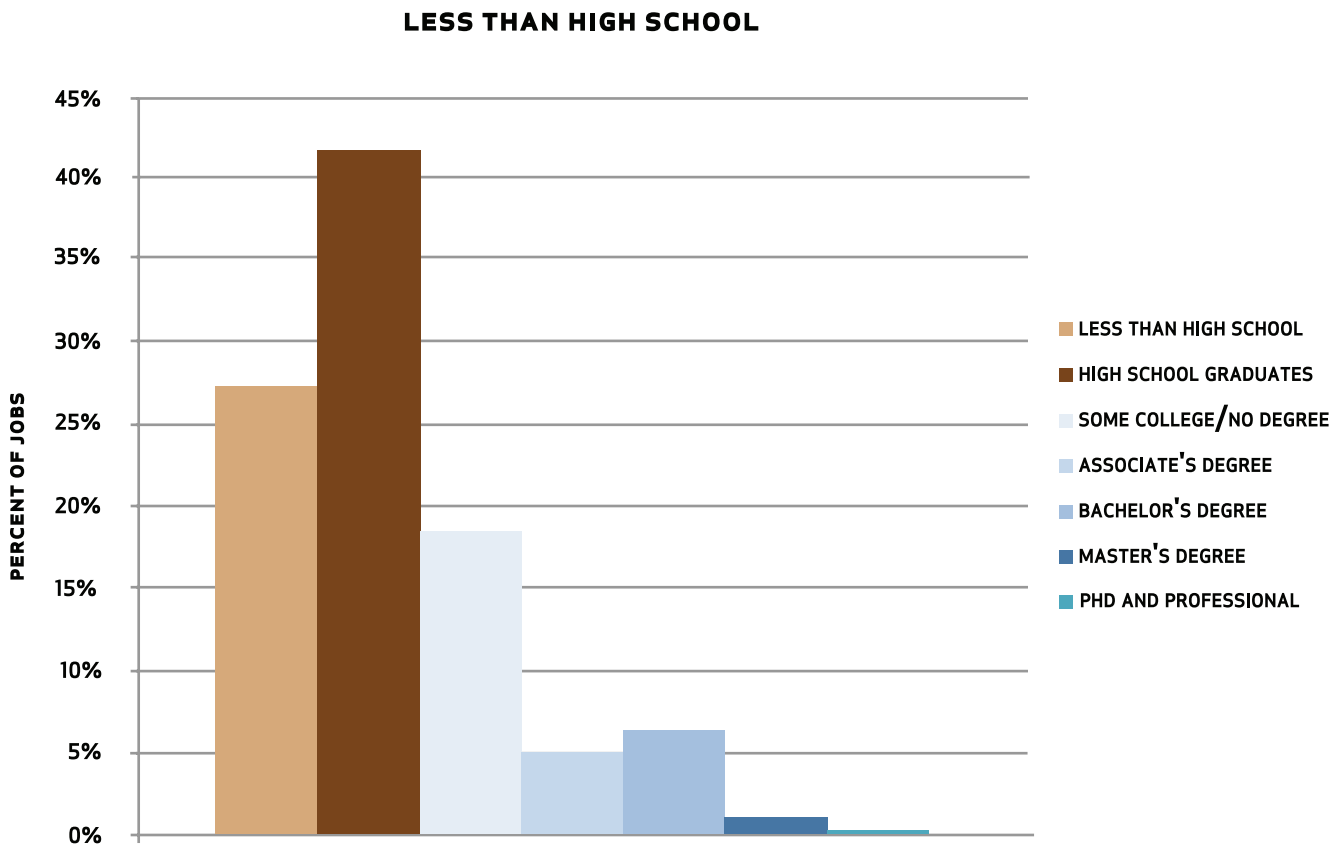


Source : Center on Education and the Workforce analysis of Current Population (CPS) and Bureau of Labor Statistics (BLS) data, 2008, 2010

LESS THAN HIGH SCHOOL DEMANDED FOR ENTRY

“Less than high school entry” is not as skewed right as the PhD assignment group is skewed left (Figure 8). This declining share of the labor force reflects the current premium for better-educated workers. The bulk of occupations (78 of 97) have a larger share of high school graduates than workers with less than high school. By the same token on-the-job training or previous experience is also reflected in this group.

FIGURE 8: Less than high school for entry vs. true employment



Source : Center on Education and the Workforce analysis of Current Population (CPS) and Bureau of Labor Statistics (BLS) data, 2008, 2010

APPENDIX 2 Occupations 2010—Education distribution of total jobs (in thousands)

Occupation	Less than high school	High school diploma	Some college/ no degree	Associate's degree	Bachelor's degree	Master's degree	Professional degree	PhD	Total
Sales & office support	2,380	12,680	9,840	3,850	7,520	1,190	150	50	37,660
Blue collar	6,410	13,250	4,270	2,670	1,550	210	30	10	28,400
Food & personal services	4,900	9,000	4,820	1,780	2,320	330	60	20	23,220
Management	480	3,930	2,680	1,630	6,940	2,980	1,060	280	19,980
Education	70	730	600	420	3,040	2,680	200	410	8,160
Healthcare practitioners & technical	40	400	910	1,500	1,840	640	890	260	6,480
STEM	50	260	1,020	590	2,620	1,150	80	290	6,050
Community services & arts	120	670	890	500	2,650	1,290	110	70	6,290
Healthcare support	360	1,140	1,180	610	290	40	30	10	3,660
Social science	—	—	10	10	160	290	40	190	700
Total	14,810	42,060	26,220	13,560	28,930	10,800	2,650	1,590	140,600

Source: Center on Education and the Workforce forecast of educational demand through 2020

Occupations 2020—Education distribution of total jobs (in thousands)

Occupation	Less than high school	High school graduates	Some college/ no degree	Associate's degree	Bachelor's degree	Master's degree	Professional degree	PhD	Total
Sales & office support	3,050	11,330	10,420	5,790	9,960	1,400	150	40	42,130
Blue collar	7,990	12,390	5,420	2,670	2,000	240	30	10	30,750
Food & personal services	6,590	8,900	5,370	2,810	3,220	410	60	10	27,380
Management	640	2,790	3,440	2,580	10,220	3,700	1,140	240	24,740
Education	100	530	790	660	4,200	3,300	210	340	10,120
Healthcare practitioners & technical	60	450	880	2,450	2,640	810	980	220	8,490
STEM	70	420	830	930	3,620	1,410	80	240	7,600
Community services & arts	160	590	950	790	3,670	1,590	110	60	7,920
Healthcare support	530	1,380	1,360	800	440	60	30	10	4,610
Social science	—	—	10	10	230	370	50	160	830
Total	19,170	38,790	29,460	19,480	40,200	13,310	2,840	1,340	164,590

Source: Center on Education and the Workforce forecast of educational demand through 2020

Industry 2010—Education distribution of total jobs (in thousands)

Industry	Less than high school	High school diploma	Some college/ no degree	Associate's degree	Bachelor's degree	Master's degree	Professional degree	PhD	Total
Financial services	560	5,000	4,530	2,460	9,430	2,050	260	110	24,400
Wholesale & retail trade services	1,680	7,160	4,070	1,830	3,910	620	70	110	19,450
Government & public education services	240	3,540	3,900	2,500	5,290	1,880	370	390	18,110
Healthcare services	560	2,670	2,160	2,220	4,180	2,790	470	620	15,670
Leisure & hospitality services	2,120	4,370	2,580	1,230	2,200	370	20	30	12,920
Manufacturing	1,160	3,680	1,590	990	1,850	670	40	100	10,080
Professional & business services	800	1,910	1,450	880	2,970	1,080	410	190	9,690
Personal services	920	2,580	1,230	930	1,260	430	20	50	7,420
Construction	1,590	3,110	1,120	620	760	140	20	10	7,370
Transportation & utilities services	410	2,140	1,240	670	840	190	20	10	5,520
Natural resources	1,130	1,510	410	270	480	40	10	10	3,860
Private education services	120	590	470	490	920	610	100	140	3,440
Information services	30	560	510	300	970	250	10	10	2,640
Total	11,320	38,820	25,260	15,390	35,060	11,120	1,820	1,780	140,570

Source: Center on Education and the Workforce forecast of educational demand through 2020

Industry 2020—Education distribution of total jobs (in thousands)

Industry	Less than high school	High school diploma	Some college/ no degree	Associate's degree	Bachelor's degree	Master's degree	Professional degree	PhD	Total
Financial services	850	5,670	5,850	3,300	11,900	2,320	430	80	30,390
Wholesale & retail trade services	2,280	7,190	4,680	2,180	4,380	620	100	80	21,510
Government & public education services	330	3,590	4,520	3,020	6,000	1,900	520	290	20,180
Healthcare services	880	3,100	2,860	3,050	5,410	3,230	780	510	19,810
Leisure & hospitality services	3,020	4,610	3,120	1,540	2,600	390	20	20	15,320
Manufacturing	1,480	3,480	1,720	1,110	1,950	630	50	70	10,490
Professional & business services	1,220	2,140	1,870	1,170	3,720	1,210	650	150	12,130
Personal services	1,320	2,720	1,470	1,150	1,480	460	40	40	8,680
Construction	2,150	3,100	1,280	740	850	150	30	10	8,290
Transportation & utilities services	580	2,210	1,460	820	960	200	20	10	6,250
Natural resources	1,260	1,550	500	330	540	60	10	10	4,260
Private education services	190	690	640	680	1,200	720	170	110	4,400
Information services	50	560	580	350	1,080	250	20	10	2,890
Total	15,610	40,610	30,550	19,430	42,060	12,130	2,840	1,380	164,600

Source: Center on Education and the Workforce forecast of educational demand through 2020

APPENDIX 3: Education distribution of occupations (detailed), 2020

HSL : High school diploma or less • SC : Some college/no degree • AA : All associate's degrees • BA+ : All bachelor's degrees or better

Managerial & professional office occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Management	3,306,430	2,262,090	1,183,450	6,093,270	12,845,240	26	18	9	47
Managers, all other	498,480	396,530	176,040	1,140,480	2,211,520	23	18	8	52
Property, real estate, and community association managers	578,770	399,800	161,040	618,500	1,758,110	33	23	9	35
General and operations managers	279,740	333,580	168,240	747,910	1,529,460	18	22	11	49
Farmers and ranchers	766,990	225,110	133,590	295,600	1,421,140	54	16	9	21
Financial managers	119,170	112,740	71,900	471,010	774,810	15	15	9	61
Construction managers	264,880	133,360	81,320	204,360	683,920	39	20	12	30
Chief executives	84,560	92,800	31,300	393,120	601,840	14	15	5	65
Food service managers	205,790	126,550	75,650	128,860	536,900	38	24	14	24
Sales managers	31,420	61,780	28,090	269,930	391,260	8	16	7	69
Medical and health services managers	35,570	33,460	50,880	199,060	319,010	11	10	16	62
Computer and information systems managers	15,950	32,550	24,510	236,060	309,110	5	11	8	76
Farm, ranch, and other agricultural managers	154,840	45,450	26,970	59,680	286,910	54	16	9	21
Education administrators, elementary and secondary school	14,140	20,450	17,640	195,890	248,120	6	8	7	79
Administrative services managers	84,480	41,870	10,750	105,490	242,560	35	17	4	43
Marketing managers	16,170	31,790	14,460	138,910	201,350	8	16	7	69
Engineering managers	8,410	18,380	12,580	122,690	162,050	5	11	8	76
Lodging managers	33,820	27,320	22,080	55,160	138,370	24	20	16	40
Social and community service managers	15,880	15,700	11,460	89,310	132,340	12	12	9	67
Industrial production managers	14,890	12,500	0	99,660	127,070	12	10	0	78
Education administrators, postsecondary	6,400	9,250	7,980	88,670	112,310	6	8	7	79
Transportation, storage, and distribution managers	2,870	25,260	5,440	62,590	96,160	3	26	6	65

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

Managerial & professional office occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Purchasing managers	11,940	6,450	7,860	41,100	67,350	18	10	12	61
Education administrators, preschool and child care center/program	3,680	5,310	4,590	50,920	64,500	6	8	7	79
Public relations managers	1,570	6,910	5,270	49,240	62,990	2	11	8	78
Human resources managers, all other	10,020	10,680	4,720	34,960	60,380	17	18	8	58
Legislators	**	**	**	53,390	54,220	**	**	**	98
Advertising and promotions managers	3,860	3,450	0	43,170	50,490	8	7	0	86
Natural sciences managers	0	0	9,610	35,600	45,200	0	0	21	79
Education administrators, all other	2,100	3,030	2,610	29,030	36,780	6	8	7	79
Compensation and benefits managers	7,390	6,100	4,680	16,560	34,720	21	18	13	48
Training and development managers	11,390	6,850	2,420	8,460	29,110	39	24	8	29
Funeral directors	9,970	8,960	7,970	0	26,900	37	33	30	0
Postmasters and mail superintendents	5,570	3,850	1,550	5,950	16,920	33	23	9	35
Gaming managers	5,450	3,960	0	1,950	11,360	48	35	0	17
Business operations	912,240	932,010	364,430	2,452,330	4,660,950	20	20	8	53
Management analysts	349,540	254,960	28,270	635,180	1,267,820	28	20	2	50
Business operation specialists, all other	190,580	225,930	91,710	516,420	1,024,640	19	22	9	50
Purchasing agents, except wholesale, retail, and farm products	53,780	83,840	30,940	145,190	313,780	17	27	10	46
Compliance officers, except agriculture, construction, health and safety, and transportation	44,630	73,590	44,140	143,120	305,490	15	24	14	47
Claims adjusters, examiners, and investigators	40,340	66,510	39,890	129,350	276,090	15	24	14	47
Human resources, training, and labor relations specialists, all other	35,130	37,820	25,240	144,210	242,420	14	16	10	59
Training and development specialists	16,300	21,700	13,620	183,560	235,160	7	9	6	78
Employment, recruitment, and placement specialists	33,440	36,000	24,030	137,300	230,790	14	16	10	59

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

HSL : High school diploma or less • SC : Some college/no degree • AA : All associate's degrees • BA+ : All bachelor's degrees or better

Managerial & professional office occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Cost estimators	50,180	38,770	20,300	95,970	205,240	24	19	10	47
Wholesale and retail buyers, except farm products	53,390	22,300	7,450	54,070	137,210	39	16	5	39
Compensation, benefits, and job analysis specialists	8,970	11,950	7,490	101,030	129,430	7	9	6	78
Logisticians	14,780	26,310	19,460	47,040	107,590	14	24	18	44
Meeting and convention planners	5,880	7,830	4,910	66,230	84,840	7	9	6	78
Agents and business managers of artists, performers, and athletes	11,450	20,030	5,440	27,870	64,790	18	31	8	43
Emergency management specialists	0	0	0	13,540	13,540	0	0	0	100
Purchasing agents and buyers, farm products	2,290	1,900	0	7,250	11,440	20	17	0	63
Insurance appraisers, auto damage	1,560	2,570	1,540	5,000	10,680	15	24	14	47
Financial services	382,000	573,540	339,210	3,804,430	5,098,910	7	11	7	75
Personal financial advisors	79,780	127,870	50,390	1,383,780	1,641,500	5	8	3	84
Accountants and auditors	83,070	119,860	119,090	1,230,620	1,552,630	5	8	8	79
Financial analysts	19,830	44,980	6,810	477,530	549,200	4	8	1	87
Loan officers	42,700	87,830	35,840	202,360	368,730	12	24	10	55
Appraisers and assessors of real estate	69,750	68,020	61,070	140,390	339,270	21	20	18	41
Financial specialists, all other	12,310	35,810	13,510	90,550	152,180	8	24	9	60
Tax preparers	29,120	19,960	22,940	64,770	136,780	21	15	17	47
Insurance underwriters	14,140	10,460	9,770	52,960	87,330	16	12	11	61
Tax examiners, collectors, and revenue agents	6,480	12,720	11,160	41,130	71,480	9	18	16	58
Credit analysts	7,560	29,360	0	29,850	66,770	11	44	0	45
Budget analysts	12,730	7,340	4,820	37,500	62,390	20	12	8	60
Loan counselors	4,530	9,330	3,810	21,490	39,150	12	24	10	55
Financial examiners	0	0	0	31,500	31,500	0	0	0	100
Legal	47,160	51,660	111,460	1,183,450	1,393,640	3	4	8	85
Lawyers	**	**	**	818,220	830,940	**	**	**	98

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

Managerial & professional office occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Paralegals and legal assistants	0	0	66,210	198,000	264,210	0	0	25	75
Title examiners, abstractors, and searchers	22,250	24,220	15,400	47,690	109,550	20	22	14	44
Legal support workers, all other	13,960	15,200	9,660	29,920	68,730	20	22	14	44
Law clerks	**	**	**	40,780	41,420	**	**	**	98
Court reporters	6,590	7,180	4,570	14,130	32,470	20	22	14	44
Judges, magistrate judges, and magistrates	0	0	5,340	15,970	21,310	0	0	25	75
Arbitrators, mediators, and conciliators	0	0	3,250	9,710	12,960	0	0	25	75
Administrative law judges, adjudicators, and hearing officers	0	0	3,020	9,030	12,050	0	0	25	75

^aThese percentages represent the total for each occupation. Row percentages sum to 100%.

**Data suppressed due to small sample size

Community services & arts occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Community services	326,680	322,790	204,380	1,653,330	2,507,120	13	13	8	66
Social & human service assistants	101,640	99,840	65,340	116,390	383,240	27	26	17	30
Educational, vocational, & school counselors	29,480	32,600	21,730	224,900	308,670	10	11	7	73
Child, family, & school social workers	19,670	24,560	14,430	239,440	298,100	7	8	5	80
Clergy	19,830	17,510	18,780	219,650	275,730	7	6	7	80
Medical & public health social workers	9,950	12,430	7,300	121,150	150,830	7	8	5	80
Mental health & substance abuse social workers	9,470	11,820	6,940	115,200	143,430	7	8	5	80
Rehabilitation counselors	13,500	14,930	9,950	103,030	141,410	10	11	7	73
Mental health counselors	13,030	14,410	9,600	99,400	136,430	10	11	7	73

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

Community services & arts occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Community & social service specialists, all other	30,230	21,440	2,160	62,120	115,970	26	18	2	54
Directors, religious activities & education	17,510	14,480	4,370	69,300	105,660	17	14	4	66
Substance abuse & behavioral disorder counselors	9,390	10,390	6,920	71,660	98,350	10	11	7	73
Probation officers & correctional treatment specialists	24,840	24,400	15,970	28,450	93,660	27	26	17	30
Social workers, all other	5,200	6,490	3,810	63,290	78,800	7	8	5	80
Health educators	6,250	3,780	10,030	44,730	64,790	10	6	15	69
Religious workers, all other	9,920	6,230	2,060	23,020	41,230	24	15	5	56
Counselors, all other	3,650	4,030	2,690	27,820	38,180	10	11	7	73
Marriage & family therapists	3,120	3,450	2,300	23,780	32,640	10	11	7	73
Arts, design, entertainment, sports & media	761,960	885,120	477,960	2,889,310	5,014,210	15	18	10	58
Radio operators	220	145,210	87,180	481,240	862,290	21	18	20	56
Choreographers	9,860	121,380	41,270	243,850	474,880	44	42	1	51
Editors	6,630	43,150	8,970	332,170	405,930	5	9	9	82
Fashion designers	4,180	67,210	56,420	202,280	380,160	14	18	15	53
Producers & directors	5,760	77,190	25,770	155,030	325,820	5	18	4	48
Broadcast news analysts	900	5,720	8,000	274,440	316,210	9	2	3	87
Craft artists	3,880	34,920	24,640	102,000	182,530	11	19	14	56
Technical writers	1,190	40,590	26,570	73,330	181,870	2	4	8	40
Reporters & correspondents	5,330	12,890	12,340	106,320	138,180	9	2	3	77
Dancers	7,350	33,430	11,370	67,170	130,810	44	42	1	51
Graphic designers	54,210	22,960	19,280	69,110	129,890	14	18	15	53
Designers, all other	2,720	19,460	3,970	79,880	109,090	14	18	15	73
Music directors & composers	18,820	26,490	5,130	29,590	105,790	14	26	9	28
Commercial & industrial designers	7,600	14,940	12,540	44,970	84,510	14	18	15	53
Floral designers	12,050	14,470	12,140	43,540	81,830	14	18	15	53
Set exhibit designers	2,480	21,850	0	46,740	79,320	14	18	15	59
Musicians & singers	68,340	15,410	10,310	27,310	77,800	14	26	9	35
Writers & authors	21,680	11,570	12,890	26,190	64,470	5	11	2	41

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**Data suppressed due to small sample size

Community services & arts occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Interpreters & translators	41,390	11,240	12,520	25,430	62,610	23	22	15	41
Art directors	22,350	11,640	8,220	34,010	60,870	11	19	14	56
Public address system & other announcers	6,950	1,090	1,520	52,100	60,040	32	20	13	87
Fine artists, including painters, sculptors, & illustrators	6,990	10,650	7,510	31,100	55,650	11	19	14	56
Multi-media artists & animators	20,970	9,420	7,900	28,340	53,260	11	19	14	53
Public relations specialists	28,050	2,040	3,970	43,050	50,240	9	2	3	86
Media & communication workers, all other	13,820	6,230	6,940	14,100	34,700	21	18	20	41
Artists & related workers, all other	6,390	5,180	4,350	15,590	29,290	11	19	14	53
Sound engineering technicians	3,960	4,440	0	17,520	28,780	21	18	20	61
Photographers	148,830	3,900	0	15,380	25,260	17	17	10	61
Film & video editors	5,990	3,900	0	15,380	25,260	24	15	0	61
Athletes & sports competitors	4,860	10,080	230	2,960	23,880	21	24	8	12
Actors	10,730	5,530	1,850	11,110	23,340	14	28	0	48
Umpires, referees, & other sports officials	10,610	9,360	210	2,750	22,180	44	42	1	12
Entertainers & performers, sports & related workers, all other	44,590	4,320	2,890	7,660	21,820	42	25	5	35
Camera operators, television, video, & motion picture	6,820	360	500	17,230	19,850	24	15	0	87
Media & communication equipment workers, all other	1,760	360	500	17,230	19,850	9	2	3	87
Merch&ise displays & window trimmers	18,520	3,380	2,830	10,160	19,100	14	18	15	53
Broadcast technicians	7,440	3,320	3,700	7,510	18,490	21	18	20	41
Interior designers	11,670	3,080	2,580	9,260	17,410	14	18	15	53
Coaches & scouts	67,870	6,980	160	2,050	16,540	21	24	8	12
Radio & television announcers	24,780	180	260	8,850	10,190	32	20	13	87
Audio & video equipment technicians	13,420	190	210	420	1,040	21	18	20	41

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

HSL : High school diploma or less • SC : Some college/no degree • AA : All associate's degrees • BA+ : All bachelor's degrees or better

Education occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Education, training & library science	992,630	998,530	603,770	7,116,430	9,711,250	10	10	6	73
Archivists	630	580	190	3,780	5,180	12	11	4	73
Audio-visual collections specialists	2,690	1,950	1,220	1,850	7,700	35	25	16	24
Farm & home management advisors	3,330	2,420	1,510	2,290	9,550	35	25	16	24
Museum technicians & conservators	1,370	1,270	420	8,280	11,340	12	11	4	73
Curators	1,390	1,280	430	8,350	11,440	12	11	4	73
Vocational education teachers, middle school	**	**	**	12,570	13,320	**	**	**	94
Vocational education teachers, secondary school	2,390	1,810	930	85,810	90,930	3	2	1	94
Library technicians	44,510	25,340	10,860	22,880	103,580	43	24	10	22
Special education teachers, middle school	2,050	5,560	1,790	99,030	108,430	2	5	2	91
Education, training, & library workers, all other	13,150	7,100	8,340	91,130	119,720	11	6	7	76
Adult literacy, remedial education, & GED teachers & instructors	2,650	7,200	2,320	128,170	140,330	2	5	2	91
Librarians	10,880	13,520	8,050	110,000	142,450	8	9	6	77
Special education teachers, secondary school	2,780	7,560	2,430	134,510	147,280	2	5	2	91
Instructional coordinators	52,920	38,440	24,020	36,430	151,810	35	25	16	24
Kindergarten teachers, except special education	27,290	37,530	29,250	103,990	198,040	14	19	15	53
Special education teachers, preschool, kindergarten, & elementary school	4,640	12,590	4,050	224,110	245,380	2	5	2	91
Self-enrichment education teachers	7,790	21,140	6,800	376,350	412,080	2	5	2	91
Preschool teachers, except special education	67,960	93,460	72,840	258,970	493,180	14	19	15	53
Middle school teachers, except special & vocational education	24,660	21,590	13,270	639,000	698,590	4	3	2	91

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**Data suppressed due to small sample size

Education occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Secondary school teachers, except special & vocational education	28,170	21,320	10,930	1,010,880	1,071,190	3	2	1	94
Teachers & instructors, all other	163,060	256,000	122,750	587,550	1,129,250	14	23	11	52
Teacher assistants	451,620	328,030	204,950	310,930	1,295,530	35	25	16	24
Elementary school teachers, except special education	57,900	50,680	31,170	1,500,360	1,640,280	4	3	2	91

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**Data suppressed due to small sample size

Healthcare professional & technical occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Healthcare professional & technical	635,330	896,480	1,036,630	5,499,750	8,068,200	8	11	13	68
Registered nurses	**	108,860	898,090	1,714,530	2,721,470	**	4	33	63
Physicians & surgeons	**	**	**	793,540	807,680	**	**	**	98
Licensed practical & licensed vocational nurses	162,620	260,100	277,180	62,930	762,750	21	34	36	8
Pharmacy technicians	87,910	131,920	71,300	62,360	353,490	25	37	20	18
Pharmacists	**	**	6,830	250,850	264,730	**	**	3	95
Physical therapists	0	0	24,450	198,400	222,870	0	0	11	89
Emergency medical technicians & paramedics	36,030	81,400	56,990	38,290	212,710	17	38	27	18
Radiologic technologists & technicians	22,860	29,590	114,190	45,750	212,420	11	14	54	22
Dental hygienists	7,090	14,400	93,730	79,110	194,330	4	7	48	41
Medical records & health information technicians	66,020	46,840	7,880	52,880	173,600	38	27	5	30
Speech-language pathologists	**	26,320	89,090	50,230	166,390	**	16	54	30
Medical & clinical laboratory technologists	13,760	21,140	36,910	85,600	157,410	9	13	23	54
Medical & clinical laboratory technicians	13,080	20,100	35,090	81,380	149,650	9	13	23	54

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Healthcare professional & technical occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Dentists, general	0	0	**	125,300	125,410	0	0	**	100
Occupational therapists	0	0	0	122,150	122,160	0	0	0	100
Respiratory therapists	8,450	41,020	23,400	39,970	112,850	7	36	21	35
Surgical technologists	24,430	36,660	19,810	17,330	98,230	25	37	20	18
Healthcare technologists & technicians, all other	13,320	13,560	7,240	59,910	94,020	14	14	8	64
Physician assistants	3,290	8,580	14,300	65,710	91,880	4	9	16	72
Health diagnosing & treating practitioners, all other	8,840	7,670	0	74,430	90,940	10	8	0	82
Veterinary technologists & technicians	21,200	31,810	17,190	15,040	85,250	25	37	20	18
Therapists, all other	**	**	0	77,890	79,490	**	**	0	98
Dietitians & nutritionists	11,320	5,500	7,600	46,220	70,630	16	8	11	65
Veterinarians	**	**	0	68,250	69,650	**	**	0	98
Psychiatric technicians	15,930	23,910	12,920	11,300	64,060	25	37	20	18
Opticians, dispensing	17,030	15,000	10,230	17,510	59,760	28	25	17	29
Chiropractors	**	0	0	59,280	59,500	**	0	0	100
Healthcare practitioners & technical workers, all other	29,590	16,750	6,180	4,370	56,890	52	29	11	8
Diagnostic medical sonographers	5,570	7,210	27,810	11,140	51,730	11	14	54	22
Cardiovascular technologists & technicians	5,510	7,140	27,540	11,040	51,230	11	14	54	22
Occupational health & safety specialists	25,970	14,700	5,420	3,830	49,930	52	29	11	8
Optometrists	0	0	0	45,410	45,410	0	0	0	100
Dietetic technicians	5,960	8,940	4,830	4,220	23,950	25	37	20	18
Recreational therapists	0	450	8,390	12,910	21,750	0	2	39	59
Nuclear medicine technologists	2,300	2,980	11,500	4,610	21,390	11	14	54	22
Podiatrists	0	0	0	20,010	20,010	0	0	0	100
Athletic trainers	9,620	5,440	2,010	1,420	18,490	52	29	11	8
Radiation therapists	**	**	**	15,910	17,020	**	**	**	93
Audiologists	0	930	0	12,990	13,920	0	7	0	93
Respiratory therapy technicians	3,160	4,740	2,560	2,240	12,700	25	37	20	18

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

Healthcare professional & technical occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Occupational health & safety technicians	5,370	3,040	1,120	790	10,320	52	29	11	8
Orthodontists	0	0	**	7,950	7,960	0	0	**	100
Oral & maxillofacial surgeons	0	0	**	7,690	7,700	0	0	**	100
Dentists, all other specialists	0	0	**	7,320	7,330	0	0	**	100
Orthotists & prosthetists	1,740	1,530	1,040	1,790	6,100	28	25	17	29
Prosthodontists	0	0	0	1,030	1,040	0	0	0	100

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

Healthcare support occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Healthcare support	438,920	1,296,580	1,777,110	1,246,550	4,759,210	9	27	37	26
Nursing aides, orderlies, & attendants	0	369,200	708,310	498,260	1,575,780	0	23	45	32
Home health aides	0	326,850	627,060	441,100	1,395,020	0	23	45	32
Medical assistants	132,980	230,400	139,070	56,510	558,950	24	41	25	10
Dental assistants	94,400	117,890	80,640	35,510	328,470	29	36	25	11
Healthcare support workers, all other	108,370	55,010	12,890	27,630	203,900	53	27	6	14
Medical transcriptionists	19,840	66,300	49,150	21,880	157,190	13	42	31	14
Massage therapists	22,830	33,580	36,770	48,340	141,510	16	24	26	34
Veterinary assistants & laboratory animal caretakers	29,280	16,340	8,980	21,330	75,930	39	22	12	28
Physical therapist assistants	8,200	12,840	27,720	24,460	73,230	11	18	38	33
Psychiatric aides	0	15,310	29,370	20,660	65,330	0	23	45	32
Physical therapist aides	5,740	8,990	19,410	17,130	51,280	11	18	38	33
Medical equipment preparers	6,190	20,690	15,340	6,830	49,050	13	42	31	14
Pharmacy aides	6,440	15,900	6,690	13,050	42,070	15	38	16	31
Occupational therapist assistants	3,580	5,600	12,090	10,660	31,930	11	18	38	33
Occupational therapist aides	1,070	1,680	3,620	3,200	9,570	11	18	38	33

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

Food & personal services occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Protective services	831,750	910,130	495,500	905,980	3,143,360	26	29	16	29
Security guards	463,790	301,980	134,420	165,750	1,065,940	44	28	13	16
Police & sheriff's patrol officers	93,950	147,750	105,760	234,260	581,710	16	25	18	40
Correctional officers & jailers	25,880	81,020	51,550	263,730	422,180	6	19	12	62
Firefighters	50,310	107,970	77,160	72,050	307,530	16	35	25	23
Lifeguards, ski patrol, & other recreational protective service workers	32,580	48,070	25,620	4,110	110,380	30	44	23	4
Detectives & criminal investigators	0	47,700	3,280	58,370	109,350	0	44	3	53
First-line supervisors/ managers of police & detectives	23,700	22,930	15,250	27,590	89,470	26	26	17	31
Protective service workers, all other	48,460	19,750	4,520	12,270	85,000	57	23	5	14
Private detectives & investigators	0	50,210	23,870	0	74,080	0	68	32	0
First-line supervisors/ managers, protective service workers, all other	11,980	13,270	14,530	27,030	66,800	18	20	22	40
Crossing guards	49,240	10,660	1,290	2,880	64,070	77	17	2	4
First-line supervisors/ managers of firefighting & prevention workers	11,900	11,700	16,550	12,240	52,390	23	22	32	23
First-line supervisors/ managers of correctional officers	9,020	10,380	8,620	14,000	42,020	21	25	21	33
Bailiffs	6,040	5,620	1,650	2,120	15,420	39	36	11	14
Animal control workers	0	11,950	0	3,210	15,160	0	79	0	21
Fire inspectors & investigators	420	4,570	6,570	2,110	13,660	3	33	48	15
Parking enforcement workers	1,280	2,010	1,440	3,190	7,930	16	25	18	40
Gaming surveillance officers & gaming investigators	0	5,330	2,530	0	7,860	0	68	32	0
Fish & game wardens	3,140	3,750	0	0	6,890	46	54	0	0
Transit & railroad police	0	2,890	0	780	3,670	0	79	0	21
Forest fire inspectors & prevention specialists	60	620	890	290	1,850	3	33	48	15

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**Data suppressed due to small sample size

Food & personal services occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Food preparation & serving related	6,961,420	2,782,330	666,420	687,700	11,098,060	63	25	6	6
Combined food preparation & serving workers, including fast food	1,869,470	595,070	139,530	131,870	2,735,940	68	22	5	5
Waiters & waitresses	1,105,790	743,590	166,760	189,700	2,205,840	50	34	8	9
Cooks, restaurant	637,230	180,910	44,110	36,020	898,270	71	20	5	4
First-line supervisors/managers of food preparation & serving workers	411,660	239,620	91,640	89,220	832,310	49	29	11	11
Food preparation workers	557,530	171,490	27,850	38,990	795,790	70	22	4	5
Cooks, fast food	377,050	107,040	26,100	21,310	531,500	71	20	5	4
Dishwashers	443,830	37,560	13,260	19,170	513,870	86	7	3	4
Bartenders	206,280	174,730	44,940	66,250	492,210	42	36	9	13
Counter attendants, cafeteria, food concession, & coffee shop	341,280	109,220	14,380	2,010	466,930	73	23	3	0
Cooks, institution & cafeteria	279,570	79,370	19,350	15,800	394,090	71	20	5	4
Dining room & cafeteria attendants & bartender helpers	275,830	71,500	22,700	14,780	384,810	72	19	6	4
Hosts & hostesses, restaurant, lounge, & coffee shop	169,600	118,190	17,270	15,420	320,480	53	37	5	5
Food servers, nonrestaurant	104,080	54,450	10,240	19,380	188,150	55	29	5	10
Cooks, short order	107,580	30,540	7,450	6,080	151,650	71	20	5	4
Chefs & head cooks	47,710	18,720	18,970	20,170	105,580	45	18	18	19
Food preparation & serving related workers, all other	0	42,680	0	0	42,680	0	100	0	0
Cooks, all other	14,960	4,250	1,040	850	21,090	71	20	5	4
Cooks, private household	11,970	3,400	830	680	16,870	71	20	5	4
Building and grounds cleaning & maintenance	4,573,600	1,200,810	509,610	411,730	6,695,590	68	18	8	6
Janitors & cleaners, except maids & housekeeping cleaners	1,602,680	339,540	140,200	132,670	2,214,860	72	15	6	6
Maids & housekeeping cleaners	1,444,630	214,920	72,430	96,940	1,829,110	79	12	4	5

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

HSL : High school diploma or less • SC : Some college/no degree • AA : All associate's degrees • BA+ : All bachelor's degrees or better

Food & personal services occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Landscaping & groundskeeping workers	709,720	357,110	141,680	**	1,215,070	58	29	12	**
First-line supervisors/ managers of housekeeping & janitorial workers	428,390	143,900	99,070	113,670	785,030	55	18	13	14
First-line supervisors/ managers of landscaping, lawn service, & groundskeeping workers	106,620	60,890	24,340	49,590	241,430	44	25	10	21
Building cleaning workers, all other	149,250	22,200	7,480	10,020	188,970	79	12	4	5
Pest control workers	67,640	34,030	13,500	**	115,800	58	29	12	**
Tree trimmers & pruners	31,280	15,740	6,240	**	53,550	58	29	12	**
Pesticide handlers, sprayers, & applicators, vegetation	19,360	9,740	3,860	**	33,140	58	29	12	**
Grounds maintenance workers, all other	14,030	2,740	810	1,050	18,630	75	15	4	6
Personal care & services	3,221,140	1,844,480	740,240	1,111,100	6,917,010	47	27	11	16
Child care workers	1,103,830	571,420	207,130	309,270	2,191,880	50	26	9	14
Personal & home care aides	707,730	304,940	115,570	137,720	1,265,830	56	24	9	11
Hairdressers, hairstylists, & cosmetologists	287,700	127,680	168,040	28,130	611,490	47	21	27	5
Recreation workers	89,270	100,150	28,940	177,470	395,870	23	25	7	45
Nonfarm animal caretakers	189,190	107,690	31,090	42,660	370,590	51	29	8	12
Fitness trainers & aerobics instructors	74,850	83,980	24,260	148,810	331,930	23	25	7	45
First-line supervisors/ managers of personal service workers	120,330	68,620	45,080	41,010	275,050	44	25	16	15
Amusement & recreation attendants	110,430	131,570	0	8,800	250,810	44	52	0	4
Personal care & service workers, all other	85,740	32,670	15,320	27,760	161,470	53	20	9	17
Animal trainers	52,700	14,580	3,040	45,770	116,080	45	13	3	39
Ushers, lobby attendants, & ticket takers	44,680	53,230	0	3,560	101,470	44	52	0	4
Flight attendants	20,230	29,870	2,100	35,900	88,090	23	34	2	41
Gaming dealers	43,410	29,180	10,080	5,420	88,080	49	33	11	6

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**Data suppressed due to small sample size

Food & personal services occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Manicurists & pedicurists	35,790	15,880	20,900	3,500	76,060	47	21	27	5
Gaming supervisors	23,550	21,310	2,370	26,150	73,380	32	29	3	36
Residential advisors	23,060	17,300	7,570	8,890	56,810	41	30	13	16
Skin care specialists	24,160	10,720	14,110	2,360	51,340	47	21	27	5
Tour guides & escorts	15,550	16,170	3,940	14,800	50,460	31	32	8	29
Baggage porters & bellhops	28,280	11,240	4,700	5,640	49,860	57	23	9	11
Barbers	30,050	9,730	7,910	**	48,850	62	20	16	**
Entertainment attendants & related workers, all other	21,690	14,380	3,220	5,430	44,730	49	32	7	12
Slot key persons	13,390	12,120	1,350	14,870	41,730	32	29	3	36
Funeral attendants	12,620	11,330	10,080	0	34,030	37	33	30	0
Concierges	10,300	7,460	750	3,540	22,060	47	34	3	16
Shampooers	10,230	4,540	5,980	1,000	21,750	47	21	27	5
Transportation attendants, except flight attendants & baggage porters	8,000	6,530	0	7,070	21,600	37	30	0	33
Locker room, coatroom, & dressing room attendants	7,770	9,250	0	620	17,640	44	52	0	4
Gaming & sports book writers & runners	7,150	4,810	1,660	890	14,510	49	33	11	6
Gaming service workers, all other	5,660	3,810	1,310	710	11,490	49	33	11	6
Motion picture projectionists	4,900	4,150	0	0	9,060	54	46	0	0
Embalmers	2,760	2,480	2,210	0	7,450	37	33	30	0
Travel guides	1,910	1,990	480	1,820	6,210	31	32	8	29
Costume attendants	2,430	2,900	0	190	5,520	44	52	0	4
Makeup artists, theatrical & performance	1,800	800	1,050	180	3,830	47	21	27	5

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**Data suppressed due to small sample size

Sales & office support occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Sales & related	7,176,760	5,140,850	1,821,650	6,787,970	20,927,160	34	25	9	32
Retail salespersons	1,787,830	1,263,890	372,340	870,080	4,294,570	42	29	9	20
Cashiers, except gaming	1,811,010	929,530	167,060	232,380	3,140,310	58	30	5	7
Real estate sales agents	458,120	558,950	335,210	1,372,990	2,725,270	17	21	12	50
First-line supervisors/ managers of retail sales workers	821,280	541,420	208,990	556,740	2,128,220	39	25	10	26
Sales representatives, wholesale & manufacturing, except technical & scientific products	349,830	314,420	119,160	605,640	1,388,760	25	23	9	44
Securities, commodities, & financial services sales agents	144,940	153,130	75,900	946,360	1,320,080	11	12	6	72
First-line supervisors/ managers of non-retail sales workers	317,500	200,920	97,580	451,370	1,067,580	30	19	9	42
Real estate brokers	143,590	175,190	105,070	430,340	854,190	17	21	12	50
Insurance sales agents	179,090	162,830	58,610	392,680	793,130	23	21	7	50
Door-to-door sales workers, news & street vendors, & related workers	352,570	178,500	37,070	104,690	672,840	52	27	6	16
Sales representatives, services, all other	116,240	151,300	58,700	286,600	612,780	19	25	10	47
Sales representatives, wholesale & manufacturing, technical & scientific products	102,910	92,490	35,050	178,160	408,530	25	23	9	44
Counter & rental clerks	176,540	81,500	25,190	82,890	366,120	48	22	7	23
Telemarketers	96,160	83,720	19,080	38,070	237,020	41	35	8	16
Sales & related workers, all other	117,770	59,630	12,380	34,970	224,750	52	27	6	16
Parts salespersons	103,210	48,260	37,120	6,500	195,080	53	25	19	3
Advertising sales agents	22,310	45,070	15,160	79,440	161,990	14	28	9	49
Demonstrators & product promoters	36,690	32,970	12,500	63,520	145,650	25	23	9	44
Travel agents	13,570	43,590	10,230	35,020	102,390	13	43	10	34
Sales engineers	15,250	18,150	18,170	17,870	69,440	22	26	26	26
Gaming change persons & booth cashiers	8,870	4,550	820	1,140	15,370	58	30	5	7
Models	1,480	840	260	520	3,090	48	27	8	17

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**Data suppressed due to small sample size

Sales & office support occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Office & administrative support	8,228,240	6,364,400	2,803,320	4,671,810	22,068,840	37	29	13	21
Office clerks, general	989,730	808,150	378,290	625,730	2,802,180	35	29	14	22
Customer service representatives	819,560	660,650	281,900	511,060	2,273,400	36	29	12	22
Bookkeeping, accounting, & auditing clerks	749,660	610,430	299,530	446,760	2,106,380	36	29	14	21
Secretaries, except legal, medical, & executive	608,240	483,800	287,530	385,310	1,765,050	34	27	16	22
Stock clerks & order fillers	1,022,280	463,320	125,470	134,020	1,745,100	59	27	7	8
Executive secretaries & administrative assistants	494,240	393,130	233,640	313,090	1,434,240	34	27	16	22
First-line supervisors/managers of office & administrative support workers	431,290	367,170	152,220	443,140	1,393,960	31	26	11	32
Receptionists & information clerks	439,180	354,450	117,190	**	1,064,410	41	33	11	**
Shipping, receiving, & traffic clerks	355,780	129,010	43,540	49,140	577,470	62	22	8	9
Medical secretaries	176,570	140,440	83,470	111,850	512,380	34	27	16	22
Tellers	200,860	156,710	70,350	80,720	508,640	39	31	14	16
Billing & posting clerks & machine operators	156,490	174,080	72,630	105,060	508,250	31	34	14	21
Bill & account collectors	163,790	107,150	55,040	98,030	424,010	39	25	13	23
Office & administrative support workers, all other	0	171,990	21,670	106,910	300,570	0	57	7	36
Postal service mail carriers	101,990	97,530	30,080	42,320	271,970	38	36	11	16
Production, planning, & expediting clerks	66,000	73,560	34,400	75,480	249,430	26	29	14	30
Data entry keyers	79,190	55,290	49,850	57,320	241,660	33	23	21	24
Hotel, motel, & resort desk clerks	89,970	86,680	22,740	34,060	233,440	39	37	10	15
Legal secretaries	79,700	63,390	37,670	50,490	231,270	34	27	16	22
Interviewers, except eligibility & loan	68,120	52,640	30,350	72,230	223,350	31	24	14	32
Insurance claims & policy processing clerks	57,960	82,760	35,140	46,110	222,000	26	37	16	21
Couriers & messengers	102,820	48,490	17,330	38,150	206,790	50	23	8	18
Loan interviewers & clerks	61,540	52,920	15,270	53,310	183,060	34	29	8	29

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Sales & office support occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Dispatchers, except police, fire, & ambulance	76,810	44,290	17,360	24,940	163,430	47	27	11	15
Information & record clerks, all other	48,030	43,720	31,490	38,270	161,490	30	27	20	24
Payroll & timekeeping clerks	70,060	42,170	14,070	32,270	158,580	44	27	9	20
Reservation & transportation ticket agents & travel clerks	44,340	60,200	6,400	**	146,040	30	41	4	**
Order clerks	59,910	29,560	16,500	**	144,470	41	20	11	**
File clerks	55,460	37,180	21,750	20,610	135,000	41	28	16	15
Human resources assistants, except payroll & timekeeping	21,650	40,760	6,320	**	131,450	16	31	5	**
Word processors & typists	35,500	43,280	22,700	20,630	122,130	29	35	19	17
Court, municipal, & license clerks	43,460	34,990	15,070	20,270	113,800	38	31	13	18
Switchboard operators, including answering service	63,220	32,890	1,010	15,470	112,610	56	29	1	14
Library assistants, clerical	16,640	51,300	13,030	28,790	109,740	15	47	12	26
Eligibility interviewers, government programs	14,930	26,510	20,110	39,610	101,140	15	26	20	39
Mail clerks & mail machine operators, except postal service	55,090	33,000	12,140	490	100,740	55	33	12	0
Police, fire, & ambulance dispatchers	46,060	26,560	10,410	14,960	98,010	47	27	11	15
Postal service mail sorters, processors, & processing machine operators	31,880	30,890	8,560	18,530	89,860	35	34	10	21
Cargo & freight agents	6,670	5,770	9,570	65,130	87,140	8	7	11	75
Computer operators	29,870	15,470	9,110	23,610	78,060	38	20	12	30
Procurement clerks	42,200	26,900	0	2,790	71,890	59	37	0	4
New accounts clerks	14,910	7,110	18,810	26,140	66,970	22	11	28	39
Office machine operators, except computer	15,470	15,830	9,780	15,930	57,020	27	28	17	28
Weighers, measurers, checkers, & samplers, recordkeeping	33,470	10,590	3,790	7,470	55,320	61	19	7	14
Credit authorizers, checkers, & clerks	18,050	22,900	1,730	9,000	51,690	35	44	3	17

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**Data suppressed due to small sample size

Sales & office support occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Brokerage clerks	16,910	0	5,730	28,150	50,790	33	0	11	55
Postal service clerks	13,840	15,130	9,170	10,160	48,300	29	31	19	21
Meter readers, utilities	13,390	4,630	5,290	6,780	30,100	44	15	18	23
Desktop publishers	6,970	8,500	4,460	4,050	23,980	29	35	19	17
Proofreaders & copy markers	2,100	0	4,280	14,590	20,970	10	0	20	70
Telephone operators	7,580	5,780	2,490	4,480	20,330	37	28	12	22
Statistical assistants	0	9,330	1,180	5,800	16,310	0	57	7	36
Gaming cage workers	5,610	2,850	3,800	0	12,260	46	23	31	0
Correspondence clerks	2,360	1,570	1,910	2,070	7,910	30	20	24	26
Communications equipment operators, all other	840	1,000	0	470	2,300	36	43	0	20

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**Data suppressed due to small sample size

Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Farming, fishing, & forestry	694,280	174,870	7,480	107,300	983,980	71	18	1	11
Miscellaneous agricultural workers	535,920	112,820	0	66,130	714,940	75	16	0	9
Fishers & related fishing workers	40,830	15,470	0	11,690	67,980	60	23	0	17
Supervisors, farming, fishing, & forestry workers	0	31,490	3,970	19,580	55,040	0	57	7	36
Graders & sorters, agricultural products	37,150	3,750	1,370	1,210	43,480	85	9	3	3
Logging equipment operators	32,500	5,010	0	1,950	39,460	82	13	0	5
Animal breeders	13,730	2,200	850	970	17,750	77	12	5	5
Agricultural inspectors	9,100	270	1,290	4,270	14,920	61	2	9	29
Fallers	8,070	1,240	0	480	9,800	82	13	0	5
Forest & conservation workers	5,980	920	0	360	7,260	82	13	0	5
Logging workers, all other	5,960	920	0	360	7,230	82	13	0	5
Log graders & scalers	5,040	780	0	300	6,120	82	13	0	5

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Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Construction & extraction	5,201,470	1,147,420	501,380	492,340	7,342,380	71	16	7	7
Construction laborers	956,270	162,150	47,440	72,960	1,238,690	77	13	4	6
Carpenters	873,940	181,620	61,840	102,460	1,219,740	72	15	5	8
First-line supervisors/ managers of construction trades & extraction workers	455,570	141,360	61,440	86,390	744,770	61	19	8	12
Electricians	277,720	157,770	103,650	42,830	581,970	48	27	18	7
Painters, construction & maintenance	347,980	55,980	21,490	40,640	466,080	75	12	5	9
Plumbers, pipefitters, & steamfitters	287,110	87,110	55,860	17,550	447,630	64	19	12	4
Operating engineers & other construction equipment operators	277,590	50,690	26,060	**	358,460	77	14	7	**
Cement masons & concrete finishers	128,190	18,450	5,300	**	154,160	83	12	3	**
Roofers	136,300	0	0	0	136,300	100	0	0	0
Sheet metal workers	76,230	30,880	12,660	15,900	135,680	56	23	9	12
Highway maintenance workers	96,820	20,810	7,200	5,790	130,610	74	16	6	4
Brickmasons & blockmasons	106,130	9,020	3,700	4,390	123,250	86	7	3	4
Drywall & ceiling tile installers	108,500	5,680	3,940	4,560	122,710	88	5	3	4
Construction & building inspectors	28,010	25,290	20,430	34,900	108,640	26	23	19	32
Helpers, electricians	66,520	15,160	2,470	4,850	89,000	75	17	3	5
Roustabouts, oil & gas	56,230	10,660	15,470	0	82,350	68	13	19	0
Tile & marble setters	61,900	7,910	1,690	**	73,140	85	11	2	**
Helpers, pipelayers, plumbers, pipefitters, & steamfitters	51,310	11,690	1,900	3,740	68,640	75	17	3	5
Structural iron & steel workers	38,950	12,360	9,530	0	60,840	64	20	16	0
Helpers, carpenters	44,820	10,210	1,660	3,270	59,960	75	17	3	5
Pipelayers	37,710	11,440	7,340	2,300	58,790	64	19	12	4
Paving, surfacing, & tamping equipment operators	48,480	0	2,760	0	51,240	95	0	5	0
Construction & related workers, all other	40,820	7,850	2,520	0	51,180	80	15	5	0

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**Data suppressed due to small sample size

Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Carpet installers	41,770	5,340	1,140	**	49,360	85	11	2	**
Service unit operators, oil, gas, & mining	29,240	15,690	3,730	0	48,660	60	32	8	0
Glaziers	30,120	4,260	3,620	5,450	43,450	69	10	8	13
Helpers, extraction workers	33,700	4,800	300	3,050	41,850	81	11	1	7
Hazardous materials removal workers	24,100	5,570	1,960	10,210	41,830	58	13	5	24
Helpers, brickmasons, blockmasons, stonemasons, & tile & marble setters	26,820	6,110	990	1,960	35,880	75	17	3	5
Plasterers & stucco masons	34,170	450	0	940	35,570	96	1	0	3
Fence erectors	30,810	2,130	0	0	32,950	94	6	0	0
Rotary drill operators, oil & gas	19,470	6,910	1,110	1,410	28,900	67	24	4	5
Insulation workers, mechanical	21,070	3,390	1,300	2,460	28,220	75	12	5	9
Septic tank servicers & sewer pipe cleaners	21,400	5,820	0	0	27,230	79	21	0	0
Tapers	23,890	1,250	870	1,010	27,020	88	5	3	4
Derrick operators, oil & gas	16,680	5,920	950	1,210	24,750	67	24	4	5
Insulation workers, floor, ceiling, & wall	20,600	1,030	1,400	280	23,310	88	4	6	1
Extraction workers, all other	18,500	2,630	160	1,680	22,980	81	11	1	7
Boilermakers	21,410	1,310	0	0	22,720	94	6	0	0
Earth drillers, except oil & gas	13,320	7,150	1,700	0	22,170	60	32	8	0
Stonemasons	17,750	1,510	620	730	20,620	86	7	3	4
Floor layers, except carpet, wood, & hard tiles	17,250	2,200	470	**	20,380	85	11	2	**
Reinforcing iron & rebar workers	20,120	0	0	0	20,120	100	0	0	0
Helpers, construction trades, all other	14,750	3,360	550	1,080	19,730	75	17	3	5
Elevator installers & repairers	8,550	4,840	1,920	3,350	18,660	46	26	10	18
Mining machine operators, all other	12,740	1,990	440	560	15,730	81	13	3	4
Rail-track laying & maintenance equipment operators	8,760	5,950	0	0	14,700	60	40	0	0

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**Data suppressed due to small sample size

Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Continuous mining machine operators	10,230	1,600	350	450	12,620	81	13	3	4
Floor sanders & finishers	10,300	1,320	280	**	12,170	85	11	2	**
Helpers, painters, paperhangers, plasterers, & stucco masons	8,990	2,050	330	660	12,030	75	17	3	5
Helpers, roofers	8,610	1,960	320	630	11,520	75	17	3	5
Mine cutting & channeling machine operators	8,260	1,290	280	360	10,200	81	13	3	4
Paperhangers	7,670	0	0	0	7,670	100	0	0	0
Explosives workers, ordnance handling experts, & blasters	1,860	2,230	0	2,440	6,530	28	34	0	37
Rock splitters, quarry	2,340	2,520	0	0	4,860	48	52	0	0
Roof bolters, mining	4,520	40	100	0	4,660	97	1	2	0
Pile-driver operators	4,450	0	0	0	4,450	100	0	0	0
Terrazzo workers & finishers	3,320	480	140	**	3,990	83	12	3	**
Segmental pavers	830	230	0	0	1,060	79	21	0	0
Installation, maintenance & repair	2,687,410	1,229,540	935,460	784,480	5,636,980	48	22	17	14
Maintenance & repair workers, general	310,160	347,910	303,410	362,870	1,324,350	23	26	23	27
Automotive service technicians & mechanics	440,190	107,420	127,900	35,780	711,360	62	15	18	5
First-line supervisors/managers of mechanics, installers, & repairers	207,610	88,160	35,650	64,300	395,680	52	22	9	16
Heating, air conditioning, & refrigeration mechanics & installers	167,420	99,810	37,480	11,310	316,060	53	32	12	4
Industrial machinery mechanics	164,820	64,990	39,810	17,150	286,790	57	23	14	6
Installation, maintenance, & repair workers, all other	184,330	31,410	1,430	68,880	286,050	64	11	1	24
Bus & truck mechanics & diesel engine specialists	159,500	25,700	50,330	**	241,050	66	11	21	**
Telecommunications equipment installers & repairers, except line installers	65,030	60,140	33,090	27,140	185,380	35	32	18	15

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**Data suppressed due to small sample size

Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Telecommunications line installers & repairers	60,530	29,820	48,640	14,070	153,060	40	19	32	9
Automotive body & related repairers	108,700	17,900	16,570	1,170	144,340	75	12	11	1
Computer, automated teller, & office machine repairers	40,460	34,240	34,500	30,390	139,580	29	25	25	22
Mobile heavy equipment mechanics, except engines	83,460	21,390	20,010	**	127,610	65	17	16	**
Helpers—Installation, maintenance, & repair workers	82,190	14,010	640	30,710	127,550	64	11	1	24
Electrical power-line installers & repairers	43,160	21,260	34,680	10,030	109,120	40	19	32	9
Aircraft mechanics & service technicians	40,630	24,760	27,480	10,620	103,500	39	24	27	10
Tire repairers & changers	72,810	16,230	260	**	90,370	81	18	0	**
Security & fire alarm systems installers	39,270	25,770	7,200	8,110	80,350	49	32	9	10
Home appliance repairers	39,700	15,300	2,170	16,040	73,200	54	21	3	22
Electrical & electronics repairers, commercial & industrial equipment	10,170	21,080	17,820	16,570	65,640	15	32	27	25
Maintenance workers, machinery	39,770	13,370	6,920	4,960	65,020	61	21	11	8
Electronic home entertainment equipment installers & repairers	22,210	20,280	7,370	1,540	51,400	43	39	14	3
Medical equipment repairers	11,140	12,500	10,900	13,040	47,580	23	26	23	27
Coin, vending, & amusement machine servicers & repairers	16,030	15,100	6,360	6,680	44,170	36	34	14	15
Control & valve installers & repairers, except mechanical door	20,990	12,510	4,700	1,420	39,620	53	32	12	4
Outdoor power equipment & other small engine mechanics	25,210	7,100	5,750	**	38,290	66	19	15	**
Millwrights	18,660	8,390	9,300	250	36,600	51	23	25	1
Locksmiths & safe repairers	16,340	12,450	0	1,950	30,740	53	41	0	6
Farm equipment mechanics	19,980	5,120	4,790	**	30,550	65	17	16	**
Motorboat mechanics	18,200	5,130	4,150	**	27,640	66	19	15	**

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Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Electrical & electronics repairers, powerhouse, substation, & relay	18,180	0	5,140	1,070	24,390	75	0	21	4
Motorcycle mechanics	15,280	4,300	3,490	**	23,220	66	19	15	**
Rail car repairers	14,470	4,080	3,300	**	21,980	66	19	15	**
Electric motor, power tool, & related repairers	11,560	3,160	3,970	750	19,440	59	16	20	4
Avionics technicians	4,680	7,820	570	3,870	16,940	28	46	3	23
Precision instrument & equipment repairers, all other	3,750	4,200	3,670	4,390	16,000	23	26	23	27
Automotive glass installers & repairers	14,500	1,140	0	0	15,640	93	7	0	0
Electronic equipment installers & repairers, motor vehicles	6,670	6,090	2,210	460	15,440	43	39	14	3
Mechanical door repairers	7,240	4,320	1,620	490	13,670	53	32	12	4
Riggers	9,540	0	1,650	1,590	12,780	75	0	13	12
Electrical & electronics installers & repairers, transportation equipment	11,450	1,110	0	0	12,560	91	9	0	0
Recreational vehicle service technicians	9,300	2,070	30	**	11,540	81	18	0	**
Manufactured building & mobile home installers	10,550	0	0	0	10,550	100	0	0	0
Bicycle repairers	8,300	1,850	30	**	10,310	81	18	0	**
Commercial divers	3,220	3,030	1,270	1,340	8,860	36	34	14	15
Musical instrument repairers & tuners	2,030	2,280	1,980	2,370	8,660	23	26	23	27
Signal & track switch repairers	1,760	0	3,990	0	5,750	31	0	69	0
Camera & photographic equipment repairers	2,380	1,490	890	340	5,100	47	29	17	7
Radio mechanics	1,750	1,620	890	730	4,980	35	32	18	15
Watch repairers	890	1,000	870	1,050	3,820	23	26	23	27
Refractory materials repairers, except brickmasons	890	400	440	10	1,740	51	23	25	1
Fabric menders, except garment	350	330	140	140	960	36	34	14	15
Production	5,536,570	1,509,720	713,880	703,260	8,463,340	65	18	8	8

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**Data suppressed due to small sample size

Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Team assemblers	650,450	160,230	55,900	68,340	934,820	70	17	6	7
First-line supervisors/ managers of production & operating workers	321,020	70,330	84,210	77,350	552,910	58	13	15	14
Inspectors, testers, sorters, samplers, & weighers	201,890	74,680	49,380	69,420	395,330	51	19	12	18
Helpers—Production workers	273,610	90,310	0	25,840	389,750	70	23	0	7
Welders, cutters, solderers, & brazers	243,660	57,920	34,690	10,970	347,250	70	17	10	3
Machinists	223,640	68,040	28,370	24,270	344,320	65	20	8	7
Packaging & filling machine operators & tenders	247,590	33,780	10,520	10,520	302,420	82	11	3	3
Laundry & dry-cleaning workers	169,450	28,230	40,770	36,420	274,900	62	10	15	13
Assemblers & fabricators, all other	175,280	43,180	15,060	18,410	251,910	70	17	6	7
Production workers, all other	166,780	55,050	0	15,750	237,570	70	23	0	7
Cutting, punching, & press machine setters, operators, & tenders, metal & plastic	127,660	17,590	9,420	8,300	162,980	78	11	6	5
Sewing machine operators	124,670	5,870	8,670	20,220	159,430	78	4	5	13
Electrical & electronic equipment assemblers	109,740	22,490	14,770	9,180	156,170	70	14	9	6
Meat, poultry, & fish cutters & trimmers	91,910	25,370	17,500	17,690	152,480	60	17	11	12
Printing machine operators	122,700	16,700	4,320	5,900	149,630	82	11	3	4
Mixing & blending machine setters, operators, & tenders	90,720	40,820	4,800	0	136,340	67	30	4	0
Bakers	80,980	22,350	15,420	15,580	134,330	60	17	11	12
Computer-controlled machine tool operators, metal & plastic	75,080	26,500	16,930	10,800	129,310	58	20	13	8
Water & liquid waste treatment plant & system operators	53,770	40,740	6,120	14,320	114,950	47	35	5	12
Butchers & meat cutters	68,820	19,000	13,110	13,240	114,160	60	17	11	12
Molding, coremaking, & casting machine setters, operators, & tenders, metal & plastic	47,740	61,010	0	0	108,750	44	56	0	0

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**Data suppressed due to small sample size

Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Tailors, dressmakers, & custom sewers	53,580	23,310	4,670	20,270	101,820	53	23	5	20
Food batchmakers	79,740	12,440	4,070	2,870	99,120	80	13	4	3
Cabinetmakers & bench carpenters	56,670	15,950	10,650	14,030	97,300	58	16	11	14
Coating, painting, & spraying machine setters, operators, & tenders	77,720	10,600	3,300	3,300	94,930	82	11	3	3
Structural metal fabricators & fitters	53,670	8,440	21,910	3,610	87,630	61	10	25	4
Slaughterers & meat packers	74,180	7,140	3,050	2,150	86,530	86	8	4	2
Jewelers & precious stone & metal workers	62,420	1,900	3,400	17,180	84,900	74	2	4	20
Upholsterers	49,030	27,490	0	1,000	77,520	63	35	0	1
Extruding, forming, pressing, & compacting machine setters, operators, & tenders	60,310	7,310	0	5,590	73,220	82	10	0	8
Paper goods machine setters, operators, & tenders	46,080	12,220	6,020	4,530	68,850	67	18	9	7
Extruding & drawing machine setters, operators, & tenders, metal & plastic	8,420	17,270	27,480	15,380	68,550	12	25	40	22
Grinding, lapping, polishing, & buffing machine tool setters, operators, & tenders, metal & plastic	58,990	5,040	2,270	0	66,310	89	8	3	0
Woodworking machine setters, operators, & tenders, except sawing	37,230	12,750	12,610	**	63,930	58	20	20	**
Tool & die makers	28,140	14,840	16,720	2,330	62,030	45	24	27	4
Cutting & slicing machine setters, operators, & tenders	40,400	18,180	2,140	0	60,720	67	30	4	0
Multiple machine tool setters, operators, & tenders, metal & plastic	26,470	33,820	0	0	60,290	44	56	0	0
Petroleum pump system operators, refinery operators, & gaugers	15,540	13,950	11,060	11,580	52,120	30	27	21	22
Pressers, textile, garment, & related materials	33,120	8,700	4,310	2,710	48,840	68	18	9	6

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Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Painters, transportation equipment	29,820	9,800	4,830	2,400	46,850	64	21	10	5
Electromechanical equipment assemblers	32,760	6,710	4,410	2,740	46,620	70	14	9	6
Molders, shapers, & casters, except metal & plastic	27,360	5,520	2,000	9,120	44,000	62	13	5	21
Sawing machine setters, operators, & tenders, wood	38,050	3,960	0	0	42,020	91	9	0	0
Photographic processing machine operators	40,140	0	0	0	40,140	100	0	0	0
Welding, soldering, & brazing machine setters, operators, & tenders	27,590	6,560	3,930	1,240	39,320	70	17	10	3
Prepress technicians & workers	32,120	4,370	1,130	1,540	39,170	82	11	3	4
Separating, filtering, clarifying, precipitating, & still machine setters, operators, & tenders	20,980	10,550	4,490	2,600	38,620	54	27	12	7
Dental laboratory technicians	10,150	14,240	9,130	4,860	38,390	26	37	24	13
Chemical equipment operators & tenders	20,830	10,480	4,460	2,580	38,350	54	27	12	7
Job printers	23,510	3,920	5,660	5,050	38,140	62	10	15	13
Stationary engineers & boiler operators	18,730	10,810	6,880	1,080	37,500	50	29	18	3
Aircraft structure, surfaces, rigging, & systems assemblers	24,150	0	5,990	7,320	37,460	64	0	16	20
Bindery workers	22,660	3,770	5,450	4,870	36,760	62	10	15	13
Furniture finishers	20,150	10,630	0	5,140	35,930	56	30	0	14
Chemical plant & system operators	10,550	9,470	7,510	7,860	35,390	30	27	21	22
Power plant operators	16,210	4,470	5,600	8,230	34,500	47	13	16	24
Lathe & turning machine tool setters, operators, & tenders, metal & plastic	19,960	5,010	9,420	0	34,380	58	15	27	0
Crushing, grinding, & polishing machine setters, operators, & tenders	18,350	9,230	3,920	2,270	33,780	54	27	12	7
Food cooking machine operators & tenders	22,880	8,040	2,340	0	33,260	69	24	7	0
Metal workers & plastic workers, all other	26,430	3,600	930	1,270	32,230	82	11	3	4

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Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Ophthalmic laboratory technicians	8,500	11,920	7,640	4,070	32,130	26	37	24	13
Grinding & polishing workers, hand	26,860	3,540	930	0	31,330	86	11	3	0
Engine & other machine assemblers	20,600	6,550	3,150	0	30,300	68	22	10	0
Painting, coating, & decorating workers	17,430	8,660	3,550	**	30,110	58	29	12	**
Plating & coating machine setters, operators, & tenders, metal & plastic	17,930	9,020	0	1,520	28,470	63	32	0	5
Woodworkers, all other	12,170	9,210	1,780	3,580	26,730	46	34	7	13
Rolling machine setters, operators, & tenders, metal & plastic	25,280	0	0	0	25,280	100	0	0	0
Textile winding, twisting, & drawing out machine setters, operators, & tenders	19,930	1,810	2,170	0	23,910	83	8	9	0
Semiconductor processors	22,120	0	0	0	22,120	100	0	0	0
Photographic process workers	21,800	0	0	0	21,800	100	0	0	0
Furnace, kiln, oven, drier, & kettle operators & tenders	12,720	0	680	7,940	21,340	60	0	3	37
Textile knitting & weaving machine setters, operators, & tenders	7,260	10,480	1,810	0	19,550	37	54	9	0
Fiberglass laminators & fabricators	13,240	3,260	1,140	1,390	19,030	70	17	6	7
Forging machine setters, operators, & tenders, metal & plastic	13,110	5,720	0	0	18,830	70	30	0	0
Sewers, hand	16,650	0	2,140	0	18,780	89	0	11	0
Drilling & boring machine tool setters, operators, & tenders, metal & plastic	6,990	11,780	0	0	18,770	37	63	0	0
Milling & planing machine setters, operators, & tenders, metal & plastic	18,410	0	0	0	18,410	100	0	0	0

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Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Heat treating equipment setters, operators, & tenders, metal & plastic	17,380	0	0	0	17,380	100	0	0	0
Gas plant operators	5,040	4,520	3,590	3,760	16,910	30	27	21	22
Cleaning, washing, & metal pickling equipment operators & tenders	12,510	4,130	0	0	16,640	75	25	0	0
Food & tobacco roasting, baking, & drying machine operators & tenders	10,170	2,540	1,600	1,820	16,120	63	16	10	11
Cutters & trimmers, hand	10,630	4,780	560	0	15,980	67	30	4	0
Textile, apparel, & furnishings workers, all other	14,920	140	0	140	15,210	98	1	0	1
Tool grinders, filers, & sharpeners	12,450	0	2,400	0	14,860	84	0	16	0
Metal-refining furnace operators and tenders	6,510	4,740	3,470	0	14,710	44	32	24	0
Tire builders	13,200	760	0	0	13,960	95	5	0	0
Textile cutting machine setters, operators, & tenders	13,920	0	0	0	13,920	100	0	0	0
Cementing & gluing machine operators & tenders	13,580	0	0	0	13,580	100	0	0	0
Medical appliance technicians	3,400	4,780	3,060	1,630	12,870	26	37	24	13
Coil winders, tapers, & finishers	8,270	0	2,050	2,500	12,820	64	0	16	20
Numerical tool & process control programmers	1,460	2,980	4,750	2,660	11,850	12	25	40	22
Etchers & engravers	2,000	2,680	3,860	3,190	11,730	17	23	33	27
Pourers & casters, metal	5,000	3,640	2,670	0	11,320	44	32	24	0
Foundry mold & coremakers	4,930	6,300	0	0	11,230	44	56	0	0
Shoe & leather workers & repairers	7,880	1,300	410	910	10,490	75	12	4	9
Cooling & freezing equipment operators & tenders	9,610	0	690	0	10,310	93	0	7	0
Plant & system operators, all other	2,940	2,640	2,090	2,190	9,870	30	27	21	22
Power distributors & dispatchers	4,440	1,230	1,530	2,250	9,450	47	13	16	24

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**Data suppressed due to small sample size

HSL : High school diploma or less • SC : Some college/no degree • AA : All associate's degrees • BA+ : All bachelor's degrees or better

Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Extruding & forming machine setters, operators, & tenders, synthetic & glass fibers	7,570	690	820	0	9,080	83	8	9	0
Model makers, metal & plastic	6,280	0	1,800	950	9,020	70	0	20	11
Textile bleaching & dyeing machine operators & tenders	8,970	0	0	0	8,970	100	0	0	0
Fabric & apparel patternmakers	0	0	0	7,200	7,200	0	0	0	100
Lay-out workers, metal & plastic	4,690	0	170	2,280	7,150	66	0	2	32
Patternmakers, metal & plastic	3,670	1,700	470	0	5,830	63	29	8	0
Nuclear power reactor operators	2,540	1,920	370	750	5,580	46	34	7	13
Bookbinders	2,940	490	710	630	4,770	62	10	15	13
Shoe machine operators & tenders	2,270	1,320	0	0	3,580	63	37	0	0
Model makers, wood	1,530	810	0	390	2,730	56	30	0	14
Patternmakers, wood	1,270	670	0	320	2,260	56	30	0	14
Timing device assemblers, adjusters, & calibrators	1,350	330	120	140	1,940	70	17	6	7
Transportation & material moving	5,794,320	1,684,300	754,160	948,450	9,181,300	63	18	8	10
Truck drivers, heavy & tractor-trailer	1,051,160	402,390	212,980	298,250	1,964,780	54	20	11	15
Laborers & freight, stock, & material movers, hand	1,352,400	375,820	106,990	89,100	1,924,300	70	20	6	5
Truck drivers, light or delivery services	525,010	200,980	106,380	148,970	981,330	54	20	11	15
Packers & packagers, hand	504,620	80,580	**	**	610,920	83	13	**	**
Industrial truck & tractor operators	393,660	79,880	**	12,110	513,050	77	16	**	2
Bus drivers, school	304,150	79,160	27,610	28,100	439,020	69	18	6	6
Driver/sales workers	275,190	71,620	24,980	25,420	397,210	69	18	6	6
Taxi drivers & chauffeurs	210,540	44,240	67,880	23,500	346,170	61	13	20	7
Cleaners of vehicles & equipment	250,340	40,790	11,930	9,950	313,040	80	13	4	3

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Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Bus drivers, transit & intercity	101,120	37,210	20,390	15,070	173,800	58	21	12	9
First-line supervisors/managers of transportation & material-moving machine & vehicle operators	87,890	20,530	24,630	38,580	171,620	51	12	14	22
Refuse & recyclable material collectors	97,650	25,060	19,760	18,970	161,440	60	16	12	12
First-line supervisors/managers of helpers, laborers, & material movers, hand	81,420	19,020	22,820	35,740	158,990	51	12	14	22
Parking lot attendants	62,730	30,290	11,600	12,990	117,600	53	26	10	11
Machine feeders & offbearers	74,180	3,670	0	3,690	81,530	91	5	0	5
Airline pilots, copilots, & flight engineers	5,280	5,210	7,000	58,980	76,460	7	7	9	77
Motor vehicle operators, all other	42,530	8,940	13,710	4,750	69,930	61	13	20	7
Service station attendants	41,000	15,720	2,050	10,880	69,660	59	23	3	16
Excavating & loading machine & dragline operators	62,070	7,480	0	0	69,540	89	11	0	0
Commercial pilots	10,960	16,190	1,140	19,450	47,730	23	34	2	41
Locomotive engineers & operators	16,330	11,650	10,670	8,870	47,530	34	25	22	19
Transportation workers, all other	15,010	12,260	0	13,260	40,520	37	30	0	33
Railroad conductors & yardmasters	14,970	12,090	4,350	7,070	38,480	39	31	11	18
Captains, mates, & pilots of water vessels	19,090	12,060	3,140	2,930	37,220	51	32	8	8
Crane & tower operators	26,320	5,800	**	**	33,600	78	17	**	**
Sailors & marine oilers	9,490	13,790	7,280	990	31,560	30	44	23	3
Conveyor operators & tenders	30,160	0	0	0	30,160	100	0	0	0
Material moving workers, all other	21,720	5,200	430	1,180	28,530	76	18	2	4
Transportation inspectors	13,920	9,210	2,020	1,310	26,450	53	35	8	5
Air traffic controllers	5,360	7,920	560	9,520	23,360	23	34	2	41
Railroad brake, signal, & switch operators	15,710	7,350	0	0	23,060	68	32	0	0
Wellhead pumpers	14,970	1,600	170	5,910	22,660	66	7	1	26

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

HSL : High school diploma or less • SC : Some college/no degree • AA : All associate's degrees • BA+ : All bachelor's degrees or better

Blue collar occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Ambulance drivers & attendants, except emergency medical technicians	8,970	3,630	2,640	4,640	19,880	45	18	13	23
Ship engineers	2,160	1,640	0	7,650	11,450	19	14	0	67
Tank car, truck, & ship loaders	5,450	1,210	0	3,290	9,950	55	12	0	33
Pump operators, except wellhead pumpers	6,460	690	70	2,550	9,780	66	7	1	26
Gas compressor & gas pumping station operators	6,130	660	70	2,420	9,280	66	7	1	26
Airfield operations specialists	1,680	2,480	170	2,980	7,310	23	34	2	41
Loading machine operators, underground mining	5,640	680	0	0	6,320	89	11	0	0
Subway & streetcar operators	2,330	1,880	680	1,100	6,000	39	31	11	18
Traffic technicians	3,380	1,300	170	900	5,750	59	23	3	16
Aircraft cargo handling supervisors	3,650	1,200	0	340	5,200	70	23	0	7
Bridge & lock tenders	3,860	0	0	0	3,860	100	0	0	0
Rail transportation workers, all other	1,610	590	900	710	3,810	42	16	24	19
Motorboat operators	1,900	1,200	310	290	3,710	51	32	8	8
Shuttle car operators	0	3,080	0	0	3,080	0	100	0	0
Hoist & winch operators	2,170	260	0	0	2,430	89	11	0	0
Dredge operators	1,980	90	30	140	2,240	89	4	1	6

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

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STEM occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Computer & mathematical sciences	260,720	578,680	316,610	2,680,320	3,836,350	7	15	8	70
Computer systems analysts	13,810	99,240	0	484,700	597,800	2	17	0	81
Computer software engineers, applications	17,610	42,990	35,520	496,870	593,000	3	7	6	84
Computer support specialists	82,150	127,580	94,630	233,950	538,310	15	24	18	43
Network systems & data communications analysts	36,760	106,930	40,350	270,380	454,420	8	24	9	60
Computer software engineers, systems software	13,460	32,870	27,150	379,850	453,330	3	7	6	84
Network & computer systems administrators	29,690	86,360	32,590	218,370	367,000	8	24	9	60
Computer programmers	29,970	32,270	43,200	253,080	358,530	8	9	12	71
Computer specialists, all other	25,290	30,430	25,350	130,700	211,770	12	14	12	62
Database administrators	3,370	8,240	6,810	95,220	113,640	3	7	6	84
Operations research analysts	5,110	3,620	5,670	49,300	63,690	8	6	9	77
Computer & information scientists, research	2,490	7,230	2,730	18,280	30,720	8	24	9	60
Statisticians	1,010	920	1,620	20,580	24,130	4	4	7	85
Actuaries	0	0	0	20,320	20,320	0	0	0	100
Mathematical scientists, all other	0	0	810	4,440	5,240	0	0	15	85
Mathematicians	0	0	0	3,300	3,300	0	0	0	100
Mathematical technicians	0	0	180	980	1,150	0	0	15	85
Architecture	41,070	35,700	28,590	208,560	313,930	13	11	9	66
Architects, except landscape & naval	**	**	7,620	140,050	154,820	**	**	5	90
Surveyors	8,420	6,640	3,860	29,290	48,220	17	14	8	61
Landscape architects	**	**	1,420	26,050	28,800	**	**	5	90
Cartographers & photogrammetrists	2,290	1,800	1,050	7,960	13,100	17	14	8	61
Surveying & mapping technicians	28,750	20,390	14,640	5,210	68,990	42	30	21	8
Engineering	215,790	286,560	279,040	1,359,730	2,141,110	10	13	13	64
Civil engineers	18,350	12,900	4,130	245,660	281,010	7	5	1	87
Mechanical engineers	12,370	17,820	18,350	172,030	220,570	6	8	8	78
Industrial engineers	13,670	20,010	26,690	157,650	218,020	6	9	12	72
Engineers, all other	10,640	9,360	11,180	142,100	173,270	6	5	6	82

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

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STEM occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Electrical engineers	7,130	8,690	7,810	113,140	136,780	5	6	6	83
Electrical & electronic engineering technicians	32,970	39,830	36,140	27,080	136,020	24	29	27	20
Electronics engineers, except computer	6,460	7,870	7,080	102,530	123,950	5	6	6	83
Architectural & civil drafters	13,530	27,100	31,320	21,950	93,910	14	29	33	23
Civil engineering technicians	19,320	23,340	21,180	15,870	79,710	24	29	27	20
Aerospace engineers	3,610	4,050	2,580	60,520	70,760	5	6	4	86
Engineering technicians, except drafters, all other	15,630	18,880	17,140	12,840	64,490	24	29	27	20
Mechanical drafters	9,240	18,510	21,390	14,990	64,120	14	29	33	23
Industrial engineering technicians	15,240	18,410	16,700	12,520	62,870	24	29	27	20
Computer hardware engineers	1,980	9,050	6,690	44,210	61,930	3	15	11	71
Environmental engineers	0	4,760	2,990	45,400	53,150	0	9	6	85
Mechanical engineering technicians	9,010	10,880	9,870	7,400	37,160	24	29	27	20
Petroleum engineers	**	0	0	33,070	35,540	**	0	0	93
Electrical & electronics drafters	3,950	7,900	9,130	6,400	27,380	14	29	33	23
Chemical engineers	620	2,540	0	22,480	25,640	2	10	0	88
Health & safety engineers, except mining safety engineers & inspectors	0	2,040	1,280	19,470	22,800	0	9	6	85
Materials engineers	2,430	3,240	3,050	14,070	22,780	11	14	13	62
Biomedical engineers	0	0	5,950	16,630	22,580	0	0	26	74
Environmental engineering technicians	5,240	6,320	5,740	4,300	21,600	24	29	27	20
Nuclear engineers	0	**	0	20,230	20,530	0	**	0	99
Drafters, all other	2,880	5,760	6,660	4,660	19,960	14	29	33	23
Electro-mechanical technicians	3,330	4,020	3,650	2,730	13,730	24	29	27	20
Mining & geological engineers, including mining safety engineers	930	920	460	11,030	13,340	7	7	3	83
Marine engineers & naval architects	**	0	1,980	5,250	7,920	**	0	25	66

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**Data suppressed due to small sample size

STEM occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Aerospace engineering & operations technicians	1,710	2,070	1,880	1,410	7,070	24	29	27	20
Agricultural engineers	0	0	0	2,520	2,520	0	0	0	100
Life & physical sciences	71,810	91,650	62,250	540,170	676,240	8	10	7	74
Medical scientists, except epidemiologists	**	**	**	128,870	130,230	**	**	**	99
Environmental scientists & specialists, including health	**	**	**	84,920	93,290	**	**	5	91
Biological technicians	5,320	20,340	9,490	40,570	75,720	7	27	13	54
Chemists	**	**	**	65,880	69,440	**	**	0	95
Life, physical, & social science technicians, all other	9,940	18,470	9,860	23,870	62,130	16	30	16	38
Chemical technicians	17,170	13,190	6,960	18,360	55,680	31	24	13	33
Geoscientists, except hydrologists & geographers	**	**	**	40,440	44,430	**	**	5	91
Environmental science & protection technicians, including health	5,990	11,120	5,940	14,380	37,430	16	30	16	38
Agricultural & food scientists	**	5,000	4,330	26,040	35,970	**	14	12	72
Geological & petroleum technicians	12,690	6,870	0	15,980	35,530	36	19	0	45
Physical scientists, all other	**	**	**	31,260	32,630	**	**	3	96
Biological scientists, all other	**	**	**	31,650	32,090	**	**	**	99
Forest & conservation technicians	4,880	9,070	4,840	11,720	30,500	16	30	16	38
Biochemists & biophysicists	**	**	**	27,880	28,270	**	**	**	99
Agricultural & food science technicians	9,950	0	5,800	3,900	19,640	51	0	30	20
Zoologists & wildlife biologists	**	**	**	17,650	17,900	**	**	**	99
Conservation scientists	**	**	**	15,050	17,250	**	**	**	87
Microbiologists	**	**	**	16,420	16,650	**	**	**	99
Physicists	**	**	**	13,180	14,880	**	**	11	89
Forensic science technicians	2,270	4,210	2,250	5,450	14,180	16	30	16	38
Life scientists, all other	**	**	**	**	12,360	**	**	**	**
Foresters	**	**	**	9,100	10,430	**	**	**	87

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STEM occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Atmospheric & space scientists	**	**	**	9,650	9,650	**	**	0	100
Materials scientists	**	**	**	7,830	8,600	**	**	5	91
Hydrologists	**	**	**	6,930	7,610	**	**	5	91
Nuclear technicians	2,820	1,140	0	2,820	6,780	42	17	0	42
Epidemiologists	**	**	**	4,990	5,040	**	**	**	99
Astronomers	**	**	**	1,450	1,640	**	**	11	89

^aThese percentages represent the total for each occupation. Row percentages sum to 100%.

**Data suppressed due to small sample size

Social science occupations

Occupation	Educational Attainment				Total jobs 2020	Percent of total jobs ^a			
	HSL	SC	AA	BA+		HSL (%)	SC (%)	AA (%)	BA+ (%)
Social sciences	9,530	41,850	27,500	738,740	853,362	1	5	3	87
Clinical, counseling, & school psychologists	0	**	**	325,660	334,490	0	**	**	97
Market research analysts	**	**	**	271,620	322,160	**	**	**	84
Urban & regional planners	0	**	**	28,810	38,930	0	**	**	74
Survey researchers	**	**	**	**	35,740	**	**	**	**
Psychologists, all other	0	**	**	33,660	34,570	0	**	**	97
Social scientists & related workers, all other	**	**	**	29,190	33,300	**	**	**	88
Social science research assistants	9,530	3,860	0	9,530	22,920	42	17	0	42
Economists	**	0	0	15,630	16,980	**	0	0	92
Anthropologists & archeologists	**	**	**	5,340	6,100	**	**	**	88
Sociologists	0	0	0	5,710	5,710	0	0	0	100
Political scientists	**	**	**	4,110	4,700	**	**	**	88
Industrial-organizational psychologists	0	**	**	4,230	4,350	0	**	**	97
Historians	**	**	**	3,430	3,920	**	**	**	88
Geographers	**	**	**	1,820	2,070	**	**	**	88

^aThese percentages represent the total for each occupation. Row percentages may not sum up to 100 percent due to rounding.

**Data suppressed due to small sample size

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Recovery: Job Growth and Education Requirements Through 2020 is
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